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### **BONE CUTTING, PLACEMENT, AND CANNIBALISM? MIDDLE PRECERAMIC MORTUARY PATTERNS OF NANCHOC, NORTHERN PERU**

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Mortuary practices of the Middle Preceramic period (ca. 8500-4000 B.P.) are discussed for the Nanchoc region of the upper Zaña Valley, northern Peru. Careful breaking, cutting, and placement of human bones from adult males during the Las Pircas Phase (8500-6000 B.P. ) gave way to more haphazard breakage and discard during the subsequent Tierra Blanca Phase (6000-5000 B.P.). The evidence of cannibalism is considered. Bone breakage, cutting, and possibly cannibalism is believed to have been part of a broader process of ritualization that mitigated the spiritual danger of the transition from hunting-gathering to horticulture.

**Key words:** Preceramic, mortuary practices, Nanchoc, Zaña Valley, cannibalism.

*Este trabajo discute las prácticas mortuorias del Período Precerámico Medio (ca. 8500 - 4000 A.P.) de la región Nanchoc del Valle superior de Zaña del norte de Perú. Rompimiento de huesos en forma cuidadosa, cortes y entierro de huesos de hombres adultos durante la Fase Las Pircas (8500 - 600 A.P.) da lugar a un quebramiento mas al azar de huesos y subsecuente descarte en la Fase Tierra Blanca (6000 - 5000 A. P.). Se considera la posibilidad de canibalismo. Las quebraduras de huesos, cortes y posiblemente el canibalismo podrían haber sido parte importante de un amplio proceso de rituales que mitigaban el peligro espiritual de la transición de los cazadores recolectores a la horticultura.*

**Palabras claves:** Precerámico, prácticas mortuorias, Nanchoc, Valle de Zaña, canibalismo.

Reported below are mortuary patterns of a middle Preceramic Period society—the Nanchoc Tradition—living in the middle and upper Zaña Valley of northern Peru between 8500 and 5000 years ago. This society is known from more than 60 recorded sites including one public site, CA09-04, and many residential sites. The Nanchoc mound site, CA09-04, is characterized by a pair of small mounds radiocarbon dated between 7000 and 5500 years ago. They are not associated with domestic debris and probably represent a public work place where cal or lime was produced for the consumption of coca leaves, the latter found in later residential sites ([Dillehay and Netherly 1983](#); [Dillehay et al. 1989](#)). Most of the residential sites contemporaneous with the mound site are defined

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by thin middens with quincha cane huts, hearths and other domestic remains. The Nanchoc Tradition is divided into two cultural phases, each of which have distinct burial patterns. The meaning of these patterns are discussed in terms of the broader societal context of the Middle Preceramic Period.

### **Previous Research and Background Material**

During ten field seasons in the Zaña Valley on the north coast of Peru, from 1976-1996, various areas of the middle and upper valley have been surveyed ([Figure 1](#)). Research focused primarily on the Preceramic Period. The middle and upper valley appears to have had a cultural florescence during the middle Preceramic period (ca. 8500-6000 B.P.), a time we have now labeled the Las Pircas Phase. The following Tierra Blanca Phase (ca. 6000-5000 B.P.) was defined in a nearby quebrada. The vast majority of the human skeletal remains pertain to the Las Pircas Phase.

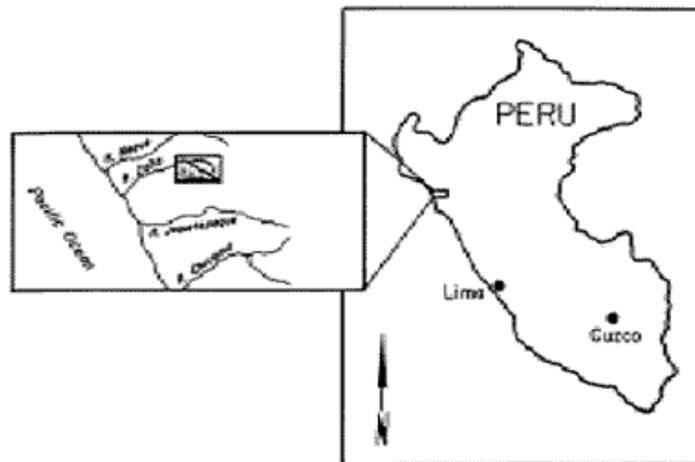


Figure 1. General map of study area.

