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Emily Grace

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DEMOGRAPHY, PALEOPATHOLOGY, AND HEALTH STATUS OF THE
MOCHE REMAINS IN HUAMBACHO, PERU: A COMPREHENSIVE
OSTEOLOGICAL ANALYSIS

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State university and
Agricultural and Mechanical College
In partial fulfillment of the
Requirements for the degree of
Master of Arts

In

The Department of Geography and Anthropology

by
Emily Grace
B.A., University of British Columbia, 2009
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TABLE OF CONTENTS

ACKNOWLEDGMENTS.....	ii
LIST OF TABLES.....	v
LIST OF FIGURES.....	vii
ABSTRACT.....	ix
CHAPTER ONE: INTRODUCTION.....	1
CHAPTER TWO: THE MOCHE.....	3
2.1 The Moche.....	3
2.2 Moche Iconography and the Sacrifice Ceremony.....	5
2.3 The Moche Expansion.....	10
2.4 The Moche in the Nepeña Valley.....	11
CHAPTER THREE: BURIAL HISTORY OF THE MOCHE.....	14
3.1 Pre-Moche Burial Patterns.....	14
3.2 Moche Burial Patterns.....	15
3.3 Huambacho Burial Patterns.....	17
CHAPTER FOUR: PALEOPATHOLOGY.....	20
4.1 Andean Paleopathology.....	20
4.2 Antemortem Pathology, Trauma, and Cultural Modification.....	23
4.3 Dental Pathologies.....	29
CHAPTER FIVE: MATERIALS AND METHODS.....	31
5.1 Sample.....	31
5.2 Methods.....	33
CHAPTER SIX: RESULTS.....	37
6.1 Sub-adult Remains.....	37
6.2 Adult Remains.....	42
6.3 Antemortem Pathology and Trauma.....	53
6.4 Dental Pathologies.....	66
CHAPTER SEVEN: DISCUSSION AND CONCLUSIONS.....	74
REFERENCES CITED.....	82
VITA.....	94

LIST OF TABLES

3.1 Huambacho Burial Descriptions (Chicoine n.d.).....	17
5.1 Burial Inventory.....	31
6.1 Sub-adult Demographics.....	37
6.2 Burial 5 Age Assessment Details.....	38
6.3 Burial 11(2) Age Assessment Details.....	39
6.4 Burial 12 Age Assessment Details.....	40
6.5 Burial 16 Age Assessment Details.....	41
6.6 Burial 17 Age Assessment Details.....	42
6.7 Adult Demographics.....	42
6.8 Burial 9 Sex and Age Assessment Details.....	43
6.9 Burial 10 Sex and Age Assessment Details.....	44
6.10 Burial 11(1) Sex and Age Assessment Details.....	46
6.11 Burial 11(3) Sex and Age Assessment Details.....	48
6.12 Burial 13 Sex and Age Assessment Details.....	50
6.13 Burial 15 Sex and Age Assessment Details.....	52
6.14 Adult Stature (cm).....	52
6.15 Adult Degenerative Joint Disease (slight, moderate, and severe).....	54
6.16 Adult Periosteal Reactions.....	56
6.17 Adult Osteophytic Growths.....	58
6.18 Adult and Sub-adult Porotic Hyperostosis and Cribra Orbitalia.....	60
6.19 Adult and Sub-adult Bowing.....	62
6.20 Adult Antemortem Healed Fractures.....	64

6.21 Adult and Sub-adult Enamel Hypoplasia.....	67
6.22 Adult and Sub-adult Calculus.....	68
6.23 Adult and Sub-adult Caries.....	69
6.24 Adult Attrition (slight, moderate, severe).....	70
6.25 Adult Periodontal Disease	71
6.26 Adult Antemortem Tooth Loss	73

LIST OF FIGURES

2.1 Map Demonstrating the Sites of the Nepeña Lower Valley and the Archaeological Site of Huambacho (Proyección: UTM, datum: WGS84, esc. 1:150 000).....	12
3.1 Distribution of Moche Burials at Huambacho (Chicoine n.d.).....	17
6.1 Burial 5	38
6.2 Burial 11(2)	38
6.3 Burial 11 (Individuals 1,2,3) In-situ (Chicoine n.d.).....	39
6.4 Burial 12.....	40
6.5 Burial 16	41
6.6 Burial 17	42
6.7 Burial 9	43
6.8 Burial 9 In-situ (Chicoine n.d.).....	43
6.9 Burial 10.....	44
6.10 Burial 11(1)	46
6.11 Burial 11(3)	48
6.12 Burial 11(3) Reconstructed Posterior Skull.....	49
6.13 Burial 13	50
6.14 Burial 15	51
6.15 Burial 15 In-situ (D. Chicoine).....	51
6.16 Slight Lipping on Proximal Right Ulna of Burial 11(3).....	53
6.17 Moderate Lipping on Proximal Left Ulna of Burial 11(1).....	53
6.18 Severe Lipping on Proximal Right Ulna of Burial 15.....	53
6.19 Burial 11(1) Left 2 nd Rib Healed Periosteal Reaction.....	56
6.20 Burial 15 Thoracic Vertebrae #7 (Slight Growth).....	57

6.21 Burial 15 Thoracic Vertebrae #7 (Moderate Growth).....	57
6.22 Burial 11(1) Lumbar Vertebrae #4 (Severe Growth).....	57
6.23 Burial 11(3) Left 6 th Rib Osteophytic Growth and Postmortem Trauma.....	58
6.24 Burial 11(3) Left Proximal Tibia Osteophytic Growths.....	58
6.25 Burial 15 Right Parietal Porotic Hyperostosis (Healed Pores Distinct).....	59
6.26 Burial 12 Left Eye Orbit, Active Cribra Orbitalia.....	59
6.27 Burial 11(1) Left and Right Ulna Antemortem Bowing.....	61
6.28 Burial 9 Left and Right Fibula (posterior).....	61
6.29 Burial 15 Superior Skull Deformation.....	63
6.30 Burial 12 Cranial Deformation.....	64
6.31 Burial 12 Cranial Deformation.....	64
6.32 Burial 11(3) C6 Anterior Compression Fracture and C7 Anterior Growth	65
6.33: Burial 10 Left Ulna Antemortem Healed Fracture	65
6.34 Burial 11(3) Antemortem cut on Right Temporal.....	66
6.35 Burial 11(3) Left Temporal Antemortem Healed Cut Mark.....	66
6.36 Burial 10 Enamel Hypoplasia on Maxillary Right Canine.....	67
6.37 Burial 11(3) Posterior Mandibular Calculus Formation.....	68
6.38 Burial 12 Severe Carie on Left Deciduous First Molar.....	69
6.39 Burial 10 Carie on Maxillary Right First Molar.....	69
6.40 Burial 15 Severe Mandibular Occlusal Attrition.....	70
6.41 Burial 10 Maxillary Occlusal Wear.....	71
6.42 Burial 15 Right Mandibular Periodontal Disease and Severe Calculus.....	72
6.43 Burial 11(3) Left Mandibular Antemortem Tooth Loss.....	72

ABSTRACT

The Moche civilization, which thrived in northern Peru from AD 100-800, influenced a vast area that extended to the southernmost monumental site of Pañamarca. Huambacho, an archaeological site in the Nepeña Valley, which dates to the Early Horizon (600-200 cal BC), has yielded multiple Moche graves uncovered by the Proyecto Huambacho (2003-2004). The graves provide the first evidence of Moche presence outside of the neighboring Pañamarca monumental complex.

This research entailed the osteological analysis of eleven individuals from nine Moche grave contexts at Huambacho, including the analysis of demographic features, pathology, trauma, and antemortem cultural modifications. Methodology included the visual analysis of each bone in addition to detailed written, drawn, and photographic documentation of all bony elements assessed.

This project provides insights into the life and death of this small Moche period group of individuals. The high frequency of arthritic lipping on the young adult individuals indicates a physically-active lifestyle. This lifestyle was particularly strenuous on the lower limbs as indicated by the high frequency of severe lipping on the lumbar vertebrae, pelvic joint, and knee joint. Several of the adult individuals display antemortem healed fractures, also indicating a physically-active lifestyle. The dental caries, dental enamel hypoplasia, cribra orbitalia, porotic hyperostosis, and the unusual antemortem bowing of the long bones indicate nutritional stress. In addition, the adult individuals are all males of a young age category (25-35 years). Thus, based on this information, these individuals were active young men who participated in strenuous activities (farmers, warriors). Culturally characteristic practices of the Moche are also present in this specific burial population in the form of cranial deformation. The

burial conditions at Huambacho also provide useful insights into the nature of the deaths of these individuals.

The results of this research provide insight into the health and social behavior of a once-thriving human culture, as well as help to clarify the Moche presence in Huambacho. Based on the burial and osteological evidence, these individuals seem to represent a population of sacrificial burials of young, male warriors and children.

CHAPTER ONE: INTRODUCTION

The north coast of Peru has a long and intricate history of cultural development and interaction. The Nepeña Valley, one of many valleys on the north coast, continues to raise questions about the cultural interactions that influenced the development of ancient Peruvian populations. More specifically, the Moche civilization, which thrived in northern Peru from AD 100-800, influenced a vast area that extended to the southern Nepeña Valley (Quilter 2002). Huambacho, an archaeological site in the Nepeña Valley, which dates to the Early Horizon (600-200 cal BC), as well as the Early Intermediate Period (40 BC and AD 300), has yielded multiple Moche graves uncovered by the Proyecto Huambacho (2003-2004). These graves indicate the first evidence of Moche presence outside of the Pañamarca monumental complex (Chicoine n.d.). My research entailed the osteological analysis of 11 individuals from nine Moche grave contexts at Huambacho. This research contributes to the ever-expanding literature about this Peruvian culture through the analysis of skeletal remains. More specifically, these remains provide insights about the health and social behavior of a once-thriving human culture as well as clarify the possible purpose of Moche presence in Huambacho (Bawden 1996).

This research project has several objectives. First, I analyze the demographic features (age, sex, and stature) of the Huambacho individuals in order to gain a better understanding of the demographic profile and burial patterns of this ancient population. Second, I conduct a study of the overall osteological health and paleopathology of these individuals. Many (but not all) illnesses, nutritional deficiencies, and mechanical stressors show up on the bones and a thorough investigation of these osteological markers of illness and stress provides important information about the health status of this population. Third, based on the osteological evidence produced by my analysis and the burial information (grave goods, burial positions, burial conditions)

described by Chicoine (n.d.), I propose explanations about the life and death of the 11 Moche individuals buried at Huambacho.

CHAPTER TWO: THE MOCHE

2.1 The Moche

The “Moche” refers to an archaeological culture that developed on the north coast of Peru during the Early Intermediate Period (1AD-800AD) (Quilter 2002). The Moche were a highly stratified state society and possibly one of the earliest regional states to emerge in the Andes (Billman 2002). This state produced archaeologically evident metal work made of principally gold and copper, textiles, wood objects, feathers, stone goods, and beautiful pottery (Jones 2001). Architectural features attest to the power and size of the Moche state and include large complexes of platforms and pyramids, most notable those at the site of the Pyramids of the Moche (Hastings and Moseley 1975). However, the Moche borrowed or inherited their ideas and cultural traits from their contemporaries, such as the Gallinazo, traits that were changed and incorporated into the Moche style (Castillo 2001).

The Moche heartland has traditionally been defined as the Moche Valleys, where some of the largest pyramids are located. However, Moche sites and artifacts have been located in sites from Piura in the North to the Nepeña Valley in the south. In other words, the extent of the Moche influence is becoming clearer to scholars as more sites are found with Moche-influenced artifacts and architecture (Quilter 2002). The large population density of the Moche is evidenced by the extensive settlements such as Cerro Orejas, Huanchaco, the settlement of the Pyramids at Moche, Cerro Blanco, San José de Moro, Pampa Grande, El Brujo, Huancaco, El Castillo, Pañamarca, Pacatnamú, and many others, as well as by intricate irrigation canals, great pyramids, palaces, and temples (Donnan 1995). The huaca complexes were sites of ritual importance that much of the Moche population migrated to for special events. These huacas and the elite individuals that resided there constituted a religious polity, which promoted ideology, social

unity, and economic growth (Shimada 1990). Furthermore, Donnan (1996) points out that the location of the Moche ceremonial centers is no accident. Specifically, Huaca de la Luna sits at the end of the irrigation system of the Moche Valley. Similarly, the Huaca Brujo complex sits at the mouth of the Chicama River. The Huacas Tembladera also sits near the end of an irrigation system. These locations re-instate the importance of the recycling water systems from the mountains that the Moche were so dependent on for agrarian sustenance.

The coastal environment of the north coast of Peru afforded the Moche with diverse environmental conditions. The Pacific coast of Peru contains coast, sierra, and forest regions all within close proximity. The coastal environment allowed for a maritime culture that relied heavily on the sea for subsistence. In addition, the extensive areas of flatland facilitated inter-valley travel and large-scale field irrigation. Quilter (1991) states that the Peruvian north coast contained rich soils, which were laid down by large rivers during the late Pleistocene and early Holocene. In fact, the Moche did utilize irrigation in order to cultivate crops such as maize, potatoes, sweet potatoes, avocados, beans, manioc, squash, peanuts, and fruits (Larco Hoyle 2001 cited in Quilter 2002). Crops such as cotton and gourds were industrial crops used for textiles, containers, and net floats. Billman (2002) postulates that the Moche state formed due to irrigation and the effect that this important process has on formation of centralized polities. In addition to crops and sea resources, the Moche also domesticated animals including guinea pigs, Muscovy ducks, dogs, and camelids. The coast was also subject to periods of intense environmental upheaval in the form of earthquakes and floods brought on by El Niño events. Ice-core data indicate an extended drought between AD 563 and 594 and frequent floods between AD 602 and 635 (Shimada et al. 1991). Thus, Shimada et al. (1991) suggest that these stressors

may have been responsible for the apparent population shift toward the northern Moche sphere and, subsequently, the eventual Moche collapse.

2.2 Moche Iconography and the Sacrifice Ceremony

Much has been interpreted about the ancient Moche society through the study of their material culture consisting of ceramics, textiles, murals, etc. Most importantly, the elaborate and decorative stirrup-spout ceramics famous to the Moche have provided vivid pictures of the life of the Moche (Popson 2002). The disturbing, explicit, and sometimes gruesome iconography of the Moche led scholars to posit that the depictions were not fully representational of real life events of the Moche, but rather, they were expressions of a religious symbolic system (Donnan 1976). However, evidence garnered by field excavations demonstrates that the archaeological evidence seems to support the iconography of the Moche as valid and accurate depictions of actual Moche events. For instance, excavations at SÍpan revealed the burials of two Moche lords who were wearing costumes of characters depicted in iconography, The Rayed Deity and The Warrior Priest (Alva and Donnan 1993): “The SÍpan discoveries combined with other studies started to shift interest away from viewing the art as a symbolic system to seeing it as representing social behavior, albeit often ritual acts, and even specific historic events” (Quilter 2002:162). Subsequent excavations at San Jose de Moro revealed elite tombs of women adorned like the iconographic Priestess (Donnan and Castillo 1992).

One scene popularly depicted in Moche iconography, particularly during the Moche III and IV periods, is The Sacrifice Ceremony, which was originally interpreted as representing celestial events rather than real ritual acts (Sutter and Cortez 2005). But, discoveries of amazingly accurate human burials and grave goods have demonstrated that the Sacrifice Ceremony did in fact take place in the Moche society. Alva and Donnan (1993) describe in detail

the Sacrifice Ceremony, possibly the most important Moche religious ceremony. The scholars explain that the symbolism of sacrifice held a dominant place in elite art and narrative ritual depiction. These artistic depictions, found on fine-line paintings and ceramic jars, illustrate a masked figure, the Decapitator, using ceremonial knives to take the blood of bound males. For instance, a vase in Munich depicts bound, naked prisoners having their throats cut for ritual bloodletting. Sacrificial acts in ancient Andean cultures established a communicative pathway and reciprocal relationship between humans and their divine creators, as blood was the currency of communication (Hocquenghem 2008; Schele 1986). In fact, goblets excavated at Moche sites have been chemically analyzed to demonstrate that they did in fact contain human blood (Bourget and Newman 1998). In addition, some burials that contain the remains of sacrificial victims have been found in later Moche sites (Phases 4 and 5).

