Ñawpa Pacha

Journal of the Institute of Andean Studies

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/ynaw20

The Cloud People of Naupallacta: Middle Horizon Camelid Management in the Hinterland of the Chicha Soras Valley

Frank M. Meddens, Dannal M. Aramburu Venegas, Nicholas P. Branch, Lars Fehren-Schmitz, Beverley J. Meddens & Cirilo Vivanco Pomacanchari

To cite this article: Frank M. Meddens, Dannal M. Aramburu Venegas, Nicholas P. Branch, Lars Fehren-Schmitz, Beverley J. Meddens & Cirilo Vivanco Pomacanchari (23 Oct 2024): The Cloud People of Naupallacta: Middle Horizon Camelid Management in the Hinterland of the Chicha Soras Valley, Ñawpa Pacha, DOI: 10.1080/00776297.2024.2399428

To link to this article: https://doi.org/10.1080/00776297.2024.2399428

Published online: 23 Oct 2024.

The Cloud People of Naupallacta: Middle Horizon Camelid Management in the Hinterland of the Chicha Soras Valley

Frank M. Meddens, Dannal M. Aramburu Venegas, Nicholas P. Branch, Lars Fehren-Schmitz, Beverley J. Meddens and Cirilo Vivanco Pomacanchari

Archaeological, ethnographic, and rural development work over the past 50 years in the Chicha Soras area has revealed that the region was first intensively used from the Middle Horizon Epoch 2 (AD 680/700–900) onward. An introduced population here had its seven occupation sites focused on the southern part of the Chicha valley and supported agriculture and textile production, while settlement in the upper Rio Yanamayo and west of the Rio Huayllaripa comprising the Naupallacta complex, served the management of camelid herds, which provided transport, fiber, and meat resources. The interrelationship between the arable farmers and camelid pastoralists produced a mutually supportive resource base for the local agropastoral community, and tribute produced for distant elite Wari administrators. This is confirmed by the interdisciplinary data sets presented here, including demographic, architectural, artefactual, archaeozoological, paleoenvironmental and aDNA results.

Investigaciones arqueológicas, etnográficas y de desarrollo rural realizados durante los últimos 50 años en el área de Chicha Soras han revelado. que la región fue utilizada intensivamente por primera vez a partir de la Época 2 (~680/700–900 d.C.) en adelante. Una población introducida aquí tuvo sus siete sitios habitacionales condel Horizonte Medio centrados en la parte sur del valle de Chicha y apoyó la producción agrícola y textil, mientras que el asentamiento en el alto río Yanamayo y al oeste del río Huayllaripa que comprende el complejo de Naupallacta, sirvió para el manejo de rebaños de camélidos, que proporcionaban transporte, fibra, y carne. recursos cárnicos. La interrelación entre los agricultores y los pastores de camélidos produjo una base de recursos de apoyo

Frank M. Meddens, School of Archaeology, University of Reading, Reading, RG6 6AB, UK (F.Meddens@Reading.ac.uk)

Dannal M. Aramburu Venegas, Independent Archaeologist and GIS specialist, Jr. Tarapacá N° 114 district and province of Concepción, Junín 12300, Peru (dannalaramburu@hotmail.com)

Nicholas P. Branch, Department of Geography and Environmental Science, University of Reading, Reading, RG6 6AB, UK (n.p.branch@reading.ac.uk)

Lars Fehren-Schmitz, Department of Anthropology, University of California Santa Cruz, 1156 High Street, Santa Cruz, CA 95064, USA (lfehrens@ucsc.edu)

Beverley J. Meddens (†2018)

Cirilo Vivanco Pomacanchari, Facultad de Ciencias Sociales, Universidad Nacional San Cristóbal de Huamanga, Portal Independencia N° 57 – Ayacucho, Peru (civipo9@gmail.com)

Ñawpa Pacha, Journal of the Institute of Andean Studies, pp. 1–34.

mutuo para la comunidad agro pastoril local, y un tributo producido para los distantes administradores de élite Wari. Esto lo confirman los conjuntos de datos interdisciplinarios presentados aquí, incluso incluidos resultados demográficos, arquitectónicos, artefactos, arqueos zoológicos, paleo ambiéntales, y ADNa.

Keywords: camelid herding, camelid fiber, Naupallacta, Chicha Soras, Middle Horizon

The Pampachiri sector of the Chicha Soras region of Peru, on the east bank of the Rio Chicha is known for camelid herding in later prehistoric times (Espinosa Soriano 2019:1144). In the early seventeenth century, the community here comprised the Anta and Mayo *ayllus* (cloud and river lineages) (Espinosa Soriano 2019:1148). The Chanca occupied the region east of the Rio Chicha (Espinosa Soriano 2019:1149), and the Soras the lands to the west (Espinosa Soriano 2019:1188, 1190). The initial establishment of an agricultural population in the upper Chicha Soras valley and their interactions with the pastoralists in the hinterland during Middle Horizon Epoch 2[1] is examined. The multidisciplinary analysis of animal bone and artifact assemblages, environmental sequences, agricultural and pastoralist infrastructure and details of inter- and intra-site planning addresses questions regarding the role of arable agriculture and organization of camelid management. We review the agropastoral interactions between a high puna Wari camelid fiber production and management site complex and its related agricultural valley demographic.

The Earlier Prehistory in the Chicha Soras Area

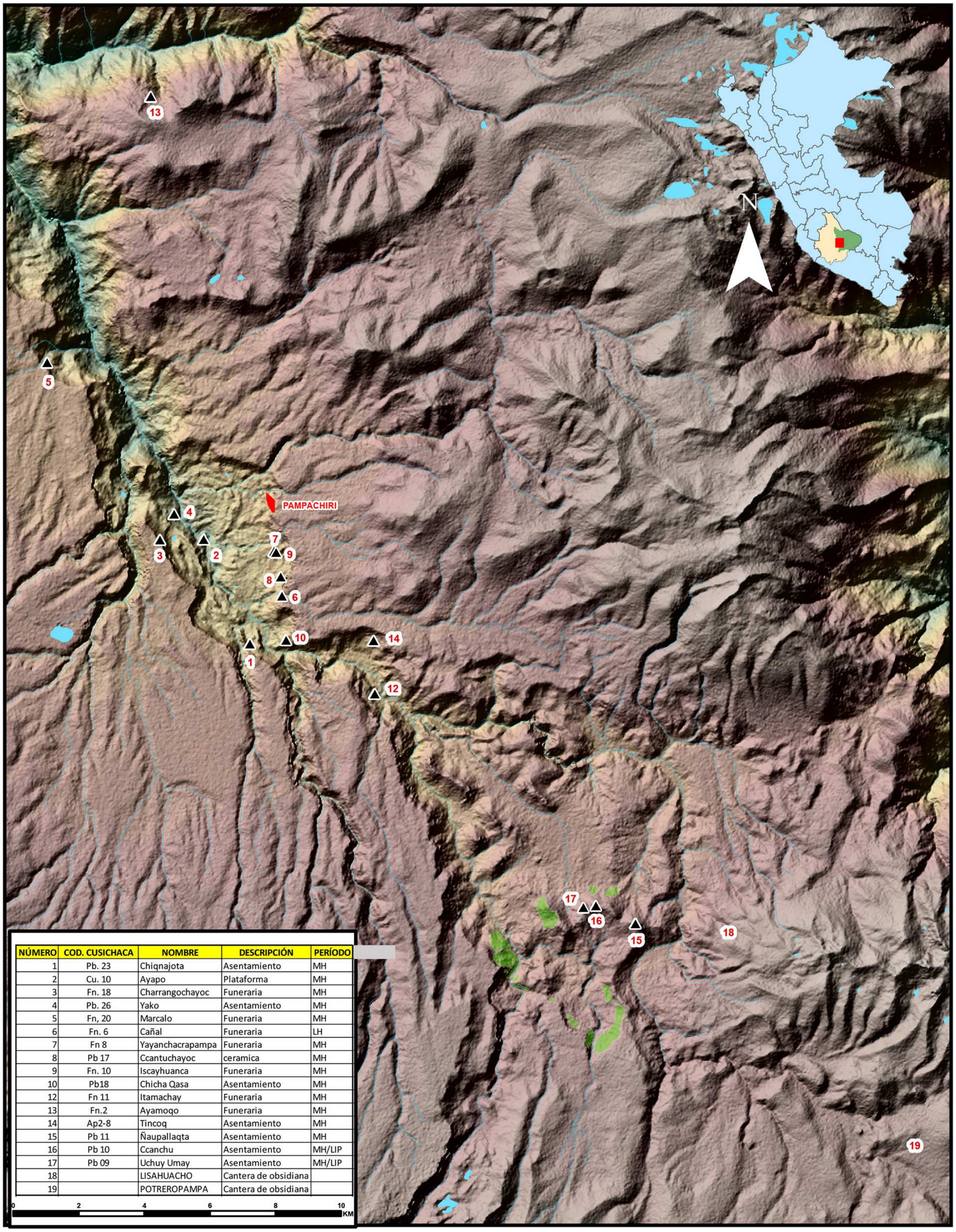
The Preceramic saw occasional lithic scatters from small transient hunter-gatherer bands (Espinoza Martínez 1995:158–159), followed by a few small Initial Period sites dating to c. 1410–1220 Cal BC (Grossman 1983). Human activity in the area from the late Initial Period onward is limited, until Middle Horizon Epoch 2 (~AD 680/700–900). The adjacent Sondondo and Negromayo valleys to the west and the Andahuaylas area to the northeast in contrast provide considerable occupational remains of Early Horizon (1200–200 BC) and Early Intermediate Period (200 BC–AD 600) date (Bauer et al. 2010; Grossman 1983; Schreiber 1992).

For the Chicha Soras valley some material with similarities to the south coastal Paracas and Qasawirka styles from Andahuaylas (Bauer et al. 2010:59–64, 163–171 passim; Grossman 1983), dating to the Early Horizon and Early Intermediate periods, comes from the southern margin of the site of Chiqna Jota (Espinoza Martínez 1995:159–160; Mallco Huarcaya 2013).

Early Intermediate Period Huarpa ceramics come from Tororayoq-Huahuerqa on the east bank of the Rio Chicha (Mallco Huarcaya 2013:254–255; Mallco Huarcaya and Angulo Paredes 2016:62). A little Huarpa pottery came from agricultural terracing at Huaylla (So 5-A1) on the west bank of the Rio Negromayo in the Sondondo area (Cazorla Zen 2006). The rare Huarpa presence in the Chicha Soras and Negromayo basins suggests restricted and intermittent interregional Early Intermediate Period contact with Huarpa in Ayacucho and Huanta, with the equally small quantities of Early Intermediate Period Qasawirka finds indicating links with Andahuaylas and the Ica Paracas material demonstrating linkages with the south coast. The marginal Early Intermediate Period occupation and the absence of Middle Horizon Epoch 1 ceramics from the Chicha Soras valley confirms that the subsequent significant Middle Horizon Epoch 2 population resulted from inward migration from elsewhere.

The Middle Horizon Occupation of the Chicha Soras Valley

Over 30 km of the valley has been investigated archaeologically with 13 sites with Middle Horizon activity being identified (Figure 1). Seven evidence habitation, all situated south of the present-day village of Larcay. Six are exclusively associated with funerary evidence with two of these being north of



NÚMERO	COD. CUSICHACA	NOMBRE	DESCRIPCIÓN	PERÍODO
1	Pb. 23	Chiqnajota	Asentamiento	MH
2	Cu. 10	Ayapo	Plataforma	MH
3	Fn. 18	Charrangochayoc	Funeraria	MH
4	Pb. 26	Yako	Asentamiento	MH
5	Fn, 20	Marcalo	Funeraria	MH
6	Fn. 6	Cañal	Funeraria	LH
7	Fn 8	Yayanchacrapampa	Funeraria	MH
8	Pb 17	Ccantuchayoc	ceramica	MH
9	Fn. 10	Iscayhuanca	Funeraria	MH
10	Pb18	Chicha Qasa	Asentamiento	MH
12	Fn 11	Itamachay	Funeraria	MH
13	Fn.2	Ayamoqo	Funeraria	MH
14	Ap2-8	Tincoq	Asentamiento	MH
15	Pb 11	Ñaupallaqta	Asentamiento	MH
16	Pb 10	Ccanchu	Asentamiento	MH/LIP
17	Pb 09	Uchuy Umay	Asentamiento	MH/LIP
18		LISAHUACHO	Cantera de obsidiana	
19		POTREROPAMPA	Cantera de obsidiana	

Figure 1. Middle Horizon site distribution in the Chicha Soras valley and on the adjoining altiplano.

Larcay. The site of Yako produced Ocros, Viñaque and Huamanga style ceramics, chert, basalt, lithics as well as copper alloy objects and metal working slag (Meddens and Cook 2000). Others such as Chiqna Jota (Figure 2) occupied from the Middle Horizon Epoch 2 to the early Colonial period had Black Decorated C, Viñaque and Huamanga material (Meddens 1985; Meddens and Branch 2010).

The Rio Yanamayo Tributary, Its Hinterland and Context

Present-Day Herding Activities

Animals grazed on pastures on the Pampa Pabellones and along the Rio Yanamayo and Yaruc Mayo and their tributaries (feeding into the Rio Chicha) are dominated by camelids, principally alpacas. Herds average 85 percent alpacas and 15 percent llamas ranging from 80 to 160 heads, tending to split into 3 percent adult males, 94 percent adult females and 3 percent castrates. Females are kept up to 6 years of age for their fiber, males being culled at ≤2 years. Herds are family owned and an average family will butcher 15 heads yearly for family consumption and trade. A typical herd will produce c. 53 newborns per year with losses low, in the order of 10 percent. Herds provide meat and fiber, and llamas are not used for transport. Alpacas are sheared as required, mostly during the wet season (November to March). Llama fiber is removed from the skins after slaughter. Fiber is traded with local intermediaries for onward sale to markets of Cuzco, Puno and Arequipa. The animals are slaughtered by family heads, with most meat converted to *charki*, with the exception of the neck, ribs and offcuts, which are consumed fresh. Approximately 20 percent of the fresh meat and charki is traded locally in Llamcama, at market in Pampachiri or to the Programa Nacional de Asistencia Alimentaria in Andahuaylas, with 80 percent serving for family consumption. Pastures are not irrigated, and herd excrement is used locally as fertilizer for potato and quinoa crops. Families have small numbers of cattle and sheep averaging up to 17 of the former and 30 of the latter (Masco 2022). The *herranza* is between April and July in the family corral. Camelids have their ears cut and colorful woolen threads attached (Medina Gamboa 2013:182). Pastureland includes extensive areas of *bofedales*. Herds roam largely unaccompanied by herders. The late arrival of the wet season in 2022 resulted in major livestock losses, particularly of young and juvenile animals.

Though animal husbandry dominates, there is some subsistence agriculture across the area. In 2007 the Cusichaca Trust identified 182 ha of cultivated land, with 172 ha lying fallow and 168 ha of former cultivated land having been permanently abandoned. The ecozone here is *suni* (3500–4000 m asl). The area around the camelid management complex of Naupallacta, within 2 to 4 km, to the north, west and south includes stretches of types 2 and 3 irrigated and unirrigated terracing (Kendall and Rodrigues 2015 [2009]:73–75) (Figure 3). The unirrigated type 3 terracing totaled 68.4 ha, of which 7.5 ha was lying fallow and the rest not used. There was a total of 132 ha of type 2 irrigated agricultural terracing (Kendall and Rodrigues 2015 [2009]:69–73), likely of prehistoric origin with Kendall and Rodrigues attributing type 2 terracing to the Middle Horizon (idem).

Relic populations of *queñua* trees (*Polylepis* sp) are present in quebradas, indicative of the region once being substantially more forested than it is today.

