2014

Determining the Minimum Number of Individuals and Significance of the Kuelap Ossuary in Chachapoyas, Peru

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DETERMINING THE MINIMUM NUMBER OF INDIVIDUALS AND SIGNIFICANCE OF THE KUELAP OSSUARY IN CHACHAPOYAS, PERU

by

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A thesis submitted in partial fulfillment of the requirements
for the Honors in the Major Program in Anthropology
in the College of Sciences
and in The Burnett Honors College
at the University of Central Florida
Orlando, Florida

Summer Term 2014

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ABSTRACT

The pre-Hispanic archaeological site of Kuelap in Chachapoyas, Peru, is representative of the variation in mortuary practices observed throughout the Chachapoya region. The goal of this study was to analyze the human skeletal remains excavated in the center of the Circular Platform between residential structures at Kuelap by creating an inventory of the remains (n=2,573) and determine the minimum number of individuals originally interred in the mortuary context. This study observed a total of 171 femora, 159 humeri, 74 calcanei, 110 ilium bones, 86 temporal bones, and 74 maxillae. Results show that this mortuary context was an ossuary of secondarily, commingled remains of at least 75 individuals and it is a previously undescribed type of tomb at Kuelap. There were significant statistical differences between the expected adult MNI (n=47) and the actual MNI counts of the ilium and cranial bones. Based on its location and the large number of individuals, I argue that this secondary ossuary had special ritual meaning to the people at Kuelap. This research is anthropologically significant because Kuelap is a major archaeological site and the variability of mortuary practices demonstrates the complex ways that people in the past treated the dead.

DEDICATION

For my mentors, Dr. J. Marla Toyne, Dr. John Schultz, Michael Aldarondo-Jeffries, and Dr. Joshua Truitt, for always encouraging me to reach for the stars,

And for my parents for always supporting me through every endeavor and for making me the person I am today.

ACKNOWLEDGEMENTS

I would like to thank you and express my deepest gratitude to all those who help make my thesis possible, including my thesis committee: Dr. J. Marla Toyne, Dr. John Schultz, and Dr. David Gay. To the UCF Ronald E. McNair Scholars Program, Burnett Honors College, Department of Anthropology, Office of Undergraduate Research, and UCF College of Sciences.

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INTRODUCTION

Ancient human cultures can be studied through rituals surrounding death that stem from the relationship between the living and the dead. In particular, death is an inevitable biological process that has a social impact and evokes a particular response in every culture. Individuals or groups of individuals have different ways of approaching and coping with death because of cultural diversity (Stutz and Tarlow, 2013). As a result, the human body may be altered, handled, and laid to rest in various ways due to ritualistic practices, beliefs about the afterlife, and sanitary purposes (Parker Pearson, 2000).

At the pre-Hispanic site of Kuelap in Chachapoyas, Peru, a pit of commingled bones was discovered and excavated by the Proyecto Arquelógico de Kuelap in 2007. This pit, known as “Estructura 9”, is a special mortuary context because it is located in the center of a building platform between residential structures at the south end of Kuelap. A large number of human remains from “Estructura 9” were commingled within this deep structure. It is a distinct type of mortuary structure that requires further detailed analysis.

Currently, there are six types of funerary repositories identified at Kuelap: wall niches, *chullpas* (small stone tower chambers), underground tombs, sarcophagi, mausoleums, and caves (Ruiz Estrada, 2009). These funerary repositories are considered the range of burial practices common to the Chachapoya culture ca. AD 900 to 1500 (Ruiz Estrada, 2009). Estructura 9 is the first of its kind for this type of mortuary practice at Kuelap where commingled remains were found in different stratigraphic layers of the pit. The commingled context and the interment of these human skeletal remains in a deep pit raise questions about how many individuals were initially deposited, who the remains belonged to, and how they came to be deposited in the pit.

Purpose

The goals of this study are to create an inventory of the skeletal remains from Estructura 9 and determine the minimum number of individuals by applying methods for sorting and analyzing commingled remains. Data obtained from these methods will be used to identify patterns in mortuary practices and for paleodemographic reconstruction of the skeletal sample. Since the preliminary inventory includes 1000s of skeletal elements, it is clear that there are many individuals in this sample, and that the degree of commingling and fragmentation suggests this is not likely a traditional burial practice, but something unique. These preliminary data suggest that Estructura 9 may have been a secondary ossuary with special ritual meaning to the people at Kuelap.

This research is crucial for understanding lesser known Andean civilizations, and the commingled context reveals additional information about Chachapoya funerary behaviors and practices. There are few publications about the Chachapoya, but there is also a growing field of research and interest in this area of Peru. In addition, Chachapoya sites, like many archaeological cultures around the world, risk destruction from modern human activities, such as looting, demolition of old structures for the construction of new buildings, etc. (Muscutt, 1998).

The overall purpose of this and any mortuary study is to understand why people treat the dead differently. The variation in funerary practices may be due to social status, changes in mortuary practices over time, or other reasons. Many types of burials, including single and collective burials, demonstrate significant differences in the perception of social identity and treatment of the dead. By reviewing the current literature and analyzing the results from this specific mortuary context, we aim to understand why the dead were treated differently at Kuelap.

Methods

This study analyzes data from the original inventory of the sample collected by Dr. J. Marla Toyne in 2008. The inventory specifies site information and observed characteristics of the skeletal elements included for analysis: femur, humerus, os coxae, calcaneus, and maxilla. These elements were selected in order to represent large and small elements, cranial and postcranial to explore skeletal completeness of individuals deposited. The total numbers of elements from the left side and the right side of each bone are recorded using inventory codes along with the total number of pairs. The data was then used for paleodemographic reconstruction of the sample and for an estimation of the possible number of individuals that were originally deposited by calculating Minimum Number of Individuals (MINI) and Most Likely Number of Individuals (MLNI). The data allow us to determine if the bodies were complete when interred and thus, whether Estructura 9 was a primary or secondary burial context. No individuals were complete or articulated to determine sex and age, but the isolated os coxae were analyzed for preliminary sex and age estimates.

Hypothesis

This research project explores mortuary practices and tests the following hypothesis about Estructura 9. The null hypothesis is that this mortuary context demonstrates patterns consistent with burials previously described at Kuelap. The alternative hypothesis is that this mortuary context is not previously known at Kuelap and may be an ossuary of secondarily commingled human skeletal remains. A skeletal analysis and comparison with other mortuary practices at Kuelap, within the Chachapoyas region, and from across the Andes will help explore this hypothesis.

Research Questions

In order to test this hypothesis, the following questions will be addressed:

- Which skeletal elements are most frequently represented among the group of bones analyzed in this sample?
- Can bone pairs be identified in the sample?
- How many individuals are represented by the skeletal sample?
- Do larger bones provide better estimation of MNI or smaller bones?
- Can the differences in the concentration of bones in the stratigraphic layers reveal information about chronology?
- Finally, what do these data tell us about the nature of this context compared to others at Kuelap?

Summary

The purpose of this research study aims to understand the broader question of why the dead are treated differently through an analysis of a commingled burial context. In the subsequent chapters, I will explore the anthropological importance of mortuary studies, the site of Kuelap, and the mortuary context of Estructura 9 as well as introduce the methods used in this study. Later chapters will present the results and discuss inferences from the data analyzed. These chapters will explain my interpretations and reasoning for my conclusions.

BACKGROUND ON MORTUARY STUDIES

This chapter evaluates the anthropological significance of bioarchaeology and mortuary studies to establish the theoretical background of Andean funerary practices and beliefs. A review of the Chachapoya civilization and mortuary practices are provided for better understanding and comparison of the mortuary practices from the pre-Hispanic site of Kuelap. This chapter also explores the archaeological context of Estructura 9.

Bioarchaeology and Mortuary Studies

Bioarchaeology is the study of past societies through examination of human remains as well as the provenience and context in which they are found. In order to understand the past, we must consider the mortuary context in which individuals are buried and the funerary rituals associated with their passing as the dead are often manipulated and disposed by the living (Isbell, 1997; Nystrom, et al., 2010; Osterholtz et al., 2014a; Parker Pearson, 2000; Sillar, 1992). The relationship between the living and the dead varies as some cultures do not perceive death as the inevitable end of life (Parker Pearson 2000; Stutz and Tarlow, 2013). Some may view death as a rite of passage where the individual transfers from one social state to another, while other cultures perceive death as a metaphoric symbol of regeneration that ties into human fertility and agriculture (Nystrom, et al., 2010; Parker Pearson, 2000; Sillar, 1992).

Furthermore, disposal of the dead is a special cultural process or series of processes that demonstrates a relationship between the living and the dead (Isbell, 1997; Parker Pearson 2000; Sillar, 1992; Sprague, 2005; Stutz and Tarlow, 2013). The dead are often interred in different places as a physical separation is required for a variety of reasons including health and sanitation, the grieving process, and cultural preferences. These decisions on how and where to dispose of

the deceased are influenced by perception on death and possibly the need to maintain physical or spatial connection to the dead via their remains.