Bourget (2001) was the first to discover skeletal evidence of large-scale prisoner sacrifice by the Moche at Huaca de la Luna. In addition, Verano (1986) described 14 young males from Moche Phase 5 who were found in a mass burial trench outside the entrance of the Huaca 1 complex at Pacatnamú. The similar characteristics of the individuals in the burials and the condition of their bones indicate that they were ritually sacrificed through mutilation. Specifically, Verano (1986) reports that the victims shared many traits: they were all young males ranging in age from 15-35 years; they all appeared to have been robust and physically strong in life as attested by the strongly developed muscle attachments on their bones. Each had several antemortem healed injuries suggesting an active and possibly violent life. These individuals were organized into three distinct superimposed groups. Group one consisted of four skeletons whose ankles were bound by rope. Their bones indicated multiple wounds in the form of perimortem fractures and lesions. Verano (1986) states that these wounds are most easily

attributed to stab wounds in the chest and abdomen inflicted with pointed objects. In fact, two sharpened bone fragments were recovered with these remains. All four individuals in this group also had the radius missing from the left forearm as well as trauma to the distal end of the articulating ulna, indicating intentional removal of the bone. Group two consisted of eight individuals containing wounds such as fractures of the neck and limbs, slashes in the throat, and head injuries. In addition, two individuals were disarticulated and scattered. Group three consisted of two individuals, both of whom had their legs forcibly pulled apart and their hips disarticulated (Verano 1986). In addition, among these bodies were fragments of 52 clay statuettes, portraits of nude males with ropes around their painted bodies. Thousands of pupal cases of flies indicate the bodies were left out to putrefy (Popson 2002).

A similar sacrificial burial context is found at Plaza 3a of Huaca de la Luna. This burial consists of several young male individuals, aged 15-39, all containing severe perimortem injuries including dismemberment (Hocquenghem 2008; Uceda 2008; Verano 2007, 2008). Eighteen skulls from a chamber at the site of Dos Cabezas in the Jequetepeque Valley reveal cut marks on the cervical vertebrae, indicating the victims had their throats cut for ritual bloodletting. The Moche V site of Pampa Grande reveals a higher than expected frequency of cranial remains, which Shimada (1994) has suggested is indicative of the use of these remains as ritual offerings. In addition, research by Verano et al. (1999) demonstrates the intentional manipulation of sacrificed human heads in order to construct trophy heads at several Moche sites, including Huaca de la Luna and Dos Cabezas. Also, analysis of sacrificial remains from the Huaca de la Luna Plaza 3C revealed that the corpses sustained perimortem defleshing and dismemberment.

Erica Hill (2005) provides an interesting perspective about the Moche practice of dismemberment and defleshing. In particular, the scholar states that the Moche, unlike modern

human populations, viewed the dead human body as a spectacle. The Moche sacrificial scenes depict the male prisoners being stripped of their social status. They are naked, with all markers of status, such as headdresses, backflaps, clubs, and shields removed. The hair is pulled back and often clutched in the hands of the prisoner's capturer. These portrayals all depict the motif of subjugation. Further subjugation is depicted through the dismemberment of the captive. Iconography depicts the prisoner with a rope around his neck, wrists, and ankles, the same body parts also depicted as separate from the prisoner's body, still with rope tied around it (Donnan and McClelland 1999). This rope literally ties the prisoner to his capturer and completely subjugates him: "the rope is used to control and restrain the movements of the prisoner by limiting the body's potential for action" (Hill 2005:126). Hill (2005) explains that this spectacular display of subjugation and restraint empties the prisoner's potential for individual action, therefore making him vulnerable to violation according to the institutional ritual and religious agenda. In addition, the dismemberment fulfills a transformative function in which the body is re-cast to a new role of service and ritual. As noted above, the Moche existence was dependent on and vulnerable to their fluctuating environment. The Moche were in constant contact with their deities, ancestors, and supernatural beings who had an omnipresent control over these important environmental conditions. And the revered dead demanded sacrifice in the form of human blood (Hill 2006). Therefore, the Moche elites conducted elaborate rituals in which they themselves served as links between the human and the supernatural realms (Hill 2006): "The death of the prisoner...served as a form of communicative exchange in which humans provided an offering and the supernatural reciprocated by providing supplicants with health, good harvests, adequate water supply and so on" (Hill 2003:288). In fact, research demonstrates that that sacrificial events increased in frequency during documented periods of

environmental stress such as El Niño events. For example, the above-mentioned 70 individuals from Huaca de la Luna were embedded in a layer of clay, suggesting that they were sacrificed during an El Niño downpour (Bourget 2001). In other words, the Moche increased their ritual activity in which they communed with the divine during periods of stress in order to beseech the divine for mercy (Hill 2003).

Controversy remains about the nature of Moche sacrifice. Specifically, did the sacrificial victims represent warriors captured in combat for territorial expansion, or were they local individuals who had lost ritual battles staged specifically to provide human sacrificial victims? Quilter (2002) states that while much of the Moche iconography depicts warriors and warrior activities, these depictions fail to illustrate the Moche waging war for conquest against another group. Rather, these drawings depict warriors fighting each other one-on-one in order to produce vanquished prisoners for the sacrificial ceremony. The non-victorious were stripped of their warrior gear and clothing and leashed around the neck with a rope. At the ceremonial center, their throats were cut for ritual bloodletting and often their bodies were dismembered. Bourget (2001) notes that warfare was purely ritual due to the fact that the shields and clubs archaeologically evident were too fragile for real combat but were rather attractive for ritual display. However, other scholars, particularly Verano (2001), state that the brutal treatment of the sacrificial victims suggests that these individuals were not Moche, but rather foreigners captured during military conquests: “Verano doubts the people at Moche, who took great care in their treatment of the dead, would have handled the remains of anyone but their enemies in this manner” (Popson 2002:4).

2.3 The Moche Expansion

The large population and social stratification of the Moche, which included craft specialization, was made possible by a Moche elite, which was able to exploit the labor of many in order to produce the crops, textiles, and goods that were so plentiful (Burger 1998). The Moche elite controlled the distribution of irrigation waters, mobilized the labor required to construct canals and monumental architecture, and managed inter-population trade and interactions (Billman 2002; Bawden 2004). However, debate remains around how the Moche elite attained the vast and wide-sweeping amount of power that they did. For instance, three interpretations are posited about the political organization and strategy of the Moche. First, scholars such as Moseley and Day (1982) posit that the Moche was a territorial state which quickly spread its power up and down the north coast of Peru. Second, scholars such as Castillo and Donnan (1994) suggest distinct north and south Moche polities. The Southern Moche extended from Chicama to Nepeña. A different polity occupied the northern valleys of Jequetepeque, Zaña, and Lambayeque. Third, scholars such as Alva (2001) instead suggest that the Moche polities were small and centered in a single valley. However, ongoing research seems to be providing a clearer perspective on the question. For instance, surveys in the Nepeña Valley by Proulx (1968) and the Santa Valley by Donnan (1973) confirmed a Moche presence in these southern valleys. The Moche artifacts were found overlaying local styles including the Gallinazo, suggesting that the Moche arrived by force: “Additional observations... have helped construct a model of rise, expansion, and fall of a single Moche state” (Quilter 2002). However, more recently, this single state model has been challenged. In particular, excavations at Jequetepeque Valley at San José de Moro demonstrate that the five-phase ceramic sequence originally posited by Larco Hoyle could not be successfully employed in this area. Larco Hoyle (1948), an early

scholar of the Moche, identified five phases which are commonly used as chronological markers of distinct subdivisions in the Moche cultural time period based on changes in pottery style and artistry: Phase 1, Phase 2, Phase 3, Phase 4, Phase 5 (Bawden 1996). However, scholars such as Castillo (2001) suggest an alternate model, which sees two distinct Moche regions on the north coast: the southern Moche region consisted of the Moche Valley, Chicama Valley and later the Viru, Chao, Nepeña, and Santa Valleys; and the Northern Moche region consisted of the Jequetepeque, Lambayeque, and Piura Valleys. These scholars clarify that a different three-phase ceramic sequence (Early, Middle and Late Moche) is more appropriately applied to the northern Moche region, whereas the original five-phase Moche sequence seems to still apply to the southern region.

2.4 The Moche in the Nepeña Valley

In 1967, Proulx (1968) surveyed the Nepeña Valley and uncovered 37 sites with Moche ceramics mostly on the southern side of the valley (Figure 2.1). Most of these sites were classified as cemeteries and were found in close proximity to Pañamarca (Proulx 1982, 2004). Thus, Proulx claimed that occupation by the Moche was tenuous, with only small numbers of Moche inhabitants controlling local populations. However, the site of Pañamarca represented the center of Moche power in the Nepeña Valley and was the southernmost Moche monumental site (Proulx 1993). Pañamarca is approximately 300 km north of Lima and consisted of a large terraced pyramid on the valley floor (Proulx 1993). Both the architecture and murals indicate Moche control as they are similar to other confirmed Moche administrative centers (Proulx 2004). In addition, the murals depict iconographic scenes identical to those found on Moche vessels (Proulx 1993). Given this contradictory evidence of the degree of Moche presence in the Nepeña Valley during the Early Intermediate, Proulx asks “what was the nature of the Moche

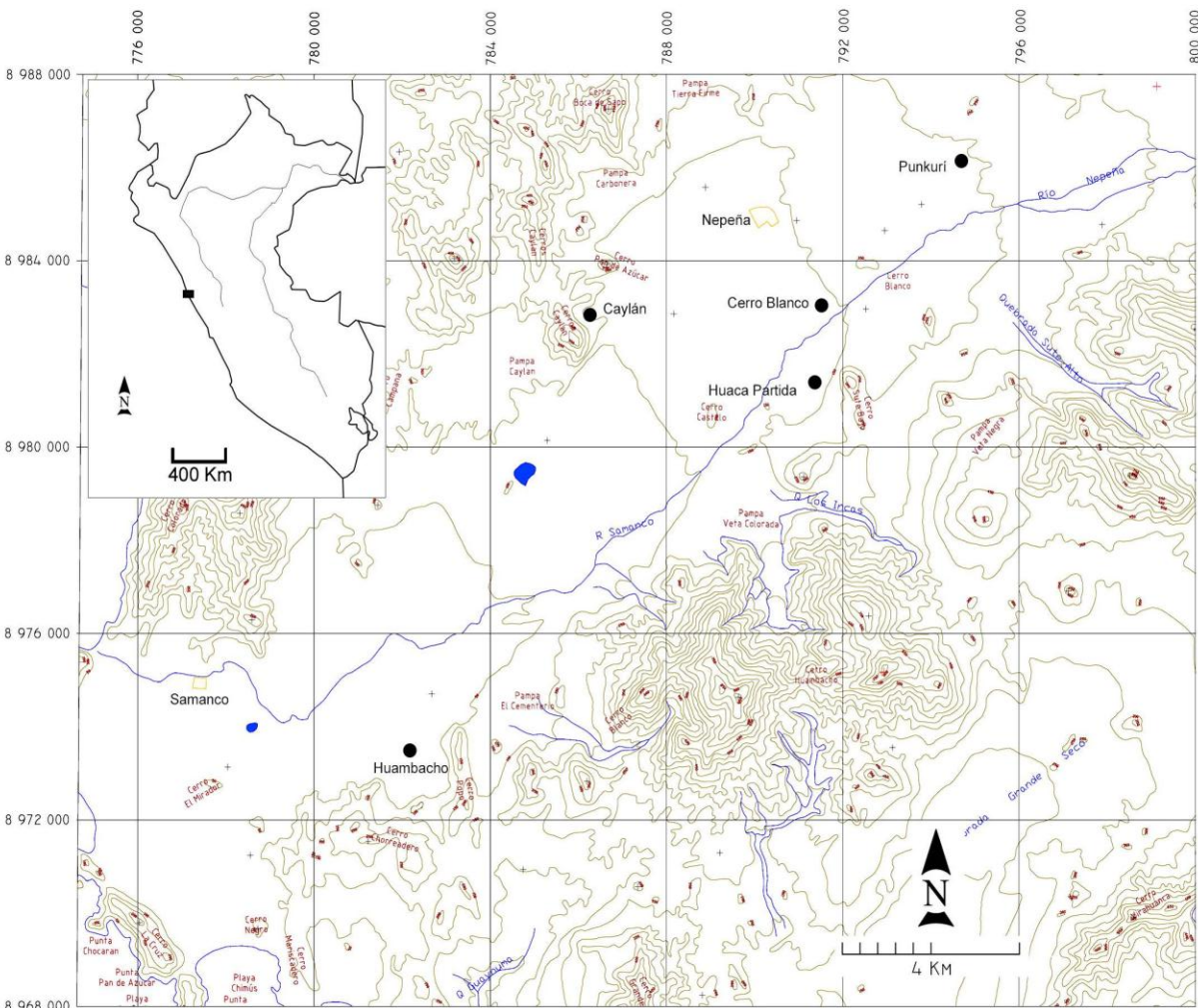


Figure 2.1: Map Demonstrating the Sites of the Nepeña Lower Valley and the Archaeological Site of Huambacho. (Proyección: UTM, datum: WGS84, esc. 1:150 000).

occupation in the Nepeña Valley?” (Proulx 2004: 2). Quilter (2002) states that an amicable agreement between the Moche and the people of Nepeña is hard to conceive of. Rather, the Moche influence in Nepeña seems to have been an intrusion of sorts. However, the degree of imposition or adoption of Moche traits is not clear. Sutter and Cortez (2005) state that the sudden appearance of Moche artifacts in distant valleys, such as the Nepeña Valley, as well as the militaristic themes in the Moche iconography, suggest military conquest. In addition, in recent years, research in the Santa Valley reveals that the Moche and Gallinazo may have coexisted in these valleys well in to late Moche periods (Chapdelaine 2004). In addition, excavations at Batán

Grande in the Lambayeque reveal the association of Gallinazo and Moche molds for the production of ceramics (Shimada 1990). This evidence suggests a more peaceful merging of cultures and peoples. Only additional research in these valleys will further clarify the nature of the Moche influence in these distant areas.

Recent research by Chicoine (2004, 2006) at Huambacho reveals Moche influence at the site of Huambacho in the Nepeña Valley. The Nepeña Valley is located on the north central coast of Peru approximately 300km north of Lima, and it is bordered by the Casma and Santa Valleys (Daggett 1999). The Nepeña Valley is divided into the lower, middle, and upper parts. The lower valley extends from the ocean to the west of Caylán, the middle valley extends north of San Jacinto, and the upper valley extends north of Jimbe (Daggett 1987). Huambacho dates to the Early Horizon (600-200 cal BC), in which it was a ceremonial center. Following the site's abandonment, it was re-occupied as a cemetery by various groups, and burials with Moche remains suggest a possible Moche re-occupation during the Early Intermediate (Chicoine n.d.). As with other Moche sites, the nature of the Moche influence of this site is in question. According to Chicoine (2006), interpretation of the architectural layout at Huambacho suggests that the Main Compound served as a ceremonial center for specific occasions. Furthermore, no domestic structures have been found to suggest permanent habitation of the site: "Preliminary analyses suggest that Huambacho represents a ceremonial center where people were probably gathering for specific occasions" (Chicoine 2004: 3).

CHAPTER THREE: BURIAL HISTORY OF THE MOCHE

The following chapter provides an overview of the burial conditions found in the pre-Moche, Moche, and Huambacho populations. Specifically, certain burial positions, contexts, and grave goods will provide insights about possible relationships and continuities between these populations. For instance, as noted below, the Moche displayed specialized burial patterns such as sacrificial burials (discussed previously), delayed burials, and grave re-opening (Millaire 2004). The burial conditions of the Huambacho sample display evidence of similar specialized burial conditions, hinting at possible cultural connection.