Archaeological Context

Upstream of the Rio Yanamayo, overlooking the Rio Huayllaripa is the c. 4 ha site of Naupallacta, on a high mesa (Figures 1 and 4) (UTM 18L 669,962.00 m E 8,418,245.00 m S 3960 m asl). There are 85 structures, 22 are orthogonal, measuring c. 7 × 6 m with c. 0.60 m thick walls of fieldstone in mud mortar, with living spaces averaging 35–42 m^2 (Figure 5). These are the main buildings, their role appearing habitation related. Some have niches measuring c. 0.30 × 0.25 m by 0.30 (Figure 6) and a few have small windows (Figure 7). These

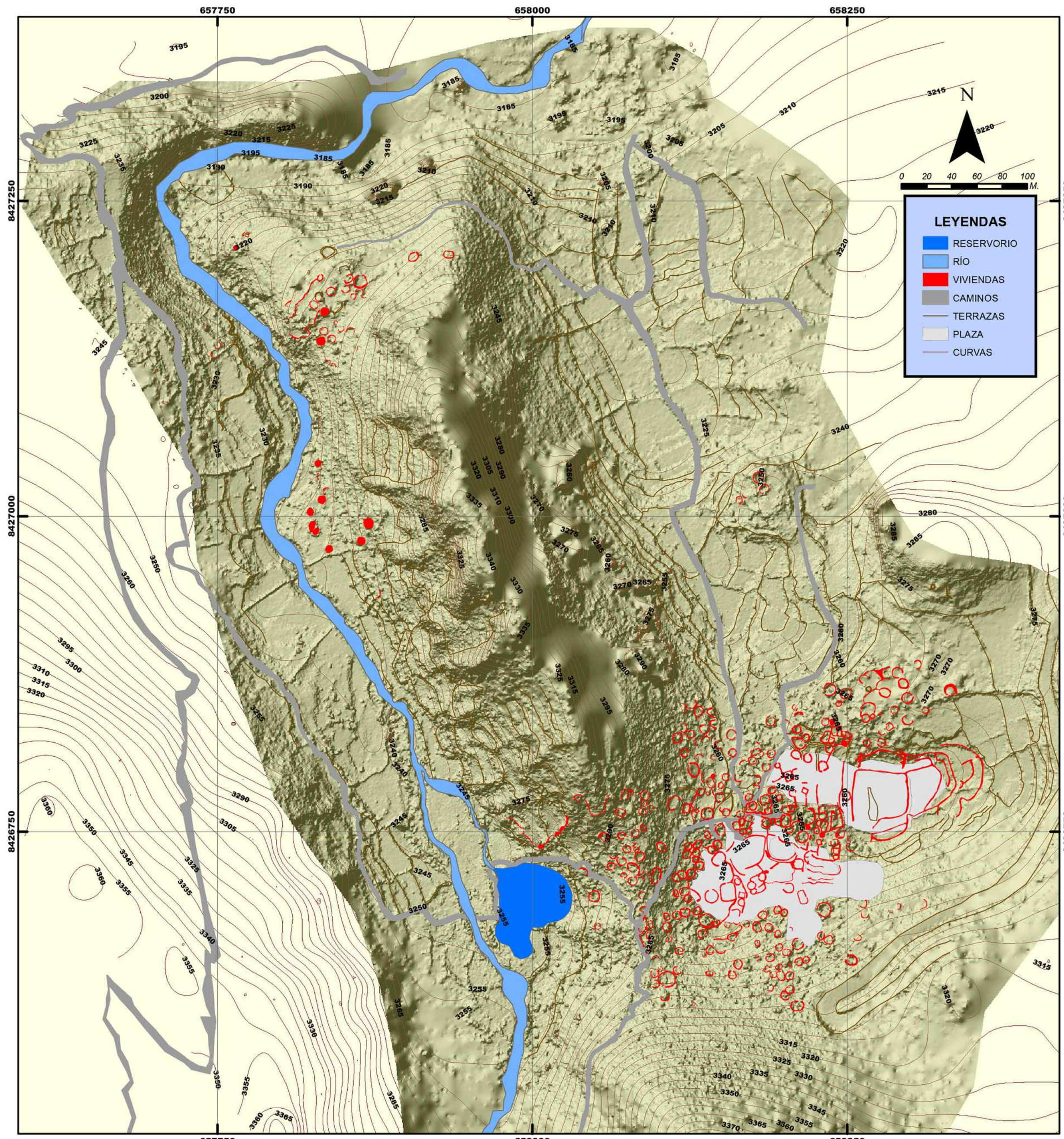


Figure 2. Plan of the multi period site of Chiqna Jota, continuously occupied from Middle Horizon Epoch 2 to the early Colonial period.

features frequently appear paired, spaced c. < 0.5 m apart. Single corrals are associated with individual dwellings and multiple support structures indicative of these units being occupied by discrete herding families. Most dwellings are associated with circular corrals with diameters of c. 15 to 23 m and a surface area of c. 56 to 132 m^2. There are rows of 3 or 4 small agglutinated orthogonal structures along the perimeter of most corrals (Figure 5). These measure c. 3 × 2.5 m and likely served kitchen, storage and processing functions. The population size is estimated at c. 100 to 150 individuals.

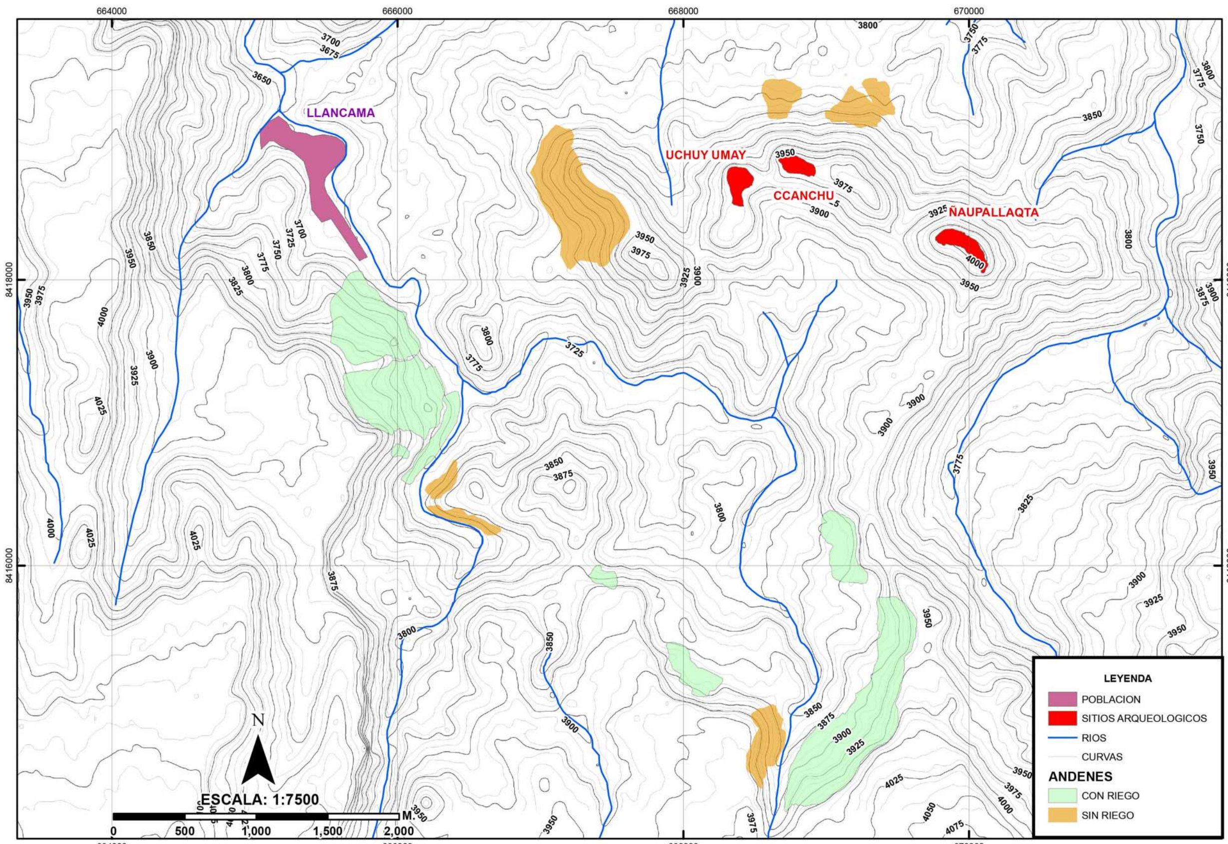


Figure 3. The Naupallacta site complex, nearby streams and both irrigated and unirrigated agricultural terraces (Kendall types 2 and 3).

The c. 20 to 25 families here shared a communal base camp and herding responsibilities.

The site had two principal zones of occupation, on the west and east sides of the mesa, with a north-central vacant space dividing these. A third smaller section, with closely spaced structures adjoins the eastern sector, on the south-eastern periphery continuing downslope (Figure 5). The dual spatial division likely reflects social *ayllu* demarcations. The smaller element on the south-eastern margin represents the main site access, and its route down to the Huayllaripa river and the agricultural terracing on its opposite bank. The open space would have served communal activities.

Though the site itself situated on top of a mesa would be defendable, absence of defensive walling and lack of evidence for weaponry, such as sling-stones, suggests conflict was not an important consideration in its siting.

It is likely the herders had small seasonal estancia sites distributed among more distant pastures and wetlands (*bofedales*), for use for several days up to several months per year (Tapia Núñez and Flores Ochoa 1984), albeit that no such sites have yet been identified. This is likely the result of these being particularly ephemeral in nature.

The Huayllaripa river is 800 m southeast and 200 m below Naupallacta, while seasonally water fed quebradas, draining into the main river have their sources within 200 to 300 m from Naupallacta (Figure 3). Water sources are important to herders with animals requiring watering every day or two (Nielsen 2000:224). The river can be forded along the streambed, providing access to additional grazing pasture, *bofedales*, a lake and agricultural terracing on the opposing bank to the south.

Figure 4. The high mesa on which the site of Naupallacta is situated.

Surface artifacts from Naupallacta comprise exclusively Middle Horizon Epoch 2 Huamanga style ceramics with small quantities of struck obsidian flakes and tools. The Lisahuacho and Potreropampa obsidian sources are c. 2.7 km east and c. 10.6 km southeast of Naupallacta respectively (Figure 1) (Burger et al. 2006). The ceramics fall within the range of products characterizing the Huamanga style in the Middle Horizon Epoch 2 Chicha Soras site assemblages and are attributable to the same later Middle Horizon phase.

On the adjoining mesas, 1.2 and 1.5 km to the west northwest are the sites of Ccanchu (UTM 18L 668,749.63 m E 8,418,821.13 m S 3925 m asl) and Uchuy Yako/Uchuy Umay (UTM 18L 668,373.00 m E 8,418,735.00 m S 3905 m asl) (Figure 8). These are small, 1.5 and 0.6 ha respectively. They have residential orthogonal and circular structures. The surface architecture at Uchuy Yako/Uchuy Umay tends toward agglutinated with several large rectangular enclosures in the central area. The c. 60 circular and orthogonal dwellings and support buildings here are concentrated around the central open spaces, with multiple structures built in runs. Seasonal streams drain c 200 m north and northwest and 80 m south. The architecture at Ccanchu has similarities to that at Naupallacta. There are c. 15 corrals here with 25 orthogonal dwellings and support structures. These sites had multiperiod use with surface material indicative of Middle Horizon and Late Intermediate Period occupations. They likely served a secondary role to Naupallacta with their focus more toward the pastureland and *bofedales* to the north and reflecting contemporary social structures such as *ayllu* divisions within a larger community.

Naupallacta with the secondary sites of Uchuy Yako/Uchuy Umay and Ccanchu provide evidence for Wari state-sponsored camelid pastoralism expedited in the puna hinterland of the Chicha Soras valley. There are no antecedents for human activity across the altiplano here, other than obsidian recovery, in the early Intermediate Period or the early Middle Horizon with the Huamanga style ceramics indicative of an Ayacucho focused origin for the herders.

Naupallacta represents a multiple household basecamp, the principal residence for a population managing herding and processing activities including shearing and slaughter here (Kuznar 1995; Yacobaccio 2007). Seasonally, herds were moved to alternate pastures as available in the surrounding zone. Herders practiced limited subsistence agriculture at the upper limit of cultivation in the vicinity.

Comparisons with other highland high pasture areas for the Middle Horizon highlight marked differences with the pattern revealed for the Chicha Soras—Yanamayo area. The Lake Suches region, at between 4,500 and 4,800 m asl (above the limit for arable agriculture), in southern Peru is dominated by a Tiahuanaco occupation with the settlement pattern dominated by small family-sized estancia sites. These measure ≤1 ha, with roughly agglutinated structures around a central focus, comprising habitation and support elements and corrals, with population sizes estimated at 4 to 10 individuals (Vining 2016).

The Middle Horizon Epoch 2 site of Tajrachullo in Espinar is on a high mesa, along the upper Apurimac, adjoining an Inca settlement below. It served a camelid management role. Carved camelid footprints were identified along a path from the lower section of the settlement complex up to the site atop the mesa (Meddens 1989). Similar carved

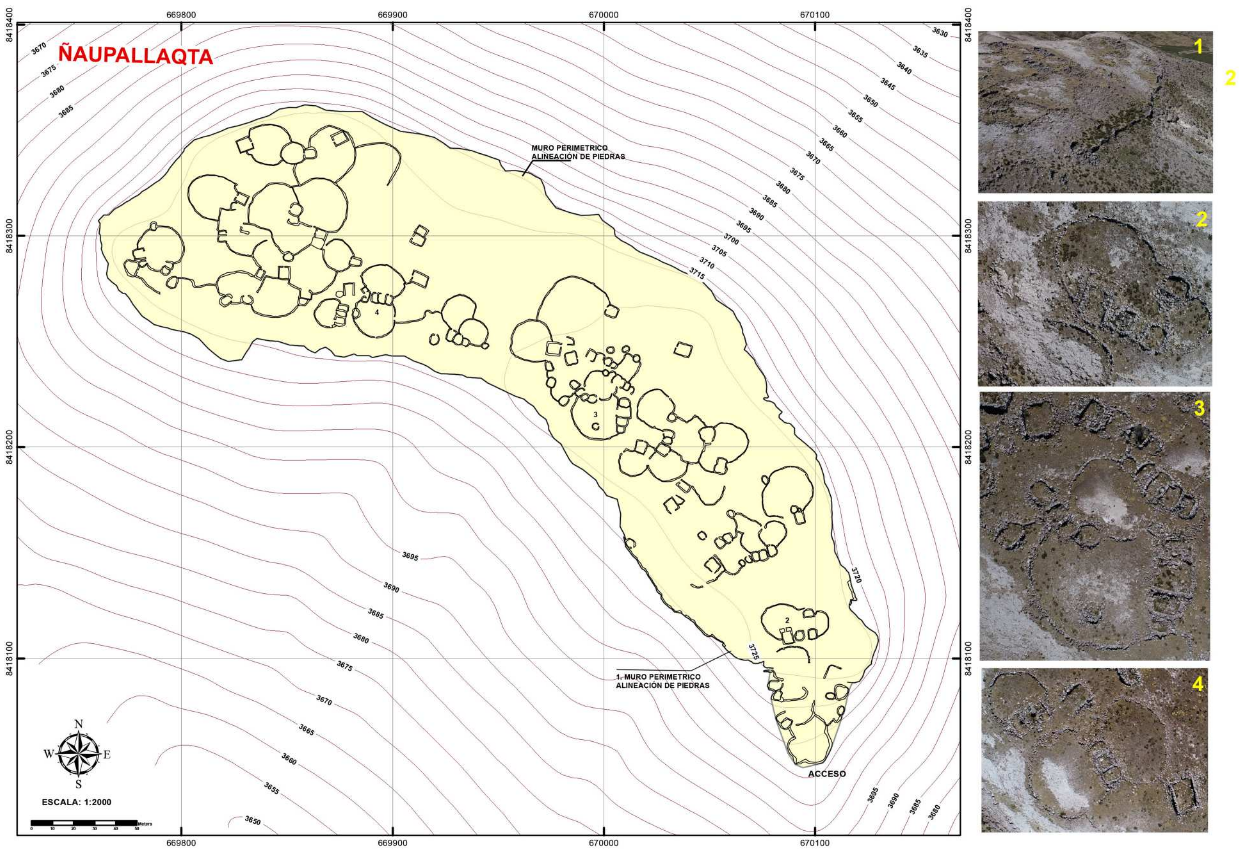


Figure 5. Plan of the Middle Horizon Epoch 2 site of Naupallacta.

camelid footprints have been found on the approach to Andamarca in the Sondondo valley. Structural remains across the Tajrachullo site include closely spaced orthogonal and circular structures (Meddens 1989). There are no clearly defined corrals, albeit a single large enclosure near the center of the site may have served such a function. Further possible corrals are present on the mesa on the opposing bank of the river.

The use of corrals by the Wari state has also been confirmed at the Middle Horizon site of Cerro Baúl in Moquegua (Feldman 1989), in the lower Santa valley (Wilson 1988), and Pampa Grande in the Lambayeque valley (Shimada and Shimada 1985:14).

