SKELETAL EVIDENCE FOR ELITE CRAFT SPECIALIZATION AMONG THE TERMINAL CLASSIC MAYA OF COPÁN, HONDURAS

A Thesis

Presented to

The Faculty of the Department

of Anthropology

University of Houston

In Partial Fulfillment

Of the Requirements for the Degree of

Master of Arts

By

Clinton Fish

May, 2015

SKELETAL EVIDENCE FOR ELITE CRAFT SPECIALIZATION AMONG THE TERMINAL CLASSIC MAYA OF COPÁN, HONDURAS

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ABSTRACT

The burials beneath the workshops of Patio H at the 9N-8 compound of Copan, Honduras were examined for signs of occupational markers and skeletal robusticity to indicate if these people were craft specialists. According to archaeological evidence, crafting activity at this location included both sacred and secular traditions. Workshop burials were compared with other burials from 9N-8 in order to determine if differing degrees of robusticity and bone size existed between these groups. Measurements of the shoulders and arms were utilized to determine differences. The presence of osteoarthritis and entheseal markers was also analyzed to assess activity levels in the upper and lower body. No significant difference in skeletal size was found to exist between the workshop burial population and the rest of 9N-8. Based on observations of osteoarthritis and entheseal markers in the workshop burial group, it was determined that both craftspeople and non-craftspeople were buried in this location.

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Chapter One-Introduction and Objectives

I.1 Introduction

The Maya were once thought to be a mysterious culture. The discovery of abandoned buildings and a small number of Maya in Mexico and Central America by the Spanish spread knowledge of the Maya to the Old World and created interest in this area of the New World. Dominance and religion motivated Spanish interest in the Maya people. They sought to control and convert the aborigines. Sadly, Spanish methods of conversion and interaction led to the deaths of many Maya people, the destruction of most Maya texts, and biased studies of Maya culture. Exploration and study in the Maya area in the nineteenth and twentieth centuries was concerned with archaeology and discerning Maya culture from the remnants of architecture. The translation of writing upon architecture deepened early Maya anthropologists' understanding of social organization. Applying translations, as well as archaeological and anthropological methods in the Maya area, has deepened the contemporary understanding of how the Maya organized themselves, used astronomy in their belief system, and even what led to their downfall in the Classic period centuries before Spanish arrival. This study is concerned with elite social organization and the ways in which a high-ranking group carried out craft practices. It seeks to determine if one particular burial group were craftspeople of the elite class that created both secular and ritual goods. Bioarchaeological and osteological methods were utilized in order to reach conclusions about the occupations of the group buried within the craft workshops of Patio 9N-8H.

I.2 Objectives

The purpose of this study was to look at Maya occupational craft specialization in a bioarchaeological context. Craft specialization has been researched with archaeological methods, with a focus on material culture, and its relationship to behavior and ideology (Emery and Aoyama 2007; Aoyama 2007, 2009; and Widmer 2009). Emery and Aoyama were concerned with tool use and analysis, while Widmer applied archaeological discoveries to kin associations and to the Maya belief system. Archaeology serves a very important purpose in researching occupational specialization, but biological and anthropological methods add to our ability to analyze discoveries and data. Bioarchaeology has fulfilled a need to apply biological theories and knowledge to human remains in a cultural context (Larsen 1997:3-4). Bioarchaeology has been utilized in the Maya area for various research interests by McAnany and Storey concerning nutrition, health, and social status at K'axob, Belize, (McAnany *et al.* 1999) and Copan, Honduras (Storey 2007). Other bioarchaeologists like Buikstra, Tiesler, Cucina, Milner, and Arlen and Diane Chase have all looked at burial context, skeletal morphology, paleopathology among the Maya (Buikstra *et al.* 2006, Tiesler and Cucina 2006, Chase and Chase 1996). Studies that are particularly useful as references in this thesis are al-Oumaoui *et al.* (2004) who looked at markers of activity in the Iberian Peninsula, Cardoso and Henderson (2010) who observed enthesopathies in the humerus, Cashmore and Zakreski (2011) who studied musculoskeletal markers in the hand, and Waldron and Cox (1989) who observed rates of osteoarthritis and musculoskeletal markers in individuals in the Spitalfields sample. All of these studies, and several others, are referenced in Chapter Five of this thesis. With its dual use of biology and archaeology/anthropology, bioarchaeology can be well-utilized in a

study of craft specialization. Bioarchaeologists can assess human remains in terms of activity, but this has not been done in a study of occupational craft specialization in the Maya area. This study takes a novel approach in using bioarchaeology to assess human remains in the context of research into craft specialization among the Maya. Recognizing a link between craft specialization and the morphology that results from activity in human remains is essential for better understanding any culture in which research is done.

This approach is used to assess the burial data from a Maya Terminal Classic elite compound. Osteological measurements and skeletal markers were examined to determine if the small burial group interred beneath two of a trio of craft workshops was crafters that worked in the rooms above or were buried in this location for a separate reason. Five models have been proposed for this study with the potential to explain what activities these few individuals participated in during their lives. The models formulated and tested in this study were developed based on several biological and cultural assumptions. The reasoning behind these assumptions is presented in Chapters Two, Three, and Five.

This study seeks to elaborate upon previous studies at Copan. Rebecca Storey recorded skeletal data, measurements, and observations from the early to late 1980s at Copan but not all of this data has been analyzed. As a bioarchaeologist, Storey places great importance on understanding biology in the context of culture. Widmer's 2009 article is the basis for this study as he participated in the excavation of Patio H at 9N-8. His archaeological analysis guided some of the assumptions and models in this study. Adding a bioarchaeological perspective to Widmer's archaeological evidence will only expand on the work done at Patio H. Stone Lee's 1995 University of Houston Master's thesis focused on activity type and differences in access to food according to status at 9N-8. She

concluded that elite people were more robust than should be expected for their status, even when compared to medium and lower status groups. Stone Lee (1995) based this finding on differential levels of activity between groups. This study goes beyond stating that there were differences in activity between groups and uses observations by Storey and Stone Lee to determine the likely occupations of a few of the people from Patio H at 9N-8.

I.3 Assumptions

1. Structures 110A, 110B, and 110C of 9N-8, Patio H were workshops for the craft specialists of the patio.
2. 9N-8, Patio H housed an elite lineage ranked lower than the lineage that occupied Patio A.
3. The tombs created in the workshops of Patio H were placed here as a form of ancestor veneration.
4. Intensity of activity during life affects the skeleton. The longer the activity occurred or the more intense the activity, the more effect this activity would have on the skeleton. Stressed bones will increase in size and density in order to cope with the mechanical strain placed upon them, especially at an early age. This response manifests itself in increased bone robusticity, the presence of enthesophytes and enthesopathies, muscle markers, and possibly osteoarthritis.
5. Different activities and varieties of mechanical stress will result in differential stress upon the skeleton. For example, long distance running will have more of an effect on the legs than the arms. Kayaking will affect the arms more than the legs.

I.4 Models and Hypotheses

Model I

The males and females buried in the tombs below Structures 110A and 110B (Figure 1) were full-time craft specialists of elite goods, both ritual and secular, independent of traditional Maya gender roles. Men and women worked equally on crafting jade and marine shell, as well as weaving, hide working, and feather working. It is suggested that men and women both participated in the same types of crafting at Aguateca, and some mortuary evidence shows men and women could both have been weavers in some elite contexts (Emery and Aoyama 2007:86; Brumfiel 2006:863). In modern day Guatemala and Oaxaca, it is normal for both men and women to be weavers and have several roles in textile production (Brumfiel 2006:869-870). They did not participate in other daily activities, such as food production and processing, or any other non-crafting activities, because crafting was their full-time occupation. They would have worked daily in lapidary and shell crafts, as well as weaving, feather working, and yarn spinning.

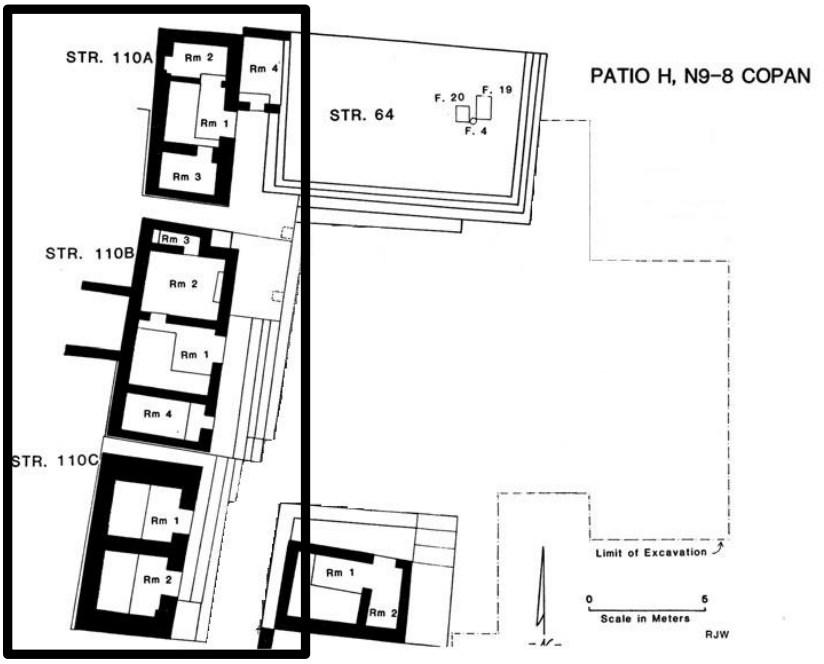

Figure 1: The Elite Workshops
(Adapted from Widmer 2009:191)

Hypothesis

If the bones of the shoulders, arms, wrists, hands, and fingers are more robust, have more apparent enthesophytes, enthesopathies, or more severe osteoarthritis then crafting activity is the likely cause of these features. Males and females will have features indicative of heavy activity in the upper body, relative to physical differences as a result of sexual dimorphism. Some evidence of activity may be apparent in the legs and lower back if these people were weavers, as the use of the backstrap loom required a sitting or kneeling posture. Comparison with other elites from Copan, buried without association to crafting activity, will establish levels of robusticity, entheseal markers, and osteoarthritis in the elite population. Interment below a craft workshop adds to any biological data supporting this hypothesis.

Model II

The males interred below Structures 110A and 110B were lapidary craft specialists that carved and manipulated jade and marine shell objects. The females were weavers, hide workers, and feather workers. They were all full-time craft specialists with occupational roles allocated according to Maya gender and status norms.