3.1 Pre-Moche Burial Patterns

The burial history leading up to and including the Moche provides important insights that will aid the interpretation of the Huambacho remains analyzed in this thesis. Specifically, Salinar style followed the Chavín during the last centuries in the Early Intermediate Period (200 B.C.-200 A.D.) (Brennan 1980). The Salinar people settled the north coast of Peru, and this culture period marks the transition between the Cupisnique and Moche cultures (Brennan 1980). The Salinar buried their dead in a supine position. The burials display sparse burial goods and do not seem to indicate differential burial treatment based on status or circumstance. These burials also display the increasing trend of placing metal objects in the deceased's mouth, a long-lasting tradition in the Moche Valley (Hill 1998). The Gallinazo culture period (200BC-AD 300) also reigned on the north coast and marks an important period in Peruvian prehistory because of the administrative aristocratic system that developed during this time. This system laid the foundation for the Moche culture and power that would soon follow. Gallinazo burials, similar to those from the Salinar tradition in the Moche Valley, were in fully extended, supine positions.

Again, simple grave goods imply no strong differentiation of status (Collier 1955; Donnan and Mackey 1978).

3.2 Moche Burial Patterns

Recently, hundreds of Moche graves from different north coast locations have begun to shed light on the Moche life-ways and social structures. While many of these graves have been displaced through looting and natural processes, some have yielded much information (Donnan and Mackey 1978). Moche burials experienced a slow evolution over time: while many features remained amazingly consistent through the five phases, such as burying the dead in an extended supine position with the arms placed along the sides and metal objects in the deceased's mouth, other features evolved slowly. In particular, the late Moche phases incorporated flexed burial positions. In addition, in the late periods, the Moche increasingly buried their dead according to their status/role during life (Millaire 2004). Scholars, such as Millaire (2004) and Verano (1995), elaborate that some Moche burials displayed unique circumstances.

Delayed Burials

The 14 individuals described above from Pacatnamú also display evidence of delayed burial, in which the bodies were left unburied for a period of time before final interment in the ground (Rea 1986). Millaire (2004) clarifies that practices such as this were actually quite common in Moche society due to the deceased's ritual importance in the society's religious system. The author hypothesizes that Moche purposely delayed burials because of political constraints, ritual conditions, or religious restrictions (Millaire 2004). For these burials, the bodies were not buried until a considerable amount of time had passed after death, and substantial amounts of decomposition had taken place (Nelson 1998). Due to this advanced state of decomposition, bodies in delayed burials tend to display more disarticulation and scattering as

decayed flesh cannot hold the bones together well (Nelson 1998). Millaire reports that delayed burials based on this pattern of disarticulation have been found quite frequently in Moche contexts. For instance, one elite individual from Huaca de la Luna was found out of anatomical position with several bones missing (Millaire 2004). However, Millaire clarifies that osteologists must be careful not to mis-identify delayed burials as many natural and animal processes could cause similar disarticulation. Verano (1995), therefore, reports that the presence of insect pupae close to the skeleton indicates delayed burial due to exposure to natural elements before interment. Twenty-six Moche graves from Pacatnamú, El Brujo Complex, and Huacas de Moche display insect pupae (Millaire 2004).

Grave Re-Opening

In addition to delayed burials, the Moche also practiced grave re-opening in which human remains were exhumed following a period of interment, possibly for manipulation in ritual purposes. This practice has been found in graves of single and multiple individuals. For instance, five individual graves from Huacas de Moche were re-opened for the removal of skull fragments as well as other small bone remains. Furthermore, some re-opened graves contain multiple individuals in which one is an elite and the other(s) is a retainer. Seven graves, each with multiple burials, have been uncovered in which at least one individual was clearly of higher status. In these burials, the “Moche exhumed certain bones while leaving others in place and then closed the grave with a new roof” (Millaire 2004: 379). Furthermore, some of the human remains were re-exhumed as offerings for other graves. Seven of these instances have been reported from Pacatnamú and Huacas de Moche (Millaire 2004). Perhaps these graves were sometimes re-opened not to remove anything, but rather to provide the deceased with new offerings, as this practice is known from several other ancient Andean societies (Millaire 2004).

3.3 Huambacho Burial Patterns

As noted above, Huambacho has yielded multiple Moche graves uncovered by the Proyecto Huambacho (2003-2004) (Chicoine n.d.) (Figure 3.1).

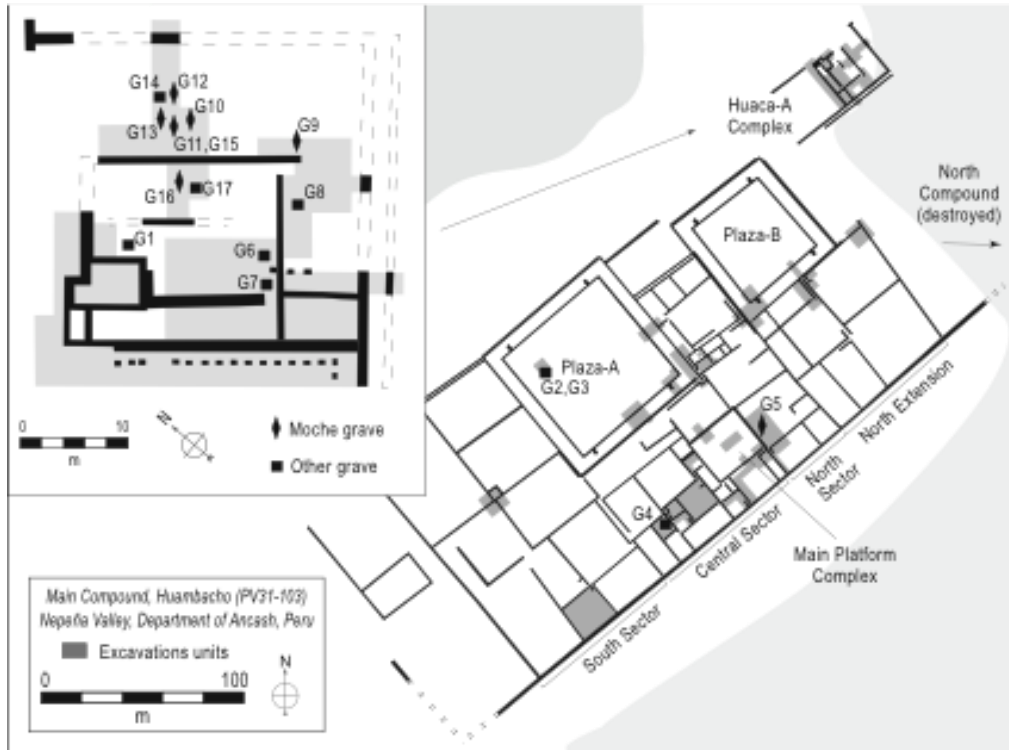


Figure 3.1: Distribution of Moche Burials at Huambacho (Chicoine n.d.)

The nine burial contexts of these individuals were found and described in detail by Chicoine (n.d.) during their excavation. Analysis of the burial positions and grave goods of these individuals, in addition to their osteological data, could provide interesting clues about possible social stratification of this small group. Table 3.1 provides an overview of the burial conditions.

Table 3.1 Huambacho Burial Descriptions (Chicoine n.d.)

Burial	Position	Grave Goods	Additional Notes
5	Extended, face up, head pointed SW	Body wrapped in cotton shroud, copper in mouth	Fine Moche Ceramics, body adornments, a wooden scepter, and copper found a few meters away in looter's pit
9	Extended, face down, head	Body wrapped in plainweave	Table 3.1 Continued p. 18

	pointed SW,	cotton shroud	Feet tied together
10	Extended, face down, head pointed SW	Body wrapped in plainweave cotton shroud, wearing cylindrical headdress made of plant fibers, textile bag with coca leaves	
11(1)	Extended, face down, head pointed SW	Body wrapped in plainweave cotton shroud	Lower legs missing, wooden digging sticks placed on each side of individual
11(2)	Buried at the left shoulder of 11(1)		
11(3)	Extended, face down, head pointed SW	Body wrapped in plainweave cotton shroud, Moche style ceramics found near head, gourd container, body adornments, copper pieces	Placed were lower legs of 11(1) should be, hands tied at waist, ankles tied, cordages tied around neck, wooden digging sticks placed on each side of individual
12	Extended, face down, head pointed SW		
13	Extended, face down, head pointed SW		
15	Extended, face down, head pointed SW	Body wrapped in plainweave cotton shroud, copper plate in mouth, sheets of copper in right hand, neck, and right foot, Moche ceramics	Directly beneath Grave 11, body unusually positioned with torso turned to the left and feet turned to the right, cotton sash tied around neck and to a wooden post, hands bound, feet bound
16	Extended, face down, head pointed SW		
17	Extended, face up	Body wrapped in plainweave cotton shroud, two gourd containers, bone pendant, wooden stick with enrolled cotton yarns	Cordages around neck

As the above chart demonstrates, several factors are quite consistent among the burials. For instance, all of the burials were found in an extended, face down position, with the head pointed southwest. In addition, most of the bodies were found wrapped in a plainweave cotton shroud (Chicoine n.d.). Chicoine (n.d.) clarifies that with the exception of the face down element, the above-mentioned burial conditions are very typical for Moche burials. Rowe (1995) states that face down burials in ancient Peruvian burials represented a position of sleep and rest. However, research at archaeological sites around the world has demonstrated that facedown burials were a custom among many ancient cultures used to disrespect and humiliate the dead. This negative treatment signifies that the individual displayed behavior that was out of the norm: “Shaming the dead is most probably a deep-rooted behavior in human kind.” (Owen 2009: 1). This chart also makes evident that these individuals were buried with varying amounts and qualities of grave goods suggesting social differentiation between these individuals. Particularly striking are the grave goods found in burials 10, 11, and 15.

The skeletal analysis below (chapter six), in addition to a consideration of the burial conditions described by Chicoine (n.d.), will provide important insights about the status and health of these individuals while alive as well as provide further information about their death and the nature of the Moche presence in Nepeña.

CHAPTER FOUR: PALEOPATHOLOGY

Paleopathology refers to the study of disease in ancient populations (Verano 1997). According to Verano (1997), South American ancient remains mostly from Peru, Chile, and Bolivia, have played a key role in the development of the scientific understanding of diseases that can be found on the skeleton. The identification of skeletal pathologies can be quite difficult, as only a small number of chronic conditions affect the skeleton, and some affect the skeleton in very similar ways. Some of these long-term ailments include arthritis (or degenerative joint disease), chronic infections, and dietary deficiencies. Diseases that kill quickly generally do not affect the skeleton (Ortner 1992).

Since paleopathology plays a major role in understanding the life-ways and health of past cultures when examining these remains, an introduction to the history of paleopathological research in the Peruvian Andes and the typical conditions one might encounter in the examination of ancient coastal Peruvian remains provides a better understanding of these skeletal stressors.

4.1 Andean Paleopathology

The Andes stretch 5,000km from north to south, from the northern Ecuador border to the Maule River in central Chile. From west to east, the Andes extend from the Pacific ocean to the eastern slopes of the Andean Cordillera (Verano 1997). Both the Inca and the many cultures that preceded the Inca have contributed a wealth of information to the paleopathological record of the area. The first skeletons from the Andes were collected by early nineteenth century explorers and anthropologists. Since then, more and more mummies and skeletal remains have allowed for in-depth studies of human adaptation, health implications due to major economic and dietary shifts, and the health impact of European contact (Allison 1979; Benfer 1990). Information about

Andean pre-historic health is available from various sources in addition to skeletal and mummified remains. For instance, the Spanish provided accounts of the health and medicine of the Inca. In addition, ethnographic data collected from modern populations provide insight about their prehistoric ancestors (Cabieses 1993). Lastly, iconography produced by these ancient cultures, particularly that of the Moche, has provided intriguing clues about the ailments of this population, such as deformed limbs, missing limbs, and congenital defects (Verano 1997).

The study of pre-Columbian Andean paleopathology deals with either case reports of specific pathological conditions and/or population studies which examine broader patterns of health and morbidity (Allison 1979; Buikstra and Williams 1991). Due to the good preservation of the coastal desert of Peru, numerous well-preserved human remains have been discovered. Over recent years, studies of these remains which have included osteological macroscopic analysis, autopsies and chemical analysis of mummy soft tissue, and chemical analysis of coprolite remains, have revealed the presence of many chronic diseases which plagued these populations including some that were thought to have not existed in South America before European contact, such as tuberculosis (Verano 1997).

Paleopathology and bioarchaeology are increasingly concerned with interrelationships between health, social organization, and identity in ancient complex societies. Integration of burial patterns, skeletal health, and interpretations of embodiment can be very useful to explore biocultural dimensions of social organization and identity on many levels. For instance, Farnum (2002) and Shimada et al. (2004) demonstrate that in pre-Hispanic Middle Sican populations (AD 900-1100), culturally constructed areas to social capital and resources (nutrition) contributed to superior elite health and comparatively worse health burden among common people. Additionally, Luce et al. (2011) state that the Middle Sican culture was an extremely

hierarchical multiethnic state, in which status buffered against health stress among the elite. Therefore, the authors analyzed 32 ethnically Muchik skeletons from the Middle Sican site of Huaca Las Ventanas and found that the burials accord well with the “biological embodiment” of social inequality (Krieger 2004). In particular, the high status burials demonstrate a very low prevalence of porotic hyperostosis, cribra orbitalia, enamel hypoplasia, non-specific infection, degenerative joint disease, and trauma. Recent research by Gagné (2004) shows that Moche graves can have varying bioarchaeological profiles. The remains analyzed were from the Santa River Valley and consisted of adults and sub-adults. The sub-adults exhibited cribra orbitalia interpreted to result from either iron deficiency or infectious diseases, cranial deformation, enamel hypoplasia, and circular caries. The adults, which were mostly male, ranges in age and status as some of the burials contained grave goods indicating elite status. Therefore, Gagné (2004) states that the graves show social ranking. However, the osteological data does not provide a clear social differentiation, as the skeletons interpreted as elite demonstrate skeletal signs of pathology and stress (particularly arthritis, osteophytosis, and dental attrition) just as severely as the non-elite skeletons.

The future for the study of Andean paleopathology looks promising. In particular, recent developments in analytical techniques, such as the development of stable isotope analysis, ensures detailed and accurate findings. These technologies have already begun to shed new light on the life and health of pre-historic Andean populations. For instance, stable isotope analysis has documented the importance of marine resources in the diet, dietary adaptations of migrant populations, the impact of agriculture on Andean health, and the affiliation of sacrificial victims (Aufderheide 1996; Benfer 1990; Burger and Van Der Merwe 1990; Tung 2008). In addition, chemical analysis of mummy hair has identified substances such as cocaine, nicotine, arsenic,

and hallucinogenic plant extracts in prehistoric populations of Chile and Peru (Aufderheide 1996; Cartmell et al. 1995). The following section provides a brief overview of the most common and important pathological conditions known from pre-Columbian Andean populations as well as other common pathological conditions that I looked for when analyzing the Huambacho sample.

4.2 Antemortem Pathology, Trauma, and Cultural Modification

Degenerative Joint Disease

Degenerative joint disease (DJD), also known as osteoarthritis, results from the breakdown of the articular cartilage of joints, which results in bone-to-bone contact. In other words, DJD results from the wear and tear on the bones and is often an indicator of physical activity and stress. This bone-to-bone contact leads to changes in the bone including lipping, porosity of the joint surface, and eburnation (Ortner 2003). DJD in the form of osteoarthritis is commonly documented in Pre-Columbian Peruvian populations (Allison 1979).

Periosteal Reactions

Periostitis is the inflammation of the outer layer, or periosteum, of the bone caused by infection or trauma (White 2000). This condition often presents itself as sclerotic bone apposition on the periosteum of the bone (Ortner 2003). The causes of this condition are often unknown or misunderstood; thus, interpretations based on the presence of this condition are difficult (Edeiken et al. 1966).