In northern Chile and southern Peru corrals are employed in the management and breeding of camelids with the males and females kept separate while grazing, the former on hill slope pasture and the latter on *bofedales* (Dransart 2002:128–129; Gundermann 1984:107; Nielsen 2000:173–174). Selective breeding was deployed to encourage favorable genetic traits in the prehistoric past (Wheeler et al. 1995).

In the Cuzco region secondary structures associated with herders' sites fulfill kitchen and storage roles while corrals fulfill multiple roles. In the Canchis area corrals with an exclusively ritual role are known (Tapia Núñez and Flores Ochoa 1984:42).

The Landscape Setting

Naupallacta is situated in a landscape dominated by features locally defined as "*bosque de piedras*" (Figure 9). These comprise steeply eroded conical landforms of volcanic tuff, ranging from several meters to several tens of meters in height. The most notable surface relief is a mountain named

Figure 6. Architectural detail of wall niches at Naupallacta.

Huaca or Apu "Pancola" (Figure 10). This peak is sacred to the resident population. It comprises a large dome-shaped summit reaching c. 3,780 m asl, pink in color, with numerous eroded conical tuff landforms fringing its base. These qualities of the local environment were undoubtedly factors in the siting of the Naupallacta complex. This landscape would have been considered charged with the sacred, which would have imbued the camelids pastured here and their produce with an added value. Natural features out of the ordinary in appearance were considered *huaca* and animate (Sillar 2009). De Vega discusses the late sixteenth-century proselytizing activities of his Cuzco-based order in Soras, Chalcos, and Andamarcas and describes valley residents going to sacred locations on the puna to worship lightning, *huacas* and other sacred entities there (de Vega 1948 [1600]:109–119). Sacrifices of camelids and guinea pigs and libations of chicha were made here, while clouds and lightning were worshipped to bring rain. Albornoz includes numerous *huacas* in the description of his extirpation campaign in the region. Many are referenced under categories reflecting landscape features, such as "*pacarinas*" (places of origin) or include elements in their naming describing topographic features e.g., "pampa" (level area), or stone field markers such as "*guanca.*" "*Llama yllas*" (small camelid-shaped portable household idols) are included in his lists of destroyed *huacas*. The importance of the puna and mountains here is confirmed by associations made between *cerros* (mountains) and *huacas* (Albornoz 1996 [1581–1585]:264–284).

Figure 7. Architectural detail of window at Naupallacta.

The setting of the Naupallacta complex offered long range visibility, assisting in control of predation of herds. Modern analogues manifest such problems, largely by condors, pumas, and foxes resulting in losses in the order of 5 percent annually (Nielsen 2000:175, 179; Yacobaccio and Madero 2001:88).

Andean pastoralism combined with arable agriculture maximizes access to varied resources (sensu Murra 1980). Pastoralists provided transport, meat (and charki), wool (fiber), leather, fertilizer, and fuel as well as bone for artifacts (particularly weaving-related instruments), fat, and llama fetuses for use in traditional medicine and ritual (Vilá 2021:38) to the agriculturalists of the valleys, in return receiving agricultural produce (maize, quinoa, beans, etc.).

The Environmental Context

The archaeological evidence from the Chicha Soras valley reveals widespread agricultural terrace construction during the Middle Horizon leading to an extraordinary transformation of the *natural landscape* into a *cultural* one. Their construction during Epoch 2 is suggested by radiocarbon dates from charcoal

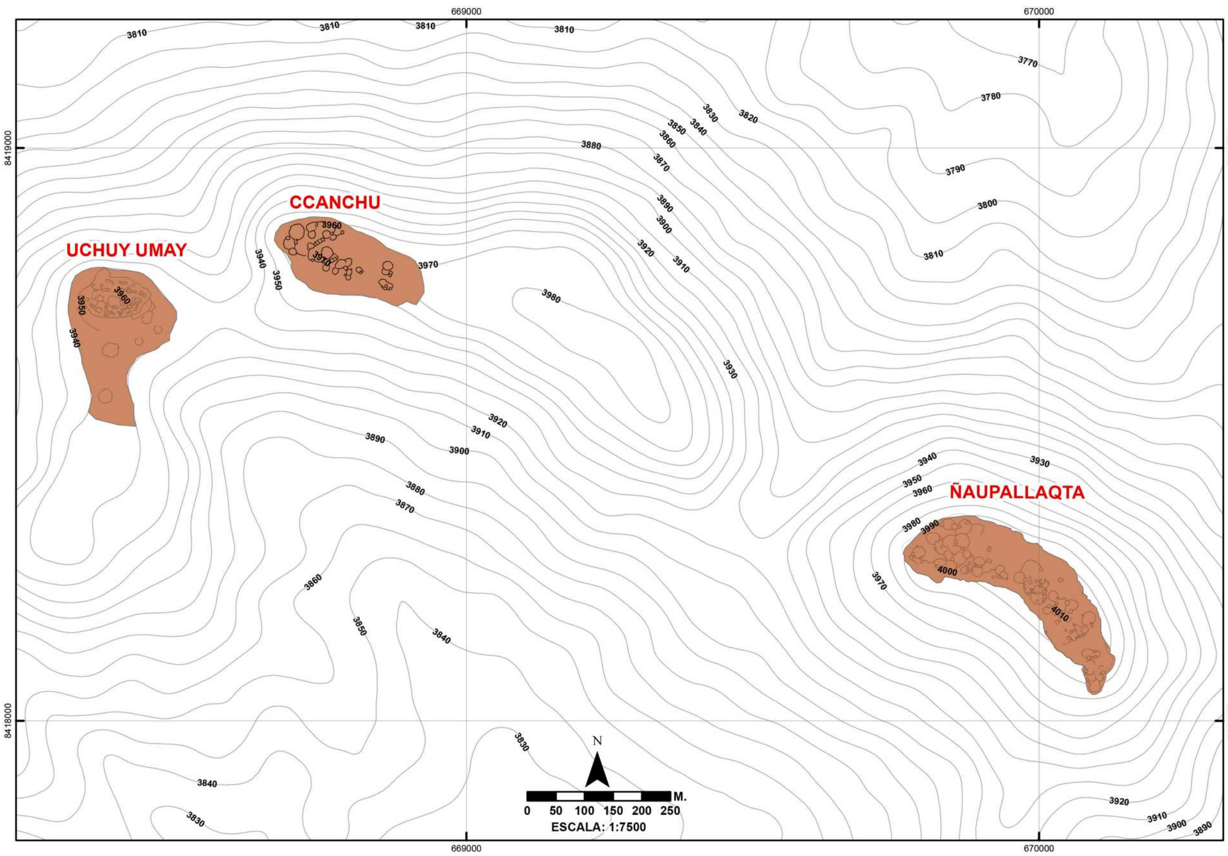


Figure 8. The Naupallacta site complex, with the adjoining sites of Ccanchu and Uchuy Umay.

extracted from paleosols, associated with two of these terraces; with dates of AD 654–774 and AD 772–991 and the recovery of Middle Horizon Epoch 2

Figure 9. Eroded conical landscape forms around the Naupallacta site complex.

type ceramics (Branch et al. 2007; Kemp et al. 2006). Agricultural tools, camelid bones and carbonized maize (*Zea mays*) cobs from archaeological sites indicate the terraces were used for cultivation, part of an extensive agro-pastoral economy (Meddens and Branch 2010). Isotope analysis of human and animal bone from the wider region has provided unequivocal evidence for maize being grown around Ayacucho for both human and animal consumption (Finucane 2009; Finucane et al. 2006). In the Chicha Soras valley, cultivation occurred on terrace soils formed within volcanic tuff enriched in both organic matter and nutrients due to rapid weathering of the substrate and burning of the terrace surfaces (Kemp et al. 2006). The landscape comprised an undulating topography, due to localized mass movement and fluvial processes, between the river margins and puna grassland with natural wetlands (including peatlands, *bofedales*)

Figure 10. Apu Pancola mountain feature.

situated within heavily weathered and eroded volcanic tuff. The numerous wetlands often formed a catena of shallow water ponds and small lakes. A few of these have provided important records of the environmental and land-use history.

The Ayapampa wetland is near the village of Ayapampa (3,360 m a.s.l.) within the upper *Quechua* ecological zone (Branch et al. 2007). The paleoecological record here is regarded broadly representative of the vegetation cover of the *Quechua* zone in the valley, although there are certainly site-specific characteristics attesting to localized events. Prior to the onset of the Middle Horizon the wetland consisted of *Cyperaceae* and *Plantaginaceae* dominated vegetation. The dryland vegetation comprised Poaceae, including evidence for *Zea mays* (maize), perennials and shrubs of Asteroideae/Cardueae, as well as *Polylepis/Acaena* and *Alnus* woodland. Several erosional events testify to the instability of the surrounding landscape prior to widespread terrace construction. Although the radiocarbon chronology does not provide a precise guide to the onset of Middle Horizon, throughout this period and into the early part of the Late Intermediate Period, much of the herb-rich rough grassland and shrubland noted earlier persisted, although significant further erosion is evidenced by deposition of a thick unit of sandy clay. The wetland continued to be dominated by Cyperaceae and Plantaginaceae. Evidence for cultivation of *Zea mays*, and possibly *Chenopodiaceae/Amaranthaceae* (e.g., quinoa), suggests intensification of agricultural practices. The pollen evidence does not provide a continuous record of *Zea mays* cultivation, which suggests whilst cultivation continued during the Late Intermediate Period, its precise timing is uncertain.

The Tocsaccocha wetland (3,390 m a.s.l.) is situated west of Ayapampa and on the opposite side of the valley. Prior to the Middle Horizon, the paleoecological record here indicates the presence of *Polylepis/Acaena*, *Apiaceae*, *Poaceae*, *Chenopodiaceae/Amaranthaceae* and *Ephedra*. There is unequivocal pollen evidence for *Zea mays* indicating cultivation on the surrounding slopes. The pollen record shows that Cyperaceae was dominant on the wetland edge with *Pediastrum*, *Potamogeton,* and *Myriophyllum* present within the lake water (Silva Brogca 2007). The transition to the Middle Horizon witnessed increases in Poaceae as well as Asteraceae, together with *Chenopodiaceae/Amaranthaceae*, *Brassicaceae*, *Plantaginaceae*, *Caryophyllaceae*, Alnus, *Podocarpus*, *Escallonia,* and *Alternanthera*. *Zea mays* continued present, whilst *Cyperaceae* dominated the wetland surface. A significant increase in *Chenopodiaceae/Amaranthaceae* from ~AD 700 together with *Zea mays* may constitute intensification of cultivation during Epoch 2. The later Middle Horizon, and transition to the Late Intermediate Period, recorded increases in *Euphorbiaceae* and a decline in *Poaceae*, *Brassicaceae,* and *Asteraceae*, as well as *Alnus*, *Escallonia*, *Plantaginaceae,* and *Ephedra*.

Both records indicate the Middle Horizon was characterized by widespread cultivation of *Zea mays*, and possibly *Chenopodiaceae/Amaranthaceae*. This was accompanied by landscape erosion, including the deposition of sandy clay (Ayapampa), and silt and clay (Tocsaccocha) rich sediments. These erosional events and transformation of the landscape morphology for terrace agriculture imply a causal link—i.e., disturbance of the soil structure and subsequent fluvial and aeolian transportation of sediment into the wetlands, although the precise timing and duration of these "events" remains uncertain.

These landscape and land-use changes coincide with a period of variable precipitation during the Middle Horizon according to multiple paleoclimate records. These derive from a range of archives such as ice cores, cave speleothems, lake and marine sediments, glacial landforms, peatlands, and archaeological records (Apaéstegui et al. 2014; Chepstow-Lusty et al. 2003; Haug et al. 2001; Rein et al. 2005; Sandweiss et al. 2020; Stansell et al. 2017; Thompson et al. 2017; Vuille et al. 2012). They reveal important episodes of enhanced climate variability during the Middle Horizon, such as the southern hemisphere expression of the *Medieval Climate Anomaly* (MCA; AD 900–1250), which were mainly characterized by changes in the hydrological cycle leading to variability (spatially and temporally) in precipitation due to the intensity of the South American Summer Monsoon (SASM).

Several paleoclimate records indicate the early Middle Horizon was a period of noticeably higher precipitation (prior to AD ~900, possibly before AD ~800), before declining levels marked the transition to the MCA e.g., Palestina cave (Apaéstegui et al. 2014), and Huagapo Cave (Kanner et al. 2013). Similarly, marine sediment records off the coast of Peru record a period of climate variability based on sedimentological, alkenone, and chlorin analyses, which were interpreted as weakening of the El Nino Southern Oscillation (ENSO) signal from AD ~800–1250 (Rein et al. 2005).

Although the precise timing of Middle Horizon terrace construction in the Chicha Soras valley remains uncertain, it likely occurred during Epoch 2 (from AD ~680/700) based upon pottery and radiocarbon dates associated with terrace paleosols noted earlier. If construction occurred from AD ~680/700 it marked a period when precipitation levels were high but transitioning toward lower levels from AD ~800/900. Terrace construction, and its associated irrigation system was an adaptation strategy to intensify farming bringing more land into agricultural production taking advantage of increased water availability. Although several studies noted variation in the timing of the onset and termination of the MCA between archives and their climate change proxies, it seems certain that the MCA was underway by AD ~900. The onset of the MCA during Middle Horizon Epoch

2 has considerable relevance here because the lower precipitation levels may have increased the vulnerability to water stress of these now intensively farmed agricultural zones, reducing their resilience.

Paleoclimate data from the Quelccaya ice core indicate that annual net accumulation was below-average values of the last 1,800 years data from AD ~1100–1300 (Thompson et al. 2013:2017). Authigenic calcite δ18O values from Laguna Pumacocha (Bird et al. 2011) suggest that the SASM was less intensive at this time, whilst δ18O values from Palestina cave (spanning the last 1,600 years) similarly show enrichment from AD 920–1100, including a distinctive "double peak" at AD ~934 and AD ~1039 (Apaéstegui et al. 2014). The termination of the Middle Horizon and transition to the early Early Intermediate Period (AD ~1000–1200) is unequivocally associated with reduced precipitation and probably drought commencing AD ~800/900. Whether this caused the collapse of the agricultural system, and indeed the Wari state, remains an area of debate. Persistence of the wetlands at Ayapampa and Tocsaccocha, amongst probably many others in the study area, throughout the Middle Horizon and into the Late Intermediate Period is evidenced by the paleoecological records and suggests suitable areas for livestock grazing and drinking water continued despite probable changes in their ecohydrological status due to declining precipitation levels after AD ~800/900.

Camelid Pastoralism and Middle Horizon Herd Management

It has been suggested the principal reason for Middle Horizon Wari expansion into the Chicha Soras valley was related to camelids with a focus on fiber and textile production (Meddens 1985; 1989). Camelids were of equal importance to the Wari state (DeFrance 2016:125) as to the Inca empire. The Inca considered all camelids state property (Murra 1980:94, 96); such an approach to this primary resource by Wari would be consistent with available archaeological evidence. In the context of its expansion, it has been demonstrated that the state had a marked impact on camelid foddering and mobility.

That a form of state control over camelid resources was exercised by Wari like that practiced by the Inca is confirmed in camelid management reflected in Middle Horizon animal bone assemblages, with two distinct management approaches recognized (Finucane et al. 2006; Thornton et al. 2011; Tomczyk et al. 2019). Isotopic data indicate bimodal foddering with groups consuming mainly C3 plants from the puna, or predominantly feeding on C4 type flora comprising maize (Finucane et al. 2006:1772; Szpak et al. 2015:454–457; Thornton et al. 2011; Tomczyk et al. 2019). C4 plants tend not to be found at altitudes above ~3,900 m asl depending on the individual area (Samec et al. 2020:357).

Llama wool prior to the Spanish conquest was used in textile production. Indeed, certain breeds of llama had a fine grade wool similar to that produced by alpacas (Szpak et al. 2015:454; Wheeler et al. 1995:834, 838). In northwest Argentina, llamas continue to be bred for their fiber (Reigadas 2001; Samec et al. 2020:356).