Types of funerary repositories range from individual burials to multiple burials with more than two individuals interred, and collective commingled burials (Parker Pearson 2000). The variation in mortuary practices is further divided into primary burials and secondary burials. In primary burials, individuals are complete, articulated skeletons with all elements present (Fox and Marklein, 2014). In secondary burials, the skeletal remains are incomplete or partial bodies collected and relocated to a tomb after the primary burial. An ossuary is one type of secondary deposition where disarticulated human remains have been deposited in a pit with defined boundaries (Ubelaker, 1974). Ossuaries are significant to mortuary studies because individual identities are lost during the commingling process, which complicates bioarchaeological analysis of the remains (O'Shea and Bridges, 1989; Sutton, 1988; Ubelaker, 1974). Regardless of the role that the dead may play in the social structure of any culture, the dead are everywhere and are an integral part of our memories (Parker Pearson, 2000).

Andean Beliefs and Mortuary Practices

In past Andean societies, previous research has suggested that the physical remains of ancestors were crucial to agriculture and social stability (Klaus and Tam, 2014; Nystrom et al., 2010). Many practices involved keeping the remains near homes and communities for regular contact between the living and the dead. According to Sillar (1002), the dead were active and manipulated by the living; they were often given offerings in the form of food as they may have had symbolic power associated with fertility (Sillar, 1992).

Specifically, secondary skeletal bundles and mummy bundles were common Andean mortuary traditions. In secondary skeletal bundles, the bodies of the deceased were specially prepared and placed in a flexed position, and then wrapped in woven cotton textiles with embroidered faces (Nystrom et al., 2005; 2010; von Hagen and Guillen, 1998). Mummy bundles were created by natural mummification, intentional mummification through enhanced natural processes, or artificial mummification through fire (Buikstra and Nystrom, 2003). Sillar (1992) has suggested that the bundles may have represented the dry hard seed. The seed may have symbolized the balance between the living and the dead, and the agricultural cycle whereby planting and sowing the dead would germinate new (social) life. The connections among life, reproduction, fertility, and regenerative cycles appear to have been deeply embedded in the relationship between the living and the physical remains of the dead among diverse Andean populations, including the Chachapoya (Nystrom et al., 2010; Sillar, 1992).

The Chachapoya Civilization

The Chachapoya flourished in the Amazonas region in the northern highlands of Peru from approximately AD 800 to 1535 prior to European conquest of the New World (Church, 2006; Church and von Hagen, 2008; Muscutt, 1998). Specifically, the Chachapoya people inhabited an area called the Central Cordillera of the Andes between the Marañón and Huallaga Rivers (Church, 2006; Church and von Hagen, 2008; Muscutt, 1998; Nystrom, 2009).

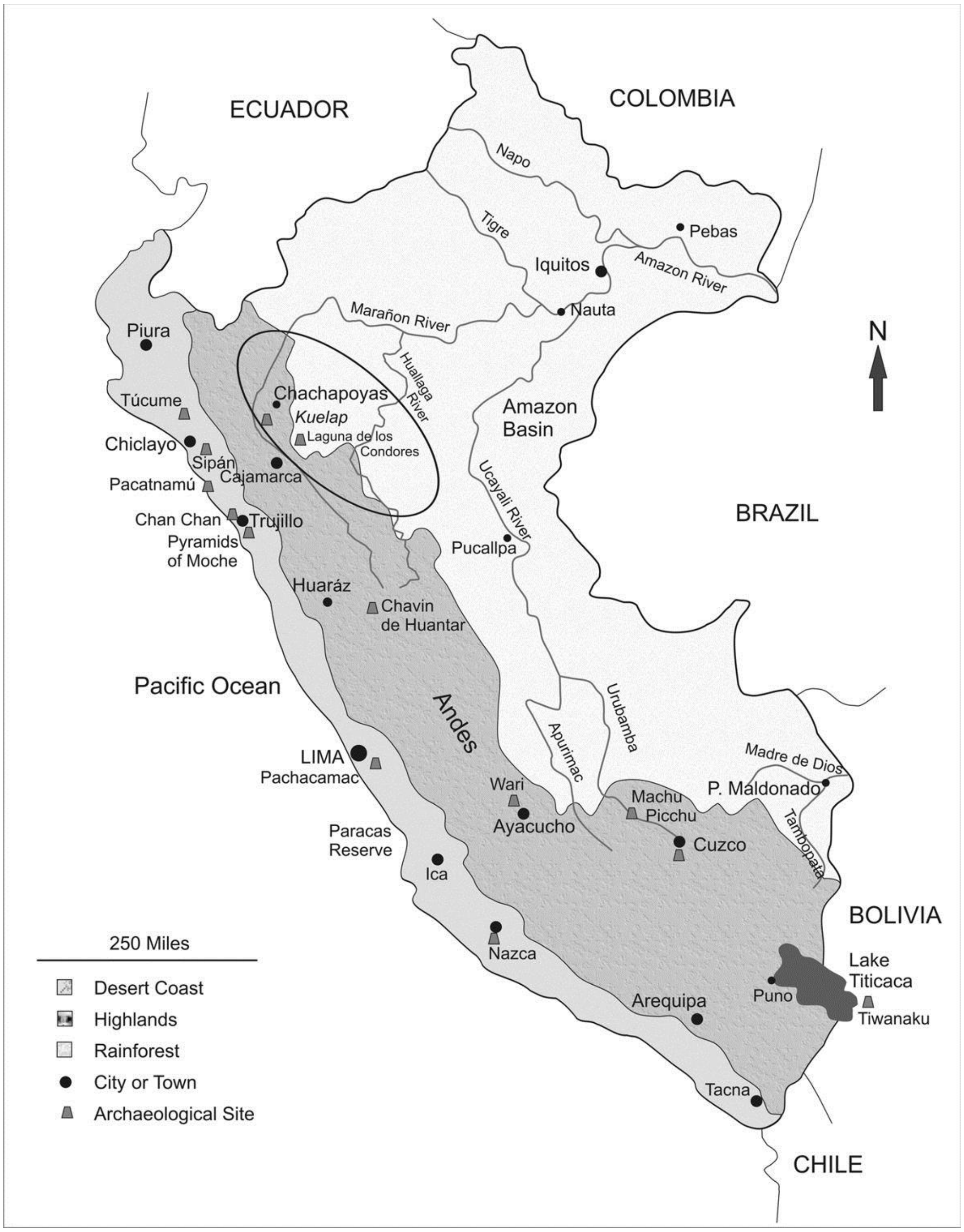

Figure 1: Map of Peru showing the location of Kuelap within the Chachapoya region. Courtesy of Dr. Toyne.

To clarify, the term “Chachapoyas” describes the pre-Hispanic geographic region around the modern city of Chachapoyas, Peru whereas “Chachapoya” refers to the people of the ancient

cultural group that lived in the Central Cordillera (Church, 2006; Church and von Hagen, 2008). However, it is uncertain how the Chachapoya identified themselves or even if they collectively acknowledged themselves as a single people as later Inca conquest significantly restructured social and political organization of the area. Current documents suggest that the Chachapoya region may have been inhabited by different sociopolitical groups that united to defend against a common enemy, like the Inca (Nystrom, 2006; 2009).

At their peak, the Chachapoya, sometimes referred to as “Warriors of the Cloud”, may have numbered well over 300,000 inhabitants, perhaps living in kinship-based communities called *ayllus* (Church, 2006; Muscutt, 1998; Henderson, 2013; Isbell, 1997).The *ayllu* was the basic Andean, lineage-based, social entity where the entire clan was believed to have been descended from two individuals. Following later Inca terminology, the *ayllu* would have been divided into two moieties which represented the male ancestor, *hanan*, and the female ancestor, *hurin* (Henderson, 2013). Individuals belonging to one moiety would often marry individuals from the other moiety. *Ayllus* may have also served important civic purposes in Andean societies where communally held property was reallocated annually to account for population changes (Henderson, 2013). Even in modern times, the *ayllu* remains a crucial part of Andean communities (Henderson, 2013).

The geographical location of the Chachapoya may have played a major role in its economic activities, especially because it was situated deep in the Central Andes (Church, 2006; Church and von Hagen, 2008). The Upper Marañón River valley west of the Chachapoyas region may have served as an important cultural crossroads and route for trade and migrations between

Amazonian and Andean cultures during this time period (Church, 2006; Church and von Hagen, 2008).

Around AD 1475, the Inca began their conquest of the Chachapoya civilization, but faced much opposition and consistent rebellion from the Chachapoya (Church and von Hagen, 2008; Muscutt, 1998). According to early historic documents, to combat the resistance, the Inca likely massacred many people and relocated almost half of the remaining population to different areas within the Inca Empire (Church and von Hagen, 2008; Muscutt, 1998).

Chachapoya Mortuary Practices

In the Chachapoyas region, mortuary practices varied either because of changes over time or because of regional organization and preference for certain types of mortuary practices (Ruiz Estrada, 2009). One of the most prevalent mortuary practices among the Chachapoya was the use of secondary skeletal bundles. However, after Inca conquest, the Chachapoya incorporated the use of mummy bundles that were artificially mummified (Buikstra and Nystrom, 2003; Nystrom et al., 2010; Wild et al., 2007). Inca mortuary practices required that the bodies be embalmed with the internal organs removed through rectum or vagina. According to a study by Nystrom et al. (2010), subadults may have been treated differently because of the absence of textile markings that would have imprinted onto their mummified skin remains.