Osteophytosis

Osteophytosis is bony lipping on non-joint surfaces produced due to stress on the bone (Ortner 2003). Gerszten (2001) reports on the widespread occurrence of degenerative osteoarthritic changes of the vertebral bodies of remains from archaeological excavations in the

Andean region of southern Peru and northern Chile. In addition, Verano (2005) has documented osteophytic vertebral lipping on several sets of remains from Pikillacta, in the Cuzco region. Hershkovitz et al. (1998) states that osteophytes in the form of bony spurs can be a result of violent activities and physically strenuous sports. The authors clarify that in addition to robust muscle markings and bone fractures, osteophytes occur due to osteoblast activity attempting to repair the bone.

Porotic Hyperostosis and Cribra Orbitalia

Ortner (2003) states that cribra orbitalia and porotic hyperostosis are porous lesions found on the external table of the orbital roofs and the skull vault. Most commonly, they are a physiological response to iron deficiency anemia and represent chronic periods of nutritional stress. Some researchers have noted that environmental stressors, such as parasites and disease, rather than specific dietary deficiencies, are more likely to be responsible for the observed pathology (Allison 1979). Also, Verano (2003) notes that these indications of anemia, especially porotic hyperostosis, are documented in coastal Pre-Columbian Peruvian populations. Specifically, Blom et al. (2005) studied the remains of 1,465 individuals from the archaeological site of Moquegua, Peru and found a high frequency of porosity on the cranial vault. Similarly, Gerszten (1998) also found iron deficiency anemia resulting in porotic hyperostosis in pre-Columbian Peruvian mummies. Schultz (1968) clarified that this observed anemia could have been the result of Carrion's Disease, a disease that has long been associated with South American countries and has been documented through pre-Inca times. The bacteria *Bartonella bacilliformis* causes this disease, and its acute expression often presents in the form of anemia (Verano 1997).

Antemortem Bowing

Antemortem bowing can result from many defects. For instance, rickets, osteomalacia, and acquired disorders such as the improper metabolism of vitamin D are all known to result in the abnormal bowing of long bones. These disorders demonstrate the importance of vitamin D to maintain the normal stability of bones. Vitamin D is a fat-soluble vitamin that is essential for promoting calcium absorption in the stomach and maintaining adequate serum calcium concentrations to enable normal bone mineralization (Ortner 2003). In addition to the exposure of sunlight, vitamin D is also acquired through the intake of the flesh of fish, beef liver, cheese, and egg yolks (<http://ods.od.nih.gov/factsheets/vitamind/>). If the body is unable to break down and use vitamin D, the bones will lack the proper amount of calcium, which gives the bone its structure. Thus, the bone is softer and prone to antemortem bowing as stress is applied to bone. Abnormal bowing of bones is also rarely the result of genetic disorders such as osteogenesis imperfecta, osteopetrosis, fibrous dysplasia, and hypophosphatemia. Genetic bone diseases cause a change in the shape, strength, density, or proportion of the bone (Pimstone et al. 1966; Riminucci et al. 2001). The Moche actually documented genetic defects in their pottery. For instance, pottery depicting infants with Robinow syndrome and cleft lips are archaeologically present (Anadiotis 2000). Pottery depicting abnormally bowed limbs is not reported.

Antemortem Cranial Deformation

Verano (1997) notes that cranial deformation was the most popular form of body modification among prehistoric Andean populations as it was a signal of group membership. However, Verano (1997) states that some of this cranial deformation was probably the unintentional flattening of the back of the skull as a result of cradle boarding of infants. This unintentional flattening is documented from prehistoric Peruvian samples. The Moche were

known to perform other types of body modifications that do not show up on bones. These modification practices include tattooing, scarification, and even intentional mutilation. Moche iconography displays depictions of all of these modifications (Verano 1997).

Tuberculosis

The existence of tuberculosis in Peru prior to the arrival of the Spanish conquistadors, who are thought to have brought the disease from the Old World to the New World, has been debated (Buikstra 1981). However, recent research demonstrates that the disease did in fact exist long before the arrival of Old World explorers. Specifically, Allison et al. (1973) were the first to diagnose pre-Columbian TB from a mummy child in the southern coast of Peru dated to 1300 BP. In addition, research by Buikstra and Wilbur has demonstrated an abundance of skeletal lesions from ancient South American remains, which demonstrates the existence of the disease early in the New World. Also, chemical analyses have identified the pathogen responsible for this disease in Western populations prior to the Columbian encounter (Buikstra and Wilbur 2005; Wilbur and Farnbach 2005). Furthermore, Conlogue's analysis of Peruvian mummies revealed spine and lung damage suggesting tuberculosis in six percent of the mummies (Conlogue 2002).

Trauma

Trauma is typically divided into antemortem, perimortem, and postmortem trauma. Postmortem trauma is the result of taphonomic factors that affect the bone following death. These factors, which include fractures, chipping, weathering, animal gnawing, crushing, etc are evidenced by the sharp fracture lines and lack of bony healing (Ortner 2003). Perimortem trauma, which occurs at or near the time of death, can indicate important information about the nature of one's death. Perimortem trauma is also evidenced by very little to no bony healing (Ortner 2003). Antemortem trauma, which occurs well before death, is evident due to the bony

build up around a healed fracture and sometimes the misalignment of the healed bony elements (Ortner 2003). Skeletal collections from pre-Hispanic Peru demonstrate many instances of antemortem and perimortem fractures. For instance, the skeletal material collected by Tello displays many instances of perimortem skull fractures that could have been inflicted by Andean weapons such as clubs and slings (Merbs 1989). Trophy heads constitute an interesting form of postmortem trauma well documented in pre-Hispanic Andean populations. Trophy heads contained a hole in the forehead and damage at the foramen magnum at the base of the skull through which a cord of rope would be strung (Verano 1995). In addition, these trophy heads often contain perimortem cut marks left from defleshing. More than 100 trophy heads from Andean populations exist in museum collections (Verano et al. 1999).

Trephination

Trephination, or the surgical removal of a portion of the skull vault, is a commonly encountered ancient surgical technique in Peruvian cultures (Verano 1997, 1998). A small portion of the skull vault was removed through methods such as cutting, drilling, or scraping (Verano 1997). According to Verano (1998), trephination and amputation are two forms of early surgery reported in pre-historic South America. In fact, Andean South America “stands out for having more examples of trephined skulls than all other geographic areas of the world combined” (Verano and Andrushko 2008; Verano 1998: 226). Trephination was practiced as far back as 500 BC and probably even earlier (Andrushko and Verano 2008; Verano and Williams 1992). Some scholars have suggested that this procedure was performed in association with skull fractures, while others have suggested this procedure as treatment of ailments such as headaches, epilepsy, and removal of tumors (Andrushko and Verano 2008; Verano 1998). Four forms of trephination are documented in ancient Peruvian samples, including scraping, linear cutting,

circular grooving, and boring; a large percentage of these trephination cases show evidence of healing, indicating survival following the procedure (Andrushko and Verano 2008; Verano and Williams 1992; Verano 1998). For instance, Gerszten (1998) demonstrated that of all of the South American remains examined, Peruvian remains were the only ones with evidence of trephination. Verano (1997) clarifies that the Peruvian trephined skulls had a frequent association with skull fracture.

Foot Amputation

Verano et al. (2000) describe the recently discovered surgical technique of foot amputation in the Moche culture. This technique involved the disarticulation of the ankle joint and removal of all bony elements underneath the distal tibia and fibula. The tibio-talar joint cavity of the amputated individuals demonstrates dense, irregular growths. In addition, the malleoli are abnormally bent inward and flattened, suggesting use of this limb following the amputation of the foot. The scholars suggest that this evidence demonstrates intentional amputation of a possibly diseased or traumatized foot. Furthermore, ceramic vessels depicting individuals with amputated limbs are documented in Moche art. In particular, 65 ceramic vessels with depictions of individuals with amputated limbs have been documented in Moche iconography (Verano 1997).

Parasites

Studies of mummies and coprolites from Andean populations have demonstrated that existence of parasitism in pre-Columbian populations. The most common include the hookworm (*Ancylostoma duodenale*) the whipworm (*Trichuris trichiura*) roundworms (*Ascaris mubricoides*), marine tapeworm (*Diphyllobothrium pacificum*), and the pinworm (*Enterobius vermicularis*) (Confalonieri et al. 1991). The tapeworm and roundworm are found in coprolite

samples from the central coast of Peru dating approximately to 4800 BP and 4300 BP (Verano 1997). Parasitism can result in the porous lesions identified as porotic hyperostosis and cribra orbitalia (Ortner 2003).

4.3 Dental Pathologies

Enamel Hypoplasia

Enamel hypoplasia is a defect in the formation of tooth enamel, which results in transverse lines of hypoplasia or enamel pitting. These lines arise during chronic periods of nutritional stress or other kinds of physical stress in which the body must selectively utilize available resources. This pathological condition most often indicates chronic periods of childhood nutritional stress (Buikstra and Ubelaker 1994; Ortner 2003).

Calculus

Plaque, a layer of protein and bacteria, when mineralized, becomes calculus that displays on teeth as hard concretions on the tooth surface (Ash 1992). Studies demonstrate, however, the presence of calculus can result in protection against caries as the tooth surface is covered with hard concretions making it less susceptible to infection (Hillson 1979).

Caries and Abscesses

Dental caries are defined as “an infectious and transmissible disease in which progressive destruction of tooth structure, crown or root, is initiated by microbial activity on the tooth surface” (Pindborg 1970: 265). The main cause of carious lesions is the bacterial fermentation of refined sugars and carbohydrates. Other exogenous factors that affect the rate of carious lesions include diet, functional use of teeth, degree and rate of wear, and oral hygiene. Caries appear on the dental crown when acid producing bacteria in the plaque initiate demineralization of the enamel. If left untreated, this demineralization can result in the destruction of the enamel and

underlying dentin (Ash 1992). If the pulp chamber becomes exposed, serious infection can overtake the tooth and result in abscesses (Ortner 2003).

Attrition

Attrition can result from two distinct processes: natural attrition as the result of mastication and localized attrition caused by abnormal use of teeth. Attrition destroys the enamel of occluding teeth, sometimes resulting in the exposure of the underlying dentin and, in severe cases, the pulp cavity (Pindborg 1970).

Periodontal Disease

Periodontal disease is an inflammatory response of the alveolar bone to irritants. The inflammation results in the resorption of the alveolar bone creating a large space between the alveolar bone and the cemento-enamel junction. The later stages of this condition can result in tooth loss and alveolar resorption. Calculus is a common cause of this irritation (Ash 1992). Other irritants, such as metabolic diseases, may result in inflammatory conditions that affect the periodontal tissues. For instance, scurvy can weaken the connective tissues of the teeth resulting in the weakening of the alveolar joint (Ortner 2003).

CHAPTER FIVE: MATERIALS AND METHODS

5.1 Sample

Twenty-three individuals from the site of Huambacho, Peru, were excavated under the direction of Dr. David Chicoine in the summers of 2003 and 2004 (Chicoine and Navarro 2005; Chicoine and Pimentel 2004). While burial patterns had been analyzed preliminarily, the skeletal remains had not been thoroughly analyzed by an osteologist. Eleven of these individuals are considered Moche period burials based on stylistic, stratigraphic, and contextual evidence (Chicoine n.d.). Chicoine prepared an inventory of these remains along with estimations of age, sex, and health. The population contains both adults and sub-adults and preservation ranges from complete to very incomplete. Table 5.1 provides the burial inventory that I collected.

Table 5.1: Burial Inventory

Burial	Adult/Sub-adult	Status
5	Sub-adult	Skeleton is almost complete, the bones missing consist of small fragments of the cranium (which is very fragmented due to postmortem trauma), the sternum, the left pubic bone, and several bones of the hands and feet.
9	Adult	Consists of a very incomplete skeleton. The bones present are the left tibia, left fibula, left foot, and the right fibula and foot.
10	Adult	Consists of an almost complete skeleton. The bones missing consist of: the left and right first rib, the coccyx, the hyoid, the right scaphoid (carpal), left hand distal phalanx (row 5), right hand distal phalanges (rows 1,2), and right foot distal phalanges (rows, 2,3,5).
11(1)	Adult	Consists of a fairly complete skeleton. The distal lower limbs (tibiae, fibulae, and feet) are missing. In addition, several distal phalanges of the hands are missing. These bones include the left rows (2,4,5) and the right rows (2,4,5). The skull, while almost complete, is fragmented due to postmortem trauma.
11(2)	Sub-adult	The bones present include the complete cranium (no basilar occipital), right half of the mandible,

Table 5.1 Continued p. 32

		left scapula, left humerus, left ulna, left clavicle, nine left ribs, 2 right ribs, left radius, one cervical vertebrae, 12 thoracic vertebrae, 5 lumbar vertebrae, left innominate, sacrum, left femur, and left fibula.
11(3)	Adult	Most of the bones are partially missing due to postmortem trauma in the form of weathering. Bones missing completely include one thoracic vertebrae, the left hand pisiform (carpal), the left hand metacarpal (row 1), left hand intermediate phalanges (row 1,2), left hand distal phalanx (row 2), the left foot intermediate phalanges (row 1,2,5), left foot distal phalanges (row 2,3,4), the right foot intermediate phalanges (row 1,2,5), and the right foot distal phalanx (row 1).
12	Sub-adult	The bones present consist of an almost complete and intact cranium and mandible, both scapulas, both clavicles, all arm bones, all left ribs, and 11 right ribs (no 12), all vertebrae, the right ilium, and one metacarpal (un-sided and unidentified).
13	Adult	The bones present consist of left and right lower limbs. The left bones present include the femur, fibula, tibia, patella, all tarsals except the calcaneous, all metatarsals, all proximal phalanges, two intermediate phalanges (rows 4 and 5), three distal phalanges (rows 1,3, and 5), and one sesamoid bone. The right bones present include the fibula, tibia, patella, all tarsals, all metatarsals, all proximal phalanges, three intermediate phalanges (rows 2,3, and 5), two distal phalanges (rows 1 and 2), and two sesamoid bones.
15	Adult	Bones missing include the hyoid, the right pisiform, right trapezoid, right proximal hand phalanx (row 4), right intermediate hand phalanges (rows 4,5), and the right distal foot phalanx (row 4).
16	Sub-adult	The skeleton is very incomplete, with only fragmented remains of the upper body and cranium. More specifically, the bones present include seven cervical vertebrae, 10 thoracic vertebrae, 5 lumbar vertebrae, two left ribs (3-9), one right rib (3-9), left humerus, left radius, left ulna, right ulna, right clavicle, left scapula, complete mandible, fragmented frontal, fragmented parietals, both temporals, and occipital.
17	Sub-adult	The remains are poorly preserved and have incurred quite a bit of postmortem damage. The skeleton consists of a fragmented cranium and mandible, both clavicles, both scapulas, both humeri, the left ulna, all vertebral elements, four left rib fragments (including the first and second rib), six fragments of the right ribs (including the first, second, and third ribs), both femura, a complete left innominate, a fragmentary right innominate, and small unidentifiable bone fragments of the long bones and ribs.

5.2 Methods

Due to the differential levels of completeness/preservation, I used as many methods for determining age, sex, and stature as possible. However, I utilized standards based on modern populations, thus, introducing some error into my results. Measurements were made utilizing instruments such as sliding and spreading calipers for smaller bones and the osteometric board for long bones. I also made use of data collection forms provided in Buikstra and Ubelaker (1994). Detailed notes and drawings were recorded utilizing these forms. In addition, detailed photographs were taken of the individuals and the bony elements targeted for analysis. Due to the lack of certain technologies (as analyses were completed in Nepeña), methods requiring microscopic analysis were not utilized.

Age Determination

Gaither (2004) demonstrates that prehistoric Andean samples are difficult to age utilizing standards such as those put forth by Buikstra and Ubelaker (1994). Therefore, I utilized as many ageing techniques as possible in an effort to reduce error and mis-classification. Depending on which bony elements were available for each individual, I utilized the following methods to determine age of adult skeletons.