It is thought that in prehistory (as at present) alpacas had a restricted distribution with a focus on puna pasture and bofedales, where both flora and climate favored the generation of fine wool fiber for which they were bred (Finucane et al. 2006:1772). In prehistory, llamas had a wider distribution than at present, being reared in zones ranging from the highlands to the coast. Though this model is now thought to be more complex and varied than originally assumed (Szpak et al. 2015). As the fibers produced by alpacas and llamas can appear very similar this can complicate isotopic analysis aimed at establishing the origin of the wool fibers, because both llamas and alpacas can and were grazed at puna locations. It is re-emphasized here that llama wool was as important in textile production as that of alpacas in prehistory (Murra 1980:47). It may therefore be fallacious to argue that a dominant llama component in archaeological animal bone assemblages necessarily reflects an emphasis on meat and or transport-related activities. An assemblage dominated by alpaca would however have served principally to produce fiber.

The identification of the Naupallacta site complex, in the hinterland of the Chicha Soras valley, confirms the importance of camelid management here and its significance to the Wari state.

The camelids pastured on the puna (particularly llamas for transport) were brought into the valley seasonally (Finucane et al. 2006). This seasonal movement served to expedite exchange of camelid products for agricultural ones. The main harvest time was in May, June, and July, the beginning of the dry season, concurring with the time when the principal slaughtering of animals occurs (Dransart 2002:48; Nielsen 2000:237). Movement of camelids from the Rio Yanamayo/Naupallacta pastures to the upper Chicha Soras valley likely followed the harvest (May/June) in July and August. Such excursions included opportunistic grazing of the animals on the post-harvest plant remains in the arable fields. This provided additional fertilizer rejuvenating the agricultural soils. The use of maize stubble left in arable fields following harvesting as fodder for camelids appears widespread in Peruvian prehistory (Dufour and Goepfert 2019:3; Finucane et al. 2006) and continues today (McCorkle 1987). It also has been confirmed in numerous isotope studies on camelid remains (Alaica et al. 2022; Finucane et al. 2006; Grant 2017; Samec et al. 2020; Szpak et al. 2015; Thornton et al. 2011; Tomczyk et al. 2019). The ritualized consumption of special foodstuffs and drink by camelids has also been confirmed, with the intake of chili peppers and beans, in anticipation of the animals being sacrificed, identified for Late Intermediate Period juvenile camelids in a Chimu context (Cagnato et al. 2021). Foddering of camelids on maize, *algarrobo* and potato (probably *chuño negro*) has been identified at the Middle Horizon site of Quilcapampa in the south coastal Sihuas Valley (Melton et al. 2023).

The Animal Bone

The animal bone from the Chicha Soras valley provides details of local camelid management strategies. The relationship of puna pastoralists with valley agriculturalists is explored. The principal focus is on the Middle Horizon albeit that the assemblage is analyzed with reference to the other periods of use from the sites investigated.

The material derives from excavations on three sites between 1980 and 1982, from Chicha Qasa (AP2-7), Chiqna Jota (Lu5) and Yako (Lu2) and dates from Middle Horizon (Epoch 2) through to the early Colonial period. The assemblage totals 4,568 NSP (Number of Specimens) including complete bones and bone fragments.

The animal bone was hand excavated. Recovery followed stratigraphic units and where deep deposits were encountered without discernible stratification, these were subdivided into arbitrary layers of 5 to 10 cm depth. All excavated deposits were sieved using a screen with a 1 cm mesh size.

The Middle Horizon material derived from household waste in midden deposits and drainage fills in agricultural terracing with a small component from an offering deposit, feasting and floor levels. The offering lacked "special" animal bone groups, the remains comprised material similar to that from the local midden and drainage contexts. Cultural debris including animal bone waste was a common component of drainage layers in terracing. These remains derived from local processing and consuming patterns. There are broad similarities in species compositions, skeletal elements represented and age profiles across all groups from the Middle Horizon through to the Late Horizon (Tables 1 and 3). This holds for the three sites for the periods they were occupied, except for the early colonial component at Chiqna Jota. This supports the notion that the assemblage is representative of the activities at these sites. Consumption of the animals for meat includes both the common meat intake and feasting events. The latter comprises a component of the early Late Intermediate Period assemblage from Chiqna Jota. This again does not differ in any material manner in species composition, ageing or anatomical elements present from the other temporal or site components of the overall animal bone assemblage. Meat is considered to have made a minor contribution to the food intake of the indigenous population. Such practices were certainly followed at the time of the Inca state's control of the Andes (Cobo 1892 [1653]). Ethnographic parallels from the 1980s onward demonstrate that altiplano (puna) herders did not consume noticeably larger quantities of meat in their daily diet than contemporary valley dwellers, and that meat formed a relatively small proportion of their food intake. The number of animals slaughtered averages one every 2 to 3 months (Moore 1989:133; Yacobaccio 2007:149). Locally for the contemporary Llamcama area, the frequency of culling is slightly higher (see above). Meat is exchanged as *charki*, *chalona,* or fresh for valley agricultural produce.

The number of specimens (NSP), the number of identified specimens (NISP) and minimum number of Individuals (MNI)[2] were calculated for all periods across the three sites as well as for each period at each individual site (Table 1), while the minimum number of elements (MNE) was established for the Middle Horizon component of the assemblage (Figure 11). The animal bone from Chicha Qasa dates from Middle Horizon (Epoch 3/4) through to the Late Horizon, for Chiqna Jota to the Middle Horizon (Epoch 2) through to the early colonial period, and the site of Yako dates to the Middle Horizon (Epoch 2).

The Middle Horizon Epoch 2 assemblage comprised a total of 1,259 bone specimens (NSP) (Table 1). Of the identifiable components, 475 (NISP) were classifiable to species or family level, of which 462 or 97.3 percent NISP (9 or 69.2 percent MNI) were camelid with minor deer (2.3 percent NISP, 3 or 23.1 percent MNI) and dog (0.4 percent NISP, 1 or 7.7 percent MNI) components. Some 489 bone fragments (38.8 percent) could not be identified while 295 (23.5 percent) could be assigned to an indeterminate *artiodactyla* category. The MNI equally reflects the dominance of camelids in the assemblage (MNI 9; 69.2 percent) (Table 1). Considering that most of the identifiable part of the assemblage comprises camelids (97.3 percent NISP) it is certain that the best part of the indeterminate *artiodactyla* category will similarly be derived from camelids.

Access to camelid resources for the Chicha Soras valley communities was uncomplicated with the surrounding puna giving the Naupallacta complex easy access to managed alpaca and llama herds as well as wild guanaco and vicuña flocks.

The dominance of camelids in the zooarchaeological assemblages is like that identified in the core area of Wari control in the Ayacucho valley at Aqo Wayqo, Conchopata and Huari (Pozzi-Escot 2004:145–146; Pozzi-Escot and Cardoza 1986). During the Middle Horizon, an analogous dominance of camelid is evident elsewhere, in assemblages from Moquegua and Cuzco, from Tiahuanaco-related sites further south, the Huarmey area on the north coast, and in the Majes and Sihuas valleys in Arequipa, all confirming a strong emphasis on camelids (Alaica et al. 2022; DeFrance 2014; Eunju Park 2001; Rosenfeld 2012; Tomczyk et al. 2019; Vallières 2012). The Moche V, early Middle Horizon remains from Pampa Grande in the Lambayeque valley on the north coast also produced assemblages where camelids were dominant ranging from 84 to 88 percent of the assemblages, with 43 percent of the assemblage having survived past 42 months (Shimada and Shimada 1985:13).

The minor presence of deer (2.3 percent NISP) and vicuña (0.8 percent NISP) in the Middle Horizon Chicha Soras valley assemblage indicates a slight contribution of hunting to the diet, while the minimal presence of dog (0.4 percent NISP) reflects either a trifling dietary element, albeit that butchery marks and charring are both absent from these bones, or in one of the many other roles dogs fulfill in their relationship with people.

Butchery and Use

Fragmentation of all the animal bone from the various phases and sites was recorded by estimating the quantity of the surviving bone elements as: complete or near complete (1), c. three-quarters (0.75) c. two-thirds (0.66), c. half (0.50), c. one-quarter (0.25) or fragment (<0.10). Using this calculation, the 1,259 Middle Horizon bones and bone fragments totaled 59.15, confirming the highly fragmented nature of the assemblage. No weights were logged for the bone.

Table 1. The animal bone assemblages from Chicha Qasa, Chiqna Jota, and Yako from the Middle Horizon through to the early Colonial period, and that for the Middle Horizon period only at these sites.

	Whole assemblage							***Middle Horizon Epoch 2***					
	NISP	*%*	*%*	*Adjusted NISP %*	*MNI*	*%*	*%*	*NSP*	*%*	*%*	*Adjusted NISP %*	*MNI*	*%*
Alpaca *Vicugna pacos**	1	0.02			1	1.4		1	0.1	0.1		1	69.2
Camelid	1717	37.59	37.9	96.5	44	59.5	68	457	36.3	36	97.3	7	
*Vicugna vicugna**	11	0.24			5	6.8		4	0.3	0.3		1	
Andean cat *Leopardus colocola or Leopardus jacobita*	3	0.07	0.1	0.2	2	2.7	2.7						
Deer Cervid	25	0.55	0.5	1.4	12	16.2	16.2	11	0.9	6.9	2.3	3	23.1
Dog *Canis familiaris*	12	0.26	0.3	0.7	4	5.4	5.4	2	0.2	1.3	0.4	1	7.7
frog	6	0.13	0.1	0.3	2	2.7	2.7						
guinea pig *Cavia porcellus*	1	0.02	0.0	0.1	1	1.4	1.4						
Cow *Bos*	1	0.02	0.0	0.1	1	1.4	1.4						
Sheep/Goat *Ovis/Capra*	15	0.33	0.3	0.8	2	2.7	2.7						
Lar	665	14.56						289	23.0				
Sar	136	2.98	60.8					6	0.5	62.3			
Unidentified (NID)	1975	43.24						489	38.8				
Total (NISP+NID)	**4568**	**100.0**	100.0	100	74	100.0	100.0	1259	100.0		475.0	13	100.0

*Alpaca and vicuña identifications derive from incisor morphology (Wheeler 1982).

The large quantities of highly fragmented long bone elements in the Middle Horizon assemblage can be indicative of marrow extraction. About half of the unidentified and large ungulate component of the MH2 assemblage (54 percent NSP) comprises long bone fragments, representing 365 NSP (29.0 percent) of the total assemblage. This predominantly derives from material redeposited in terrace drainage and make-up contexts with the remainder from offering deposits and a little from floor surfaces. Much could therefore have been impacted by post-depositional processes resulting in breakage. The presence of conchoidal impact fractures denotes that part of this component corresponds to highly fragmented processed camelid bone indicating their importance in consumption of the marrow fractions of the carcasses (Binford 1981:134–136, 148–169; Mengoni Goñalons 1991; Pozzi-Escot 2004:145), or alternatively the partitioning of bone elements into smaller pieces to fit into cooking vessels as a food preparation method (pers. comm. Jennifer Grant). The low percentage of worn or eroded bone (3.4 percent NSP) suggests that despite much of the material having been redeposited following its initial discard that the assemblage suffered relatively little post-depositional damage (Madgwick and Mulville 2012). The soil matrix with a limited clay and relatively low moisture content and a neutral to slightly acidic pH (up to 6) is unlikely to have contributed much to the observed high fragmentation (Baker and Worley 2019:1, 68).

Besides the breaking up of long bones for marrow extraction or boiling there is evidence for lateral cut marks around articulations of long bones and metapodials for dismembering of the carcasses. Another practice registered is the detaching of longitudinal fragments by impacting the proximal facet of long bones and metapodials. The purpose of this was likely for the manufacture of weaving tools and needles.

Butchery evidence was found on 9.4 percent NSP of the Middle Horizon assemblage, with percussion mark impacts most frequently reflecting the breaking up of long bones, the limited evidence for other butchery marks (0.3 percent) may confirm that the meat here was largely consumed fresh rather than as *charki* (Valdez 2000:570).

A study of a llama by Mengoni Goñalons contributes significantly to our understanding of the meat, marrow fat, and bone fat yields of the various bone elements of camelids (1991). Bone elements such as the tibia, radius, ulna and autopodium produce relatively low yields of meat and fat. These are often transported jointly with the humerus and scapula or femur thereby inflating the meat returns of these lower-yield bone elements (1991:184). The results of this study confirm that ribs and vertebrae together with sternum, humerus, and femur and its ball joint constitute the elements with the highest meat and fat yields (Mengoni Goñalons 1991:185, 188, 187). The humerus (4.7 percent NISP), femur (7.1 percent NISP), pelvis (13.4 percent NISP) and ribs (identified only to *artiodactyla* level) (8.3 percent NISP) are significantly represented in the Middle Horizon Chicha Soras valley assemblages. This pattern continues throughout the cultural sequence at the three sites represented.

The consumption of some skeletal parts with higher proportions of meat is noted (31.1 percent NISP), although the limited consumption of vertebrae (3 percent NISP), among the largest meat-bearing elements, is relevant (Table 2). The meat-bearing vertebrae of the neck and rib elements are favored for fresh meat consumption in the area at present (see above). The presence of lower meat-bearing elements in the assemblages such as tibia (2.8 percent NISP), radius and ulna (4.7 percent NISP) metapodials (10.6 percent NISP) and phalanges (3.5 percent NISP) contributed only a minor element to the local meat use. The presence of carpals, astragali and calcanea (9.1 percent NISP) indicates that the lower extremities of the animals arrived in some quantity at the valley sites (Rosenfeld and Sayre 2016:506). These are riders sensu Binford (1981:234), such as minor low utility bone elements that remain joint with higher meat value elements when transported. The low percentage of phalanges suggests that the slaughter and initial butchery of the animals occurred elsewhere or that these remained with the skins of the animals, while the other riders were transported from the initial butchery location to its consumption site jointly with the radius and tibia. The high proportion of skull and mandible fragments (29.9 percent NISP) could suggest slaughter or sacrifice of animals in the vicinity of the valley sites (Table 2). Alternatively, the presence of a high proportion of skull and mandible fragments resulted from the local population favoring the heads of the animals for reasons based on cultural preferences. Traditional butchery procedures on a mature llama in the Ayacucho puna in the early 1970s observed that the ribcage and spinal column were separated out in their entirety at the butchery site to be removed to the homestead for further processing (Flannery et al. 1989:86). This aspect of partition of the animal appears to be relatively widespread (Nielsen 2000). Such practices could explain the limited quantities of vertebrae found at the valley sites, with this part of the animals' carcasses being taken for processing, consumption, or use elsewhere. These elements may have been used for *charki* (Moore 1989) for longer term preservation and to facilitate long-distance transportation. The MNE distribution of the camelid bone present confirms a consumption practice with initial butchery being carried out away from the end consumer location (Figure 11).

Meat consumption by the Middle Horizon population of the valley sites reflects the diet of a community active in arable agriculture in support of a population in the puna hinterland whose economic activity focused on animal husbandry. Using present-day ethnographic parallels within the context of reciprocal exchange or *ayni* it seems likely that within this larger agropastoral community both valley and puna dwellers had approximately

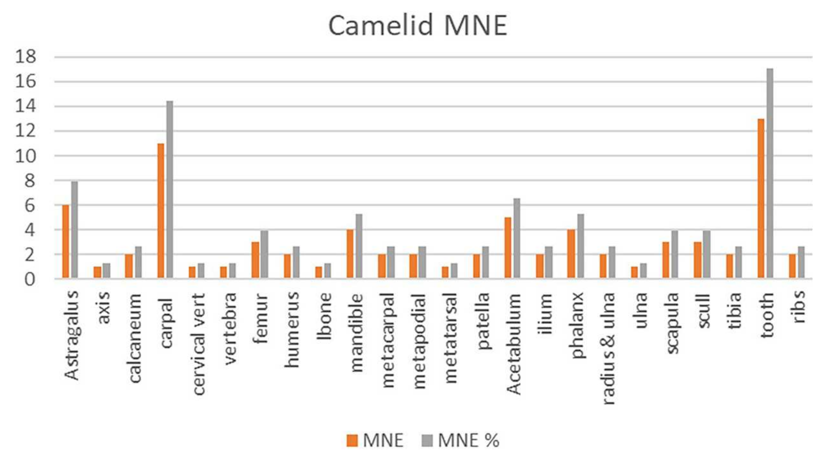


Figure 11. Middle Horizon camelid MNE distribution.

equal access to animal and plant-based resources (Mannheim 1991:89–91; Mayer 2002). This assumption appears broadly supported by the extant animal bone assemblages. The mixture between elements usually found in herders' loci or places of slaughtering and initial processing (such as head, usually associated with primary butchering) and the presence of elements with high yields of meat, like humerus, femur, and innominate (usually the remains of consumption and secondary butchering), as well as the low frequency of some of the higher meat yield elements (vertebrae and sternum), are relevant here.