The Preceramic sites of the Nanchoc Valley are located in an area where the vegetation presently grades from thorny brush at 300-500 m and dry subtropical forest between 500-1200 m to low montane dry forest between 1200-300m. The presence of deciduous and evergreen forests on the western slopes can no longer be considered unique to the Nanchoc and Zaña Valleys. It is a part of a discontinuous north-south continuum which extends from Trujillo to Manabi, Ecuador. In the past, the low montane dry forest zone extended across the Andes to the valley of the Chotano River because north of Cajamarca the cordillera does not exceed 3000 masl. These forest zones oscillated up and down the slopes in the past with changes in temperature and rainfall patterns.

### **The Las Pircas Phase**

The Las Pircas Phase dates from 8500-7000 B.P. This period seems to represent the first major population of the inland, western slopes of the Zaña and Nanchoc Valleys. The Quebrada de Las Pircas is the largest of the quebrada side canyons in the Nanchoc region. Its alluvial fans and fan remnants are dotted with small (30-100 m long) preceramic residential and special activity sites, several of which have been excavated ([Dillehay et al. 1989](#), [1997](#); [Rossen 1991](#)). All Las Pircas Phase sites contain thin ashy middens ranging from 20-70 cm in depth. Features at these sites appear to be interrelated and are never superimposed, suggesting a single cultural occupation.

The Las Pircas artifact collections are dominated by a varied, well made, exclusively unifacial lithic industry that we have denoted the Nanchoc Lithic Tradition (NLT) ([Dillehay et al. 1989](#); [Rossen 1991](#), [1998](#)). The NLT was heavily oriented toward plant processing and woodworking, and bright plant polish and fibers on many analyzed use edges, along with heavy wear on human teeth supports this ([Dillehay and Rossen i.p.](#); [Guillen 1988](#)). Las Pircas Phase sites also contain an abundant and varied ground stone assemblage, botanical remains including squash, peanuts, manioc, a quinoa-like chenopod, and fleshy Solanaceous and cactus fruits ([Rossen 1991](#); [Rossen et al. 1996](#)). Exotic items

such as quartz crystals, stingray spines, fossils, beads, and one broken Paijan point made of red jasper represent various coastal and highland environments throughout the regions.

Human skeletal remains were found at only three sites. Such remains were extremely rare at site CA0927, but were common at site CA0952 and abundant at site CA0928 (Table 1). These differences in abundance of human remains represent the most visible intersite distinction noticed during the 1987 field season. The skeletal assemblage is quite fragmentary, apparently due to intentional bonebreaking and cutting practices. This section describes and evaluates the human remains, discusses dietary/health indicators and the spatially segregated context of the remains. The remains described here were analyzed by Sonia E. Guillen of the Museo Nacional de Ciencias de Salud, Lima, but except where noted, the interpretations are the authors. Additional human remains were discovered in the laboratory mixed with the faunal collection, and were identified by Elizabeth S. Wing, Florida State Museum.

Table 1. Summary of recovered human remains

	CA09 - 27	CA09 - 28	CA09 - 52
Bone clusters		4	
Fragmented burial			1
Articulated burial		1	
Scattered small bones/fragments	1	857	262
Areal density of fragments (# per unit)	—	31.7	5.8
Volumetric density of fragments (# per quadrat)	—	7.9	1.4

Site CA0927:

Only a single human tooth was recovered from this site. The specimen was recovered in the midden of Unit South 1 West 70.

Site CA0928:

This site contained by far the greatest amount of human remains. The density of fragments in the midden is more than five times greater than that of site CA-0952 measured either areally (twodimensionally) or volumetrically (three-dimensionally) (Table 2). Human remains were recovered in three forms: (1) a series of bone clusters and crushed bone concentrations, (2) one complete intact flexed burial (Figure 2), and (3) fragments scattered throughout the midden. Each will be briefly discussed.

