

**HUMAN SKELETAL REMAINS OF THE ANCIENT MAYA IN THE CAVES OF
DOS PILAS, GUATEMALA**

A Thesis

by

AMADOR MINJARES, JR.

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

August 2003

Major Subject: Anthropology

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August 2003

Major Subject: Anthropology

ABSTRACT

Human Skeletal Remains of the Ancient Maya in the Caves of Dos Pilas, Guatemala.

(August 2003)

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Chair of Advisory Committee: Dr. Lori E. Wright

This study focuses on the assessment of the depositional activity that occurred in six caves of the Petexbatun region of the Peten, Guatemala through a quantitative analysis of the human skeletal material recovered from them. Five of these caves are associated with the site of Dos Pilas; the sixth cave (Cueva de Los Quetzales) is located beneath the site of Las Pacayas. The cave is an important aspect of the Maya worldview, as evidenced in the artifactual and skeletal material found in caves by archaeological exploration. My study is specifically focused on the assessment of the primary and/or secondary burial of Maya dead within these caves via analyses of the relative skeletal element frequencies, the minimum and probable number of individuals, and the identification of human cut marks. Based on these lines of evidence and data from preliminary reports, between 100 and 150 individuals of both sexes and various age groups were primarily deposited/buried in these caves. Secondary activity may be inferred based on evidence of human-made cut marks on several elements. There is no osteological evidence to support the hypothesis of human sacrifice. I was unable to determine the status of the individuals deposited in the caves. The best interpretation is that several types of depositional activity occurred within these caves over time.

DEDICATION

For the past three years, I have spent many hours attending classes, studying for exams, and preparing a thesis. However, my academic work pales in comparison to the time and effort my parents have invested in my pursuit of a brighter future. They have supported my every decision and I know they will be there for me in the years to come. In appreciation for all the years of support, advice, and prayer, I dedicate this thesis to my parents, Amador and Maria Teresa Minjares. This work is as much yours as it is mine. Thank you for everything and I love you.

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This research was made possible through a number of individuals that deserve recognition. I would like to thank Dr. Lori Wright for allowing me to work with the skeletal material from the caves of Guatemala and helping me formulate a thesis topic. I know it came down to the wire, but everything came together in the end. I would also like to thank my other committee members, Dr. D. Gentry Steele and Dr. Jonathan Smith, for their much-needed input and constructive criticism. I would also like to extend a special thanks to Dr. Rob Bonnichsen in the Center for the Study of the First Americans for granting me access to the newly acquired stereomicroscopes, and Jim Wiederhold for taking time out of his schedule to help me take photographs of cut marks. I would also like to thank Dr. James Brady for the useful information despite the missed phone calls. I also owe a debt of gratitude to Sam Sweitz and Anna Lee Presley for doing a preliminary inventory of the skeletal material. You made my job a lot easier.

I would like to thank my parents and my sister for their continuous support throughout my academic career. You have always been there for me, and I thank you. Finally, I would like to extend a very special thanks to my extremely patient fiancé, Felisha Rohan. She supported my every decision and kept me grounded. I cannot fully express how important she was in this very grueling process. She lifted my spirits when I was down and always kept me looking forward no matter what. I know it was a rough ride, but we finally made it. Thank you so much for being there for me; I know I couldn't have done it without you.

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CHAPTER I

INTRODUCTION

Caves have been used as functional spaces for hundreds of thousands of years. The archaeological record illustrates that caves provided shelter to our earliest ancestors. Other lines of evidence have demonstrated that caves served a purpose beyond that of protection and shelter against the elements. The cultural role of the cave as sacred space has manifested itself on a global scale. The ancient Maya were a people that assigned sacred and ritual significance to the subterranean world. Over the decades, archaeological efforts have procured an abundance of artifactual and skeletal material from numerous caves in the Maya area. This intentional deposition of material clearly illustrates the importance of the cave in the Maya worldview. Ceramic found in these caves provide evidence for early use, dating to the Late Preclassic (300 BC-AD 250) and extending into the Early and Late Classic periods (AD 250-900) (Coe 1999).

This thesis will focus on the role of caves in the Maya world, and specifically the treatment and disposal of human remains in caves. The main objective of this investigation is to illustrate the sacred significance of these caves through a quantitative analysis of one of the largest collections of human skeletal material procured from any system of caves in the Maya area. A large proportion of the skeletal sample was recovered from five caves associated with the Maya site of Dos Pilas in Guatemala (Figure 1). Skeletal remains were also collected from a sixth cave located underneath

This thesis follows the style and format of the American Journal of Physical Anthropology.

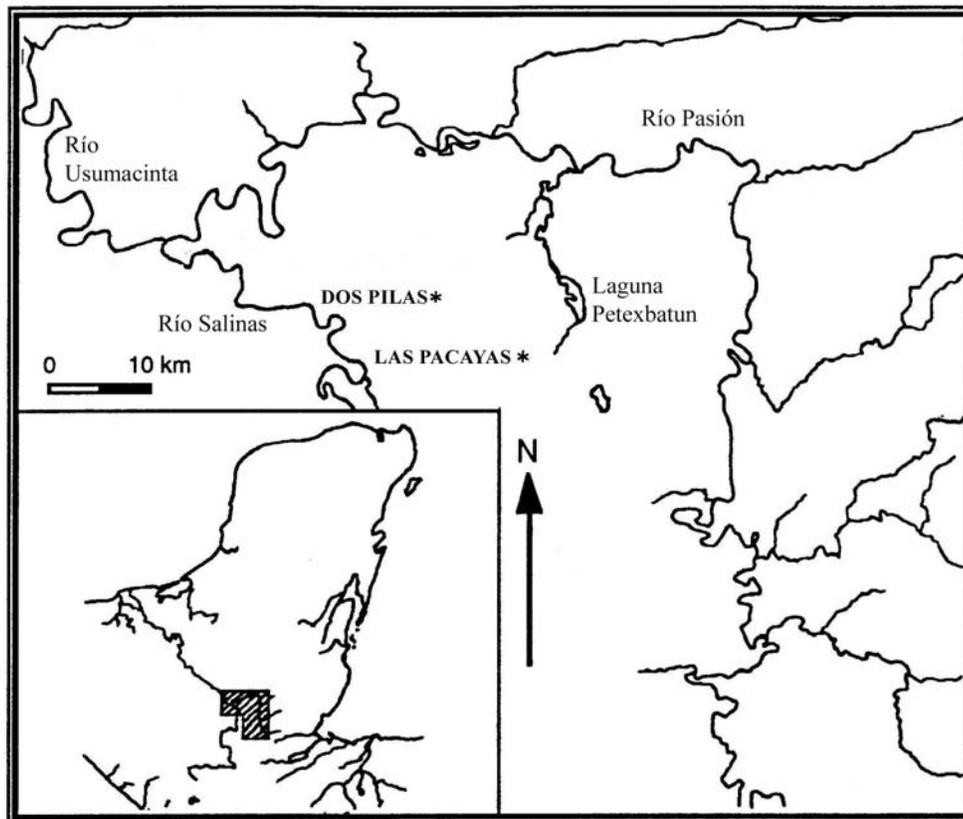


Fig. 1. Map of the Petexbatun region in Guatemala. The sites of Dos Pilas and Las Pacayas are associated with several caves (After Wright 1994:Figure 3.1).

the site of Las Pacayas 12.5 km southeast of Dos Pilas. Information on the taphonomic conditions of the cave, the age and sex distributions of the sample, as well as the calculation of the relative skeletal element frequencies and estimates of the minimum and probable number of individuals for each cave will be used to interpret who these individuals were, and how their remains came to be deposited in these caves.

The data collected from this skeletal analysis will be used to evaluate the following hypothesis: the caves associated with Dos Pilas do not represent simple bone

repositories used for the disposal of the general Maya population, insomuch as that they were sacred spaces utilized for the secondary deposition/burial of select individuals. A secondary burial involves the exhumation and re-deposition of skeletal remains in a location other than the site of the primary interment. The skeletal collection from the caves of Dos Pilas may also contain the venerated remains of a select group of individuals afforded primary interment within these subterranean spaces. The practice of human sacrifice by the ancient Maya may have also occurred in the sacred context of these caves. These possibilities will be evaluated via a detailed, osteological analysis of the human skeletal material recovered from these caves. The identification and analysis of intentional bone modification of several skeletal elements represents another facet of this thesis. A careful examination of these marks may facilitate a more accurate interpretation of the treatment these individuals experienced before and/or after their deposition in the caves.

Chapter II reviews archaeological evidence for the use of caves by the ancient Maya. Despite the unique nature of every cave, the caves that have been explored share a suite of general characteristics. Chapter III outlines the materials and methods of the study: Chapter IV describes the archaeological investigations carried out in the caves, and their results. The chapters following these focus on the analysis and interpretation of the data. Chapter V is an analysis of the NISPs and the MNI and PNI estimates for each cave, and the implications behind these calculations. Chapter VI contains the analysis of bone modification. Chapter VII attempts to interpret all the data in order to

prove or disprove my hypothesis. The final chapter presents an overview of the study and a few comments on the future of cave investigations in the Maya area.

CHAPTER II

EVIDENCE OF MAYA CAVE USE

The archaeological investigation of caves in the Maya area is a growing field of study. These efforts reflect an attempt to better understand the physical and cultural world of the ancient Maya. These subterranean spaces have been explored, mapped, and investigated on a scientific level for over a century. Early archaeological expeditions document the exploration of caves throughout the Maya area, yet thorough investigations were a low priority. Early archaeological efforts were focused on the discovery of the larger, more impressive architectural achievements of the Maya civilization. Over time, a significant number of Mayan urban centers emerged from the lowland tropical forests of Guatemala, Belize, and Honduras, and Mexico's Yucatán Peninsula.

Despite a general lack of study in the caves of the Maya region, there were those who realized their importance and possible role in the physical and cultural world of the ancient Maya. The early works of Gordon (1898), Thompson (1897), Mercer (1896), and Joyce (1928), introduced the study of caves into the larger scope of Maya archaeology. Albeit cursory, these investigations established a foundation from that others would build upon in the decades to come. The continued efforts of J.E.S. Thompson (1959), Digby (1958), Anderson (1962), and others were also significant contributions to the growing body of literature focusing on the investigation of the subterranean world of the Maya. In essence, these investigations not only demonstrated

the ubiquity of cave use in the Maya area, they also set the stage for the onset of a multidisciplinary approach towards the study and interpretation of Maya cave use.

An increase in the systematic exploration and investigation of caves in the Maya area occurred in the 1970s, and it continues to the present day. The works of Pendergast (1974, 1971, 1970, 1969), MacLeod and Puleston (1978), Pohl and Pohl (1983), Brady (1997, 1995, 1994, 1990a, 1990b), Owen (2002), Gibbs (2000), etc., not only describe the Maya cave as a natural setting, they also discuss the cultural importance and the role(s) these underground spaces may have played in the ancient Maya world. Through a multidisciplinary approach, these archaeologists have been able to glean a considerable amount of information from the cave and everything associated with them. For instance, ceramic typologies have been useful in the establishment of a temporal/chronological framework of Maya cave use. Moreover, increased knowledge of Maya hieroglyphs and iconography has also contributed greatly in the decipherment of the sacred role of caves in the Maya area. The bioarchaeological study of human and faunal remains recovered from these caves is imperative in the interpretation of these subterranean spaces as sites for human sacrificial acts, ancestor veneration, or simple bone ossuaries.

In spite of this growing body of archaeological evidence that caves did serve several functions, both sacred and secular, much remains unknown about the exact role(s) caves play in the Maya world. According to Thompson (1970), vessels were placed in caves to collect *zuhuy ha*, or “virgin” water, for ceremonies and other ritual purposes. He also suggests that these caves may have “served as depositories of human remains” (Thompson 1970:184). A greater understanding of Maya cosmology, religion,

and iconography will reveal that the cave was a revered space of ritual and sacred significance. As we shall see in the following section, the cave has held a special place not only in Maya culture, but also in cultures throughout Mesoamerica. This discussion will be followed by a review of the physical and cultural evidence indicating Maya cave use.

The cave as sacred space

Much of what we know regarding Maya cosmology, as well as their religious beliefs and practices has been acquired through various sources: ethnohistoric and ethnographic documentation, the Maya creation story, or *Popol Vuh*, and the interpretation of Maya iconography and hieroglyphics. Researchers in search for a greater understanding and appreciation of the sacred and/or ritual role of the cave in the Maya world have turned to these sources of information.

Iconography

The cave, or *ch'en*, represents one of many important Mesoamerican motifs that the Maya may have adopted before their florescence as a major civilization. According to Stone (1995:35), caves are important symbols because of the cultural information they represent. Caves are connoted as being the dark and mysterious abodes for the gods of rain, maize, wind, etc. Iconographic depictions of cave openings take various stylistic forms. For example, a common Mesoamerican motif is “the open maw of a beast,” which may represent “a portal into sacred space” (Stone 1995:23). A derivative of this motif is also represented in images of individuals sitting within the gaping mouth of a giant creature.

Caves are also known to share an opposite relationship with the mountain. For example, caves may naturally occur within close proximity to mountains or other mountainous features. Thus, these motifs are iconographic representations of the natural environment that surrounded the Maya. According to Stone (1995:34), “mountain-tops and caves constitute the most important classes of topographic shrines in Mesoamerica.” The mountain is usually associated with maize, whereas the cave represents the source of water that must sustain this crucial crop (Bassie-Sweet 1991).

Cosmology and religion

Maya cosmology and religion are also bound to the sacredness of the cave, as the *Popol Vuh* will attest. In the creation story, the Hero Twins, Hunahpuh and Xbalanque, must avenge their father’s death by descending into the dark recesses of the Maya underworld, or *Xibalba*. After their descent into the inner depths of *Xibalba*, the twins undergo a number of tests and outwit the lords of the underworld. Upon their return to the surface, the Hero Twins are transformed into the sun and moon. The ancient Maya believed that the sun journeyed through a cave at night in order to rise once again on the eastern horizon. They regarded the underworld as a dark and fearful place where the gods of death and pestilence resided; however, it also represents a crucial metaphysical landscape in the creation story of the ancient Maya. Despite the negative connotations of *Xibalba* and the cave, the ancient Maya strongly revered and respected this sacred space. This is evident in the cultural material and artificial modifications that indicate purposeful cave use by the Maya.

General characteristics of Maya cave use

Every cave utilized by the Maya represents a unique physical and cultural construct shaped by natural and human agents. However, there is a suite of general characteristics that commonly occur in the caves used by the ancient Maya. The artifactual materials deposited in these caves have many forms and are found in varying quantities. Material includes items, cultural or otherwise, introduced into the cave context, including human and faunal remains. The implications of human remains in these caves are very important and require due attention. The presence of artificial constructions clearly demonstrates the time and labor invested by the Maya in the modification of the natural cave environment. These artificial features include plastered floors, retaining walls, or simple altars. Evidence of settlement configurations, which suggest that both domestic architecture and major architectural structures were often intentionally placed over caves, represents yet another characteristic of Maya cave-use. Lastly, the presence of cave paintings and other rock art further demonstrates the ritual use of caves in the Maya area. The following review of the archaeological evidence regarding Maya cave-use is intended to establish the importance of the cave in the Maya world. It must be noted that the following cave descriptions focus on a specific characteristic. This, however, does not suggest that a particular cave solely contains a single characteristic. In many cases, several of these features manifest themselves in a cave.

Artifactual material

The artifacts that occur in these caves may vary in the type, quality, and quantity of material present. Artifactual material that suggests cave-use typically constitutes any item deposited within the cave environment. Evidence of broken stalagmites and stalactites, or speleothems, found within these caves also qualifies as artifactual material, which may indicate the use of caves as settings for religious rites (Brady and Prufer 1999). The most common artifacts found in these caves are ceramics. Ceramics are especially useful in the estimation of relative dates of cave use. However, artifactual material includes more than just ceramic material. Stone and bone implements, obsidian blades, jade, shell, and bone jewelry, and pyrite and quartz pieces, represent a few examples of the material recovered from these caves. The recovery of human and faunal remains also occurs throughout the caves of the Maya area, yet these are not considered artifacts. The deposition of human remains will be discussed in more detail in a later section. The following descriptions are a few examples of some the diverse artifact assemblages that have been recovered from caves throughout the Maya area.

Balankanche Cave

The site of Balankanche is located 3 km southwest of the Yucatec site of Chichen Itza. The surface site pales in comparison to the cave associated with the few surface structures present. The exploration of the cave system by Andrews and his team produced one of the most impressive collections of ceremonial artifacts recovered from any cave in the Maya area. Most of the artifacts were associated with either a body of water or a speleothem formation (Andrews 1970). Clay censers with the visage of

Tlaloc and vessels with “bands of studs” were the principal ceremonial offerings found throughout the chambers (Andrews 1970). This image of the rain god may suggest the presence of Central Mexican influences in the area. One of the more impressive offerings contained 232 miniature stone *manos* and *metates* strewn on the cave floor, as well as 25 clay spindle whorls and other large offertory vessels. The “Throne of the Balam” consisted of a large cache of ceremonial objects associated with an impressive pillar formed by a stalactite and stalagmite (Andrews 1970). This columnar formation also had evidence of two handprints produced in red ochre. Artificial constructions were also found in the entrance of the cave, as well as the main passageway.

Ch'en P'ix Cave

A single artifact may be as informative and noteworthy as a large ceremonial offering consisting of hundreds of elements. This is true in the case of the serendipitous find in the inner depths of the Ch'en P'ix cave, a cave located in the Northern Vaca Plateau in west-central Belize. Exploration and basic surface collections of the cave produced abundant deposits of artifacts. However, one of the more interesting discoveries was a nearly complete tripod plate with a depiction of an individual engaged in a possible bloodletting ritual (Colas et al. 2000). The ceramic sherds of the plate were found near a few obsidian blades atop an artificial platform feature (Colas et al. 2000). A path outlined by broken speleothems led one from the cave entrance to this platform. According to Colas et al. (2000:9), these artificial constructions and the broken polychrome Tripod plate represent a possible location “built specifically for ritual

activities, which included bloodletting.” These discoveries surely provide insight into ritual cave-use by the Maya.

Actun Balam

The cave of Actun Balam is also located in the Vaca Plateau in close proximity to Ch'en P'ix Cave and southeast of the site of Caracol. The exploration and excavation of the five chambers of this dry cave produced a variety of ceramic and non-ceramic material. More than 22,000 ceramic sherds were excavated from Chamber C, dating from the Late Classic to the Terminal Classic/Early Postclassic period (Pendergast 1969:58). One of the more important artifacts recovered from the chamber was the Actun Balam Vase, a nearly complete polychrome vessel with a detailed depiction of a deer hunt. Pendergast (1969:60) posits that the accumulation of ceramics in Chamber C may represent “offerings made to spirits thought to inhabit caves,” a notion that clearly resonates with the cosmological beliefs of the ancient Maya. Non-ceramic artifacts included bone and shell beads, stone bifaces, and a small sample of unmodified faunal remains. The cave, like many others in the Maya area, also had evidence of artificial constructions in the form of retaining walls demarcating boundaries between certain chambers (Pendergast 1969).

Artificial constructions and cave modifications

The physical alteration of the natural cave environment has been documented in a number of caves throughout the Maya area. The construction of artificial structures and/or the direct modification of cave features demonstrate the time and energy expended on the functional or ritual changes made by the ancient Maya. Evidence of

crude stone walls, simple altars, artificial platforms, and cave carvings point to the Maya's attempt at creating a particular cultural atmosphere in the cave, ritual or otherwise.

Eduardo Quiroz Cave

The cave system is situated northeast of the site of Caracol in the southern Cayo District of the Vaca Plateau in Belize. No surface site was found associated with the cave. Of the six chambers explored and investigated, four of these were associated with some type of artificial construction. For example, the first chamber produced the remains of several dry-laid masonry walls, small earth terraces, and a portion of a plaster floor (Pendergast 1971). The walls found throughout the chambers were constructed out of rough-hewn blocks of limestone. The most extensive concentration of artificial constructions was located between the second and third chambers. The Maya created a very narrow passageway (55-65 cm in width) between these chambers by filling the existing tunnel with large limestone blocks (Pendergast 1971). There was a similar construction between the fifth and sixth chambers. According to Pendergast (1971:11), "the intent seems to have been to make movement from one area to another as difficult as possible, perhaps partly to increase the aura of mystery surrounding the cave or to keep hidden from the eyes of onlookers the ceremonies carried out in the deeper recesses of the caverns."

Río Frío Cave E

This dry cave is located in western Belize in the Vaca Plateau. An abundance of ceramics was found throughout the cave; however, other artifacts were not as well

represented. A ceramic analysis revealed that most of the activity conducted within the cave might date to the Late Classic period (Pendergast 1970). One of the more telling artifacts encountered in the cave entrance was a stalagmite in the form of a seated figure. Pendergast (1970) suggests that the figure may have represented an important idol worshipped by the ancient Maya, and may have played a role in the ritual use of the cave. A similar feature was also discovered in Footprint Cave in Belize; it consisted of a mask with exaggerated and grotesque features (Graham et al. 1980). Unlike the figure from Río Frío Cave E, the mask appears to have been carved into a stone outcropping inside the cave. A flat surface above the mask may have served as a surface for burning offerings, evidenced by a blackened area on the cave wall (Graham et al. 1980:169).

Cave art

The artistic reproduction of important Maya figures, rituals, scenes of life and death, etc. have been depicted on a number of mediums, i.e. ceramic vessels, stelae, murals, and monumental architecture. As the archaeological record attests, the walls of caves have also been utilized for the creative efforts of the ancient Maya. Given the ritual and sacred significance of the cave, the discovery of paintings and other rock art in this subterranean context should not be a surprise. There are a handful of Maya cave sites that have produced some form of Maya cave painting and rock art. One of the more impressive collections of Maya cave paintings and hieroglyphic text were discovered at the site of Naj Tunich.

Naj Tunich

The extensive cave system of Naj Tunich, or “stone house,” is located in the foothills of the Maya Mountains on the southeast corner of El Petén, Guatemala. Since its discovery in 1980, the cave has been systematically explored, excavated, and mapped. The cave is accessed through an impressive entrance, whereby an imposing stalagmite formation somewhat hinders the amount of natural light that penetrates into the large chamber. As one moves deeper into the cave, it eventually gives way to an extensive system of smaller tunnels wherein four major concentrations of hieroglyphic text and paintings were found. According to Brady and Stone (1986:19), the cave may have been in use from the Late Preclassic period (ca. 100 BC) to the Late Classic (AD 550-900), however, its greatest use may have occurred during the Early Classic period (AD 250-500). The discovery of nearly 500 hieroglyphic inscriptions and 44 painted figures represents one of the most impressive and important finds in Maya cave archaeology. This collection of Maya cave imagery provides “a new context for the interpretation of Maya art and writing” (Brady and Stone 1986:19).

The various passageways of Naj Tunich also produced several other interesting features. A system of retaining walls and an artificially constructed, two-tiered balcony were among a few of the modifications present in the cave. The skeletal remains of 20 individuals, including four children and four juveniles were also found in the cave. The skeleton of a young child (5-6 years) was recovered from a shallow grave. The child’s skull has “three holes that show no signs of healing,” which Brady and Stone (1986:22) attribute to the ritual sacrifice of the young individual. The presence of elite burials was

based on the identification of three tombs constructed out of limestone blocks and their associated artifact assemblages. Brady and Stone (1986) argue that the detailed artwork and glyphic texts, the artificial modifications of the cave, and the diverse artifact assemblages suggest that Naj Tunich once served as a final resting place for the elites of a local population.

Settlement configuration

The concept of geomancy involves the incorporation of the artificial environment (monuments, plazas, etc.) with that of the natural environment (Carlson 1981). This concept requires forethought, civil planning, and a sufficient labor force. The Maya appear to have been very cognizant of their natural surroundings, and this awareness is exemplified in several sites. For example, the Maya exploited natural landscapes, i.e. bodies of water, deep chasms, etc., as defense mechanisms. The planning of sites such as Aguateca and Punta de Chimino clearly incorporated the natural environment into a settlement configuration that was easily defended. However, a highly defensible post was not the only consideration in a site's location. We also see the integration of natural landmarks such as caves in the settlement configuration of sites such as Dos Pilas.

Dos Pilas

The Petexbatun Regional Cave Survey was a subproject of the larger Petexbatun Regional Archaeological Project headed by Vanderbilt University. The goal of the former was aimed at the systematic investigation of the role of caves in prehistoric Maya sacred geography (Brady 1997). More specifically, the project focused its energy in

better understanding the vast cave system directly associated with the site of Dos Pilas. A study of the settlement configuration of Dos Pilas showed a correlation between caves and the major architecture of the site. This would suggest that the Maya intentionally planned and erected structures of importance directly above or in close proximity to the system of caves in the area. For example, the largest ceremonial structure, the El Duende complex, is situated directly above an underground spring that runs through Cueva de Río El Duende (Brady 1997) (Figure 2). According to Brady (1997:614),

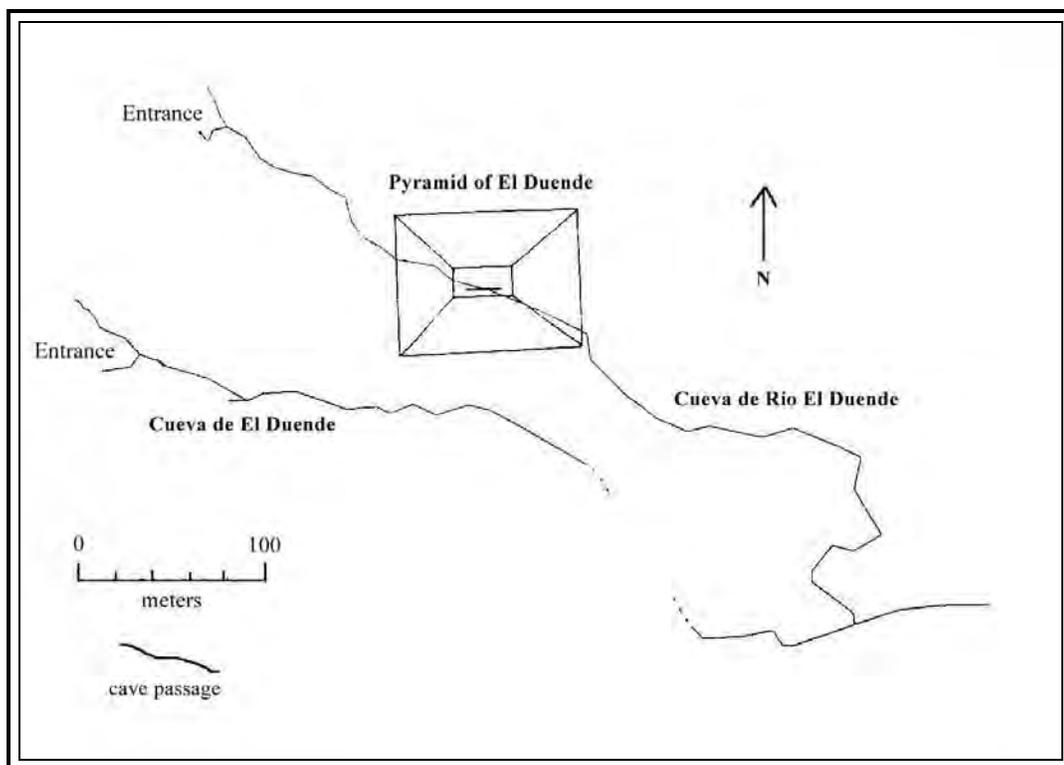


Fig. 2. Map of El Duende pyramid in relation to Cueva de Río El Duende. The settlement configuration of Dos Pilas demonstrates the intentional placement of the site's main ceremonial structure above Cueva de Río El Duende (After Brady et al. 1991: Figure 37.21).

when a structure is placed over or in close proximity to a cave, the “surface architecture becomes an extension of and interwoven into the sacred landscape.” The surface structure and the associated cave become a “cave complex.” For this reason, Brady (1997) believes this pattern of cave utilization is more widespread in the Maya area. This type of settlement configuration has been identified in Maya (e.g. Mayapan, Chichen Itza, Las Pacayas), as well as non-Maya sites (e.g. Teotihuacan). Documentation of man-made caves throughout Mesoamerica also points to the importance of these subterranean spaces in regions where caves do not naturally occur (Brady 1997).

The extensive system of caves at Dos Pilas has also procured ceramic assemblages dating back to the Preclassic. This suggests that these subterranean spaces were important features before the rise of Dos Pilas as a dominant regional polity (Brady 1997:610). This belief of the cave as ritual and sacred space clearly manifests itself in the Late Classic construction of major architecture over the vast system of caves associated with the site, as well as the intentional deposition of human remains throughout these caves.

Human skeletal material

The discovery of human remains within a niche or in a pool of water is not an uncommon find in the caves of the Maya area. Deposits of human skeletal material of varying size and states of preservation have been found in virtually all caves in the Maya area that show evidence of human use (Gibbs 2000, Owen 2002, Pendergast 1971, Rue et al. 1989). Sites such as Talgua Cave in northeastern Honduras demonstrate that burial

or deposition of human remains within a cave represents a pan-Mesoamerican phenomenon that occurred before the rise of the Maya culture. Moreover, the placement of human remains in caves clearly demonstrates an act of intentional deposition within a sacred context. However, the interpretation of these remains focus around the Maya as practitioners of sacrificial acts and/or a people that ritually venerated their dead. As we shall see in the following descriptions, the archaeological context, age and sex distributions, the position and treatment of the remains, and the presence of associated grave goods, are a few of the considerations that must be examined when determining the agents responsible for the deposition of human remains in the context of a cave.

Gordon's Cave

The four caves first explored and investigated by George B. Gordon in the late 19th century are located 3 km north of the site of Copán in the Sesesmil River Valley, Honduras. Gordon's (1898) initial investigations of Cave #3 documented ceramics that date to the Middle Preclassic and a chamber, which contained a large quantity of human remains. In 1983, several members of the Proyecto Arqueológico Copán, Phase II revisited Cave #3 in order to reexamine the cave's stratigraphy and collect pollen samples (Rue et al. 1989). Their archaeological efforts produced evidence of the cave's minimal Late Classic utilization and confirmed the use of the third chamber as a possible ossuary for the cremated remains of several individuals (Rue et al. 1989:398). An analysis of the skeletal material estimated 68 individuals: 22 adults and 46 juveniles. More than half of these subadults (24) were less than one year of age (Rue et al. 1989:398).

The Copan Ritual Caves Project launched a study in 1991 designed to reassess the chronology and utilization of Gordon's Cave #3. Further excavations and a reanalysis of the ceramic material revealed that the cave's most intense use occurred during the Classic period (Brady 1995). This ceramic analysis also disproved the "supposed hiatus in cave use between the Middle Preclassic and Late Classic" (Brady 1995:34). An excavation in the first chamber uncovered six burials. This indicates that the cave's role as an ossuary was not limited to the third chamber (Brady 1995:36). Furthermore, Brady (1995) interprets the uncremated remains of several children six years and younger as possible offerings for the cremated adults deposited in this third chamber. The palynological, skeletal, and artifactual evidence from Cave #3 point to a style of ritual cave use similar to one utilized in the Guatemalan highlands (Brady 1995).

Barton Creek Cave

Barton Creek Cave site consists of a large river cave and a group of 15 residential mounds located in near Barton Creek in the Cayo District, Belize. Investigations of the site were concentrated on the cave itself. Within the first 450 m of the cave, most of the cultural material was concentrated on ten ledges above the underground river (Owen 2002:64). Six of these ledges contained human remains, whereby a minimum number of 31 individuals were estimated from the skeletal sample deposited on these ledges. Ceramic and non-ceramic artifacts were also found with the skeletal remains; however, there is no evidence to suggest that these represent grave goods per se (Owen 2002). Several lines of evidence suggest that the individuals represented in the skeletal sample were sacrificial victims, not individuals interred in the cave for purposes of continued

ancestor veneration. For example, several clusters of skeletal material contained semi-articulated elements, which facilitated in the interpretation of the body's relative position after death. The position and orientation of the remains were not in accordance with the positioning of an interred body. Furthermore, a general lack of grave goods may suggest an activity not associated with the intentional burial of several individuals. The skeletal material consisted mostly of children and young adults. Owen (2002:131) posits that these individuals represent sacrificial victims, not the physical remains of ancestors that were venerated within the context of these caves.

Aktun Tunichil Muknal and Aktun Uayazba Kab

These two caves are approximately 700 m apart from each other and are located along a limestone ridge in the Roaring Creek river valley in Western Belize. Analyses of the human remains recovered from these caves indicate that two different activities were conducted in each cave. The remains of 14 individuals, six of them infants (0-3 years), were found in crevices, niches, and pools of water throughout Aktun Tunichil Muknal. All the infants and a young child (seven years old) show evidence of possible trauma to their skulls, which may also represent the result of taphonomic processes (Gibbs 2000:95). Moreover, all of the skeletal elements were found in secluded areas away from "presumed 'pathways' within the caves" and deposited on the surface in a "haphazard" nature" (Gibbs 2000:147). The cultural material associated with the remains was not interpreted as representing grave goods intentionally placed with interred individuals (Gibbs 2000). With this, Gibbs (2000:146) suggests that several of these individuals, especially the remains of the six infants and young child, represent

sacrificial victims. The identification of infant remains in caves is not a rare occurrence. Caves that have produced infant remains include Talgua Cave (Brady et al. 1995), Eduardo Quiroz Cave (Pendergast 1971), and Naj Tunich Cave (Brady and Stone 1986). Given this information, Gibbs (2000) believes that Aktun Tunichil Muknal was the site for a number of sacrificial acts.

The human remains recovered from Aktun Uayazba Kab tell a different story. Unlike the remains of the previous cave, the individuals in this sample were located in closer proximity to the cave entrance. The remains of one adult and one subadult were surface collected from the “Histo Chamber,” and the “Burial Alcove” produced seven burials. Semi-articulated skeletal remains were associated with grave goods such as obsidian blades, pyrite, lithic flakes, crystal quartzite, etc. (Gibbs 2000). Unlike the remains found within the inner depths of Aktun Tunichil Muknal, the individuals from Aktun Uayazba Kab were clearly buried with various grave goods. Gibbs (2000) interprets the individuals interred in this cave as the venerated ancestors of a lineage group or a local community. The burial and veneration of the dead was and still is a common practice throughout the Maya area. The utilization of a cave as a final resting place for revered ancestors represents another important role of the cave as sacred or ritual space.

These cave descriptions are intended to demonstrate the various lines of evidence that illustrate cave use by the Maya. This information is the basis for my investigation, which will focus on the specific treatment of the human skeletal material exhumed from the caves of the Petexbatun region. Through a quantitative skeletal analysis of the

sample, I aim to establish the predominance of secondary deposition/burial treatment of the remains deposited throughout the extensive cave system associated with Dos Pilas.

The following chapter is a detailed description of the materials and the methodology employed in this current investigation.

CHAPTER III

MATERIALS AND METHODS

Skeletal sample

Between 1990 and 1993, more than 30 caves were mapped and surveyed during the Petexbatun Regional Cave Survey. A significant amount of time and archaeological effort was focused on the meticulous exploration and investigation of the extensive cave system underneath the Maya site of Dos Pilas. These caves produced abundant evidence for cave use by the ancient Maya. Over the duration of three field seasons, artifactual material, artificial constructions, and human and faunal remains were documented from six of these caves. The five caves associated with Dos Pilas - Cueva de El Duende, Cueva de Río El Duende, Cueva de Río Murciélagos, Cueva de Sangre, and Cueva de Kaxon Pec – are all interconnected via a subterranean river system. The sixth cave, Cueva de Los Quetzales, is separated from the main cave system and is located approximately 12.5 km southeast of Dos Pilas. It is believed that Cueva de Los Quetzales is somehow connected to this extensive river system, though the passages that might join them have not been identified. Every one of these caves varies in size and dimension, geomorphology, and most importantly, their respective artifact assemblages and the agents responsible. The physical environment and the artifactual material are important elements to consider in the interpretation of these remains, however, this thesis will concentrate on the analysis of the human remains. Detailed descriptions of each cave and their respective artifact and skeletal assemblages will follow this chapter.

The sample from the six caves of the Petexbatun region constitutes one of the largest collections of human skeletal material recovered in the Maya area. The largest quantities of skeletal material were deposited in Cueva de Sangre and Cueva de Río El Duende. As previously stated, the latter cave is situated underneath the largest structure of Dos Pilas, the pyramid of El Duende. The significance of this will be discussed in a future chapter. Relatively smaller deposits were recovered from the other four caves. Overall, each cave yielded a unique skeletal sample, however, there are certain bony elements that occurred consistently throughout the cave system. For instance, long bones such as femurs are the most abundant skeletal element found in the caves. Cranial material and vertebrae are also well represented in certain caves. A larger proportion of fragmentary and incomplete bones certainly outnumber the few complete and nearly complete elements recovered from these caves.