Adults

1. Suchey-Brooks pubic symphysis scoring system (Brooks and Suchey 1990; Buikstra and Ubelaker 1994)
2. Age-related changes of the auricular surface of the os coxae (Bedford et al. 1989; Buikstra and Ubelaker 1994; Lovejoy et al. 1985)
3. Sternal rib ends (Iscan et al. 1984, 1985; Yoder et al. 2001)
4. Cranial suture closure: endocranial and ectocranial (Buikstra and Ubelaker 1994; Meindl and Lovejoy 1985)

Infants

1. Union of primary ossification centers (Stewart 1979)
2. Tooth formation (Buikstra and Ubelaker 1994; Moorees et al. 1963a,b)
3. Epiphyseal union (Bass 2005; Ubelaker 1989)

Sex Determination

Previous research has demonstrated that the determination of sex in ancient Andean populations is difficult. For instance, Verano (2003) re-examined a large sample of remains from Machu Picchu, which were first examined by Eaton. He found that Eaton greatly over-classified many of the individuals as female. Native Andeans tend to be relatively short in stature and maintain relatively small body sizes. Therefore, native Andean male skeletons are easily classified as female due to their gracile nature (Verano 2003). Consequently, I utilized as many sexing techniques as possible in an effort to reduce possible error and mis-classification.

Adult

1. Pelvis

1. Sub-pubic angle (Buikstra and Ubelaker 1994)
2. Ventral arc (Buikstra and Ubelaker 1994; Phenice 1969)
3. Sub-pubic concavity (Buikstra and Ubelaker 1994; Phenice 1969)
4. Ischiopubic ramus ridge (Buikstra and Ubelaker 1994; Phenice 1969)
5. Greater sciatic notch (Buikstra and Ubelaker 1994)
6. Preauricular sulcus (Buikstra and Ubelaker 1994; Milner 1992)

2. Skull

1. Nuchal crest (Acsadi and Nemeskeri 1970; Buikstra and Ubelaker 1994)
2. Mastoid process (Acsadi and Nemeskeri 1970; Buikstra and Ubelaker 1994)
3. Supraorbital margin (Acsadi and Nemeskeri 1970; Buikstra and Ubelaker 1994)
4. Prominence of glabella (Acsadi and Nemeskeri 1970; Buikstra and Ubelaker 1994)
5. Mental eminence (Acsadi and Nemeskeri 1970; Buikstra and Ubelaker 1994)

3. Other

1. Long limb bone lengths (Trotter and Gleser 1952)
2. Femur head (Stewart 1979)

Stature Determination

Stature estimations were made based on Genoves's Mesoamerican stature formulae (Genoves 1967), which has proven to work well for coastal Peruvian skeletal material (Verano 1997). Genoves's formulae required the use of long bones including the tibia or femur (Genoves 1967). I utilized whichever long bone was the most complete and well preserved.

Analysis of Pathology and Trauma

The analysis of pathology and trauma included the macroscopic examination of each bone and documentation of any observable anomalies including arthritic lipping, periosteal reactions, hypoplasias, antemortem trauma, perimortem trauma, postmortem trauma, cultural modifications such as trephination, and any other observable pathology. In addition, the dentition was closely examined for pathological conditions such as caries, calculus, periodontal disease, enamel hypoplasias, attrition, antemortem tooth loss, and cultural modifications. All pathological conditions were documented through written description, detailed drawings, and photographs.

1. Skeletal Pathologies

Stages of degenerative joint disease (DJD) and spinal osteophytosis were determined utilizing the stages put forth by Buikstra and Ubelaker (1994). Specifically, the four stages of DJD scored for every joint surface as well as the stages of osteophytosis on the vertebrae were: none present; slight lipping; moderate lipping and/or pitting; and severe lipping, pitting, and/or eburnation. The severity and activity of the porotic hyperostosis and cribra orbitalia were scored utilizing the stages defined by Buikstra and Ubelaker (1994). These stages include: none present; pores present, but barely discernable; pores distinct; and pores coalescing into foramina.

2. Dental Pathologies

Calculus formation was determined utilizing the scoring system provided by Buikstra and Ubelaker (1994). Stages of calculus formation include: absent, small (thin coat on some of tooth), moderate (thin coat on most of tooth with some possible areas of bulging calculus), and heavy (tooth covered in thick, bulging calculus). Slight, moderate, and severe attrition (assigned with numerical values) was scored utilizing the standards provided by Scott (1979). Severity of periodontal disease was scored utilizing the stages provided by Buikstra and Ubelaker (1994).

These stages include: absent; less .5 root exposed; greater .5 root exposed; and remnants of alveolus.

CHAPTER SIX: RESULTS

The following chapter provides detailed descriptions of the demographic features and paleopathological conditions found in the 11 Moche individuals from Huambacho. First, I discuss the demographic features of the sub-adult remains, followed by the demographic features of the adult remains. Second, I will discuss the skeletal and dental pathologies documented on the adult and sub-adult remains.

6.1 Sub-adult Remains

This sample contained five sub-adult skeletons. The following is a detailed description of the demographic analysis. These remains were not sexed, as sexually differential characteristics on the bones develop at sexual maturity (Buikstra and Ubelaker 1994). In addition, stature formulae are not relevant for immature remains, as they have not reached sexual maturity and their full potential height. Thus, stature was not assessed. Table 6.1 provides the sub-adult demographics.

Table 6.1: Sub-adult Demographics

Burial	Bone Union Age	Dental Eruption Age
5	<1 year	0-6 months
11(2)	2-4 years	2-3 years
12	2-7 years	5-6 years
16	2-5 years	2-3 years
17	1-2 years	1-2 years

Burial 5

Burial 5 (Figure 6.1) contained an almost complete small child. The bones are very well preserved as they have not sustained substantial amounts of postmortem trauma in the form of weathering. This individual is extremely young as attested to by many features. Specifically, age

was determined utilizing bone union, epiphyseal closure, and dental eruption and development (Buikstra and Ubelaker 1994; Ubelaker 1989). All of the bony features demonstrate that this individual was <1 year at death (Table 6.2).

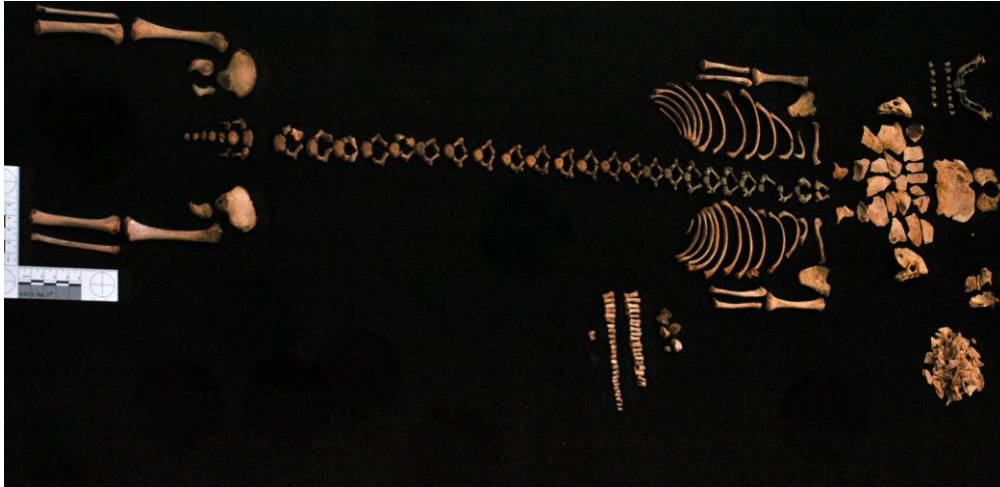


Figure 6.1: Burial 5

Table 6.2: Burial 5 Age Assessment Details

Bone Union (Buikstra and Ubelaker 1994; Ubelaker 1989)	Dental Eruption (Ubelaker 1989)
No epiphyseal closure	No permanent teeth visible
No union of primary ossification centers	Crown development of .5 to complete
<1 year	0-6 months

Burial 11 (Individual 2)

Burial 11 (Individual 2) (Figure 6.2) consists of the skeleton of a sub-adult. The bones present are well preserved and display little postmortem weathering.

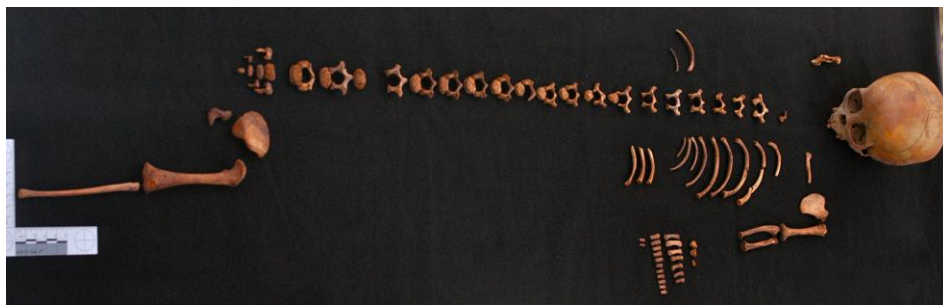


Figure 6.2: Burial 11(2)

Age was determined utilizing bone union, epiphyseal closure, and dental eruption and development (Buikstra and Ubelaker 1994; Ubelaker 1989). Based on the assessment of these features, this individual was 2-4 years at death (Table 6.3).

Table 6.3: Burial 11(2) Age Assessment Details

Bone Union (Buikstra and Ubelaker 1994; Ubelaker 1989)	Dental Eruption (Ubelaker 1989)
No bone union	.5 root development on second maxillary molars
Little union of primary ossification centers	.75 root development on first maxillary molars
Neural arches fused on thoracic and lumbar vertebrae	Complete root development on incisors
2-4 years	Permanent first molars and incisors erupting
	2-3 years

Figure 6.3 depicts burial 11 in situ at Huambacho in which individual 1 rests above individual 3 and individual 2 rests behind individual 1's left shoulder.



Figure 6.3: Burial 11 (Individuals 1,2,3) In situ (Photograph by Chicoine n.d.)

Burial 12

Burial 12 (Figure 6.4) consists of the remains of a young child. The bones present are very well preserved. The age of this individual was assessed utilizing the bone union, epiphyseal closure, and dental eruption and development (Buikstra and Ubelaker 1994; Ubelaker 1989).

Based on the features assessed, this individual was 2-7 years at death (Table 6.4).

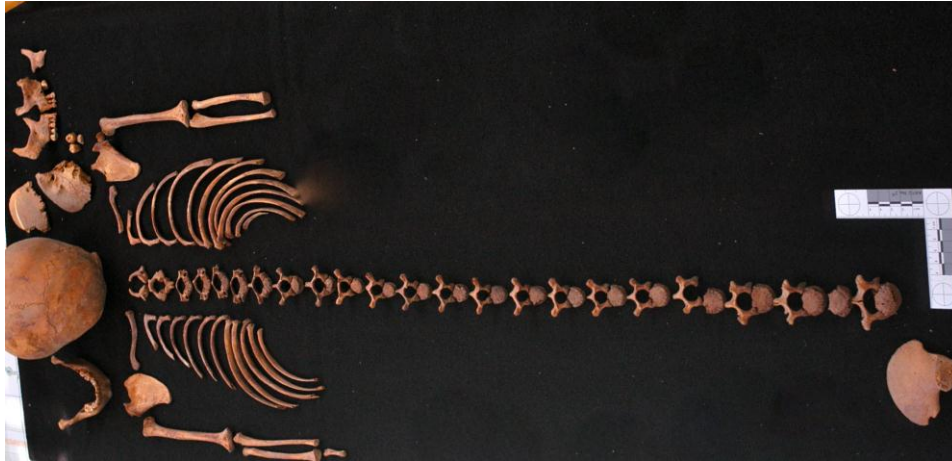


Figure 6.4: Burial 12

Table 6.4: Burial 12 Age Assessment Details

Bone Union (Buikstra and Ubelaker 1994; Ubelaker 1989)	Dental Eruption (Ubelaker 1989)
No epiphyseal fusion	Permanent incisors erupting
Little union of primary ossification centers	Permanent first molars almost fully erupted
Neural arches of all vertebrae fused	Molar roots .5 developed
Neural arches not fused to centrum	First and second molars erupting
2-7 years	5-6 years

Burial 16

Burial 16 (Figure 6.5) consists of the skeleton of a small child. The skeleton is very incomplete, with only fragmented remains of the upper body and cranium. Age was assessed

through the analysis of bone union and epiphyseal closure (Buikstra and Ubelaker 1994; Ubelaker 1989). Few bones were available for the assessment of epiphyseal fusion. Based on the assessment of these features, this individual was 2-5 years at death (Table 6.5).

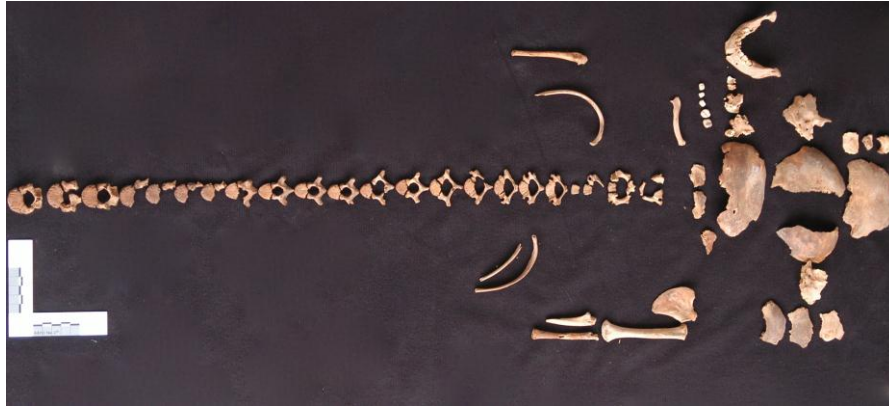


Figure 6.5: Burial 16

Table 6.5: Burial 16 Age Assessment Details

Bone Union (Buikstra and Ubelaker 1994; Ubelaker 1989)	Dental Eruption (Ubelaker 1989)
No union of present long bones	Deciduous molar root development of .25
Billowing on metaphyseal ends of long bones	Deciduous canine and incisor root development of .5
Neural arches of all vertebrae fused	Several permanent teeth present
Neural arches and centrums fused on L5 vertebrae	No root development on permanent teeth
2-7 years	2-3 years

Burial 17

Burial 17 (Figure 6.6) consists of the partial skeleton of a young child. The remains are poorly preserved and have incurred quite a bit of postmortem damage. An age assessment was determined for this individual utilizing the bone union, epiphyseal closure, and dental eruption and development (Buikstra and Ubelaker 1994; Ubelaker 1989). These features suggest an age of 1-2 years at death (Table 6.6).



Figure 6.6: Burial 17

Table 6.6: Burial 17 Age Assessment Details

Bone Union (Buikstra and Ubelaker 1994; Ubelaker 1989)	Dental Eruption (Ubelaker 1989)
No epiphyseal union of long bones	All deciduous teeth erupted
Neural arches of all vertebrae fused	Deciduous root development of .5-.75
Neural arches not fused to centrum	Permanent first and second molars erupting
1-2 years	1-2 years

6.2 Adult Remains

This sample contained 6 adult individuals. The following is the demographic assessment of age, sex, and stature. Table 6.7 provides the adult demographics. Descriptions of skeletal and dental pathological conditions will follow in later sections.

Table 6.7: Adult Demographics

Burial	Sex	Age
9	Possibly male	Adult
10	Male	20-30
11(1)	Male	25-30
11(3)	Male	25-35
13	Probable male	Adult
15	Male	25-35

Burial 9

Burial 9 (Figure 6.7 and Figure 6.8) consists of a very incomplete skeleton that lacks the skull and pelvis. As the skull and pelvis are the most indicative elements for the determination of age, long bone assessment provides only a general age and sex. Based on the elements present, this individual was an adult male (Table 6.8).



Figure 6.7: Burial 9



Figure 6.8: Burial 9 In-situ
(Photograph by Chicoine n.d.)