Table 2.  
Vertical distribution of scattered human bone fragments  
(Frequencies and percentages)

Level	CA09 - 27	CA09 - 28	CA09 - 52	Totals
1		146 17.0%	80 30.5%	226 20.2%
2		230 26.8%	76 29.0%	306 27.3%
3	1 100%	232 27.1%	71 27.1%	304 27.1%
4		210 24.5%	24 9.2%	234 20.9%
5		39 4.6%	2 0.8%	41 3.7%
6			9 3.4%	9 0.8%
<b>Totals</b>	<b>1</b>	<b>857</b>	<b>262</b>	<b>1120</b>

Figure 2. Human remains at site CA09-28. Articulated flexed burial (except for displaced and scattered feet,



see lower left hand corners of first row photos), top of fragmented bone cluster (center photo), and cluster consisting of cranium and long bones (lower row photo).

Four human bone clusters were excavated. Three of these clusters consists of long bones located in the center of the site (Figures 3 and 4). Many of these bones are broken and some were possibly scored and cut, either at their midpoints or to remove epiphyses. The three clusters all represent the remains of young adult males (Guillen 1988). The fourth cluster, located in test unit North 5 West 0 (zero) consisted of long bones and a complete cranium of an adult male of advanced age (Figure 5). The teeth show great wear with secondary enamel and exposed roots, but no cavities, a pattern repeated in recovered teeth at all sites (Ibid.). Also in the main block, three distinctive crushed bone concentrations were noted near the bone clusters (Figure 3). These possibly represent waste debris from bone fragmentation and possible bone cutting activities that resulted in the bone clusters. Large flat worn stones (classified as grinding clusters of the west side, Unit North 1, West 1) and the crushed bone concentrations of the east side (Units North 1, East 1 and North 0, East 1) suggest that the large stones were possibly used to crush bones.

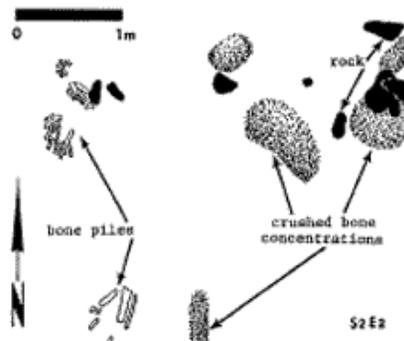


Figure 3. Features of Main Block, site CA09-28.

Figure 4. Rock covering over burial 3 (flexed and complete skeleton) at CA09-28.



the bone clusters and flexed burial denoted by the dotted circles.

The complete burial was an adult male in flexed position on its right side facing west ([Figure 3](#)). Although no definite pit outline was discerned in the dark midden deposits, this burial was covered by a rock pavement and was situated in a depression on top of sterile subsoil. Some spongy bone elements of this articulated burial were missing, probably reflecting differential decomposition of the remains. Only the feet were displaced and scattered. Soil chemistry analysis produced extremely alkaline soil pH readings of 8.5 in this burial. It thus appears that the burial began to decay soon after burial, but as midden rapidly accumulated and soil pH elevated, the burial became preserved with only spongy bone portions (the bone most susceptible to decay) absent ([Rossen 1991:616-625](#)).

The abovedescribed spatial patterns lead to two possible conclusions concerning treatment of the dead at Site CA0928. First, it appears that the fragmentation and dispersal of human bone in the midden resulted from cultural activity, because if natural, postdepositional disturbance had shattered and displaced bone, high frequencies of fragmented bone should be present in all areas of the site with human remains. In the case of the bone clusters, this premise is illustrated by a Rose diagram that depicts the orientation of the 42 bones in the clusters that are larger than 10 cm in length ([Figure 7](#)). The downslope direction of site CA0928 is 42 degrees (northeast) and although 16 bones are oriented just west of downslope at from 10 to 30 degrees, other bones in clusters are oriented at other angles, including 12 bones oriented from 120 to 150 degrees, almost opposite to the downslope direction. Fluvial action thus cannot explain these bone clusters, and intentional human placement is a more likely explanation. Also, the articulated burial was in some way special, not only because it was left intact and covered with large stones, but also because little or no fragmented bone occurred near it.