Hypothesis

If males were full-time lapidary craftsmen then they will exhibit robusticity of the shoulders, arms, wrists, and hands. This will occur as carving stone and shell is a strenuous and physically straining activity. Enough time and mechanical stress from repeated activity will increase the strength of the stressed bones, and the adaptive ability of the body will be observable. If females were full-time, non-lapidary crafters, their skeletons will show less evidence of their occupation relative to sex. Weaving, hide-working, and feather-working are less stressful on the upper body, and the effects of such activity will not be as apparent as the effects of lapidary work in men. Female weavers would have used a backstrap loom that would have put stress on the lower back and leg joints. Osteoarthritis and muscle markers would indicate this stress. Comparisons with other individuals from 9N-8 will demonstrate that the purported crafters of Patio H will have more robust upper bodies, relative to their sex.

Model III

Both males and females interred in Structures 110A and 110B were part-time craft specialists that participated in other elite activities away from crafting responsibilities.

Perhaps crafting was done according to a calendrical cycle or for upcoming religious rituals that required newly created objects. Elite part-time crafters would perhaps only work on crafting a few times a year at Patio H. Additional possibilities that fall under this model:

A. Only males were part-time crafters.

B. Only females were part-time crafters.

Hypothesis

If either males or females were part-time crafters, then they will display similar occupational markers to those that were not craft specialists. Both sexes will share skeletal features with other elites, as they all likely participated in similar activities separate from their occupational work. If Model IIIA fits the group interred in the Patio H workshops, then the males buried therein will show reduced skeletal markers for occupational craft specialization as a result of less time spent using the upper body and arms for strenuous and repetitive activity. Their skeletal measurements will be similar in size to male non-crafters of 9N-8. If Model IIIB fits the females buried in the Patio H workshops, then they would show reduced measurements and skeletal markers for craft specialization, and their measurements would be comparable in size to other females of 9N-8.

Model IV

All of the people buried in these tombs were buried here for ancestor veneration purposes but were not craft specialists living in Patio H. Instead, they were elite scribes or the *Ahau* (Lord) from the high-ranking lineage that lived at Patio A.

Hypothesis

This model was formulated as a result of Widmer's (2009) hypothesis that the dearth of elite burials at Patio A was because they were buried elsewhere in 9N-8. Patio A contained the scribes' house, according to architectural and epigraphic data, but no elite burials are associated with this structure. Perhaps the *Ahau* of Patio A was buried in Patio H to create a bridge between the spirit and natural worlds. Kin relationships linked these two patios and this would be reflected in burial patterns.

Males and females will not display any skeletal markers that indicate they were craft specialists. No increased arm robusticity will be apparent unless an individual participated in some activity that produced enough mechanical stress to show up on the skeleton. Compared to other elites from 9N-8, Patio H workshop burials will show relatively similar patterns of skeletal robusticity and presence of osteoarthritis and entheseal markers. An *Ahau* or scribe will not have indicators of continuous mechanical stress in the upper body during their life.

Model V

Only a few individuals buried in the tombs of the Patio H workshops were crafters of elite goods. They were crafters and deified ancestors buried alongside non-crafting deified ancestors.

Hypothesis

The upper body measurements and skeletal markers of any crafters will show evidence of their occupation, while non-crafters will not exhibit these characteristics. Comparisons with non-workshop burials and comparisons among individuals within the workshop burials are important. Female and male instances of entheseal markers and osteoarthritis will illustrate occupation. Comparison of osteoarthritis, robusticity, and entheseal markers on a case-by-case basis will be necessary due to a small sample size and lack of necessary data for every individual.

These models and hypotheses were formulated as a result of assumptions formed around knowledge about Maya ritual practices, available archaeological remains, and human skeletal biology. For this study to be effective both Maya culture and osteology need to be investigated in tandem. This methodology, and consideration of potential explanatory models, will lead to a reasonable conclusion.

Chapter Two-Mesoamerican Environment, Natural Resources and Maya Beliefs

II.1 Mesoamerican Environment and Geography

Before the events that led to the abandonment of Maya sites during the Classic period, the Maya flourished in southern Mexico, Guatemala, and parts of Honduras and El Salvador. The Maya area is usually considered to consist of two general areas: the lowlands and the highlands. A further breakdown splits the lowlands into the North and South. The Northern lowlands exist in the Yucatan peninsula. The Southern lowlands area covers most of Guatemala, Belize, and parts of Honduras and El Salvador (Figure 2) (Sharer and Traxler 2006:28-52).

Figure 2: Maya Lowlands and Highlands
(Adapted from www.latinamericanstudies.org)

The Maya highlands stretch from the Chiapas of southern Mexico into Guatemala, El Salvador, and Honduras. This area is called the "highlands" because of the mountainous and volcanic topography. The highlands are considered to exist above about 300 meters up to around 4,000 meters. Pine trees, oak trees, and grasses cover the area. The volcanic soils are conducive to agriculture, and the topography allows fields to be placed on slopes. Maize, beans, squash, manioc, and chili peppers were planted in these fields. Highland and lowland agriculture were similar in practice; regional climate variations affected how long people in these regions needed to let fields rest and how often vegetation was cleared (Coe 2011:14-16).

The lowlands differ greatly from the highlands. Flora and fauna differ, as well as climate and topography. Even the Northern and Southern lowland environments vary with one another. The tallest objects in the Northern lowland area are the Puuc range. In Belize and the Peten of Guatemala, hills are more prominent and break up flat areas. The Yucatan peninsula is flat in appearance, but in reality there is pitting of the limestone shelf upon which the region sits. The largest geological features in the Yucatan peninsula are *cenotes*. *Cenotes* are sinkholes formed through the collapse of underground caves. Water exists at the bottom of these sinkholes, and Maya populations in the area were concentrated around them as *cenotes* were the only reliable sources of water. These are located mostly in the eastern Yucatan peninsula and in Belize. Where cenotes did not exist, the Maya created water storage structures (Coe 2011:17; Sharer and Traxler 2006: 41-52).

The hot climate and abundant rainfall support tropical and sub-tropical areas in the Northern and Southern lowlands. Climate not only affected the environment, it affected the cultures that lived in these areas. Rain produced floods in riverine and lake areas that

nourished agricultural lands. While the rainy season provided enough resources for the wet and dry seasons, there were also negative factors that impacted culturally modified areas. During the rainy season, floods and soil erosion removed valuable agricultural land and damaged human settlements. In modern times, floods have destroyed parts of the Copan site; this likely happened during Maya habitation as well. Low rainfall stimulated the creation of water storage structures such as wells and *chultuns*. These were greatly utilized during the dry season. *Cenotes* provided water for Northern lowland populations, and settlements grew around these features. Settlements grew around fertile agricultural soils as well. These provided the resources to drive population growth and led to an increase in sociocultural complexity over time (Sharer and Traxler 2006:53-56).

The geological context of Mesoamerica not only affected topography and produced features like *cenotes* and fertile soils; it also determined the cultural beliefs of those who lived there. Volcanism not only produced fertile soils in the highlands, it produced obsidian. Obsidian held important utilitarian and ritual significance. The Maya gathered obsidian, formed it into cores, and then into blades, weapon points, and other tools. Volcanism is not the only geologic determinant of cultural practices and beliefs. Mesoamerica is a region of metamorphism due to a convergent tectonic boundary along the Pacific coast. Metamorphism created jadeite, the resource sought after most by the Maya. Geological uplifting and erosion made jadeite available for extraction and cultural manipulation. Jade was highly desired among the Maya, and it held many religious meanings for them. The placement of the Maya civilization between large bodies of water created further realms of exploration and religious meaning. The Maya collected and traded marine shell from the Pacific Ocean, Atlantic Ocean, and the Gulf of Mexico. Water was

seen as a portal to the Underworld, and the shell therein was associated with this otherworldly realm (Sharer and Traxler 2006:488,744; Blackmore 2011:172-173). Jadeite, obsidian, and marine shell were incredibly important in the Maya economy and religious organization.

II.2 Jade

Jade, or jadeite as it's technically named, is visible in the archaeological record of Mesoamerica and was vital to the beliefs of the Maya. The importance of jade among the Maya during the Classic period stands as a very significant part of their culture. True jadeite was valued because it was rare, having only one source. Its hardness meant the procurement and working of jade was difficult without the appropriate tools. Without metallurgy the tools used were still not ideal for manipulating this hard material. Jade's rarity and its difficult acquisition process led it to be treasured. Rare tends to equal beautiful in the human mind, and therefore it was highly sought after and appreciated by the elite and non-elite Maya alike. Jade's color was representative of maize for the Maya, a life sustaining resource and important agricultural crop. Jade statuettes and celts have been discovered that depict the maize god. Some statuettes have carved foliage growing out of their heads to represent the world tree. Crosses are also present on these figures that represent the cardinal directions and display the importance of the world tree and maize according to the axis mundi, or the world center. Copan and other Honduran sites display this directionality through dedicatory jade placement in houses and burial caches. The tomb of the great ruler Pakal at Palenque was richly laden with jade. The tomb itself had jade set out in directional and central placement. Jade was also placed upon Pakal himself. Beads were placed on the hands and feet with another placed upon his midsection. Pakal's

sarcophagus depicts him as the maize god at the base of the world tree (Taube 2005:25). This imagery and the presence and pattern of jade placement demonstrate the importance of jade in the Maya belief system concerning rebirth and its link to the cosmos and the afterlife.

Karl Taube states that, "…jade was esteemed for its beauty and preciousness and as a rarefied embodiment of life essence, not only as maize and life-giving water, but also as a physical manifestation of the breath spirit" (Taube 2005:47). Jade had extreme ritual importance because it was seen as a physical manifestation of spirituality and the afterlife. Jade was placed upon the mouths or in the mouths of recently deceased lords and elites because it was believed that jade would carry the soul to the afterlife. Intricate jade funerary masks served the same purpose. Jade was thought to be like the wind. Wind was the carrier of rain, and jade was the carrier of the life essence. The wind god is represented with a headband on which a jade piece is placed. The wind god is also represented with images of sound or music. Jade was possibly a ceremonial sound-producing material when cut, polished, placed upon belts, and suspended (Taube 2005:32).

Jade earspools, or earflares, worn by the elite served to represent moisture or rain. It is thought these were ways to represent the rains necessary for successful crop growth. The elites that wore jade ear spools were seen as constantly communing with the ancestral spirits as well. Jade earspools were likely viewed as cave-like portals as well. Natural caves in the Mesoamerican landscape were viewed as portals to the underworld and the home of deities and ancestors. The hole of the earspool represented a cave entrance through which the living and dead were linked (Taube 2005:46-47). Using jade as the material for the earspool greatly increased its religious meaning since jade is linked to the life essence.