The two most common forms of funerary repositories were the sarcophagi, which were prevalent in the north, and *chullpas*, which were dominant in the south (Nystrom et al., 2010). Sarcophagi entombed individual bodies where the deceased were seated upright and flexed in anthropomorphic-shaped capsules and arranged in rows on narrow cliff ledges (Church, 2006). The sarcophagi were made of mud plaster and straw, and varied in size and design. Some were

as large as 2.5 meters and elaborately decorated with painted faces while others were smaller and plain (Nystrom et al., 2010). *Chullpas*, on the other hand, were smaller, collective above-ground stone tower structures, similar in construction of materials and overall design with some variation in floor plans (Isbell, 1997; Nystrom et al., 2010; Rowe, 1995).

Another type of mortuary practice was the use of open collective masonry cliff tombs called mausoleums. The *ayllus* venerated their ancestors by interring them together in these mausoleums because they believed that their ancestors watched over their community lands (Church, 2006; Church and von Hagen, 2008). The mortuary site at Laguna de los Cóndores provides excellent examples of the typical Chachapoya cliff tombs (Church and von Hagen, 2008). The Chachapoya also painted pictographs above the cliff tombs possibly to publicize their claim of the territory and to display their ideological beliefs of ancestral veneration, which was a crucial part of Andean funerary belief and the active relationship between the living and the dead (Church, 2006).

Kuelap, Citadel of the Chachapoya

During their occupation of the Central Cordillera, the Chachapoya constructed many monumental centers with circular stone buildings and extensive agricultural terraces on high ridges that may have served for defense (Church, 2006; Muscutt, 1998; Narváez, 1987). Of the many structures built by the Chachapoya, Kuelap, located at 3000 meters above sea level, was massive in size. Kuelap was likely constructed between AD 800 and 1100 on a high mountainous ridge based on a massive build stone platform, flanked to the west by hills of terraces used for agriculture (Narváez, 1987; Nystrom, 2009). The main platform covered approximately 600

meters and contained over 400 circular residential stone buildings situated inside its massive perimeter wall that is up to 20 meters high in some places (Church, 2006; Narváez, 1987).

Additionally, there is another wall that divides the site into lower and upper levels within the other wall (Nystrom, 2006). This division has been suggested to be sociopolitical division between the two moieties residing at Kuelap (Narváez, 1987). At the south end of Kuelap near Estructura 9, there is the “Tintero”, an inverted conical tower structure that may have served as a sacred temple for the elite (Narváez, 1996; Toyne, 2011; Toyne and Narváez, 2014). Several other structures at Kuelap have been identified for ceremonial and funerary functions. The outer perimeter wall may have served as a type of funerary repository because of the skeletal remains found embedded within the masonry (Ruiz Estrada, 2009).

Mortuary Practices at Kuelap

At Kuelap, six types of funerary repositories have been identified by archaeologists: wall niches, *chullpas*, underground tombs, sarcophagi, mausoleums, and cave deposits (Ruiz Estrada, 2009). The first type of funerary repository comprised of wall niche burials where the Chachapoya embedded secondary skeletal bundles of human remains into individual and collective niches of the high structural walls of Kuelap. The inhabitants of Kuelap also placed their deceased collectively in *chullpas*, stone tower structures located near the circular stone buildings and along edges of the high walls (Church and von Hagen, 2008; Muscutt, 1998; Nystrom et al., 2005). These individuals were interred as secondary skeletal bundles.

A third type of funerary repository was the underground tomb. These small, individual, and relatively shallow tombs were built in the interior floors of the circular residential buildings. A fourth type was the individual cane and plaster sarcophagus, where the body of the individual

was seated with limbs tightly flexed. All of the sarcophagi at Kuelap have been completely destroyed (Ruiz Estrada, 2009). Mausoleums were also utilized at Kuelap, which were open collective masonry cliff tombs where it was believed that the dead would watch over community lands. The people of Kuelap also exploited surrounding natural caves as places to deposit the dead. Initial observations from Ruiz Estrada (2009) noted numerous disarticulated human bones semi-buried in the entrances of caves around Kuelap. The caves are situated on the same level as the walkways leading up the mountain ridge (Ruiz Estrada, 2009).

These six types of mortuary practices are considered the "typical" burial practices at Kuelap because they have been identified by archaeologists and are frequently distributed within or around Kuelap (Ruiz Estrada, 2009). The defined characteristics of the mortuary practices found at Kuelap, including Estructura 9, can be seen in Figure 1. The variation in mortuary practices at Kuelap is representative of the variation in mortuary practices observed throughout the Chachapoya region, which makes Kuelap unique among other Chachapoya sites.

Table 1: Characteristics of Kuelap Mortuary Practices

Funerary Repository	Number of Individuals	Primary or Secondary	Location	Relative Size
Wall Niches	Individual or Multiple	Secondary	Above ground	Large
Chullpas	Multiple	Secondary	Above ground	Large
Underground Tombs	Individual	Primary	Underground (shallow)	Small
Sarcophagi	Individual	Primary	Above ground	Small
Mausoleums	Multiple	Secondary	Above ground	Large
Caves	Multiple	Secondary	Underground	Large
Estructura 9	Multiple	Secondary	Underground (deep)	Large

Estructura 9

This study focuses on the commingled human skeletal remains from the large underground structure, known as Estructura 9, from the site of Kuelap (Figure 2). Information about this specific mortuary context from Estructura 9 was directly provided by Dr. Toyne. The pit was discovered at the south end of the site near six large circular structures on the Circular Platform that Narváez (1987) suggested may have belonged to an elite residential group. In the center of this platform, archaeologists excavated a circular stone lined crypt, which was labeled "Estructura 9".

Figure 2: A photograph taken of Estructura 9 after excavation. Courtesy of Dr. Toyne.

The cylindrical crypt measured approximately 3 meters in diameter and 2.5 meters deep, and contained numerous human skeletal elements. Based on photos, illustrations, and plan drawings of the Estructura 9 excavation, the human remains appeared disarticulated and commingled. Very few other artifacts were recovered. Furthermore, the excavation of the crypt

included eight arbitrary stratigraphic layers (levels 7-16) of bones with varying concentrations of the remains (Figure 3). Currently, no radiocarbon dates are available to provide a more specific chronology of this context.

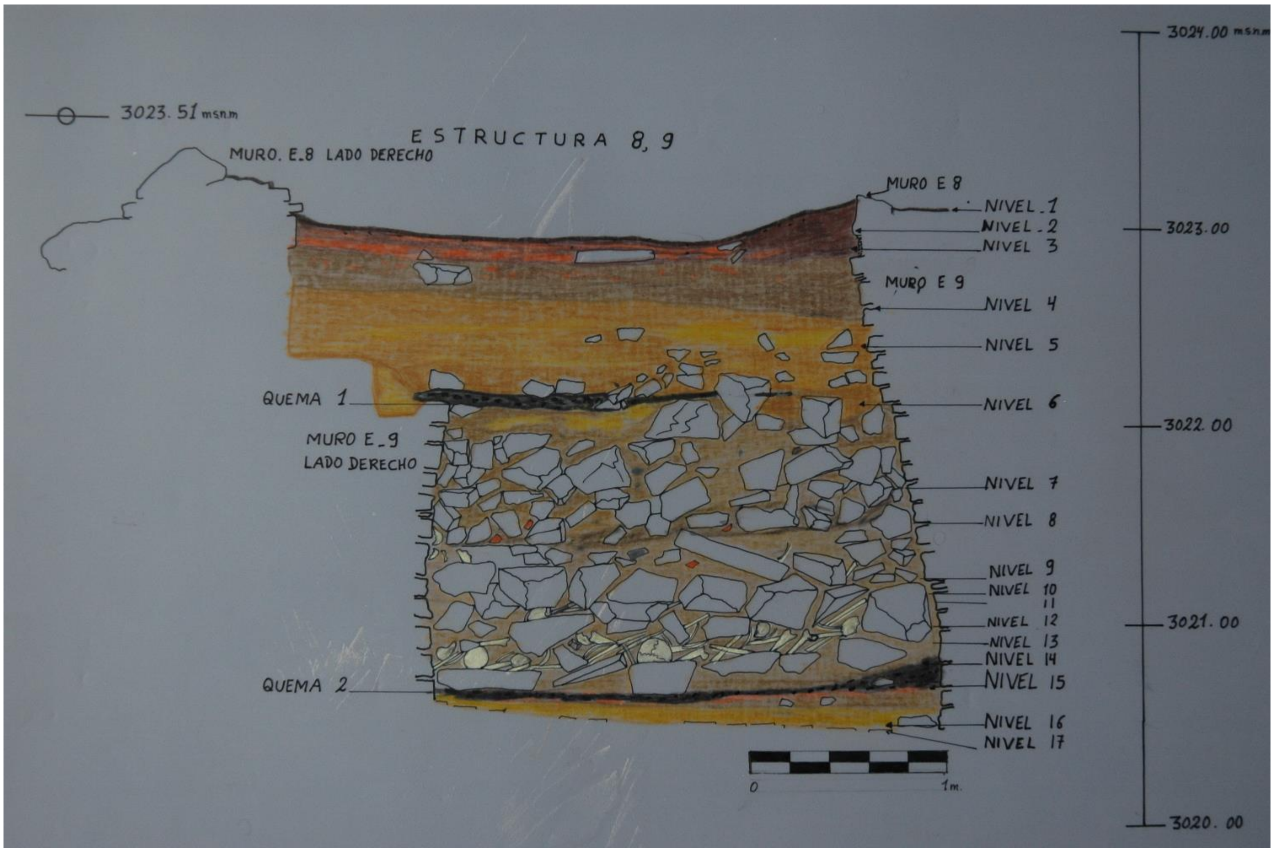

Figure 3: Profile Drawing of Estructura 9 (levels 7-16). Courtesy of Dr. Toyne.