Table 6.8: Burial 9 Sex and Age Assessment Details

Sex	Age
Robust muscle markings in foot bones	Bones fully formed
	All epiphyses fused
Possibly Male	Adult

Burial 10

Burial 10 (Figure 6.9) consists of a complete skeleton. This individual’s pelvis is completely intact and, therefore, an age determination was possible utilizing the pubic symphyses and auricular surfaces. The 4th rib ends were not available for age determination as both sternal ends were missing. The pelvis and skull provide an age estimate of about 20-30 years (Table 6.9). In addition to these elements, the sutures of the skull display minimal closure, this individual’s epiphyses are all fused, and the third molars are completely erupted.

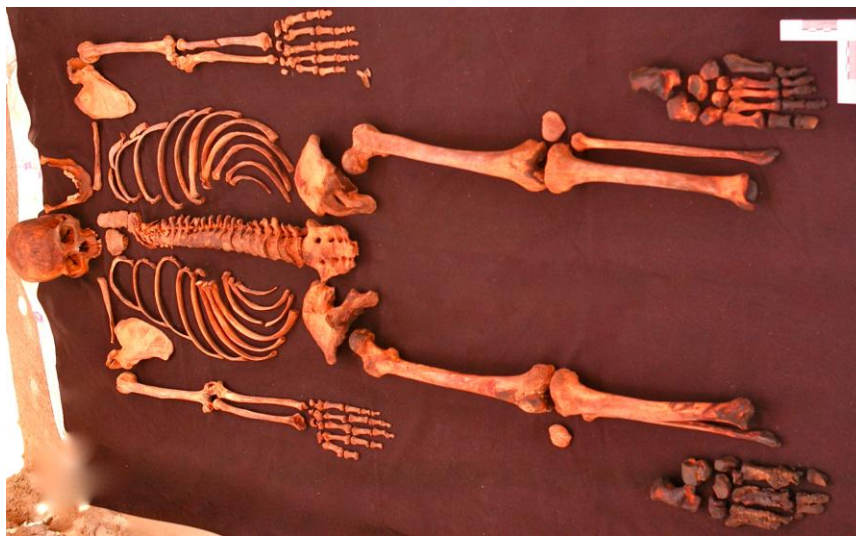


Figure 6.9: Burial 10

The pelvis and skull were also utilized for the determination of sex and most of the features attest to a male sex (Table 6.9).

Table 6.9: Burial 10 Sex and Age Assessment Details

Sex, Pelvis (Phenice 1969)	Sex, Skull (Buikstra and Ubelaker 1994)	Age, Pubic Symphysis (Suchey-Brooks 1990)	Age, Auricular Surface (Lovejoy et al. 1985)
Ischio-pubic ramus ridge is convex	Robust nuchal crest	Marked billowing	Clear striae
Greater sciatic notch is very narrow	Robust mastoid processes	Formation of striae	Marked border
			Table 6.9 Continued p.45

No pre-auricular sulcus	Thick supra-orbital margin	Start of a dorsal border	Very fine granularity
Sub-pubic angle is acute	Robust glabella	Bony nodules on superior margin	No porosity
Male	Pronounced mental eminence	22-24 years	Little to no retro-auricular activity
	Prominent temporal lines		25-29 years
	Post-zygomatic roots		
	Gonial angle of 90 degrees		
	Sloping forehead		
	Male		

Burial 11 (Individual 1)

Burial 11 (individual 1) (Figure 6.10) consists of a fairly complete skeleton. Age assessments were possible on multiple bony features. In particular, the pubic symphyses were assessed utilizing the Todd (1921) and Suchey-Brooks (1990) scoring systems. The auricular surfaces were assessed according to the Lovejoy et al. (1985) scoring system (Table 6.10). In addition to the pelvis, the sutures of the skull were analyzed for an age assessment. It should be noted that the fragmented nature of this individual's cranium makes the age assessments based on suture closure less valid. However, the sutures available for analyses were open and display little to no closure, indicating the youth of this individual. The fourth rib ends were available for analysis utilizing Iscan et al.'s (1984) scoring system. Both of the rib ends display shallow and V-shaped sternal articulation pits, thick borders with the beginning of scalloping, and the rib ends are thick and strong. The rib ends place this individual's age in the late 20s. In addition to these elements, the third molars are fully erupted and the speno-occipital suture and epiphyses

of the clavicle are fused (both fuse in early to mid 20s). All of these factors indicate that this individual was 25-30 years at death.



Figure 6.10: Burial 11(1)

This individual displays very robust bones and muscle attachments, suggesting a male sex. The skull and pelvic features used to assess sex validate this determination (Table 6.10).

Table 6.10: Burial 11(1) Sex and Age Assessment Details

Sex, Pelvis (Phenice 1969)	Sex, Skull (Buikstra and Ubelaker 1994)	Age, Pubic Symphysis (Suchey-Brooks 1990; Todd 1921)	Age, Auricular Surface (Lovejoy et al. 1985)
No ischio-pubic ramus ridge	Robust nuchal crest	Some retention of billowing and striae	Distinct striae, pores
Narrow greater sciatic notch	Robust mastoid processes	Slight coarsening of granularity	Fine granularity
No pre-auricular sulcus	Thick supra-orbital margin	Complete dorsal border	Distinct border
		25-30 years	
Acute sub-pubic angle	Pronounced mental eminence	Table 6. 10 Continued p. 47	

Male	Post-zygomatic roots	Little retro-auricular activity
	Sloping forehead	25-29 years
	Very robust jaw	
	Square gonial angle	
	Male	

Burial 11 (Individual 3)

This individual (Figure 6.11) is very complete but not well preserved. The antemortem mandibular alveolar resorption suggests this individual is an older adult. However, the analysis of the pelvis and skull indicate that this individual is actually quite young (Table 6.11). In addition, the cranial sutures of the skull are all very open and display little to no closure. Both 4th ribs end were available for age assessment. It should be noted that the ribs were all very fragmented and, therefore, the rib ends that I pieced together are not 100% accurate. The rib ends both display bony outgrowths, which tends to characterize much older individuals. Yet, the other features of the ribs indicate a young individual. In particular, the sternal articulation is quite shallow and just starting to approach a U shape. The edges are thick and strong and display the beginning of scalloping. Therefore, based on Iscan et al.'s (1984) fourth rib scoring system, this individual was aged late 20s to early 30s. In addition to these elements, all epiphyses (including the clavicles) are fused and the third molars are present. Thus, this individual was probably 25-35 at death. The skull and pelvis were both analyzed to assess sex. This individual displays robust bony features, indicating a male sex (Table 6.11).



Figure 6.11: Burial 11(3)

Table 6.11: Burial 11(3) Sex and Age Assessment Details

Sex, Pelvis (Phenice 1969)	Sex, Skull (Buikstra and Ubelaker 1994)	Age, Pubic Symphysis (Suchey-Brooks 1990; Todd 1921)	Age, Auricular Surface (Lovejoy et al. 1985)
Convex sub-pubic region	Robust nuchal crest	Billowing evident	Striae
Narrow greater sciatic notch	Robust mastoid processes	Fine granularity	Fine granularity
No pre-auricular sulcus	Thick supra-orbital margin	Some porosity	Some patches of coarse granularity
Narrow sub-pubic angle	Robust glabella	Complete dorsal border	Patches of porosity
Male	Pronounced mental eminence	Ventral border starting to form	Distinct border
	Robust temporal lines	Bony nodules on superior end	Little retro-auricular activity
	Post-zygomatic roots	25-30 years	30-35 years
	Sloping forehead		
	Robust jaw, square gonial angle		
	Male		

Burial 11(3) displays a fragmented cranium. While closer inspection of these fragments for marks of perimortem trauma yielded no evidence of violence, this fragmentary state could indicate perimortem violence. Figure 6.12 depicts this fragmentation which was previously reconstructed following excavation in 2004 by Dr. David Chicoine.



Figure 6.12: Burial 11(3) Reconstructed Posterior Skull Depicting Possible Perimortem Fragmentation

Burial 13

Burial 13 (Figure 6.13) consists of a very incomplete skeleton that lacks the skull and pelvis. Based on the assessment of long bones, this individual is an adult male (Table 6.12).



Figure 6.13: Burial 13

Table 6.12: Burial 13 Sex and Age Assessment Details

Sex	Age
Robust muscle markings on long bones and patellas	Bone fully formed
Probable Male	All epiphyses fused
	Adult

Burial 15

Burial 15 (Figure 6.14 and Figure 6.15) is an almost complete individual. The innominates of this individual are well preserved, except both pubic symphyses are missing due to postmortem trauma (Table 6.13). In addition, the sutures of the skull also indicate a young age, as all but two (obelion and incisive) display minimal to no closure. The 4th sternal rib ends attests to this age assessment, as they display a shallow surface that is almost a U-shape, strong, thick walls, slight wall scalloping, and no boney projections. Thus, according to Iscan et al.'s (1984) scoring system, this individual is in his mid to late 20s. In addition, the clavicles are both fused, suggesting that this individual is at least older than 21. Furthermore, all other epiphyses

are fused and the third molars are present. The above features provide an age estimation of 25-35 years.



Figure 6.14: Burial 15



Figure 6.15: Burial 15 In-situ (Photograph by D. Chicoine)

The pelvis and skull were both available for analysis and they provide a male sex estimate (Table 6.13). However, the bones of this individual are very gracile compared to the others in the population. Despite this gracile state, the bony elements most indicative of sex all denote a male sex.

Table 6.13: Burial 15 Sex and Age Assessment Details

Sex, Pelvis (Phenice 1969)	Sex, Skull (Buikstra and Ubelaker 1994)	Age, Auricular Surface (Lovejoy et al. 1985)
Convex sub-pubic region	Robust nuchal crest	Clear border
No ischio-pubic ramus ridge	Robust mastoid processes	Fine granularity
Narrow greater sciatic notch	Thick supra-orbital margin	Little porosity
Acute sub-pubic angle	Robust glabella	Lines of striae
Male	Pronounced mental eminence	Little retro-auricular activity
	Post-zygomatic roots	25-35 years
	Male	

Stature

Stature was determined utilizing Genoves's (1967) formula. The adult stature of this population ranged from approximately 165.488 cm to 181.66 cm (or 5'4" to 6'0"). Table 6.14 provides the adult stature estimates.

Table 6.14: Adult Stature (cm)

Burial	Element Used	Formula Used (Genoves 1967)	Stature
9	Tibia	$1.96 (36.6) + 93.752 \pm 2.812$	165.488 cm \pm 2.812
10	Femur	$2.62 (41.85) + 66.379 \pm 3.417$	176.030 cm \pm 3.417
11(1)	Femur	$2.62 (40.95) + 66.379 \pm 3.417$	173.668 cm \pm 3.417
11(3)	Femur	$2.62 (41.15) + 66.379 \pm 3.417$	174.192 cm \pm 3.417
13	Femur	$2.62 (44.0) + 66.379 \pm 3.417$	181.660 cm \pm 3.417
15	Femur	$2.62 (39.8) + 66.379 \pm 3.417$	170.655 cm \pm 3.417

6.3 Antemortem Pathology and Trauma

All of the adult remains display significant amounts of postmortem trauma in the form of weathering, chipping, and fractures. The following is a description and analysis of antemortem cranial, post-cranial, and dental pathology and trauma.

Degenerative Joint Disease

Degenerative Joint Disease (DJD) is present on every adult individual in the Huambacho population in the form of arthritic lipping, porosity around joint surfaces, and eburnation of articulating bony surfaces. Figures 6.16, 6.17, and 6.18 demonstrate examples of slight, moderate, and severe lipping DJD found in the Huambacho population.

These individuals display degenerative joint disease on almost every joint surface and sometimes very severe cases. For instance, every adult individual displays severe arthritic lipping



Figure 6.16: Slight Lipping on Proximal Right Ulna of Burial 11(3)

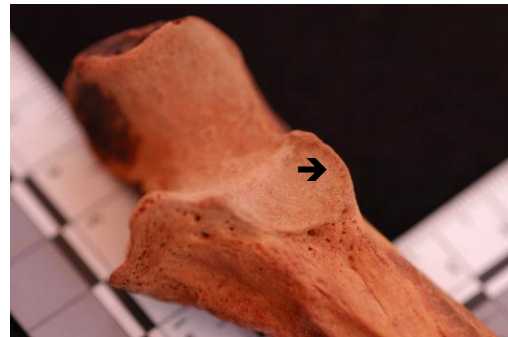


Figure 6.17: Moderate Lipping on Proximal Left Ulna of Burial 11(1)

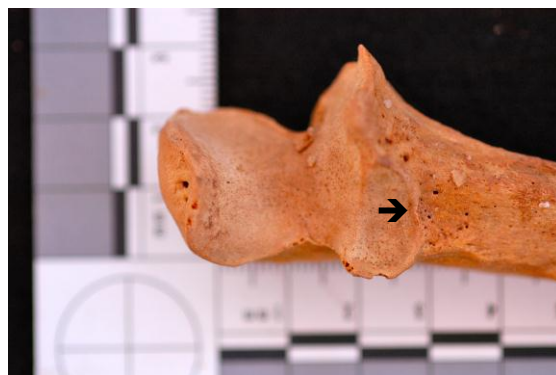


Figure 6.18: Severe Lipping on Proximal Right Ulna of Burial 15

around the knee joint (proximal tibia, distal femur), hip joint (acetabulum, femoral head), and lower back (lumbar vertebrae). This trend indicates an active lifestyle that particularly utilized the lower limbs (running, walking). Table 6.15 demonstrates the frequency of slight, moderate, and severe DJD on the adult skeletons.

Table 6.15: Adult Degenerative Joint Disease (slight, moderate, and severe)

Burial	Slight Lipping (per total surfaces)	Moderate Lipping and/or Pitting (per total surfaces)	Severe Lipping, Pitting, and/or Eburnation (per total surfaces)	Total (per total surfaces)	Total Percent	Notes
9	32/79	9/79	4/79	45/79	56.96%	Severe lipping on L proximal tibia, L proximal and distal foot phalanx (row 1)
10	190/432	40/432	16/432	246/432	56.94%	Severe lipping on L and R proximal humerus, L and R proximal ulna, L and R femoral head, L and R distal femur, L and R proximal tibia
11(1)	55/372	35/372	11/372	101/372	27.15%	Severe lipping on L and R proximal humerus, L and R femoral head, L and R distal femur
11(3)	196/412	82/412	22/412	300/412	72.82%	Severe lipping on L and R lateral clavicles, L and R proximal humerus, L and R femoral head, L and R distal femur, L and R proximal tibia
13	50/120	7/120	5/120	62/120	51.67%	Severe lipping on L Table 6.15 Continued p. 55

						femoral head, L greater trochanter, L distal femur, L and R proximal tibia
						Severe lipping on L and R proximal humerus, R rib 9 (head), L rib 10 (head), L and R acetabulum, L and R femoral head, L and R greater trochanter, L and R proximal tibia, L intermediate foot phalanx (row 5)
15	195/467	90/467	13/467	298/46	7	63.81%

Periosteal Reactions

Periosteal reactions in the Huambacho population display as minor bony overgrowths indicative of sclerotic bone apposition mostly on long bone diaphyseal surfaces. Only a few cases of slight periosteal reactions were found in the Huambacho population (Table 6.16).

Periosteal reactions were scored as either active or healed based on the degree of bone healing.

No instances of active periostitis were found in the Huambacho population. Figure 6.19

demonstrates a slight healed periosteal bony apposition on the sternal end of the 2nd rib of burial 11(1).