Some jade pieces were buried with the deceased, as mouth beads and masks were. Personal ornamental pieces were handed down that linked the living with their sometimes long-dead ancestors (Taube 2005: 32-43).

The Olmec and Aztec seemed to have similar beliefs to the Maya concerning jade. The Olmec followed a cosmological model based on the four cardinal directions and a world center. The importance of such a belief was carved into greenstone stelae, celts (hachas), and onto jade jewelry. The Maya also followed the cardinal directions model of the universe and have been known to represent these directions on their earspools. The center of the spool represented the world center with the four directions represented every 90 degrees. Many Olmec beliefs diffused throughout Mesoamerica and became important ritual and cultural beliefs of the Maya and Aztec (Taube 2005:23, 33, 43-47).

It is evident that jade had a multitude of meanings to the Maya and other cultures of Mesoamerica. The earlier Olmecs carved representations of directionality and the world center into their jade pieces. These beliefs remained into the later periods of the Maya culture. They incorporated even more cosmological beliefs into the material. It represented maize, a life bringing resource. Jade was also linked with the life essence, and it became a noteworthy material to include in burials of elite people. The hardness and durability of this stone made it possible to pass down through generations. This added to its religious significance because what once belonged to an ancestor now belonged to someone currently living, a prodigious honor for the relative in possession of such a piece.

Jadeite and greenstone were both important to the Maya. Different colors of jadeite and greenstone were used to create different types of artifacts by Maya craftspeople. At Cancuen, Andrieu *et al*. (2014) found that craftspeople applied different criteria to the

various colors and forms of jadeite and greenstone. Variations of light, "brilliant", and dark jade and greenstone existed. The "brilliant" color variation of jade was one valued by and could only be worn by the elite. Pieces of this type of jade were found within the palace in the immediate vicinity of the palace at Cancuen. Light-colored earflares of jade were also found in elite contexts but smaller ones were found in trash pits of simple structures (Andrieu *et al*. 2014:153). Dark jadeite was designated for beads. These are found in non-elite contexts and perhaps not considered to actually have been jade by the Maya people. Color and physical properties defined desirability and access to the variations of jade. The difference in the distribution of jade colors shows that the Maya valued jade and greenstone differentially and what was considered more desirable was crafted for elites. The jade craftspeople of Cancuen were crafters of preforms, not necessarily finished products. They would have traded preforms out to consumers who would then create whatever they wanted out of the material. The Cancuen crafters were also not elites, according to their grave goods and the architecture of the workshops. No jade artifacts have been found in burials associated with the workshops and the workshops themselves were located in simple structures. These crafters would not have been allowed to keep any elite jade objects, but they were in charge of the production of all jade at Cancuen. Finished jade artifacts were found at Cancuen workshops but these are believed to have originated outside of Cancuen (Andrieu *et al*. 2014:160-161). The creation of jade preforms would also mean there was a lack of sacred value to these unfinished pieces. The final form and context of a jade piece was left up to the consumer according to their own traditions (Andrieu *et al*. 2014:161).

Jadeite's source was unknown to archaeologists for some time due to the unique tectonic characteristics of Southern Mexico and Central America. Fortunately, this unique

tectonic characteristic, and erosion caused by Hurricane Mitch, led to the rediscovery of the source of jade that was used by the Maya and the earlier Olmec (Seitz *et al.* 2001:687). William Foshag used geological principles to analyze Maya jade pieces and determine their origin. He recognized outcrops of serpentinite as being associated with certain metamorphic rocks, jadeite being among them (Gendron *et al.* 2002:838). A short discussion of metamorphic rock types is necessary in order to understand what they are and why they were important in discovering the source of jadeite.

Metamorphic rock formations develop under extreme pressure and temperature from a protolith, or origin rock. Extreme pressure and temperature change the shape of the molecular matrix of the protolith resulting in what is considered a new geological mineral. The new metamorphic rock retains the same chemistry as its protolith except its atoms and molecules change position to create a different looking rock or mineral. Some minerals, like serpentinite, are geologically associated with other metamorphic minerals because of the environment in which they formed. Metamorphosis exists as a spectrum in a rock formation due to differences in temperature and pressure along the length of a tectonic plate or rock formation (Kornprobst 2002:3). Jade is a metamorphic mineral and its existence was predicted and tracked by Foshag.

Minerals can have worldwide presence, but it is almost guaranteed that the chemistry will not be exactly the same from location to location. For example, diamonds from the same geographic location can be different colors. This is because the chemistry is slightly different among them. A boron or nitrogen atom could be included in the carbon matrix that forms the crystal, and that one boron or nitrogen atom every few million carbon atoms is enough to show a visible color difference. Jade is similar in that chemistry affects

the appearance of the mineral. Chinese jade is nephrite-jade from one mineral group (Amphibole), and Maya jade is jadeite-jade from a different mineral group (Pyroxene) (Gendron *et al.* 2002:837,842).

With his knowledge of geological metamorphosis and the geology of Mesoamerica, Foshag was able to track the Maya jade source to Guatemala in the Motagua River Valley. Figure 3 shows the proximity of the Motagua Valley jade source (in the black rectangle) to the site of Copan. Following this discovery, published in 1955, excavations on the north side of the Motagua River Valley were carried out. Tons of jade blocks and pebbles have been excavated from this site in modern times. The south side of the Motagua Valley could also have been an historical source of jade, but further study and excavation is necessary for verified results (Gendron *et al.* 2002:847).

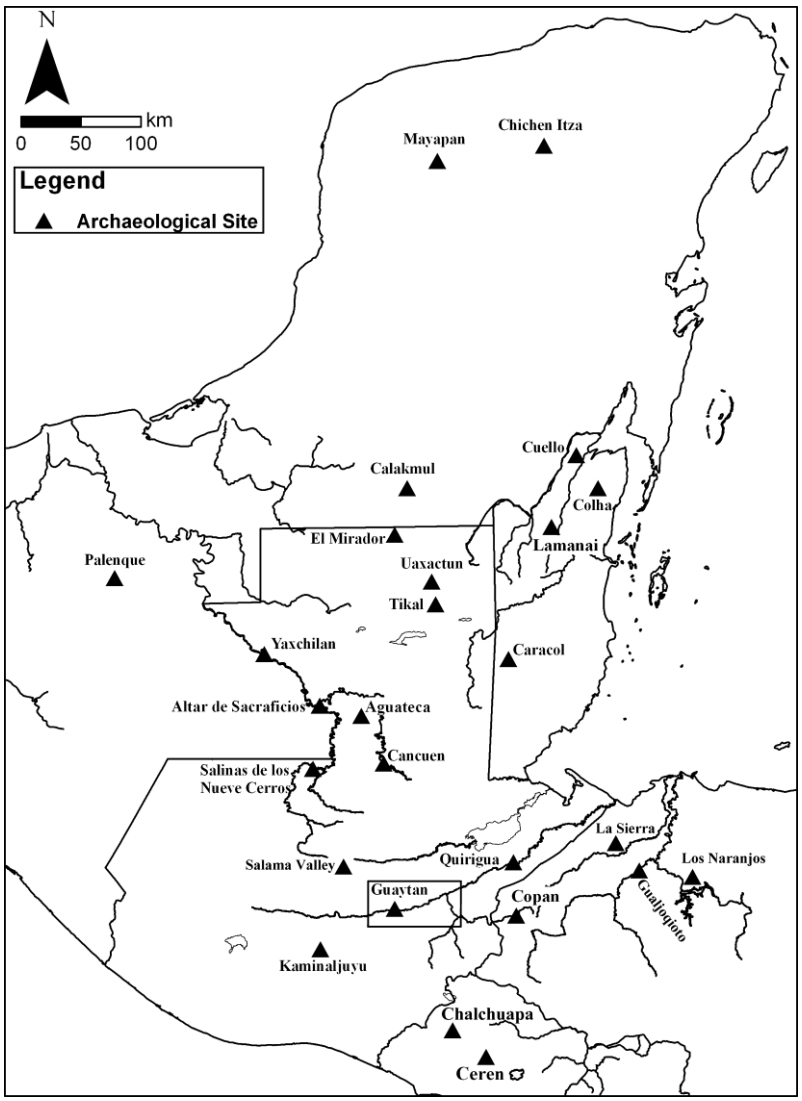

Figure 3: Proximity of Motagua Valley Jade source to Copan (Adapted from Rochette 2009:206)

II.3 Obsidian

Obsidian was used by the Maya to make tools of all sorts. The Maya created weapon points, household tools, and blades out of obsidian. Obsidian tools were used for everyday tasks. They were formed and shaped with percussion flaking. Obsidian's glass structure and hardness made blades very sharp and hard, but brittle. They were also used in ritual bloodletting (Sharer and Traxler 2006:37). Obsidian was sourced from several

locations in the highlands, but most of the obsidian fragments and tools found at Copan from the Classic and Terminal Classic periods were sourced from Ixtepeque in Guatemala. Ixtepequian obsidian artifacts have been found at many Maya sites hundreds of kilometers away from their source. Obsidian from other sources was imported into Copan during the Classic and Terminal Classic periods as well (Golitko *et al.*, 2012:511-514). It is obvious the Maya depended on obsidian for a multitude of reasons, and sites that held economic and social power were able to import the material, trade, and distribute it. Obsidian's role in bloodletting demonstrates its role in ritual practice among the Maya. However, obsidian had ritual uses beyond bodily sacrifice.

Widmer (2009) believes obsidian had a ritual role in the creation of ritual goods. In the elite workshops (see Figure 1) of Patio H in Structures 110A, 110B, and 110C, mostly Structure 110B, obsidian blades and blade sections have been found. These findings and their context will be discussed in more detail in Chapter Four, Section Two. These are all associated with elite crafting activity, both secular and sacred. The stone and shell modified for ritual purposes was modified with obsidian tools that were not as efficient at working these materials as chert blades. Chert was less brittle and lasted longer, but it was a resource with no religious significance to the Maya. Obsidian was brittle but very sharp. Its poor ability to carve stone and shell is likely why it was used when crafting ritual goods. Obsidian itself was ritually important, and when used in a religious context the finished piece was ritually important as well. Time and effort spent carving a beautiful shell object was worth it as the object itself became ritually charged through the process of crafting and through the materials used in crafting. Research has shown that shell takes four times longer to manufacture with obsidian tools, as opposed to chert tools (Widmer 2009:199).