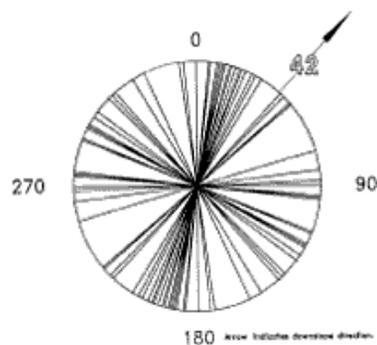


Figure 7. Orientations of human bones in clusters at site CA09-28

#### Site CA0952:

Although this site contained less than one-fifth the density of human bone (in terms of scattered fragments in the midden), significant human remains were recovered ([Figure 8](#)). A single highly fragmented bone burial was excavated, the remains of a complete adult male with extreme tooth wear. The teeth also show striations that are evidence of advanced periodontal disease ([Guillen 1988](#)). All bones except the cranium were broken into small pieces with an average length of 5 cm, and placed into a 30 cm diameter pit in unit South 1 West 0 (zero) of the South Block. The cranium was broken or cut into only two pieces.

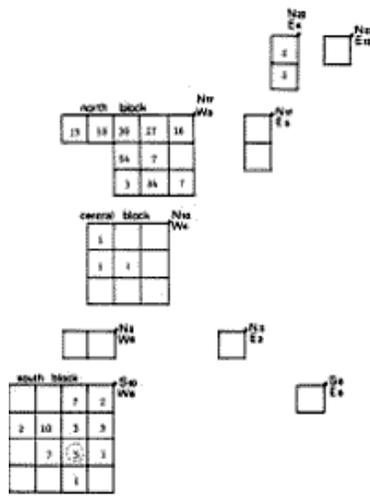


Figure 8. Spatial distribution of bone fragments at site CA09-28. This does not include cut bones in pit denoted by dotted circle.

Three fragmented vertebrae of a newborn infant were recovered from the Central Block. One specimen each was located in units North 9, West 5, level 3 ; North 9, West 6, level 4; and North 10, West 6, level 2. These are (1) the only recovered human remains that are not adult or subadult males and (2) the only human remains present in the Central Block. The spatial segregation of the infant remains implies a totally different context than that of the other recovered human remains. Perhaps infants were somehow unsuitable for the special treatment accorded male adult and subadult remains.

A total of 262 fragments of human bone was mixed into the 4065 cm midden of site CA0952, which is, as mentioned above, a far lower density than at site CA0928 ([Table 1](#)). As at site CA0928, many fragments were fragmented and possibly cut and/or deliberately crushed. Many specimens are calcinated and a few are carbonized. Pits were impossible to define on the basis of soil color or texture, although in at least one case (the fragmented burial), it was obvious from the spatial configuration of bones that a pit was present. The difficulty in defining pits warns that the vertical associations of these bones could have been altered by their placement in pits. Despite what could be artificially deep associations, bone fragments were vertically distributed slightly higher in the midden than in site CA0928, with the heaviest frequencies in levels 1 to 3 and with frequencies diminishing in lower levels ([Table 2](#)).

Human fragments were horizontally concentrated in the North Block, with a secondary concentration in the South Block ([Figure 8](#)). This distribution is curious, as the North Block fragments are not associated with any site features or significant artifact concentrations. Unlike at site CA0928, the North Block bones were not associated with crushed bone areas, and unlike at both site CA0928 and the South Block of site CA0952, no large flat stones suggestive of anvils were present. It is thus not clear whether this northern site edge was in part a bonefragmenting and smashing area, or if bone fragments merely secondarily collected at this downslope site end.

The secondary concentration in the South Block is easier to understand, as it was generally associated with the fragmented bone burial in the small pit. Most South Block fragments were located in units surrounding the burial, denoted in Figure 8 as a dotted circle, with its associated stones, while several units of the block, farther from the burial, totally lacked human bone fragments. Many of these fragments may have been associated with the fragmented bone burial. Lastly, the lack of human remains between the North and South Blocks (except for the three newborn infant vertebra fragments), and the generally clustered pattern of human bone contrasts markedly with the unclustered, even distribution of chipped lithics at this site. Too, despite the association of two stones with the fragmented bone burial, the greatest concentration of ground stone at the site occurred in the Central Block, where little bone was present. Thus, while clustering suggests that bone fragments were at least partially related to specific activity areas instead of being merely welldispersed midden inclusions, those activities cannot be further understood at site CA0952 on the basis of artifact associations.