Table 6.16: Adult Periosteal Reactions

Burial	Element	Description
9	L tibia	Border, lateral diaphyseal end
	L navicular	Inferior bony thickening
	L first cuneiform	Superior bony thickening
	L metatarsals (row 1,3,4)	Bony thickening on medial and lateral shafts
	L border phalanx (row1,3)	Inferior bony thickening

Table 6.16 Continued p. 56

	R metatarsals (row 1,2,3,4)	Bony thickening on medial and lateral shafts
	R border phalanx (row 1,2,3)	Inferior bony thickening
11(1)	L and R clavicles	Inferior, medial ends
	L second rib	Bony thickening on the sternal end
11(3)	R clavicle	Medial, inferior end
15	R distal fibula	Posterior bony thickening
	L navicular	Inferior bony thickening
	L first cuneiform	Superior bony thickening
	L second cuneiform	Superior bony thickening
	R navicular	Inferior bony thickening
	R first cuneiform	Superior bony thickening



Figure 6.19: Burial 11(1) Left 2nd Rib Healed Periosteal Reaction

Osteophytosis

The adult individuals in this population display severe spinal osteophytosis. Every adult displays at least one vertebrae with severe osteophytic growths. The most severe growths are

almost always on the lumbar 3, 4, and 5, and sometimes on the middle thoracic. Figures 6.20, 6.21, and 6.22 provide examples of slight, moderate, and severe spinal osteophytosis in the adult Huambacho individuals.



Figure 6.20: Burial 15
Thoracic Vertebrae #7
(Slight Growth)

Figure 6.21: Burial 15
Thoracic Vertebrae #7
(Moderate Growth)

Figure 6.22: Burial 11(1)
Lumbar Vertebrae #4
(Severe Growth)

Non-vertebral osteophytic growths in the Huambacho adult population display as unusual sharp outgrowths along lines of muscle attachments (Table 6.17). These outgrowths resemble myositis, or the ossification of muscles at attachment areas (Ortner 2003). Figures 6.23 and 6.24 demonstrate these outgrowths on individual 11(3).

Table 6.17: Adult Osteophytic Growths

Burial	Element	Description
9	L tibia	Distal posterior articular border
	L metatarsal (row 2)	Medial mid-shaft
	L metatarsal (row 4)	Border anterior diaphysis
	L foot phalanx (row 2)	Inferior border shaft
11(3)	L and R innominates	Along the pubic-ischium union
	L tibia	Border lateral diaphysis
	L second rib	Inferior sternal end
	L third rib	Superior sternal end
	L sixth rib	Superior mid-shaft



Figure 6.23: Burial 11(3) Left 6th Rib Growth and Postmortem Trauma

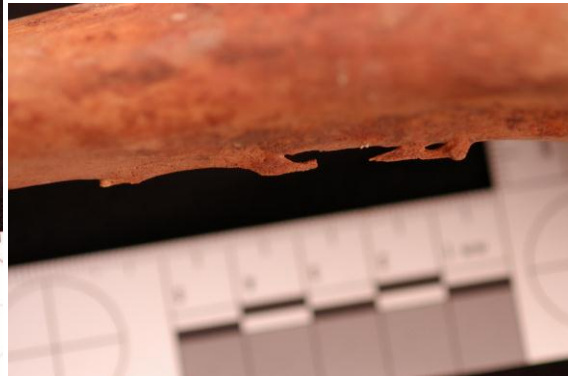


Figure 6.24: Burial 11(3) Left Proximal Tibia Osteophytic Growths

Porotic Hyperostosis and Cribra Orbitalia

Almost every individual in the Huambacho sample displays porotic hyperostosis in the form of both active (on the sub-adults) and healed porosity along the sagittal and lambdoidal sutures. This porosity ranges from slight to severe, with the most severe expressions on the occipital. Figure 6.25 demonstrates healed porosity (pores distinct) along the sagittal suture of burial 15.



Figure 6.25: Burial 15 Right Parietal Porotic Hyperostosis (Healed Pores Distinct)

Several individuals also display cribra orbitalia in the form of porosity on the superior wall of the eye orbit. These pores range from slight to severe. Interestingly, most of the cases of cribra orbitalia are displayed on the sub-adults. For instance, individual 12 displays severe porosity on both eye orbits in addition to porotic hyperostosis. Figure 6.26 depicts the active porosity (pores coalescing into foramina) on the left eye orbit of burial 12. Table 6.18 lists instances of adult and sub-adult porotic hyperostosis and cribra orbitalia.



Figure 6.26: Burial 12 Left Eye Orbit, Active Cribra Orbitalia

Table 6.18: Adult and Sub-adult Porotic Hyperostosis and Cribra Orbitalia

Burial	Pathology	Description
5 (Sub-adult)	Porotic hyperostosis	Along the posterior sagittal suture (mild)
10 (Adult)	Porotic hyperostosis	Along the sagittal suture of the parietals and along the anterior cranial vault.
11(1) (Adult)	Porotic hyperostosis	Sagittal suture (slight) of the parietals and the occipital (severe).
11(2) (Sub-adult)	Porotic hyperostosis	Active pores are discernable on the frontal and occipital
	Cribra Orbitalia	Both eye orbits (active, slight)
11(3) (Adult)	Porotic hyperostosis	Parietals and occipital (mild, porosity)
	Cribra Orbitalia	Slight porosity on both eye orbits
12 (Sub-adult)	Porotic hyperostosis	Frontal (active, slight) and both parietals (healed and active, slight)
	Cribra Orbitalia	Both eye orbits (active, severe)
15 (Adult)	Porotic hyperostosis	Parietals (mild, healed) and occipital (severe)
	Cribra Orbitalia	Mild porosity on left orbit
16 (Sub-adult)	Porotic hyperostosis	Left parietal and occipital (mild, active)
17 (Sub-adult)	Porotic hyperostosis	Superior portion of the occipital (mild, active)

Antemortem Bowing

This Huambacho population displays an unusually large amount of antemortem long-bone bowing. Most of the bowing is displayed on the arm bones, especially the ulnae in which

the border diaphysis is concave laterally and the distal diaphysis is concave medially. In addition, many of the individuals display bowing on the humerus and radius in which the proximal half of the diaphysis is bowed medially. Figure 6.27 demonstrates this bowing on the ulnae of burial 11(1).



Figure 6.27: Burial 11(1) Left and Right Ulna Antemortem Bowing

Some bowing is also displayed on the long bones of the leg, especially on the fibulae. For instance, Figure 6.28 depicts the fibulae of burial 9 in which the distal diaphysis in the left fibula (top) is bowed toward the posterior. Table 6.19 provides descriptions of the adult and sub-adult antemortem bowing.



Figure 6.28: Burial 9 Left and Right Fibula (posterior)

Table 6.19: Adult and Sub-adult Bowing

Burial	Element	Description
5 (Sub-adult)	L and R humerus	Border diaphyses bowed medially
	L and R ulna	Border diaphyses bowed anteriorly
	L and R radius	Border diaphyses bowed medially and anteriorly
9 (Adult)	L and R fibulae	Bowed in a concave manner towards the posterior
10 (Adult)	L and R humerus	Border half of diaphysis is bowed medially
	L and R radius	Border half of diaphysis is bowed medially and anteriorly
	L and R ulna	Bowed in an exaggerated S shape so the border diaphysis is concave laterally and the distal diaphysis is concave medially
	L and R tibia	Concave slightly posteriorly
11(1) (Adult)	L and R humerus	Border diaphyseal bowing medially
	L and R radius	Border diaphyseal anterior and medial bowing
	L and R ulna	Distal diaphysis bowed laterally
11(2) (Sub-adult)	L ulna	Border diaphyses bowed anteriorly and medially
	L radius	Border diaphyses bowed anteriorly
11(3) (Adult)	R metacarpal (row 5)	Concave towards the palmar
	L and R humerus	Border diaphyseal, medial bowing
	L and R radius	Border diaphyseal bowing anteriorly and medially
	L and R ulna	Lateral diaphysis bowed medially
13 (Adult)	L and R fibula	Diaphyses bowed antero-medially convex (R is very severe)

Antemortem Cranial Deformation

Individual 15 from the Huambacho population demonstrates cranial deformation possibly indicative of cultural deformation. Specifically, the frontal and anterior portions of the parietals are flattened and the posterior portion of the parietals displays extreme bossing due to the frontal pressure. In addition, the superior portion of the occipital is unusually bossed creating a very large occipital bump. Due to this malformation, the lambdoidal suture is poorly aligned. Figure 6.29 depicts this deformation.



Figure 6.29: Burial 15 Superior Skull (Deformation)

The cranium of sub-adult individual 12 also displays marked deformation in which the anterior parietals, frontal, and occipital have been flattened resulting in bossed parietals. This is probably the result of cultural cranial deformation resulting from intentional deformation or unintentional cradle boarding. Figures 6.30 and 6.31 depict this deformation.



Figure 6.30: Burial 12 Cranial Deformation



Figure 6.31: Burial 12 Cranial Deformation

Antemortem Fractures (Healed)

Two of the adult remains in the Huambacho population display antemortem healed fractures (Table 6.20). Individual 11(3) displays quite a few antemortem healed fractures

Table 6.20: Adult Antemortem Healed Fractures

Burial	Element	Description
10	L ninth rib	Mid-shaft
	L ulna	Mid-shaft
	L ulna	Proximal shaft
11(3)	Cervical vertebrae (6)	Compression fracture, compact wedge-shaped fracture
	R ninth rib	Mid-shaft
	L eleventh rib	Mid-shaft

including several rib fractures. In addition, the sixth cervical vertebra has an antemortem compression fracture as evidenced by the compacted wedge shape of the fracture. As a result of this fracture, the cervical vertebrae, when articulated, bend anteriorly. Figure 6.32 depicts this

compression fracture (C6 is the middle vertebrae). C7 (left of C6) displays anterior bony outgrowth on the centrum, which formed to compensate for the compression fracture.

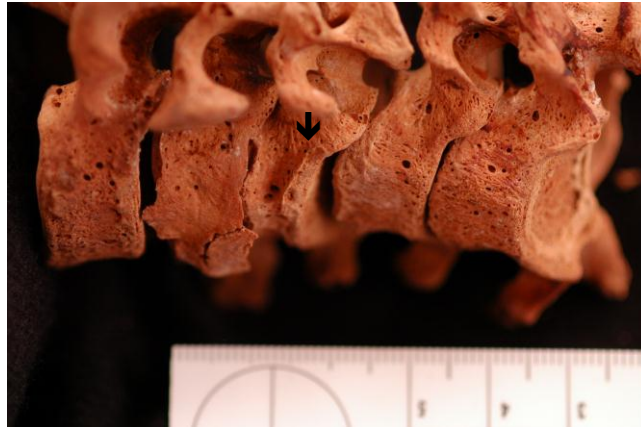


Figure 6.32: Burial 11(3) C6 Anterior Compression Fracture and C7 Anterior Growth (Fracture is Postmortem)

In addition to individual 11(3), individual 10 also displays several healed fractures including the fracture of the left ulna (proximal diaphysis) indicating a violent (possibly combat produced) injury (Figure 6.33).



Figure 6.33: Burial 10 Left Ulna Antemortem Healed Fracture

Antemortem Cut Marks

Individual 11(3) displays several antemortem cuts on the cranium. These include a horizontal cut above the left temporal (2.5 cm), two horizontal cuts above the right temporal (3.5 cm and 1 cm), and one horizontal cut on the right temporal (2.5 cm) (Figure 6.34).



Figure 6.34: Burial 11(3) Antemortem cut on Right Temporal

In addition, Figure 6.35 depicts one horizontal cut approximately 6cm long across the left temporal of burial 11(3). These cut marks could be the result of interpersonal violence.



Figure 6.35: Burial 11(3) Left Temporal Antemortem Healed Cut Mark

6.4 Dental Pathologies

Enamel Hypoplasia

The individuals in the Huambacho sample display a few instances of enamel hypoplasia in the form of horizontal grooves on the outer enamel surface of mostly the labial teeth. Figure

6.36 depicts enamel hypoplasia on the right maxillary canine of Burial 10 and Table 6.21 depicts the frequency of adult and sub-adult enamel hypoplasia.



Figure 6.36: Burial 10 Enamel Hypoplasia on Maxillary Right Canine

Table 6.21: Adult and Sub-adult Enamel Hypoplasia

Burial	Number of teeth	Percentage of teeth
5 (Sub-adult)	0/15	0%
10 (Adult)	1/27	3.70%
11(1) (Adult)	5/30	16.67%
11(2) (Sub-adult)	0/5	0%
11(3) (Adult)	2/14	14.29%
12 (Sub-adult)	0/19	0%
15 (Adult)	10/30	33.33%
16 (Sub-adult)	0/13	0%
17 (Sub-adult)	0/15	0%

Calculus

This sample displays a high frequency of calculus build up (often quite severe) beginning at a young age as several of the sub-adults display evidence of calculus formation (Table 6.22). Figure 6.37 depicts all four stages of calculus formation on the mandibular teeth of burial 11(3). Specifically, the second right premolar (far right) displays zero calculus; the first right premolar

displays slight calculus; the left canine displays moderate calculus; and the lateral left incisor displays severe calculus.

Table 6.22: Adult and Sub-adult Calculus

Burial	Number of teeth (small)	Number of teeth (moderate)	Number of teeth (heavy)	Total	Total Percentage
5 (Sub-adult)	0/15	0/15	0/15	0/15	0%
10 (Adult)	11/27	14/27	2/27	27/27	100%
11(1) (Adult)	14/30	10/30	6/30	30/30	100%
11(2) (Sub-adult)	0/5	0/5	0/5	0/5	0%
11(3) (Adult)	7/19	5/19	7/19	19/19	100%
12 (Sub-adult)	15/19	0/19	0/19	15/19	78.94%
15 (Adult)	8/30	15/30	5/30	28/30	93.33%
16 (Sub-adult)	7/13	0/13	0/13	7/13	53.85%
17 (Sub-adult)	13/15	0/15	0/15	13/15	86.67%



Figure 6.37: Burial 11(3) Posterior Mandibular Calculus Formation

Caries and Abscesses

The individuals in this population display no dental abscesses and few dental caries (Table 6.23). However, some individuals do display severe caries (multiple surfaces covered). For instance, Figure 6.38 depicts a severe carie on the left deciduous first molar of individual 12. The tooth is completely hollow. Figures 6.38 and 6.39 both depict examples of caries.

Table 6.23: Adult and Sub-adult Caries

Burial	Number of teeth	Percentage of teeth
5 (Sub-adult)	0/15	0%
10 (Adult)	7/27	25.93%
11(1) (Adult)	3/30	10%
11(2) (Sub-adult)	0/5	0%
11(3) (Adult)	6/19	31.58%
12 (Sub-adult)	7/19	36.84%
15 (Adult)	4/30	13.33%
16 (Sub-adult)	1/13	7.69%
17 (Sub-adult)	0/15	0%



Figure 6.38: Burial 12 Severe Carie on Left Deciduous First Molar and Carie On Left Deciduous Second Molar



Figure 6.39: Burial 10 Carie on Maxillary Right First Molar

Attrition

The individuals in the Huambacho population demonstrate severe attrition (Table 6.24).

Table 6.24: Adult Attrition (slight, moderate, severe)

Burial	Number of teeth (slight)	Number of teeth (moderate)	Number of teeth (severe)	Total	Total Percentage
10	2/27	22/27	3/27	27/27	100%
11(1)	1/30	25/30	4/30	30/30	100%
11(3)	0/19	12/19	7/19	19/19	100%
15	1/30	24/30	5/30	30/30	100%

Every adult has several teeth with dentin exposure. Some even display attrition so severe that it resulted in non-carious pulp exposure. Figures 6.40 and 6.41 depict this severe attrition on the dentition of burials 15 and 10.