Melgar Tísoc *et al.* found that secular artifacts of exotic materials were created with chert tools at Monte Albán. Shell and stone crafts that were considered sacred were fabricated with obsidian blades (Melgar Tísoc *et al.* 2009:14-20). High status craft specialists could afford to spend extra time producing and manufacturing ritual goods for the elite class as they were removed from food production. Obsidian's cultural value is apparent in a mortuary context as well because it has been found included in burials as an offering (Widmer 2009:174, 190, 196).

Maya religious figures likely believed that obsidian's source was the underworld (Fox *et al.* 1996:485). Their belief gave obsidian its ritual significance and inspired elite craft specialists to use it as the tool for ritual lapidary and shell products. The violent and awesome display produced by volcanic activity in the Maya highlands likely inspired the idea of obsidian's otherworldly origins. While the Maya attributed obsidian's origin to the gods, it is a natural process that creates obsidian. It is formed when magma solidifies at the earth's surface. It is a volcanic glass that forms from the quick cooling of lava where no minerals can crystallize and create an ordered mineral matrix (Chesterman and Lowe 2008:690-691). This characteristic allows obsidian to be manipulated and formed into tools requiring a sharp edge or point (Demarest 2010:156-157).

II.4 Marine Shell

Marine shells had a place in Maya ritual symbolism in association with jade. They were both associated with agriculture, fertility, and regeneration (Blackmore 2011:172). *Spondylus*, or spiny oysters, shells were highly prized by the elite for their ritual meaning and as prestige goods. Red *Spondylus* lives at a depth of 90 feet or greater in the Pacific

Ocean and was prized even over other *Spondylus* species from the Atlantic Ocean (Blackmore 2011:173). Its rarity made it only acquirable by the most influential and powerful groups. Conch, Olivella, and Marginella are several other species evident in Classic period Maya burials (Blackmore 2011:170). All of these shells have cosmological meanings and are linked with ritual practices and burials. As with jade, the possession of shell ornaments was associated with power and status (Blackmore 2011:173-174). Marine shell was sometimes left unmodified when included in a burial (Widmer 2009:188-190). Shells were also carved and used for personal ornamentation of elites (Widmer 2009:190-191; Inomata 2001:324-330).

II.5 Secular Crafts

Feathers, woven goods, hide, and bone were all used in secular circumstances and crafted in the same locations as jade and shell at Aguateca and Copan (Inomata 2001:325-326; Widmer 2009:176). These were used to create elite regalia, possibly as worn by the *Ahau* (Lord). Cotton and other fibers were woven by women for clothing and decorative purposes (Chase *et al.* 2008:127-131). Feathers of the quetzal were adhered to headdresses and clothing for elite regalia (Nations 2006:254). The quetzal was not the only bird utilized for its feathers. The scarlet macaw, roseate spoonbill, green parakeet, lovely cotinga, oropendula, heron, and eagle were all utilized for their feathers in a multitude of contexts. The Mexica and Maya shared some contexts of feather use. Besides elite regalia, warriors' shields were adorned with colorful feathers (Berdan 2006:3-4). Although featherwork is considered to be a secular craft in this study, feathers were sometimes used in ritual contexts in ceremonies or as offerings. The colorful feathers of these birds are considered to have been luxuries for rulers and elites (Berdan 2006:9-10). Jade and marine shell

carving took place in Structures 110B and 110C of Patio H in both ritual and secular circumstances. Weaving, feather working, and hide working were carried out, likely by women, in Structure 110A (Widmer 2009:197). Crafting was the established activity in these structures at Copan as a result of embedded crafting specialization within elite families. Craft specialization was a result of the elite class being removed from food production and labor due to their high lineage status (Widmer 2009:199).

II.6 Ancestor Veneration

Burial patterns among the Maya were based on ancestor veneration. The Maya buried their dead relatives in locations close to family. This included near and within houses and house platforms. Most people were buried and received few, if any, grave goods. Leaders and chiefs were given extravagant burials with lavish grave goods that reflected their status in life and their position in the afterlife. People within elite lineages were generally buried with lavish grave goods as well, but not as extravagant as those of a leader or ruler. This is the general pattern of Maya burials but variation does exist across time, between age and the sexes, and throughout the highland and lowland Maya area. In studying mortuary practices we can gain an understanding of social organization according to how individuals and groups were treated in the context of death and the notion of the Maya afterlife (McAnany 1999:129).

Ancestor veneration was a main tenet of ancient Maya religious belief and a summary of this type of belief system will be advantageous when studying Maya burials. Understanding the belief system will lead to an understanding of the function of ritual.

Ancestor veneration was carried out as a way to commune with the cosmos and as a way to insure kin continuity (Gillespie 2002:67). When a relative died a family or kin group would renovate or alter their house. They would incorporate their newly deceased relative into the house structure (Gillespie 2002:70). Generations of the dead were incorporated into the same structure or kin-based area over time. There was a ritual significance to gathering all of these ancestors and more recently deceased family members together. It is thought that this was a way to be physically near the ancestors being commemorated so their physical presence will warrant certain religious and material rights. The dead were the ritual link to the cosmos or underworld. Ancestor curation was also a way to make sure ancestors were kept on the land that they lived on during their lives. Contemporary and future generations were linked to the land of their ancestors through the ancestors themselves. This might also have been a way to insure property rights on family land (Gillespie 2002:70-71).

Ancestral links and veneration were not just important in a religious sense; they also functioned as a means of supporting rulership (Sharer and Traxler, 2006:274). A spiritual connection to a royal ancestor would legitimate a king's rule just as the physical remains of ancestors in platforms or homes would legitimate a family's property rights. Economic and religious power was justified when a ruler could link themselves back to a dynastic founder, sometimes deified, or just a notable ancestor (Sharer and Traxler 2006:296-297. 734).

Soul curation was another aspect of ancestor veneration. Residential burial of ancestors assured an eventual soul "reincarnation" within a child of the family. This linked the living through the dead to the cosmos and it reinforced kin-based rights (Gillespie 2002:71). Even juveniles, children, and infants were awarded the rite to be buried near

ancestors because they were believed to be reincarnated ancestors themselves (Gillespie 2002:72). Primary interments were sometimes exhumed as part of ancestor veneration rituals only to be reburied or retained above ground as a completion of mortuary ritual (McAnany *et al.* 1999:131).

Evidence of exhumation of a primary burial with skeletal modification is called a secondary burial or interment. The exhumation of a primary interment occurred after a person had died. The skeleton would sometimes be defleshed, if flesh was still present, and some bones would be selectively kept out of the secondary burial and often reburied as a bundle. Sometimes exhumation occurred only to have the entire skeleton reinterred intact after a ritual or ceremony was performed. If bones were removed from a primary burial then they were put into a shrine or "bundle" (McAnany *et al.* 1999:131).

Secondary burials were carried out in ritual circumstances, sometimes long after death. A two-stage burial system was common in some locales. It is likely the stages were a way to fully complete the passage from life to death. Primary interments allowed bodies to decompose and reduce to a skeletal stage. Secondary internments were the final, permanent interment locations meant to allow a soul to move on and power to transfer to living successors. Recurring rituals and significant calendrical dates sometimes led to re-exhumation of an ancestor. Long bones and facial bones were sometimes left out of the secondary burial to be included in a bundle. These were placed in an altar or ritual context above ground as a shrine to the ancestor (McAnany *et al.* 1999:131). Cremation and disarticulation can be linked with secondary burials. The techniques and rituals behind cremation and disarticulation vary over time and between sites (Weiss Krejci 2006:76-78).

Secondary burial evidence is best represented in royal entombments. The purpose of reentering a royal tomb was to carry out additional funerary rites to transform Maya kings into supernatural beings and deities. Funerary rituals continued at intervals after the interment of an individual. For example, cinnabar was scattered over the remains of the deceased leader, which was thought to have properties that accelerated apotheosis (Sharer and Traxler 2006:733-734).

Sacrifice is also present in the burial record. Sacrificial victims were usually decapitated or had their heart extracted. They were also included in noble burials (Tiesler and Cucina 2006:505, 510). Human sacrifice was important in Maya culture but the focus on ancestor veneration is more necessary for this study as no sacrifice burials are apparent in the sample. Primary interments are the most prominent at 9N-8H. However, secondary burials of individuals are evident in some tombs of primary interments. A few bones and teeth can indicate a secondary burial of a different individual as they do not belong to the most obvious primary burial within a tomb or grave. Disturbed primary burials are also present at 9N-8H. These people were interred for some amount of time before their tombs were reentered and the deceased's remains were moved but not removed from their first burial location.

Chapter Three-Social Organization and Craft Specialization

III.1 Sociopolitical Complexity

The multilinear cultural evolution model states that cultures evolve from small-scale organization, such as hunter-gatherers, into more complex organizational schemes, such as chiefdoms and states (Steward 1972:18-22; Sharer and Traxler 2006:73). The identification of complexity in the absence of ethnographic data depends on certain archaeological correlates. These correlates, such as tool type or architecture, demonstrate an increase in complexity and an increase in population that necessitates large-scale organization. Less complex cultures and societies tend to have more equality within the population whereas the most complex levels of sociocultural integration have more inequality between people (Sharer and Traxler 2006:76). The Maya were a highly complex culture. The people that evolved to become the Maya grew over time from early hunter-gatherer groups into chiefdoms and states. There is debate as to whether the Maya reached statehood or whether they remained a high-level chiefdom. However, the answer is not simple as different levels of complexity existed at the same time across sites (Sanders 1992:282).

The basis for sociocultural complexity is inequality. When an individual, group, or lineage is more capable of producing food or a resource they are able to control people with less or no control over such things. They can organize labor better because they control something people need or want, and by giving something in return for something else, a relationship of inequality is created. Chiefdoms emphasize the control of people. The closer a person is related to the chief or the closer an entire lineage is related to the chief, the more

power that person or lineage has. Chiefdoms control through ascribed rather than achieved status. Power and resources are passed down through parental or kin lines in order to maintain power of one lineage through generations. An elite class can develop over time through this type of organization and leads to stratified societies (Sharer and Traxler 2006:76). This class will monopolize power, both religious and political. Chiefdoms incorporate nearby communities under the authority of their chief. Incorporation can occur through marriage or violent means. Chiefly power is evident archaeologically through three-tiered site hierarchy. A central site where the chief lives will control lower tier sites that still have some power through chiefly interaction. The lowest tier site will be under full control of the other sites. Every tier produces a good that is then taken and used, stored, or redistributed (Figure 4). The downward pointing arrows show chiefly influence moving from the central site into secondary centers and finally from secondary sites into hamlets. Upward and downward pointing arrows also indicate redistribution. Surplus goods will be distributed to places that need them from the central or secondary centers.