The harsh effects of the subterranean environment of the caves are evident on many of the skeletal elements. For example, several bones were encased in a layer of calcium carbonate deposits. These deposits actually aid in the preservation of the bones, however, they hinder any accurate measurements of these elements. The fluvial action of the river system during the rainy season also changed the physical appearance of many bony elements, including significant wear, polishing, and staining. Evidence of animal disturbance, i.e. gnaw marks, are also apparent on several bones. This type of activity is not uncommon in an underground setting. However, the identification of possible cut marks indicates intentional post-mortem treatment of secondarily deposited/buried individuals or possible sacrificial acts.

Inventory

My analysis began with a thorough inventory of the skeletal collection on loan from Guatemala; no further excavation in the caves of Dos Pilas was necessary. Unfortunately, the collection I analyzed does not contain the entire sample recovered from these caves. An inventory of the skeletal material and estimates of the minimum number of individuals for the first operation of Cueva de Sangre are included in the preliminary report by Brady et al. (1991). Several elements recovered from the four other caves were not exported from Guatemala for study and are documented in Wright's unpublished notes (1994). My skeletal analysis has accommodated for this incomplete sample by including the material described in these reports with the sample I examined, specifically the calculation of the number of identified specimens (NISP) for each cave.

The inventory includes the identification and side of each skeletal element. I excluded from the analysis small fragments and bones that were too fragmentary to identify. There were instances where I pieced several bone fragments to form an identifiable long bone shaft or a nearly complete cranium or cranial bone. I also recorded a detailed description of each skeletal element. For instance, I noted the portion and proportion of the bone present, as well as any other pertinent information that could be gleaned through a basic observation of the bones, i.e. evidence of bone modification, animal gnawing, extreme staining and polishing, pathology, etc.

I determined the age and sex of each skeletal element when possible. A large proportion of the bony material is too fragmentary to be analyzed. This made age and

sex assessments difficult for a large proportion of the sample. However, I was able to assign a probable sex for a number of skeletal elements based on skeletal landmarks discussed by Steele and Bramblett (1988), i.e. greater sciatic notch of the pelvis, gonial angle and overall robustness of the mandible, etc. I also used metric dimensions to assess the sex of adult skeletal elements, whenever possible. I based age estimates on several skeletal characteristics: overall bone size, epiphyseal fusion in long bones, tooth eruption, and cranial suture closure (Bass 1995, Johnston 1962, McKern and Stewart 1957, Ubelaker 1978). Good preservation of the skeletal material was crucial in accurate age and sex estimates.

The entire skeletal sample represents both adults and subadults. A “subadult” is a general categorical term that includes infants (0-2 years), young children (3-5 years), older children (6-12 years), and adolescents (13-24 years) (Steele and Bramblett 1988). For this particular collection, most of the smaller skeletal elements were categorized as subadults because these bones could not be placed in a specific age group. However, evidence of epiphyseal fusion, dental eruption, and cranial suture closure was documented in the inventory of the skeletal sample, and used in the age estimation of a few children and adolescents. Several adult males and females were also identified from the deposits of skeletal material. The demographic information gleaned from this large skeletal sample is especially important in the interpretation of who and why these individuals were being deposited in these caves.

The estimation of the minimum number of individuals for each cave deposit is imperative in an accurate interpretation of the possible depositional activities

responsible. A precise methodology was developed through an analysis of one of the smaller cave deposits. Two estimates of the minimum number of individuals (MNI) were conducted for this particular cave. These MNI estimates were calculated according to the basic levels of investigation and documentation utilized in each cave. Before I discuss the specific details of my methods, it would be beneficial to explore the general concept behind the estimation of the minimum number of individuals.

Methods – NISPs and MNIs

The identified specimen, i.e. a tooth, bone fragment, etc., represents the basic counting unit used in the quantification of the relative abundance of skeletal elements in an assemblage, faunal or human (Grayson 1984:17). In terms of faunal remains, the number of identified specimens (NISP) of a particular assemblage corresponds to the relative abundance of a particular species present. For example, 50 right and 25 left deer femora may represent a maximum estimate of 75 animals. This technique of quantifying the abundance of a particular skeletal assemblage has undergone scrupulous criticism over the years (see Casteel 1977, Klein and Cruz-Uribe 1984, Plug and Plug 1990). Despite the inherent problems of this method, the information that can be gleaned from the estimation of NISPs is imperative in the calculation and interpretation of relative skeletal element frequencies and minimum number of individuals (MNI).

The minimum number of individuals, or MNI, is an estimate of the smallest number of individuals that could account for a given skeletal sample. For example, four left humeri and two right humeri would render an MNI of four individuals, whereas an estimate based on the number of identified specimens would render a figure of six. One

important element in the estimation of MNIs is the general assumption that a left and right humerus *could* derive from the same individual. Several other methods must be considered in the estimation of the most accurate MNI estimates. This first method was originally proposed by T.E. White, whereby “the higher of the left- and right-side counts is then taken as the smallest number of individual animals which could account for the sample: the minimum number of individuals” (O’Connor 2000:59). This is the basic technique I used in the above example. An alternative method involves the summation of the total number of specimens and dividing by two (Klein and Cruz-Urbe 1984). The last technique entails the “matching” of skeletal elements, whereby size, sex, and/or age criteria are used to determine the possibility of two or more skeletal elements deriving from the same individual (Klein and Cruz-Urbe 1984). O’Connor (2000:59) states that “most MNI calculations attempt to take account of pairs, requiring efforts to match left- and right-side specimens until the analyst is satisfied that only specimens which derived from the same individual have been paired up...” I used a modified version of this last method in my analysis of the skeletal deposits from each of the caves, as well as a more general approach.

Many skeletal assemblages are composed of fragmentary elements. This represents a serious issue that must be considered when calculating MNIs. According to Klein and Cruz-Urbe (1984), skeletal fragments may be ignored, treated as complete bones, or recorded as fractions of complete bones. With the third option, fragments of a skeletal part are summed up and added to the number of complete bones. For example, three complete tibiae, half a tibia, and another third of a tibia would give a value of 3.83.

After rounding up to the highest whole number we would render an MNI of four individuals. Another means to increase the number of bones scored would involve a count of discrete bone regions of the fragmentary material. In many cases, the skeletal material is too fragmentary to be considered in any accurate estimation and would thus be disregarded from the sample. An exact estimate of the individuals represented in a given skeletal sample is nearly impossible to ascertain. Nevertheless, the calculation of NISP and MNI estimates are reasonable methods to consider.

These methods were developed and are still widely utilized within the sub-field of zooarchaeology, however, bioarchaeologists have applied these procedures in their own investigations. For example, Tim White (1992) calculated and interpreted the information collected from the MNIs and NISPs in his study of prehistoric cannibalism among the Anasazi of the Mancos Canyon site. Despite the theoretical shortcomings of these methods, they can still provide the investigator with a complimentary estimate of the number of individuals represented in a particular skeletal assemblage.

My quantitative analysis of the various skeletal deposits began with a basic assessment of the total number of identified specimens for each cave. The additional material documented in Brady's preliminary report (1991) and Wright's unpublished notes (1994) are included in these NISP calculations. The Appendices list the sample I studied including Wright's unpublished notes (1994). The NISPs are used to calculate the relative skeletal element frequencies for each cave in order to evaluate the types of depositional activities that may have occurred. The interpretation of the NISPs and the relative skeletal element frequencies will be discussed in more detail in Chapter VII.

Unlike the NISPs, the MNI estimates were divided according to three basic levels of investigation and documentation of the cave. Each cave was subdivided into lots, sub-operations, and operations during fieldwork, where the lot represents the smallest unit and the operation, the largest. These subdivisions are different for each cave, yet there are certain characteristics used to differentiate between these levels. For instance, large chambers, main passageways, and the openings of caves may represent an operation. This operation, in turn, may contain several lots represented by natural features such as restrictive openings, balconies, small alcoves, as well as artificial constructions and modifications of the natural cave setting, i.e. altars, plastered floors, etc. I calculated MNIs considering bone assemblages as discrete groups at the various levels, and in certain cases, I considered the cave as a whole unit. Every cave presented a unique context whereby different units contained varying amounts of cultural and skeletal material. Natural processes responsible for the formation of a cave's specific archaeological record were also considered when calculating the minimum number of individuals. These include the proximity of lots to one another, evidence of skeletal material displaced by water or other agents, as well as looting. Consideration of these issues allow for the most accurate estimation of the minimum number of individuals represented by the skeletal material found in each cave.

The calculation of the minimum number of individuals for each cave consists of two separate estimates: the minimum number of individuals (MNI) and the probable number of individuals (PNI). The first estimate, or MNI, is a general calculation that takes into account the age and sex of the skeletal elements. As stated previously, adults

and subadults are differentiated based on several osteological features. Both metrically and morphologically sexed bones are included in this calculation. However, the overall size and robusticity of a bone was not considered for adult skeletal elements that do not have sexually diagnostic morphology. The second estimate, or PNI, is a modified calculation of the first general estimate whereby adult and subadult skeletal elements are paired based on their overall size and robusticity. The age and sex of the bones is still considered in this estimate. The calculation of the PNI considers the possibility of a right femur or humerus matching up with its left counterpart, thus representing a single individual. Given the small likelihood of finding paired antimeric elements in a sample of disarticulated and commingled remains, the PNIs should produce slightly larger estimates than the MNIs. These estimates will provide a demographic profile of each cave and indicate whether the various skeletal samples are the product of intentional deposition or the accumulation of material via taphonomic processes over time. It must be noted that the figures and calculations rendered in this investigation are educated estimates and should be treated as such.

Bone modification

Skeletal elements with some evidence of bone modification, i.e. cut marks, animal gnawing, dental mutilation, etc., were carefully studied and compared with other documented cases of similar activity. The correct identification of cut marks will be the first step in this analysis. This involves a careful examination of the few skeletal elements with some indication of cut marks. Evidence of animal gnawing is also explored in order to differentiate between the morphology of these two types of

modification. Photographs and microscopic analysis are utilized in this investigation. I assess a number of possible agents and/or activities responsible for the cut marks. These data will be used to evaluate several possible reasons that cut marks might occur: 1) the primary burial of select individuals, e.g. war victims; 2) sacrificial acts involving the dismemberment and deposition of an individual; 3) secondary burial activity and associated post-mortem cleaning/processing or disarticulation of the body; or 4) acts of cannibalism. The type of bone and the anatomical location of the cut mark(s) are crucial elements in this analysis. For instance, a cut mark located on a specific part of the bone may point to an activity that removed the soft tissue from a bone. A femur that was connected to a hipbone may have cut marks in the area of the joint articulation. This may be evidence for the dismemberment or disarticulation of a secondarily buried person or a sacrificial victim. Evidence of bone modification can present itself on any part of the bone, thus necessitating careful analysis and interpretation.

The archaeological, ethnohistorical, and ethnographical documentation of the mortuary and sacrificial practices of the Maya, past and present, is also a good source of information that may compliment this examination of bone modification. This information is pertinent in the interpretation of who these individuals were and why they were placed in these caves.

Maya mortuary practices

The ancient Maya did not physically sequester the dead from the rest of the community, as is the case in modern-day western burial practices (McAnany 1995).
Archaeological and ethnohistorical documentation on Maya mortuary practices

demonstrate the practice of interring the dead in close proximity to living spaces. For example, the Maya buried the dead underneath house platforms, in residential shrines, within large funerary structures, below plazas, and in caves. According to McAnany (1995:1), the means of communication between the living and the dead were maintained through a “complex series of rituals and sacrilization of places.” The Maya understood the importance of maintaining a physical closeness to their ancestors in an active attempt to preserve the relationships between the living and the dead. The influence of the deceased in the realm of the living did not expire with the physical body. In the Maya world, the living and the dead co-exist in a custom known as “living with the ancestors” (McAnany 1995:1). The deceased represent ancestral ties to the land established over time through the proliferation of familial lineages and the veneration of ancestors. This interrelation between the living, the dead, and the land occurs in the archaeological record as the mortuary practices of the Maya.

Primary burial

A primary burial generally involves the interment of one or more complete and/or articulated individuals in a number of grave types. Smith (1972:212) defines burials as “interments of human skeletal material with or without associated objects in a grave.” A grave is a specific type of receptacle designed to accommodate the dead (Welsh 1988). Different Maya grave types include simple interments, chultunes, cists, crypts, and tombs. The remains of a complete or incomplete skeleton may represent the primary interment of an individual. For example, decapitation and/or skeletal mutilation may have occurred at or immediately after the death of an individual and before

interment. There is evidence that suggests the heads of captives were taken as trophies during campaigns of war. Acts of peri- or post-mortem dismemberment and the subsequent burial of the individual represent activities that may occur before death and/or interment.

Secondary burial

A secondary burial is another form of mortuary practice documented not only in the Maya area, but also throughout the world. This type of interment includes the exhumation of remains followed by re-burial or deposition in a different place. According to Hurlbut (2000:11), secondary interments may occur in a number of contexts, which include mass graves or ossuaries, individual graves, urns, or bundle burials. Becker (1988:126) posits that the Maya may have intentionally selected certain skeletal elements that were “more representative of the total remains of an individual than other bones” because of their “recognizability” and/or “religious or ceremonial value.” Elements such as the skull and long bones (femur, tibia, humerus) may have been preferred because of their larger size. This would facilitate easier transport and re-burial. However, the process of exhumation and re-burial may have warranted additional processing of the skeletal material.

Secondary burial activity may involve post-mortem alteration of the remains, which includes intentional disarticulation and defleshing of bony elements (Hurlbut 2000). The Maya may have allowed a primarily interred body to decompose before its exhumation, post-mortem manipulation (if necessary), and secondary interment. The Maya may have removed residual tissue if the body had not fully decomposed.

Implements such as stone tools may have facilitated the disarticulation and/or defleshing of a semi-decomposed body. An ossuary also falls under the category of a secondary burial. This type of burial entails the act of exhuming and reburying skeletal remains in order to accommodate the burial of other individuals. This usually involves the intentional rearrangement and relocation of skeletal material in a different location.

Human sacrifice

The act of human sacrifice represents an important pan-Mesoamerican theme that occurs in the art, iconography and writing of the ancient Maya. Bioarchaeological and ethnohistorical records have also contributed to the growing corpus of evidence substantiating the practice of human sacrifice in the Maya area. For instance, osteological studies of human remains have documented skeletal evidence for human sacrifice (Blos et al. 2002, Massey and Steele 1997). Welsh (1988:144) asserts that “evidence for sacrifice consists primarily, though not exclusively, of skeletal mutilation.” Evidence of mutilation includes bodily injury (trauma) or the intentional removal of a body part (decapitation, cutting off fingers, etc.) (Welsh 1988). However, mutilation may also include any activity that leaves some identifiable mark on a skeletal element, i.e. cut marks. This does not imply that every cut mark qualifies as evidence for human sacrifice.

The interpretation of human sacrifice via cut marks is akin to the examination of secondary burial, whereby the anatomical location of cut marks is a very crucial point of analysis. Death by decapitation is a common form of human sacrifice documented in the Maya area. Osteological evidence indicating decapitation and flaying of sacrificial

victims (Pagden 1975) manifests itself as cut marks on the skull and the first cervical elements of the vertebral column (C1-C3). Massey and Steele (1997:73) found deep cuts on the fragments of two children's cervical vertebrae, which they attribute to "unsuccessful efforts to decapitate the victim." Moreover, there are several lines of evidence to suggest that the cranial remains of 20 adults and 10 young children from the skull pit in Colha represent the victims of religious sacrifice. First, the demographic composition of the sample consists of both sexes and various age groups, which Massey and Steele (1997) argue as resembling a group of incomplete nuclear families with some symbolic importance. Second, the identification of cut marks on the skulls suggests that the victims were decapitated, flayed, and buried in a manner similar to Maya sacrifice. Thirdly, the close proximity of the skull pit next to a monumental structure may also point to possible religious sacrifice. Finally, the placement of the older individuals above the remains of the younger adults may illustrate a "pattern based on deference and respect" (Massey and Steele 1997:76).

Cut marks that suggest human sacrifice may also occur in other anatomical locations of the body. An archaeological investigation in Templo XIII-sub in Palenque exhumed and analyzed the remains of three individuals. The skeletal remains represent an older female individual accompanied by a child (8-10 years old) and a young woman (Blos et al. 2002). The authors posit that the two younger individuals represent sacrificial victims interred with the older adult. An osteological examination of the skeletal material uncovered cut marks on the child's third cervical vertebra and the young woman's ribs and several vertebrae. Blos et al. (2002) suggest that the sacrifice

of the young woman involved the ritual extraction of her heart evidenced by the cut marks on the ribs and vertebrae.

Multiple burials occasionally contain the remains of an adult accompanied by one or more subadults as evidenced in the abovementioned burial. The interpretation of this burial type as an example of human sacrifice may be problematic. However, there is evidence of adult and subadult individuals interpreted as possible sacrifices in ritual settings. Pendergast (1971) identified the primary burial of a three to five year old child in Eduardo Quiroz Cave, Belize. Pendergast (1971:113) tentatively posits that the child may represent “a human sacrifice as a constructional offering...” based on the location of the burial and the identification of two small holes in the right parietal bone. He then goes on to say that it is difficult to assess whether the child represents a sacrificial offering or a simple primary burial. The Cenote of Sacrifice in Chichen Itza contains one of the most well known skeletal deposits, which is often interpreted as the remains of sacrificial victims thrown into a deep sinkhole as an act to appease the gods (Hooton 1940, Tozzer 1957). Furthermore, the skeletal remains of several subadult individuals recovered from Barton Creek (Owens 2002) and Actun Tunichil Muknal (Gibbs 2000) may represent sacrificial victims. These interpretations are based on several key elements: 1) the haphazard deposition of several semi-articulated bodies is not in accordance with traditional burial practices; 2) there is a general lack of grave goods directly associated with the remains; and 3) the remains of several infants and a young child contain evidence of possible trauma to the skull.

CHAPTER IV

SITE DESCRIPTIONS

The area known as the Petexbatun region is located in the Pasión River valley of the southwestern Peten district of Guatemala. The Salinas River to the west and the Riachuelo Petexbatun to the east flank major Maya sites such as Dos Pilas, Tamarindito, and Aguateca. The region consists of Late Cretaceous-Early Tertiary carbonate and clastic rocks. Over time, these rocks have faulted and resulted in horst and graben formations. The faulting and erosion of the horst uplands have created geologic features such as steep gorges, deep streams, extensive cave systems, and sinkholes. Low-lying areas of the Petexbatun tend to flood due to the high regional water table, backflows from the larger Pasión River, and the 2,500 mm of annual precipitation that falls from May to December (Dunning et al. 1997).

Between 1990 and 1993, over 30 caves were investigated during the Petexbatun Regional Cave Survey. Archaeological efforts were primarily focused on the extensive cave system associated with the site of Dos Pilas. Seven caves were mapped and surveyed in detail over the period of three field seasons. The following chapter will focus on the physical description of six of these caves, paying close attention to the geomorphology of each cave, artifact assemblage, the deposition of human remains, evidence of cultural modifications, etc. The descriptions are presented in a west to east order across the site of Dos Pilas, beginning with Cueva de El Duende and ending with Cueva de Los Quetzales (Figure 3). They will follow the direction of the river system that flows through the entire cave system during the rainy season.

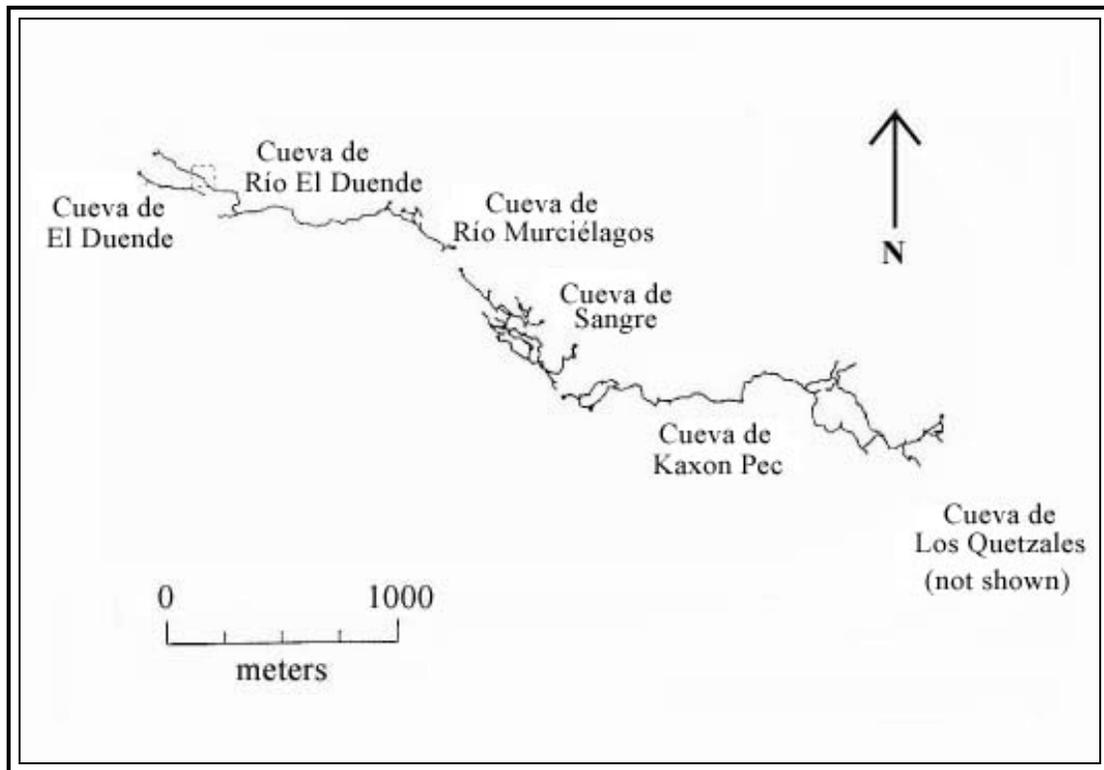


Fig. 3. Caves of the Petexbatun. The caves associated with Dos Pilas extend from Cueva de El Duende to Cueva de Kaxon Pec. Cueva de Los Quetzales, which is 12.5 km southeast of Dos Pilas, is not directly associated with this extensive cave system (After Brady et al. 1991: Figure 37.1).

Cueva de El Duende

Cueva de El Duende is a 300 m-long cavern that runs parallel to the northern branch of Cueva de Río El Duende. Henceforth, Cueva de El Duende will be recognized by the code CD. This cave is located in close proximity to the largest ceremonial complex of the site of Dos Pilas, the pyramid of El Duende. George Veni and Allan Cobb mapped and surveyed the cave during the 1990 field season (Figure 4). The exploration of the cave was divided into three operations. The first operation (Operation

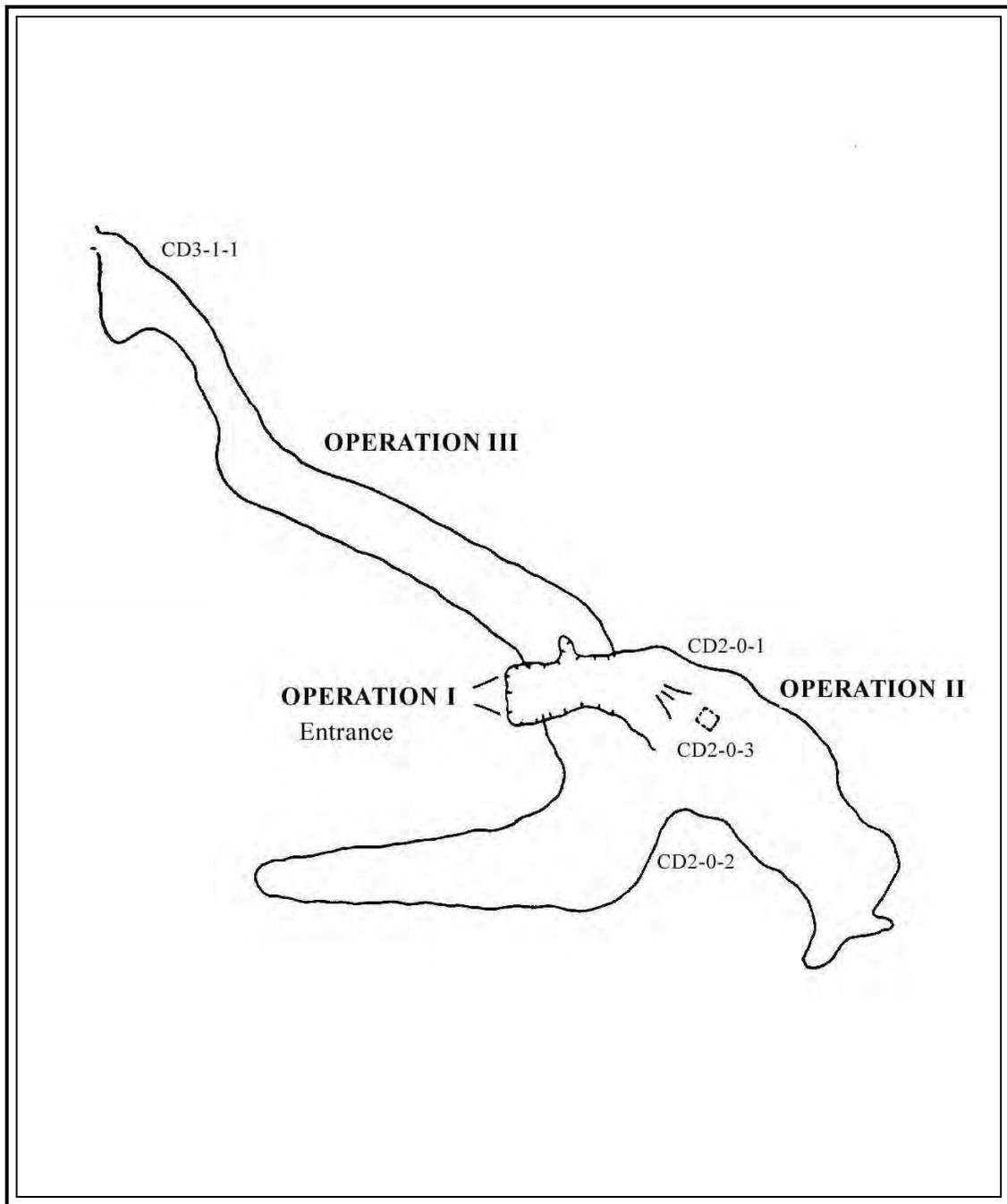


Fig. 4. Map of Cueva de El Duende. The main entrance is located in Operation I; the other two operations were excavated during the 1990 field season. Operation IV (not shown) was excavated during a later field season (After Brady 1990a: Figure 17.1).

I) consisted of an excavation in a steep incline that extended from the cave entrance to the first room of the cave. This initial area received plenty of natural light. The following operation (Operation II) consisted of excavations in a large, dry room, which contained the largest proportion of surface artifacts found throughout the cave. Two large holes at the north end of the room were interpreted as the disturbance of looters (Brady 1990a:336). The final operation (Operation III) consisted of two large tunnels with low ceilings. This portion of the cave system was designated as the official “dark zone” of the cave. The muddy floor was evidence of flooding, most likely during the rainy season (Brady 1990a). Many artifacts were buried underneath this layer of mud. Each operation will now be considered in more detail.

Operation I – The remains of a stone construction were discovered under a mound of rocks in front of the cave entrance. A surface collection of the area produced artifactual material, as well as worked stone from under these rocks. According to Brady et al. (1991:680), the worked stone may represent an attempt to close off the only entrance to this cave during its use in antiquity. After passing through a wide cave entrance, a depth of 7 m was traversed on a 10 m descent from the cave entrance to the floor of the first room. Suboperation CD1-01 was the continuation of a surface survey that sought the remains of a staircase that was thought to have led into the cave. Unfortunately, these stairs were never uncovered. An area 2.5 x 3 m was surface collected on the west side of the cave entrance. Ceramic sherds dating to the Late Preclassic and Early Classic periods were found at a depth of 1.5 m (Brady et al.

1991:680). A few human remains were excavated from a 2 x 2 m pit in this first room. This pit was 2 m from the main entrance, and was divided into two sides by a row of rocks: “A” (east) and “B” (west).

Operation II – This operation was accessible through a south entrance that led into two large tunnels. These tunnels constituted the main room or chamber of this cave. Brady et al. (1991:680) describes the cave as “plenty big, but not very tall,” the ceiling reaching a maximum height of 5 meters in some places. The exact dimensions of this portion of the cave were not provided in the preliminary report. Two surface lots (CD2-0-1 and CD2-0-2), each 2 x 2 m, were excavated. Two looting pits were also discovered in this area. A 30 x 40 cm test pit (CD2-0-3) was excavated in the larger of these two looting pits. Large quantities of ceramic were found in a layer of dark brown soil underneath a layer of sterile, yellow clay found throughout the cave floor. After a depth of 65 cm, the artifact density decreased. A larger excavation of the entire chamber was also conducted, producing artifacts as well as small concentrations human and faunal remains. Some of the artifacts include portions of whistles, worked stone, bone implements, shell, spear points, obsidian blades, and flint pieces. Most of the ceramic collected in this operation pertained to the Late Classic period (Brady et al. 1991).

Operation III – This portion of the cave represents the “dark zone” of Cueva de El Duende. Human and animal remains were collected from the north end of Lot CD3-1-1. According to Brady (1990a:336), the human remains may represent at least two individuals: a child and an adult individual.

Cueva de Río El Duende

Cueva de Río El Duende is situated directly underneath the main ceremonial structure of El Duende. This cave extends southward until it connects with Cueva de Río Murciélagos. Cueva de Río El Duende will be referred to by the code CNP, hereafter. Approximately 1.3 km of the cave was successfully mapped during the 1993 field season (Figure 5). According to Brady (1994:533), Cueva de Río El Duende should connect to the smaller cave of Cueva de Murciélagos to the north, however a passage connecting the two caves was never discovered. This cave produced one of the larger deposits of human skeletal material. All of the bony elements were recovered by a simple surface collection. In a preliminary report, López (1994:659) identified and described several femurs and other bone fragments, especially long bones. A few of the skeletal elements were covered in deposits of calcium carbonate, which proved beneficial in the preservation of the remains. A total of 65 individuals were calculated for this cave (López 1994: 672). Most of the remains pertained to adult individuals, however there was evidence of children and juveniles (López 1994:672).

Cueva de Río Murciélagos

Cueva de Río Murciélagos is located 2.5 km southeast of Dos Pilas. Approximately 350 m of passages were mapped and surveyed during the 1993 field season. A connection between Cueva de Río Murciélagos and Cueva de Sangre was never found during the cave explorations. The code CRM will be used to refer to Cueva de Río Murciélagos. A test pit (1 x 2 m) was excavated at the entrance of the cave in order to establish a stratigraphy based on the ceramic material recovered. This

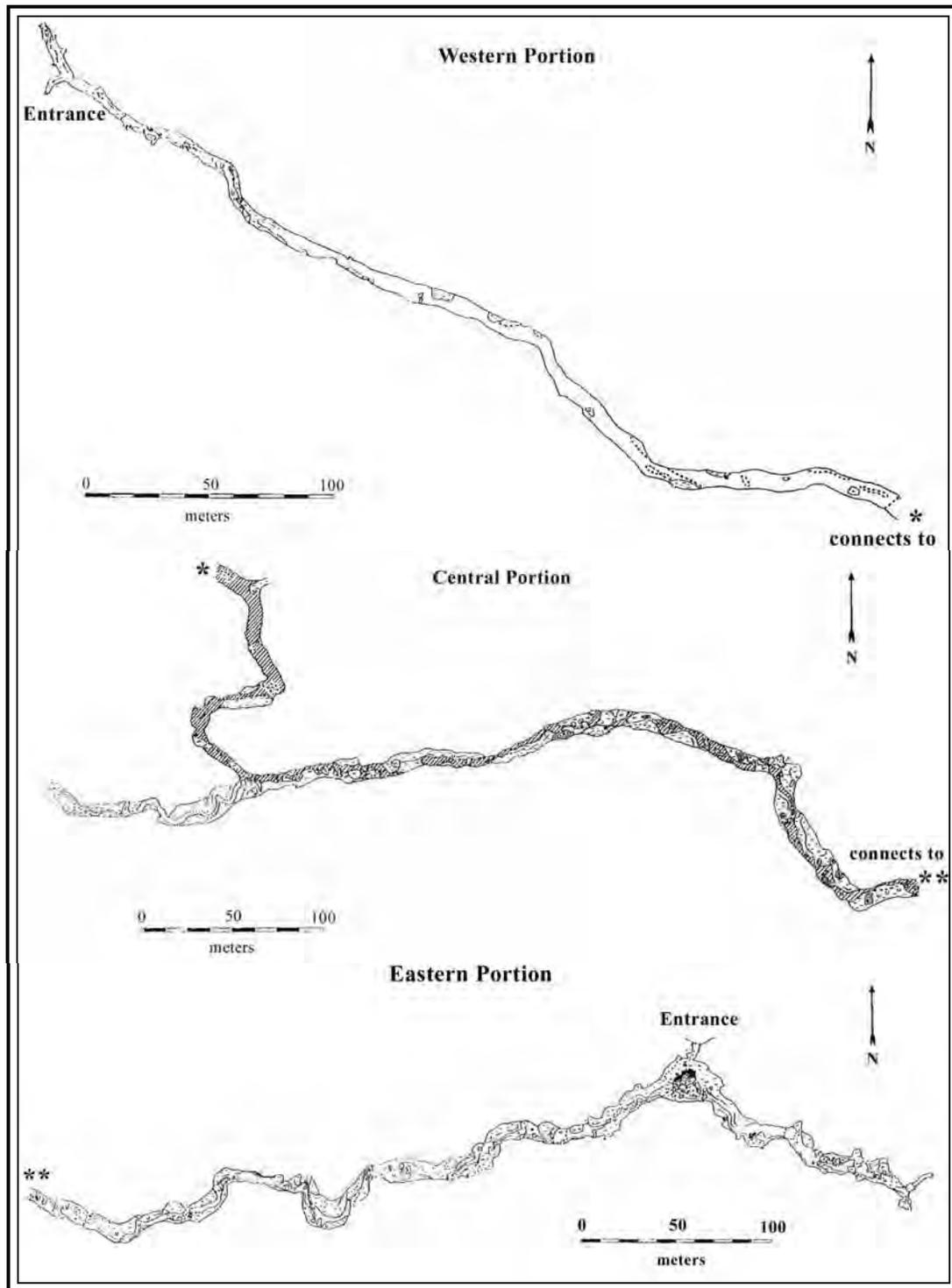


Fig. 5. Map of Cueva de Río El Duende. The central and eastern portions of the cave contained the largest proportions of skeletal material (After Brady 1994: Figures 48.2a-c).

excavation uncovered evidence of artificial constructions - the remains of three plastered floors (Brady et al. 1991:668). The uppermost floor contained ceramics dating back to the Early Classic period, whereas the two inferior floors were associated with ceramic material from the Preclassic period.

Six additional lots of varying size (50 x 50 cm and 1 x 1 m) were also excavated at 10 cm increments. The mud excavated from these lots was bagged in order to test an experimental sampling technique, whereby sodium carbonate is utilized to dissolve the clay of alluvial cave deposits (see Brady and Schwegman 1993). This new sampling technique yielded ceramic material from three of the six lots sampled, however, no skeletal material was recovered. This technique was also utilized for soil samples in Cueva de Sangre. Moreover, evidence of extensive speleothem mutilation was also documented in one of the tunnels (Urquizú 1994:555).

The few skeletal remains that were surface collected from CRM appear to be in a good state of preservation. A preliminary estimate of the minimum number of individuals was calculated. According to López (1994:689), this particular deposit accounts for 16 individuals: 10 adults, three children, and three subadults.

Cueva de Sangre

Cueva de Sangre is located approximately 3 km southeast of Dos Pilas' main plaza. Hereafter, Cueva de Sangre will be recognized by the code CS. The archaeological exploration and mapping of this large cave system began in 1990. Over a period of three field seasons, more than 3 km of passages were mapped and surveyed,

including three additional cave entrances. This extensive cave system is actually formed by a central branch more than 400 m in length (Brady 1990b:440). A surface investigation revealed various mounds and other architectural structures associated with this elaborate cave system. This surface exploration also uncovered an opening that may have been deliberately blocked with rocks (Brady et al. 1991:655). Moreover, an exploration of the deeper passages of Cueva de Sangre revealed a chamber with large quantities of human remains (Brady et al. 1991:655). Given the size of the cave and the large volume of artifactual material recovered, it would be best to consider this cave system in terms of the various operations conducted.