The high representation of elements with low energy yield (skull, mandible, radius, ulna, tibia, and autopodium) and the high fragmentation of long bones may indicate use focused on obtaining nutrients such as marrow, brain, and bone fat. Absence of a portion of the highest meat-yielding bone elements (vertebrae) from the assemblages, indicates these were consumed elsewhere, either at or in the vicinity of the Naupallacta site complex, or alternatively some of the higher meat-yielding bone elements were exchanged with distant end-user locations. Present-day ethnographic parallels indicate that the agropastoral valley and pastoralist puna exchange networks result in similar distributions of meat and fat elements, it may be that the long-distance end user alternative for the missing skeletal elements, perhaps in the form of *charki*, is more likely (Miller and Burger 1995, 2000). The presence of these underrepresented bone elements in the Chicha Soras assemblages at primary elite centers of the Wari state, such as Huari and Conchopata (Pozzi-Escot and Cardoza 1986; Rosenfeld 2012), may support such an interpretation.

Shimada and Shimada note camelid meat was unlikely traded on the hoof as the animals would have needed to spend considerable efforts grazing to maintain their bodyweight and that meat would therefore be exchanged either fresh or in the form of *charki* (1985:4). Such a consideration was not a factor in the exchanges between the valley sites and the Naupallacta complex, with only half a day travel separating these. Neither would the proximity of the Naupallacta camelid meat, fiber, and fertilizer supply sites to the valley user sites necessitate the meat supply being in the form of *charki*. However extended storage times of meat would favor the production of *charki*. Indeed, general consumption of *charki* in the region in the early historic period is confirmed by de Vega (1948 [1600]) and observed in the present day (see above). Shimada and Shimada state that in traditional Andean practices when trading *charki* the head and lower legs are not used, albeit that customs vary somewhat across the distribution area of the Andean camelids (Shimada and Shimada 1985:4; see below).

Table 2. Middle Horizon 2 camelid anatomies (NISP) and the whole assemblage compared to the MH2 group.

	Middle Horizon Epoch 2		*Whole assemblage*		
Camelid	*NISP*	*Percentage*	*NISP*	*Percentage*	*Variance from MH2 assemblage*
Skull	53	20.9	233	15.7	−5.1
Mandible	23	9.1	70	4.7	−4.3
Atlas	0	0.0	5	0.3	0.3
Axis	1	0.4	13	0.9	0.5
Vertebra (not further defined)	3	1.2	9	0.6	−0.6
Cervical vertebra	3	1.2	13	0.9	−0.3
Thorasic vertebra	0	0.0	6	0.4	0.4
Lumbar vertebra	0	0.0	17	1.1	1.1
Caudal vertebra	0	0.0	1	0.1	0.1
Sacrum	0	0.0	0	0.0	0.0
Sternum	0	0.0	0	0.0	0.0
Ribs (artiodactyla)	21	8.3	127	8.6	0.3
scapula	6	2.4	93	6.3	3.9
Humerus	12	4.7	102	6.9	2.2
Radius & ulna	11	4.3	88	5.9	1.6
Radius	0	0.0	0	0.0	0.0
Ulna	1	0.4	3	0.2	−0.2
Metacarpal	6	2.4	25	1.7	−0.7
Carpal	12	4.7	29	2.0	−2.8
Pelvis	34	13.4	191	12.9	−0.5
Femur	18	7.1	85	5.7	−1.3
Tibia	7	2.8	76	5.1	2.4
Metarsal	1	0.4	23	1.6	1.2
Metapodial (not further defined)	20	7.9	146	9.9	2.0
Tarsal	0	0.0	11	0.7	0.7
Patella	2	0.8	5	0.3	−0.4
Astragalus	9	3.5	58	3.9	0.4
Calcaneum	2	0.8	26	1.8	1.0
First phalanx	3	1.2	12	0.8	−0.4
Second phalanx	0	0.0	2	0.1	0.1
Third phalanx	0	0.0	1	0.1	0.1
Phalanx (not further defined)	6	2.4	10	0.7	−1.7
Total	**254**	**100.0**	**1,480**	**100**	

In the MH2 dated group, the low proportion of weathered/eroded bone (3.4 percent NSP) and absence of gnawing evidence demonstrates the assemblage was quickly buried, whereas the incidence of burning and charring (9.8 percent NSP) confirms its consumption as food (for people or deities). This may indicate roasting meat was included in the food preparation methods used, albeit the charring could reflect discard of bone waste for fuel. Other than charring, burning, and fragmentation aspects of part of the collection the condition of the bone does not of itself aid in deciding what

Table 3. The Middle Horizon camelid age profile.

Camelid age categories NISP		*Fetal / neonate* < 1 month*	*Juvenile* >1 months–<36 months*	*Adult* >36 months–13 yrs*	*Older adult* > 14 yrs to 20 yrs*
Total NISP	60	4	24	29	3
Percentage	100.0	6.7	40.0	48.3	5.0

*Age estimates are based on both fusion and dental data.

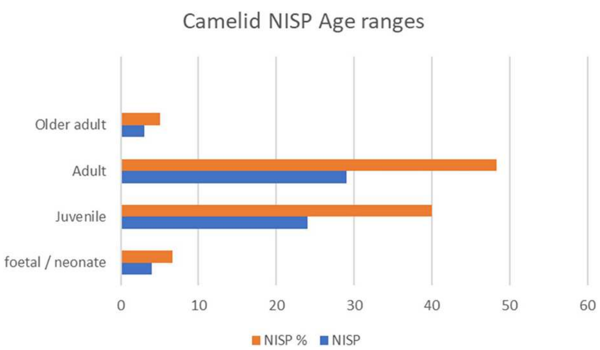


Figure 12. Middle Horizon camelid age range distribution.

types of preparation were favored by the population which produced the assemblages (Bray 2003:8; Rowe 1946:220–221).

Age Profile

The age profile of the Middle Horizon assemblage is based on fusion data as used by Kent (1982) and Wheeler (1982; 1999) with Wheeler (1982) used for tooth eruption and wear data. This confirms that 53.4 percent NISP of the ageable part of the assemblage had an age at slaughter of over 36 months, with a further 5.0 percent aged between 15 and 20 years (Table 3; Figure 12).

Within current managed camelid populations in northwest Argentina animals are sheared once annually aged between 2 and 8 years (Yacobaccio 2007:149). Herding strategies primarily aimed at meat production in recent times have a more juvenile age profile for the animals at time of slaughter. Once they reach their first year, the animals do not continue to increase their meat and fat load for the pasture consumed (Kuznar 1995:119), albeit that older female animals will be retained for the purposes of herd reproduction (Vallières 2012:69). In the Naupallacta area, males tend to be slaughtered prior to reaching 2 years of age, and females tend not to be kept beyond 6 years (see above).[3] Llamas used for cargo transport in caravans (based on ethnographic data) are largely dominated by castrated males of ~2 years and older (Nielsen 2000:171–173), with the animals feeding on any available fodder along the caravan routes. In herds where the focus is on a mixed use for fiber production and transport, an age profile where most of the animals are adults aged ~36 months or more has been proposed (Rosenfeld 2012:142; Yacobaccio 2007:146, 150–152). It appears from the data presented here, that most of the animals in the Middle Horizon assemblages from the Chicha Soras valley were kept past their best for consumption as fresh meat, instead retained for wool recovery and/or transport prior to slaughter. This is like the use pattern identified by Yacobaccio with the community of Susques in Northwest Argentina (2007:151–152). That a significant proportion of the Chicha Soras assemblage (46.7 percent NISP) was less than 36 months at slaughter suggests that meat production was included in the herd management practices (Table 3). This age profile could result from most of the males being culled before reaching adulthood with only prime males kept for breeding (observed ethnographically and current locally) (Flannery et al. 1989; Tomka 1994).

An age profile where older animals dominate has been observed at the Middle Horizon sites of Aqo Wayqo, Conchopata and Huari in the Wari heartland (Pozzi-Escot & Cardoza 1986). Rosenfeld's analysis of assemblages from the Middle Horizon sites of Conchopata in the Ayacucho valley and Cotocotuyoc in the Huaro valley detected a preponderance of young camelids, indicative of a focus on meat consumption. A Middle Horizon assemblage from Chokepukio, southeast of Cuzco, was dominated by adult camelids revealing a focus there on wool and transport (Rosenfeld 2012). It should be noted that, except for Aqo Wayqo, constituting a Wari rural village site, the other aforesaid sites in the Ayacucho and Cuzco areas represent state installations and/or sites with a significant Wari elite. A contributary factor to the camelid age profile at slaughter in the Chicha Soras valley rural sites was ease of access and proximity to the *puna* herds (Miller 2003). A small-scale local elite functioned in the Chicha Soras area, with most of the local population here made up of rural people responsible for their own sustenance as well as for the tribute payments to larger and distant Wari elites.

The Chicha Soras valley camelid age profile (Table 3, Figure 12) indicates most were kept for wool and transport with a small proportion reaching mature old age (5.6 percent NISP), well past their prime, with a minority bred principally for their contribution to the meat component of the local diet. Based on ethnographic data in contemporary camelid herding practices it is likely that most juvenile males were slaughtered as surplus to requirement. Males can be more aggressive with a select few kept for breeding (Flannery et al. 1989; Tomka 1994), while meat of younger animals is considered more agreeable to eat. Other options to manage males into maturity exist such as castration or keeping then separate from the females (Nielsen 2000), both alternatives permit retaining males to more mature ages, with llamas serving for transport. However, keeping uncastrated males to maturity is a labor-intensive option.

The evidence indicates that the camelid bone elements in the various temporally distinct assemblages across the three sites investigated remain proportionately similar over time. This denotes the traditions involved in the processing, consuming and exchange patterns did not change substantially over time (Table 2).

The notion that elements of the prime meat-bearing parts continued to be exchanged with more distant end users during the subsequent Late Intermediate Period is significant. The continuation of such interactions is supported by the presence of other finds categories confirming such distant links. Resources of relevance here are products from the distant tropical rainforest slopes to the north or the coastal desert oases to the west, comprising palm and arrowroot, identified in archaeological contexts from the valley for the Middle Horizon and Late Intermediate periods (Handley et al. 2023; Meddens et al. in prep). Continuation of, or even intensification of long-distance trade during the Late Intermediate Period is confirmed elsewhere across the Andes at this time of endemic conflict (Nielsen 2022), and it unsurprisingly also continued during the Late Horizon.

Instances of pathologies in the assemblages are limited, with occasional dental abscesses and healed leg bone fractures the typical ones found (0.1 percent NSP).

Other Significant Aspects of the Animal Bone Assemblages

There are additional characteristics of the assemblages which merit mentioning though they do not relate to the Middle Horizon.

There are small quantities of feline remains, either Andean cat (*Leopardus jacobita*) or Pampas Cat (*Leopardus colocola*), in early Late Intermediate Period deposits at Chiqna Jota and Late Horizon layers at Chicha Qasa. The importance of this animal in Andean mythology is noted in its prominence in the iconography of a range of Andean cultural traditions (Kauffmann Doig 2011). The Chuquichinchay or Choque chinchay star constellation was worshipped in pre-Spanish times, and it references a cat (Calancha 1638:book 2 chap XI and XIII, 368, 384). Pachacuti Yampqui illustrates a small cat in his diagram of Qoricancha. Here it is linked with the term for hail and is situated on the side close to a spring, clouds, and winter (1993 [1613]:13v; 208). It is described as a multicolored cat, the deity of the jaguars (1993 [1613]:21v, 224). It continued to play a cosmological role in recent times (Urton 1981:99, 114) and persists in contexts related to camelid fertility in *herranza* rituals. Kauffmann Doig sees this animal as signifying an attendant to the principal Andean weather deities (Kauffmann Doig 2011). Similarly, Gálvez (2020) interprets this sacred being as representing a water deity. The single bone from Chicha Qasa is an unfused humerus from a juvenile, while the remains at Chiqna Jota comprise cranial and postcranial elements with butchery marks on the proximal end of a radius, cutting the bone longitudinally; a pattern indicative of this bone being used for the manufacture of needles. The sacred nature of this animal suggests its selection for the fashioning of needles will have had a special purpose.

As elsewhere in many of the prehistoric animal bone assemblages from the Peruvian Andes, guinea pig remains are rare, with just a single fragmentary mandible from a late Late Intermediate Period context from Chicha Qasa. This rarity has elsewhere been explained resulting from the remains being consumed by dogs (Valdez and Valdez 1997). Though dogs are present in small numbers in all animal bone groups and this interpretation may therefore be valid, evidence for gnawing of the animal remains by dogs is rare with only two examples on a camelid long bone, and a radius and ulna, from early Late Intermediate Period deposits at Chiqna Jota. As other small-sized bones were recovered (see below) and the deposits were sieved, the absence of guinea pig from most of the assemblages appears real. Other options for the lack of guinea pig remains include their exclusion from the redeposition process of the bone assemblage, with perhaps the primary or secondary locations for their deposition being elsewhere.

Small quantities of frog remains came from early Late Intermediate Period and Late Horizon deposits at Chiqna Jota. Amphibians are currently rarely encountered in the area. Their presence may stem from wetter episodes, albeit these likely were short term as the Late Intermediate Period overall was drier than the preceding period, while the Late Horizon witnessed overall more variable climatic conditions.

DNA Evidence

We attempted to extract ancient DNA from bones of 10 camelids obtained from the sites Chicha Qasa (AP2-7, $n = 4$) and Yako (LU2, $n = 6$) using a protocol optimized for the recovery of small ancient DNA molecules (Dabney et al. 2013), adding a 0.2 percent bleach pre-digestion as described by (Boessenkool et al. 2016), using 60 mg of sample. These DNA extracts were used to build partially-UDG treated, double-indexed Single Stranded Genomic DNA (ssDNA) sequencing libraries (Kapp et al. 2021). All DNA extraction and sequencing library constructions were performed in the cleanroom facilities of the University of California Santa Cruz Paleogenomics Lab (UCSC-PGL), following strict precautions for contamination prevention as described in Llamas et al. 2017 and Nakatsuka et al. 2020. Each of the libraries was sequenced for ~10 Mio reads on a NextSeq2000 (Illumina) sequencer for 2×100 cycles at UCSC-PGL. The raw sequencing data was processed using our in-house pipeline as described in Fehren-Schmitz et al. (2017), mapping the sequenced reads with BWA (v0.6.1) (Li and Durbin 2009) against the Vicugna pacos genome reference VicPac3.2 (Richardson et al. 2019). We observed a relatively low endogenous DNA content for each sample / library, ranging from 0.03 to 4.2 percent, nevertheless complete or partially complete mitochondrial genomes (mtGenomes) for 5 of the specimens were reconstructable, all from Yako, all of Middle Horizon (Epoch 2) date, at low average coverage ranging from 2-to 26-fold. Using MapDamage 2 (Jónsson et al. 2013), we observe high damage rates at the read termini ranging from 6 to 13 percent, characteristic for ancient DNA molecules.

To determine the species of our five successfully sequenced samples we aligned the mtGenomes to those of modern samples representing the four species: *Vicugna vicugna, Vigugna pacos, Lama guanicoe,* and *Lama glama,* obtained from GenBank with the following accession numbers: NC_011822.1, FJ456892.1, AP003426.1, KU168760.1, AJ566364.1, as well as ancient camelid mtGenomes from Northern Chile (Diaz-Maroto et al. 2021) employing MUSCLE (Edgar 2004). The preliminary analysis of the alignment reveals that four of the camelids from Yako can be identified as Alpacas (*Vicuna Pacos*), while the mtGenome of one camelid matches most closely with Lama (*Lama glama*). Since all the South American camelid species can cross breed, and the mitochondrial genomes obtained here only reflect the maternal ancestry, we cannot exclude that the individuals investigated might have exhibited a phenotype not matching the latter. Further research, including the analysis of genome-wide genetic markers will allow us to gain deeper insights into the ancestry and breeding history of the camelids found at Yako.

Discussion

Intervention of the Wari state in the Chicha Soras valley and its hinterland was marked, with pre-

Middle Horizon activity limited. The manifest population increase across the area resulted from actions by the Wari polity. This occurred during Epoch 2, when the formation processes responsible for the establishment of the Wari state had sufficiently developed to embed its institutions. The late Middle Horizon witnessed widespread reorganization of the Wari phenomenon, characterized by population shifts, changes in iconography and signs of shifts to more integrated hierarchical forms of governance (Knobloch et al. 2023; Jennings and Berquist 2022:13). The Wari polity was able to transplant populations and construct the infrastructure necessary to set up a new tribute hub with ultimately a focus on camelid products in the Chicha Soras area.