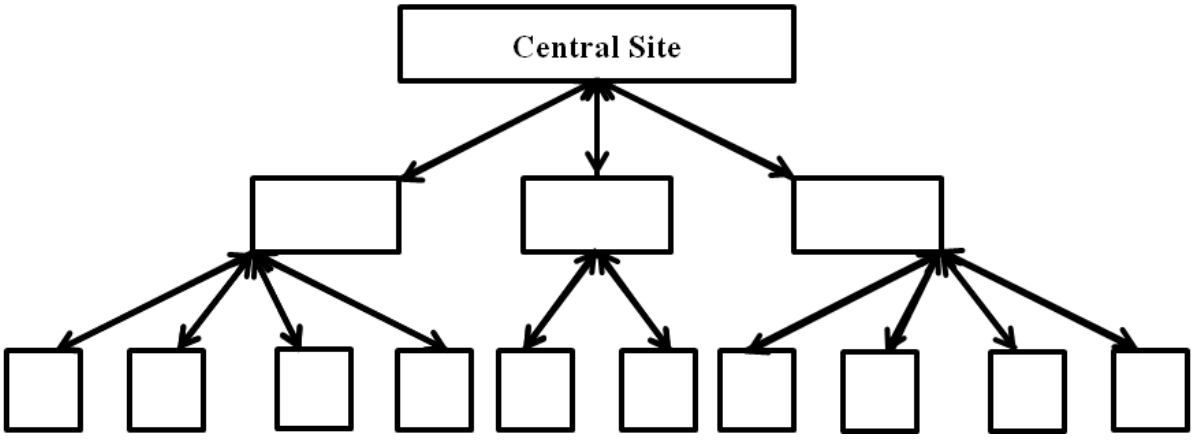

Figure 4: Three-tiered Hierarchy of a Chiefdom

Chiefs do not hold true political power but do hold power as a warrior, religious figure, and wealthy individual. A chief will justify his or her rule through relationships with

ancestors such as lineage founders and will preserve control through supernatural threats or accolades. Chiefs receive tribute as a religious power from surplus sources. A chief will bestow his good will upon his subjects through feasts and rituals (Sharer and Traxler 2006:76-77).

Chiefdoms and states are the highest levels of sociocultural complexity and at certain times and places, the Maya fulfilled the criteria to be one or the other. States are the most complex, in terms of social, political, and economic organization, and most the populous level of organization and therefore cannot be considered equal to chiefdoms in this regard. However, both chiefdoms and states maintain control of larger populations than Big Man and hunter-gatherer societies. Understanding the differences and similarities between chiefdoms and states is essential in understanding the Maya. Archaeological and anthropological distinctions of chiefdoms and states have been established to recognize when these levels of organization were achieved. No comparison is made between cultures said to be at the same level of organization, because each is a product of its environment and circumstances. Chiefdoms and states both have monumental architecture and prestige goods that are evident in the archaeological record. These cultural features demonstrate disparities between groups within the society. One group, such as a lineage, has the power to control labor to construct monumental architecture for the purposes of religious worship or public gathering. Archaeologically, chiefdoms can be distinguished by looking at site proximity and size. A large site with unique architecture that exists among several smaller, less unique sites in close proximity may show that the large site had power over the surrounding, smaller communities. Prestige goods made a statement about the wealth or power of a group or individual (Sharer and Traxler 2006:75-77). By possessing an object

that someone else cannot have displays supremacy and power. Those that possess a prestige object are saying that they have the resources and control to procure this arbitrarily established item that denotes a difference between people. For the Maya prestige goods included anything made of jade, shell artifacts, and feather costumery.

Chiefdoms and states share the previous distinctions, but states go beyond chiefdoms in maintaining control of people and territory. States have palaces and government structures for the ruler and elites to congregate and discuss any issue at hand. Buildings like this are still used today in order to create a separation between rulers and subjects and to create an area for organized governmental and/or religious functions (Sharer and Traxler 2006:76). States also establish boundaries with fortifications not only around a single site, but between themselves and other territory. A wall was constructed 4.5km north of the Great Plaza at Tikal during the Classic period. This wall was built several kilometers away from a central population in order to, "…screen an extensive sustaining hinterland", not necessarily to define its territorial boundaries (Webster 1976:363-364). Most sites that had fortifications built around them were built for protection from attack (Willey 1981:398-399; Sharer and Traxler 2006:73, 91, 386, 409). Another indicator of any level of sociopolitical organization is population control. Whereas chiefdoms aim to control people, states seek to control territory (Sharer and Traxler 2006:76). The people within controlled territory become subjects of the state. More territory equals more people. States have a four-tiered hierarchy of sites whereas chiefdoms only have a three-tiered hierarchy at most (Sharer and Traxler 2006:75).

Maya states were ruled by a central figure, called the *Ahau*. He had authority in war, politics, and religion. He was aided by an extensive network of administrators,

religious officials, and warriors. Chiefs depended on the redistribution of goods to maintain the people under his or her influence. States depend on centralized control with full political power and a ruler to maintain territory and defend the people within the territory. State societies are stratified by wealth and the status that springs from this wealth. Outside of the elite classes, status is achieved rather than ascribed. The elite were powerful and wealthy enough to have ascribed status roles within lineages (Sharer and Traxler 2006:76).

There are differing opinions as to the level of social organization that the Maya reached in the Classic and Terminal Classic periods. There is no doubt that the Maya did achieve at least chiefdom status at major sites throughout the Maya area. According to Ball (1977), chiefdoms were established in the Northern Lowlands during the Preclassic period, but by the Classic period these chiefdoms were negatively affected by some force, be it environmental or human conflict (Ball 1977:124-132). There is evidence for social and political ranking among these sites based on differential site sizes and monumental architecture. Differing access to prestige goods based on the distribution of grave goods and midden deposits demonstrates the presence of ranking as well (Ball 1977:127). Chiefdoms developed when more powerful sites incorporated small, weaker sites through warfare and alliances, often through marriage. Access to food, or lack thereof, created conflict and those sites with food and power were able to control other sites without easy access to these resources (Ball 1977:124-126).

Rands (1977) hypothesizes that before the reign of Pakal, the site of Palenque was the central site for a high-level chiefdom. During and after his reign in the Late Classic, Palenque reached the level of a small state. This is based on Sanders and Prices' (1968) interpretation of state formation. Architecture grew more monumental, and hieroglyphic

texts upon these structures lengthened, compared with those upon earlier structures. The central area of construction moved to the east in Palenque where temple-pyramids were constructed. Vault architecture became prominent and moved away from very thick walls and narrow corridors. Pakal's reign and accomplishments as a ruler support the theory that elite activity bolstered economic progress and pushed the need for more population to construct palaces and administrative buildings (Rands 1977:176-179).

McKillop (2004) believes the beginning of the Classic period and the evolution of states began when stelae began to be erected. Since these monuments refer to the rulers that ordered their construction and discuss their achievements, which must mean that civilization had evolved in complexity (McKillop 2004:90-91). By the Late Classic, the Maya in the lowlands were organized into 80 city-states according to (McKillop 2004:175). By this time, the major Maya centers had reached statehood and were organized into a four-tiered hierarchy of settlements and social organization consisted of differing social strata of people. The highest ranked and most complex site was the capital with stelae recording the feats and dates important to the *Ahau*. Minor ceremonial centers were the second highest level in the hierarchy. They had monumental architecture but no stelae. Minor centers were smaller and housed local elites and small buildings for local governance. The lowest level consisted of small hamlets and farmsteads with no elite presence and only contained religious shrines for local lineages (McKillop 2004:181) (Figure 5). Figure 5 represents these relationships and is similar to Figure 4 representing chiefdoms. However, in Figure 5 the arrows represent administrative power moving from the main site all the way into the smallest village. The upward pointing arrows represent

labor or taxes moving from the smallest site up to a point that serves the main administrative, centralized site.

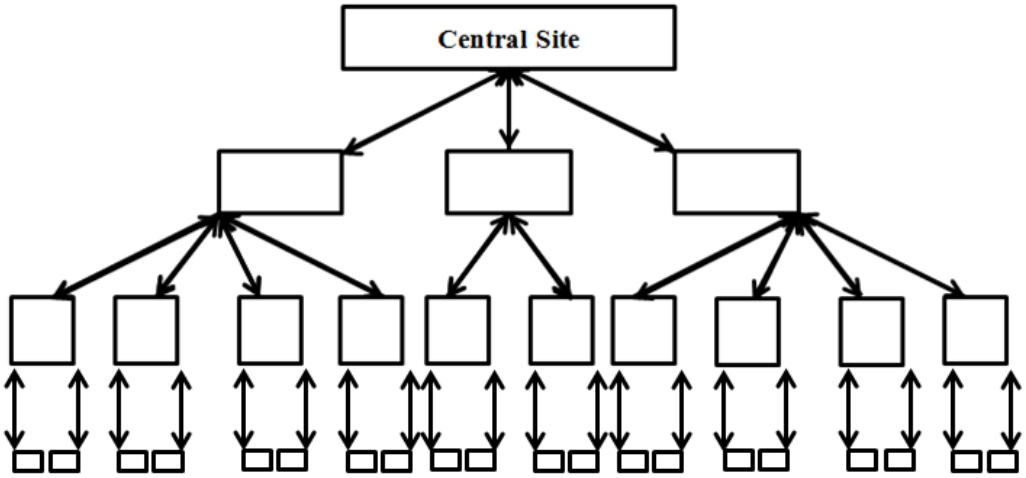

Figure 5: Four-tiered Hierarchy of a State

McKillop also breaches the subject of Teotihuacan influence and if this influence pushed Maya sites toward statehood. Teotihuacano influence is evident throughout the Maya area in pottery, weapon points, and architecture. Kaminaljuyu, Tikal, and Copan all show that Teotihuacan had some type of influence at these sites, be it a violent takeover, trade influence, or the duplication of style due to a marriage alliance (McKillop 2004:182-184). Estrada-Belli *et al.* (2009) believe that any apparent Teotihuacan influence in the lowlands during the Classic period was due to Tikal's political expansion. Teotihuacan did have influence at Tikal and its influence was spread through the lowlands by Tikal. Copan's royal dynasty came about due to the installation of Yax K'uk' Mo' as leader during the Early Classic (Estrada-Belli *et al.*2009:255). The influence of Teotihuacan at Copan was indirect and did not advance sociopolitical complexity. It was Tikal's political influence that pushed Copan's development.