Cueva de Sangre represents the most elaborate cave system associated with the site of Dos Pilas. Because of its sheer size and numerous side passages, this cave system was divided into four operations during the 1990 field season. Operation III is a small branch that runs parallel to Operation II. Several side passages were found associated with Operations II through IV. During the following two field seasons, seven more operations were carried out in Cueva de Sangre (Figure 6). The artifactual material and the human remains that were surface collected throughout this extensive cave system clearly demonstrate the use of the caves by the ancient Maya.

The remains of three architectural structures were found in close proximity to the cave entrance of Operation I. One of these structures appeared to be the remains of a wall that may have been built to seal off this entrance (Brady 1990b:442). Six square meters of limestone pavement were also discovered near this entrance. A large quantity of ceramic was deposited on the cave floor. Many complete vessels as well as

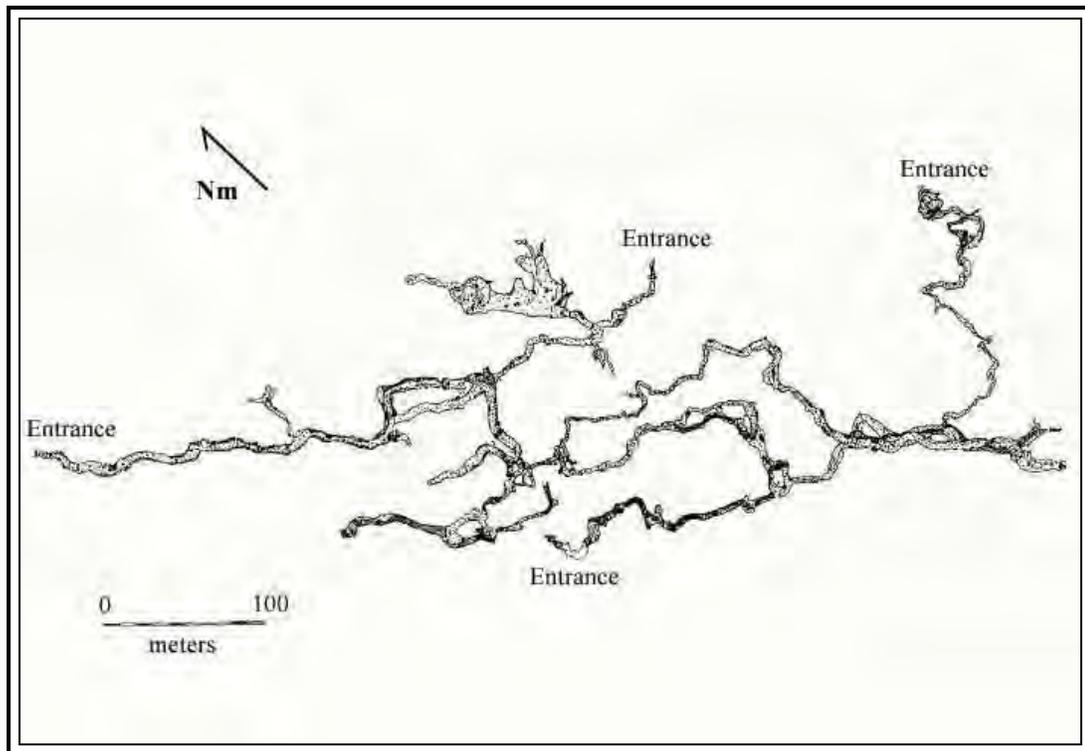


Fig. 6. Complete map of Cueva de Sangre. More than 3.2 km of this cave were mapped and surveyed over three field seasons during the Regional Petexbatun Cave Project (After Brady et al. 1997: Figure 1).

concentrations of ceramic sherds were mapped. Most of the ceramic material dates to the Early and Late Classic periods, however, material dating as early as the Late Preclassic Period was also collected (Brady 1990b:450, Scott 1994a:541).

A portion of Operation I consists of a cave branch with a muddy hollow that fills with water during the rainy season. This area is flanked on both sides by a tall, rocky cornice that may have been used as a platform by the ancient Maya. A large proportion of the artifactual material recovered from this first operation was located in this muddy

hollow. According to Brady (1990b:489), the accessibility of these natural platforms may have provided an ideal environment for offerings and other possible ritual activity.

The artifact assemblage collected from Cueva de Sangre is consistent with the types of artifacts found in the caves of Dos Pilas, as well as other caves throughout the Maya region. The thick mud floor impeded surface collection of the artifactual material. However, this problem was resolved with the implementation of a new sampling technique. A chemical deflocculant (NaHCO_3) was utilized to dissolve the highly plastic mud in order to obtain small artifacts (Brady et al. 1997). This technique was used for the surface collections obtained from Operation CS7 and CS11. Due to the success of this new processing technique, an abundance of ceramic sherds, smaller artifacts, and human and faunal remains were recovered from these operations. This material was occasionally associated with larger, more intact material, such as earthen jars, vessels, and other non-ceramic artifacts. For example, 26 obsidian knives, an obsidian core, and nine large flint spear points were found throughout the entire cave system. A few of these knives were found broken, but in fairly good condition. Some of the more interesting finds included sewing and thread-making implements. Bone needles and spindle whorls are two examples of the sewing artifacts found in these caves. Brady (1990b) discusses the implications of these implements in conjunction with the identification of female individuals in the skeletal record. These artifacts may represent functional objects in a non-domestic context, or ritual offerings in a sacred space.

Most of the human material found throughout the cave system pertains to the various niches and passages that constitute the greater area of Cueva de Sangre. Most of

these remains were recovered by means of surface collection. Smaller skeletal elements, i.e. phalanges and metapodials, were obtained from the aforementioned sampling technique. With the exception of these smaller skeletal elements, long bones and cranial fragments were the most abundant skeletal elements recovered from Cueva de Sangre. These remains represented both adults and subadults. The mineralized environment of the caves played a factor in the excellent preservation of the human remains (Brady et al. 1991:655). However, some of the bones show evidence of water disturbance, post depositional breakage, and animal gnawing. Evidence of dental mutilation, cranial deformation, and possible cut marks were also identified on several of the elements (Brady et al. 1991). Preliminary assessments of the minimum number of individuals for Operation CS1 were also calculated at the level of the lot and chamber (Brady et al. 1991). According to Brady et al. (1991), 54 individuals of all ages and both sexes were estimated at the level of the lot; 19 individuals were calculated at the level of the chamber. The semi-articulated remains of a single individual were found in Operation CS3. The remains recovered from the other operations are analyzed in more detail in the following chapter.

Cueva de Kaxon Pec

Cueva de Kaxon Pec is a riverine cave that lies 2.75 km southeast of Dos Pilas. This was the longest cave discovered during the Petexbatun Regional Cave Survey, measuring 4.6 km in length (Scott 1994b:542). Cueva de Kaxon Pec will be identified by the code CKP. The cave was discovered at the end of the 1991 season, by which time 350 m of passages were mapped and surveyed. Further investigations of the cave

resumed during the 1993 field season when efforts were focused on a survey of the surface site, continued cave mapping, and archaeological sampling. The cave is situated beneath a surface site consisting of various mound structures and linear constructions. Small platforms and plaza groups with karst features are also associated with this site. A 1 x 1 m test pit was excavated in the central area of the surface site where 101 ceramic sherds were recovered (Scott 1994b:542). Archaeological efforts then focused on the eight operations that were conducted within the cave.

Cueva de Kaxon Pec was accessed through three entrances. Entrance 1 is situated at the base of the escarpment south of the surface site. This aperture is approximately 8 m wide and 1.5 m high. An arroyo located outside the cave opening may point to possible water activity during the rainy season (Scott 1994b:542). The second cave entrance was not archaeologically investigated. Entrance 3 is located 2 km east of entrance 1. An extensive investigation of the third entrance was conducted during the 1993 field season along with the further exploration of the cave.

Most of the exploration and investigation of the cave was concentrated in the eight operations. All the artifactual and skeletal material recovered from these operations was surface collected. Lots were established in order to maintain some horizontal provenience within each operation (Scott 1994b:543). The first five operations (CKP2-CKP6) constitute the dry portion of the cave. An abundance of ceramic material associated with an array of various non-ceramic artifacts were recovered from throughout this portion of the cave. An analysis of the ceramic material illustrated the use of the cave during the Preclassic period, possibly before the rise of

Dos Pilas as a dominant polity in the region (Scott 1994b:553). Ceramics dating to the Terminal Classic period may suggest that the cave was still utilized after the decline of Dos Pilas (Scott 1994b:553).

The largest proportion of human skeletal material from this cave was surface collected from Operation CKP2. Nearly every lot produced some skeletal remains, however, some lots contained larger deposits than others. The other four operations in this dry portion of the cave produced little to no skeletal material. The last three operations (CKP7-CKP9) represent the wet portion of the cave. The river passageway made investigation and artifact recovery more difficult in the latter portion of this cave. (Scott 1994b:550). Despite the watery environment, a few skeletal elements were recovered from these last three operations.

The investigation of Cueva de Kaxon Pec produced impressive examples of artificial constructions and cave modifications. Evidence of floor terracing, restricted access ways, and altar construction clearly demonstrate the time and energy invested by the Maya in an effort to transform the physical environment into a space of ritual and sacred importance. This is clearly exemplified in some of the more impressive artificial features of this cave. For example, an elaborate altar constructed out of a flowstone bed supported by a base of broken speleothems contained a large cache of calcified cave formations (Scott 1994b:553).

Cueva de Los Quetzales

Cueva de Los Quetzales is located 12.5 km southeast of Dos Pilas, underneath the site of Las Pacayas. Hereafter, Cueva de Los Quetzales will be denoted by the code

CQ. This is the only cave not connected to the other five caves associated with the site of Dos Pilas. This particular cave is situated underneath a surface site, which consists of structures such as a platform with pyramids and constructions with plazas. The main ceremonial complex is built directly on top of Cueva de Los Quetzales (Figure 7). The entrance underneath this complex is clearly incorporated into the plaza located near the tallest pyramid (Brady et al. 1991:684). This main entrance extends for 60 m with a width that varies between 5-10 m and a height of 2-4 m. Evidence of a possible altar was identified at this entrance. The cave then divides into two passes, one high and one low, which extend for 7 m before converging once again. At this point, the cave extends for another 15 m until it narrows into an impassable juncture.

The ceramic and non-ceramic material from this cave was excavated. The investigation of an impressive deposit of ceramic material inside the cave indicates possible ceremonial activity, which likely consisted of dropping offerings into the aperture situated in the main plaza (Brady and Rodas 1995). Similar ceremonial deposits have been documented in other sites such as Actun Balam and Pusilha. Ceramic analyses found material dating to the Preclassic and Late Classic periods (Brady et al. 1991). A small deposit of human remains was also excavated from this cave. Two of these elements produced possible evidence of bone modification suggestive secondary burial treatment. Two other caves – Cueva del Tepezquintle and Cueva del Tortuga – are associated with the surface site. According to Brady et al. (1991:684), these two additional caves may form one system whereby water enters one and exits the other during the heavy fluvial activity of the rainy season.

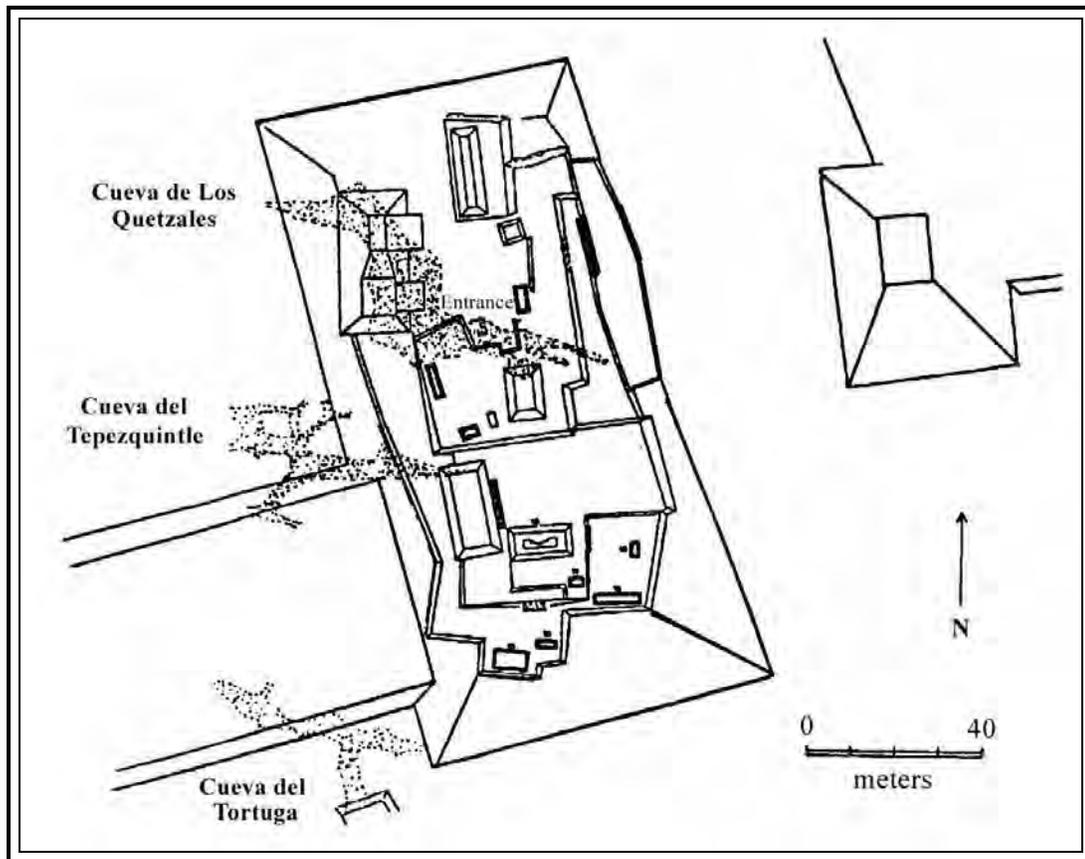


Fig. 7. Map of Cueva de Los Quetzales. The site of Las Pacayas is situated directly above this cave with an entrance incorporated into one of the plazas (After Brady and Rodas 1995:Figure 2).

Sampling bias

The recovery method(s) utilized in an archaeological investigation represent an important issue that must be considered. This is especially pertinent in the recovery of human skeletal material from a geologically active environment, such as a cave. It must not be noted that a particular recovery method may bias the representative sample collected. In the case of the caves of Dos Pilas, two basic recovery methods were utilized: 1) excavation and 2) a basic surface collection (Table 1). I consider the

deflocculent technique used in two of the excavated operations in Cueva de Sangre as a form of excavation. The skeletal samples surface collected from Cueva de Río El Duende, Cueva de Sangre and Cueva de Kaxon Pec contained high frequencies of larger, more robust elements such as long bones and cranial material. Smaller elements such as bones of the hands and feet, ribs, and vertebral material are rare in these particular samples. This may be the effect of a specific recovery method or a particular depositional activity. It would appear that a basic surface collection has the potential to produce a biased sample, whereas an excavation may provide a more representative sample. This archaeological issue represents one of many factors that must be considered in an accurate interpretation of the agents responsible for the deposition of human remains in these caves.

TABLE 1. Caves of the Petexbatun and their respective recovery methods.

Cave	Recovery Method
Cueva de El Duende	excavation
Cueva de Río El Duende	surface collection
Cueva de Río Murciélagos	excavation
Cueva de Sangre	surface collection/ excavation
Cueva de Kaxon Pec	surface collection
Cueva de Los Quetzales	excavation

CHAPTER V

NISP AND MNI – AN ANALYSIS

The entire skeletal sample recovered from the six caves of the Petexbatun region is represented by 1,575 elements, including several nearly intact crania. This figure corresponds to the complete sample collected from the caves, including the elements reported by Brady et al. (1991) and Wright (unpublished notes 1994). Of this total sample, I examined 1,028 mostly incomplete bones. I calculated the number of identified specimens (NISP) and estimated the minimum number of individuals (MNI) for each cave (Table 2). The Appendices contain a complete inventory of the sample analyzed for this study as well as the additional material reported by Brady et al. (1991) and Wright (unpublished notes 1994). The NISP represents the total number of bones identified in a particular sample. Unidentifiable bone fragments were not considered in the count. As stated previously, the NISP is used to calculate the relative skeletal element frequencies for the sample recovered from each cave. The NISP for each cave will be discussed with its corresponding MNI estimates. The general MNI and the more conservative PNI estimates will also compliment these data with a demographic profile of each cave. This information aids in assessing the type of depositional activity that may have occurred within these caves. The discussion of the NISPs and the MNIs for each cave follows the same order as the site descriptions in the previous chapter.

TABLE 2. Number of identified specimens for caves of the Petexbatun.

	Bones	Caves					
		Cueva de El Duende	Cueva de Río El Duende	Cueva de Río Murciélagos	Cueva de Sangre	Cueva de Kaxon Pec	Cueva de Los Quetzales
Cranial	frontal	0 (0)	3 (10)	0 (2)	11 (15)	4 (7)	0
	temporal	2 (2)	10 (10)	1 (5)	5 (11)	6 (11)	1
	parietal	2 (2)	14 (35)	8 (12)	20 (31)	3 (9)	1
	occipital	0 (1)	5 (7)	2 (4)	19 (25)	0 (3)	0
	nasal	0 (0)	0 (0)	1 (2)	0 (0)	0 (1)	0
	ethmoid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	sphenoid	0 (0)	0 (0)	0 (0)	1 (5)	0 (0)	0
	zygomatic	0 (0)	2 (2)	1 (3)	0 (0)	1 (1)	0
	mandible	3 (3)	17 (23)	1 (1)	7 (12)	1 (1)	0
	maxilla	1 (3)	0 (0)	1 (2)	1 (5)	0 (2)	0
	hyoid	0 (0)	0 (0)	0 (0)	0 (1)	0 (0)	0
	teeth	2 (2)	5 (14)	4 (4)	37 (51)	13 (13)	12
Post-cranial: upper torso	clavicle	0 (1)	0 (0)	0 (0)	3 (10)	1 (1)	0
	scapula	0 (2)	3 (3)	0 (0)	4 (11)	5 (5)	0
	sternum	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)	0
	rib	38 (71)	3 (6)	0 (0)	43 (91)	2 (2)	0
	vertebra	6 (12)	1 (2)	2 (2)	53 (110)	21 (21)	0
	humerus	3 (3)	37 (52)	2 (2)	19 (27)	10 (10)	2
	radius	1 (2)	6 (14)	4 (4)	16 (26)	2 (2)	0
	ulna	0 (1)	11 (17)	4 (4)	13 (23)	4 (4)	0
	carpal	0 (2)	0 (0)	0 (0)	16 (20)	0 (0)	0
	metacarpal	1 (3)	0 (0)	0 (0)	13 (28)	2 (2)	1
	man.phalange	6 (14)	1 (1)	1 (1)	51 (61)	0 (0)	2
Post-cranial: lower torso	pelvis	2 (2)	8(9)	1 (1)	10 (19)	9 (12)	1
	sacrum	0 (0)	0 (0)	0 (0)	2 (9)	11 (11)	0
	femur	2 (3)	78 (90)	6 (6)	41 (58)	22 (22)	4
	patella	1 (2)	0 (0)	0 (0)	7 (10)	1 (1)	1
	tibia	0 (1)	34 (48)	3 (3)	30 (43)	12 (12)	1
	fibula	0 (1)	1(5)	0 (0)	4 (8)	0 (0)	2
	talus	2 (2)	1(1)	0 (0)	5 (13)	1 (1)	1
	calcaneus	0 (0)	0 (0)	0 (0)	4 (8)	0 (0)	0
	tarsal	0 (3)	0 (0)	0 (0)	12 (27)	2 (2)	4
	metatarsal	2 (5)	0 (0)	0 (0)	15 (27)	4 (4)	4
	ped.phalange	1 (2)	0 (0)	0 (0)	30 (35)	1 (1)	3
Total		75 (145)	240 (349)	42 (58)	493 (822)	138 (161)	40

Note: Figures in **(bold)** represent the skeletal material reported in Brady et al. (1991) and Wright's unpublished notes (1994).

Cueva de El Duende

One hundred forty five identifiable skeletal elements were excavated from Cueva de El Duende (CD). This figure represents the sample on loan from Guatemala as well as the material reported in Wright's unpublished notes (1994). Figure 8 is a graphical break down of the seventy-five bones represented in the sample I examined; the additional material is not included in the NISP histogram. The most abundant skeletal elements were rib fragments, accounting for more than half of the entire sample (51 percent). One complete rib and two rib head fragments account for at least three ribs. The other rib fragments do not suggest that 35 separate ribs are represented in this sample, insomuch as that several rib fragments may constitute the same rib(s), which may, in turn, belong to the same individual. Vertebral fragments and phalanges of the hand were also common skeletal elements found throughout the cave, each accounting for eight percent of the sample. Portions of long bones and cranial material were also present, but in relatively smaller quantities. The additional material not examined in this study consisted largely of smaller elements, i.e. rib and vertebral fragments, and bones of the hands and feet (see Appendix I).

Four operations were conducted in Cueva de El Duende, whereby artifactual and human skeletal material was excavated and collected. The first operation (CD1) consisted of excavations at the cave entrance and just beyond this entrance. Cranial and post-cranial material representative of an adult and subadult was recovered from this operation. A fragmentary right mandible with intact permanent teeth and an unerupted third molar is good evidence of a child at least 12 years of age (Ubelaker 1978). Other

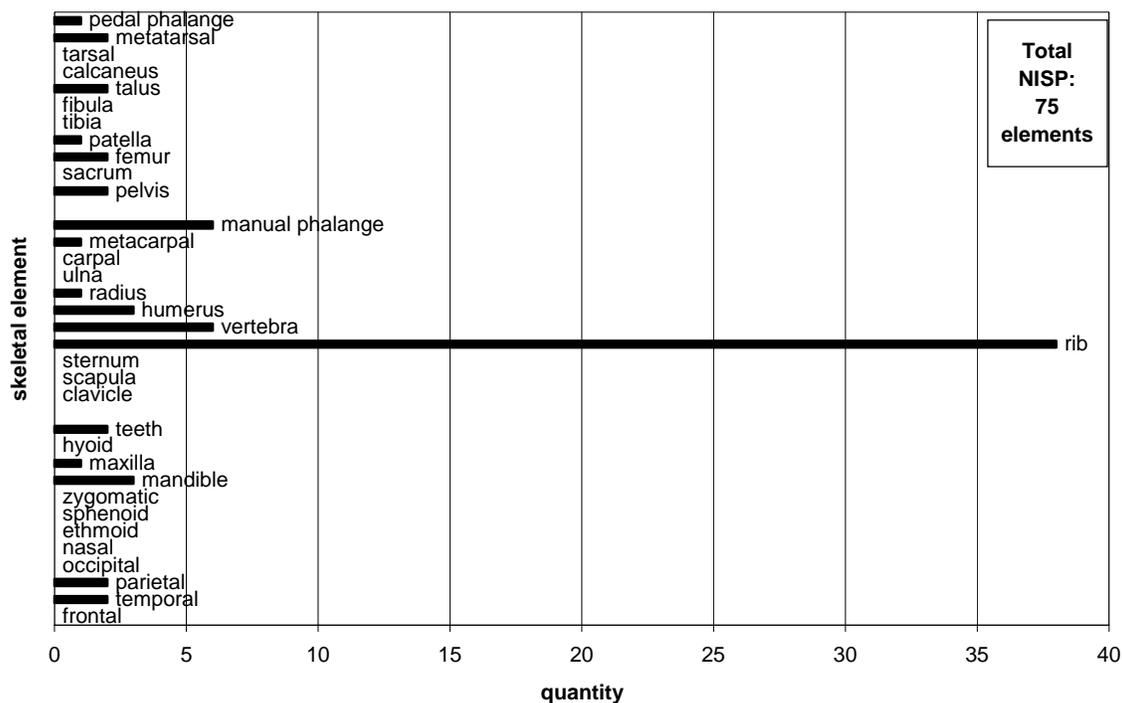


Fig. 8. NISP by element for Cueva de El Duende.

skeletal material recovered from this operation includes a few long bone shafts, thin cranial vault fragments, and a number of rib portions. A small femoral shaft and the thin cranial fragments may be associated with the remains of the child. Operation CD3 contained two lots with minimal skeletal material. The right portion of a maxilla with both premolars, a portion of a humerus and a nearly complete talus could well represent a single adult individual. The final operation (CD4) contained several elements reported by Wright (unpublished notes 1994), which included mostly rib and vertebral material, a few hand bones, and two incomplete arm bones.

The largest area excavated was the second operation (CD2), and it produced the largest proportion of skeletal material recovered from this cave. Bones of the hands and

feet were the most common skeletal elements recovered from this operation. Other bones of interest include a complete right radius shaft, a nearly intact axis, the left portion of an atlas, and the ischial portion of a right pelvis with good evidence of bone modification. The radius may represent an adult male because of the overall size and robusticity of the bone. The other bones may represent two additional individuals including an adult individual of unknown age and sex, and a subadult. The cranial remains recovered from this operation include a nearly complete temporal bone, and the fragments of a temporal and parietal bone. The chamber floor had evidence to suggest that this part of the cave was occasionally flooded during the rainy season. Despite the wet conditions, the bones are in a relatively good state of preservation. Several bones of the hands and feet, a few rib and vertebral fragments, two incomplete maxillae, and two long bone elements represent the additional material not included in the sample.

Estimates of the minimum number of individuals were conducted at four different levels – lot, suboperation, operation, and the cave as a whole. If each lot is considered individually, and their MNIs are summed, the cave contains a total of 16 individuals (Table 3). This estimate includes a possible adult male, 12 adults of indeterminate age and sex, and 3 subadults. Two of these subadults have been identified as probable children. An estimate at the level of the suboperation produced six less individuals than the Lot MNI. Six individuals were estimated at the level of the operation. This Operation MNI is reduced to half when an MNI of the cave as a whole is calculated. It must be emphasized that these figures are estimates and do not represent the exact number of individuals represented in the skeletal deposit of this cave.

TABLE 3. MNI for Cueva de El Duende.

Lot #	Lot MNI	Subop MNI	Op MNI	Cave MNI
CD1-01-1	1 adult	1 adult 1 subadult	1 adult 1 subadult	1 adult male 1 adult 1 subadult
CD1-01-5	1 adult			
CD1-04-2	1 adult 1 subadult			
CD2-01-4A	1 adult	1 adult male 1 adult 1 subadult	1 adult male 1 adult 1 subadult	
CD2-01-5"A"	2 adults			
CD2-01-6B	1 adult			
CD2-01-7B	1 adult			
CD2-01-8B	1 adult male 1 subadult			
CD2-01-12"A"	1 adult			
CD2-1-3	1 adult			
CD2-1-4	1 subadult			
CD3-1-1	1 adult	1 adult	1 adult	
CD3-4-1	1 adult	1 adult		
Total	16	10	6	3

However, estimates of three individuals (Cave MNI) and six individuals (Operation MNI) seem more plausible than an estimate of 16 individuals at the level of the lot, considering the small sample size, the type and frequency of certain skeletal elements, and the fragmentary condition of many of these bones. Estimates of the probable number of individuals (PNIs) are identical to the MNI estimates for this cave. These

estimates indicate that Cueva de El Duende probably has a skeletal sample representative of three to 16 individuals. Due to the small sample size, the MNIs at the level of the lot and suboperation may not be as accurate as the estimates at the level of the operation and the entire cave. If the additional skeletal material reported by Wright (unpublished notes 1994) is factored into the MNI estimates, the number of individuals increases slightly: the operation accounts for nine individuals, and the cave represents five individuals.

Cueva de Río El Duende

Cueva de Río El Duende runs directly underneath the main ceremonial structure of Dos Pilas – the pyramid of El Duende. The cave is accessible through two known entrances. The entrance on the eastern end is larger than the small entrance pit located on the western end. Judging by the amount of skeletal material recovered from the eastern half of the cave and the larger size of the eastern entrance, it is clear that a majority of the depositional activity occurred in this portion of the cave. Evidence of water activity in the cave may have also played a role in the under-representation of skeletal material in the western half of the cave. If the water flowed in an easterly direction, then the accumulation of skeletal material at the eastern end of the cave may have been a result of this fluvial activity. However, we cannot disregard the activity of human and animal agents in the possible displacement of the skeletal material.

The second largest deposit of skeletal remains recovered from these caves was surface collected primarily from the eastern half of Cueva de Río El Duende. The deposit recovered from this cave contains 349 skeletal elements, including material left

in Guatemala (Wright's unpublished notes 1994). However, only 240 of these bones were exported from Guatemala and examined in this study. Seventy-eight complete and incomplete femoral shafts represent the most common element in the deposit, accounting for 32 percent of the total sample (Figure 9). Humeral (15 percent) and tibial elements (14 percent) also occur in higher frequencies than other elements. Other long bones such as the ulna, radius, and fibula are not as well represented as the larger, more robust elements of the leg and upper arm. Marginal quantities of mandibular (17 fragments, seven percent) and parietal material (14 fragments, six percent) were also identified. Several portions of temporal, occipital, and frontal bone represent the remaining cranial material present in the deposit. There is a very low incidence of rib and vertebral material, and the bones of the hands and feet are nearly absent. The additional elements not present in the sample are comprised primarily of long bone and cranial material, with the exception of several teeth and a few rib fragments (see Appendix II).

Cueva de Río El Duende was divided into three operations – CNP, CNP1, and CNP2. Two long bone fragments and a mandible were recovered from the first operation. The preliminary report by Brady et al. (1991) does not mention the exact location of this particular operation. The only element collected from Lot CNP1-02-1 was a middle phalange of the hand. The largest proportion of human remains was collected from the last operation. Out of 41 lots in Operation CNP2, 34 contained some skeletal material. The distribution of the bony elements varied from lot to lot. CNP2-07-1, CNP2-12-1, CNP2-20-1, CNP2-24-1, CNP2-26-1, and CNP2-28-1 contained the

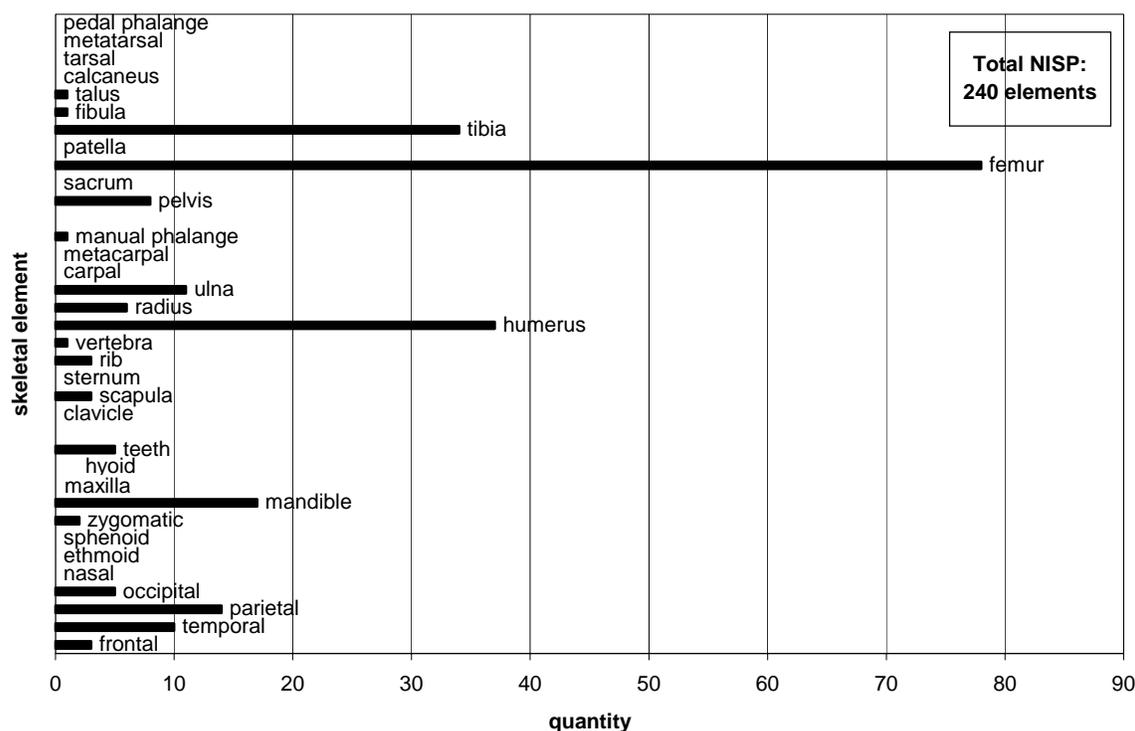


Fig. 9. NISP by element for Cueva de Río El Duende.

largest deposits of bone. Skeletal remains of adults, young adults, juveniles, and children are present in the sample.

Due to the large size of Operation CNP2, I divided this portion of the cave into five “rooms,” which vary in length (80-150 m). I considered the physical layout and geomorphology of the cave in order to identify the most logical points for demarcating the rooms. For instance, the flow of water may have displaced bones from one lot and deposited them in other 5 m away. The proximity of lots to one another is a good rationale for keeping two or more lots in the same room. However, if two lots were separated by a sharp bend or obstructed by a natural cave formation or artificial

construction, the movement of material may have been impeded by these elements. This would justify a designation of two separate spaces at that juncture. The first room extends from Lot CNP2-02-1 to CNP2-07-1. This point was chosen because of a natural bend in the cave before the next lot. Lot CNP2-08-1 to CNP2-12-1 represents the second room, which also accounts for a natural bend in the cave's layout. The next room contains Lots CNP2-13-1 to CNP2-19-1. The sharp bend at the end of the third room was a good starting point for the fourth room, which extends from Lot CNP2-20-1 to CNP2-28-1. The final room contains the remaining lots, which include CNP2-27-1 to CNP2-33-1. These rooms may facilitate a better interpretation of the skeletal material when conducting MNI and PNI estimates, than would the operation as a whole.

The MNIs and PNIs for Cueva de Río El Duende were calculated on five levels. The MNI estimates at the level of the lot and suboperation produced identical figures, thus both will be considered as one level. The lot/suboperation produced an estimate of 74 individuals – 3 adult males, 53 adults of indeterminate age and sex, 6 young adults, 1 juvenile, five children, and six additional subadults (Table 4). A pair of complete, robust femoral shafts represents an adult male from Lot CNP2-07-1. The left femur may have evidence of bone modification. The other adult male was identified from the distal half of a left femur found in Lot CNP2-21-1. The proximal half of the same bone was recovered from Lot CNP2-08-1, about 150 m away. This indicates that natural and/or human agents may have displaced the proximal or the distal portions of this femur considerably. This occurrence illustrates that the room divisions may not be an effective means of accounting for the movement of skeletal elements. The final adult male from

TABLE 4. MNI for Cueva de Río El Duende.

Lot #	Lot MNI	Subop MNI	Room MNI	Op MNI	Cave MNI	
CNP Stat.16	1 subadult	1 subadult	1 adult	1 adult	3 adult males 32 adults 4 y.adults 7 subadults	
CNP Stat.17	1 adult	1 adult	1 subadult	1 subadult		
CNP1-02-1	1 adult	1 adult	1 adult	1 adult		
CNP2-02-1	1 adult	1 adult	1 adult male 6 adults 2 subadults	3 adult males 32 adults 4 y.adults 7 subadults		
CNP2-03-1	1 adult	1 adult				
CNP2-04-1	2 adults 1 subadult	2 adults 1 subadult				
CNP2-05-1	1 adult	1 adult				
CNP2-06-1	2 adults	2 adults				
CNP2-07-1	1 adult male 3 adults 1 subadult	1 adult male 3 adults 1 subadult				
CNP2-08-1	3 adults 1 subadult	3 adults 1 subadult				7 adults 2 subadults
CNP2-10-1	2 adults	2 adults				
CNP2-11-1	2 adults	2 adults				
CNP2-12-1	3 adults 1 subadult	3 adults 1 subadult				
CNP2-13-1	2 adults 1 y.adult	2 adults 1 y.adult	4 adults 3 y.adults			
CNP2-14-1	2 adults	2 adults				
CNP2-15-1	1 adult	1 adult				
CNP2-17-1	1 adult 1 y.adult	1 adult 1 y.adult				
CNP2-18-1	2 y.adults	2 y.adults				
CNP2-19-1	1 adult	1 adult				
CNP2-20-1	5 adults	5 adults		2 adult males 14 adults 3 subadults		
CNP2-21-1	1 adult male 2 adults 1 subadult	1 adult male 2 adults 1 subadult				
CNP2-22-1	1 adult 1 subadult	1 adult 1 subadult				
CNP2-24-1	5 adults 1 subadult	5 adults 1 subadult				

TABLE 4. continued.