## Diet and Health Indicators

According to Sonia Guillen, important dietary observations may be made from this collection, including indirect evidence of a dietary emphasis on plant foods.

"All teeth, whether from complete burials or fragments, show an exaggerated, advanced tooth wear. This wear is more pronounced in the lingual zone of the mouth, but affects incisors to molars. This abrasive wear resulted not from the material consumed, as in the case of shellfish eaters who consume large quantities of sand, but from a mechanical stress, probably from chewing tough plant material. Besides, it can be deduced that the diet was adequate. There is no evidence of cavities, and much dentition was intact at the time of death. However, the extreme wear produced periodontal problems that resulted in tooth loss ([Guillen 1988:2](#))".

Despite the small (minimum 6 individuals) and biased (all male) sample, it is noteworthy that [Guillen \(1988\)](#) observed no signs of disease and deduced that an adequate diet existed, free from obvious vitamin and mineral deficiencies. One question for future research thus be to what extent larger and less biased skeletal samples of early intensifying groups in various environments (relatively resourcerich and poor) will also display the combination of little disease and exaggerated tooth wear.

## The Tierra Blanca Phase

During the Tierra Blanca phase, there was in some ways a cultural devolution or degradation from the Las Pircas Phase. Lithic technologies were cruder and more expedient, without formal types. There also was a shift from small elliptical quincha dwellings to larger, segmented, nearly rectangular house styles from the Las Pircas Phase to the Tierra Blanca Phase. Also important during these phases was the construction of public twin mounds of the Nanchoc site located deep in a lateral quebrada. This site was utilized for specialized production of calcite (presumably for coca use), though the mounds were built up mainly during the latter phase. Following the Preceramic Period florescence, the Zaña Valley was never again an important center of cultural development. Despite some large sites from several time periods, and a notable Inca installation at Nanchoc, the middle and upper valley was superseded in cultural and political importance by the neighboring Lambayeque and Jequetepeque Valleys.

The Tierra Blanca Phase dates to approximately 6000-5000 B.P. Like the Las Pircas Phase sites, these sites are small single households with shallow middens. Some semi-rectangular house structures with small basin-shaped hearths have been excavated. The kinds of diverse lithics and exotic items found in the Las Pircas sites are not present in the Tierra Blanca sites, suggesting decreased autonomy and exchange, and, in the presence of the Nanchoc mounds, increased corporate activity. In comparison with the preceding phase, the unifacial lithics are crude and poorly worked. Despite a cultural degradation, there appears to have been the addition of coca and cotton to the plant inventory.

The Tierra Blanca skeletal remains appear almost exclusively in site CA-09-77 where the assemblage is highly fragmented (n=179) and was recovered from a house floor. The presence of subadults in the assemblage is clearly indicated by three deciduous teeth found at CA-09-77. Many of the bones show evidence of having been burned as indicated by the presence of porcelain-like rings of staining on the hard surfaces ([Verano 1991](#)). "The fact that highly fragmented and burned human remains are found comingled with faunal material under house floors at CA-09-77 suggests the possibility of cannibalism. Despite its popularity in the anthropological literature, convincing evidence of cannibalism in the archeological record has, until recent decades, been largely elusive. The most convincing arguments that certain human bone assemblages represent the end product of "conspecific consumption" ([White 1992:339](#)) come from cases in which it can be demonstrated that there is a close similarity in the processing of human bones and faunal remains at the same site. Crucial to such arguments is the identification of patterned damage to the skeleton consistent with defleshing, disarticulation, marrow extraction, and cooking. Unfortunately, the relatively poor preservation of the skeletal material precludes the identification of systematic perimortem breakage, evidence of defleshing and dismemberment, patterned burning, or other key indicators that could confirm butchery and consumption ([Verano 1991:8 and 11](#)). Our hunch is that the human remains were heavily disturbed and subjected to various postenterrment disturbances by occupants of the house.