Fox, Cook, Chase, and Chase (1996) are beyond debating whether Maya civilization consisted of chiefdoms or states during the Classic period. Their debate consists of whether sites were segmentary or centralized states. Chase and Chase believe lowland Maya polities were centralized. Polities housed dense populations, with institutional bureaucracy and social stratification, as well as differentiated economic activity between classes. The Chases depend upon strong archaeological correlates in their position supporting a centralized state organization (Fox *et al*. 1996:797-798). Fox and Cook are decentralists that use ethnohistory to show the presence of segmentary states. Lineages and ranked communities guided the ruler's leadership and maintained ties to other communities. Bureaucracy and formal laws are rarely mentioned in hieroglyphic texts and, therefore, were not as important as lineage ties in Maya states (Fox *et al*. 1996:798-800). Fox uses the model of segmentary states because it is a model applicable to the Quiche Maya of the highlands. The Quiche have a segmentary lineage system, and Fox considered them to be complex enough to be considered a state (Chase and Chase 1992:307-308).

Marcus (1993) believes that military conquest was prevalent enough in the lowlands to sustain the needs of regional states, another possible form of statehood. Warfare was needed to defend territory that provided sustenance for a population and insured there was enough agricultural land to provide for population growth. Greater access to resources meant elites were able to express their power through monumental architecture and prestige goods. The control of territory, expanded warfare activities, and marriage and trading alliances define a state according Marcus' organization criteria. Population reached such a level that regional states formed to defend and use their economic interests in the most

efficient way possible. Copan, Tikal, Calakmul, and Palenque can be classified as regional states (Marcus 1993:150-161, 180-183).

Glyphic evidence for Maya sociopolitical organization exists in the lowlands that links smaller sites to larger sites. For some archaeologists these glyphs prove the existence of states. These figures are called "emblem glyphs." These glyphs refer to a place and a person and are present at even low level sites on monuments. The places are typically central polity sites, or locations under the control of polities, and the names are those of divine lords. Since territory is claimed by one polity through these glyphs, they are considered to define the range of a state, not a chiefdom. The distance between centers referenced on emblem glyphs would mean that city-states would have been about 2,000 square kilometers in range (Demarest 2010:209; Rice 2004:47-49).

There is evidence that state formation did occur at Tikal during the Classic period. Tikal formed as a primary state as opposed to a secondary state. Primary states are states, "…that form from chiefly societies, in the absence of a preexisting state that could serve as a model" (Marcus 2003:86). Archaeologists consider Tikal to have been a state due to the presence of stelae, detailed sequences of public architecture, and subordinate towns under Tikal's control. Tikal cycled through chiefdom/state phases as leaders came and went. This wavering aspect is typical of emerging states. Three tiers of administration exist below the capital center as evidenced from stone monuments from nearby sites. External threats from other sites bolstered Tikal's need to defend their territory (Marcus 2003:87-92). Webster (1977) believes warfare was a major cause for state formation in the Maya Lowlands. Warfare with neighboring sites allowed the stronger site to expand and create room for population growth and resource use. The elite could maintain wealth and authority with a

standing army, and social stratification arose from elite interest in resources and labor (Webster 1977:366-371). Marcus suggests that Teotihuacano military conquest of the lowlands was not the cause of state formation, but friendly alliances for the trade of resources and spouses (Marcus 2003:92 Estrada-Belli *et al.* 2009:255). Calakmul shared the characteristics of statehood with Tikal and was probably an even larger polity (Marcus 2003:94). It is acknowledged that these two polities should be considered states due to their population size and highly complex level of social and political organization.

Marcus also considers Copan to be a secondary state that arose 350 years after Tikal. It arose as a result of a usurper from another site, not a chiefly lineage (although Copan is believed to have been a chiefdom beforehand) (Bell *et al.* 2004:367). The usurper was Yax K'uk' Mo', a powerful warrior from Tikal. Strontium isotope evidence suggests that he was originally from Caracol before moving to Tikal and becoming a member of the royal court (Price *et al.* 2010:28-31). He likely married into the royal lineage at Copan and became its ruler. He commissioned monumental architecture and his successors linked themselves to Yax K'uk' Mo'. Copan is considered a secondary state because of Yax K'uk' Mo's tactics as a military leader and because he brought the power of a primary state, Tikal, upon Copan and raised its influence to create a powerful polity that commissioned stelae, monumental structures, and controlled sites like Quirigua, Pusilha, and Uxbenka (Marcus 2003: 94-96).

Fash (1991) considers Copan to have been a chiefdom up until the rule of Smoke Imix, the twelfth ruler of Copan. During his reign, Copan's population rose to between 8,000 and 12,000. Fash considers a society to be a state when population has reached 10,000 people (Fash 1991: 77). However, this is only one criterion that may not have

necessarily been fulfilled (Fash 1991:112). Other criteria required by Fash for statehood include a central place for the governing class to operate, a four-tiered settlement hierarchy, a monopoly on the use of force or a standing army, and institutionalized offices partially dependent or completely independent from kinship ties (Fash 1991:77). During Smoke Imix's rule, Copan was bounding toward a higher level of sociopolitical complexity and reached it after, if not before, the end of Smoke Imix's rule (Fash 1991:100-112). His successor, 18 Rabbit, increased monumental construction and interacted with the well-established polities of Tikal, Calakmul, and Palenque. The amount of land controlled by Copan, and the status-showing architecture commissioned by 18 Rabbit, situates Copan within the realm of statehood, rather than remaining a chiefdom throughout the Classic period (Fash 1991:112-114). In 746 CE political institutions were definitely separated from kinship lines. If this is to be considered a characteristic of statehood, it happened in 746 CE, if not previously (Fash 1991:135).

Webster (1992) does not believe Copan had reached the level of a state by Copan's collapse or thereafter. He believes that, due to the maintenance of kin relations and lineage ranking, Copan was a chiefdom. Webster maintains that social organization was based on kinship but under the leader Yax Pasah, stratification may have increased, a sign of increasing social complexity (Webster *et al.* 2000:193). Webster and Sanders believe that Copan was a society that was highly segmented along social lines. Kinship was the mechanism by which the Maya at Copan organized themselves. There was a central group of titled elites who ran the political side of the polity. Other elite lineages and non-elite lineages were present in Copan as well. Essentially, a two-class structure existed (Sanders 1992:282). Each lineage was internally ranked and controlled its own resources. The

highest ranking elites could be considered royalty and had kin relationships with other non-royal lineages at Copan. It seems likely that the lineage with the most prestige, the lineage of the ruler, was able to restrict access to important titles and roles within his and other elite lineages. This is the sort of lineage system suggested for the Quiche Maya by Fox. During population and economic growth in the Classic period, elites came to control more land and resources. This increased their power and likely the amount of stratification. Webster suggests that royal elites were able to confer titles upon non-royal elites based on lineage. These titles likely held no significant purpose in administration but were a way to show honor. There was no bureaucratic system in place, just the conference of titles based on rank and royal will. The reason for Copan's centralization of elite compounds is questionable if the site is to be considered a chiefdom. The concentration of population was based on desirable agricultural lands and the desirability of royal and non-royal elites to remain near the royal court to maintain some sort of influence. The king may have also wanted elites to remain nearby as to not have the potential for powerful elites breaking away from Copan. The king was likely rather politically weak if he wanted powerful lineages to remain close at hand for fear of rebellion or emigration from Copan. The use of kinship in social and political areas with an absence of non-kinship structures for upholding political, religious, and economic structures would mean Copan was a chiefdom throughout its existence (Webster 1992:153-156). Copan obviously expanded its influence and monumental construction during the reign of Smoke Imix, as stated before by Fash, but Copan retained its kinship organization, according to Webster (1992:155). Sanders does agree with Fash that Copan did reach statehood for about 100 years during the eighth century. This classification is due to strong social stratification evidenced by architecture

more characteristic of a state than of a chiefdom (Sanders 1992:282). Although architecture may indicate the existence of a state Copan lost its important trading relationship with Quirigua due to Quirigua's violent capture and sacrifice of Copan's leader, Waxaklajuun Ub'aah K'awiil, in the year 738. Even though Copan was a political and ceremonial center it lost some of that power when Quirigua broke away. Copan never fully recovered from economic downturn due to the loss of its leader and remained as a less complex lowland center (Sharer and Traxler 2006:482-491).

Despite the evidence supporting the presence of either chiefdoms or states across the Maya area, one thing is certain. Social organization consisted of an elite group or elite lineages that held wealth and power, especially at large sites like Tikal and Copan. They held economic, ideological, and political power above and beyond what non-elite Maya people had. They could organize labor, religious ceremonies, and warfare campaigns (Rice 2004:276). The highest ranking elite person was the ruler, or *Ahau*. For the most part *Ahau*s were hereditary successors of the previous ruler (Rice 2004:7). Warfare and revolt could alter this pattern, as occurred at Copan with Yax K'uk' Mo'. The *Ahau* and advisors could establish and control a military force to defend territorial interests from incursion by outsiders (Rice 2004:276). Maya rulers were also religious figures of a semi-divine nature (Rice 2004:285).

III.2 Social and Domestic Organization

Maya culture was organized in several different ways. For sites at the level of chiefdom organization, kinship determined the structure of society. These were ranked

societies. Many lineages existed, and those lineages with kin relations closest to the ruler were the most highly ranked. The further a lineage was from the *Ahau*, according to patrilineal descent, the lower it was ranked (Sanders 1992:282). Copan was organized this way during the Classic and Terminal Classic periods. There were typically few elites that were high ranking enough to be considered royal. These people had important roles based on their relation to the ruler. Non-royal elites also existed that held economic and political power; they were just not ranked high enough. Non-elites did not hold significant sway concerning political, religious, or economic power. These people made up the majority of the population and were used as laborers (Sharer and Traxler 2006:85-86). When food was available and trade in goods was available, commoners lived a decent life, albeit a life without extreme wealth and influence.

Elites lived at the center of sites in well-constructed buildings, while commoners lived on the periphery (Chase and Chase 1992:8-9). Monumental structures were created to be used by elites and for religious purposes. A tertiary class has been postulated to have existed in Maya society that had access to some prestige goods or that provided a service to the elite class. These people were likely merchants and artisans specializing in one field. People like masons, priests, and warriors were all likely part of this "middle class" (Chase and Chase 1992:11-12). These people were non-elite occupational specialists and provided their services for the elite. Elite occupational specialization also existed. These elite people created goods for their own elite lineages. Elite craft specialization is central to the research presented in this thesis.