Lot #	Lot MNI	Subop MNI	Room MNI	Op MNI	Cave MNI	
CNP2-25-1	1 adult	1 adult				
CNP2-26-1	2 adults 1 subadult	2 adults 1 subadult				
CNP2-27-1	1 adult 1 subadult	1 adult 1 subadult				
CNP2-28-1	1 adult male 5 adults 2 subadults	1 adult male 5 adults 2 subadults				
CNP2-29-1	1 adult	1 adult				1 adult 1 y.adult
CNP2-30-1	1 adult 1 y.adult	1 adult 1 y.adult				
CNP2-33-1	1 y.adult	1 y.adult				
Total	74	74	49	49	46	

Lot CNP2-28-1 was identified based on a nearly complete left ilium and ischium, and a complete left femoral shaft. The identification of the five children is based on the relative size of several long bones and two mandibles, including a nearly complete mandible from Lot CNP2-28-1. The presence of deciduous premolars, unerupted central incisors, and an erupted left first molar suggests an age at death of at least six years (Ubelaker 1978). The identification of the young adults in the sample was also based on the relative size of the skeletal elements.

At the level of the operation, the minimum number of individuals drops to 49. The most significant changes are noted in Operation CNP2. The number of adults of unknown age and sex decreased from 53 individuals at the level of the lot/suboperation to 32 individuals at the level of the operation. The other age categories did not demonstrate significant changes. MNI estimates were also calculated for each of the

five rooms in Operation CNP2. Room 1 contained one adult male, six other adults, and two subadults. The second room produced seven adults of indeterminate age and sex and two subadults. The third room accounted for four adults and three young adults. Room 4 had the other 2 adult males, 14 additional males, and 3 subadults. The final room contained an adult and young adult, for a total of 46 individuals. This figure also corresponds to the estimate calculated at the level of the cave. The MNI estimates indicate that Cueva de Río El Duende has a deposit that accounts for 46 to 73 individuals, a large proportion of those adults of indeterminate age and sex.

The PNI estimates produced slightly larger figures than the MNIs. The estimate at the level of the lot/suboperation was 91 individuals (Table 5). Adults of unknown age and sex represented the largest proportion of individuals, similar to the MNI estimate. There was a significant discrepancy between the MNI and PNI estimates at the level of the operation. Seventy-six individuals were calculated for the PNI, in comparison to the 49 that were estimated for the MNI. The PNIs at the level of the room and the cave accounted for 73 individuals. These more conservative estimates suggest that Cueva de Río El Duende may have the remains of 73 to 91 individuals, a majority of them adult individuals of unknown age and sex.

Cueva de Río Murciélagos

Cueva de Río Murciélagos is one of the smaller caves associated with the site of Dos Pilas. A total of fifty-eight skeletal elements were excavated from this cave, including two nearly intact crania (see Appendix III). These crania represent the only

TABLE 5. PNI for Cueva de Río El Duende.

Lot	Lot MNI	Subop MNI	Room MNI	Op MNI	Cave MNI
CNP Stat.16	1 adult 1 subadult	1 adult 1 subadult	1 adult 1 subadult	1 adult 1 subadult	3 adult males 55 adults 5 y.adults 10 subadults
CNP Stat.17	1 adult	1 adult			
CNP1-02-1	1 adult	1 adult	1 adult	1 adult	
CNP2-02-1	1 adult	1 adult	1 adult male	3 adult males	
CNP2-03-1	1 adult	1 adult	10 adults 3 subadults	55 adults 5 y.adults 10 subadults	
CNP2-04-1	2 adults 1 subadult	2 adults 1 subadult			
CNP2-05-1	1 adult	1 adult			
CNP2-06-1	3 adults	3 adults			
CNP2-07-1	1 adult male 5 adults 1 subadult	1 adult male 5 adults 1 subadult			
CNP2-08-1	5 adults 1 subadult	5 adults 1 subadult	14 adults 3 subadults		
CNP2-10-1	3 adults	3 adults			
CNP2-11-1	2 adults	2 adults			
CNP2-12-1	6 adults 1 subadult	6 adults 1 subadult			
CNP2-13-1	3 adults 1 y.adult	3 adults 1 y.adult	7 adults 4 y.adults		
CNP2-14-1	2 adults	2 adults			
CNP2-15-1	1 adult	1 adult			
CNP2-17-1	1 adult 1 y.adult	1 adult 1 y.adult			
CNP2-18-1	2 y.adults	2 y.adults			
CNP2-19-1	1 adult	1 adult			
CNP2-20-1	6 adults	6 adults	2 adult males		
CNP2-21-1	1 adult male 3 adults 1 subadult	1 adult male 3 adults 1 subadult	23 adults 4 subadults		
CNP2-22-1	1 adult 2 subadults	1 adult 2 subadults			

TABLE 5. continued.

Lot	Lot MNI	Subop MNI	Room MNI	Op MNI	Cave MNI
CNP2-24-1	6 adults 1 subadult	6 adults 1 subadult			
CNP2-25-1	1 adult	1 adult			
CNP2-26-1	2 adults 1 subadult	2 adults 1 subadult			
CNP2-27-1	1 adult 1 subadult	1 adult 1 subadult			
CNP2-28-1	1 adult male 7 adults 2 subadults	1 adult male 7 adults 2 subadults			
CNP2-29-1	1 adult	1 adult	1 adult		
CNP2-30-1	1 adult 1 y.adult	1 adult 1 y.adult	1 y.adult		
CNP2-33-1	1 y.adult	1 y.adult			
Total	91	91	76	76	73

elements not analyzed in the study. The material from CRM is the second smallest skeletal sample recovered from the six caves investigated, the lowest pertaining to Cueva de Los Quetzales. The most common skeletal elements were parietal fragments, accounting for nearly 20 percent of the sample (Figure 10). A smaller amount of other cranial material was also recovered from throughout the cave. Nearly complete femoral shafts and other long bones, i.e. tibiae, radii, ulnae, and humeri, occurred in relatively higher frequencies than other skeletal elements, accounting for 45 percent of the total sample. The smaller hand and foot bones were almost absent from the sample.

Cueva de Río Murciélagos was excavated and divided into four operations – CRM, CRM1, CRM3, and CRM4. The first of these operations (CRM) produced two femoral shaft portions, and portions of a humerus and radius. A manual phalangeal shaft

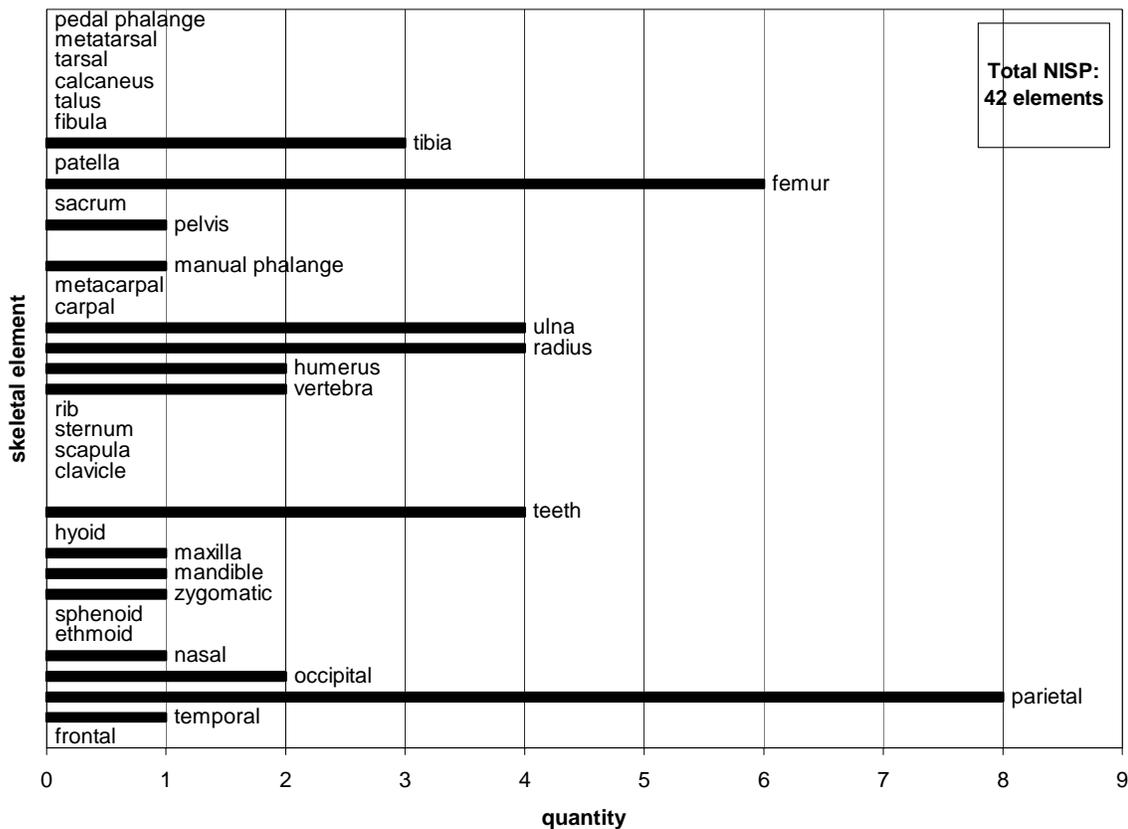


Fig. 10. NISP by element for Cueva de Río Murciélagos.

with an unfused epiphysis, a right mandibular fragment with six intact deciduous teeth showing little wear, and a fragmentary deciduous second incisor were recovered from Operation CRM1. The phalange, the incisor, and the mandibular fragment may be evidence of a subadult at least three to five years of age (Ubelaker 1978). The third operation (CRM3) was the largest chamber excavated and produced the largest proportion of skeletal material recovered from the cave. As previously stated, the cranial material represented the majority of the skeletal elements collected in this operation, including the two crania. The long bone material from this operation was not as abundant as the cranial elements. A right femoral shaft with evidence of bone

modification was one of the more interesting elements recovered from this operation.

The final operation (CRM4) produced nearly complete left and right femurs that are very symmetrical in form and point to a single individual. Their relative size and robusticity suggests that they belonged to an adult male. A tibial portion and a worn cranial fragment were also found in this operation.

The MNIs for this cave were also calculated at the four levels utilized in Cueva de El Duende. At the level of the lot, 19 individuals accounted for the material I analyzed (Table 6). This estimate includes one adult male, 12 adults of unknown age and sex, and six subadults. My estimate of 19 individuals is very close to the approximate estimate of 16 individuals assessed by López (1994:689) in her preliminary report. The MNI estimate at the level of the suboperation had one less individual than the lot estimate. At the level of the operation, 11 individuals were estimated for the four operations – one adult male, seven adults, and three subadults. The adult male was identified and sexed based on the relative size and robusticity of the paired left and right femurs found in Operation CRM4. The femurs have dimensions characteristic of a male individual from the Maya area. Both femoral heads have vertical diameters greater than 44 mm. The child identified in Operation CRM1 has been discussed above. A four to five year old child was identified in Operation CRM3 based on a complete radius shaft 104 mm long with unfused epiphyses (Johnston 1962). This same operation produced a portion of an iliac crest with an unfused epiphysis and a vertebral centrum fragment with an unfused epiphysis, which may point to a juvenile 16 years or older (McKern and Stewart 1957, Bass 1995). An MNI estimate for the entire cave rendered three fewer

TABLE 6. MNI for Cueva de Río Murciélagos.

Lot #	Lot MNI	Subop MNI	Op MNI	Cave MNI
CRM-05-1	1 adult	1 adult	2 adults	1 adult male 5 adults 2 subadults
CRM-06-1	1 adult	1 adult		
CRM1-04-5	1 subadult	1 subadult	1 subadult	
CRM1-06-3 D27	1 subadult	1 subadult		
CRM1-06-4 D27	1 subadult			
CRM3-01-1	2 adults	2 adults 2 subadults	5 adults 2 subadults	
CRM3-01-2	2 subadults			
CRM3-03-1	3 adults	3 adults		
CRM3-04-6	1 adult	1 adult		
CRM3-06-2	2 adults	2 adults		
CRM3-07-2	1 adult 1 subadult	1 adult 1 subadult		
CRM4-02-1	1 adult male	1 adult male	1 adult male	
CRM4-03-1	1 adult	1 adult		
Total	19	18	11	8

individuals than the estimate at the level of the operation, for a total of eight individuals.

An MNI estimate at the level of the cave assumes the skeletal material has experienced some type of disturbance, both natural and/or intentional, which may have resulted in the commingling of the entire sample. However, these processes can occur on all levels.

The MNI and PNI estimates produced identical figures. The PNI estimates should be slightly larger than the general estimates. Similar estimates for both MNI groups may

result from a small sample size, sampling bias, or observer error. The skeletal material recovered from CRM represents eight to 19 individuals.

Cueva de Sangre

The various chambers and niches of Cueva de Sangre produced the largest and most diverse deposit of human skeletal material recovered from the six caves of the Petexbatun. Eight hundred twenty two skeletal elements constitute the complete sample of human remains recovered from Cueva de Sangre, of which 493 of these are analyzed and reported here. The remaining 329 bones are documented in the preliminary report by Brady et al. (1991). Most of this material was surface collected, however, an experimental recovery technique was used in a few of the operations. As Figure 11 demonstrates, the sample contains nearly every skeletal element listed. There were no traces of zygomatic, ethmoid, or nasal material. Vertebral fragments represent the most abundant element, accounting for 11 percent of the entire sample. Fifty-one complete and incomplete manual phalanges represent another frequently recovered element in this sample. Aside from these manual phalanges, the total number of bones of the hands and feet account for 13 percent of the sample. Thus, 24 percent of all the elements recovered from Cueva de Sangre are bones of the hands and feet. This may reflect a sampling bias or the simple anatomical fact that hands and feet are comprised of many bones. Other elements with relatively high frequencies include rib fragments (nine percent), femoral material (eight percent), dental elements (seven percent), and tibial portions (six percent). Other long bones such as the humerus, ulna, radius, and fibula, did not occur

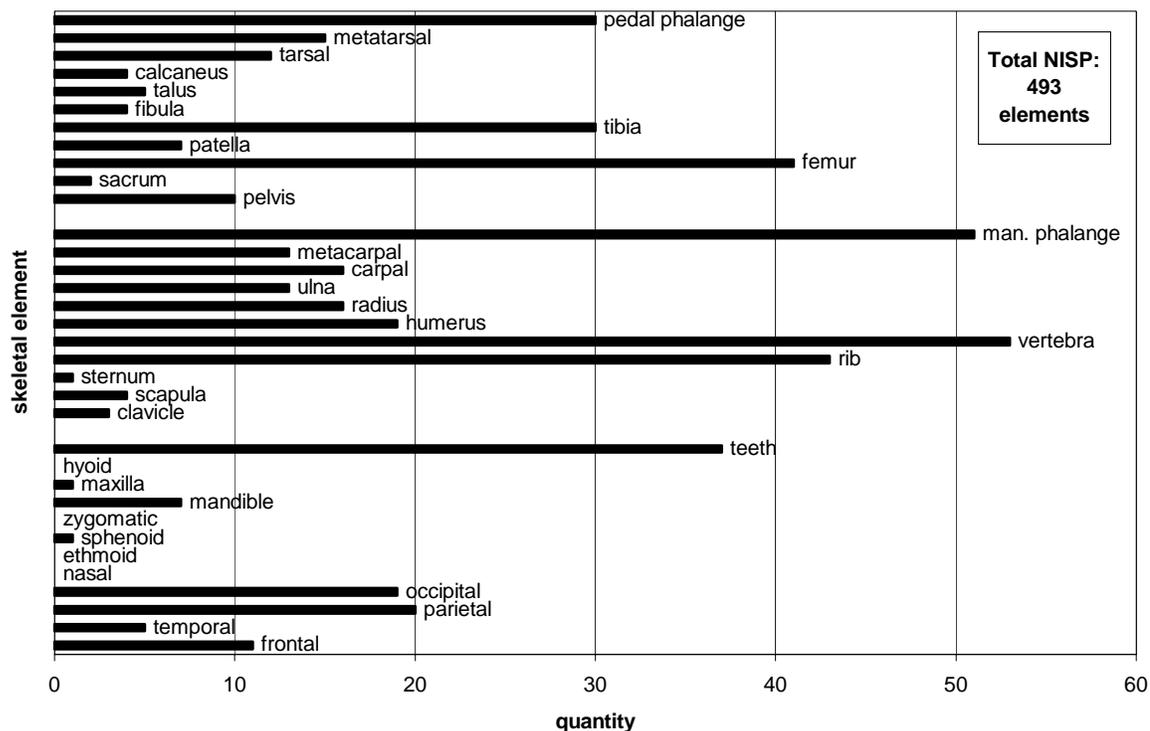


Fig. 11. NISP by element for Cueva de Sangre.

as frequently as the more robust bones of the leg. Cranial material such as occipital and parietal bones occurred in higher frequencies than other cranial elements such as the frontal, temporal, mandible, and maxilla. However, many of these cranial bones are articulated with one another, and represent the cranium of a single individual.

By the end of the third field season, artifactual and skeletal material from 11 operations had been collected and preliminarily analyzed. The first four operations (CS1-CS4) were mapped and surveyed during the first field season and are documented in a preliminary report by Brady (1990b). The other seven operations (CS5-CS11) were subsequently mapped and surveyed in the following years. Based on the data from the

material examined in this study, nine of these operations produced some skeletal material. The sample I am analyzing from Cueva de Sangre is incomplete and does not represent the entire skeletal deposit collected throughout the three field seasons. The material not analyzed in this study is comprised of 329 cranial and post-cranial elements, including the articulated remains of a possible adult male analyzed elsewhere by Wright (Brady et al. 1991). The preliminary MNIs calculated for this material will be considered with my estimates of the material I analyzed. The following descriptions represent the information gleaned from the skeletal sample analyzed in this study, which does not include the additional material.

Operation CS1 contains over 100 lots whereby eight of these were represented in the sample I examined. Lots CS1-77-2 and CS1-78-2 contain most of the skeletal material. The other six lots from this Operation contain very little material. A nearly complete mandible was used to identify a possible adult male. Deciduous teeth and a vertebral fragment with unfused epiphyses were evidence of a subadult. Three lots represent the second operation (CS2). Lot CS2-10-1 contained skeletal elements derived from at least two subadults. A large proportion of the skeletal material collected in Lot CS2-11-1 consists of manual and pedal elements. Complete humerus and radius shafts, and a nearly complete patella represent some of the larger elements from this deposit. The only element recovered from Operation CS3 is the superior portion of a manubrium. The fourth operation (CS4) contains long bone material from a child. The relative size of the bones and the unfused epiphyses were used to determine an age of 5-10 years for this individual (Bass 1995). Operation CS5 contains five lots that produced skeletal

material, most of which consists of hand and foot elements that were primarily collected from Lots CS5-07-1 and CS5-08-1. The other lots produced more long bone material. A possible adult male was identified in Lot CS5-01-1 based on the dimensions of two nearly complete femoral shafts and a portion of a left pelvis. Another possible adult male was identified in Lot CS5-07-1 based on a nearly complete mandible. According to Scott (1994), the new deflocculent technique was used in Operation CS7. Lot CS7-04-1 contains elements of the hand, rib fragments, and a vertebral body. Arm and leg bones comprise the sample recovered from Lot CS8-01-1. A considerable amount of skeletal material was recovered from eight lots in Operation CS9, predominantly long bone and cranial material. For instance, Lot CS9-03-1 produced a large quantity of cranial material: 11 complete and partial occipitals, 6 frontal bones (three showing possible evidence of cranial deformation), and 12 nearly complete parietal bones (a few articulating with other cranial elements). The final operation (CS11) produced the largest proportion of hand and foot bones recovered from Cueva de Sangre. Long bone and cranial material also occurred throughout the operation in lower frequencies. The new deflocculent technique was also utilized throughout Operation CS11 (Scott 1994a).

I calculated MNI and PNI estimates for Cueva de Sangre at three levels – lot, suboperation, and operation. It must be stressed that these calculations are based on an incomplete sample, and the estimates are representative of the material I inventoried. At the level of the lot, the entire sample accounted for a minimum of 74 individuals (Table 7). This estimate consists of seven possible adult males, 40 adults of indeterminate sex, four young adults, and 23 subadults. The possible identification of 10 children is

TABLE 7. MNI for Cueva de Sangre.

Lot #	Lot MNI	Subop MNI	Op MNI
CS1-13-2	1 adult	1 adult	1 adult male 1 adult 1 subadult
CS1-33-1	1 adult	1 adult	
CS1-46-1	1 adult	1 adult	
CS1-75-1	1 adult	1 adult	
CS1-77-2	1 adult male 1 adult	1 adult male 1 adult	
CS1-78-2	2 adults 1 subadult	2 adults 1 subadult	
CS1-91-1	1 adult	1 adult	
CS1-94-1	1 adult	1 adult	
CS2-03-43	1 adult	1 adult	
CS2-10-1	2 subadults	2 subadults	
CS2-11-1	1 adult 2 subadults	1 adult 2 subadults	
CS3-04-1	1 adult	1 adult	1 adult
CS4-01-1	1 subadult	1 subadult	1 subadult
CS5-01-1	1 adult male 1 subadult	1 adult male 1 subadult	2 adult males 2 y.adults 1 subadult
CS5-05-1	1 adult male	1 adult male	
CS5-07-1	1 adult male 1 y.adult	1 adult male 1 y.adult	
CS5-08-1	1 y.adult	1 y.adult	
CS5-10-1	1 subadult	1 subadult	
CS7-04-1	2 adults 1 subadult	2 adults 1 subadult	2 adults 1 subadult
CS8-01-1	1 adult 1 subadult	1 adult 1 subadult	1 adult 1 subadult
CS9-01-1	1 adult 1 subadult	1 adult 1 subadult	1 adult male 13 adults 3 subadults
CS9-02-1	2 subadults	2 subadults	
CS9-03-1	8 adults 2 subadults	8 adults 2 subadults	
CS9-04-1	3 adults 1 subadult	3 adults 1 subadult	
CS9-05-1	2 adults	2 adults	

TABLE 7. continued.

Lot #	Lot MNI	Subop MNI	Op MNI
CS9-06-1	1 adult male 4 adults	1 adult male 4 adults	
CS9-07-1	1 adult	1 adult	
CS9-08-1	1 adult 1 subadult	1 adult 1 subadult	
CS11-03-1	1 adult male 1 subadult	1 adult male 2 subadults	1 adult male 3 adults 3 subadults
CS11-03-2	1 adult male		
CS11-03-3	1 adult 1 subadult		
CS11-03-4	1 adult 1 subadult		
CS11-04-1	1 adult 1 subadult	1 adult 1 subadult	
CS11-05-1	2 adults 1 subadult	2 adults 1 subadult	
CS11-06-1	2 y.adults 1 subadult	2 y.adults 1 subadult	
Total	74	70	43

included in this figure of 23 subadults. The estimate at the level of the suboperation rendered four less individuals than the lot estimate, for 70 individuals. There is one less adult male, two less adults of unknown age and sex, and one less subadult. Finally, the MNI at the level of the operation produced a significantly lower estimate: 43 individuals. Operation CS9 had the highest estimate with 15 individuals, most of those adults of indeterminate age and sex. The preliminary MNIs of the additional material were also assessed at three levels: lot, "chamber," and cave (Brady et al. 1991). The Lot

MNI considered material from 41 lots and produced an estimate of 54 individuals – 15 male adults, 9 female adults, 18 adults of indeterminate age and sex, three adolescents, and nine children. The estimate at the level of the “chamber,” or suboperation, divided the material into 10 units, which rendered an MNI estimate of 19 individuals. The final calculation at the level of the cave produced an estimate of nine individuals. If both sets of MNIs are considered, Cueva de Sangre has a skeletal sample representative of 52 to 128 individuals.

The PNI estimates for the sample I analyzed produced slightly larger numbers, as anticipated. A total of 92 individuals – eight possible adult males, 54 adults of unknown age and sex, six young adults, and 24 subadults – were estimated at the level of the lot (Table 8). Ten of the subadults were tentatively identified as children. Similar to the MNI estimates, the level of the suboperation produced four less individuals than the estimate at the lot level, a total of 88 individuals. When considered at the level of the operation, 62 individuals can be accounted for the by sample. Every age category was reduced in quantity, especially the adults of unknown age and sex. The PNI estimates suggest that the deposit recovered from this cave represents the remains of 62 to 92 individuals. These estimates do not include the additional material reported by Brady et al. (1991). In that report, Wright estimated a Lot MNI of 54 individuals and a “chamber” MNI of 19 individuals, which together with the sample analyzed here, indicates a likely number of 71 to 146 skeletons. The MNI and PNI estimates seem probable given the large sample size.

TABLE 8. PNI for Cueva de Sangre.

Lot #	Lot MNI	Subop MNI	Op MNI
CS1-13-2	1 adult	1 adult	1 adult male
CS1-33-1	1 adult	1 adult	2 adults
CS1-46-1	1 adult	1 adult	1 subadult
CS1-75-1	1 adult	1 adult	
CS1-77-2	1 adult male 1 adult	1 adult male 1 adult	
CS1-78-2	2 adults 1 subadult	2 adults 1 subadult	
CS1-91-1	1 adult	1 adult	
CS1-94-1	1 adult	1 adult	
CS2-03-43	1 adult	1 adult	1 adult
CS2-10-1	2 subadults	2 subadults	3 subadults
CS2-11-1	1 adult 2 subadults	1 adult 2 subadults	
CS3-04-1	1 adult	1 adult	1 adult
CS4-01-1	1 subadult	1 subadult	1 subadult
CS5-01-1	1 adult male 1 subadult	1 adult male 1 subadult	2 adult males 1 adult
CS5-05-1	1 adult male 1 adult	1 adult male 1 adult	2 y.adults 1 subadult
CS5-07-1	1 adult male 1 y.adult	1 adult male 1 y.adult	
CS5-08-1	1 y.adult	1 y.adult	
CS5-10-1	1 subadult	1 subadult	
CS7-04-1	3 adults 1 subadult	3 adults 1 subadult	3 adults 1 subadult
CS8-01-1	2 adults 1 subadult	2 adults 1 subadult	2 adults 1 subadult
CS9-01-1	1 adult 1 subadult	1 adult 1 subadult	1 adult male
CS9-02-1	2 subadults	2 subadults	23 adults
CS9-03-1	15 adults 2 subadults	15 adults 2 subadults	5 subadults
CS9-04-1	3 adults 1 subadult	3 adults 1 subadult	
CS9-05-1	2 adults	2 adults	

TABLE 8. continued.

Lot #	Lot MNI	Subop MNI	Op MNI
CS9-06-1	1 adult male 7 adults	1 adult male 7 adults	
CS9-07-1	1 adult	1 adult	
CS9-08-1	2 adults 1 subadult	2 adults 1 subadult	
CS11-03-1	1 adult male 1 subadult	1 adult male 2 subadults	1 adult male 2 adults 3 y.adults 4 subadults
CS11-03-2	1 adult male		
CS11-03-3	1 adult 1 subadult		
CS11-03-4	1 adult 1 subadult		
CS11-04-1	1 adult male 1 adult 1 subadult	1 adult male 1 adult 1 subadult	
CS11-05-1	2 adults 2 y.adults 2 subadults	2 adults 2 y.adults 2 subadults	
CS11-06-1	2 y.adults 1 subadult	2 y.adults 1 subadult	
Total	92	88	62

Cueva de Kaxon Pec

The 161 skeletal elements surface collected from Cueva de Kaxon Pec represent the total number of identified specimens (NISP) recovered from this cave. However, the sample I analyzed consists of 138 bones, most of which are femoral shafts, accounting for 16 percent of the total sample (Figure 12). The vertebral elements are also well represented in the sample (15 percent). There are relatively high concentrations of teeth (nine percent), tibial portions (nine percent), sacral fragments (eight percent), and humeral elements (seven percent). Nine pelvic elements were also recovered from

Cueva de Kaxon Pec. These do not include the three additional innominates not on loan from Guatemala; all three are identified as possible adult females (see Appendix V).

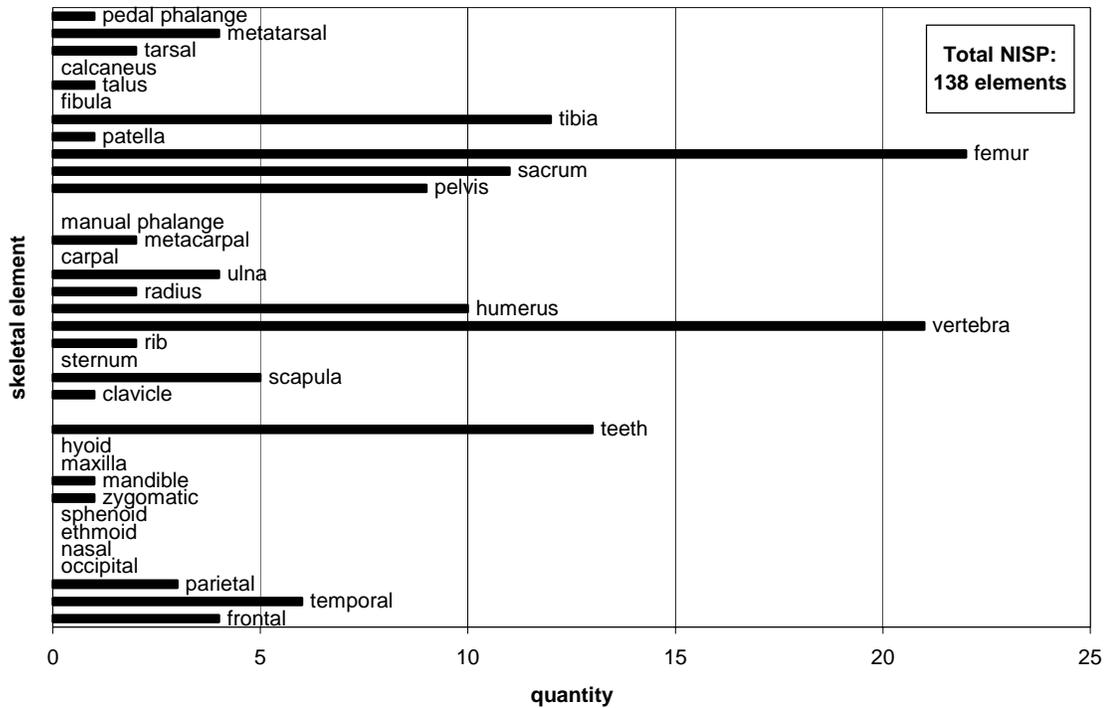


Fig. 12. NISP by element for Cueva de Kaxon Pec.

Cranial material includes portions of temporals, parietals, frontals, zygomatics, and mandibles, as well as the three nearly intact crania not represented in this sample. Other long bones, i.e. radius, ulna, and fibula, do not occur as frequently as the larger, more robust bones of the legs and upper arm. Bones of the hands and feet are present in the sample, however, not in significant quantities.

Three hundred and fifty meters of the cave were mapped and surveyed during the Petexbatun Regional Cave Survey, whereby the material from eight operations was surface collected. Every operation produced some artifactual material, however, only four operations produced human skeletal material. Seven lots within Operation CKP2 contained human skeletal material. Lot CKP2-03-01 contained the largest amount of skeletal material. Femora, humeri, tibiae, pelvis portions, and vertebral material are among the most common skeletal elements in this lot. A right ilium with a wide sciatic notch was identified as an adult female (Steele and Bramblett 1988). Deciduous teeth and relatively smaller-sized skeletal elements with unfused epiphyses indicate the presence of subadults. The other six lots did not produce nearly the amount of material collected from Lot CKP2-03-01. Operation CKP6 has a single lot that produced two right femoral shafts and three unidentified long bone shaft fragments. Operation CKP7 has two lots with skeletal material: Lot CKP7-06-1 contained a single maxillary second molar and Lot CKP7-07-1 had two left femoral shafts and several well-preserved cranial elements. An adult male was identified based on the dimensions and general robusticity of a complete left femoral shaft from this lot. The final operation (CKP9) has five lots with minimal skeletal material. Teeth and long bone material are the most common elements in this particular operation.

I estimated the minimum and probable number of individuals for Cueva de Xaxon Pec at four levels. The lot and suboperation produced identical MNI estimates, thus both will be treated as a single level. Skeletal material was broadly categorized as adult or subadult, however, precise age estimates were assessed when possible. These

TABLE 9. MNI for Cueva de Kaxon Pec.

Lot #	Lot MNI	Subop MNI	Op MNI	Cave MNI
CKP2-01-1	1 adult	1 adult	1 adult female 1 adult male	1 adult female 1 adult male
CKP2-02-1	2 adults	2 adults	3 adults 3 subadults	4 adults 3 subadults
CKP2-03-1	1 adult female 2 adults 2 subadults	1 adult female 2 adults 2 subadults		
CKP2-04-1	1 adult male	1 adult male		
CKP2-06-1	1 adult 1 subadult	1 adult 1 subadult		
CKP2-07-1	1 adult 1 subadult	1 adult 1 subadult		
CKP2-08-1	2 adults 1 subadult	2 adults 1 subadult		
CKP6-02-1	2 adults	2 adults	2 adults	
CKP7-06-1	1 adult	1 adult	1 adult male 1 adult	
CKP7-07-1	1 adult male 1 adult	1 adult male 1 adult		
CKP9-01-1	1 adult	1 adult	1 adult 1 subadult	
CKP9-04-1	1 adult	1 adult		
CKP9-05-1	1 adult	1 adult		
CKP9-06-1	1 subadult	1 subadult		
CKP9-07-1	1 adult	1 adult		
Total	26	26	14	9

general MNI estimates do not consider the relative robusticity of the element and/or paired elements. At the level of the lot/suboperation, the skeletal sample accounted for

26 individuals (Table 9). I identified one adult female and two adult males in addition to the other 17 adult individuals of indeterminate age and sex. The two individuals of known sex were identified based on iliac portions with intact greater sciatic notches. Six subadults are also represented in the sample, as evidenced by deciduous teeth, smaller-sized skeletal elements, and bones with unfused epiphyses.

The number of individuals I estimated at the level of the operation is nearly half the estimate of the lot/suboperation. Ten adult individuals (including the male and female adults) and four subadults constitute the 14 individuals calculated at the level of the operation. The most noteworthy disparity between the MNIs of the lot/suboperation and the operation is in the portion of the cave with the largest concentration of skeletal material: Operation CKP2. There are 11 adults and 5 subadults at the level of the lot/suboperation, whereas the estimate at the level of the operation accounts for five adults and three subadults. An adult male and another adult of unknown age and sex were identified in Operation CKP7. The most accurate calculation of the material recovered from each lot in Operation CKP9 is at the level of the operation, given that most of the artifactual and skeletal material collected from the latter portion of this cave was submerged in water during the recovery process (Scott 1994b). Moreover, evidence of alluvial activity throughout the cave may suggest the possibility of displacement and/or commingling of the skeletal material between lots and operations. The disturbance of skeletal material throughout the cave by means of human agents is yet another factor that must be considered in these calculations. With this in mind, I also

TABLE 10. PNI for Cueva de Kaxon Pec.

Lot #	Lot MNI	Subop MNI	Op MNI	Cave MNI
CKP2-01-1	1 adult	1 adult	1 adult female 1 adult male	1 adult female 2 adult male
CKP2-02-1	2 adults 1 subadult	2 adults 1 subadult	9 adults 3 subadults	13 adults 3 subadults
CKP2-03-1	1 adult female 5 adults 2 subadults	1 adult female 5 adults 2 subadults		
CKP2-04-1	1 adult male 1 adult	1 adult male 1 adult		
CKP2-06-1	1 adult 1 subadult	1 adult 1 subadult		
CKP2-07-1	1 adult 1 subadult	1 adult 1 subadult		
CKP2-08-1	3 adults 1 subadult	3 adults 1 subadult		
CKP6-02-1	2 adults	2 adults	2 adults	
CKP7-06-1	1 adult	1 adult	1 adult male 1 adult	
CKP7-07-1	1 adult male 1 adult	1 adult male 1 adult		
CKP9-01-1	1 adult	1 adult	2 adults 1 subadult	
CKP9-04-1	1 adult	1 adult		
CKP9-05-1	1 adult	1 adult		
CKP9-06-1	1 subadult	1 subadult		
CKP9-07-1	1 adult	1 adult		
Total	32	32	21	19

calculated an MNI at the level of the entire cave. The entire skeletal sample can be accounted for by nine individuals – six adults and three subadults.