Following the 2007 excavation, the remains were inventoried, analyzed, and photographed by Dr. Toyne in 2008 (Figure 4). These remains are currently curated in a storehouse in Kuelap, Peru, and could not be personally assessed due to timing and funding. Therefore, this study will utilize original inventories and photographs collected by Dr. Toyne for

analysis of the remains. Dr. Toyne also provided samples from other mortuary contexts for comparative analysis.

Figure 4: Inventory example layout of human skeletal remains. Courtesy of Dr. Toyne.

Summary

This chapter explored the importance of bioarchaeological studies of mortuary practices to introduce Andean funerary practices and beliefs. Chachapoya civilization and mortuary practices were described in this chapter for comparison of the mortuary practices from Kuelap. Site information about Estructura 9 was also provided in this chapter. Since the human skeletal remains appeared commingled and disarticulated, methods for commingled, collective burials were applied to maximize data, which will be described in the next chapter.

METHODS

In this chapter, I introduce the methods used in this study for sorting and counting the skeletal remains from Estructura 9 as well as the methods for determining the possible number of individuals interred in the pit for data analysis and paleodemographic reconstruction. Based on the photographs, the bones were commingled and many elements were fragmentary, which complicated analyses of MNI and MLNI when determining the possible number of individuals in the pit. Thus, to begin, we must review how taphonomic processes contribute to commingling of skeletal remains in a mortuary context.

Commingled Skeletal Remains

Taphonomy, which refers to the natural or intentional processes that alter the body after the individual has passed away, can influence commingling (Adams and Konisberg, 2008; Baustian et al., 2014). Commingling involves the process of mixing partial and disarticulated skeletal elements from two or more individuals in a single assemblage (Byrd and Bradley, 2003; Nikita and Lahr, 2011; Varas and Leiva, 2012). Natural taphonomic processes include disarticulation and fragmentation of the remains by processes of decomposition and animal scavenging that lead to scattering/dispersal of the remains (Adams and Konisberg, 2008; Baustian et al., 2014). Intentional taphonomic processes by human action may involve transporting certain skeletal elements from a primary burial to a secondary burial or mixing the remains in some original location (Baustian et al., 2014; Shaefer and Black, 2007; Sutton, 1988; Ubelaker and Rife, 2008).

In primary burials, individuals are complete, articulated skeletons with all elements present (Osterholtz et al., 2014a; Fox and Marklein, 2014). In secondary burials, the incomplete

or partial bodies are collected and relocated to another location after the primary burial. While these processes may be ritualistic and symbolic, they are inherently destructive to the preservation of the remains and challenging to the reconstruction of sample demographics, which is one of the main goals in this research study. Since the remains were commingled and represent multiple individuals in Estructura 9, it was necessary to approach the reconstruction of this funerary context and analyses using a different method than with individual burials.

Methods for Sorting and Counting Remains

To maximize data analysis, a systematic process, including inventorying, sorting, organizing, and cataloguing remains, must be applied for this commingled mortuary context. The first step involved reorganizing the data in the original inventory of the sample provided by Dr. Toyne and sorting the remains. Dr. Toyne was responsible for recording the original collection of data into spreadsheets that included identification and siding of the skeletal elements as well as other observations. She was assisted in the field by Alexandra Ortiz, a graduate student from Peru, in 2008.

All skeletal elements were inventoried, but only certain bone types were counted and used to determine the original number of individuals in Estructura 9. The bones that were selected represent examples of long bones, cranial bones, and small bones because if complete individuals had been deposited, then all the skeletal elements for each individual should be present in the burial. These elements included right and left femur, humerus, ilium, temporal, maxilla, and calcaneus. The ilium was also selected to identify possible sexual distribution of individuals within this sample. It is the largest of the three os coxa bones and was the most represented.

In the inventory, site information and provenience of each identified human skeletal element was recorded to document context. Using Table 1, each row described one bone element identified by the sector, subsector, unit, structure (Estructura 9), quadrant, and stratigraphic level where each bone was located.

Table 2: Example Inventory of Estructura 9 Contents

Sector	Sub-Sector	Structure	Unit	Quadrant	Level	Bone	Side	Segment	Completeness

Afterwards, information regarding the bone's observed characteristics were logged into the same row on Table 1 based on protocols described in *Standards for data collection from human skeletal remains* (Buikstra and Ubelaker, 1994). These characteristics include: the type of bone, side (R=right, L=left), the completeness of the bone using quartile percentages (25%, 50%, 75%, and 100%), and segment using a specific inventory coding system (Figure 5). The inventory codes for the long bones include 1 (complete), 2 (proximal end missing), 3 (distal end missing), 4 (shaft only), 5 (proximal fragment), and 6 (distal fragment). The codes for other bones in the body, including the cranium and other irregular bones are 1 (100% complete) and 2 (partial, at least 50% complete). The data from this complete inventory of all the bones were further organized into individual tables of each element to count the total number of each bone. Table 3 is an example of the table that was used to count the MNI for long bones.

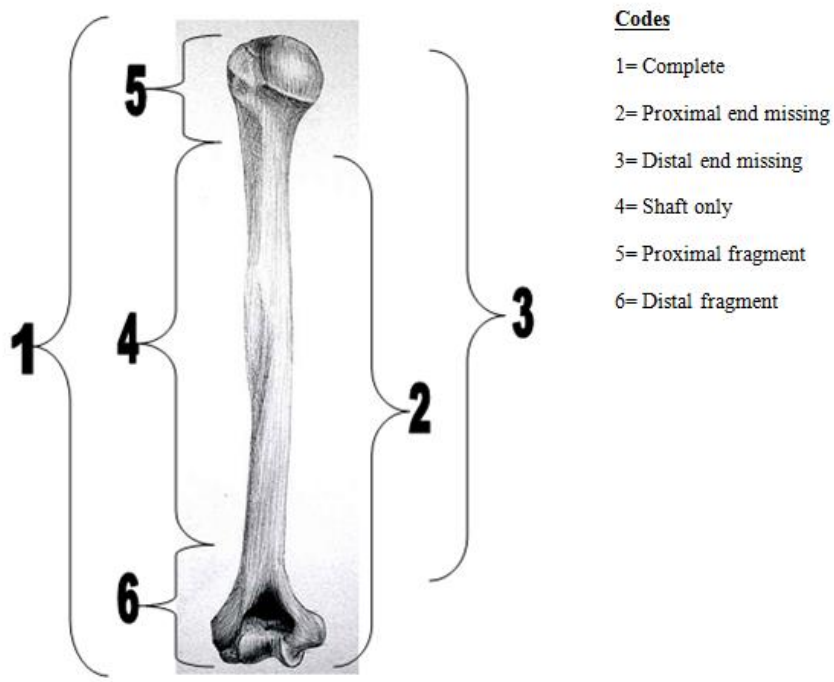

Figure 5: Illustration of Long Bone Coding System. Image of Humerus retrieved from http://scientificillustration.tumblr.com/post/18368785549/grandanatomy-humerus-2-views-after-albinus

Table 3: Example Table for Long Bones using inventory codes for completeness

Codes	**Total**	**L**	**R**	**Total**	**Adult L**	**Adult R**	**Total**	**Subadult L**	**Subadult R**
1									
2									
3									
4									
MNI									
Pairs									

In Table 3, for each long bone type (humerus, femur, etc.), left and right bones were recorded separately using the inventory codes. For example, the number of left femora scored with a code of 1 was recorded. This procedure was repeated for all left femora with codes 2, 3, and 4. Afterwards, the Minimum Number of Individuals (MNI) for all the left femora was determined. The same steps were repeated for all right femora. Then, the number of pairs was counted and finally, the MNI represented by all femora in the sample was determined. This procedure was repeated for other bones in the sample.

Only long bones with codes 1, 2, 3, and 4 were used to calculate later MNI because codes 5 and 6 represent the proximal and distal ends of a long bone. Long bone fragments with codes 5 and 6 could potentially overestimate the MNI because the proximal and distal ends could match with long bone shaft fragments that were scored a code of 4. The final count for the total number of skeletal elements for each bone was also differentiated into separate counts for the basic categories of adult and subadult remains. In some cases, observations of different characteristics associated with a range of adult ages were noted. However, for this study, all adults were grouped together.

In addition, the total number of skeletal elements found at each level was also calculated and organized into individual tables for each bone type, which allowed for better observation of potential patterns in the distribution of the bones throughout the different layers of the pit (Table 4).

Table 4: Example Table for Bone Counts by Level

Levels	Adult	Subadult	Total
7			
8			
9			
10			
11			
12			
13			
14-16			
Total			

Methods for Data Analysis and Calculating MNI and MLNI

Once the inventory and counts of individual skeletal elements were complete, methods for data analysis were applied to calculate the possible number of individuals originally interred and for data comparison. Since humans have approximately 206 bones in our bodies, a commingled context affects analysis of the original mortuary sample. Every single bone cannot be counted and assessed as each separate individual. The number of individuals would be significantly overestimated. Therefore, additional steps must be taken to determine how many individuals may be represented in the sample based on overlap and totals of individual element classes. These methods include the Minimum Number of Individuals (MNI) and Most Likely Number of Individuals (MLNI).