III.3 Craft Specialization

Despite arguments about the level of sociopolitical organization among the Maya, it is certain that there were economic specialists whose job it was to participate in one activity as a profession. People with the lowest status primarily participated in several activities in daily life. Men, women, and children had their own tasks according to their age and sex. Some low-status people were likely economic specialists, like builders. Medium-status Maya were more likely to be specialists in one area. Elite economic specialists existed as well. These people only served elite-status people in select activities. They produced ritual and secular goods from elite-controlled resources. Polychrome pottery, jade, and shell objects were all crafted for the purpose of showing high prestige among this small group of people.

The existence of craft specialization is dependent on factors of economic organization. Craft production resulted in trade goods or goods used within the site they were created. Costin's (1991) definition of craft specialization is, "A differentiated, regularized, permanent, and perhaps institutionalized production system in which producers depend on them for acquisition of goods they do not produce themselves" (Costin 1991:3). During the Preclassic period, household utilitarian production involved cooperation among household members for the construction of house platforms and homes. Men constructed buildings, hunted, and did woodworking, while women produced textiles and processed food. People of all ages helped with pottery production and farming. These jobs, along with any religious obligations that needed to be fulfilled, filled the daily lives of commoners (Demarest 2010:165).

Production organization changed as sociopolitical complexity increased. Households began to produce surplus goods for trade because they now had the ability to designate and remove some individuals from non-specialized production without the worry of losing a working member of their family. Individuals were sometimes dedicated to producing one type of goods, and if their settlement was located by a resource, such as stone or clay, they could produce more effectively and gain wealth if they could control a natural resource. It is possible that these people could increase their wealth and influence or confer directly with elites through trade. As population grew, so did the need for dedicated craft production.

Specialized production allowed a site to produce a product from a resource that was in abundance locally and trade for something that was harder to produce locally, such as food or tools. For example, Komchen did not have direct access to rich agricultural land but produced salt and traded it for food to support a large population. Population growth and the need to trade for goods, like pottery and stone tools, bolstered the production of whatever craft or resource in which a household or community specialized. This pushed economic development toward a more complex organizational form (Demarest 2010:166-167).

Non-elites produced common domestic goods for themselves and other non-elite communities. Some of their production was dedicated to elite offerings as well. They gave food and labor as tribute to elite groups (McKillop 2004:181; Sharer and Traxler 2006:85-86). Elites had their own specialists as well. These are known archaeologically as "attached specialists" that served only the needs of the elite. They were artists, sculptors, carvers, and scribes. The attached specialists were elites themselves as evidenced by their residences

and placement within elite areas. Some were in the same lineage as the ruler. These elite crafters are called "embedded crafters." They are called this because crafting activity is carried out by one of the elites' own population for elite use (Aoyama 2009:3). These embedded crafters' work is defined in terms of kinship, not economics (Janusek 1999:126). Production of elite-controlled resources, like jade, was present only in elite compounds. These craft items served as prestige and ritual goods (Demarest 2010:168-169).

Craft specialization occurred in lineage household compounds. The crafting itself was done in a workshop that housed the crafter or crafters. They had their own structures, or their own rooms, separated from areas that served other purposes. Through midden deposits and architectural remains, archaeologists are able to determine where and when these workshops existed (Aoyama 2009:3). These workshops, while separate structures, were integrated into elite communities, as they provided the high-status objects elite lineages desired. Both men and women participated in craft specialization and maintained traditional Maya gender roles. The men carved stone, shell, and bone, while women were weavers, hide workers, and feather workers. However, it is possible that men and women shared artistic tasks concerning crafting (Aoyama 2007:18-24).

Evidence for craft specialization exists at several Maya sites across the region. Maya pottery has been found with the written names of the artist and commissioner of the piece upon them (Inomata 2001:324). At Copan, Aoyama found evidence of an attached specialist at the Acropolis. A carver's house has been found at a smaller Copan group (Inomata 2001:325). Evidence supporting the presence of craft specialization consists of architecture, artifacts, and refuse deposits. Elite craft production is evident at the site of Aguateca as well (Inomata 1997:343). Elite residences show remains of usable products

and the tools which were used for crafting. Jade and marine shell has also been found. Domestic activities took place in these residences as well. Scribal artifacts, like grinding tools and powder containers, were found that indicate that an important elite scribe lived and worked in this location (Inomata 2001:326-327). A woman also likely lived here as needles, spindle whorls, and unattached shell decorations have been found. Maya women were traditionally in charge or weaving and sewing. "The House of the Axes" housed a stone carver. The person that lived here likely carved stelae (Aoyama 2007:18). The implications of the workshops at Aguateca are significant. The debitage resulting from crafting was not as abundant as one would expect from a full-time crafting operation. It is possible that these people only crafted part-time and fulfilled other elite roles besides crafting (Aoyama 2007:24). Elite crafting was also an activity full of ideological and political importance. Crafters created ritual pieces for rulers that displayed religious and social prominence. The crafters and scribes were privy to knowledge only a select few understood and this created a form of cultural capital. These people were valuable to any person who procured their skills (Inomata 2001:332).

Costin (1991) makes a comment about the evolution of craft specialization. Essentially, a product will have one way of being produced efficiently, and every time a similar product is created, it will have a similar mode of production (Costin 1991:13). This insures efficient production so that more crafting can happen faster. Production volume can increase over time as well. This is not the way in which Classic Maya elite craft production functioned. There was no incentive to mass produce goods or produce them quickly. Elite artists likely sought aesthetic refinement or ideational creation. Inomata calls this scheme of crafting involution, rather than evolution. This scheme characterizes other aspects of

high-ranking Classic Maya culture. They created a writing system and calendars which did not have much bearing on the development of economic systems (Inomata 2001:334-335).

Costin's work in Peru shows the increase in craft specialization after the incursion of the Inka. Her study was concerned with the production of ceramics. The amount of producers decreased, but production increased after Inka conquest. When more consumers than producers exist, craft specialization is present (Costin 1991:24-25). The amount of debitage needs to be accounted for as well when considering the type of craft specialization. Independent craft specialists will try to produce as efficiently as possible while reducing costs, be they labor or economic. Refuse will be more abundant at these locations because more was being produced. Attached specialists may not need to be time-efficient as they are crafting for the desires of a smaller group of people where the quality a few finished products is more important than producing many lower-quality products. Less refuse material will be apparent (Costin 1991: 26-27). When looking at craft specialization, it is important to consider the type of archaeological remains. Four parameters also need to be considered when studying craft specialization: context, concentration, scale, and intensity (Costin 1991:43). Context will show what type of crafting took place in a location, such as for secular or ritual purposes or for elites or non-elites (Costin 1991:11-13). Concentration will show for whom craft specialization existed, be it independent or attached (Costin 1991:13-15). Scale can demonstrate the size of a crafting operation (Costin 1991:15-16). Intensity will show how much was produced and how quickly things could be produced (Costin 1991:16-18). These parameters will demonstrate how craft specialization worked in any culture with this type of organization.

At the Mississippian site of Moundville, craft specialization is evident through the greenstone industry. Gall and Steponaitis discovered the likely source of this greenstone and identified its mineral classification "…as very-fine-to medium-grained, massive to crudely foliated, actinolite-epidote-albite metabasites" (Gall and Steponaitis 2001:109). Greenstone was the object of two types of production. One type served non-elites and produced greenstone objects for utilitarian uses. The other type served elite production of non-utilitarian greenstone sociotechnic and ceremonial objects (Wilson 2001:120-122). There was no restriction to greenstone sources, and it was heavily used at Moundville. Utilitarian uses included clearing fields and carving wood (Wilson 2001:118-119,125). Only a small amount of non-utilitarian greenstone artifacts have been found. These were found in a different location (Mound E). These artifacts are associated with ritual weaponry and "politically-charged material symbols" (Wilson 2001:126). Elite authority was maintained through the possession of these objects (Wilson 2001:125-126). Greenstone was not a limited resource for the Moundville culture, and its significance lie in who possessed and used the resource. The role of elite craft specialists was to ritually charge a typically utilitarian material. Moundville sociopolitical organization was similar to that of Copan, but strict access to resources did not give Moundville elites power over greenstone as strict access to jade and marine shell did at Copan. Greenstone was abundant to everybody, but the act of using a special crafter and design raised greenstone pieces above utilitarian tools and up to ceremonial prestige objects (Knight 2011:220-223, 230-231).

Chapter Four-Copan

IV.1 History of Copan

The Maya site of Copan is located in the western highlands of Honduras (Figures 6 and 7). Although Copan is located in the highlands of Mesoamerica, it is considered a lowland site due to its architectural and art style (Webster *et al.* 2000:16). It is located along a tributary of the Motagua River, called the Copan River (Figure 7).

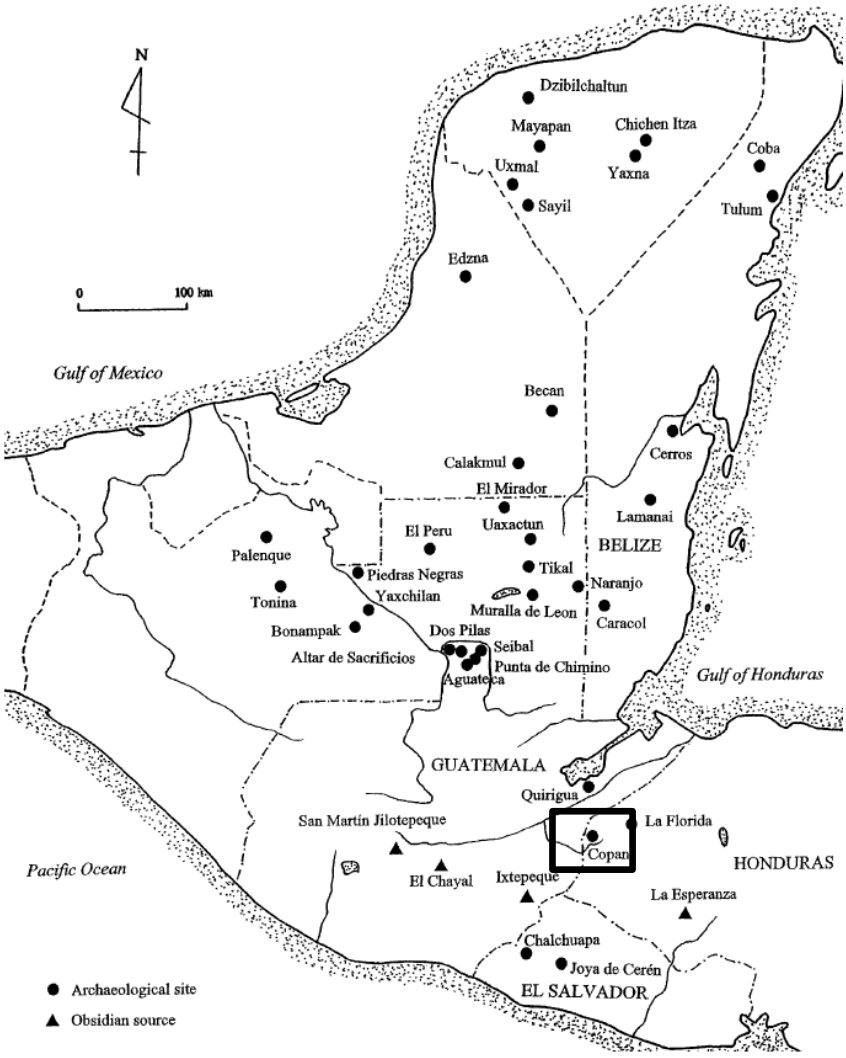

Figure 6: Location of Copan
(Adapted from Aoyama 2007:5)