The influence exerted by the Wari state on the population introduced from elsewhere into the Chicha Soras area was deeply entrenched as discerned from the associated artifact complexes. The ceramics from settlements in the Chicha Soras valley are limited to Black Decorated C, Huamanga, and Viñaque, as well as a minimal amount of Ocros, while the Naupallacta complex produced exclusively Huamanga style ceramics. Suggesting that the Chicha Soras valley and Naupallacta communities either originated in the Wari heartland centered around Huari in the Ayacucho basin or the nearby Sondondo area where the Wari administrative site of Jincamocco was established during Middle Horizon Epoch 1B, albeit that the latter area also witnessed a period of settlement expansion during Epoch 2 (Schreiber 1992:261). Absence of Viñaque and Black Decorated C styles from the Naupallacta sites does not reflect a temporal difference. All the Huamanga style material at Naupallacta closely parallels the valley assemblages. Huamanga ceramics have been equated with the utilitarian component of the Wari ceramic assemblages (Leoni 2009:157–161). The exclusively Huamanga style assemblage at Naupallacta may reflect a less prestigious aspect of this community compared to the ranking of the contemporary valley sites. It has been argued elsewhere that Black Decorated C represent higher status wares and with polychrome Viñaque material being associated with a "lay elite" (Leoni 2009:155–156), albeit that these styles have also been found in common domestic contexts (pers comm Jose Ochatoma P.).

The various architectural forms at Naupallacta served several different functions. The corrals were for the management of the camelids, the larger orthogonal structures operated as domestic habitation units. The smaller secondary units served kitchen, storage, and processing roles.

The size of Naupallacta and its subsidiaries forming this prominent base for camelid management in the Chicha Soras valley hinterland confirms the state-managed aspect of the enterprise. The modular organization of Naupallacta and Ccanchu of single dwellings each associated with its individual corral and support structures present a formal planned arrangement across the high mesa for the herding community. This likely was underwritten by a yet to be discovered range of small ephemeral estancia-type sites. The choice of this base location for the Naupallacta complex was rooted in the extraordinary appearance in parts of its landscape of fantastical eroded volcanic tuff forms, which would have imbued this scenery with a highly charged animated sacred character.

A factor in the siting of the Naupallacta complex is its proximity to the Lisahuacho and Potreropampa obsidian sources (Figure 1), both exploited during the Middle Horizon and sourced for the obsidian artifacts found on the Chicha Soras settlements (Burger et al. 2006:122) (Figure 1). Obsidian at Naupallacta was likely from these sources. Llamas from the Naupallacta complex likely were deployed in long-distance transport of obsidian to distant end-user sites.

The emphasis on a support role for the focus on camelid management of the agricultural settlements in the Chicha Soras valley is corroborated by the distribution of the Middle Horizon settlements here. They are concentrated at the southern Naupallacta facing end of the valley and the lower reaches of the Yanamayo drainage. This is the nearest Quechua zone (2,300–3,500 m asl) to the puna and *bofedales* area around the Naupallacta pastoralist complex and the most proximal to the agricultural produce this could deliver, though some highaltitude crops were cultivated on agricultural terraces close to the Naupallacta complex itself (Figure 3). The Rio Chalhuanca area to the east, also within the Quechua zone is a similar distance, however there is no valley route access, and the *puna* must be crossed to get there. No sites of Middle Horizon date are reported from this area. The closest late Middle Horizon occupation here is known from Caraybamba, 30 km to the east southeast of Naupallacta (van Dalen Luna 2011).

Camelid parturition predominantly occurs between December and March when pastures are verdant, although births occur at other times. Fetal failure rates are high, up to 40 percent, while such losses at birth are comparatively rare (<4.5 percent) although higher among the non-domesticates due to predation and starvation. Losses in the first year can be 30–40 percent (Bonavia 2008:13, 19; Browman 1989:263; Shimada and Shimada 1985:6). The Middle Horizon assemblages from the Chicha Soras valley do not manifest this high mortality profile for camelids aged less than 12 months (c. 8.3 percent NISP). As noted above it continues to be low at present with losses in the order of 10 percent being reported (pers. comm. Victoria Sotelo), close to that observed in the archaeological assemblages reported on here, albeit that such losses are known to increase significantly resulting from natural disasters such as droughts. Such fatalities are and probably were also deployed elsewhere in ritual and folk medicine type contexts (Rösing 1994; Yacobaccio and Malmierca 2006:152), notably at times of excess juvenile mortality at present in the Chicha Soras area the carcasses are consumed.

The distance between the nearest Middle Horizon sites in the Chicha Soras valley and Naupallacta is 15 km—excessive for any daily commute to look after cultivated fields. Such an orbit would however be easily accommodated in the seasonal cycle where agricultural produce is exchanged for animal produce. Such distances were still part of exchanges between produce from Huayana (from altitudes of ~ 2,800–3,200 m asl) and Pampachiri in the 1980s (c. ~15 km), where residents from Pampachiri would seasonally go to harvest a maize crop. The movement of camelids and produce between the valley agricultural sites and the Naupallacta herding complex would be achievable within half a day. This distance was eminently practical with respect to the relationship envisaged with the farming communities. In the Chicha Soras valley, the initial period of construction of irrigated agricultural terrace systems dates to the Middle Horizon Epoch 2 (Branch et al. 2007; Kemp et al. 2006; Meddens and Branch 2010). Correspondingly the Naupallacta camelid management complex and associated infrastructure dates to this same period.

Large numbers of spindle whorls and potsherds adapted to serve as spindle whorls were present in Middle Horizon deposits excavated at Chiqna Jota and Yako, representing 2.1 and 1.5 percent respectively of the analyzed ceramic assemblages (Meddens 1985:252, Figure 6, 364, Figure 102). The local collection of artifact material at the colegio Jose Manuel Ocampa in Pampachiri, reportedly from tombs in the valley, included high quality Middle Horizon Wari textile fragments decorated in elaborate design motives including a frontal faced individual with divided eye elements (Figure 13) and profile anthropomorphized felines from a Huari style tapestry tunic, confirming the prominence of elite textiles in this regional setting. Considering no such finds were identified in the materials from Naupallacta nor in any collections in the nearby villages, it appears that the processing of camelid fiber and production of textiles during the Middle Horizon was focused on the valley sites rather than on the pastoralist settlement complex of Naupallacta.

The larger Wari polity was particularly interested in the fiber and textile production potential of the *puna* to the Chicha Soras valley. The high proportion of Middle Horizon textiles incorporating camelid fiber bears witness to this (Meddens 1985; Oakland Rodman and Cassman 1995). The presence of fragments of high-status prestige Wari textiles in local collections demonstrates the access to these goods for part of the elite segment of the resident population. More likely than not, such textiles as were produced here fed into the Middle Horizon long distance exchange networks.

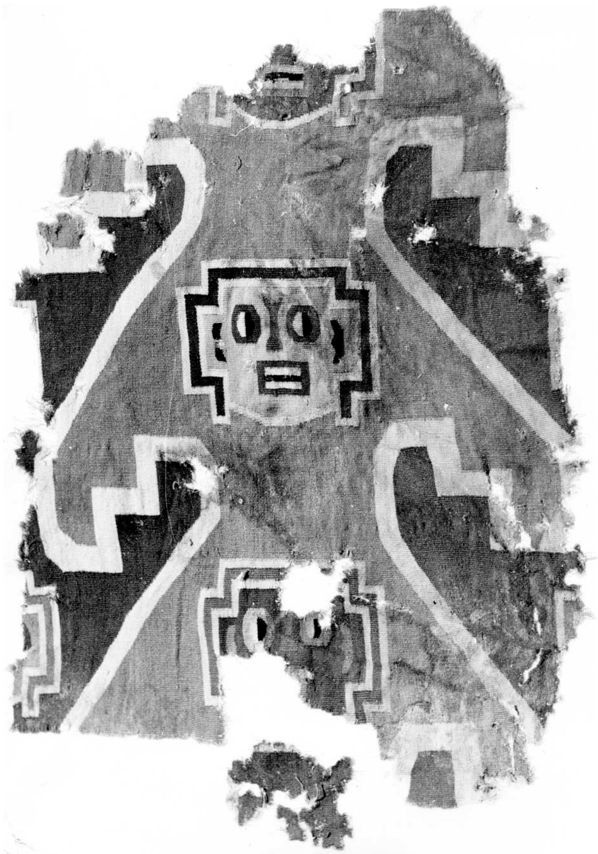


Figure 13. Example of a Middle Horizon Wari textile fragment from the collection of the Colegio Jose Manuel Ocampa in Pampachiri.

That fiber and meat were an important part of the long-distance exchange is confirmed in the age profile of the slaughtered camelids, reflecting an emphasis on wool and transport. The few occasions where dental morphology allowed species identification, the individuals were alpacas with a few vicuña. The aDNA results support an emphasis on fiber production with four of the five examples, where it was possible to identify the mitochondrial DNA attesting to have originated from alpacas. It is stressed though that the sample, where conclusive results proved possible, is both small and that crosses among all four subspecies of camelid are possible and hybrids occur (Bruford et al. 2006). Though this evidence indicates a focus on alpacas, it cannot positively confirm it. Combined all lines of evidence argue in favor of a fiber-focused agropastoral economic setting for the Chicha Soras area during the Middle Horizon.

The pastoralist puna dwellers contributed to and managed the long-distance mobile transport caravans moving trade goods, including wool, *charki*, tubers, *chuño*, maize, salt, and obsidian across the Middle Horizon exchange network. At the other ends of this traffic were coastal desert oases and tropical rainforest environments, confirmed to have provided palm and arrowroot products. The Wari state control of this network is further corroborated at the site of Pataraya, in the Nasca region, southwest of the Chicha Soras area. This small Wari administrative site focused on the extraction of coastal products (such as coca and cotton) and their exchange with highland locales via the system of interregional roads implicit through caravan connections (Edwards 2010; Edwards and Schreiber 2014; Schreiber 2000).

Environmental markers for the later Middle Horizon indicate a period starting with higher precipitation levels followed by a period of declining rainfall. These changing conditions were concurrent with the introduction of significant landscape transformation comprising extensive irrigated agricultural terracing. This in turn formed part of a new integrated exchange network with the pastoralist site complex of Naupallacta. There is no evidence for matching camelid management hubs on the puna west of the Rio Chicha. The extraordinary terrain features present around the Naupallacta complex and the widespread occurrence of *bofedale*s here were significant reasons to focus the camelid management base here rather than in any of the alternative pasture grounds present. The quebradas near Naupallacta offered access to timber and fuel, important factors in its siting as was the proximity to important obsidian sources favoring this location over its alternatives.

Metal working slag at Yako may be an indication that mining was a contemporary activity in the valley hinterland. Gold and silver extraction was of importance there in early colonial times (Espinosa Soriano 2019), and continues in an artisanal fashion today, while copper mining continues at scale.

The mixed agropastoral focus continued into the colonial period and beyond as confirmed by the reference to the *Anta* and *Mayo ayllus* in sixteenth-century documentary source material, which substantiates an enduring community of valley (river) and *puna* (cloud) dwellers in the area.

Conclusions

The upper Chicha Soras valley was first extensively occupied early in Middle Horizon Epoch 2. This Wari state underwritten settlement accompanied construction of terraced and irrigated agricultural infrastructure. Arable agriculture served in part to support the pastoralist community at the Naupallacta complex 15 km to the southeast, this being the first such positively identified Wari camelid management complex. Camelid rearing here focused on the production of alpaca fiber for use in Wari textiles. The siting of Naupallacta was a result of its proximity and accessibility to the arable resources in the upper Chicha Soras valley through its Rio Yanamayo tributary, its proximity to *bofedales* providing grazing for the camelid herds as well as access to important obsidian sources and the extraordinary landscape features there, which would have enriched the esteem of this setting with animated *huaca*-type elements.

Acknowledgments

The authors are grateful to the community of Pampachiri for their support of our fieldwork, to Jennifer Grant for her very useful comments and critical review of an earlier version of this paper, to Douglas Walsh for his help with the Cusichaca Trust data and information gathering, to Marivel Walsh and Daniel Quispe Jimenez for their invaluable assistance in the field, and to Fernando Gonzalez and Martín Tzimaná De La Flor for useful discussions, as well as the helpful comments of two peer reviewers, and the support of Robyn Cutright, the editor of this journal.

Funding

The research was funded by several sources: NERC [project no. NER/B/S/2001/00256] (Branch, Meddens), British Academy [project no. KF2\100158] (Branch, Meddens), Academy of Medical Sciences [project no. GCRFNG\100411] (Branch, Meddens), and Royal Academy of Engineering [project no. FF\1920\1\74] (Branch, Meddens, Aramburu Venegas, Vivanco Pomacanchari).

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Notes

1 The earliest radiocarbon date for terrace construction in the Chicha Soras valley is AD 654-774 (Branch et al. 2007; Kemp et al. 2006). A C14 assay associated with Middle Horizon Epoch 2 ceramics from the site of Chiqna Jota produced a date of cal AD 740–889 (Meddens and Vivanco Pomacanchari 2018). Work by Knobloch et al places ceramics with parallels in the Chicha Soras valley assemblages to a time frame of AD 800/825-900 (Knobloch et al. 2023). While a D-shaped structure such as identified at Yako, were present by AD 720 (Williams et al. 2024). In the absence of ceramic styles attributed to Epoch 1, when referencing Epoch 2 for the Chicha Soras valley herein a date range of ~AD 680/700–900 is intended.

2 MNI – minimum number of individuals is alternatively known as MAU – minimum animal units, introduced as a concept by Binford (Lyman 1994).

3 It is noted that a drought in 2022 affecting the southern highlands of Peru, including the study area, resulted in excess death among juveniles. The carcasses of these animals were butchered for consumption. The presence of larger numbers of juveniles in archaeological contexts can therefore reflect a response to drought or other excess mortality conditions.

Notes on the contributors

Frank Meddens is a visiting research fellow at the University of Reading. He got his PhD in Archaeology at the Institute of Archaeology (UCL) of the University of London, he is a Fellow of the Society of Antiquaries of London, a member of the Chartered Institute for Archaeologists, a Research Associate of the Institute of Andean Studies, and has conducted wide-ranging research in Britain and the Peruvian Andes.

Dannal M. Aramburu Venegas has a degree in archaeology from the Universidad Nacional San Cristóbal de Huamanga, he has been a principal investigator for the Cusichaca Trust and participated in numerous multidisciplinary projects and as a specialist forensic investigator. He has carried out research in Ayacucho and Apurímac and is currently active as a forensic archaeologist.

Nicholas Branch is a professor in palaeoecology at the University of Reading, Department of Geography and Environmental Science. He has a BSc in archaeology and an MSc in archaeobotany from University College London and a PhD in geography from Royal Holloway, University of London. His research focus is on environmental change in the Peruvian Andes with an emphasis on the response of wetland ecosystems and landscapes to human activity and climate variability.

Lars Fehren-Schmitz is at the department of anthropology, University of California, Santa Cruz, CA, USA (lfehrens@ucsc.edu), and an associate director of the UCSC Genomics Institute. He got his PhD in ecology and evolutionary biology from the Georg-August-University Goettingen in 2008. He is a paleogeneticist specializing in the co-evolution of biology and culture, specifically emphasizing the ancient Andes.

Beverley Jane Meddens got her BSc in environmental archaeology from the Institute of Archaeology (UCL) from the University of London. She worked as an archaeozoologist for the Ancient Monuments Laboratories of the Historic Buildings and Monuments Commission for England, and as an environmental archaeologist on sites in the Andes and the UK. She researched land snails and animal remains in archaeological contexts in the UK.

Cirilo Vivanco Pomacanchari is a native of Sarhua, in Ayacucho. He has got a Master's degrees and a doctorate in history, heritage management and archaeology from the Universidad Internacional de Andalucía, Universidad Pablo de Olavide, Sevilla and Pontificia Universidad Católica del Perú. He is a lecturer in archaeology, history and anthropology at the National University of San Cristóbal de Huamanga (UNSCH). He has been the principal and co-investigator in numerous multidisciplinary projects engaged in research of pre-ceramic, formative and Middle Horizon, Late Intermediate Period, and late Horizon cultures.