## Human Bone Fragmentation, Cutting, and Burning: a Case of Cannibalism?

The Paijan huntergatherers who inhabited much of northern coastal Peru (and preceded the Nanchoc Culture in the lower portion of the Zaña Valley) in the late Pleistocene and early Holocene periods do not exhibit disarticulation or fragmentation, nor cutting and burning, in the reported skeletons ([Chauchat and LaCombe 1984](#); [Dricot 1979](#)). The few excavated Paijan burials are flexed and completely articulated (Ibid.). Paijan burial sites also appear to be well-separated from the surface lithic scatters that represent their living surfaces, unlike the Nanchoc remains, which, although spatially segregated from remains of dwellings and domestic debris, are located nearby homesteads in essentially domestic contexts.

Broad contextual consideration of the disarticulated and fragmented human bones in the Las Pircas and Tierra Blanca sites appears to underscore their separation from daily domestic activities. The great majority of these bones was found at site CA0928, which contained no evidence of a dwelling, including an absence of daub, which would be widespread in the midden even if the actual hut were not located in excavation. The fragmented human remains at site CA0952, however, were not as contextually separated from evidence of other activities as the human bones of site CA0928, and may represent a secondary activity at a mixed-function site. In contrast, the near-absence of human remains at site CA0927, where the dwelling and overlapping activity areas, botanical remains, and a variety of domestic activities were best-represented, implies a spatial separation of activities involving human bone disarticulation, fragmentation, and cutting from domestic activities. The heavily fragmented, burned, and sometimes cut human skeletal remains in the house floor of CA09-77 are associated with and display the same modifications as the bone remains of animals consumed for food.

[Luis G. Lumbreras \(1989\)](#) has recognized, compiled, and discussed numerous archaeological sites in the Andes, beginning in the Late Pre-ceramic Period, with heavily disarticulated human remains. Lumbreras believes that disarticulated human bone represents evidence of cannibalism that has been mentioned only as an aside or ignored outright ([Lumbreras 1989:206216](#)). In most of these cases, fragmented human bones were found mixed with other subsistence remains. In Peru, these cases include the Late Pre-ceramic (ca. 4500-3700 B.P.) central coast sites of Asia, Aspero, and Los Gavilanes ([Engel 1963](#); [Feldman 1977](#); Bonavia 1982), and the Late Pre-ceramic southern highland site of Pachamachay ([Rick 1980](#)). Similar evidence has been reported at Quebrada de Las Conchas, a Pre-ceramic shell midden in northern Chile ([Llagostera 1979:314](#)). For the early ceramic period (ca. 3700-3100 B.P.) the Peruvian sites of Huacaloma, Las Haldas, and Supe, and the Late Formative sites of Viru 434 and Chavin de Huantar also include fragmented and burned human remains ([Lumbreras 1989](#); [Fung 1969](#); [Uhle 1925](#)). Unfortunately, all the abovelisted cases suffer from a lack of detailed description and quantification of the human remains and contexts in question.

Elsewhere in tropical America, sporadic archaeological evidence of disarticulated human remains has been documented. These examples are mentioned because the cases have been compared to the Las Pircas and Tierra Blanca sites in other ways, such as for having unifacial lithic industries in forested settings. The Late Pre-ceramic site of Aguazuque, Colombia, contained substantial cut and placed human bone. This site also contained human crania carved with curvilinear and spiral designs in contexts dated to approximately 4000 B.P. ([Correal 1989:146154, 255256](#)). In Panama, at the Pre-ceramic shell midden site of Cerro Mangote, slightly more than one-fourth of the excavated burials (18 of 67) were disarticulated and cut ([McGimsey et al. 1986:1987](#)). Cerro Mangote has been dated to approximately 7000 B.P., or about the same time period as the Quebrada de Las Pircas sites. Also in Panama, the Aguadulce Shelter, a Late Pre-ceramic site dated from 6000 to 4500 B.P., contained burned and cut human bones of both males and females ([Ranere and Greenfield 1981](#)). In this case, the investigators argued that a single incidence of cannibalism occurred involving five individuals as an act of survival by nutritionally stressed people (Ibid.:46).