The PNI estimates for this sample produced slightly larger numbers than the MNI estimates. An estimate at the level of the lot/suboperation rendered six more individuals (five adults and a subadult) than the MNI estimate, for a total of 32 individuals (Table 10). The discrepancies between the MNI and PNI estimates are consistent throughout the other levels. At the level of the operation, there is a difference of seven individuals between the estimates. Six additional adults in Operation CKP2 and one more in Operation CKP9 increased the total to 21 individuals at the level of the operation. The number of subadults for both MNIs is identical with three individuals. An estimate at the level of the cave also produced an interesting discrepancy between the MNIs and PNIs. The MNI is nine individuals, whereas the more precise PNI is nearly double that figure - 19 individuals. The major difference is in the identification of nine additional adults in the PNI estimate. According to these PNI estimates, Cueva de Kaxon Pec has a skeletal sample representative of 19 to 32 individuals.

Cueva de Los Quetzales

Cueva de Los Quetzales is the only cave not connected to the extensive cave system associated with the site of Dos Pilas. However, the artifactual and skeletal material excavated from this small cave demonstrates its importance during the Maya occupancy of the area. A total of 40 skeletal elements were excavated from Cueva de Los Quetzales. Thirty percent of the sample (12 elements) consists of teeth (Figure 13). Bones of the feet also occur in relatively higher frequencies than other skeletal elements.

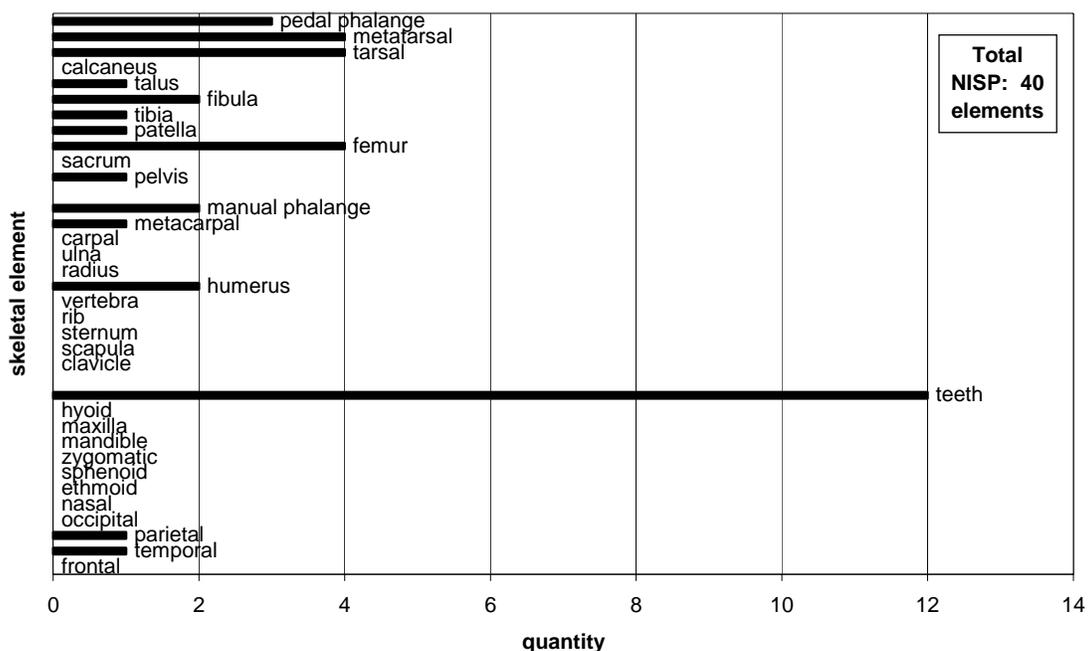


Fig. 13. NISP by element for Cueva de Los Quetzales.

Long bone elements present in the sample include femurs, tibiae, fibulae, and humeri. The femur accounts for the highest proportion of long bone material in the sample with 10 percent. Minimal cranial material was recovered from this particular cave.

The skeletal material from Cueva de Los Quetzales was excavated from three operations - CQ1, CQ2, and CQ10. A large proportion of the sample was recovered from Operation CQ1, most of which are teeth and bones of the hands and feet. Long bone and cranial material is not as well represented in the sample. However, a complete left femoral shaft with possible evidence of bone modification was found in this operation. The other two operations produced minimal skeletal material. A right navicular found in Lot CQ2-01-0 may articulate with a right talus found in Lot CQ1-10-9. This may illustrate the movement or displacement of articulated or semi-articulated

TABLE 11. MNI for Cueva de Los Quetzales.

Lot #	Lot MNI	Subop MNI	Op MNI	Cave MNI
CQ1-03-1	1 adult	1 adult	1 adult male 1 adult	1 adult male 2 adults
CQ1-09-16	1 adult	1 adult	1 subadult	1 subadult
CQ1-10-9	1 adult	1 adult 1 subadult		
CQ1-10-10	1 adult 1 subadult			
CQ1-10-11	1 adult 1 subadult			
CQ1-10-12	1 adult 1 subadult			
CQ1-11-4	1 adult	1 adult		
CQ1-11-5	1 adult			
CQ1-12-4	1 adult	1 adult		
CQ1-13-4	1 adult	1 adult		
CQ1-15-12	1 adult	1 adult		
CQ1-16-8	1 adult male 1 adult	1 adult male 1 adult		
CQ2-01-0	1 adult	1 adult	1 adult	
CQ10-1-1	1 adult	1 adult	1 adult	
Total	18	12	5	4

skeletal elements through the process of water, animal, and/or human disturbance.

Operation CQ10 produced two partial fibulae and a tibial fragment. I calculated four MNIs for the material collected from Cueva de Los Quetzales. The first MNI estimates treat each lot separately, producing an estimate of 18 individuals – an adult male, 14

adults of indeterminate age and sex, and three subadults (Table 11). The determination of the sex of the adult male is based on the dimensions of a complete left femoral shaft from Lot CQ1-16-8. The fused femoral head has a vertical diameter of 39.32 mm, indicating a smaller adult male. The subadults are represented by several phalanges and metapodials with unfused epiphyses. A few deciduous teeth confirm the presence of children in the sample. The MNI conducted at the level of the suboperation renders an estimate of 12 individuals. The largest discrepancy between the MNIs of lot and suboperation occur in the estimation of the individuals represented in suboperation CQ1-10. The material recovered from the four lots of Suboperation CQ1-10 account for four adults and three subadults. This differs from the two adults and one subadult calculated for the entire suboperation.

The estimates at the level of the operation and the cave as a whole seem more plausible considering the relative size of the entire skeletal sample. I estimate five individuals at the level of the operation. The adult male and female identified at the level of the suboperation are treated as the same individual in the operation MNI. Operation CQ1 contained the adult male as well as another adult of indeterminate sex, and a subadult. The two other operations each contain at least one adult individual. However, as previously stated, the navicular found in Lot CQ2-01-0 may be associated with an individual in the first operation. Due to this possible displacement of skeletal material within the cave, I also calculated an MNI estimate of the entire cave sample, which tallies four individuals. This is one less individual than the estimate at the level of the operation. Given the small size of the skeletal sample, MNI estimates at the level of

the operation and the cave seem more accurate. Both MNIs and PNIs rendered estimates of four to 18 individuals.

CHAPTER VI

BONE MODIFICATION

Bone modification represents “any alteration in size, structure, or texture of bone by an external agent” (Marshall 1989:8). There are two key components in the analysis of these changes to bone: process and pattern. The former is the agent(s) responsible for the modification, whereas the latter represents the physical result of a natural or human agent on a bony element. Natural agents such as weathering due to exposure, bioturbation, fluvial activity, and animal disturbance may affect the structure and appearance of a skeletal element. Human activities such as butchering or processing an animal’s carcass may also leave evidence of bone modification.

These modifications may manifest themselves in a number of forms, including cut marks, percussion breakage, burning, and animal gnawing. Moreover, different agents may produce different types of bone modification. The gnawing action of an animal will produce a mark that may be morphologically distinct than a cut mark left by a stone tool used for butchering. The anatomical location of the modification may also point to the specific activity responsible. For example, cut marks that suggest disarticulation and dismemberment tend to occur on or near articular surfaces, in areas of muscle and ligament attachments (Hurlbut 2000). On the other hand, evidence of defleshing does not tend to concentrate on a particular area of a bone, and may occur as single marks scattered throughout long bone shafts and all over the skull. This pattern of cut marks suggestive of defleshing occurred on a number of skulls exhumed from the Maya skull pit of Colha, Belize (Massey and Steele 1997). Morphological differences

between these two types of activity have also been documented. Cut marks caused by defleshing activity tend to be U-shaped in cross section, whereas those caused by dismemberment are V-shaped (Raemsch 1993). Thus, the morphology and anatomical location of the modification are important elements to consider when assessing the possible process responsible for the type of modification present.

This chapter focuses on the identification and description of possible cut marks on several skeletal elements from the Petexbatun cave sample. My goal is to demonstrate that these cut marks are the result of specific human activities, i.e. disarticulation/dismemberment, defleshing, etc. Other bones with evidence of animal gnawing and other taphonomic agents are also described in order to illustrate the morphological differences between cut marks caused by human action and those produced by other natural agents. The following are possible human activities, which may account for the presence of cut marks on a human bone.

- 1) Primary burial – the individuals may represent a specific group of the Maya population primarily buried in these caves, i.e. war victims. The marks may be evidence of wounds inflicted before the death and deposition of an individual in the cave.
- 2) Sacrificial victims – the sample may represent a select group of individuals that were sacrificed, dismembered and primarily buried in these caves. The marks may indicate peri- or post-mortem activity whereby the dismemberment of the body followed the actual sacrificial act. The dismemberment of the body with the aid of sharp stone implements may have facilitated easier transport and

deposition of the individual(s) in the caves, or may have been ritually significant in its own right.

- 3) Secondary burial – the skeletal deposit may represent the remains of individuals exhumed from a primary burial site and re-deposited in these caves. The marks may indicate the physical evidence of post-mortem burial activity, i.e. the cleaning of any residual soft tissue associated with the bones. The disarticulation and dismemberment of a semi-decomposed body may have warranted the separation of skeletal elements from tendons, ligaments, etc. for easier transport and deposition. These bones may represent the venerated remains of certain individuals that were secondarily buried in these caves, or bones that were removed from primary burials for other more mundane reasons (Boyd and Boyd 1997, Nelson et al. 1992).
- 4) Cannibalism – cut marks found on particular human skeletal elements, i.e. long bones and cranial material may resemble activities associated with the processing of an animal carcass for consumption. Cannibalistic behavior may be inferred based on the type and anatomical location of the cut marks (White 1992).

In the case of the skeletal remains from these caves, one or more of these activities may have occurred at some point during the extent of the caves' use by the ancient Maya.

The sample

Only 10 of more than 1,000 bones in the skeletal collection recovered from the caves of the Petexbatun show possible evidence of bone modification. Seven femur shafts, one tibia shaft, the ischial portion of a pelvis, and an incomplete parietal bone

represent the sample with evidence of cut marks and animal gnawing. The state of preservation varies for each bone; some exhibit extensive cortical wear while others are relatively well preserved. All of the elements represent possible adult individuals of indeterminate age and sex. Despite the small number of elements with identifiable bone modification, the information gleaned from these bones is imperative for an accurate interpretation of the type of agent(s) responsible and the depositional activities that may have occurred in these caves.

Cut marks

Eight skeletal elements contain some evidence of possible cut marks produced by human action. The morphology and anatomical location of these marks are the most important features to consider in the interpretation of this specific type of bone modification. An incomplete pelvic bone from Cueva de El Duende and a left femur from Cueva de Los Quetzales show the best evidence of cut marks that indicate peri- or post-mortem disarticulation or dismemberment of an individual. I also identified two other femora with cut marks, which may point to possible defleshing activity. The other three elements have evidence of bone modification, however, I was unable to determine whether they represent cut marks.

CD2-01-8B

I identified two groups of cut marks on an incomplete right ischium. The bone consists of an intact ischial tuberosity, a portion of the ischial ramus, and the inferior portion of the articular surface of the acetabulum; the ischial spine is broken off. The element is too fragmentary to accurately sex; however, the complete fusion of the ischial

tuberosity indicates an individual older than 16-17 years of age. The first set of cut marks consists of two deep, parallel marks located on the anterior aspect of the bone between the inferior portion of the articular surface of the acetabulum and the superior portion of the ischial tuberosity (Figure 14). The uppermost mark is 4.55 mm in length, whereas the deeper mark below it measures 7 mm in length. The latter mark is U-shaped in cross section and is associated with a similar mark located on the superior aspect of the ischial tuberosity. If these two marks are considered as a single unit, it measures 16 mm in length.



Fig. 14. Cut marks on left ischium (CD2-01-8B) from Cueva de El Duende. Note the two deep, parallel cuts underneath the inferior portion of the acetabulum.

The second group consists of eight parallel marks of varying lengths (3.9 mm – 13 mm) that extend from the inferior aspect of the ischial spine to the superior portion of the ischial tuberosity. The cut marks follow the border of the lesser sciatic notch (Figure 15). The two longest marks (10.4 mm and 13 mm) have a U-shaped pattern. The longer of these two marks may be associated with the other group of parallel marks. It appears as if the cutting action followed the contours of the bone.



Fig. 15. Second group of cut marks on CD2-01-8B. These marks begin below the ischial spine and follow the border of the lesser sciatic notch.

CQ1-16-8/2

This left femur has clear evidence of cut marks. The well-preserved shaft of this possible adult has two pairs of parallel marks barely visible to the naked eye on the proximal-anterior aspect of the shaft lateral to the gluteal tuberosity. These small, diagonal marks average 3.2 mm in length. Using a low magnification (12.8X) objective on a Leica MZ 12₅ stereomicroscope, the faint cut marks clearly resemble bone modification caused by human action, and reveal several parallel cut marks (Figure 16).



Fig. 16. Cut marks on left femur (CQ1-16-8/2) from Cueva de Los Quetzales. Several parallel marks were clearly visible under a 12X objective.

One of the deeper cut marks was viewed and photographed at 160X magnification in order to illustrate the straight, V-shaped morphology of these marks (Figure 17). Based on the morphology and anatomical location of these cut marks, an activity associated with the secondary processing of the individual may be inferred.



Fig. 17. Close-up of a single cut mark at 160X magnification of CQ1-16-8/2. Note the straight, V-shaped morphology of the center mark.

CRM3-03-1/1

Given its size, this incomplete, left femoral shaft probably belongs to an adult individual. Despite the worn surface, I identified eight possible cut marks on the anterior-distal and anterior-proximal aspects of the shaft (Figure 18). The marks on the distal end of the bone are parallel and horizontal in orientation. The two superior marks

are shorter in length (7.9 mm each) than the three inferior ones measuring 10.7, 13.1, and 11.9 mm, respectively. The three single marks on the anterior-proximal aspect of the shaft are not as well defined as the marks on the distal end. These parallel marks measured 7.85, 5.85, and 5 mm in length, respectively (superior-inferior).



Fig. 18. Cut marks on femur (CRM3-03-1/1) from Cueva de Río Murciélagos. The possible marks on this femur are distinguishable, but appear to have suffered from erosional wear.

CNP2-07-1/18

A complete left femoral midshaft from an adult has approximately 20 single marks situated throughout the bone (Figure 19). The distal end of the shaft shows dense, sclerotic bone remodeling, however, the entire bone has evidence of periostitis. A large proportion of the marks are concentrated on the posterior-lateral aspect of the shaft. The effects of the cave environment have clearly worn the cortical surface of the entire bone. Despite this extensive wear, I was able to identify several possible cut marks. For example, there are two deep, U-shaped cut marks (13 mm each) on the inferior portion of the femoral neck and one below the lesser trochanter (10 mm). The medial-posterior aspect of the shaft also shows several marks with broad and shallow morphologies. Finally, there is a single deep cut 11.34 mm long on the posterior-distal aspect of the bone. These possible cut marks as well as the other marks identified throughout the femur may point to possible defleshing activity.

Thus, two elements show clear cut marks that indicate some peri- or post-mortem disarticulation or dismemberment of a body. The cut marks are parallel in orientation, sometimes deep enough to macroscopically distinguish a U-shaped in cross section, a pattern Raemsch (1993) attributes to defleshing activity. The anatomical location of these marks in areas of ligament and muscle attachments is also good evidence for a dismemberment activity. This may point to secondary burial activity after incomplete decomposition, however, the processing of a primarily buried individual deposited in a cave represents another possibility. In addition, four other long bones (CQ1-16-8/1, CRM3-06-2/2, CNP2-21-1/8, and CNP2-24-1/6) show marks that I considered as

possible cut marks, but determined were more likely the effects of other taphonomic processes. The anatomical location and morphology of these particular marks did not provide unequivocal evidence for cut marks indicating human activity.



Fig. 19. Cut marks on left femur (CNP2-07-1/18) from Cueva de Río El Duende. Most of the possible cut marks are concentrated along the entire shaft of the femur.

Taphonomy

Signs of animal disturbance and other taphonomic processes may also manifest themselves as evidence of bone modification, which is occasionally mistaken as the product of human activity. Morphological differences exist between cut marks produced by human action and those of other taphonomic agents. For instance, evidence of animal gnawing generally consists of relatively broad and shallow parallel grooves that may

occur throughout the bone. The following descriptions are examples of marks caused by taphonomic processes that could be misinterpreted as human modifications.

CRM-06-1

A left femur from an adult individual has evidence of animal gnawing located on the anterior aspect of the shaft. The first area of disturbance consists of two parallel marks on the proximal end of the bone (Figure 20). Both horizontal marks measure 7.8 x 1.5 mm and are deep enough to feel with a fingernail. The second area is a circular groove/depression located on the distal end of the bone. The striations within this groove are parallel and horizontal in orientation. The dimensions of the area are 5.4 mm (medial-lateral) and 6.7 mm (anterior-posterior). The marks on the proximal end of the shaft resemble the gnaw marks of a small rodent.



Fig. 20. Animal gnawing on femur (CRM-06-1) from Cueva de Río Murciélagos.

CNP2-26-1/3

Several vertical marks were identified on a partial right parietal bone. The relative thickness of the bone may represent an adult individual. There are three groups of marks located below the external surface of the parietal boss (Figure 21). The identification of this type of mark demonstrates the possibility of animal modification resembling the morphology of a human cut mark. These marks may also be mistaken for animal gnawing, however, the morphology of the marks suggests that another taphonomic agent may have caused the modification. This may include the abrasion of the bone against a rough surface over time. Marks pointing to possible defleshing activity would be located closer to the parietal boss and oriented in a horizontal direction. The marks on this parietal are a good example of natural modifications that can be mistaken as caused by human activity.



Fig. 21. Unidentified marks on right parietal (CNP2-26-1/3) from Cueva de Río El Duende.

The identification of human-made cut marks on several skeletal elements from this collection represents an important element in this study. The identification and analysis of cut marks is essential in the interpretation of the peri- or post-mortem treatment these individuals may have experienced before or after their deposition in the caves of the Petexbatun. The following chapter will evaluate all the lines of evidence in the hopes of ascertaining the activity or agents responsible for the deposition of the skeletal material in these caves.

CHAPTER VII

DISCUSSION AND INTERPRETATION

Discussion

The human skeletal remains recovered from the caves associated with the sites of Dos Pilas and Las Pacayas represent over 1,000 pieces of an intricate bioarchaeological puzzle involving the dead of an ancient population. My analysis has focused on examining and addressing the following questions: who were these individuals and how were they deposited in these subterranean spaces? My research and the research of others have demonstrated that the cave represents a revered space of great importance in the Maya worldview. The large quantity of skeletal remains is proof that some form of intentional deposition of the Maya dead in caves occurred in the past. However, before there is any interpretation of the data, it is important to begin with a physical description of the archaeological context of these caves and the various taphonomic processes that have acted on this particular skeletal sample. This discussion serves as a platform for the evaluation of the data with regard to the specific depositional activities that may have occurred in the past.

Cave context and taphonomic agents

The skeletal collection analyzed in this study contains over 1,000 human bones. The various elements examined in this study represent a large proportion (65 percent) of the sample recovered from the six caves of the Petexbatun region. The varied states of preservation and the fragmentary condition of many elements clearly demonstrate the

harsh effects of the active environment of these caves. An underground river flows through this entire cave system. The effects of fluvial activity, especially during the rainy season, are evident in the caves as well as on the skeletal material. For example, the displacement of two portions of the same femoral shaft is documented in Cueva de Río El Duende. It is not clear whether the flow of the river was responsible for the 150-m displacement, yet this displacement illustrates the movement that may have occurred in these caves. The flow of water in these caves represents one of the most dynamic taphonomic processes that have shaped their archaeological record. Evidence of the commingling and displacement of skeletal elements, as well as signs of erosional weathering over time represent the direct effects of this river system on the skeletal material. Several elements clearly show the effects of the karstic environment as deposits of calcification on the surfaces of the bones. There is also evidence of the natural burial of smaller elements under the mud of the cave floor. This, as we will see, may affect the interpretation of the activity occurring in these caves. It is clear that the archaeological record represented in the artifactual and human material has undergone considerable disturbance over time. This undoubtedly obscures the interpretation of the possible types of activities responsible for the deposition of the human remains.

Other taphonomic agents that have acted on this sample include animal disturbance and evidence of continued human activity within these caves. There is evidence of animal gnawing and other activity on a few skeletal elements from this collection. Human activities such as archaeological excavations, looting, and the possible re-use of these underground spaces by the Maya have likely disrupted the

archaeological record. Thus, it is important to consider these various taphonomic agents in the interpretation of the data. Despite the unstable cave environment and the likelihood of a disturbed archaeological context, I contend that the human remains deposited in these caves represent a select group of secondarily buried individuals based on the relative skeletal element frequencies, the minimum number of individuals, and evidence of possible human cut marks that indicate possible post-mortem activity.

Relative skeletal element frequencies

Relative skeletal element frequencies reveal pertinent information concerning the type and number of each bone deposited in a particular sample. In the case of the caves of the Petexbatun, a specific depositional activity may have produced a skeletal sample containing certain bones and not others. For example, the primary burial or deposition of a complete human individual should produce most if not all of the bones of a complete skeleton. With the exception of any peri- or post-mortem removal of body parts, this sample should contain the larger, more robust elements of the limbs and cranium, as well as the smaller bones of the hands and feet, ribs, and vertebra. Thus, the presence of articulated remains or a sample comprised of both large and small skeletal elements may indicate possible primary burial/deposition and/or human sacrifice. The articulated remains of a nearly complete adult individual in Cueva de Sangre are good evidence of a primary burial or a possible sacrificial victim. The individual was found in a dry, isolated passage that was geologically higher than the lower main passage. Due to its placement away from the more active main chamber, it appears as if the flow of water

did not affect this particular burial. Unfortunately, these were the only articulated remains documented in the cave system.

The occurrence of secondary burial or deposition represents another activity that may have occurred in these caves. The exhumation and re-deposition of skeletal material usually involves the larger skeletal elements of an individual's body. The femur or cranium of a decomposed body may represent an individual in a way that a rib fragment or vertebral portion cannot (Becker 1988). Moreover, the larger, more robust bones of the arms and legs, as well as the head may have been easier to transport. This is especially true if we consider the confined spaces of a cave environment. Therefore, the relative skeletal element frequency of a secondarily deposited sample may consist of a deposit of disarticulated long bones, a nearly intact cranium, or a collection of bones that may resemble a primary burial. A simple bone ossuary falls under the category of a secondary burial/depositional activity. The individuals in the caves of the Petexbatun could represent the accumulation of human remains deposited in an ossuary over time. The high frequency of long bones and cranial material in some caves may point to the collection and re-deposition of the remains of primary burials in order to accommodate for recently interred individuals. This would clearly mirror activity interpreted as secondary burial.

In assessing the possible activities responsible for a particular skeletal sample, one must consider the sample method used in the recovery of the material. The under-representation of certain elements may be the direct result of a specific sampling method. Surface collections and excavations may produce distinct skeletal samples,

which may resemble a particular depositional activity. For example, the excavated remains from Cueva de El Duende rendered a skeletal deposit with high frequencies of rib and vertebral material, as well as bones of the hands and feet. On the other hand, the surface collection conducted in Cueva de Río El Duende produced a significant amount of commingled long bone material. If we disregard the possibility of smaller elements buried in the muddy floors of CNP, this particular skeletal sample may reflect a secondarily buried/deposited bone assemblage or an ossuary. The absence of excavation in this cave surely factors into the possibility of a biased sample. Is a cave's skeletal sample the result of a specific depositional activity or a particular recovery method? I examine other lines of evidence in an attempt to address this issue.

Demographics

The calculation of the minimum number of individuals (MNI) and the probable number of individuals (PNI) represents a quantitative means of establishing a demographic profile for each cave. These estimates provide important information concerning the type of depositional activity that may have occurred in these subterranean spaces. In terms of the six caves of the Petexbatun, the MNI estimates for the skeletal material I examined account for a total of 70 to 227 individuals. The more conservative PNI estimates account for 107 to 268 individuals (Table 12). These estimates represent the diverse population of individuals accounting for both sexes and various age groups. Adults of indeterminate age and sex constitute a significant proportion of this population. This was largely due to incomplete and poorly preserved skeletal elements, which hindered accurate assessments of age and sex. The remains of adults of known

TABLE 12. NISPs, MNIs, and PNIs for the caves of the Petexbatun.

Cave	NISP		MNI				
	NISP-addl	NISP	Lot	Suboperation	Room	Operation	Cave
CD	145	75	16	10	6*	6	3
CNP	349	240	74	74	46	49	46
CRM	58	42	19	18	11*	11	8
CS	822	493	74	70	43*	43	0
CKP	161	138	26	26	14*	14	9
CQ	40	40	18	12	5*	5	4
Total	1575	1028	227	210	125	128	70
* Operation MNI, as cave was not divided into rooms.							
Cave	NISP		PNI				
	NISP-addl	NISP	Lot	Suboperation	Room	Operation	Cave
CD	145	75	16	10	6*	6	3
CNP	349	240	91	91	73	76	73
CRM	58	42	19	18	11*	11	8
CS	822	493	92	88	62*	62	0
CKP	161	138	32	32	21*	21	19
CQ	40	40	18	12	5*	5	4
Total	1575	1028	268	251	178	181	107
*Operation MNI, as cave was not divided into rooms.							

sex (including several males and one female), juveniles, and children also occurred throughout these caves, but at lower frequencies. For example, an estimate of 16 children was calculated for the skeletal collection I analyzed for this study.

It is possible that these caves served as repositories or ossuaries used for the primary and secondary deposition of the general populations of Dos Pilas and Las Pacayas. However, these individuals may also be the remains of important ancestral lineages that utilized these subterranean spaces for purposes of primary burial and ancestor veneration. The practice of ancestor veneration would account for the adult individuals, however, the subadults should not logically qualify as ancestors. This particular assessment is beyond the scope of this investigation, but one that warrants its due attention in future research. The demographics of these caves do not provide a clear picture concerning the type(s) of possible depositional activity, however, there is evidence to suggest that the Maya of Dos Pilas granted equal access to both sexes and all age groups. The evidence is not sufficient to substantiate the hypothesis that the remains deposited in these caves represent a select group of individuals.

Human cut marks

The identification and analysis of cut marks caused by human agents is another element examined in the assessment of the possible depositional activity or activities of these caves. As stated in the previous chapter, the morphology and anatomical location of cut marks represent the key elements examined in the interpretation of the activity responsible. Direct and indirect human activities may manifest themselves on a skeletal element as a cut mark. For example, the post-mortem cleaning of a body being

processed for secondary burial (direct) and the decapitation of an individual (indirect) may leave evidence of cut marks on a skeletal element. The skeletal collection recovered from these caves produced a small number of elements with evidence of possible bone modification; this includes natural and human agents. An even smaller proportion of this sample has evidence of possible cut marks. The best evidence of cut marks produced by a human agent appear on the ischial portion of an incomplete right pelvis recovered from Cueva de El Duende and a left femoral shaft from Cueva de Los Quetzales. It is difficult to determine whether the activity occurred shortly after death or some time after the body had decomposed. Nevertheless, these elements represent the best examples of cut marks pointing to an activity evidencing possible dismemberment or disarticulation, i.e. secondary burial or deposition. The possible cut marks identified on the other six elements are not as clear and well defined as the marks examined on the other two bones, but they may also be consistent with an interpretation of possible secondary activity.

The remains of children and juveniles may point to the practice of human sacrifice in the caves of the Petexbatun. Ethnohistorical accounts of the Maya have documented the sacrifice of children and juveniles in a ritual setting. Osteological evidence of human sacrifice may appear as cut marks on the skull and upper neck area, as well as the ribs (Blos et al. 2002, Massey and Steele 1997). The subadults identified in these caves may represent sacrificial victims, however, in view of the lack of bioarchaeological evidence (cut marks), I cannot substantiate this hypothesis. This does not suggest that the sacrifice of human individuals could not have occurred in these

subterranean contexts. Moreover, the children identified in the sample may be subadults that died of natural causes and interred within these caves.

Caves of the Petexbatun

Each cave of the Petexbatun region represents a unique geological and archaeological context. The activities suggested in this study are not ubiquitous throughout the entire cave system. Consideration of each cave as a separate unit may facilitate a better interpretation of the type(s) of depositional activity that may have occurred in these caves.

Cueva de El Duende

Evidence of fluvial activity and looting was clearly responsible for the disturbance of the archaeological record of CD. The skeletal sample excavated from this small cave is represented by smaller elements such as rib and vertebral material. The number of identified specimens (NISP) and the relative skeletal element frequencies suggest primary burial or deposition, and possible secondary activity. No articulated remains were documented in CD. However, the identification of several cut marks on the ischial portion of an incomplete pelvic bone points to a depositional activity that may have necessitated the dismemberment or disarticulation of a human body or skeletal elements, i.e. secondary burial activity. This is the only bone with evidence of cut marks caused by a human agent from CD. The most accurate estimate of the minimum and probable number of individuals is at the level of the lot with six individuals, including an adult male, three adults of indeterminate age and sex, and two children. One must keep

in mind that this and the many other skeletal samples recovered from these caves are incomplete deposits, as portions of the cave remain unexcavated.

Cueva de Río El Duende

The skeletal material recovered from CNP was surface collected from the eastern portion of the cave. This concentration of material may be due to easier access via the larger cave entrance on the eastern side or the easterly flow of the river. The sample recovered from CNP is disproportionately long bone material, especially femora. It is difficult to determine whether the sample is a product of a certain depositional activity or the result of a specific sampling method. The NISP and the relative skeletal element frequencies point to a secondary depositional activity such as an ossuary. However, I cannot rule out primary deposition because of the possibility of a biased sample. A basic surface collection would neglect to recover smaller skeletal elements buried in the muddy cave floors, which would clearly bias a primarily deposited skeletal sample. The demographic profile of CNP supports the possibility of an ossuary. The cave produced skeletal elements that accounted for approximately 46 to 73 individuals. These figures represent the MNI and PNI estimates at the level of the entire cave, respectively. The estimates are most accurate at this level because of evidence of skeletal element displacement occurring within the cave. Most of the individuals are adults of indeterminate age and sex, however children and juveniles also constitute a small portion of the sample (15 percent). This points to the burial or deposition of various age groups within the cave, which resembles the demographic composition documented in the skull pit at Colha (Massey and Steele 1997). Three incomplete femur shafts have cut marks

that suggest post-mortem activity. Judging by the amount of human material recovered, this cave may have served as an ossuary for the primary or secondary deposition of the general population of Dos Pilas.

Cueva de Río Murciélagos

This cave produced a skeletal sample biased towards long bone and cranial material. The only elements not examined in this analysis are two crania, possibly of an adult male and a young adult female (Wright's unpublished notes 1994). The disarticulated remains excavated from CRM account for a minimum of eight to 19 individuals, which includes several adults and a few subadults. The most accurate MNI and PNI estimates are at the level of the Operation with 11 individuals. An incomplete femur and tibia exhibit possible cut marks caused by human agents. These cut marks are not clear enough to suggest a specific depositional activity, however, the NISP and the relative skeletal element frequencies resemble secondary activity despite the mode of recovery. This cave may not have experienced the volume of depositional activity as Cueva de Río El Duende and Cueva de Sangre.

Cueva de Sangre

Cueva de Sangre represents the most complex cave system used by the Maya of Dos Pilas. A combination of excavations and basic surface collections produced the largest skeletal deposit recovered from the caves of the Petexbatun region. I analyzed 493 out of the 822 elements recovered from CS. This partial skeletal sample did not hinder the interpretation of the possible depositional activity or activities that may have occurred throughout this extensive cave system. For example, the articulated remains of

an adult male recovered from an isolated location in Operation CS3 represent clear evidence of primary burial/deposition (Brady et al. 1991). Brady et al. (1991:658) also noted accumulations of hand and foot bones in Lot CS1-46-1, suggesting the possible deposition of intact individuals. Evidence pointing to secondary deposition is not as clear as that for primary deposition, yet it may have occurred. For instance, within Lot CS9-03-1 Brady (2003 personal communication) speculates that a cluster of stacked cranial vault bones point to the secondary treatment of human remains. My analysis of these elements shows that the inner tables of the occipitals are well preserved, whereas the external surfaces exhibit clear signs of erosion. This wear pattern supports the type of secondary treatment described by Brady. The intentional placement of an incomplete tibia underneath a complete vessel may represent yet another example of secondary treatment. Brady et al. (1997:361) hypothesize that the bone may have belonged to a captive “later sacrificed and a portion of the victim was offered in a vessel commissioned to celebrate the victory.” The sample recovered from CS did not produce any elements with cut marks that would demonstrate dismemberment or disarticulation, and there is no osteological evidence pointing to the practice of human sacrifice. The amount of material deposited in CS clearly demonstrates the importance of the cave as a possible ossuary or a burial place for a sizable number of individuals. The MNIs and PNIs for Cueva de Sangre render a combined estimate of 43 to 92 individuals. The demographics imply equal depositional treatment for both sexes and all age groups.

Cueva de Kaxon Pec

CKP is the last cave directly associated with the site of Dos Pilas. One hundred sixty one elements were surface collected from this extensive cave. Skeletal material not examined in this study includes three nearly complete hipbones and three intact crania (reported in Wright's unpublished notes 1994). The sample recovered contained high percentages of femoral and vertebral material. Other cranial and post-cranial elements occurred in relatively lower frequencies. Despite the lack of articulated remains, the relative skeletal element frequencies for Operation CKP2 suggest primary burial or deposition. This operation contained the largest proportion of skeletal material represented by large (femora, pelves, crania, etc.) and small (rib and vertebral fragments, teeth, etc.) elements. Moreover, the operation's close proximity to the cave entrance would have facilitated for the primary deposition of individuals. Operations CKP6 through CKP9 constitute the "wet portion" of the cave. The small amount of material recovered from this portion of the cave consists of long bone and cranial material. This quantitative discrepancy between the two portions of the cave may be the result of a sampling bias, which could be misinterpreted as a specific depositional activity occurring in the wet portion of the cave. It appears that primary activity occurred predominantly throughout CKP. None of the elements from this cave produced evidence of cut marks indicating secondary activity. The demographic profile of CKP is consistent with the others seen throughout the system. Both sexes and all age groups are represented by a skeletal sample accounting for a combined MNI/PNI estimate of nine to 32 individuals.

Cueva de Los Quetzales

The skeletal deposit excavated from this cave represents the smallest sample recovered from the caves of the Petexbatun region. Forty skeletal elements represent the material recovered from three operations, most of which consists of teeth and bones of the hands and feet. Several incomplete long bone shafts constitute a small portion of the sample, however, a nearly complete left femoral shaft shows clear cut marks. The relative skeletal element frequencies as well as possible cut marks may indicate both primary and secondary depositional activity. The most accurate MNI and PNI estimate for this cave is at the level of the operation, with five individuals. This estimate includes an adult male, three adults of unknown age and sex, and a subadult. Despite the absence of articulated remains, the relative skeletal element frequencies suggest primary deposition and the identification of cut marks points to possible secondary activity.