MNI represents an estimate of the minimum number of individuals possible within a specific mortuary sample based on the count of a distinctive portion, fragment, or landmark on a single skeletal element (Adams and Konisberg, 2004; 2008; Boz and Hager, 2014; Varas and

Leiva, 2012). The landmark ensures that fragments of the skeletal element are not counted as more than one individual. MNI is calculated based on the following equation:

$$\mathrm{MNI}=\mathit{Maximum}\ L \text{ or } \mathrm{MNI}=\mathit{Maximum}\ R$$

MNI involves separating the bones based on side and element; the most repeated element of either side is the estimated count.

The Most Likely Number of Individuals (MLNI) is derived from the Lincoln/Peterson Index (LI), which has been used in faunal assemblages of animal bones for zooarchaeological analyses based on capture-recapture techniques of animals for population studies (Adams and Konisberg, 2004; 2008). The LI equation is:

$$\mathrm{N}= n_1 n_2/m$$

The animals trapped for the capture stage are tagged and released back into the wild, n_1. A second group, n_2, is then captured after some time has passed. The number of animals trapped in the first capture is multiplied by the number of animals caught in the second capture. The product is then divided by the number of tagged animals recaptured from the initial catch, m, to calculate the estimated population size, N. For bioarchaeological analyses of human skeletal remains to estimate the original death assemblage, the LI equation can be applied and is calculated by (Adams and Konisberg, 2004; 2008):

$$\mathrm{LI}=LR/P$$

The sides of the body represent the first capture group, L for the left side, and second capture group, R for the right side. The variable P represents the number of pairs in the sample. To calculate MLNI, a simple modification is made to the LI equation to represent the maximum likelihood estimate. MLNI is calculated as:

$$\text{MLNI}=\frac{(L+1)(R+1)}{(P+1)}-1$$

An important factor in the determining MLNI depends on the accuracy of pair matching which can be accomplished through visual pair matching by process of elimination (Abbe, 2005) or osteometric sorting (Byrd and Adams, 2003; Thomas et al., 2013). Visual pair matching involves observations of similarities in morphology to match the left and right side, and taphonomic appearance such as color, staining, etc. Osteometric pair sorting refers to the method in which the measurements and morphology of the bones are compared. Rather than being based on qualitative features, osteometric sorting is based on quantitative measurements, such as maximum length and mid-shaft diameter (Byrd and Adams, 2003; Thomas et al., 2013). It also utilizes a regression model, which limits the interobserver and intraobserver variability, and maximizes objectivity of the results (Byrd and Adams, 2003). However, osteometric sorting does require complete measurements from whole bones, which were not available for many bones in this collection. Thus, the accuracy of MLNI is significantly influenced by the preservation and condition of the remains.

Although MNI is a commonly used method to analyze commingled remains, it can significantly underestimate the population size of the mortuary sample as shown in a study by Adams and Konisberg (2008) where both MNI and MLNI were applied to the well-preserved Larson Village sample. MLNI is considered the more accurate method because it estimates the original number of deceased individuals in the mortuary sample whereas MNI estimates the recovered assemblage (Adams and Konisberg, 2004; 2008). MNI may be more appropriate when MLNI cannot be applied in samples where the remains are highly fragmented and poorly preserved because pairing the bones would be difficult.

Both MNI and MLNI were applied to the Estructura 9 sample and the results were compared to show which method was scientifically better based on the condition of the remains. Furthermore, Chi-square tests, specifically Fisher's Exact Test with two-tailed *p*-values, were calculated to analyze the frequencies observed. The Chi-square tests were used to determine if there were significant differences between the expected total MNI and actual MNI counts of each bone type.

Paleodemographic Reconstruction

Paleodemography refers to the reconstruction of demographic parameter and categories, such as age and sex, to past populations based on a skeletal morphology (Roksandic and Armstrong, 2011; Sutton, 1988). Paleodemographic reconstruction is capable of revealing patterns in a mortuary sample because by estimating the sex and age of the skeletal remains, it may be possible to determine who may have been deposited in the assemblage (Sutton, 1988).

Standard methods for estimating age are based on scoring systems of different skeletal features such as the pubic symphysis, auricular surface and cranial sutures (in adult remains), epiphyseal closure and tooth eruption (in juvenile remains) (Buikstra and Ubelaker, 1994). In the *Standards* volume (Buikstra and Ubelaker, 1994), the chronological age categories for adults based on biological age include young adult (20-34 years), middle-aged adult (35-49 years), and older adult (50+ years). The age categories used in this study are: subadult, young adult, middle adult, and "older" adult, but typically, only the distinction between subadult and adult is possible (Osterholtz et al., 2014b).

Standard methods for estimating sex focus mainly on features in the adult pelvis and skull using the following scoring categories: undetermined sex, female, probable female, probable

male, and male (Buikstra and Ubelaker, 1994). Subadults cannot be sexed by their skeletal elements because they lack secondary sexual characteristics prior to adolescence.

The reliability of these methods depends significantly on the quality and completeness of the human skeletal remains or individual elements. In commingled cases, these methods are less reliable because the skeletal elements and features analyzed to determine age and sex are missing, fragmented, or of poor quality. Therefore, aging commingled individuals, especially adults, usually focuses on the overall presence and degree of osteoarthritic changes and osteophyte formation (Bello et al., 2006; Buikstra and Ubelaker, 1994; Nikita and Lahr, 2011). Sexing individuals may or may not be possible depending on which skeletal elements are well preserved. The same scoring categories are applied to identify sex of the remains (Buikstra and Ubelaker, 1994).

Although the remains in Estructura 9 are fragmentary, sexing and aging methods were applied in the preliminary analysis of the remains by Dr. Toyne. Using the data from the inventory, a possible male to female ratio based on the ilium and a possible adult to subadult ratio were estimated in this study.

Summary

This chapter outlined the methods used in this study for sorting and counting the skeletal remains, determining the possible number of individuals, and data analysis. Estructura 9 required a different approach from single, individual burials because of its commingled nature. An inventory of the human skeletal remains from Estructura 9 was set up using information from the original data collection. The data were then analyzed to determine MNI and MLNI. Age and sex

ratios were also estimated for further paleodemographic reconstruction. The following chapter will present results from the data analyses.

RESULTS

This chapter presents the summary and final counts from the inventory for each skeletal element examined. The total number of bones in Estructura 9 was approximately 2,573. This study analyzed a subset of 637 elements out of the total bones including 311 left elements and 326 right elements. The total number of adult elements observed was 467 and the number of subadult elements was 170. The counts of each bone were separated by adults and subadults age categories and further divided into stratigraphically defined levels to identify possible differences in the concentration of bones in the layers.

Skeletal Element Counts by Side and Age Categories

Original skeletal element counts are presented in the Appendix A and those results are presented here at the summary counts in Table 5. Based on photographic review, many of the bones observed were fragmented and were less than 100% complete.

Table 5: Final Counts of Bones for MNI and MLNI

Bone	Adult				Subadult				MNI Calculation	MLNI Calculation
	Left	Right	Total	Pairs	Left	Right	Total	Pairs		
Femur	47	39	86	8	22	28	50	8	75	279
Humerus	40	45	85	8	13	23	36	0	68	413
Ilium	41	46	87	6	13	10	23	0	59	446
Temporal	35	38	73	4	5	8	13	0	46	350
Maxilla	29	31	60	7	8	6	14	1	39	159
Calcaneus	31	32	63	2	5	6	11	2	38	287

The femur was the most common skeletal element observed. There was a raw total of 171 femora, which comprised 6.6% of the total number of bones recovered in the sample, with 109 adult femora and 62 subadult femora, not including 2 femora of unknown age. Of the total, there were 86 adult femora and 50 adult femora with inventory codes from 1 through 4. Forty-seven

femora were found 100% complete, with 26 adult femora and 21 subadult femora. The majority of the femora were 75% complete with the proximal end missing, complete with the distal end missing, or the shaft only. There were 69 lefts and 69 rights. Only 16 pairs were identified with 8 pairs for the adult femora and 8 pairs for the subadult femora.

Following the femur, the humerus was the second most representative bone in the sample. There was a raw total of 159 humeri with 110 adult humeri and 49 subadult humeri, which made up roughly 6.2% of the total sample. There were 53 lefts and 68 rights. Many of the elements were either 100% complete or 75% complete with the proximal end missing. Overall, the total counts for the humerus are similar to the counts of the femur, but there are slightly less humeri in the sample. Only 8 pairs of adult humeri were identified; the subadult humeri could not be paired.

In the original data, the os coxa was recorded separately as the ilium, ischium, or pubis. To avoid overestimation, only ilium bones were counted, including counts from complete pelvises found in the crypt. From the total sample, there were 98 ilium portions (3.8%) counted. Of the 98 ilium bones, about half were 100% complete or nearly complete and the other half were approximately 50% partially complete. There were 75 adult and 23 subadult ilium bones, with 47 lefts and 51 rights. Six pairs were identified.