Archaeological reports of disarticulated and fragmented human remains are less frequent in the ceramic periods following the Formative Period. However, some reports are emerging to show continuity in the practice of disarticulating and cutting human remains. For example, partial human remains have been reported from the Middle Horizon site of Tiwanaku, Bolivia (Manzanilla and Woodward 1990). The point being made is that disarticulated and sometimes burned and cut human remains are quite common in many time periods in the Andes, and are especially common in

Preceramic contexts throughout tropical America. The associated activities and meanings of these remains, however, remain poorly understood.

## Conclusions

The Las Pircas Phase appears in summary to have been characterized by a dispersed yet aggregated and locally permanent settlement pattern, of the sort that has been termed "pseudo-dense," in that the site cluster defines a key natural or social resource instead of a purely dense or pressured population ([Bronson 1977](#)). Well-developed unifacial chipped lithic and ground stone technologies, a heavily plant-oriented economy, sporadic outside contacts, households rituals involving exotic materials and special treatment of the dead, and separation of public and private space are evident.

At two excavated Las Pircas Phase sites, partial and complete human remains were found. These remains are most often cut or deliberately snapped long bones that were carefully placed in piles or pits. Stone anvils possibly used in treating the dead lay nearby. Human bones are primarily located at different localities than habitational structures and food refuse and possible garden plots. In contrast, at the subsequent Tierra Blanca Phase sites, the treatment of the dead took on a more haphazard and less sophisticated appearance.

The placement and cutting of bones, along with the possible cannibalism of males, may have been part of a ritualization process related to colonization, early plant use intensification, and the development of cultivated plants (Coursey 1976). Several scholars have discussed how colonizing populations ritualize their landscape, and the process may include defining sacred places and ritual space ([McGhee 1997:73-105](#)). In this sense, the building of small earthen mounds away from domestic sites at the Nanchoc Mounds site (ca. 6500-5000 B.P.) may be considered an aspect of ritualization, although the activities performed there may have had a fundamentally economic (and not a ritual) nature ([Dillehay and Netherly 1983](#); [Dillehay et al. 1989](#)).

The ritualization process may include activities designed to mitigate and control the supernatural powers and spirits of new resources that are being experimented with. For example, small artifacts which we consider to be exotic oddities are scattered through the Las Pircas Phase domestic sites, mostly in undulating areas we suspect were garden plots. Artifacts of this type include the above-mentioned quartz crystals, ammonite fossils, and grooved and worn stingray spines ([Dillehay et al. 1997](#); [Rossen 1991:599-601](#)). In eastern Peru, peoples such as the Jivaro place small exotic objects such as these in their plots as garden magic. In the Jivaro case, garden magic serves multiple purposes; to ensure fertility, to protect the gardeners against the plant spirits, and to protect the garden from theft. Women place objects in the garden in the reported belief that intruders will be eaten if they steal from the plots (Brown 1985:125-130). Remembering that only adult male bones were cut, placed, and cannibalized, it is tempting to speculate on a male/female ritual dichotomy involving selected and limited cannibalism of certain body parts of individuals, in which male cannibalism counterpoints against a symbolic female version that was embodied in garden magic.

In conclusion, specialized treatment of the dead during Middle Preceramic times in the Zaña Valley may be viewed against the backdrop of early societal developments of the region. Social, technological, and economic changes all occurred within a relatively stable, rich, diverse forested environment.

There is no evidence to suggest that population pressure or climatic change were primary factors in the cultural developments. The developments of the Las Pircas Phase include a logistical network represented by exploration of long-distance resources by small, locally permanent groups. Simultaneously, the development of a specialized extractive technology produced public space, and the dispersed population was socially bound together. Furthermore, a ritualization process reaching beyond specialized mortuary treatment accompanied subsistence reorientation and intensification. These processes were most elaborately expressed during the earlier Las Pircas Phase. In the subsequent Tierra Blanca Phase, certain aspects of culture continued to advance, such as the addition of new cultivated plants, but mortuary treatment, along with outside contacts and the ritualization process in general, became degraded, probably signaling the end of the region's role as cultural innovator.

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