Interpretation

I examined several lines of evidence in an attempt to decipher the types of depositional activity or activities responsible for the skeletal collection recovered from the six caves of the Petexbatun region. Based on the analysis of the relative skeletal element frequencies, estimates of the minimum and probable number of individuals, and cut marks caused by human agents, there is insufficient evidence to support my hypothesis that the remains are the result of the secondary burial or deposition of a select group of individuals. I was unable to determine whether the remains deposited within these caves represent a select group of individuals, an ancestral lineage, or individuals drawn from the general population. However, individual assessments of each cave

sample demonstrate that several types of depositional activity may have played a role in the formation of the cave samples, including secondary burial or deposition. For instance, the calculation of the number of identified specimens indicates that bones representative of the entire human skeleton are present in varying quantities and frequencies throughout the caves. This would suggest that the caves might have been predominantly used as spaces for either primary burial or primary deposition. A primary burial may have involved the interment of a body and perhaps a few grave goods in a grave within the cave. However, the cave itself might represent the physical grave, thus necessitating no further interment under the cave floor. Thus, the primary deposition of a body with or without associated grave goods on the surface of the cave floor may also explain the deposits recovered from these caves. Over time, the effects of an active cave environment have produced deposits of commingled remains, which resemble secondary depositional activity. Cueva de Sangre produced the best evidence for primary burial or deposition. Caves such as Cueva de El Duende and Cueva de Los Quetzales also produced relative skeletal element frequencies that are consistent with primary activity; however, the evidence is not conclusive. The remains from Cueva de Río Murciélagos are consistent with secondary activity despite the use of excavation in the recovery of these elements. The remains collected from Cueva de Río El Duende, Cueva de Sangre (with the exception of the articulated skeleton), and Cueva de Kaxon Pec may represent secondarily deposited samples, based on the high relative skeletal element frequencies of long bone and cranial material; however, the recovery method (surface collection) raises

some doubt. These assessments based on NISPs and relative skeletal element frequencies demonstrate that primary activity predominantly occurred in these caves.

Estimates of the minimum and probable number of individuals for each cave provide a demographic profile of the entire cave system. A conservative estimate of 100-150 individuals illustrates that the intentional burial or deposition of the dead in these various caves did occur. It is unlikely that the skeletal material in these caves was produced by natural taphonomic processes, inasmuch as that they were deposited by the ancient inhabitants of Dos Pilas and Las Pacayas. Moreover, it appears that both sexes and all age groups were afforded equal burial/depositional access to these caves.

Several elements from five of the six caves contain evidence of possible cut marks caused by human agents. The best evidence of secondary activity is identified as cut marks on an incomplete hipbone from Cueva de El Duende and a nearly complete left femur from Cueva de Los Quetzales. An additional six elements also have bone modification, however, the morphology and anatomical location do not confirm that they are human-made cut marks. The secondary placement of several cranial bones in Cueva de Sangre is also evidence of intentional secondary activity. There is no archaeological or osteological evidence to support the practice of human sacrifice within these caves; however, the collective demographic profile of these subterranean spaces resembles the demographics of the sample of mutilated crania recovered from the skull pit of Colha (Massey and Steele 1997). This, however, is not conclusive evidence for the occurrence of human sacrifice within the caves of the Petexbatun region.

The Maya regarded the cave as a birthplace of their people as well as the gateway to Xibalba or “the place of fright” (Tedlock 1985). Various gods of the underworld reside in this subterranean world of darkness and dread, where images of death and decay are vividly captured in the names of deities such as Pus Master, Blood Gatherer, Skull Scepter, and One Death. The deposition of dead bodies throughout these various caves would have surely produced an environment of putrefaction and malodor similar to the one described in the Popol Vuh. In essence, the Maya may have intentionally created an atmosphere that resembled the mythological underworld they feared through the primary deposition of their dead.

CHAPTER VIII

CONCLUSIONS

The information gleaned from this collection has shed some light concerning the use of caves by the Maya of the Petexbatun region. Over 1,000 skeletal elements recovered from these caves account for an estimate of 100 to 150 individuals, which represents a diverse population comprised of both sexes and various age groups. Based on several lines of evidence including relative skeletal element frequencies, estimates of the minimum and probable number of individuals, and the identification of human cut marks, I was able to determine a predominance of primary depositional activity in these caves. The identification of cut marks suggests that secondary activity did occur, but possibly at a lesser extent than primary deposition. Unfortunately, there was insufficient evidence to determine the status of these individuals. The possibility of human sacrifice was also considered in the study; however, the skeletal record produced no unequivocal osteological evidence to support this hypothesis. Archaeological issues such as sampling bias and the active environment of the caves pose definite challenges in the accurate interpretation of the activities responsible for the deposition of the skeletal sample. The evidence presented in this thesis clearly demonstrates the need for further investigation focusing on the deposition of human remains in caves, and underscores the need for careful excavation instead of basic surface collections.

The exploration and investigation of caves associated with Maya sites represents a growing field of study. The continued archaeological study of caves in the Maya area represents an important element in the general understanding of Maya lifestyles and their

worldview. Despite the subterranean nature of these studies, the information gleaned from future cave research will provide additional evidence concerning the importance and role of the cave in the Maya area. This study is a contribution to the growing body of literature focusing on the use of caves by the ancient Maya. Moreover, the bioarchaeological aspects of this investigation demonstrate the importance of a multi-disciplinary approach in the future study of Maya cave-use. With a growing body of knowledge concerning the cultural and skeletal material from these caves, issues such as the social status of individuals, evidence of sacrificial practices, and the ubiquity of human remains in the caves of the Maya area may be explored and developed in future studies.

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APPENDIX

APPENDIX I

INVENTORY FOR CUEVA DE EL DUENDE

Lot	Bone	Side	Description
CD1-01-1	mandible	R	R horizontal ramus, no teeth present, sockets for I1-C, teeth lost post mortem
CD1-01-5	upper canine	L	moderate wear, hypoplasia
CD1-04-1	clavicle	R	dist.inferior frag
CD1-04-1	prox.phalange		manual, complete
CD1-04-2	cranial		5 frags, poss.subadult
CD1-04-2	femur	?	shaft frag, small size
CD1-04-2	metacarpal I		prox.1/2 shaft
CD1-04-2	phalange		2 manual, complete
CD1-04-2	prox.phalange		pedal, complete
CD1-04-2	rib		several frags, poss.adult
CD1-04-2	rib		2 frags, poss.juvenile
CD1-04-2	scapula	R	lateral border
CD1-04-2/1	humerus	L	dist.end w/ trochlea & medial epicondyle
CD1-04-2/2	mandible	R	body w/out ascending ramus, P4, M1 & M2 present, little wear, M3 unerupted, 12 or > yrs
CD1-04-2/3	mandible	?	1 body frag
CD1-04-2/4	rib	?	18 shaft frags
CD1-04-2/5	femur	L	dist.1/2 shaft, no end, small size, poss.child
CD1-04-2/6	long bone	?	14 shaft frags
CD1-04-2/7	vertebra	A	lumbar, articular surface of inferior articular process
CD1-04-2/8	vertebra	A	thoracic, transverse process
CD1-04-2/9	cranial		14 frags, very thin & fragile, frag w/ lambdoidal suture
CD1-04-2/9	parietal		1 frag
CD1-04-2/10	femur	R	dist.1/2 shaft, anterior 1/2 very eroded & fragmentary, no ends
CD2-01-2	tibia	L	shaft w/ unfused dist.epiphysis, poss.juvenile

CD2-01-4	maxilla	L	portion w/ alveoli for I1 to M2, no teeth but alveoli open
CD2-01-4	phalange		manual, prox.or medial
CD2-01-4	rib	L	frag.
CD2-01-4A/1	parietal	R	portion of squamosal & lambdoidal suture
CD2-01-4A/2	metatarsal V	R	prox.1/2 shaft
CD2-01-5	metatarsal IV	R	dist.1/2 shaft, healed sclerotic periostitis
CD2-01-5"A"	atlas	A	L side, 1/2 of superior articular pit, missing transverse process
CD2-01-5"A"	axis	A	nearly complete minus spinous process
CD2-01-5"A"	humerus	?	portion of distal end including ulnar groove & humeral condyle portion
CD2-01-5"A"	long bone	?	frag.
CD2-01-5"A"	temporal	L	portion w/out squamosal suture or petrous portion
CD2-01-5"A"	temporal	L	nearly complete, good condition
CD2-01-5"A"	frag	?	frag of cancellous bone
CD2-01-5"A"	vertebra	A	frag
CD2-01-6	dist.phalange		manual, complete
CD2-01-6	occipital		basilar and edges of foramen magnum, condyles broken
CD2-01-6B	dist.phalange	?	complete minus prox.end, dorsal surface of dist.end broken, small size
CD2-01-6B	upper I2	R	complete, marked occlusal wear, LEH present, caries on labial surface between LEH
CD2-01-6B	prox.phalange	?	manual, complete w/ detached prox.end
CD2-01-6B	prox.phalange	L	complete
CD2-01-6B	phalange	?	manual, complete
CD2-01-6B	phalange	?	manual, complete
CD2-01-6B	patella	R	complete, distal-posterior portion broken off, large size, poss.adult
CD2-01-6B	rib	?	17 shaft frags, 1 head frag
CD2-01-6B	rib	?	head, articular surface & neck
CD2-01-6B	vertebra	A	thoracic, right portion w/ both articular surfaces
CD2-01-7B	metatarsal II	L	complete, good condition, poss.adult
CD2-01-7B	phalange	?	pedal, complete big toe
CD2-01-7B	phalange	?	manual, complete

CD2-01-8B	pelvis	R	complete ischium & inferior ptn.of acetabulum, poss.cutmarks, poss.adult
CD2-01-8B/1	metacarpal I	L	complete, good condition
CD2-01-8B/2	rib	R	nearly complete, vertebral end unfused
CD2-01-8B/3	radius	R	complete shaft, no ends, large size, poss.adult male
CD2-01-12"A"	pelvis	R	iliac portion w/ greater sciatic notch & arcuate line, small ptn.of auricular surface
CD2-01-13	rib	L	frag.
CD2-01-15	fibula	?	shaft, some superficial sclerosis, patch of healed periostitis
CD2-01-15	maxilla	R	no teeth, antemortem loss of 2nd/3rd molar, P4, abcess for I1 & P3
CD2-01-15	patella	R	medial 1/2
CD2-01-15	tarsal	?	3 poss.frag
CD2-01-15	vertebra	A	cervical, body frag
CD2-01-15	vertebra	A	thoracic, end plates not fused, poss.juvenile
CD2-01-15A	med.phalange		manual, complete
CD2-01-16	metatarsal V	L	prox.shaft w/ arthritic lipping
CD2-1-3	talus	R	nearly complete, poss.arthritic lipping on head
CD2-1-4	long bone	?	epiphysis unfused, possible infant, porous metaphyseal texture
CD2-1-5	metacarpal I	?	shaft
CD2-1-5	metatarsal IV	R	prox.1/2 shaft w/ arthritis
CD2-1-5	prox.phalange		manual, prox.1/2 shaft
CD3-1-1/1	talus	L	dorsal 1/2 missing
CD3-1-1/2	humerus	R	dist.1/2 shaft minus articular end, pits worn into cortical surface
CD3-4-1	maxilla	R	ptn w/ sockets for I1 to P4, P3 & P4 still present, others lost post mortem, slight wear

CD4-00-1	hamate	R	complete
CD4-00-1	med.phalange		manual, complete
CD4-00-1	triquetral	L	complete
CD4-00-1	vertebra	A	body frag
CD4-02-1	rib		3 frags
CD4-02-1	vertebra	A	thoracic, spine frag
CD4-03-1	radius	L	3 frags, same bone
CD4-03-1	rib		16 frags
CD4-03-1	rib		10 frags
CD4-03-1	scapula	R	portion w/ acromion process
CD4-03-1	ulna	R	dist.1/2 shaft, fused epiphysis, no arthritis
CD4-03-1	vertebra	A	thoracic, spine frag
CD4-03-1	vertebra	A	thoracic

NOTE: Skeletal elements in **bold type** were inventoried by Wright (unpublished notes 1994) and are not included in the sample analyzed in this study.

APPENDIX II

INVENTORY FOR CUEVA DE RIO EL DUENDE

Lot	Bone	Side	Description
CNP Stat.16	mandible		mental symphysis portion w/ sockets for incisors, stained
CNP Stat.16	tibia	R	central midshaft portion, stained & worn, 2 other frags, stained
CNP Stat.17	femur	?	central midshaft portion, stained & worn
CNP Stat.18	mandible		portion w/ gonial & chin, L-R M2 present, large size, poss.adult male
CNP Stat.18	rib		2 frags
CNP1-02-1	med.phal.	?	manual, complete, stained & worn, poss.adult
CNP2-02-1	upper I2	R	complete, shoveled, poss.adult
CNP2-02-1/1	femur	R	dist.1/2 shaft w/ condyles, condyles worn to expose trabecula, poss.adult
CNP2-02-1/2	tibia	R	central midshaft, no ends, worn, stained & worn, poss.adult
CNP2-02-1/3	humerus	?	central midshaft portion, worn, chalky white appearance
CNP2-02-1/4	femur	?	midshaft portion, cortex very worn, stained
CNP2-03-1	humerus	R	complete shaft, no ends, cortex heavily worn away, stained
CNP2-03-1	tibia	R	nearly complete midshaft, 2 pieces, fragmentary, stained
CNP2-03-1	lower I2	R	complete, minimal wear, poss.adult
CNP2-04-1/1	tibia	L	prox.2/3 shaft, no end, partial tibial tuberosity, stained & polished, robust, poss.adult
CNP2-04-1/2	femur	L	central midshaft, small size, stained & polished
CNP2-04-1/3	femur	?	central midshaft portion, cortex very worn, stained & polished, poss.adult
CNP2-04-1/4	femur	L	prox.2/3 shaft, no end, heavily worn cortex, stained, poss.gnaw marks, poss.adult

CNP2-04-1/5	femur	L	prox.2/3 shaft, no end, heavily worn cortex, stained, small size, poss.subadult
CNP2-04-1/6	humerus	?	midshaft portion, heavily worn cortex
CNP2-04-1/7	tibia	R	central midshaft, medial aspect very worn (holes), stained & polished
CNP2-04-1/8	frontal		nearly complete, portion of L superior orbit present, outer table stained & worn, poss.adult
CNP2-04-2	parietal	R	lambdoid edge
CNP2-04-2	radius	?	midshaft frag
CNP2-04-2	tibia	R	frag w/ anterior crest
CNP2-04-2	ulna	R	prox.2/3 shaft w/ head, eroded
CNP2-04-2	vertebra	A	thoracic, upper body frag and L pedicle
CNP2-05-1	ulna	R	prox.1/3 shaft w/ portion of coronoid process, cracked
CNP2-05-1	femur	L	prox.shaft, eroded
CNP2-05-1	femur	?	midshaft frag, eroded
CNP2-05-1	radius	R	dist.1/2 shaft, eroded
CNP2-06-1/1	femur	R	complete shaft, no ends, dist.end stained, poss.adult
CNP2-06-1/2	femur	R	prox.2/3 shaft, no end, part of lesser trochanter & neck, poss.adult, poss.paired w/ CNP2-06-1/3
CNP2-06-1/3	femur	L	nearly complete shaft, no dist.end, part of neck, cortex worn, stained & polished, poss.adult
CNP2-06-1	humerus	R	dist.1/2 shaft, poss.subadult
CNP2-06-1	mandible	L	portion w/ sockets from M2-I2, no teeth, poss.adult female
CNP2-06-1	radius	R	shaft, eroded surface
CNP2-06-1	ulna	R	midshaft portion, eroded surface, poss.adult
CNP2-07-1/1	humerus	L	complete, no lateral aspect of head, good condition, stained, poss.adult
CNP2-07-1/2	ulna	L	prox.1/2 shaft, no end, stained & polished
CNP2-07-1/3	humerus	L	dist.1/2 shaft, no end, stained & polished, poss.adult
CNP2-07-1/4	humerus	R	prox.1/2 shaft, no end, stained & polished, pronounced muscle attachment, poss.adult
CNP2-07-1/5	humerus	L	prox.1/3 shaft, no end, cracked & stained
CNP2-07-1/6	femur	L	nearly complete shaft, no ends, stained & polished (black), robust, poss.adult
CNP2-07-1/7	femur	?	central midshaft portion, cortex very worn, stained & polished
CNP2-07-1/8	femur	R	nearly complete shaft, no ends, part of lesser trochanter, stained & polished
CNP2-07-1/9	femur	L	prox.2/3 shaft, no end, part of neck, cortex flaking off, stained & polished

CNP2-07-1/10	femur	L	prox.1/2 shaft, no end, stained
CNP2-07-1/11	femur	?	central midshaft, cortex worn, stained
CNP2-07-1/12	femur	?	central midshaft, posterior side very fragmentary, worn & stained
CNP2-07-1/13	femur	R	nearly complete shaft, no ends, poss.subadult, poss.cutmarks on anterior face, stained & polished
CNP2-07-1/14	femur	L	dist.portion w/out condyles, popliteal surface, stained & worn
CNP2-07-1/15	radius	L	central midshaft portion, poss.adult
CNP2-07-1/16	ulna	?	midshaft frag
CNP2-07-1/17	tibia	?	shin fragment
CNP2-07-1/18	femur	L	complete shaft, no ends, pronounced lateral bump, poss.adult male, poss.cutmarks on lateral aspect
CNP2-07-1/18	femur	R	complete shaft, no ends, pronounced lateral bump, paired w/ CNP2-07-1/18 L femur, poss.adult male
CNP2-08-1/1	ulna	?	central midshaft portion, stained & polished
CNP2-08-1/2	tibia	L	central 1/3 midshaft portion
CNP2-08-1/3	femur	L	complete shaft, no ends, stained, small size, poss.subadult
CNP2-08-1/4	femur	L	nearly complete shaft, no ends, cortex very worn, crack on anterior face, stained & polished, poss.adult
CNP2-08-1/5	femur	L	prox.1/2 shaft, no end, cortex very worn, poss.cutmarks on prox-ant.face, stained, poss.adult
CNP2-08-1/6	femur	L	complete shaft, no ends, stained, robust, poss.adult
CNP2-08-1/8	femur	L	prox.1/4 shaft, no end, part of neck
CNP2-08-1/9	ulna	R	prox.1/2 shaft, no end, stained & polished
CNP2-08-1/10	humerus	R	dist.1/2 shaft, no end, stained & polished (black), poss.adult
CNP2-08-1/11	humerus	?	central shaft portion, polished
CNP2-08-1/12	tibia	L	nearly complete shaft, no ends, stained & polished, worn, poss.adult
CNP2-08-1/13	tibia	R	central midshaft, stained & polished, poss.adult
CNP2-08-1/14	tibia	R	complete shaft, no ends, stained & polished, poss.adult
CNP2-08-1/15	tibia	R	central midshaft, fragmentary, cortex very worn, stained & polished, poss.adult
CNP2-09-1	femur	R	prox.1/2 shaft, poss.subadult
CNP2-09-1	humerus	?	2 frags
CNP2-09-1	parietal	R	frag
CNP2-09-1	tibia	R	shaft, surface erosion w/ poss.sclerotic striae on anterior side
CNP2-09-1	tibia	R	dist.shaft
CNP2-10-1/1	femur	R	complete shaft w/ head & neck ptn, no dist.end & trochanters, A-P bowing w/ pronounced linea aspera

CNP2-10-1/2	femur	R	complete shaft w/ most of the neck, no dist.end, no head & trochanters, stained & polished, poss.adult
CNP2-10-1/3	femur	L	complete shaft, no ends, stained & polished (black), poss.adult
CNP2-10-1/4	tibia	L	prox.1/2 shaft, no end, stained & polished, poss.adult
CNP2-10-1	femur	R	shaft, surface eroded w/ poss.sclerosis in striae
CNP2-10-1	femur	L	shaft
CNP2-10-1	frontal	R	post-squama w/ coronal suture
CNP2-10-1	mandible	R	inferior edge of body
CNP2-10-1	radius	R	shaft, surface eroded
CNP2-10-1	tibia	R	1/2 shaft, poss.subadult
CNP2-10-1	tibia	L	shaft frag, surface eroded
CNP2-10-1	ulna	R	shaft
CNP2-11-1	upper P3	L	complete, some wear, poss.adult
CNP2-11-1/1	femur	R	prox.2/3 shaft w/ neck portion, no end, cortex very worn, stained & polished, poss.adult
CNP2-11-1/2	tibia	R	prox.1/2 shaft, no end, stained, poss.adult
CNP2-11-1/3	tibia	R	prox.shaft frag, lateral aspect
CNP2-11-1/4	humerus	L	prox.1/2 shaft, no end, stained & polished, poss.adult
CNP2-11-1/5	ulna	?	central midshaft, stained & polished
CNP2-11-1/6	femur	R	prox.1/2 shaft, no end, flattened anterior-posteriorly, stained & polished
CNP2-11-1	humerus	L	shaft
CNP2-12-1/1	pelvis	L	acetabular portion, tuberosity epiphysis unfused, suture connecting to ilium still fusing, poss.juvenile
CNP2-12-1/2	ulna	L	prox.1/4 shaft, cortical surface worn @ broken end, olecrenon process
CNP2-12-1/3	humerus	L	nearly complete, no prox.end, dist.end w/ worn condyles, septal aperture(?), cortex broken off
CNP2-12-1/4	mandible	R	mental symphysis & horizontal ramus w/ sockets for L I2 to R M2, stained & polished, poss.adult
CNP2-12-1/5	radius	?	prox.1/4 shaft, no end, including pacchionian depressions, hole worn on radial tuberosity
CNP2-12-1/6	femur	L	prox.1/2 shaft & neck, stained & polished
CNP2-12-1/7	femur	L	prox.1/2 shaft, no end, pt.of lesser trochanter, cortex worn, stained & polished
CNP2-12-1/8	femur	R	complete shaft, no ends, stained & polished, poss.adult
CNP2-12-1/9	tibia	L	central midshaft portion, stained
CNP2-12-1/10	femur	R	prox.2/3 shaft, no end, worn, pronounced linea aspera
CNP2-12-1/11	femur	R	dist.1/2 shaft, no end, anterior face very worn (gnawed?), cave concretions, heavy cortex wear, stained
CNP2-12-1/12	femur	L	dist.1/2 shaft, no end, linea aspera worn away, surf.flaking off, chalky white appearance, small size

CNP2-12-1/13	humerus	R	dist.1/2 shaft, no end, stained
CNP2-12-1/14	tibia	R	dist.1/3 shaft, no end, stained & polished, small size, poss.subadult
CNP2-12-1/16	rib	?	shaft frag., broken ends worn
CNP2-12-1/19	long bone	?	40+ shaft frags
CNP2-12-1/22	parietal	?	frag, outer table worn to expose diploe
CNP2-12-1/23	occipital		superior 1/2 w/ lambdoidal suture, outer table worn, inner table well preserved, poss.adult
CNP2-12-1/24	parietal	R	posterior portion w/ sagittal & lambdoidal sutures, articulates w/ CNP2-12-1/23 & 26 occipital & L parietal
CNP2-12-1/25	parietal	L-R	anterior frag.of sagittal suture including pacchionian depressions, sutures fused, poss.adult
CNP2-12-1/26	parietal	L	posterior portion w/ lambdoidal suture, articulates w/ CNP2-12-1/23 occipital
CNP2-12-1/27	fibula	?	midshaft frag, stained & polished
CNP2-12-1	parietal	L-R	lamdoid corner w/ piece of occipital, sagittal suture fused, lambdoid flattening
CNP2-12-1	parietal	R	posterior/inferior corner, highly mineralized
CNP2-13-1/1	femur	L	nearly complete shaft, no ends, stained, poss.adult
CNP2-13-1/2	tibia	L	nearly complete shaft, no ends, stained & polished, poss.young adult
CNP2-13-1/3	femur	L	prox.1/2 shaft, no end, cortex worn, poss.adult
CNP2-13-1/4	femur	L	prox.1/2 shaft, no end, stained & polished, poss.adult
CNP2-13-1/5	humerus	R	dist.1/3 shaft, no end, poss.adult
CNP2-13-1/6	humerus	L	prox.1/2 shaft, no end, stained, small size, poss.young adult
CNP2-13-1	frontal		glabella & orbits, poss.adult male
CNP2-13-1	parietal	R	frag
CNP2-13-1	fibula	?	4 frags
CNP2-14-1/1	tibia	R	complete shaft, no ends, some lateral curvature, stained & polished, poss.adult
CNP2-14-1/2	femur	L	nearly complete shaft w/ neck portion, no dist.end, stained & polished, poss.adult
CNP2-14-1/3	femur	R	nearly complete shaft w/ neck, crack down prox.side, may pair w/ CNP2-14-1/2 L femur, poss.adult
CNP2-14-1/4	femur	R	complete shaft, no ends, pronounced linea aspera, stained & polished (black), poss.adult
CNP2-14-1/5	temporal	?	petrous portion, highly polished & stained (black)
CNP2-15-1/1	cranial		1 frag, both tables stained
CNP2-15-1/2	long bone	?	frag, stained
CNP2-15-1/3	humerus	?	portion of shaft, stained & polished
CNP2-15-1/4	occipital		nearly complete, ptn of L lambdoidal suture, both tables stained, poss.adult

CNP2-16-1	femur	R	shaft, surface eroded & slightly mineralized
CNP2-16-1	frontal	R	squamous portion, mineralized
CNP2-16-1	humerus	L	shaft frag
CNP2-16-1	tibia	L	shaft, slight bowing, irregular sclerotic buildup
CNP2-17-1/1	humerus	R	dist.1/2 shaft, no end, small size, poss.young adult
CNP2-17-1/2	femur	R	prox.1/2 shaft, no end, cortical surface worn, stained & polished, poss.adult
CNP2-17-1/3	femur	L	prox.1/2 shaft, no end, small size, stained & polished, poss.young adult
CNP2-17-1/4	tibia	R	central midshaft, no ends, poss.rodent gnawing, stained & polished, poss.adult
CNP2-17-1	humerus	R?	metaphysis, very eroded
CNP2-17-1	parietal	L	bregmatic corner, thick sagittal suture
CNP2-17-1	parietal	?	2 frags
CNP2-17-1	tibia	L	dist.shaft, very eroded
CNP2-18-1/1	humerus	L	dist.1/3 shaft, no end, cortex breaking off, stained & polished
CNP2-18-1/2	humerus	L	dist.1/3 shaft, anterior portion missing, stained & polished
CNP2-18-1/3	long bone	?	3 shaft frags
CNP2-18-1/4	tibia	L	central midshaft, cortex worn, stained & polished, poss.young adult
CNP2-18-1/5	tibia	R	central midshaft portion, cortex worn, stained & polished
CNP2-18-1/6	radius	L	defined interosseous margin w/ radial tuberosity & prox.1/2 shaft, no end
CNP2-18-1/7	radius	?	dist.shaft portion, no end
CNP2-18-1/9	femur	L	prox.2/3 shaft w/ neck & lesser trochanter, worn cortical surface, stained & polished, poss.young adult
CNP2-19-1/1	mandible	R	good cond, 1st molar intact (worn), sockets for I1, I2, C, P3 (w/roots), P4, M2 (w/roots), M3, poss.adult
CNP2-19-1/2	parietal	R	coronal & sagittal sutures present, both tables stained & polished
CNP2-19-1/3	temporal	?	pt.of petrous portion, stained & polished
CNP2-19-1/4	humerus	L	dist.1/2 shaft, no end, cortical surface worn, stained & polished
CNP2-19-1/5	femur	?	linea aspera of midshaft (posterior portion), stained & polished
CNP2-20-1/1	rib	L	complete central rib, no sternal end, poss.adult
CNP2-20-1/2	ulna	R	complete shaft, no dist.end & olecrenon process, friable, chalky white appearance
CNP2-20-1/3	femur	R	complete shaft, no ends, pt.of neck, no trochanters, poss.adult
CNP2-20-1/4	femur	L	prox.2/3 shaft, neck & lesser trochanter, no head, stained & polished (black), worn, poss.adult

CNP2-20-1/11	femur	L	nearly complete shaft, pt.of greater trochanter & head, chalky white appearance, poss.adult
CNP2-20-1/12	femur	L	prox.1/2 shaft, no end, stained & worn, poss.adult
CNP2-20-1	femur	L	prox.2/3 shaft, eroded
CNP2-20-1	femur	?	shaft frag
CNP2-20-1	humerus	L	midshaft frag
CNP2-20-1	humerus	L	dist.1/2 shaft, eroded
CNP2-20-1	parietal	L	not deformed, eroded
CNP2-20-1	parietal	L-R	2/3 R-side & 1/2 L-side, anterior/coronal edge, coronal suture fused
CNP2-20-1	parietal	R	lambda corner
CNP2-21-1/1	humerus	L	nearly complete shaft, no ends, polished, small size, poss.subadult
CNP2-21-1/2	femur	L	prox.1/3 shaft w/ pt.of neck, no trochanters, stained & polished, poss.adult
CNP2-21-1/3	femur	L	complete shaft w/ neck ptn, no dist.end, stained, poss.adult male, paired w/ CNP2-08-1/7 L femur
CNP2-21-1/4	femur	R	prox.1/2 shaft, no end, stained & worn
CNP2-21-1/5	humerus	L	prox.1/3 shaft, no end, cortex breaking off, stained & polished, poss.adult
CNP2-21-1/6	femur	?	central anterior shaft portion, very worn
CNP2-21-1/7	femur	?	shaft portion w/ linea aspera
CNP2-21-1/8	femur	L	prox.1/2 shaft w/ neck, poss.cutmarks on prox.side, worn, poss.adult
CNP2-21-1	occipital		squama only, eroded
CNP2-21-1	parietal	R	frag
CNP2-22-1/1	tibia	L	central shaft portion, stained & polished
CNP2-22-1/2	ulna	R	prox.1/4 shaft, no end
CNP2-22-1/3	humerus	R	dist.1/3 portion, no end
CNP2-22-1/4	long bone	?	shaft portion, stained & polished, poss.femur, poss.child
CNP2-22-1/5	femur	L	complete shaft, no ends, chalky white appearance, poss.child
CNP2-22-1/6	long bone	?	4 frags
CNP2-22-1	frontal	L	midsection, missing supraorbital, marked frontal flattening
CNP2-22-1	frontal		midsection, flattened deformation, poss.adult female
CNP2-22-1	frontal		midsection, no supraorbital
CNP2-22-1	parietal	L	midsection
CNP2-22-1	tibia	L	dist.shaft

CNP2-24-1/1	mandible	L	complete body minus ascending ramus, alveoli for central & lateral incisors to M3, @ least 18 yrs
CNP2-24-1/2	mandible	L	mental protuberance, sockets for L&R canines, L P3 & P4, L/R I2
CNP2-24-1/3	mandible	L	horizontal ramus & left 1/2 of mental protuberance
CNP2-24-1/4	humerus	R	complete shaft, no ends, dist.end stained
CNP2-24-1/5	humerus	R	complete shaft, no ends
CNP2-24-1/6	femur	L	complete shaft, no ends, portion of < trochanter, popliteal surface & neck, poss.cutmarks, poss.adult
CNP2-24-1/7	temporal	L	nearly complete, portion of zygomatic process, large mastoid process, stained, poss.adult
CNP2-24-1/8	femur	?	shaft portion, very robust, broken ends worn
CNP2-24-1/9	vertebra	A	spinous process & portion of body around vertebral foramen, worn to expose cancellous bone
CNP2-24-1/11	humerus	R	dist.1/3 shaft, no end, chalky white appearance, small size, poss.subadult
CNP2-24-1/12	humerus	R	dist.1/3 shaft, no end, stained, cortex flaking off
CNP2-24-1/13	humerus	R	prox.1/3 shaft, no end, stained & polished
CNP2-24-1/14	femur	L	nearly complete shaft, no ends, stained & polished, worn, small size, poss.subadult
CNP2-24-1/16	femur	L	prox.2/3 shaft, no end, poss.adult
CNP2-24-1/17	femur	R	complete shaft, prox.end w/ head & neck portion, no dist.end, chalky white appearance, poss.adult
CNP2-24-1/18	femur	?	midshaft portion
CNP2-24-1/19	occipital		portion of internal occipital crest & cerebral fossae, stained, pinhole appearance
CNP2-24-1/20	tibia	R	midshaft portion, robust, poss.adult male, stained & polished
CNP2-24-1/21	long bone	?	100+ frags - tibia, femur, radius, ulna, humerus frags
CNP2-24-1/24	temporal	R	portion w/ zygomatic process, both tables stained & polished
CNP2-24-1/26	radius	L	prox.1/2 shaft, no end, part of radial tuberosity present
CNP2-24-1/28	cranial	?	10 frags, stained & polished
CNP2-24-1/29	femur	L	prox.1/2 shaft, anterior portion missing, chalky white appearance
CNP2-24-1/31	humerus	?	2 shaft portions
CNP2-24-1/33	tibia	R	midshaft portion, stained & worn, chalky appearance
CNP2-24-1/34	tibia	R	midshaft portion, stained & worn
CNP2-24-1/35	tibia	R	midshaft portion, stained & worn
CNP2-25-1/1	tibia	R	central midshaft portion, no end, stained, poss.adult
CNP2-25-1/2	parietal	L	edges & sutures broken away, both tables stained
CNP2-25-1/3	long bone	?	3 frags
CNP2-25-1/4	humerus	?	3 shaft frags

CNP2-26-1/1	long bone	?	4+ frags
CNP2-26-1/2	temporal	R	posterior portion w/ zygomatic process, temporal suture present, stained & polished
CNP2-26-1/3	parietal	R	nearly complete, stained, gnaw marks on eminence, both tables stained, poss.adult
CNP2-26-1/4	tibia	R	central midshaft, stained & polished, small size, poss.child
CNP2-26-1/5	femur	L	nearly complete shaft, but fragmentary, no ends, stained & worn
CNP2-26-1/6	femur	L	2/3 prox.shaft w/ neck, good condition, small size, poss.child
CNP2-26-1/7	parietal	R	portion w/ sagittal suture, edges worn, stained & polished, pinhole appearance
CNP2-26-1	femur	R	midshaft portion, poss.subadult
CNP2-26-1	frontal	R	flattened forehead, surface eroded
CNP2-26-1	humerus	L	dist.1/2 shaft, poss.subadult
CNP2-26-1	mandible	R	portion of ramus, unerupted M3, poss.subadult, < 18 yrs.
CNP2-26-1	mandible	L	body frag w/ sockets for M2 & P3 (resorbing), all teeth lost antemortem
CNP2-26-1	parietal	R	nearly complete, surface eroded
CNP2-26-1	parietal	L-R	sagittal section
CNP2-26-1	pelvis	R	ischial portion w/ sciatic notch
CNP2-26-1	radius	?	2 frags
CNP2-26-1	tibia	L	shaft, surface eroded
CNP2-26-1	tibia	?	2 frags
CNP2-26-1	ulna	R	shaft, surface eroded
CNP2-26-1	ulna	R	prox.1/3 shaft, surface eroded
CNP2-27-1/1	frontal		ptn w/ frontal crest, outer table stained & polished, poss.cranial deform., thin cran.vault, poss.subadult
CNP2-27-1/2	long bone	?	small shaft, no ends, white appearance, poss.child
CNP2-27-1/3	occipital		nearly complete, lambdoidal suture present, both tables stained & polished, poss.adult
CNP2-27-1/4	long bone	?	shaft portion, poss.femur
CNP2-27-1/5	femur	R	complete shaft, no ends, cortex worn, poss.child
CNP2-27-1	femur	R	shaft, poss.subadult, < 10 years
CNP2-27-1	humerus	?	3 frags, don't join up
CNP2-27-1	M1	L	complete, some wear
CNP2-27-1	molar	R	complete, poss.1st or 2nd molar, some wear, cervical caries
CNP2-27-1	parietal	R	superior/posterior corner
CNP2-27-1	parietal	?	4 frags
CNP2-27-1	radius	L	prox.1/2 shaft
CNP2-27-1	radius	L	shaft, small size, poss.subadult, < 10 years