ORCID

Frank M. Meddens http://orcid.org/0000-0002-7210-7101
Nicholas P. Branch http://orcid.org/0000-0001-8826-0365
Lars Fehren-Schmitz http://orcid.org/0000-0001-5510-1114
Cirilo Vivanco Pomacanchari http://orcid.org/0000-0001-7087-5345

References Cited

Alaica, Aleksa K., Beth K. Scaffidi, Luis Manuel González La Rosa, Justin Jennings, Kelly J. Knudson, and Tiffiny A. Tung
2022 Flexible Agropastoral Strategies During the 1st Millennium CE in Southern Peru: Examining Yunga Arequipa Camelid Husbandry Practices During Wari Expansion Through Stable Isotope Analysis (δ13C and δ15N) in the Majes and Sihuas Valleys. *Quaternary International* 634:48–64. doi:10.1016/j.quaint.2022.06.015.

Albornoz, Cristobal de
1996 [1581–1585] Relación de la visita de extirpación de idolatrías. In *El Retorno de las Huacas*, edited by L. Millones, pp. 265–287. Instituto de Estudios Peruanos, Lima.

Apaéstegui, James, Francisco W. Cruz, Abdelfettah Sifeddine, Mathias Vuille, Jhan Carlo Espinoza, Jean-Loup Guyot, Myriam Khodri, Nicolas Strikis, Roberto V. Santos, Hai Cheng, R. Lawrence Edwards, E. Carvalho, and William Santini

2014 Hydroclimate Variability of the Northwestern Amazon Basin Near the Andean Foothills of Peru Related to the South American Monsoon System During the Last 1600 Years. *Climate Past* 10:1967–1981. doi:10.5194/cp-10-1967-2014.

Baker, Polydora, and Fay Worley

2019 *Animal Bones and Archaeology Recovery to Archive, Historic England Handbooks for Archaeology*. Historic England, Swindon.

Bauer, Brian S., Lucas C. Kellett, and Miriam Aráoz Silva

2010 *The Chanka: Archaeological Research in Andahuaylas (Apurímac), Peru*. Cotsen Institute of Archaeology Press, Los Angeles, California.

Binford, Lewis R.

1981 *Bones, Ancient Men and Modern Myths, Studies in Archaeology*. Academic Press, New York.

Bird, Broxton W., Mark B. Abbott, Mathias Vuille, Donald Rodbell, Nathan D. Stansell, and Michael F. Rosenmeier

2011 A 2,300-Year-Long Annually Resolved Record of the South American Summer Monsoon from the Peruvian Andes. *Proceedings of the National Academy of Sciences* 108(21):8583–8588.

Boessenkool, Sanne, Kristian Hanghøj, Heidi M. Nistelberger, Clio Der Sarkissian, Agata T. Gondek, Ludovic Orlando, James H. Barrett, and Bastiaan Star

2016 Combining Bleach and Mild Pre-Digestion Improves Ancient DNA Recovery from Bones. *Molecular Ecology Resources* 17(4):742–751. doi:10.1111/1755-0998.12623.

Bonavia, Duccio

2008 *The South American Camelids: An Expanded and Corrected Edition*. Cotsen Institute of Archaeology Monograph 64, UCLA.

Branch, Nicholas P., Robert A. Kemp, Barbara Silva, Frank M. Meddens, A. Williams, Ann Kendall, and Cirilo Vivanco Pomacanchari

2007 Testing the Sustainability and Sensitivity to Climatic Change of Terrace Agricultural Systems in the Peruvian Andes: A Pilot Study. *Journal of Archaeological Science* 34:1–9.

Bray, Tamara L.

2003 Inka Pottery as Culinary Equipment: Food, Feasting, and Gender in Imperial State Design. *Latin American Antiquity* 14(1):3–28.

Browman, David L.

1989 Origins and Development of Andean Pastoralism: An Overview of the Past 6000 Years. In *The Walking Larder. Patterns of Domestication, Pastoralism, and Predation*, edited by J. Clutton-Brock, pp. 256–268. Unwin Hyman, London.

Bruford, Michael W., Chikhi, Lounès, Wheeler, C. Jane, and Bradley, Daniel G.

2006 Genetic Analysis of the Origins of Domestic South American Camelids. In *Documenting Domestication: New Genetic and Archaeological Paradigms*, edited by Melinda A. Zeder, Daniel Bradley, Eve Emshwiller and Bruce D. Smith, pp. 329–341. University of California Press, Berkeley. doi:10.1525/9780520932425-026

Burger, Richard L., Fidel A. Fajardo Rios, and Michael D. Glascock

2006 Potreropampa and Lisahuacho Obsidian Sources: Geological Origins of Andahuaylas A and B Type Obsidians in the Province of Aymaraes, Department of Apurimac, Peru. *Ñawpa Pacha, Journal of Andean Archaeology* 28:109–127.

Cagnato, Clarissa, Nicolas Goepfert, Michelle Elliott, Gabriel Prieto, John Verano, and Elise Dufour

2021 Eat and Die: The Last Meal of Sacrificed Chimú Camelids at Huanchaquito-Las Llamas, Peru, as Revealed by Starch Grain Analysis. *Latin American Antiquity* 32(3):595–611. doi:10.1017/laq.2021.19.

Calancha, Fray Antonio de la

1638 *Corónica Moralizada del Orden de San Agustín en el Perú*. Pedro Lacavalleria, Barcelona.

Cazorla Zen, Carmen

2006 *Informe de análisis de material cultural Andamarca*, Unpublished Report for the Cusichaca Trust.

Chepstow-Lusty, Alex, Michael Frogley, Brian Bauer, Alfredo Tupayachi Herrera, and Mark B. Bush

2003 A Late Holocene Record of Arid Events from the Cuzco Region, Peru. *Journal of Quaternary Science* 18(6):491–502.

Cobo, Bernabe

1892 [1653] Historia del Nuevo Mundo, vol. III. *Sociedad de Bibliófiles Andaluces*. Edited by D.M. Jiménez de la Espada. E. Rasco, Seville.

Dabney, Jesse, Michael Knapp, Isabelle Glocke, Marie-Theres Gansauge, Antje Weihmann, Birgit Nickel, Cristina Valdiosera et al.

2013 Complete Mitochondrial Genome Sequence of a Middle Pleistocene Cave Bear Reconstructed from Ultrashort DNA Fragments. *Proceedings of the National Academy of Sciences of the United States of America* 110:15758–15763.

DeFrance, Susan D.

2014 The Luxury of Variety: Animals and Social

Distinction at the Wari Site of Cerro Baúl, Southern Peru. In *Animals and Inequality in the Ancient World*, edited by Benjamin S. Arbuckle and Sue Ann McCarty, pp. 63–84. University Press of Colorado, Denver. doi:10.5876/9781607322863.c003.

2016 Pastoralism Through Time in Southern Peru. In *The Archaeology of Andean Pastoralism*, edited by J.M. Capriles and N. Tripcevich, pp. 119–138. University of New Mexico Press, Albuquerque.

Diaz-Maroto, Paloma F., Alba Rey-Iglesia, Isabel Cartajena, Lautaro Núñez, Michael V. Westbury, Valeria Varas, Mauricio Moraga, Paula F. Campos, Pablo Orozco-ter Wengel, Juan C. Marin, and Anders Johannes Hansen

2021 Ancient DNA Reveals the Lost Domestication History of South American Camelids in Northern Chile and Across the Andes. *eLife* 10: e63390. doi:10.7554/eLife.63390.

Dransart, Penelope Z.

2002 *Earth, Water, Fleece and Fabric, an Ethnography and Archaeology of Camelid Herding*. Routledge, London.

Dufour, Elise, and Nicolas Goepfert

2019 Past Andean Pastoralism: A Reconsidered Diversity. Introduction to the Special Issue. *Environmental Archaeology* 25(3):257–261. doi: 10.1080/14614103.2019.1619981.

Edgar, Robert C.

2004 MUSCLE: Multiple Sequence Alignment with High Accuracy and High Throughput. *Nucleic Acids Research* 32:1792–1797. doi:10.1093/nar/gkh340.

Edwards, Matthew J.

2010 Archaeological Investigations at Pataraya: A Wari Outpost in the Nasca Valley of Southern Peru. Unpublished Ph.D. Dissertation, University of California, Santa Barbara.

Edwards, Matthew J., and Katharina Schreiber

2014 Pataraya: The Archaeology of a Wari Outpost in Nasca. *Latin American Antiquity* 25(2): 215–233.

Espinoza Martinez, Hector

1995 Asentamientos Prehispanicos de la Provincia Sucre-Ayacucho. *Revista Arqueologica Saqsaywaman* 4:149–170.

Espinoza Soriano, Waldemar

2019 *Etnias del Imperio de los Incas: reinos, señoríos, curacazgos y cacicatos, Volumes 1, 2, and 3*. Editorial Universitaria Ricardo Palma, Lima.

Eunju Park, Julie

2001 Food from the Heartland: The Iwawi Site and Tiwanaku Political Economy from a Faunal Perspective, MA thesis unpublished, Simon Fraser University.

Fehren-Schmitz, Lars, Catrine L. Jarman, Kelly M. Harkins, Manfred Kayser, Brian N. Popp, and Pontus Skoglund

2017 Genetic Ancestry of Rapanui Before and After European Contact. *Current Biology* 27: 3209–3215.e6. doi:10.1016/j.cub.2017.09.029.

Feldman, Robert A.

1989 A Speculative Hypothesis of Wari Southern Expansion. In *The Nature of Wari: A Reappraisal of the Middle Horizon Period in Peru*, edited by R.M. Czwarno, F.M. Meddens, and A. Morgan, pp. 72–97. BAR International Series 525, Oxford.

Finucane, Brian C.

2009 Maize and Sociopolitical Complexity in the Ayacucho Valley, Peru. *Current Anthropology* 50 (4):535–545.

Finucane, Brian, Patricia Maita Agurto, and William H. Isbell

2006 Human and Animal Diet at Conchopata, Peru: Stable Isotope Evidence for Maize Agriculture and Animal Management Practices During the Middle Horizon. *Journal of Archaeological Science* 33:1766–1776.

Flannery, Kent V., Joyce Marcus, and Robert G. Reynolds

1989 *The Flocks of the Wamani: A Study of Llama Herders on the Punas of Ayacucho, Peru*. Academic Press Inc, San Diego, California.

Gálvez, Ana Maria

2020 *Chuqui Chinchay, deidad del agua: animal de poder en la cosmovisión Andina*. Sinco Editores.

Grant, Jennifer

2017 Of Hunting and Herding: Isotopic Evidence in Wild and Domesticated Camelids from the Southern Argentine Puna (2120–420years BP). *Journal of Archaeological Science: Reports* 11:29–37.

Grossman, Joel W.

1983 Demographic Change and Economic Transformation in the Southcentral Highlands of Pre-Huari Peru. *Ñawpa Pacha, Journal of Andean Archaeology* 21:45–126.

Gundermann, Hans K.

1984 Ganadería Aymara, Ecología y Forrajes: Evaluación regional de una actividad productiva andina. *Chungara: Revista de Antropología Chilena* 12:99–123.

Handley, Josephine, Nicholas P. Branch, Frank M. Meddens, Michael Simmonds, and José Iriarte

2023 Pre-Hispanic Terrace Agricultural Practices and Long-Distance Transfer of Plant Taxa in the

Southern-Central Peruvian Andes Revealed by Phytolith and Pollen Analysis. *Vegetation History and Archaeobotany* 33(3):375–391. doi: 10.1007/s00334-023-00946-w.

Haug, H. Gerald, Konrad A. Hughen, Daniel M. Sigman, Larry C. Peterson, and Ursula Röhl
2001 Southward Migration of the Intertropical Convergence Zone through the Holocene. *Science 293*:1304–1308. doi:10.1126/science.1059725

Jennings, Justin, and Stephen Berquist
2022 Ayllus, Ancestors and the (Un)Making of the Wari State. *Cambridge Archaeological Journal* 33(2): 349–369. doi:10.1017/S0959774322000336.

Jónsson, Hákon, Aurélien Ginolhac, Mikkel Schubert, Philip L F Johnson, and Ludovic Orlando
2013 MapDamage2.0: Fast Approximate Bayesian Estimates of Ancient DNA Damage Parameters, in: Bioinformatics. pp. 1682–1684. doi:10.1093/bioinformatics/btt193

Kanner, Lisa C., Stephen J. Burns, Hai Cheng, R. Lawrence Edwards, and Mathias Vuille
2013 High-Resolution Variability of the South American Summer Monsoon Over the Last Seven Millennia: Insights from a Speleothem Record from the Central Peruvian Andes. *Quaternary Science Reviews* 75:1–10.

Kapp, Joshua D., Richard E. Green, and Beth Shapiro
2021 A Fast and Efficient Single-Stranded Genomic Library Preparation Method Optimized for Ancient DNA. *Journal of Heredity* 112: 241–249. doi:10.1093/jhered/esab012.

Kauffmann Doig, Frederico
2011 Los dioses andinos: dioses del sustento. *Arqueología y Vida* 4:245–293.

Kemp, Robert, Nicholas P. Branch, Barbara Silva, Frank M. Meddens, A. Williams, Ann Kendall, and Cirilo Vivanco Pomacanchari
2006 Pedosedimentary, Cultural and Environmental Significance of Paleosols Within Pre-Hispanic Agricultural Terraces in the Southern Peruvian Andes. *Quaternary International* 158:13–22.

Kendall, Ann, and Abelardo Rodríguez
2015 [2009] *Desarrollo y perspectivas de los sistemas de andenería de los Andes centrales del Perú*, Nueva edición [en línea]. Institut français d'études andines, Lima. https://books.openedition.org/ifea/6110.

Kent, Jonathan D.
1982 The Domestication and Exploitation of South American Camelids: Methods of Analysis and their Application to Circum-lacustrine Archaeological Sites in Bolivia and Peru. Unpublished Ph.D. Dissertation, Department of Anthropology, Washington University, St. Louis.

Knobloch, Patricia J., Michael D. Glascock, and Brandi L. MacDonald
2023 Picking up the Pieces: Instrumental Neutron Activation Analysis (INAA) of Early Intermediate Period and Middle Horizon Pottery from Ayacucho, Peru. *Ñawpa Pacha, Journal of the Institute of Andean Studies* 43(1):55–98.

Kuznar, Lawrence A.
1995 *Awatimarka: The Ethnoarchaeology of an Andean Herding Community*. Harcourt Brace, San Diego.

Leoni, Juan B.
2009 *Archaeological Investigations at Ñawinpukyo, Change and Continuity in an Early Intermediate Period and Middle Horizon Community in Ayacucho, Peru*. BAR International Series 1991, Archaeopress, Oxford.

Li, Heng, and Richard Durbin
2009 Fast and Accurate Short Read Alignment with Burrows-Wheeler Transform. *Bioinformatics* 25: 1754–1760. doi:10.1093/bioinformatics/btp324.

Llamas, Bastien, Guido Valverde, Lars Fehren-Schmitz, Laura S. Weyrich, Alan Cooper, and Wolfgang Haak
2017 From the Field to the Laboratory: Controlling DNA Contamination in Ancient DNA Research. *STAR-Science and Technology of Archaeological Research* 3:1–14.

Lyman, R. Lee
1994 Quantitative Units and Terminology in Zooarchaeology. *American Antiquity* 59:36–71.

Madgwick, Richard, and Jaqui Mulville
2012 Investigating Variation in the Prevalence of Weathering in Faunal Assemblages in the UK: A Multivariate Statistical Approach. *International Journal of Osteoarchaeology* 22:509–522.

Mallco Huarcaya, Rafael
2013 Ocupación Prehispanica en el area del distrito de San Pedro de Larcay, Sucre—Ayacucho. *Arqueología y Sociedad* 25:215–258.

Mallco Huarcaya, Rafael, and Luis Angulo Paredes
2016 Desarrollo Cultural y Principales Caracteristicas Arquitectónicas en los Sitios Prehispanicos del Distrito de San Pedro de Larcay, Provincia Sucre, Departamento Ayacucho. *Arqueología y Sociedad* 32:57–110.

Mannheim, Bruce
1991 *The Language of the Inka Since the European Invasion*. University of Texas Press, Austin.

Masco, Elizabeth
2022 Informe en criaderos de camelidos

sudamericanos de las comunidades de Pabellones, Huaccoto y Llancama, Unpublished field report for Cropp.