The temporal bones were also well represented in this sample with a raw total of 86 elements, comprising of 3.3% of the total sample. However, it is poorly preserved as only 14 were scored as complete or nearly complete. Of the total, 73 temporal bones were aged as adults and 13 elements were subadults. Four pairs were identified within the 40 lefts and 46 rights.

The total raw number of maxillae in this sample was 74 elements (2.95%) with 60 adult maxillae and 14 subadult bones. Although only 18 maxillae were found as complete or incomplete, 8 pairs were identified. There were 37 lefts and 37 rights identified.

Although the calcaneus is a small bone, there was a raw total of 74 calcanei (2.87%) of which almost all were found complete or nearly complete. There were four pairs identified, and 36 lefts and 38 rights. There were 63 adult calcanei and only 11 subadult calcanei.

Skeletal Element Counts by Level

The total counts for each bone type in the arbitrary stratigraphic levels are presented in Appendix B and Table 6.

Table 6: Total Number of All Bones for Each Level

Levels	Total
7	30
8	54
9	69
10	62
11	37
12	216
13	184
14-16	22
Total	674

The femur was the most well represented bone in all 8 stratigraphic layers. However, the number of femora was fewer in level 11, but increases again in levels 12 and 13 before decreasing again in levels 14-16. Levels 12 and 13 have the most femora of all of the levels. Based on the femur counts alone, the levels can be divided into two major layers with a high

concentration of femora near the top of the cistern (7 through 10) and again in two lower layers (12 and 13).

The humerus does not exhibit a similar pattern as the femur where there are two major layers of concentration. The humerus has an approximately consistent distribution throughout the levels except in levels 7 and 14-16. However, based on a Chi-square test that compared the counts of the femur and humerus at each level, there was no statistical difference [p-value=0.304] between the distribution of the femur and humerus throughout the levels.

A majority of the ilium were found in levels 12 and 13 while there was relatively few found in the higher levels. The temporal bones were almost exclusively found in the two lower levels. The maxilla exhibits a similar pattern as the femur where there is a high concentration of bones in the top levels and again in the two lower levels. No calcanei were found in levels 7 or 11 of the pit, but there were two concentrations of calcanei, like the femur, in levels 8 through 9 and again in levels 12 through 13. Since there were less subadult calcanei found, only a few subadult elements of this bone type were found in four of the levels.

Calculation of MNI and MLNI

Calculations for both MNI and MLNI were employed; the values are shown in Table 5. Table 5 is separated by side and age category because the sides of the different age categories cannot be paired. MNI was calculated for each bone type by adding the maximum number of right or left adult elements and the maximum number of right or left subadult elements. The equation is a modified variation of MNI to include both adult and subadult counts; it is calculated by:

Total MNI = *Maximum (L or R) Adult MNI + Maximum (L or R) Subadult MNI*

There was a difference between adult MNI and subadult MNI as the adult calculations were higher overall. The average difference between the left and right sides overall was approximately 4.44. There was no significant difference between the left and right sides overall [*p*-value=0.8591]. The element with the highest MNI of 75 was the femur while the lowest MNI of 38 was calculated from the calcaneus. The range for all elements was 37. Therefore, the MNI calculated by the femur was selected as the total MNI represented in this sample based on the bone analyzed.

Generally, the MLNI is considered the more accurate method because it estimates the original number of deceased individuals in a sample. However, since there were a relatively small number of pairs identified in this sample, the final MLNI values are significantly higher than the MNI values, as shown in Table 5. The element with the highest MLNI of 413 was the humerus and the lowest MLNI was 159, which was calculated from the maxilla. Since the MLNI values may be skewed, the MNI values appear more appropriate for this commingled, mortuary context. Therefore, the possible number of individuals represented by the skeletal sample is at least 75 individuals based on MNI calculations.

Chi-square tests were calculated to determine if there were significant differences between the expected adult MNI based on the femora and the MNI counts of each adult skeletal element (Table 7). There were no statistical differences between the expected MNI and the MNI counts of the humerus and ilium. However, when compared to the temporal, maxilla, and calcaneus, the Chi square tests showed that the differences were statistically significant.

Table 7: Expected MNI (47 Adult Individuals) vs. Actual MNI of Each Skeletal Element

	Humerus MNI (n=45)	Ilium MNI (n=46)	Temporal MNI (n=38)	Maxilla MNI (MNI=31)	Calcaneus MNI (n=32)
P-value	0.4946	1	0*.0026*	*<0.0001*	*<0.0001*

**italics*=significant results

Age and Sex

Based on the femur counts, there were the fragmentary and incomplete remains of at least 47 adults and 28 subadults in this sample (Table 5). The difference between the adult MNI and subadult MNI in this context was statistically significant [$p=<0.0001$].

Of the 98 ilium, only 26 elements were complete enough to be sexed. The sex estimates were 7 left female elements, 3 right female elements, 12 right male elements, and 4 right male elements, which represents a possible ratio of at least 7 females to at least 12 males in this sample. The difference between the number of females and males found in the pit was statistically significant [$p=0.037$] with more males than females.

Summary

This chapter presented the final counts from the inventory for the skeletal elements that were sorted and counted (femur, humerus, os coxa, temporal, maxilla, and calcaneus), including the right and left sides of adult and subadult age categories. Since the age estimations represent broad categories, there may be an underestimation because the right and left elements cannot be paired between different age estimations. Chi-square tests were employed for further data analysis. The final counts by stratigraphic levels for each bone type were also presented to identify patterns in the concentration and distribution of the bones in the pit. Using methods to

calculate MNI and MLNI, the number individuals possibly represented in the pit was at least 75, comprising of 47 adults and 28 subadults, and at least 7 females and 12 males.

DISCUSSION

This chapter discusses the results of the total counts for the individual skeletal elements and the minimum number of individuals originally interred in the pit. The MNI and MLNI estimates are compared to determine the most appropriate method for this specific mortuary context because the burial context contained approximately 2,573 skeletal elements that were commingled, disarticulated, and fragmentary. Analyses of the data and context of Estructura 9 are also compared to other mortuary contexts at Kuelap and in the Chachapoya region. Furthermore, Estructura 9 has special implications and anthropological significance for this particular mortuary treatment and placement of the dead since it is different from the typical mortuary practices commonly found at Kuelap. Most importantly, this chapter addresses the broad anthropological question of why the dead are treated differently.

Individual Skeletal Elements

The number of bones excavated from Estructura 9 is 2,573. For the purposes of this study, only certain elements were analyzed to represent examples of long bones, cranial bones, and small bones to distinguish between primary burial and secondary burial based on relative representativeness of the whole body.

Based on the results, two specific bone types were more represented than others. The two long bones (femur and humerus) were the most well represented bones in all eight stratigraphic layers. These two bone types may have preserved better than other skeletal elements because they are larger than the other bones, especially in adults (Byrd and Adams, 2003). The comparison between a large bone and a small bone, like the calcaneus, can help determine how the bones may have been deposited (Fox and Marklein, 2014). If the individuals were buried as

complete skeletons, then there would be a similar MNI for the different sized bones, including cranial remains, consistent with a primary mortuary context. In secondary burials and assemblages, smaller bones are less likely present (Osterholtz et al., 2014a; Fox and Marklein, 2014). The counts between the femur and the calcaneus were significantly different based on Chi-square tests. In addition, there were also significantly less cranial bones than the femur, which may reflect selective removal of certain skeletal elements.

There are two possible explanations for this phenomenon of differential representation; both of which suggest that Estructura 9 is an ossuary of secondarily interred human remains. The first possible explanation is that during transport of the bones from the primary burial to the secondary burial, the smaller bones were lost along the way or they were never collected during exhumation at the primary location. Smaller bones are generally more fragile, less likely to preserve, and are sometimes eaten by animals (Osterholtz et al., 2014a; Fox and Marklein, 2014). Cranial vault bones also preserve less than long bones, especially when the cranial vault becomes fragmented (Bonogofsky, 2011). The second possible explanation is that certain bone types were selected over others because they were bigger and easier to transport. Bone selection for secondary interment is not uncommon as we also see this occurrence in a study by Klaus and Tam (2014). In addition, crania are sometimes collected and placed separately from other bones in the body for special ritual purposes (Bonogofsky, 2011). In ancient Andean cultures, the head appeared to have had a symbolic importance as they were often curated as trophy heads from victims in combat (Arnold and Hastorf, 2008; Forgey and Williams, 2003).

Based on the results, the null hypothesis was rejected because this mortuary context is not a tomb previously described at Kuelap. A more extensive and in-depth analysis of the inventory

and of the remains themselves could possibly identify complete individuals from this sample, but based on the current data, the remains are incomplete, disarticulated skeletal elements and not representative of complete human bodies. The results support the alternative hypothesis which suggests that this circular stone lined crypt may be an ossuary of secondarily commingled remains (O'Shea and Bridges, 1989; Sutton, 1988; Ubelaker, 1974).