CNP2-28-1	lower m2	L	complete crown, roots broken off, no wear, poss.subadult
CNP2-28-1/1	talus	L	complete, stained & worn, poss.adult
CNP2-28-1/2	femur	L	complete shaft, no ends, portion of lesser trochanter, stained & polished, robust, poss.adult male
CNP2-28-1/3	femur	L	prox.2/3 shaft, fragmentary, possible cutmarks (prox.-posterior portion), stained & polished
CNP2-28-1/4	mandible	L	nearly complete, RI1, RI2(unerupted), Rp3(rts), Rp4, RM1, LI1, Lp3, Lp4, LM1(socket), poss.child (6 yrs)
CNP2-28-1/5	mandible	R	portion w/ C, P4, M1 (considerable wear), sockets for I1, I2, P3, stained & polished, poss.adult
CNP2-28-1/6	mandible	R	horizontal ramus frag, molar w/ alveolus resorbing, stained & polished
CNP2-28-1/7	mandible	L	no teeth & no resorption, sockets for P3, P4, M1 & M2, stained & polished, poss.adult
CNP2-28-1/8	parietal	R	body, coronal & sagittal sutures present, some periostitis, pinhole appearance, tables stained & polished
CNP2-28-1/9	occipital		portion w/ cruciform eminence, stained
CNP2-28-1/10	temporal	R	petrous pyramid, external auditory meatus, mastoid process
CNP2-28-1/11	zygomatic	R	portion of zygomatic process & orbit, stained & polished
CNP2-28-1/12	temporal	R	zygomatic proc., mandibular fossa, petrous portion, temporal suture present, stained & polished
CNP2-28-1/13	rib		1st rib, complete, worn
CNP2-28-1/14	scapula	L	greater scapular notch, portion of acromion process, no glenoid fossa
CNP2-28-1/15	scapula	L	greater scapular notch w/ glenoid fossa
CNP2-28-1/16	scapula	?	glenoid fossa only
CNP2-28-1/17	tibia	L	2/3 midshaft, no ends, stained & polished
CNP2-28-1/18	tibia	L	prox.1/2 shaft w/ gnaw marks on anterior margin, stained & polished, small size, poss.child
CNP2-28-1/19	femur	L	prox.1/2 shaft, no end, very worn
CNP2-28-1/20	humerus	R	dist.1/4 shaft, no end, stained on lateral aspect
CNP2-28-1/21	humerus	L	dist.1/4 shaft, no end, stained on anterior aspect
CNP2-28-1/22	ulna	R	prox.1/4 shaft minus articular end, holes worn into cortical surface, stained & polished
CNP2-28-1/24	mandible	L	partial, no teeth & no resorption, stained & polished
CNP2-28-1/25	mandible	L	no teeth present, lost postmortem, no alveolar resorption, stained & polished, poss.child
CNP2-28-1/26	temporal	R	petrous pyramid & external auditory meatus
CNP2-28-1/28	temporal	R	petrous pyramid & external auditory meatus, part of zygomatic process & mandibular fossa
CNP2-28-1/29	temporal	R	petrous portion & mastoid process
CNP2-28-1/30	pelvis	L	complete, no blade, plus acetabulum, greater sciatic notch & auricular surface, poss.adult male
CNP2-28-1/31	pelvis	L	portion of acetabulum, apex of greater sciatic notch & arcuate line, stained & polished
CNP2-28-1/32	pelvis	L	frag including arcuate line & portion of auricular surface, apex of greater sciatic notch, stained & polished
CNP2-28-1/33	pelvis	R	lower acetabulum, small size, poss.subadult
CNP2-28-1/34	femur	R	prox.1/4 shaft, femoral neck present, head & trochanters broken off, stained & polished

CNP2-28-1/35	mandible	L	no teeth & alveoli, worn, sockets for M1, P4, P3
CNP2-28-1/36	pelvis	R	ischial tuberosity w/ ischial spine & lesser sciatic notch, worn, stained & polished
CNP2-28-1/39	femur	L	prox.1/2 shaft, no end, stained & polished
CNP2-28-1/42	humerus	R	dist.1/3 shaft, no end, broken ends are worn, stained & polished
CNP2-28-1/48	zygomatic	?	portion, stained
CNP2-28-1/49	parietal	?	frag stained on both tables
CNP2-28-1/50	parietal	?	2 pieces, both tables stained & polished
CNP2-28-1/51	femur	?	19+ cortical frags, highly friable & stained
CNP2-28-1/52	long bone		100+ shaft frags
CNP2-28-1/53	pelvis	?	5+ frags, poss.os coxa, stained & worn
CNP2-28-1/54	mandible	R	gonial angle & crypt for most posterior molar, unerupted probably M1, stained & polished
CNP2-28-1/55	mandible		lingual portion of mental symphysis, stained & polished
CNP2-28-1/56	mandible	R	edentulous, M1 & M2 still resorbing, also C1 & I2, very worn
CNP2-28-1/57	mandible		3 frags, stained
CNP2-28-1/59	upper M	R	unerupted, complete crown, no roots, poss.subadult
CNP2-28-1/60	long bone	?	100+ frags of cortical bone
CNP2-28-1/61	fragments	?	miscellaneous frags
CNP2-28-1/63	cranial	?	20+ frags, stained & polished, worn
CNP2-28-1/65	pelvis	R	ischial portion of acetabulum & superior portion of ischial tuberosity, stained
CNP2-29-1	long bone	?	shaft portion, deformed
CNP2-29-1	humerus	?	2 frags
CNP2-29-1	I1	R	complete, shoveled, little wear, no mutilation, large size
CNP2-29-1	mandible	L	body frag, alveolar 1/2 w/ no teeth
CNP2-29-1	occipital	?	squamous frag
CNP2-29-1	parietal	?	1 frag
CNP2-29-1	rib	?	midshaft frag
CNP2-29-1	tibia	R	shaft, eroded
CNP2-30-1/1	pelvis	L	iliac portion w/out blade, portions of auricular surface, acetabulum & greater sciatic notch, poss.adult
CNP2-30-1/2	tibia	R	prox.1/2 shaft, no end, worn, stained & polished, poss.adult
CNP2-30-1/3	tibia	R	prox.1/3 shaft, no end, stained & polished, poss.young adult
CNP2-30-1/4	mandible		alveolar portion, poss.faunal remains

CNP2-30-1/5	parietal	L-R	large frag.w/ sagittal suture, larger portion (L), fused sutures, poss.adult
CNP2-30-1/6	long bone	?	3 shaft frags, poss.humerus frags
CNP2-30-1/9	long bone	?	portion of long bone w/ concretions
CNP2-30-1/11	long bone	?	miscellaneous frags
CNP2-30-1/12	cranial	?	5 frags, parietal & frontal frag, stained & polished, worn edges
CNP2-31-1	M1/2	L	fossilized
CNP2-31-1	P4	L	fossilized
CNP2-31-1	ulna	R	midshaft frag
CNP2-31-1	ulna	R	dist.shaft, patch of sclerotic bone on anterior surface
CNP2-32-1	femur	L	shaft, surface covered w/ stalagmite
CNP2-32-1	femur	?	shaft w/ irregular sclerotic periostitis
CNP2-32-1	humerus	?	shaft
CNP2-32-1	I2	L	complete, shoveled, filed (A4)
CNP2-32-1	tibia	L	shaft, surface erosion
CNP2-33-1/1	femur	R	complete shaft, no ends, worn, stained & polished, poss.young adult
CNP2-33-1/2	cranial	?	4 frags, stained & polished
CNP2-33-1/3	humerus	L	dist.1/3 shaft, no end, small size, stained & polished
CNP2-33-1/4	long bone	?	20+ frags, stained
CNP2-36-1	M1	L	complete, roots eroded, fossilized
CNP2-36-1	M1	R	complete, roots eroded, fossilized
CNP2-36-1	M1/2	L	nearly complete, root broken, very little wear
CNP2-41-1	tibia	L	shaft

NOTE: Skeletal elements in **bold type** were inventoried by Wright (unpublished notes 1994) and are not included in the sample analyzed in this study.

APPENDIX III

INVENTORY FOR CUEVA DE RIO MURCIELAGOS

Lot	Bone	Side	Description
CRM-05-1	femur	L	prox.1/2 midshaft, no end, linea aspera worn, post.aspect stained, concretions
CRM-05-1	humerus	L	dist.1/2 shaft minus articular end, polished & worn
CRM-05-1	radius	R	prox.1/3 shaft, no end, pronounced interosseous margin, stained & polished
CRM-06-1	femur	L	nearly complete shaft, no ends, ptn of less trochanter, poss.gnaw marks on anterior face, S&P
CRM1-04-5	phalange	?	manual, complete shaft, unfused epiphyses, poss.subadult
CRM1-06-3 D27	mandible	R	alveolus frag w/ Li2 to Rp3, teeth show little wear, highly friable, stained, poss.child (3-5 yrs)
CRM1-06-4 D27	i2	L	crown complete, root broken, alveolus frag.attached, caries on mesial surface
CRM3-01-1/1	temp-occip	R	occipital portion w/ nuchal crest; temporal portion w/ mastoid proc., ext.aud.meatus, petrosal ptn
CRM3-01-1/2	occipital		nearly complete, pronounced nuchal area, good condition, both tables stained
CRM3-01-1/3	cranial		4 cranial vault frags, possible parietal
CRM3-01-1/3	cranial		17 fragile cranial frags
CRM3-01-1/3	long bone		4 frags
CRM3-01-1/4	long bone		femur or tibia shaft frag, polished
CRM3-01-1/4	cranial		6 fragile cranial frags, embedded in cave concretions
CRM3-01-1/5	zygomatic	L	complete process w/ portion of inferior orbit
CRM3-01-1/5	nasal		complete w/ heavy concretions, portion of nasal aperture
CRM3-01-1/5	maxilla		portion w/ left P4 & M1 intact, sockets for C, P3, P4, M1, heavy concretions, maxillary molar
CRM3-01-1/6	ulna	R	complete midshaft, no ends, cortex flaking off, stained
CRM3-01-1	cranium		complete, tabular oblique deformation, all sutures open, poss.young adult female
CRM3-01-1	cranium		nearly complete, no facial bones, no deformation, poss.adult male

CRM3-01-2	pelvis	?	small portion of inner surface w/ unfused epiphysis of iliac crest
CRM3-01-2	radius	R	complete shaft, unfused epiphyses, good condition, poss.subadult
CRM3-01-2	vertebra	A	1/2 centrum frag, unfused epiphysis, poss.subadult
CRM3-03-1/1	femur	R	prox.2/3 shaft, no end, anterior surface worn & stained, poss.cutmarks on dist-anterior surface
CRM3-03-1/2	tibia	R	prox.1/2 shaft, no end, circular holes worn throughout medullary cavity, stained w/ concretions
CRM3-03-1/3	long bone		2 frags, stained & polished, poss.faunal remains
CRM3-03-1/4	humerus	R	complete shaft, no ends, concretions on distal end, stained & worn
CRM3-03-1/5	femur	?	shaft frag, robust
CRM3-03-1/6	parietal	R	nearly complete, possible burn stains
CRM3-03-1/6	parietal	R	complete, good condition, outer table stained & polished
CRM3-03-1/6	parietal	L	nearly complete, outer table stained & polished
CRM3-03-1/6	parietal	L	small portion w/ stain
CRM3-03-1/7	long bone	?	poss.radius/ulna portion, stained & polished
CRM3-03-1/7	long bone		shaft frag, polished
CRM3-04-6	ulna	L	prox.1/3 shaft, no end, large size, poss.adult
CRM3-06-2/1	ulna	?	midshaft frag, stained & polished
CRM3-06-2/1	long bone		10 small frags, worn
CRM3-06-2/2	tibia	L	prox.2/3 shaft, no end, stained & polished
CRM3-06-2/3	radius	R(?)	central portion of shaft, stained & polished, poss.adult
CRM3-06-2/4	radius	L(?)	central midshaft portion, poss.adult
CRM3-07-2/1	cranial		2 parietal frags, stained & worn, 1 w/ concretions on both tables
CRM3-07-2/1	vertebra	A	lumbar, anterior face of centrum, heavily mineralized
CRM3-07-2/1	occipital		portion w/ lambdoid suture
CRM3-07-2/1	ulna	L	prox.1/2 shaft including olecrenon process, dist.end stain
CRM3-07-2/2	lower molar	L	complete, poss.M1, moderate wear, calculus on lingual side
CRM3-07-2/2	M1		complete crown only, no root development
CRM3-07-2/2	M2		3+ cusp pattern, root partially developed
CRM4-02-1/1	femur	L	complete minus dist.end, stained, possible adult male
CRM4-02-1/2	femur	R	complete minus dist.lateral condyle, stained, possible adult male

CRM4-03-1/1	tibia	R	shaft frag, cortex worn exposing trabecular bone, stained
CRM4-03-1/2	cranial		rounded frag, water worn

NOTE: Skeletal elements in **bold type** were inventoried by Wright (unpublished notes 1994) and are not included in the sample analyzed in this study.

APPENDIX IV

INVENTORY FOR CUEVA DE SANGRE

Lot	Bone	Side	Description
CS1-13-2	med.phalange	?	manual, complete
CS1-33-1	lower molar	L	complete, considerable wear, poss.adult
CS1-46-1	premolars	R	complete P3 & P4, slight wear, poss.adult
CS1-46-1	prox.phalange	?	manual, nearly complete, no prox.end
CS1-46-1	upper I1	L	complete, modification on lateral aspect, poss.adult
CS1-75-1	tibia	R	central midshaft portion
CS1-77-2	lower I2	L	complete, some wear
CS1-77-2/1	clavicle	R	dist.articular end, poss.adult
CS1-77-2/1	humerus	R	dist.end of shaft & shaft frag, posterior aspect, no end
CS1-77-2/1	long bone	?	humeral/femoral head frag
CS1-77-2/1	pelvis	?	iliac crest frag
CS1-77-2/1	pelvis	R	iliac portion w/ superior aspect of auricular surface
CS1-77-2/1	sacrum	A	posterior portion of sacral element, possible S1, concretions
CS1-77-2/1	scapula	L	acromion process, poss.adult
CS1-77-2/1	vertebra	A	3 neural arch frags
CS1-77-2/2	mandible		complete, no R asc.ramus & L articular condyle, L&R P4 & M1(heavy wear), poss.adult male
CS1-77-2/3	dist.phalange	?	complete, poss.arthritic/osteophytic lipping
CS1-77-2/3	hamate	L	complete
CS1-77-2/3	med.phalange	?	complete, concretion on prox.end
CS1-77-2/3	metacarpal	?	shaft frag, no ends

CS1-77-2/3	sacrum	A	anterior aspect of S1, parts of the ala, concretions
CS1-77-2/3	vertebra	A	lumbar, centrum w/ osteophytic lipping, concretions dorsal aspect
CS1-78-2	lower i2	L	nearly complete, no root, poss.subadult
CS1-78-2	premolars		3 nearly complete lower premolars, no roots, poss.subadult
CS1-78-2/1	dist.phalange	?	pedal, complete
CS1-78-2/1	femur	?	2 dist.articular condyles, 1 unfused epiphyseal frag.
CS1-78-2/1	humerus	?	midshaft frag, concretion
CS1-78-2/1	metacarpal I	L	ventral-prox.portion w/ articular end
CS1-78-2/1	metacarpal I	L	complete, osteophytic growth on lateral aspect of dist.articular facet, prox.dorsal aspect missing
CS1-78-2/1	metacarpal II	L	nearly complete, no dist.end
CS1-78-2/1	metacarpal V	L	prox.1/2 shaft, no dist.end
CS1-78-2/1	metatarsal	?	prox.1/2 shaft, no end
CS1-78-2/1	navicular	R	nearly complete, medial portion missing
CS1-78-2/1	prox.phalange	?	manual, dist.1/2 shaft
CS1-78-2/1	prox.phalange	?	pedal, 2 complete
CS1-78-2/1	radius	L	dist.1/3 shaft, lateral portion missing, some concretions, poss.adult
CS1-78-2/1	radius	R	central 1/3 shaft frag, rodent gnawing, poss.adult
CS1-78-2/1	rib	?	shaft frag
CS1-78-2/1	ulna	R	complete shaft, no ends, good preservation, poss.adult
CS1-78-2/1	vertebra	A	cervical, centrum
CS1-78-2/1	vertebra	A	cervical, centrum & portion of R neural arch, epiphyses unfused
CS1-78-2/1	vertebra	A	1 transverse process frag
CS1-78-2/1	vertebra	A	4 neural arch frags
CS1-91-1	femur	?	nearly complete femoral head, neck portion, poss.adult
CS1-94-1	talus	L	nearly complete, posterior calcaneal articular surface missing, small size, poss.subadult
CS2-03-43	long bone	?	cortical frag, charred, calcined on outer surface
CS2-03-43	prox.phalange	?	pedal, digit 1, nearly complete, no dist.end, charred, calcined on prox.plantar surface
CS2-10-1	lower molar	R	nearly complete, root still forming, poss.subadult

CS2-10-1	upper p3	L	nearly complete, root forming, poss.subadult
CS2-10-1/1	humerus	L	dist.2/3 shaft, no end, small size, poss.child
CS2-10-1/2	long bone	?	portion of shaft, poss.radius or ulna, small size, poss.child
CS2-10-1/2	rib	?	fragment
CS2-10-1/3	talus	R	superior 2/3 portion, small size, unfused epiphyses, poss.child
CS2-10-1/4	long bone	?	shaft frags, poss.humerus, small size, poss.child
CS2-10-1/5	humerus	R	dist.2/3 shaft, no end, broken in 1/2, some concretions, small size, poss.child
CS2-10-1/6	femur	L	nearly complete, femoral neck, unfused head & trochanters, poss.child
CS2-11-1	canines		3 nearly complete, roots broken off, no wear, poss.subadult
CS2-11-1	incisors		4 nearly complete, roots forming, no wear, poss.subadult
CS2-11-1	mandible	L	alveolar portion w/ intact C-M1, slight wear, poss.adult
CS2-11-1	molars		9 nearly complete, roots forming or broken off, poss.subadult
CS2-11-1	premolars		6 nearly complete, 2 complete, no wear, poss.adult & subadult
CS2-11-1/1	capitate	L	complete
CS2-11-1/1	dist.phalange	?	pedal, 2 shafts, poss.digits 2-4
CS2-11-1/1	dist.phalange	?	pedal, dist.end, poss.digit 1
CS2-11-1/1	dist.phalange	?	pedal, 2 complete, poss.digit 1
CS2-11-1/1	inter.cuneiform	R	dorsal portion
CS2-11-1/1	lat.cuneiform	L	dist.1/2, lytic lesion on plantar end of articular facet for metatarsal III, circumscribed border
CS2-11-1/1	long bone	?	100+ frags
CS2-11-1/1	long bone	?	unfused epiphysis, femoral/humeral head, trabecular bone
CS2-11-1/1	med.phalange	?	pedal, 2 shaft frags, no articular ends
CS2-11-1/1	patella	L	nearly complete, poss.adult
CS2-11-1/1	pelvis	?	iliac crest frag
CS2-11-1/1	pisiform	L	complete
CS2-11-1/1	prox.phalange	?	pedal, 3 nearly complete, poss. digits 2-4
CS2-11-1/1	prox.phalange	?	pedal, complete, poss.digit 2, concretions on dist.end
CS2-11-1/1	prox.phalange	?	manual, complete
CS2-11-1/1	rib	?	5 shaft frags
CS2-11-1/1	scaphoid	L	lateral 1/2
CS2-11-1/1	triquetral	L	complete
CS2-11-1/1	vertebra	A	3 centrum frags

CS2-11-1/2	radius	R	complete shaft, no ends, good preservation, poss.adult
CS2-11-1/3	humerus	L	complete shaft, no ends, broken 1/3 of the way down
CS2-11-1/4	tooth roots	?	4 frags, no enamel/crowns
CS2-11-1/5	med.phalange	?	manual, 3 shafts minus dist.epiphyses
CS2-11-1/5	med.phalange	?	manual, 3 complete
CS2-11-1/5	med.phalange	?	manual, 1 nearly complete minus dist.end
CS2-11-1/5	med.phalange	?	manual, 1 nearly complete minus prox.end
CS2-11-1/5	phalange	?	manual, shaft minus articular end
CS2-11-1/5	phalange	?	manual, 3 complete prox.epiphyses unfused, subadult
CS2-11-1/5	prox.phalange	?	manual, epiphysis unfused, nearly complete, poss.lytic lesion @ center 1mm diam.
CS2-11-1/5	prox.phalange	?	manual, 4 complete
CS3-04-1	sternum		superior aspect, poss.adult
CS4-01-1/1	femur	R	prox.2/3 shaft, prox.epiphyses unfused, part of < trochanter, no dist.end, poss.child
CS4-01-1/2	calcaneus	L	complete, unfused epiphyses
CS4-01-1/3	tibia	L	unfused prox.lateral epiphysis, poss.child
CS4-01-1/4	humerus	L	dist.1/2 shaft, no end, small size, poss.child
CS4-01-1/5	tibia	L	complete shaft, no ends, small size, poss.child
CS4-01-1/6	tibia	R	central shaft frag, small size, poss.child
CS4-01-1/7	femur	L	dist.1/2 shaft, no end, small size, poss.child, paired w/ CS4-01-1/1 R femur
CS5-01-1/1	humerus	R	prox.1/2 shaft, no end, stained red, pronounced muscle attachment, poss.adult
CS5-01-1/2	femur	R	prox.1/2 shaft, no end, small size, stained & polished (red), poss.child
CS5-01-1/3	mandible		inferior portion w/ mental spine & protuberance, stained & polished (red)
CS5-01-1/4	long bone	?	8+ cortical frags
CS5-01-1/5	pelvis	L	post.aspect of acetabulum, auric.surface & ischial tuberosity, narrow sciatic notch, poss.ad.male
CS5-01-1/6	femur	L	nearly complete, no dist.end, stained reddish color, flaking, poss.adult male
CS5-01-1/6	femur	R	nearly complete, no dist.end, heavy concretions, poss.ad.male, paired w/ CS5-01-1/6 L femur
CS5-01-1/7	temporal	R	portion w/ mandibular fossa & portion of zygomatic process
CS5-01-1/8	humerus	L	trochlea portion
CS5-05-1/1	humerus	R	dist.2/3 shaft, no end

CS5-01-1/2	femur	R	prox.1/2 shaft, no end, small size, stained & polished (red), poss.child
CS5-01-1/3	mandible		inferior portion w/ mental spine & protuberance, stained & polished (red)
CS5-01-1/4	long bone	?	8+ cortical frags
CS5-01-1/5	pelvis	L	post.aspect of acetabulum, auric.surface & ischial tuberosity, narrow sciatic notch, poss.ad.male
CS5-01-1/6	femur	L	nearly complete, no dist.end, stained reddish color, flaking, poss.adult male
CS5-01-1/6	femur	R	nearly complete, no dist.end, heavy concretions, poss.ad.male, paired w/ CS5-01-1/6 L femur
CS5-01-1/7	temporal	R	portion w/ mandibular fossa & portion of zygomatic process
CS5-01-1/8	humerus	L	trochlea portion
CS5-05-1/1	humerus	R	dist.2/3 shaft, no end
CS5-05-1/1	long bone	?	shaft frag
CS5-05-1/1	talus	L	trochlear portion of superior articular surface
CS5-05-1/1	tibia	L	dist.articular end w/ medial malleolus, poss.adult
CS5-05-1/2	femur	R	nearly complete shaft, dist.artic.end, condyles worn to expose trabecular bone, poss.ad.male
CS5-07-1	lower I2	R	complete, heavy wear, poss.adult
CS5-07-1	lower P4	R	complete, slight wear, poss.adult
CS5-07-1/1	mandible		complete Lside & partial Rside (I1-P4 sockets), P3-M3 (L side), wear, concretions, poss.ad.male
CS5-07-1/2	dist.phalange	?	manual, complete
CS5-07-1/2	med.phalange	?	manual, complete
CS5-07-1/2	med.phalange	?	manual, complete
CS5-07-1/2	metacarpal	R	dist.articular end & 1/2 shaft, holes worn on dorsal & palmar aspects of articular end
CS5-07-1/2	prox.phalange	?	manual, complete, concretions on palmar surface
CS5-07-1/2	prox.phalange	?	manual, complete digit 1, holes worn into prox.end
CS5-07-1/3	radius	R	prox.1/3 shaft w/ head portion, heavy concretions
CS5-07-1/4	ulna	L	nearly complete shaft, no ends, polished, small size, poss.subadult
CS5-07-1/5	ulna	L	central 1/2 shaft, concretions on dorsal aspect, prox.portion worn, poss.adult
CS5-07-1/6	patella	R	nearly complete, concretion on anterior aspect, small size, poss.subadult
CS5-07-1/7	frags	?	trabecular bone w/ concretions, 4 pieces
CS5-07-1/8	occipital		poss.basi-occipital portion w/ part of foramen magnum
CS5-07-1/9	pelvis	L	inferior portion of lunate surface of acetabulum
CS5-07-1/10	vertebra	A	articular facet frag.
CS5-07-1/10	vertebra	A	neural arch frag.

CS5-07-1/11	frags	?	7 frags
CS5-07-1/12	rib 1	L	sternal end including ossified cartilage for manubrium attachment, holes on dorsal aspect
CS5-08-1/1	vertebra	A	lumbar, centrum & R neural arch frag
CS5-08-1/1	vertebra	A	thoracic, 3 nearly complete
CS5-08-1/1	vertebra	A	thoracic, centrum
CS5-08-1/1	vertebra	A	3 neural arch frags
CS5-08-1/2	calcaneus	?	posterior/plantar portion
CS5-08-1/2	cuboid	L	complete
CS5-08-1/2	dist.phalange	?	manual, complete
CS5-08-1/2	long bone	?	21+ cortical frags
CS5-08-1/2	metacarpal III	L	complete, no dist.end
CS5-08-1/2	metacarpal IV	L	complete, prox.end worn to expose trabecular bone, hole worn on distal/dorsal end, poss.adult
CS5-08-1/2	metatarsal II	L	complete, no prox.articular surface, poss.adult
CS5-08-1/2	metatarsal III	R	prox.2/3 shaft, no dist.end, poss.adult
CS5-08-1/2	patella	L	complete, small size, poss.subadult
CS5-08-1/2	patella	R	complete, small size, poss.subadult
CS5-08-1/2	pelvis	R	iliac portion w/ superior portion of auricular surface & arcuate line, ptn of preauricular sulcus
CS5-08-1/2	pisiform	L	portion that articulates w/ triquetral
CS5-08-1/2	prox.phalange	?	manual, complete
CS5-08-1/2	prox.phalange	?	manual, complete, no prox.end
CS5-08-1/2	prox.phalange	?	pedal, complete
CS5-08-1/2	rib	?	sternal end
CS5-08-1/2	rib	?	3 head & neck frags
CS5-08-1/2	rib	?	5 shaft frags
CS5-08-1/2	talus	L	complete, good preservation, small size, poss.subadult
CS5-08-1/2	tibia	L	portion of medial articular surface
CS5-08-1/2	tibia	R	medial articular surface
CS5-08-1/3	fibula	?	central shaft portion
CS5-08-1/4	radius	L	complete shaft, no ends, good preservation, poss.subadult
CS5-08-1/5	ulna	L	dist.2/3 shaft, no end, poss.subadult
CS5-08-1/6	metapodial	?	complete, no prox.end, part of encrustation
CS5-08-1/7	tibia	R	complete shaft, no ends, concretions on dist.end, poss.subadult

CS5-10-1	radius	R	dist.2/3 shaft, no end, small size, poss.subadult
CS7-04-1	capitate	L	complete, slight wear to expose trabecular bone
CS7-04-1	frags	?	5 podial frags
CS7-04-1	lunate	L	complete
CS7-04-1	lunate	L	complete
CS7-04-1	lunate	R	complete
CS7-04-1	lunate	R	complete
CS7-04-1	prox.phalange	?	manual, prox.end, poss.adult
CS7-04-1	prox.phalange	?	manual, unfused prox.epiphysis, poss.subadult
CS7-04-1	rib	?	10+ shaft frags
CS7-04-1	scaphoid	R	complete
CS7-04-1	vertebra	A	body frag, unfused epiphyses, poss.subadult
CS8-01-1/1	humerus	R	complete shaft, very robust deltoid tuberosity, no articular ends, concretions, poss.adult
CS8-01-1/2	long bone	?	shaft frag, stained black
CS8-01-1/3	ulna	R	2/3 shaft w/ prox.articular end, no olecranon process, stained & polished, poss.adult
CS8-01-1/4	humerus	R	dist.articular end w/ septal aperture (8.85 mm), trochlea & med.epicondyle intact
CS8-01-1/5	fibula	L	nearly complete shaft, no ends, stained & polished, poss.adult
CS8-01-1/6	tibia	L	prox.2/3 shaft, portion of tibial tuberosity, portion of medial articular surface, poss.adult
CS8-01-1/7	femur	L	prox.2/3 shaft w/ femoral neck, fused < trochanter, unfused femoral head, poss.adol. (robust)
CS8-01-1/8	femur	R	complete shaft w/ femoral neck, < trochanter (worn), stained & worn, poss.adult
CS8-01-1/9	femur	R	complete shaft w/ femoral neck, no dist.end, trochanters worn, stained & polished, poss.adult
CS9-01-1/1	cranial	?	fragment
CS9-01-1/2	humerus	?	dist.portion, no end, dorsal aspect broken off
CS9-01-1/3	long bone	?	shaft frag
CS9-01-1/4	humerus	?	midshaft portion, stained, cortical bone flaked off
CS9-01-1/5	humerus	L	prox.portion, stained & polished
CS9-02-1 B2	tibia	R	central 1/3 shaft, posterior aspect, surface worn
CS9-02-1 B4	humerus	L	central midshaft portion, cortical bone flaking off, stained & worn, poss.adult
CS9-02-1 B5	long bone	?	2 shaft frags

CS9-02-1 B7	tibia	L	prox.2/3 shaft, no end, cortex worn medial-laterally, stained & polished, poss.subadult
CS9-02-1 D6	tibia	R	central shaft portion, stained & polished, poss.subadult
CS9-03-1/1	femur	L	prox.1/2 shaft w/ femoral neck, no head & trochanters, stained & polished, poss.adult
CS9-03-1/2	tibia	R	prox.2/3 shaft, no end, posterior portion flaked off, stained & polished, poss.adult
CS9-03-1/3	tibia	R	prox.2/3 shaft, stained, friable, poss.adult
CS9-03-1/4	tibia	R	central midshaft portion, worn, stained & polished, poss.subadult
CS9-03-1/5	humerus	R	dist.2/3 shaft, no end, stained, large size, poss.adult male
CS9-03-1/6	parietal	L-R	portion w/ fused sagittal suture, inner table stained & polished, poss.older adult
CS9-03-1/7	parietal	R	complete, all sutures present & intact, very worn, stained, artic.w/ CS9-03-1/13 L parietal
CS9-03-1/8	occipital	R	portion w/ lambdoidal suture, articulates w/ CS9-03-1/7 R parietal
CS9-03-1/9	long bone	?	2 shaft frags, one is stained on the outer table & friable
CS9-03-1/10	parietal	R	nearly complete, coronal, sagittal & lambdoidal sutures present, surface stained & worn
CS9-03-1/11	occipital	L	portion w/ interior occipital crest, stained & polished
CS9-03-1/12	pariet/occip	L	portion w/ lambdoidal suture, articulates w/ CS9-03-1/8 R occipital
CS9-03-1/13	parietal	L	portion w/ sagittal & lambdoidal sutures, articulates w/ CS9-03-1/7 R parietal
CS9-03-1/14	frontal		nearly complete, superior portion of L orbit, thin cran.vault, coronal suture present, poss.child
CS9-03-1/15	cranial	?	20+ frags; 2 parietal frags w/ sutures
CS9-03-1 #3172	occipital		portion w/ internal occipital protuberance
CS9-03-1 #32	maxilla	R	alveolar portion w/ sockets for C, P3, P4, M1, stained & polished
CS9-03-1 #32	occipital		nearly complete w/ small portion of parietal, outer table worn, poss.adult
CS9-03-1 #33	long bone	?	shaft frag, 2 pieces
CS9-03-1 #33	parietal	?	1 frag, stained & worn
CS9-03-1 B1	occipital		portion w/ internal occipital crest
CS9-03-1 B10	parietal	R	nearly complete, temporal & lambdoidal sutures present, exposed diploe, poss.yng adult
CS9-03-1 B12	humerus	R	prox.1/4 shaft, no end, fragmentary, medial portion broken, stained & worn, poss.subadult
CS9-03-1 B13	parietal	R	portion w/ sagittal suture, poss.adult
CS9-03-1 B14	occipital		complete, both tables stained, poss.young adult
CS9-03-1 B15	frontal		small portion w/ frontal crest, outer table worn to expose diploe, poss.child
CS9-03-1 B16	parietal	R	nearly complete, all sutures present, worn, stained & polished, poss.adult
CS9-03-1 B17	tibia	L	central midshaft portion, cortex stained & worn, stained & polished, small size, poss.subadult
CS9-03-1 B19/1	long bone	?	2 frags, stained & polished

CS9-03-1 B19/2	pariet/frontal		both parietals fused to posterior portion of frontal, sutures fused, poss.older adult
CS9-03-1 B19/3	frontal		portion w/ coronal suture, thick cranial vault, poss.adult
CS9-03-1 B19/4	occipital		superior portion w/ lambdoidal suture & occip.protuberance, both tables stained, poss.yng adult
CS9-03-1 B19/5	cranial	?	24 fragments
CS9-03-1 B2	tibia	L	central midshaft portion, cortex worn & stained, poss.adult
CS9-03-1 B20	pariet/temp	L	portion w/ fused temporal suture & mastoid sinus, worn, stained & polished, poss.adult
CS9-03-1 B21	occipital		superior portion w/ R lambdoidal suture, thin cran.vault, holes in sinus sulci, poss.yng adult
CS9-03-1 B22	frontal		large portion w/ upper margin of R orbit, frontal crest, pt.of nasal sinus, exposed diploe
CS9-03-1 B22	mandible	L	portion of ascending ramus w/ mandibular condyle & coracoid process broken off
CS9-03-1 B23	radius	?	central 1/3 shaft, small circumference, stained & worn, poss.child
CS9-03-1 B24 pt.1	frontal		portion w/ supraorbital torus & frontal crest, outer table stained & polished, poss.subadult
CS9-03-1 B24 pt.2	long bone	?	fragment, small circumference
CS9-03-1 B25	long bone	?	12+ frags
CS9-03-1 B25	tibia	L	central midshaft, stained & polished, small size, poss.subadult
CS9-03-1 B26	femur	?	complete shaft, no ends, small size, poss.child
CS9-03-1 B29	occipital		complete, outer table stained & polished, poss.young adult
CS9-03-1 B3	frag	?	faunal remain
CS9-03-1 B30	tibia	R	nearly complete shaft, no ends, stained, poss.young adult
CS9-03-1 B31	occipital		portion w/ internal occipital crest & lambdoidal suture (R side)
CS9-03-1 B4	ulna	L	1/4 prox.shaft, no end, cortex stained & worn
CS9-03-1 B5	long bone	?	midshaft frag, poss.radius/ulna, stained, broken ends worn
CS9-03-1 B6	cranial	?	poss.parietal portion, outer table worn to expose diploe
CS9-03-1 B7	long bone	?	20+ frags
CS9-03-1 B7	tibia	R	midshaft, very fragmentary, heavy wear, stained & polished, poss.subadult
CS9-03-1 B8	occipital		complete, good preservation, outer table has chalky white appearance, poss.young adult
CS9-03-1 B8	parietal	L-R	posterior aspect of cranium, sagittal suture fused, poss.cranial deform., poss.older adult
CS9-03-1 B8	rib	?	6 frags
CS9-03-1 B9	frontal		nearly complete, pt.of nasal sinus, very worn, stained & polished, poss.cran.deform, poss.adult
CS9-03-1 Msc.	clavicle	R	complete, no ends, broken in 1/2, poss.adult
CS9-03-1 Msc.	long bone	?	fragment, stained & polished
CS9-04-1/1	scapula	R	spine, acromion & coracoid process, glenoid surface worn away, stained, poss.adult
CS9-04-1/2	mandible	L	outer portion of horizontal ramus w/ sockets for C, P3, P4, M1, stained & polished

CS9-04-1/3	tibia	R	prox.1/2 shaft, no end, some concretions, stained & polished, large size, poss.adult male
CS9-04-1/4	femur	R	dist.1/3 shaft, no end, stained & polished, poss.adult male
CS9-04-1/5	occipital		complete, good preservation, stained & polished, poss.young adult
CS9-04-1/6	parietal	L	nearly complete, stained & polished, articulates w/ CS9-04-1/5, poss.young adult
CS9-04-1/7	temporal	R	nearly complete, mastoid proc.worn, petrosal portion & ext.auditory meatus present, stained
CS9-04-1/8	frontal		nearly complete w/ coronal suture, portion w/ frontal crest broken off, stained, poss.yng adult
CS9-04-1/9	parietal	R	nearly complete w/ fused portion of L parietal, articulates w/ CS9-04-1/5, stained & polished
CS9-04-1/11	cranial	?	poss.frontal portion, inner table worn, both tables stained & polished
CS9-04-1/13	occipital		nearly complete w/ lambdoidal suture, inferior portion missing, stained & worn
CS9-04-1/15	long bone	?	poss.humerus shaft frag, small size, poss.child
CS9-04-1/16	humerus	R	dist.1/2 shaft, no end, stained & polished, poss.adult
CS9-04-1/17	tibia	R	midshaft portion, no ends, lateral aspect very worn, chalky texture, stained, poss.adult
CS9-04-1/18	femur	R	complete shaft, no ends, 3 pieces, stained & polished, small circum, poss.yng adult
CS9-04-1/20	long bone	?	shaft frag, stained & polished
CS9-04-1/21	tibia	R	complete shaft, no ends, stained & polished, poss.adult
CS9-04-1/22	humerus	L	complete shaft, no ends, stained & polished, poss.adult
CS9-05-1/1	calcaneus	L	nearly complete, lateral aspect flaked off, poss.adult
CS9-05-1/1	cuboid	L	complete, articulates w/ calcaneus
CS9-05-1/1	femur	R	dist.end, stained, articular end worn to expose trabecula, large size, poss.adult male
CS9-05-1/1	lat.cuneiform	L	nearly complete, no plantar surface
CS9-05-1/1	lat.cuneiform	L	nearly complete, no plantar surface
CS9-05-1/1	long bone	?	2 frags, burned (white appearance)
CS9-05-1/1	med.cuneiform	L	nearly complete, worn to expose trabecular bone
CS9-05-1/1	metatarsal	?	poss.articular end, no shaft
CS9-05-1/1	metatarsal III	R	prox.1/2 shaft, no end
CS9-05-1/1	metatarsal IV	L	prox.1/3 shaft w/ end
CS9-05-1/1	metatarsal V	L	prox.1/2 shaft, medial portion broken off
CS9-05-1/1	prox.phalange	?	manual, dist.shaft portion w/ end
CS9-05-1/2	rib	?	40+ shaft frags
CS9-05-1/2	scapula	R	portion w/ glenoid fossa & acromion process, poss.adult
CS9-05-1/2	vertebra	A	centrum frag, epiphyses unfused
CS9-05-1/3	femur	?	central portion of dist.articular end, intercondylar fossa present, condyles worn away