Mayer, Enrique
2002 *The Articulated Peasant: Household Economies in the Andes*. Westview Press, Boulder.

McCorkle, Constance M.
1987 Punas, Pastures and Fields: Grazing Strategies and the Agropastoral Dialectic in an Indigenous Andean Community. In *Arid Land Use Strategies and Risk Management in the Andes: A Regional Anthropological Perspective*, edited by D.L. Browman, pp. 57–80. Westview, Boulder, Colorado.

Meddens, Frank M.
1985 The Chicha/Soras Valley During the Middle Horizon; Provincial Aspects of Huari. Unpublished Ph.D. dissertation, Institute of Archaeology University of London.
1989 Implications of Camelid Management and Textile Production for Huari. In *The Nature of Wari: A Reappraisal of the Middle Horizon Period in Peru*, edited by R.M. Czwarno, F.M. Meddens, and A. Morgan, pp. 146–165. BAR International Series 525, Oxford.

Meddens, Frank M., and Nicholas P. Branch
2010 The Wari State, Its Use of Ancestors, Rural Hinterland, and Agricultural Infrastructure. In *Beyond Wari Walls the Nature of Middle Horizon Peru Away from Wari Centers*, edited by Justin Jennings, pp. 155–170. University of New Mexico Press, Albuquerque.

Meddens, Frank M., Nicholas P. Branch, Francisco Ferreira, Josie Handley, and Mike Simmonds
in prep. Expansión demográfica, conflictos, e intercambios a larga distancia: Nueva evidencia de productos tropicales en andenes agrícolas del valle de Chicha Soras, en los Andes peruanos, durante el Horizonte Medio y el Período Intermedio Tardío. Edited by P. van Dalen Luna. *La Arqueologia de Apurimac*.

Meddens, Frank M., and Anita Cook
2000 La Administración Wari y el culto a los muertos: Yako, Los edificios en forma “D” en la sierra surcentral del Peru. In *Wari: Arte Precolombino Peruano*, edited by Luis Milliones, pp. 212–228. Fundación El Monte, Seville.

Meddens, Frank, and Vivanco Pomacanchari, Cirilo
2018 The Late Intermediate Period Ceramic Traditions of Ayacucho, Apurimac, and Huancavelica: current thoughts on the Chanca and other Regional Polities. *Ñawpa Pacha 38*: 3–56. doi:10.1080/00776297.2018.1436653

Medina Gamboa, Luz Melisa
2013 *Informe Final Descripción Socioeconómica y Cultural. In: Evaluación de los Recursos Hídricos en Cabecera de las Subcuencas de las Provincias de Andahuaylas y Chincheros, Aspecto Socioeconómico y Cultural*, Anexo II. Ministerio de Agricultura Autoridad Nacional del Agua Dirección de Conservación y Planeamiento de Recursos Hídricos.

Melton, Mallory A., Aleksa K. Alaica, Matthew E. Biwer, Luis Manuel González La Rosa, Gwyneth Gordon, Kelly J. Knudson, Amber M. VanDerwarker, and Justin Jennings
2023 Reconstructing Middle Horizon Camelid Diets and Foddering Practices: Microbotanical and Isotope Analyses of Dental Remains from Quilcapampa, Peru. *Latin American Antiquity* 34(4):783–803. doi:10.1017/laq.2022.80.

Mengoni Goñalons, Guillermo Luis
1991 La llama y sus productos primarios, FILO Universidad de Buenos Aires. *Revista Arqueología* 1:179–196.

Miller, George R.
2003 Food for the Dead, Tools for the Afterlife. In *The 1912 Yale Peruvian Scientific Expedition Collections from Machu Picchu. Human and Animal Remains*, edited by Richard Burger and Lucy Salazar, pp. 1–63. Vol. 85. Yale University Publications in Anthropology, New Haven, Connecticut.

Miller, George R., and Richard L. Burger
1995 Our Father the Cayman, Our Dinner the Llama: Animal Utilization at Chavín de Huántar, Peru. *American Antiquity* 60(3):421–458. doi:10.2307/282258.
2000 Ch’arki at Chavín: Ethnographic Models and Archaeological Data. *American Antiquity* 65(3): 573–576. doi:10.2307/2694537.

Moore, Katherine Mattison
1989 Hunting and the Origins of Herding in Peru. Ph.D. dissertation. University of Michigan, Ann Arbor. University Microfilms, Ann Arbor.

Murra, John V.
1980 *Economic Organization of the Inca State, Research in Economic Anthropology. Supplement 1980, Suppl. 1*. JAI Press, Greenwich, Connecticut.

Nakatsuka, Nathan, Iosif Lazaridis, Chiara Barbieri, Pontus Skoglund, Nadin Rohland, Swapan Mallick, Cosimo Posth, et al.
2020 A Paleogenomic Reconstruction of the Deep Population History of the Andes. *Cell* 181: 1131–1145.e21. doi:10.1016/j.cell.2020.04.015.

Nielsen, Axel E.
2000 Andean Caravans: An Ethnoarchaeology. Unpublished Ph.D. dissertation, The University of Arizona. http://hdl.handle.net/10150/289098.
2022 Rest Areas and Long-Distance Caravans: Ethnoarchaeological Notes from the Southern Andes. In *Caravans in Socio-Cultural Perspective: Past and Present*, edited by Persis B. Clarkson and Calogero M. Santoro, pp. 20–38. Routledge, London.

Oakland Rodman, Amy, and Vicki Cassman
1995 Andean Tapestry: Structure Informs the Surface. *Art Journal* 54(2):33–39.

Pachacuti Yamqui, Joan de
1993 [1613] *Relación de Antigüedades deste Reyno del Pirú. In Relación de Antigüedades deste Reyno del Pirú*, J. Pachacuti Yamqui, P. Duviols and C. Itier, 181-68. Instituto Francés de Estudios Andinos/Centro de Estudios Regionales Andinos "Bartolomé de las Casas", Cusco.

Pozzi-Escot, Denise
2004 Los camélidos en el antiguo Perú, un balance desde la arqueozoología. In *Zooarchaeology of South America*, edited by G.L. Mengoni Goñalons, pp. 139–151. BAR International Series 1298, Archaeopress, Oxford.

Pozzi-Escot, Denise, and Carmen R. Cardoza
1986 *El consúmo de camélidos entre el Formativo y Wari en Ayacucho*. INDEA LTNSCH, Ayacucho.

Reigadas, Maria del Carmen
2001 Herding Today, Lassoing the Past, Herding Yesterday: Towards the Ancients (Livestock Specialization and Variability in Pastoral Contexts, Kuznar, L.A. (ed) Ethnoarchaeology of Andean South America, Contributions to Archaeological Method and Theory. *International Monographs in Prehistory, Ethnoarchaeological Series* 34:221–242.

Rein, Bert, Andreas Lückge, Lutz Reinhardt, Frank Sirocko, Anja Wolf, and Wolf-Christian Dullo
2005 El Niño Variability off Peru During the Last 20,000 Years. *Paleoceanography and Paleoclimatology* 20(4): 1–17. doi:10.1029/2004PA001099.

Richardson, Mark F., Kylie Munyard, Larry J. Croft, Theodore R. Allnutt, Felicity Jackling, Fahad Alshanbari, Matthew Jevit, et al.
2019 Chromosome-Level Alpaca Reference Genome VicPac3.1 Improves Genomic Insight into the Biology of New World Camelids. *Frontiers in Genetics* 10:586. doi:10.3389/fgene.2019.00586.

Rosenfeld, Silvana A.
2012 Animal Wealth and Local Power in the Huari Empire. *Ñawpa Pacha, Journal of Andean Archaeology* 32(1):131–164.

Rosenfeld, Silvana A., and Matthew P. Sayre
2016 Llamas on the Land: Production and Consumption of Meat at Chavín de Huántar, Peru. *Latin American Antiquity* 27(4):497–511.

Rowe, John H.
1946 Inca Culture at the Time of the Spanish Conquest. In *Handbook of South American Indians*, Vol. 2, edited by J. Steward, pp. 183–330. Smithsonian Institution, Washington, DC.

Rösing, lna
1994 La Deuda de Ofrenda: Un concepto central de la religión andina. *Revista Andina* 12(1): 191–216.

Samec, Celeste T., Malena Pirola, Hugo D. Yacobaccio, and Héctor O. Panarello
2020 Assessing Prehispanic Herding Strategies Through Stable Isotope Analysis: A Case Study from the Dry Puna of Argentina. *Environmental Archaeology* 25(3):353–364. doi: 10.1080/14614103.2018.1549348.

Sandweiss, Daniel H.C., Fred T. Andrus, Alice R. Kelley, and Paul B. Roscoe
2020 Archaeological Climate Proxies and the Complexities of Reconstructing Holocene El Niño in Coastal Peru. *Proceedings of the National Academy of Sciences* 117(15): 8271–8279.

Schreiber, Katharina J.
1992 *Wari Imperialism in Middle Horizon Peru, Anthropological Papers of the Museum of Anthropology University of Michigan*, No 87, Ann Arbor.
2000 Los Wari en su Contexto Local: Nasca y Sondondo. *Boletin de Arqueología PUCP* 4: 425–447.

Shimada, Melody, and Izumi Shimada
1985 Prehistoric Llama Breeding and Herding on the North Coast of Peru. *American Antiquity* 50(1): 3–26.

Sillar, Bill
2009 The Social Agency of Things? Animism and Materiality in the Andes. *Cambridge Archaeological Journal* 19(3):367–377. doi:10.1017/S0959774309000559.

Silva Brogca, Barbara Nelsa
2007 *Late Glacial and Holocene Environmental Changes in the Peruvian Andes: Implications for Human*

Society. Unpublished Ph.D. dissertation, Royal Holloway University of London.

Stansell, Nathan D., Joseph M. Licciardi, Donald T. Rodbell, and Bryan G. Mark
2017 Tropical Ocean-Atmospheric Forcing of Late Glacial and Holocene Glacier Fluctuations in the Cordillera Blanca, Peru. *Geophysical Research Letters* 44(9):4176–4185. doi:10.1002/2016GL072408.

Szpak, Paul, Jean-François Millaire, Christine D. White, George F. Lau, Surette Flannery, and Fred J. Longstaffe
2015 Origins of Prehispanic Camelid Wool Textiles from the North and Central Coasts of Peru Traced by Carbon and Nitrogen Isotopic Analyses. *Current Anthropology* 56(3):449–459.

Tapia Núñez, Mario E., and Jorge A. Flores Ochoa
1984 *Pastoreo y Pastizales de los Andes del Sur del Peru*. Instituto Nacional de Investigación y Promoción Agropecuaria, Programa Colaborativo de Apoyo a la Investigación en Rumiantes Menores, Lima.

Thompson, Lonnie G., Ellen Mosley-Thompson, Mary E. Davis, and Stacy E. Porter
2017 Ice Core Records of Climate and Environmental Variability in the Tropical Andes of Peru: Past Present and Future. *Revista de Glaciares y Ecosistemas de Montaña* 3:25–40.

Thompson, Lonnie G., Ellen Mosley-Thompson, Mary E. Davis, Victor Zagorodnov, Ian Howat, Vladimir Mikhalenko, and Ping-Nan Lin
2013 Annually Resolved Ice Core Records of Tropical Climate Variability Over the Past ~1800 Years. *Science* 340(6135):945–950.

Thornton, Erin K., Susan D. deFrance, John Krigbaum, and Patrick Ryan Williams
2011 Isotopic Evidence for Middle Horizon to 16th Century Camelid Herding in the Osmore Valley, Peru. *International Journal of Osteoarchaeology* 21:544–567.

Tomczyk, Weronika, Miłosz Giersz, Arkadiusz Sołtysiak, George D. Kamenov, and John Krigbaum
2019 Patterns of Camelid Management in Wari Empire Reconstructed Using Multiple Stable Isotope Analysis: Evidence from Castillo de Huarmey, Northern Coast of Peru. *Archaeological and Anthropological Sciences* 11: 1307–1324. doi:10.1007/s12520-017-0590-6.

Tomka, Steve Alojas
1994 Quinua and Camelids on the Bolivian Altiplano: An Ethnoarchaeological Approach to Agro-pastoral Subsistence Production with an Emphasis on Agropastoral Transhumance. Unpublished Ph.D. dissertation, University of Texas at Austin.

Urton, Gary
1981 *At the Crossroads of the Earth and the Sky: An Andean Cosmology*. University of Texas Press, Austin.

Valdez, Lidio M.
2000 On Ch'arki Consumption in the Ancient Central Andes: A Cautionary Note. *American Antiquity* 65(3):567–572.

Valdez, Lidio, and J. Ernesto Valdez
1997 Reconsidering the Archaeological Rarity of Guinea Pig Bone in the Central Andes. *Current Anthropology* 38(5):896–898.

Vallières, Claudine
2012 *A Taste of Tiwanaku: Daily Life in an Ancient Andean Urban Center as Seen Through Cuisine*, Unpublished Ph.D. thesis, McGill University.

van Dalen Luna, Pieter
2011 *Arqueología Prehispánica Tardía de Caraybamba, Aymaraes, Apurímac, Asentamientos y Andenerías*. Universidad Nacional Mayor de San Marcos, Lima.

Vega, P. Antonio de
1948 [1600] *Historia del Colegio y Universidad del Colegio y Universidad de San Ignacio de Loyola de la Cuidad del Cuzco*, R. Vargas Ugarte S.J. (Red), Vol. VI. Biblioteca Histórica Peruana, Lima.

Vilá, Bibiana
2021 Times of Change, Young People and the Future of Llama Caravans in Santa Catalina, Jujuy, Argentina. In *Caravans in Socio-Cultural Perspective: Past and Present*, edited by Persis B. Clarkson and Calogero M. Santoro, pp. 6–18. Routledge, London.

Vining, Benjamin R.
2016 Pastoral Intensification, Social Fissioning, and Ties to State Economies at the Formative Period—Middle Horizon Transition in the Lake Suches Region, Southern Peru. In *The Archaeology of Andean Pastoralism*, edited by J.M. Capriles and N. Tripcevich, pp. 87–118. University of New Mexico Press, Albuquerque.

Vuille, Mathias, Stephen J. Burns, B.L. Taylor, Francisco W. Cruz, Broxton Bird, Mark B. Abbott, L.C. Kanner, Henyi Cheng, and Valdir Felipe Novello
2012 A Review of the South American Monsoon History as Recorded in Stable Isotopic Proxies Over the Past Two Millennia. *Climate of the Past* 8(4):1309–1321. doi:10.5194/cp-8-1309-2012.

Wheeler, Jane C.
1982 Aging Llamas and Alpacas by Their Teeth. *Llama World* 1:12–17.

1999 Patrones prehistóricos de utilización de los camélidos sudamericano. *Boletín de Arqueología PUCP* 3:297–305.

Wheeler, Jane C., A.J.F. Russel, and Hilary Redden

1995 Llamas and Alpacas: Pre-Conquest Breeds and Post-Conquest Hybrids. *Journal of Archaeological Science* 22:833–840.

Williams, Patrick Ryan, David Reid, M. Elizabeth Grávalosc, Erik Marsh, Véronique Bélislee, Christina Conlee, Sarah Kerchusky, and Gordon McEwan

2024 Wari Across the Andes: Modeling the Radiocarbon Evidence. *Quaternary International* 703: 49–66. doi:10.1016/j.quaint.2024.04.007

Wilson, David J.

1988 *Prehispanic Settlement Patterns in the Lower Santa Valley Peru: A Regional Perspective on the Origins and Development of Complex North Coast Society*. Smithsonian Institution Press, Washington, DC.

Yacobaccio, Hugo D.

2007 Andean Camelid Herding in the South Andes: Ethnoarchaeological Models for Archaeozoological Research. *Anthropozoológica* 42(2):143–154.

Yacobaccio, Hugo D., and Celina M. Madero

2001 Ethnoarchaeology of a Pastoral Settlement of the Andean Plateau: An Investigation of Archaeological Scale. In *Ethnoarchaeology of Andean South America, Contributions to Archaeological Method and Theory, International Monographs in Prehistory, Ethnoarchaeological Series 34*, edited by L.A. Kuznar, pp. 84–96. Ann Arbor.

Yacobaccio, Hugo D., and Marcela Malmierca

2006 The Role of the Challada in Llama Culling (Puna of Atacama, Argentina). In *Kay Pacha: Cultivating Earth and Water in the Andes*, edited by Penelope Dransart, pp. 151–156. BAR International Series 1478, Archaeopress, Oxford.