Stratigraphic Layers in Estructura 9

The stratigraphic levels can be generally divided into two major layers with a high concentration of the remains at the top of the crypt (levels 7 to 10) and again in the two lower levels (12 to 13). In the two lower layers, there is a higher concentration of bones, including both long bones and the smaller bones. Smaller bones tend to trickle down over time and may end up aggregating in lower stratigraphic layers (Osterholtz et al., 2014b). Alternatively, long bones could be found in high numbers at the top of the crypt with few smaller bones at the bottom. However, this may not be the case for Estructura 9 because there was a mix of both small and large bones in the two lower layers. Therefore, these elements were deposited individually as disarticulated bones and fragments, and not likely as complete or articulated individuals. This also suggests that the bones were deposited over time with an intermediate period (level 11) of less concentration in between the two major concentrations. However, the humerus has a fairly consistent distribution throughout the levels except in levels 7 and 14-16 as opposed to other elements such as the femur. The reasoning behind the different distribution of the humerus is unclear. A possible explanation for the varying concentrations may be from the changes in mortuary practices at Kuelap when Estructura 9 may have been used more frequently than other times.

Furthermore, in many Andean cultures like the Chachapoya, *ayllus* have been identified as the basic social unit (Church, 2006; Muscutt, 1998; Henderson, 2013; Isbell, 1997). Moieties have functioned to help balance power within the entire *ayllu* in the past and in present times (Henderson, 2013). At Kuelap, there may have been two moieties as there is an internal wall dividing the site into two sections. Estructura 9 is situated at the southern end of Kuelap; it likely would have been part of the southern moiety. Within Estructura 9, human skeletal elements were deposited mainly in the lower levels and again in the higher levels with an intermediate level (11) of less concentration. The middle level of less concentration raise questions about why fewer human remains were deposited during this period when compared to the other levels. Therefore, the smaller number of bones in level 11 suggests that the residents did not use the ossuary as much during this period even though preliminary data suggested that the ossuary may have held special meaning as a secondary ritual deposit. Alternatively, during the intermediate period, skeletal remains may have been relocated to another location at the site. If there were two moieties at Kuelap, it would be interesting to see if there is a similar structure or deposit at the northern end of the site.

Minimum Number of Individuals and Most Likely Number of Individuals

In this study, both MNI and MLNI were employed to determine the possible number of individuals interred in Estructura 9. MNI is a commonly used method to quantify commingled remains, but it can significantly underestimate the population size of the mortuary sample as shown in a study by Adams and Konisberg (2008). MLNI is considered the more accurate method because it estimates the original number of deceased individuals in the mortuary sample whereas MNI estimates the recovered assemblage (Adams and Konisberg, 2004; 2008). Since

there were a relatively small number of pairs identified in this sample, the final MLNI values are significantly higher than the MNI values.

In ideal preservation where complete bones or nearly complete bones are recovered, pair matching is possible through visual pair matching by process of elimination (Abbe, 2005) or osteometric sorting (Byrd and Adams, 2003; Thomas et al., 2013). In this study, many of the bones were not 100% complete. Therefore, MNI may be more appropriate when MLNI cannot be applied in samples where the remains are highly fragmented and poorly preserved because pairing the bones would be difficult. The results in this study suggest that MNI is the scientifically better method for this commingled, mortuary context from Estructura 9 based on the condition of the remains. However, there are still limitations in MNI because it only estimates the recovered assemblage and may have underestimated the MNI of 75 individuals in this sample, comprising of at least 47 adults and 27 subadults, based on the number of adult and subadult femur counts. Larger bones provided a better estimation of MNI than smaller bones because larger bones, like the femur and humerus, appear better preserved.

Paleodemography: Age and Sex

In Estructura 9, there were at least 47 adults and 27 subadults entombed in the pit. Of the 47 adults, there were at least 7 females and 12 males determined. Based on the results from the Chi-square tests, there were significant differences between adults and subadults, and females and males. The significant difference between the number of adults and subadults may be due to differential preservation (Bello et al., 2006). Subadult remains preserve poorly since they are generally smaller and more fragile than adult bones. Another possibility for the significant

difference, in addition to differential preservation, could be that more adults were placed in the pit than subadults.

There was also a relatively small number of complete ilium bones that were sexed in the original inventory. Many physical features used to sex elements were poorly preserved which complicated analysis. There is a significant difference between males and females, since more males were found in the pit then females. The higher number of males may be intentional and implies that adult males were more likely to be placed in Estructura 9 than adult females.

The results suggest that there may have been cultural preferences for individuals of certain age groups and sex to be deposited in the pit. However, despite the biases in age and sex distributions, Estructura 9 contains a mixed assemblage of subadults and adults, females and males with a slight preference for adult males.

Comparison to Kuelap Mortuary Practices

The evidence in this thesis suggests that Estructura 9 is the first of its kind for this type of mortuary practice at Kuelap because it is likely a secondary ossuary of commingled remains. The six “typical” burial practices common at Kuelap differed from Estructura 9, but were representative of the mortuary practices in the entire Chachapoya region (Ruiz Estrada, 2006). The burial practices of wall niches, *chullpas*, and mausoleums differed from Estructura 9 because the secondary skeletal bundles of human remains were interred in large, above-ground human built structures. The bundles were carefully prepared and wrapped in textiles as individuals by the living and were recovered mostly complete. Although the tombs may be collective, the remains in Estructura 9 were not handled in the same manner, as they were not specially prepared or wrapped in any way. Estructura 9 is similar to the *chullpa* and mausoleum

because all three contexts contain multiple individuals, secondary remains, and are large structures. The primary difference is that Estructura 9 is an underground crypt whereas *chullpas* and mausoleums are above ground structures. These parallels require further examination.

Alternatively, the mortuary practices of the underground tomb and sarcophagus differed from Estructura 9 because the underground tomb and sarcophagus were primary, individual interments. Cave burials, on the other hand, are similar to the ossuary because they contained numerous secondary and commingled human remains from multiple individuals as observed by Ruiz Estrada (2009). However, the remains from the natural caves were not entombed in a human made, stone-lined crypt, deposited over time like the remains from Estructura 9. Again, the structural parallels between caves and underground crypts invite further exploration.

Based on the comparison of this mortuary context to the six common funerary repositories at Kuelap, Estructura 9 may be an ossuary of secondary remains. The human skeletal remains were likely collected from somewhere else and deposited into the pit over time. In other words, the human remains were not deposited all at once because there were bones found in varying concentrations with two major periods of use and an intermediate period of less concentration. This suggests that the Estructura 9 was consistently used as a place to deposit disarticulated, skeletonized human remains over a period of time, but the location of the original or primary interment is still unknown.

Furthermore, the crypt is located in the center of the Circular Platform near residential structures that may have belonged to an elite group (Narváez, 1987). Although more information is needed, it is possible that this ossuary contains the ancestral remains of residents of the nearby residential structures. Current mortuary studies suggest that many Andean cultures, including the

Chachapoya, focused on keeping the dead close as essential for daily life (Buikstra and Nystrom, 2003; Klaus and Tam, 2014; Nystrom et al., 2010). The recurring theme of keeping the physical remains of ancestors near homes and communities may have been a way for regular contact between the living and the dead. At Kuelap, the common mortuary practices likely implied this close relationship as the bodies were buried in different repositories near residential structures. In addition, Estructura 9 contains commingled remains from multiple individuals with no clear indication of which bone belonging to who. Single burials, such as the sarcophagi and underground tombs, preserve the individual identity of the deceased. Commingling, on the other hand, may remove individual identity, but can create a sense of community where all individuals become incorporated into the collective whole (Duncan, 2005).

Comparison to Other Mortuary Contexts Outside of Kuelap

At another Chachapoya site south of Kuelap, Laguna de los Cóndores, bundles of disarticulated human bones were found and may have been secondarily deposited (Buikstra and Nystrom, 2003). These remains were originally from the *chullpas* at the site and were likely placed there to enhance preservation. While these remains were also disarticulated and contain multiple individuals, they were not interred as isolated remains or scattered in a deep pit like the ossuary from Kuelap.

Other ossuaries have also been uncovered from the site of Andahuaylas, Peru. Seventeen cave ossuaries were found with hundreds of skeletal remains from males, females, and subadults. Many of the crania analyzed from the ossuaries had evidence of trepanation, cranial modification, and some crania showed signs of healing. According to Kurin (2013), these cave ossuaries, or *machays*, were commonly used during the Late Intermediate Period and likely

entombed groups of family members. The *machays* may provide insight on how ossuaries may have been used in addition to other mortuary practices and traditions throughout the Andean region.

Current research on Andean mortuary practices implies that the physical remains of the dead were crucial for agricultural stability and social life (Buikstra and Nystrom, 2003; Klaus and Tam, 2014; Nystrom et al., 2010; Sillar, 1992). Although it is likely that the people at Kuelap kept the remains of ancestors near their homes for these same reasons, Estructura 9 may have had a different usage from the other mortuary contexts found at Kuelap since it is the first underground ossuary discovered at this site. According to Duncan (2005) in his review of Bloch's (1992) model of ritual violence, veneration and violation of the dead look similar in the archaeological record as postmortem treatment of the body can complicate analysis of the remains and the archaeological context. Veneration refers to honoring the dead and helping the soul gets to its final resting place whereas violation includes destroying the soul or denying the dead a proper burial (Duncan, 2005). I argue that Estructura 9 is likely a place of veneration because of its location on the Circular Platform near possibly elite residential structures and the Tintero. The Tintero is considered part of the Templo Mayor, which had an important role in rituals and ceremonies at the site (Toyne and Narváez, 2014). At the center of the Tintero, there is a deep cistern that contains human skeletal remains and elite ritual paraphernalia. Based on preliminary observations, Estructura 9 parallels the structure of the deposit on the Tintero, since it is at the center of the Circular Platform. Future excavation and research at the Tintero could reveal more about the relationship between the Tintero and the Circular Platform.