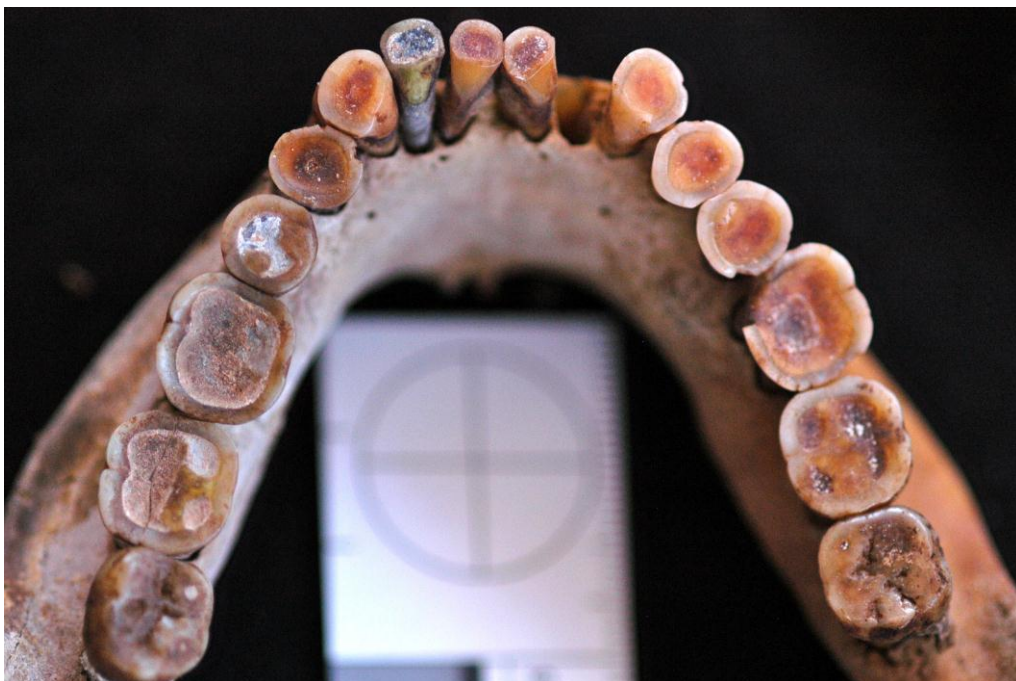


Figure 6.40: Burial 15 Severe Mandibular Occlusal Attrition



Figure 6.41: Burial 10 Maxillary Occlusal Wear

The older sub-adult (aged 4-7) displays early signs of attrition. Attrition in this population does not demonstrate abnormal cultural use of the teeth as the wear affects the teeth evenly. Thus, the severe adult attrition probably resulting from coarser foods, such as grains, or even grit in the food resulting from residual sand.

Periodontal Disease

The adult dentitions of this population display noticeable periodontal disease in the form of alveolar resorption resulting in antemortem root exposure. Most of the Huambacho remains display less than .5 root exposure; however, burial 11(3) displays three instances of alveolar resorption so severe that the root is almost completely exposed (Table 6.25). Figure 6.42 displays a more severe case of periodontal disease on burial 15.

Table 6.25: Adult Periodontal Disease

Burial	<.5 root exposed	>.5 root exposed	Remnants of alveolus	Total	Total Percentage
10	23/27	4/27	0/27	27/27	100%
11(1)	22/27	5/27	0/27	27/27	100%
11(3)	4/18	11/18	3/18	18/18	100%
15	6/23	17/23	0/23	23/23	100%



Figure 6.42: Burial 15 Right Mandibular Periodontal Disease and Severe Calculus

Antemortem Loss

Only one adult individual in this population, burial 11(3), exhibits severe antemortem tooth loss, probably the result of severe periodontal disease. This individual displays antemortem loss of the maxillary and mandibular molars and premolars. As a result, this individual's alveolar bone exhibits severe resorption resulting in a misleading appearance in terms of age. His age is estimated to be between 25 and 35 years. Figure 6.43 depicts this antemortem tooth loss on the left mandible. Other individuals display cases of singular tooth loss (Table 6.26).



Figure 6.43: Burial 11(3) Left Mandibular Antemortem Tooth Loss

Table 6.26: Adult Antemortem Tooth Loss

Burial	Number of instances
10	1/27
11(1)	2/27
11(3)	12/18
15	0/23

CHAPTER SEVEN: DISCUSSION AND CONCLUSIONS

Moche scholars clarify that archaeological evidence provides insights to the Moche world and the activities and lifestyles that characterized these early Andean peoples. According to Quilter (2002), the Moche were perhaps the first ancient Andean society to attain state level social complexity. The complexity produced a very elaborate and detailed system of iconographic representation of this ancient Peruvian culture. These representations depict the importance of warriors (probably for ceremonial purposes), sexual fertility, crop production, and the reciprocal relationship between the world of the living and the afterworld (Bourget 2006). Specifically, scenes of hunting, weaving, warfare, metalworking, and agrarian activities depict the intense physical activities that Moche individuals engaged in on a daily basis (Benson 1972). The frequency of arthritic lipping and osteophytic growths found on the young males in this burial population demonstrate intense physical activities. In addition, the healed fractures in burials 11(3) and 10 suggest that these individuals may have led particularly active and potentially violent lives. Furthermore, the antemortem healed fracture on the ulna of burial 10 and the antemortem healed cut marks found on the left and right temporals of burial 11(3) may support interpersonal violence.

Nutritional stress can provide a plausible explanation for several skeletal markers. For instance, the adult individuals of this Moche group possess prevalent antemortem bowing on the long bones. The Moche were farmers and fishermen who subsisted on fish, shellfish, wild plants, and crops such as maize, beans, sweet potatoes, peppers, avocados, and squash (Bawden 1996). However, Bawden notes that the north coast of Peru was extremely vulnerable to variable weather conditions. The ancient cultures of Peru witnessed floods, erosion, and long periods of drought due to these changing climate patterns. Therefore, the Moche suffered food shortages,

political unrest, and competition for farmland that eventually brought about their downfall (Bawden 1996). These periods of unrest and subsequent food shortages could have resulted in vitamin D deficiency and, thus, the weakness and subsequent bowing of bones. The prevalent bowing could have also resulted from a genetic defect, and, given the high frequency of bowing observed in the Huambacho sample, genetic explanations are very possible. The Moche actually documented genetic defects in their pottery. However, defects revealing the bowing of bones are not known. Nutritional stress also affected this population in the form of porotic hyperostosis and cribra orbitalia. Almost every individual in the Huambacho sample displays porotic hyperostosis and/or cribra orbitalia, indicating that these individuals suffered from either nutritional deficiencies or parasitism. Specifically, Ubelaker (1992) discovered a higher frequency of porotic hyperostosis in coastal Peruvian populations compared to highland populations and suggested that parasitism may have been a contributing factor to this condition. Parasites, such as hookworms, require warm and damp environments like those found on the coast. Armas (1979) conducted research which demonstrates the abundance of aquatic parasites on the north coast of Peru. A diet high in fish increases the risk of acquiring these parasites.

The Huambacho remains display cultural modifications in the form of cranial deformation. The cranial modifications found in this sample indicate that, similar to other populations along the north and central coast of Peru, this group practiced cranial deformation during infancy, a popular Andean technique of demonstrating group membership (Verano 1997). However, Verano (1997) clarifies that some of this cranial deformation was probably the unintentional flattening of the back of the skull as a result of cradle boarding of infants.

The dental pathology conditions of this small population were numerous. Specifically, the remains exhibit few instances of enamel hypoplasia. However, the transverse lines present

indicate that at least some of these individuals experienced nutritional/physical stress at some point in their childhood when enamel was forming (Ortner 2003). As noted above, the north coast of Peru had variable weather conditions that often led to drought and subsequent food shortages (Bawden 1996).

Caries are caused by the bacterial fermentation of refined sugars and carbohydrates, including Moche staples such as wild plants, sweet potatoes, and maize (Quilter 2002). However, the individuals in this group display only some cases of caries, and even fewer severe examples. As noted previously, studies suggest that the presence of calculus can result in protection against caries as the tooth surface is covered with hard concretions making it less susceptible to infection (Hillson 1979). The calculus build-up on these individuals is quite severe and starts at a young age. Therefore, perhaps this calculus provided some protection against caries. In addition, research has reported that diets high in coarser foods, such as grains, produce fewer instances of caries due to the natural cleansing process resulting from chewing these foods (Buikstra and Ubelaker 1994). However, the above-mentioned foods consumed by the Moche contain coarser grains, which can cause heavy occlusal wear and periodontal disease. This heavy mastication can become an irritant to the alveolar bone, which results in the resorption of the bone. Calculus formation, which is quite heavy in this population, is also a common cause of periodontal disease (Ash 1992, Ortner 2003). For instance, individual 11(3) has severe antemortem tooth loss of the mandibular molars and premolars suggesting periodontal disease.

The occupation of Huambacho appears to have been tenuous, serving mostly ceremonial functions (Proulx 1982). Thus, based on the burial and osteological evidence, these individuals seem to represent a population of sacrificial burials, possibly of young, male warriors and children. The Moche did sacrifice young children in addition to ceremonial warriors

(Hocquenghem 2008). As noted previously, there is still contention about the nature of Moche sacrifice. Scholars, such as Donnan (1996), maintain that the individuals sacrificed by the Moche were young Moche warriors who lost ritual battles intended to produce sacrificial victims. However, other scholars, such as Verano (1997), contend that the Moche did in fact sacrifice non-Moche individuals taken by force. This small Huambacho population adds more intriguing questions to be answered by future research. More specifically, these eleven individuals do seem to be Moche as indicated by the grave goods and burial positions. Some, if not all of them, appear to have been sacrificial victims. This demonstrates that the Moche did in fact sacrifice other Moche individuals. The Huambacho skeletons reveal many qualities similar to other Moche sacrificial burials. In particular, previously mentioned studies of sacrificial burials by Verano (1986, 2007, 2008) at Pacatnamú and Huaca de la Luna reveal that the Moche participated in sacrificial practices involving the killing and dismemberment of young male warriors. The Huambacho sample, like those described by Verano, display similar vertebral osteophytosis, antemortem fractures, robust muscle markings, and antemortem cut marks. These osteological markers indicate physically active and possibly violent lives. In addition, these populations show signs of sacrifice including missing limbs, cut marks, and demographic profiles similar to those depicted on Moche scenes of sacrifice (young men). In addition, Moche individuals of differential social statuses appear to have been sacrificed.

Paleopathology and bioarchaeology are increasingly concerned with interrelationships between health, social organization, and identity in ancient complex societies. Integration of burial patterns, skeletal health, and interpretations of embodiment can be very useful to explore biocultural dimensions of social organization and identity on many levels. The nine burial contexts of these individuals were found and described in detail by Chicoine (n.d.) during his

excavation. Analysis of the burial positions and grave goods of these individuals in addition to their osteological data could provide interesting clues about possible social stratification of this small group. Chicoine (n.d.) clarifies that with the exception of the face down element, the abovementioned burial conditions are very typical for Moche burials. However, some of these individuals were buried with varying amounts and qualities of grave goods, suggesting social differentiation among them. Particularly striking are the grave goods found in burials 10, 11, and 15.

Individual 10 was found wearing a cylindrical headdress and holding a textile bag containing coca leaves and a small bone spatula made of a camelid metatarsal (Chicoine n.d.). These two elements are found in Moche iconographic depictions of the Coca Ceremony. These depictions show a double *ulluchus* headdress ornament on figures holding lime gourd containers for the coca ceremony. Coca was ingested during Moche ceremonies as a means of communicating with gods (Bourget 2006). Benson (1972) clarifies that it is possible that warriors and agrarian field workers also chewed coca as a means of reducing fatigue and increasing courage for battle. Therefore, individual 10 was possibly a ritual actor in coca ceremonies related to battle. As noted previously, individual 10 displays very robust muscle markings as well as several antemortem healed fractures. One of these fractures, on the proximal shaft of the ulna, is a common defensive wound from combat in which the arm is held up to shield one's head from an attack. These archaeological and osteological factors all demonstrate that individual 10 was probably a warrior. However, the wealth and specificity of grave goods indicate that this individual was of special importance, possibly in the realm of ritual ceremony.

Burial 11 was composed of three individuals, individuals 1 and 3 (adults) and individual 2 (sub-adult). Chicoine (n.d.) explains that individual 11(3) was buried directly below individual

11(1) in place of individual 11(1)'s missing lower leg bones. In addition, individual 11(2) was buried above the left shoulder of individual 11(1). In other words, the three bodies were aligned in a horizontal row. Two large wooden digging sticks, most likely related to agrarian practices, were placed along the sides of the bodies. Chicoine (n.d.) suggests that this grave could indicate a status differentiation. Specifically, individual 11(3) contains some noticeable differences: hands, ankles, and neck bound with cordages; spherical gourd containers; body adornments; copper pieces. Also two fine Moche style ceramic vessels were found near the head. One of these vessels contains the image of a toad, an animal linked to fertility and agriculture, with a maize plant painted between the legs (Benson 1972). Chicoine (n.d.) concludes that individual 11(3) might have maintained a higher, more prominent status due to the funerary goods. In addition, the possible amputation of individual 11(1)'s lower legs could indicate this individual's status as a funerary retainer. Both of the adult individuals in burial 11 display evidence of extreme physical activity and possibly evidence of interpersonal violence. Most notably, individual 11(1) displays severe vertebral osteophytes, ubiquitous and widespread degenerative joint disease indicative of physical stress, and possible perimortem damage to the skull resulting in fragmentation. Individual 11(3) displays possible perimortem damage to the skull resulting in fragmentation, several antemortem fractures including the compression fracture of a thoracic vertebrae, several severe bony spurs, severe lumbar osteophytosis, and widespread degenerative joint disease. The osteological evidence of these two adult individuals suggests that they were probably involved in physically strenuous activity and possibly interpersonal violence. However, individual 11(1) seems to have been afforded a special burial.

Burial 15, which was located directly beneath grave 11, was found in an odd, twisted position with the neck bound to a wooden post. In addition, the hands and feet were also bound.

Several grave goods accompanied individual 15 including: a copper plate in the mouth; sheets of copper in the right hand, neck, and right foot; a Moche neck jar with the form of a toad similar to that found in grave 11; a jet mirror; a spherical gourd container; a stone polisher; and a shell pendant (Chicoine n.d.). This individual displays signs of a physically active and strenuous lifestyle including possible perimortem damage to the skull that resulted in fragmentation of the face and temporal regions, severe osteophytosis on the lumbar vertebrae, and widespread degenerative joint disease.

The burial contexts described above do indicate that the individuals in this small sample probably embodied different status positions in life. Burial 11 is particularly illuminating as two adult individuals are in one grave but seem to display differential funerary treatment. One contains few grave goods and displays possible perimortem dismemberment and the other contains many grave goods. Both, however, display similar osteological signs of physical activity and stress. In addition, the grave goods present in all three burials described above do seem to portray a consistent motif of agriculture: depictions of maize, coca, and digging sticks. This agricultural theme could indicate that these sacrificial events took place during a time of environmental stress. Perhaps these sacrifices were the Moche appealing to the gods to help with agricultural turmoil (Hill 2005).

Previous studies of Moche sacrificial burials provide little discussion of possible social differentiation. Millaire (2004) notes that later Moche phase populations increasingly buried their dead according to status. However, like the Moche remains reported by Gagné (2004), this Huambacho sample does not display the biological embodiment of social inequality, as the bodies containing elite remains display skeletal markers of pathology and stress just as markedly as the non-elite bodies. Furthermore, the research previously cited by Luce et al. (2011)

emphasize that the osteological/biological status differentiation exhibited in the Sican site of Huaca Las Ventanas was a product of the highly stratified and hierarchical state society of Sican. According to Klaus (2011), despite popular consensus, the state status of the early and middle Moche phases should be re-considered. Rather, the scholar states that the early and middle Moche phases boasted complex chiefdoms rather than state societies. Future research could further explore the state status of the Moche. Updated information about the social complexity of the Moche phases could greatly impact the biological interpretation of burials, as the degree of complexity and stratification would have affected elite access to better nutrition and healthier lives. In other words, if the Moche did not possess the state level complexity that current literature purports, then the biological profile will reflect it. The Huambacho biological profile does not seem to indicate social stratification that was intense enough to impact nutrition and health.

Little is known about the Moche presence in Nepeña and their subsequent religious and funerary practices there. Only future research of Moche graves, and particularly Moche sacrificial graves, will provide further insight into the sacrificial ceremony of the Moche in Nepeña. While this group seems to be somewhat atypical with regard to Moche sacrifice and funerary standards, perhaps the Moche customs were changed as they were incorporated into the southern region of the Nepeña Valley. This population may represent an amalgamation of two different cultures.

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