CS9-05-1/3	vertebra	A	cervical, complete minus left transverse process
CS9-05-1/3	vertebra	A	lumbar, complete
CS9-05-1/3	vertebra	A	thoracic, nearly complete, L-side worn
CS9-05-1/3	vertebra	A	thoracic, R-1/2 body & transverse process
CS9-05-1/3	vertebra	A	5 neural arch frags
CS9-05-1/3	vertebra	A	11+ frags
CS9-05-1/3	vertebra	A	3 centrum frags
CS9-05-1/4	frags		miscellaneous cortical & trabecular bone frags
CS9-05-1/4	patella	R	nearly complete, posterior aspect broken, small size
CS9-05-1/4	patella	R	nearly complete, lateral aspect broken off, worn, small size
CS9-05-1/4	radius	?	dist.1/4 shaft minus articular end, stained
CS9-05-1/4	radius	?	central 1/4 shaft, worn
CS9-05-1/4	radius	?	shaft frag., radial crest present
CS9-05-1/4	scapula	L	portion w/ glenoid fossa & acromion process, fragmented, poss.adult
CS9-05-1/4	ulna	R	prox.1/2 shaft, no end, worn, chalky white appearance
CS9-05-1/4	vertebra	A	transverse process frag
CS9-05-1/5	femur	R	prox.2/3 shaft, head & trochanters intact, poss.cutmarks or gnawing (posterior), poss.adult
CS9-05-1/6	femur	L	complete shaft, no prox.end, neck portion & < trochanter, portion of condyles, poss.adult
CS9-05-1/7	femur	L	prox.1/2 shaft, no end, part of < trochanter, stained & polished, poss.adult
CS9-06-1/1	radius	L	central shaft portion
CS9-06-1/2	radius	L	central shaft portion
CS9-06-1/3	humerus	R	complete shaft, no ends, concretions, pronounced deltoid tuberosity, poss.adult
CS9-06-1/4	humerus	L	nearly complete shaft, no ends, stained & polished, poss.adult
CS9-06-1/5	tibia	L	prox.1/2 shaft, no end, heavy concretions/Ca deposits proximally, stained
CS9-06-1/6	tibia	L	nearly complete, no ends, concretions, pronounced med.bump, stained & polished, poss.adult
CS9-06-1/7	tibia	R	nearly complete, no ends, pronounced med.bump, stained & polished, poss.adult
CS9-06-1/8	tibia	L	central midshaft, no ends, stained & polished, poss.adult
CS9-06-1/9	long bone	?	19+ frags
CS9-06-1/10	femur	R	complete shaft, no ends, neck portion, concretions, stained & polished, poss.adult male
CS9-06-1/11	femur	R	nearly complete shaft & neck, chalky appearance, cracked & friable, poss.subadult
CS9-06-1/12	femur	R	prox.1/3 shaft, neck portion, no trochanters, stained, poss.adult
CS9-06-1/13	femur	L	complete shaft, no ends, heavy concretions, broken in 1/2, stained & polished, poss.adult

CS9-06-1/14	femur	L	complete shaft, no ends, pt.of < trochanter, concretions, stained & polished, poss.adult
CS9-06-1/15	femur	L	prox.1/2 shaft, no end, pt.of < trochanter, pronounced linea aspera, polished, poss.adult
CS9-06-1/16	femur	R	dist.1/3 shaft, no end, concretions, stained & polished, poss.adult
CS9-06-1/17	femur	R	prox.1/2 shaft, no end, pronounced linea aspera, poss.adult
CS9-06-1/18	femur	L	complete shaft, no ends, neck ptn, stained & polished, poss.ad.male, paired w/ CS9-06-1/10
CS9-06-1/19	femur	L	complete shaft, no ends, concretions, stained & polished, poss.adult
CS9-06-1/20	pelvis	L	portion of pubis, superior ramus, stained
CS9-07-1/1	femur	L	prox.2/3 shaft, no ends, portion of < trochanter, stained & polished, worn, poss.adult
CS9-07-1/2	cranial	?	20+ frags
CS9-07-1/3	parietal	L-R	fused portion w/ visible sagittal suture, thin cranial vault, poss.older adult
CS9-07-1/4	occipital		central portion, nuchal crest present, both tables stained, fragmentary
CS9-07-1/5	frontal		portion w/ frontal crest, thick cranial vault, stained, poss.adult
CS9-07-1/6	radius	?	5 shaft frags, stained & polished
CS9-08-1/1	mandible	R	horizontal ramus portion w/ sockets for I2, C P3, P4, M2; M1 socket resorbed
CS9-08-1/2	cranial	?	fragment
CS9-08-1/4	humerus	R	dist.1/2 shaft, small size, stained & polished, poss.child
CS9-08-1/5	frags		2 rib frags, 1 cortical frag
CS9-08-1/6	tibia	L	dist.1/2 shaft, no end, cortex worn, poss.adult
CS9-08-1/7	tibia	R	prox.2/3 shaft, no ends, concretions, stained & polished, poss.adult
CS9-08-1/8	femur	R	complete shaft, no ends, stained & polished, poss.adult
CS9-08-1/9	femur	L	complete shaft, no ends, neck portion, poss.adult
CS11-03-1/1	humerus	?	dist.1/3 shaft, no end, small size, poss.subadult
CS11-03-1/2	radius	R	prox.1/2 shaft w/ articular head, poss.2mm lytic lesion on superior artic.end, poss.adult
CS11-03-1/4	vertebra	A	cervical, body & frags
CS11-03-1/5	long bone	?	shaft portion, poss.radius or ulna, small size, poss.child
CS11-03-1/6	rib	L	nearly complete, large size, poss.adult
CS11-03-1/7	rib	?	L shaft w/ articular ends & other frags
CS11-03-1/8	long bone	?	shaft frags
CS11-03-1/9	femur	R	complete, no prox.end, good preservation, medial condyle worn, poss.adult male
CS11-03-1/10	humerus	L	complete shaft, unfused head, septal aperture, no med.epicondyle, poss.subadult

CS11-03-2B	humerus	R	complete, head broken off, good preservation, poss.adult male
CS11-03-3B	dist.phalange	?	manual, complete
CS11-03-3B	fibula	R	nearly complete shaft, no prox.end, unfused dist.epiphysis, poss.subadult
CS11-03-3B	humerus	L	complete bone, good preservation, cortex flaking off, poss.adult
CS11-03-3B	med.phalange	?	manual, complete
CS11-03-3B	rib	L	shaft portion
CS11-03-3B	vertebra	A	cervical, body w/ unfused epiphyses
CS11-03-4A	occipital		portion w/ internal occipital crest & protuberance, both tables stained & polished, poss.adult
CS11-03-4A	rib	L	poss.rib 12, nearly complete
CS11-03-4A	rib	R	complete, no sternal end, poss.adult
CS11-03-4C	ulna	L	complete, olecrenon process intact, no dist.head, good preservation, poss.adult
CS11-03-4C	vertebra	A	cervical, complete minus spinous process
CS11-03-4C	vertebra	A	portion of inferior articular facet
CS11-03-4E	femur	L	complete, dist.end broken, unfused head & trochanters, poss.subadult
CS11-03-4E	scaphoid	L	complete
CS11-04-1/1	med.phalange	?	manual, complete
CS11-04-1/1	parietal	R	anterior aspect, coronal suture present, outer table stained
CS11-04-1/1	rib	?	shaft frag
CS11-04-1/1	rib	L	articular end w/ poss.lytic lesion on articular facet, facet fusing
CS11-04-1/1	vertebra	A	thoracic, centrum frag., unfused epiphysis
CS11-04-1/2	ulna	L	nearly complete shaft, no ends, parts of prox.end
CS11-04-1/3	femur	R	complete shaft, no ends, part of lesser trochanter, stained & worn
CS11-04-1/4	long bone	?	3 frags
CS11-05-1/1	tibia	L	nearly complete shaft, no ends, stained, poss.adult
CS11-05-1/1	ulna	L	prox.1/3 shaft w/ portion of olecrenon process, poss.adult
CS11-05-1/2	frontal		portion w/ frontal crest & sinus cavity
CS11-05-1/2	med.phalange	?	manual, complete, no prox.end
CS11-05-1/2	occipital		complete, good preservation, poss.young adult
CS11-05-1/2	vertebra	A	articular facet

CS11-05-1/3	long bone	?	15 frags
CS11-05-1/4	occipital		portion w/ internal occipital protuberance, both tables stained & polished, worn, poss.adult
CS11-05-1 grp.A/1	axis	A	nearly complete, good preservation
CS11-05-1 grp.A/1	dist.phalange	?	pedal, complete, digit 1
CS11-05-1 grp.A/1	fibula	R	dist.1/2 shaft w/ articular end, dorsal aspect worn, stained, poss.adult
CS11-05-1 grp.A/1	metacarpal III	R	complete, good preservation, poss.adult
CS11-05-1 grp.A/1	metacarpal IV	L	prox.1/2 shaft, articular end worn, poss.adult
CS11-05-1 grp.A/1	metacarpal V	R	complete, circular hole worn into dist.dorsal surface, poss.adult
CS11-05-1 grp.A/1	metatarsal I	L	dist.1/2 shaft, no prox.end, poss.adult
CS11-05-1 grp.A/1	metatarsal II	L	complete, no dist.end, prox/plantar surface broken off
CS11-05-1 grp.A/1	metatarsal III	R	complete, dist.end worn, poss.adult
CS11-05-1 grp.A/1	metatarsal IV	L	prox.1/2 shaft, no dist.end, poss.adult
CS11-05-1 grp.A/1	metatarsal IV	R	prox.1/3 shaft, articular end worn, poss.adult
CS11-05-1 grp.A/1	navicular	L	complete
CS11-05-1 grp.A/1	pelvis	R	ischium portion w/ pt.of acetabulum, unfused ischial tuberosity, poss.child
CS11-05-1 grp.A/1	pelvis	R	pubis portion, unfused pubic symphysis, poss.child
CS11-05-1 grp.A/1	prox.phalange	?	pedal, complete, no dist.end, prox.epiphysis fusing, poss.subadult
CS11-05-1 grp.A/1	prox.phalange	?	pedal, 5 complete
CS11-05-1 grp.A/1	prox.phalange	?	manual, dist.1/2 shaft, unfused dist.epiphysis, poss.subadult
CS11-05-1 grp.A/1	prox.phalange	?	manual, dist.1/2 shaft
CS11-05-1 grp.A/1	prox.phalange	?	manual, complete
CS11-05-1 grp.A/1	prox.phalange	?	manual, complete, unfused prox.epiphysis, poss.subadult
CS11-05-1 grp.A/1	rib	?	6 shaft frags & 1 sternal end
CS11-05-1 grp.A/1	rib I	L	complete, no sternal end, epiphysis fusing, poss.subadult
CS11-05-1 grp.A/1	vertebra	A	thoracic, neural arch, unfused epiphysis, poss.subadult
CS11-05-1 grp.A/1	vertebra	A	thoracic, complete minus spinous process & left transverse process
CS11-05-1 grp.A/2	femur	?	unfused femoral head, poss.subadult
CS11-05-1 grp.A/2	long bone	?	unfused epiphysis, poss.greater trochanter, poss.subadult
CS11-05-1 grp.A/2	navicular	L	nearly complete, worn to expose trabecular bone
CS11-05-1 grp.A/2	pelvis	L	iliac portion w/ auricular surface & unfused acetabular epiphysis, poss.subadult
CS11-05-1 grp.A/2	vertebra	A	thoracic, centrum
CS11-05-1 grp.A/2	vertebra	A	centrum, unsued epiphysis, poss.subadult

CS11-05-1 grp.A/3	calcaneus	L	complete, unfused calcaneal tuberosity, plantar surface very worn, friable, poss.subadult
CS11-05-1 grp.A/3	capitate	L	complete
CS11-05-1 grp.A/3	dist.phalange	?	pedal, complete, prox.epiphysis fusing
CS11-05-1 grp.A/3	dist.phalange	?	manual, 7 complete
CS11-05-1 grp.A/3	frags	?	cortical bone & vertebral frags
CS11-05-1 grp.A/3	humerus	L	unfused humeral head, poss.subadult
CS11-05-1 grp.A/3	inter.cuneiform	L	complete, poss.adult
CS11-05-1 grp.A/3	long bone	?	shaft frag, poss.radius or ulna, small size, poss.child
CS11-05-1 grp.A/3	lunate	L	complete
CS11-05-1 grp.A/3	med.phalange	?	manual, complete, small size, poss.digit 5
CS11-05-1 grp.A/3	med.phalange	?	pedal, complete, unfused prox.epiphysis, poss.subadult
CS11-05-1 grp.A/3	med.phalange	?	pedal, complete, poss.digit 4
CS11-05-1 grp.A/3	med.phalange	?	pedal, complete, poss.digit 5
CS11-05-1 grp.A/3	phalange	?	3 shaft frags, 1 w/ unfused epiphysis
CS11-05-1 grp.A/3	prox.phalange	?	manual, unfused prox.epiphysis, poss.subadult
CS11-05-1 grp.A/3	prox.phalange	?	pedal, 1 complete & 1 prox.1/2 shaft
CS11-05-1 grp.A/3	rib	?	5 shaft frags
CS11-05-1 grp.A/3	rib	L	central shaft portion
CS11-05-1 grp.A/3	triquetral	R	complete
CS11-05-1 grp.A/3	vertebra	A	thoracic, unfused epiphyses, poss.subadult
CS11-05-1 grp.A/3	vertebra	A	thoracic, complete, no spinous process, poss.adult
CS11-05-1 grp.A/3	vertebra	A	thoracic, nearly complete, body worn around margins, poss.adult
CS11-05-1 grp.A/3	vertebra	A	neural arch frags
CS11-05-1 grp.A/4	humerus	R	complete, unfused prox.epiphysis, dist.end worn, septal aperture, poss.subadult
CS11-05-1 grp.B/1	femur	R	complete shaft, no ends, pronounced linea aspera, poss.adult
CS11-05-1 grp.B/1	med.cuneiform	R	complete, stained, poss.adult
CS11-05-1 grp.B/1	metacarpal III	R	complete, good preservation, poss.adult
CS11-05-1 grp.B/1	metatarsal II	L	complete, no plantar aspect of prox.end, poss.adult
CS11-05-1 grp.B/1	metatarsal V	R	complete, no tuberosity, poss.adult
CS11-05-1 grp.B/1	patella	R	complete, large size, poss.adult
CS11-05-1 grp.B/1	talus	R	2 complete, large size, poss.adult males
CS11-05-1 grp.B/1	temporal	L	auditory meatus & mastoid region, small mastoid process, poss.subadult

CS11-05-1 grp.B/1	vertebra	A	centrum & portions of neural arch, unfused epiphyses, poss.subadult
CS11-05-1 grp.B/2	clavicle	L	acromial portion, no sternal side, poss.adult
CS11-05-1 grp.B/2	cranial	?	2 frags
CS11-05-1 grp.B/2	frags	?	25 cortical frags
CS11-05-1 grp.B/2	humerus	L	complete shaft, no ends, small size, poss.child
CS11-05-1 grp.B/2	long bone	?	shaft frag
CS11-05-1 grp.B/2	long bone	?	shaft frag., poss.child
CS11-05-1 grp.B/2	metacarpal IV	R	complete, no dist.end, well-healed fracture @ center of shaft(palmar bending), poss.adult
CS11-05-1 grp.B/2	metatarsal	?	dist.1/2 shaft, poss. III or IV
CS11-05-1 grp.B/2	podial	?	fragment
CS11-05-1 grp.B/2	radius	R	nearly complete shaft, small size, unfused dist.epiphysis, poss.child
CS11-05-1 grp.B/2	rib	?	9+ shaft frags
CS11-05-1 grp.B/2	ulna	L	complete bone, dist.1/2 cracked & flaking, poss.adult
CS11-05-1 grp.B/2	ulna	R	complete shaft, no ends, defined interosseus margin, poss.adult male
CS11-05-1 grp.B/2	ulna	R	complete shaft, no ends, portion of prox.end, olecrenon process broken off, poss.adult
CS11-05-1 grp.B/2	vertebra	A	4+ neural arch frags
CS11-06-1/1	metapodial	?	shaft frag
CS11-06-1/1	radius	L	dist.1/2 shaft, unfused epiphysis, small size, poss.child
CS11-06-1/1	rib	?	articular end
CS11-06-1/1	temporal	L	nearly complete, worn mastoid proc, stained outer table, good preservation, poss.young adult
CS11-06-1/2	cranial	?	20+ frags
CS11-06-1/2	cranial	?	2 basicranial frags
CS11-06-1/2	frontal		portion w/ frontal crest & zygomatic proc, upper margin of L orbit, poss.cran.deform, poss.adult
CS11-06-1/2	occipital		basioccipital portion w/ anterior portion of foramen magnum
CS11-06-1/2	parietal	L	portion w/ squamosal suture, articulates w/ L temporal & frontal (CS11-06-1/2)
CS11-06-1/2	sphenoid	L	portion of greater wing, articulates w/ L temporal (CS11-06-1/2)
CS11-06-1/2	temporal	L	complete, no mastoid process, base of styloid proc.present, good preservation, poss.yng adult

APPENDIX V

INVENTORY FOR CUEVA DE KAXON PEC

Lot	Bone	Side	Description
CKP2-01-1	upper I1	L	complete, no wear, some caries, poss.adult
CKP2-02-1	canine	R	complete, slight wear, poss.adult
CKP2-02-1/1	tibia	L	complete shaft, no prox end, tibial tuberosity & medial malleolus present, robust, poss.adult male
CKP2-02-1/3	femur	R	complete shaft, neck present, trochanters, head, & dist.end missing
CKP2-02-1/4	tibia	L	dist.1/2 shaft w/ partial end
CKP2-02-1/5	tibia	L	central midshaft portion
CKP2-02-1/6	femur	?	nearly complete shaft, no ends, worn on posterior end along linea aspera, poss.subadult
CKP2-02-1/7	long bone	?	midshaft portion, poss.femur or humerus
CKP2-02-1/8	humerus	R	dist.1/2 shaft, no end, worn, chalky white appearance, large size, poss.adult
CKP2-03-1	decid.molar	?	complete, no wear, poss.subadult
CKP2-03-1	decid.molar	?	nearly complete, roots broken off, poss.subadult
CKP2-03-1	decid.molar	?	nearly complete, roots still forming, tooth attached to alveolus portion
CKP2-03-1	decid.molar	?	complete, attached to alveolus portion, poss.subadult
CKP2-03-1	lower P3	R	complete, slight wear, poss.adult
CKP2-03-1/1	femur	R	complete shaft, no dist.end, femoral head & neck portion, fused < trochanter, stained, poss.adult
CKP2-03-1/2	radius	R	dist.1/2 shaft, no end, chalky white appearance
CKP2-03-1/3	tibia	L	nearly complete midshaft, no ends, fragmentary, prox.end stained
CKP2-03-1/4	pelvis	R	inf.ptn of acetab. & ischial tuberosity, ptns of ilium & auricular surf., wide sciatic notch, poss.ad.female
CKP2-03-1/5	pelvis	L	nearly complete acetab, unfused ischial tuberosity & iliac spine, complete auricular surf., poss.adol.
CKP2-03-1/6	pelvis	L	superior ramus of pubis, portion of acetabulum, no pubic symphysis
CKP2-03-1/7	femur	R	complete shaft w/ head & lateral 1/2 of dist.end, trochanters still fusing, head fused, poss.adolescent
CKP2-03-1/8	humerus	L	dist.1/2 shaft w/ complete end, good condition, robust, poss.adult
CKP2-03-1/9	tibia	R	complete shaft, no ends, pronounced muscle attachment, tibial tuberosity present, stained

CKP2-03-1/10	femur	L	complete shaft, no dist.end, head & neck broken off, pt.of < trochanter, dist.portion flaking
CKP2-03-1/11	humerus	R	complete shaft, no prox.end, portion of trochlea & med.epicondyle, chalky white & stained
CKP2-03-1/12	femur	R	complete shaft, no dist.end, unfused head and trochanters, poss.adolescent
CKP2-03-1/13	tibia	R	central midshaft portion, stained & worn
CKP2-03-1/14	femur	L	complete shaft, no ends, chalky white appearance, stained
CKP2-03-1/15	femur	R	nearly complete shaft, no ends, pt.of < trochanter, small circumference, chalky white, poss.subadult
CKP2-03-1/16	femur	L	prox.2/3 shaft, no end, chalky white, small circumference, poss.subadult
CKP2-03-1/17	tibia	R	central midshaft portion, worn, chalky white appearance, small size, poss.subadult
CKP2-03-1/18	talus	R	complete, good condition
CKP2-03-1/19	zygomatic	R	part of maxillary sinus
CKP2-03-1/20	metatarsal	?	prox.1/2 shaft w partial end, poss.II/III
CKP2-03-1/22	femur	R	medial & lateral condyles (broken), no epicondyles, may belong to CKP2-03-1/1
CKP2-03-1/23	humerus	R	complete shaft, no ends, dense bony growth @ prox.end, stained
CKP2-03-1/24	temporal	L	nearly complete, mastoid process worn, complete petrous portion
CKP2-03-1/25	tibia	L	nearly complete shaft, no ends, robust, poss.adult male, stained
CKP2-03-1/26	tibia	R	complete midshaft, no ends, small circumference, good condition, poss.subadult
CKP2-03-1/27	humerus	L	prox.1/2 shaft, no end, frag.missing, stained
CKP2-03-1/28	femur	L	articular portion of medial condyle, no epicondyle
CKP2-03-1/29	humerus	?	portion of humeral head w/ shaft portion
CKP2-03-1/30	sacrum	A	superior portion of 1st sacral element & left ala
CKP2-03-1/31	femur	R	anterior neck portion, no greater trochanter
CKP2-03-1/32	pelvis	L	greater sciatic notch w/ superior acetabulum, pt of ilium, auricular surface, poss.adult male
CKP2-03-1/33	pelvis	?	25+ frags
CKP2-03-1/34	vertebra	A	thoracic, arthritic lipping, no transverse process & head of spinous process
CKP2-03-1/36	ulna	R	dist.1/3 shaft, no end, worn
CKP2-03-1/37	radius	L	nearly complete shaft, no ends, fragmentary, stained & polished
CKP2-03-1/38	humerus	L	nearly complete shaft (2 pieces), no ends, central portion missing
CKP2-03-1/40	vertebra	A	lumbar, part of centrum
CKP2-03-1/41	vertebra	A	lumbar, nearly complete, superior portion of centrum
CKP2-03-1/42	vertebra	A	thoracic, most of centrum missing, L transverse proc.complete, no R side, no spinous proc.head
CKP2-03-1/43	vertebra	A	thoracic, centrum, transverse process & head of spinous process missing
CKP2-03-1/44	vertebra	A	thoracic, body present, no transverse process, R superior articular process, spinous process
CKP2-03-1/45	vertebra	A	thoracic, spinous process & part of pedicles & full laminae

CKP2-03-1/46	vertebra	A	thoracic, transverse process & body missing
CKP2-03-1/47	vertebra	A	cervical, 2 bodies, unfused epiphyses
CKP2-03-1/47	vertebra	A	cervical, interior articular surface w/ right lamina
CKP2-03-1/47	vertebra	A	lumbar, centrum
CKP2-03-1/47	vertebra	A	lumbar, centrum
CKP2-03-1/47	vertebra	A	lumbar, inferior articular process
CKP2-03-1/47	vertebra	A	lumbar, part of centrum
CKP2-03-1/47	vertebra	A	thoracic, inferior articular process w/ L transverse process
CKP2-03-1/47	vertebra	A	thoracic, R superior & inferior articular surfaces w/ R costal transverse proc. & pt.of spine
CKP2-03-1/47	vertebra	A	thoracic, transverse process
CKP2-03-1/48	clavicle	L	nearly complete, medial 2/3 portion
CKP2-03-1/49	rib	L	shaft portion, possible rib 2
CKP2-03-1/50	rib		20+ frags
CKP2-03-1/51	metatarsal V	R	prox.1/2 shaft w/ end, some concretions
CKP2-03-1/52	metatarsal V	R	prox.1/2 shaft w/ end
CKP2-03-1/53	patella	L	anterior portion w/ articular facet
CKP2-03-1/54	pieces		long bone frags
CKP2-03-1/55	humerus	L	nearly complete shaft, no ends, fragmentary, chalky white, small size, poss.subadult
CKP2-03-1/56	humerus	R	complete shaft, no ends, very worn
CKP2-03-1/58	ulna	R	prox.1/2 shaft, no end, stained & worn
CKP2-03-1/59	pieces		many miscellaneous frags
CKP2-03-1/60	pelvis	R	part of acetabulum, greater sciatic notch
CKP2-03-1/61	pelvis	R	inferior portion of acetabulum w/ ischial tuberosity
CKP2-03-1/63	metatarsal III	L	complete
CKP2-03-1/64	metacarpal I	R	nearly complete shaft, dist.end & prox.-dorsal end missing
CKP2-03-1	pelvis	R	portion of ilium & ischium, wide sciatic notch, poss.adult female (35-45 yrs)
CKP2-03-1	pelvis	L	complete ilium, ischium & sup.ramus of pubis, wide sciatic notch, poss.ad.female (50-60 yrs)
CKP2-03-1	cranium		nearly complete, poss.cranial deformation, poss.adult male
CKP2-03-1	cranium		complete, poss.frontal & lambdoid flattening, poss.young adult female
CKP2-03-1	pelvis	R	portion w/ ilium & ishium, wide sciatic notch, poss.adult female (35-40 yrs)
CKP2-04-1/1	pelvis	L	greater sciatic notch, acetabulum, auricular surface, ischial body & spine, poss.adult male
CKP2-04-1/2	ulna	L	prox.1/2 shaft, no end, posterior portion of prox.head only

CKP2-04-1/3	femur	L	dist.1/2 shaft, no end, depressions worn on medial aspect, stained
CKP2-04-1/4	humerus	L	complete midshaft, no ends, stained & worn
CKP2-06-1	decid.molar	?	nearly complete crown, no roots, poss.subadult
CKP2-06-1/1	sacrum	A	1st sacral element, unfused epiphyses, pt.of R lateral mass, pieces of sacral crest
CKP2-06-1/2	ulna	?	midshaft portion, stained
CKP2-06-1/3	long bone	?	3 midshafts
CKP2-06-1/4	rib	?	portion of shaft
CKP2-06-1/5	femur	L	complete shaft, no dist.end, trochanters & head missing, complete neck, stained & polished
CKP2-07-1/1	temporal	L	petrous & mastoid portions, no mastoid process, external auditory meatus, stained
CKP2-07-1/2	femur	?	posterior portion of dist.shaft, beginning of lateral condyle
CKP2-07-1/3	long bone	?	7 midshaft portions
CKP2-07-1/4	pelvis	?	subadult acetabulum
CKP2-07-1/5	scapula	?	glenoid fossa w/ lateral border
CKP2-07-1/6	scapula	?	portion of lateral border
CKP2-07-1/7	sacrum	A	articular tubercle
CKP2-07-1/8	long bone		poss.articular surface frags, poss.tibia
CKP2-08-1/1	temporal	R	mastoid proc., glenoid proc., pt.of squama, petrous portions, sulcus for sigmoid sinus
CKP2-08-1/2	temporal	L	part of mastoid process, squama, petrous portion, sinus sulcus
CKP2-08-1/3	temporal	L	no mastoid proc, no petrous portion, sinus sulcus & petrous portion present
CKP2-08-1/4	pelvis	L	pt.of acetabulum w/ greater sciatic notch & ilium portion
CKP2-08-1/5	femur	L	prox.1/2 shaft, no end, stained
CKP2-08-1/6	frontal		nasal spine, sinuses, L&R supraorbital tori, stained
CKP2-08-1/7	scapula	?	glenoid fossa
CKP2-08-1/8	scapula	L	greater scapular notch, part of acromion process
CKP2-08-1/9	metacarpal	?	midshaft only
CKP2-08-1/10	sacrum	A	1st sacral element, centrum only, superior articular process
CKP2-08-1/11	scapula	L	nearly complete, acromion process & body, scapular blade missing, coracoid process, concretions
CKP2-08-1/12	parietal	?	portion w/ meningeal vessels, stained
CKP2-08-1/13	vertebra	A	thoracic, body & superior articular process
CKP2-08-1/14	frontal		portion w/ supraorbital torus, stained & worn

CKP2-08-1/15	cranial	?	8 frags, stained
CKP2-08-1/16	long bone	?	5 frags, stained
CKP2-08-1/17	sacrum	A	7 frags, possible coccygeal frag
CKP2-08-1/18	vertebra	A	2 centrum frags, neural arch frags
CKP2-08-1/19	pedal bones	L	complete dist.phalange, complete L navicular, complete L int.cuneiform
CKP2-08-1/20	frags		miscellaneous bone frags
CKP6-02-1/1	femur	R	complete shaft, no ends, groove worn out on dist.1/3 medial surface, stained & polished
CKP6-02-1/2	femur	R	complete shaft, no ends, heavily worn, stained & polished
CKP6-02-1/3	long bone	?	3 shaft frags
CKP7-06-1	upper M2	R	complete, considerable wear, attached to alveolus portion w/ sockets for P3-M2, poss.adult
CKP7-07-1/2	femur	L	complete shaft, no ends, large popliteal surface, concretions on prox-post.side, poss.adult male
CKP7-07-1/3	femur	L	prox.2/3 shaft, no end, hole worn on anterior face, concretions, stained & polished (black)
CKP7-07-1/4	frontal		complete, good condition, anterior side completely covered w/ concretions
CKP7-07-1/5	temporal	L	ext.auditory meatus, mandibular fossa, squamous portion, no mastoid proc., stained w/ concretions
CKP7-07-1/6	temporal	L	petrous portion
CKP7-07-1/7	parietal	L	complete, outer table covered w/ concretions, goes w/ CKP7-07-1/4
CKP7-07-1/8	parietal	R	nearly complete but fragmentary, portion w/ sagittal suture
CKP7-08-1	cranium		complete, no cranial deformation, poss.adult male
CKP9-01-1	femur	R	CKP 38-41; prox.2/3 shaft, no end, worn
CKP9-04-1	canine	L	CKP-C51; complete, considerable wear, poss.adult
CKP9-04-1	lower molars	L	CKP-C51; 1 complete, 2 nearly complete w/ caries, considerable wear, poss.adult
CKP9-04-1	mandible	L-R	CKP-C51; mandibular portion, no ascending ramus, 1 tooth(PM/C?)
CKP9-04-1	tibia	L	CKP-C51; central midshaft, bump on medial surface, stained
CKP9-05-1	frontal		CKP 56-62; L supraorbital torus w/ zygomatic process, stained & polished
CKP9-05-1	tibia	?	CKP 56-62; midshaft portion w/ concretions, other frag w/ heavy concretions, stained & polished

CKP9-06-1	tibia	R	CKP 62-63; prox.1/2 shaft, no end, poss.subadult
CKP9-07-1	femur	L	CKP Sta.63; complete midshaft, no ends, worn, stained & polished (black)

NOTE: Skeletal elements in **bold type** were inventoried by Wright (unpublished notes 1994) and are not included in the sample analyzed in this study.

APPENDIX VI

INVENTORY FOR CUEVA DE LOS QUETZALES

Lot	Bone	Side	Description
CQ1-03-1	cranial	?	15 fragments
CQ1-03-1	metatarsal V	R	prox.1/2 shaft
CQ1-09-16	upper canine	L	complete, moderate wear, possible LEH
CQ1-10-9	talus	R	nearly complete, articulates w/ CQ2-01-0 - R navicular
CQ1-10-10	lower molar	R	nearly complete, no wear, tips of roots broken off
CQ1-10-10	med.cuneiform	L	dorsal aspect
CQ1-10-10	metatarsal I	R	complete shaft minus distal aspect & lateral articular aspect
CQ1-10-10	patella	R	medial 1/2
CQ1-10-11	dist.phalange	?	pedal, complete digit V
CQ1-10-11	dist.phalange	L	pedal, complete digit I
CQ1-10-11	med.phalange	?	manual, complete w/ unfused prox.epiphysis, prox.end partially broken, hole on dorsal aspect
CQ1-10-11	prox.phalange	R	manual, complete w/ hole worn into dorsal aspect @ dist.end & palmar lateral aspect
CQ1-10-11	phalange	?	pedal, unfused prox.epiphysis, poss.med.phalange
CQ1-10-11	metacarpal	?	dist.epiphysis unfused, poss.juvenile, maybe metacarpal V
CQ1-10-11	metatarsal IV	L	shaft, no prox.end, unfused dist.epiphysis, poss.subadult
CQ1-10-11	metatarsal	?	shaft frag.
CQ1-10-11	navicular	R	medial aspect highly worn
CQ1-10-11	femur	?	shaft frag. anterior aspect
CQ1-10-11	femur	?	fragment of popliteal surface
CQ1-10-11	pelvis	L	ilium portion w/ sciatic notch
CQ1-10-11	long bone	?	9 frags, possible femur

CQ1-10-11	upper I2	R	root is forming, crown unworn, small size, poss.subadult
CQ1-10-12/1	humerus	R	complete shaft, no ends, good condition
CQ1-10-12/2	humerus	?	1/2 shaft, no end, dorsal portion broken off
CQ1-10-12/3	navicular	R	complete minus medial aspect, lytic lesion on articular surface for talus 2mm diameter
CQ1-10-12/3	temporal	L	petrosal aspect
CQ1-10-12/3	lower i2	L	complete, poss.shoveled, poss.subadult
CQ1-11-4	upper canine	R	complete, moderate wear on occlusal surface to expose dentine
CQ1-11-4	upper M1	L	complete, slight wear, broken roots, calculus on mesial surface
CQ1-11-4	upper P3	L	complete, slight wear
CQ1-11-5	lower molar	R	complete, M1 or 2, moderate wear, roots broken
CQ1-11-5	upper I2	L	complete, slight wear
CQ1-12-4	upper molar	R	complete, M2 or 3, stained black, frags of alveolus attached, marked wear
CQ1-13-4	parietal	R	portion w/ juncture of sagittal & coronal sutures, good condition
CQ1-15-12	lower I2	R	complete, moderate wear to expose dentine
CQ1-15-12	upper I2	L	complete, marked wear on lingual surface to expose dentine
CQ1-16-8/1	femur	L	complete shaft, no dist.end, < trochanter broken off, poss.cutmarks, poss.adult male
CQ1-16-8/2	femur	L	complete shaft, no ends, neck & pt.of < trochanter, holes worn on distal end, poss.adult
CQ2-01-0	navicular	R	nearly complete, medial portion worn away
CQ10-1-1/1	fibula	L	dist.1/3 shaft w/ completely fused epiphysis, poss.adult
CQ10-1-1/2	fibula	L	prox.1/3 shaft, no end, poss.adult
CQ10-1-1/3	tibia	R	dist.midshaft portion, robust, poss.adult

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Summer 2001 Archaeological field school at Ludlow Massacre Site, Trinidad, CO.
2000-2001 Research on dental microwear, Texas A&M University, Department of Anthropology.
1999-2000 Analysis of burial practices in Byzantine Palestine through a survey of tomb typologies, University of Notre Dame, Department of Anthropology.
1999-2000 Assistant to the curator of the Arts of the Americas Gallery, Snite Museum of Art, University of Notre Dame; research on Native American beadwork.

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