Mortuary practices and funerary repositories at Kuelap demonstrate that the living used the dead to recreate their living spaces (Parker Pearson, 2000; Stutz and Tarlow, 2013). The evidence at Kuelap and other Andean sites suggest that there was an active relationship between the living and the dead that involved ancestral veneration (Nystrom et al., 2010; Sillar, 1992). The mortuary contexts, like ossuaries, mausoleums, and other types of burial, are various ways for the living to keep their ancestors an integral part of their daily lives by placing and replacing them through secondary rituals within close proximity to their dwellings. It is uncertain exactly why the dead were treated differently at Kuelap, but the evidence does indicate that the dead were significant as they were transported from their primary burial to a well-defined, secondary ossuary.

Summary

In this chapter, the results of the total counts for the individual skeletal elements and the Minimum Number of Individuals were discussed and analyzed for patterns and interpretation. The research questions addressed in the chapter provide support for the alternative hypothesis, suggesting that Estructura 9 was likely an ossuary of secondary, commingled remains with varying concentrations. The varying concentrations of the remains suggest that there were two major periods of use and one period of less frequent use based on the small number of remains found at level 11. The partial remains of at least 75 individuals were deposited in the pit with differences in the age and sex of the individuals. Age and sex bias may be due to selective recovery and taphonomy.

Estructura 9 was also compared to other mortuary contexts at Kuelap and outside of Kuelap for further understanding of Chachapoya mortuary beliefs and practices. Estructura 9 has

different features than the six other mortuary contexts at Kuelap, but there are similarities with *chullpas* and mausoleums. When compared to mortuary contexts outside of Kuelap, Estructura 9 was still unique in that it is a well-defined pit with secondary commingled remains, situated near residential dwellings. Evidence and previous research suggest that Estructura 9 may have exhibited special positive meaning for the people of Kuelap and that the individuals were likely placed there for reason of proximity to facilitate ancestral veneration.

CONCLUSION

This research presents evidence that Estructura 9 is likely an ossuary of secondarily commingled remains and that it is a special mortuary context at Kuelap. The crypt required different methods to reconstruct and to analyze of this funerary context than with individual burials. The study analyzed a subset of 637 elements out of the total 2,573 bones with 311 left elements and 326 right elements. The total number of adult elements observed was 467 and the number of subadult elements was 170. The minimum number of individuals originally interred in the ossuary was at least 75 individuals, comprising of 47 adults and 28 subadults, and 7 females to 12 males based on MNI calculations. MLNI overestimated the counts since there were a low number of pairs identified. Differences in the final counts of adult skeletal elements suggest that Estructura 9 is a secondary ossuary that had two major periods of use in the upper and lower levels with an intermediate period of less use. The demographics of the individuals found in the pit showed that there were more adults found than subadults and more males found than female. The MNI counts of the different ages and sex provide information whom may have been deposited in the pit, but may also be the result of differential preservation.

Estructura 9 is located in the center of the Circular Platform surrounded by six residential structures near the Tintero structure at the southern end of Kuelap (Narváez, 1987; Toyne, 2011). The residential structures may have belonged to an elite group, according to Narváez (1987). Estructura 9 parallels the cistern on the Tintero because of its location in the center of the Circular Platform and its skeletal contents. The contents from the cistern have yet to be analyzed. Current studies and evidence suggest ancestral veneration as Andean traditions often involved keeping the remains close so that the dead can still be a part of everyday life. It can be inferred

that the ossuary was used by a select group, perhaps of the southern moiety, at Kuelap during the periods of use. Moieties played an important role in Andean societies as they helped maintain balance in the *ayllu* (Henderson, 2013).

In addition, ossuaries and the six other funerary repositories (wall niches, *chullpas*, underground tombs, sarcophagi, mausoleums, and caves) were clearly important for the people at Kuelap because they had set aside resources, space, and effort to construct relatively elaborate funerary repositories for their dead relatives and ancestors directly within the living areas of the site. The analysis of Estructura 9 suggests that the living had a personal connection to the physical remains as they carried the remains from their original deposition and specifically placed them in a stone lined crypt where the dead lose their individual identity to become a part of the community.

Future Studies

Due to timing, this study only analyzed six types of bones (femur, humerus, ilium, calcaneus, temporal, and maxilla) to represent major parts of the human body, such as the long bones (upper and lower limbs), cranial bones, and small bones. Therefore, it is a preliminary study of the human skeletal remains from Estructura 9. For future research, all bones types need to be assessed. As shown in this study, element representativeness is crucial for distinguishing between primary and secondary burials. While the femur was the most represented skeletal element and the largest analyzed, it only comprises 6.6% of the 2,573 bones recovered from the ossuary. A Bone Representation Index (BRI) should be calculated of all bone types to determine the ratio between the total number of bones excavated from the ossuary and the number of bones that should be present based on the total MNI (Bello and Andrews, 2006; Klaus and Tam, 2014).

A more detailed analysis of the age and sex distribution by levels would also provide more information if the practices change over time.

Final Considerations

This research is anthropologically significant because variability of mortuary practices at Kuelap demonstrates the complex ways that people in the past treated the dead. This study provides analyses and interpretations of a specific context at a major archaeological site and contributes to helping us understand the special relationship between the living and the dead at Kuelap. There is limited research on the Chachapoya, and many archaeological sites and structures risk destruction from modern human activities. At Kuelap and many Andean sites, death may have played an important role in the social life and agricultural stability. Estructura 9 is one of the few ossuaries discovered in the Andean region and there may be more that have yet to be discovered. The primary use of the ossuaries as a part of Andean mortuary practices is unknown, but the evidence in this study suggests that ossuaries, such as Estructura 9, were a way for the living to keep the dead (or at least fragments of them) close and a part of their daily lives.

APPENDIX A: TABLES OF FINAL COUNTS FOR EACH SKELETAL ELEMENT USING INVENTORY CODES FOR COMPLETENESS

Tables of Final Counts for Each Skeletal Element using Inventory Codes for Completeness

Table 1: Femur

Codes	Total	L	R	Total	Adult L	Adult R	Together	Subadult L	Subadult R
1	47	23	24	26	13	13	21	10	11
2	28	13	15	21	13	8	7	0	7
3	26	14	12	17	9	8	9	5	4
4	35	19	18	22	12	10	13	7	6
MNI	136	69	69	86	47	39	50	22	28
Pairs	16			8			8		

Table 2: Humerus

Codes	Total	L	R	Total	Adult L	Adult R	Together	Subadult L	Subadult R
1	45	25	20	27	16	11	18	9	9
2	40	15	25	29	11	18	11	4	7
3	16	5	11	12	5	7	4	0	4
4	20	8	12	17	8	9	3	0	3
MNI	121	53	68	85	40	45	36	13	23
Pairs	8			8			0		

Table 3: Ilium

Codes	Total	L	R	Total	Adult L	Adult R	Total	Subadult L	Subadult R
1	51	38	13	32	25	7	19	13	6
2	59	16	43	55	16	39	4	0	4
MNI	110	54	56	87	41	46	23	13	10
Pairs	6			6			0		

Table 5: Temporal

Codes	Total	L	R	Total	Adult L	Adult R	Total	Subadult L	Subadult R
1	14	8	6	13	7	6	1	1	0
2	72	32	40	60	28	32	12	4	8
MNI	86	40	46	73	35	38	13	5	8
Pairs	4			4			0		

Table 6: Maxilla

Codes	Total	L	R	Total	Adult L	Adult R	Total	Subadult L	Subadult R
1	18	10	8	16	8	8	2	2	0
2	56	27	29	44	21	23	12	6	6
MNI	74	37	37	60	29	31	14	8	6
Pairs	7			6			1		

Table 7: Calcaneus

Codes	Total	L	R	Total	Adult L	Adult R	Total	Subadult L	Subadult R
1	72	34	38	61	29	32	11	5	6
2	2	2	0	2	2	0	0	0	0
MNI	74	36	38	63	31	32	11	5	6
Pairs	4			2			2		

APPENDIX B: TABLE OF FINAL BONE COUNTS SEPARATED BY LEVEL

Table of Final Bone Counts Separated by Level

Levels	Femur			Humerus			Calcaneus			Ilium			Temporal			Maxilla		
	Adult	Subadult	Total	Adult	Subadult	Total	Adult	Subadult	Total	Adult	Sub-adult	Total	Adult	Subadult	Total	Adult	Subadult	Total
7	11	1	12	5	0	5	0	0	0	6	0	6	6	0	6	1	0	1
8	10	5	15	10	6	16	3	1	4	13	1	14	0	0	0	4	1	5
9	16	5	21	11	5	16	5	3	8	5	3	8	3	4	7	6	3	9
10	8	9	17	12	8	20	7	0	7	6	2	8	8	0	8	1	1	2
11	6	5	11	12	4	16	0	0	0	4	1	5	0	0	0	5	0	5
12	29	20	49	22	13	35	20	3	23	36	7	43	35	0	35	28	3	31
13	27	14	41	30	11	41	23	4	27	17	9	26	21	7	28	15	6	21
14-16	2	3	5	8	2	10	5	0	5	0	0	0	0	2	2	0	0	0
Total	109	62	171	110	49	159	63	11	74	87	23	110	73	13	86	60	14	74

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