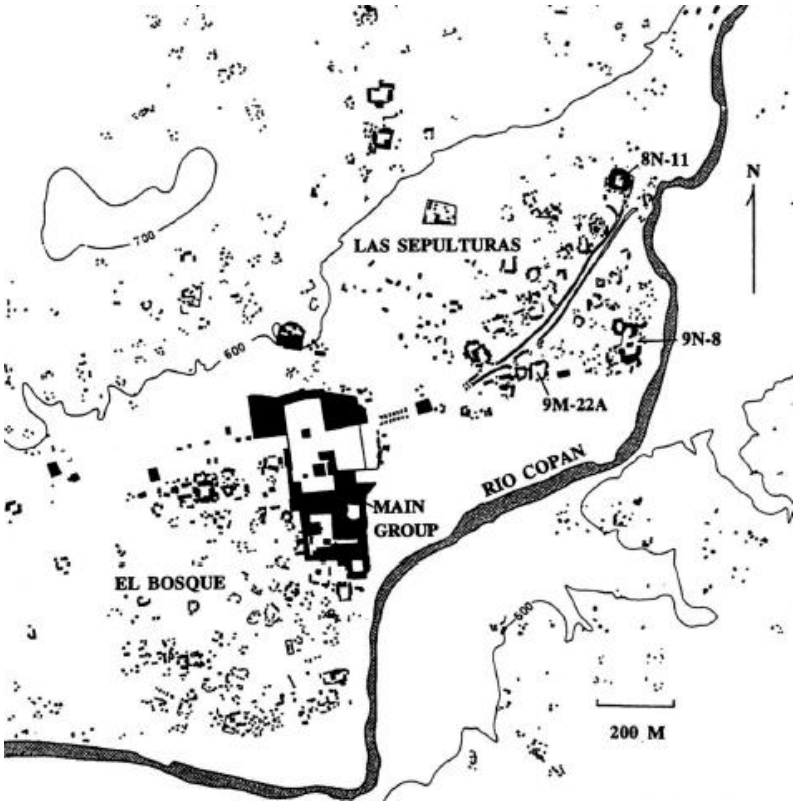

Figure 7: The Urban Core of Copan
(Adapted from Webster 1999:20)

The site sits at nearly 600 meters in elevation (Webster *et al.* 2000:8). The Main Group at Copan (Figure 8) consists of a central areas filled with temples, courtyards, and palaces. These structures cover an area of 0.12 square kilometers with a structure density of 1,400-1,800 structures per square kilometer (Sharer and Traxler 2006:687; Webster *et al.* 2000:3, 7). Geological events and river erosion have destroyed parts of the site, so it was larger during the time of occupation. The Main Group's amount of public structures and grand architecture set Copan apart from other Maya sites in terms of population density and size. The Copan ball court was used from its construction until the end of the founding lineage 400 years later (Sharer and Traxler 2006:491). The Acropolis of Copan is filled with architecture around the East and West Courts. Religious and government structures

populated the Acropolis. The southern part of the Acropolis contained Group 10L-2, a group of royal residential structures. The architecture, visible in modern times, dates to about 700-750 C.E (Webster *et al.* 2000:3-7). This last phase of construction consists of buildings made of well-cut limestone rather than the adobe and river cobbles of earlier years.

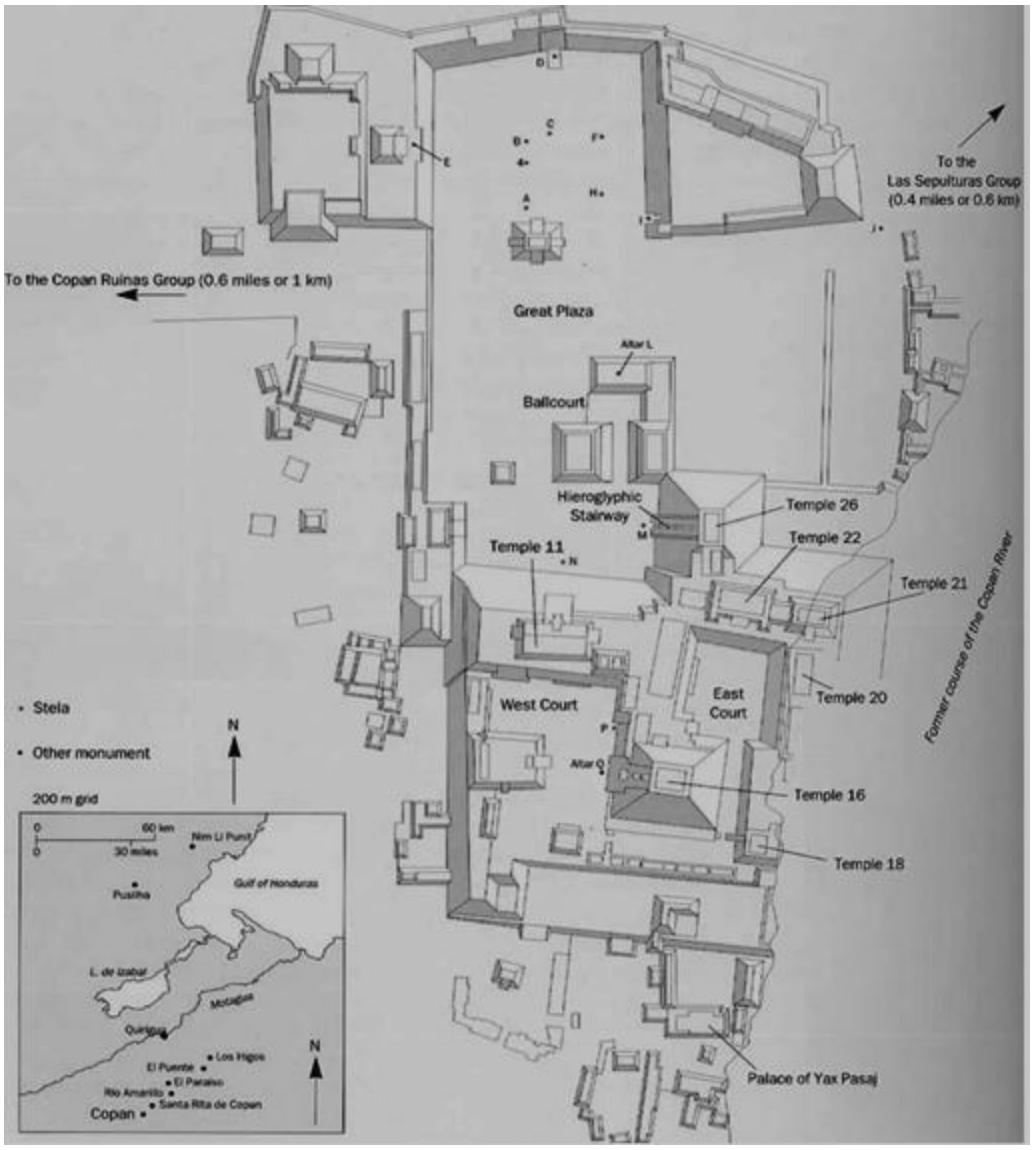

Figure 8: Copan, Main Group
(Adapted from Martin and Grube 2008:190)

The El Bosque and Las Sepulturas enclaves existed off of the Main Group. Las Sepulturas consisted of 1,400-1,800 buildings prior to destruction by flooding and erosion. Elite families lived in the multi-courtyard households of this enclave. They maintained close proximity to the main royal areas of Copan and to rich soils (Webster *et al.* 2000:7). The Copan pocket produced areas of rich alluvial deposits, which were perfect for agriculture. Most people lived within a two- to three-hour walk of the royal areas of Copan (Webster *et al.* 2000:16). They could access agricultural lands and still maintain a link with the most concentrated population areas. The geography and geology of the Copan Valley had agricultural benefits and downfalls. Erosion made normally rich agricultural areas useless but also revealed valuable sources of natural resources. Clay for pottery, basalt for manos and metates, and volcanic tuff and limestone for building construction were all available to the people of Copan (Webster *et al.* 2000:17).

Excavations have shown that agricultural groups have inhabited the Copan valley since the Early Preclassic. Late Preclassic sites exist on ridges away from the best agricultural soils. This placement indicates a need for protection at the cost of more fertile soils (Sharer and Traxler 2006:258). According to Fash, sites like these worked together in trade networks with Mesoamerica (Sharer and Traxler 2006: 243-244). Evidence suggests that Tikal extended its influence into the southeastern areas of the Maya area and established a capital at Copan. Two Late Classic stelae mention an event that occurred in the year 159. This record is present on stelae at Tikal and Copan. This means that Copan was established over 260 years before any dynastic founding took place. In the year 426, Tikal took over Copan and established its ties with Copan by installing a warrior who came to be called K'inich Yax K'uk' Mo'. His rule was likely legitimized by marrying a woman

from the Copan's ruling family (Sharer and Traxler 2006:333-338). Altar Q of Copan depicts K'inich Yax K'uk' Mo' and shows him in Teotihuacan regalia with goggles (Sharer and Traxler, 2006:341-342). He oversaw the construction of residential structures, platforms, palaces, and a ballcourt in Maya lowland and Central Mexican styles (Sharer and Traxler 2006:348). K'inich Yax K'uk' Mo' was the founder of a dynasty that endured for the rule of sixteen kings. The Hieroglyphic Stairway, completed by the fifteenth ruler of Yax K'uk' Mo's' dynasty, shows the Copan's dynastic history. Altar Q also depicts all sixteen rulers of the same dynasty around its sides (Sharer and Traxler 2006:83-84, 146; Agurcia Fasquelle and Fash 2005:234-235).

Excavations of Copan's Acropolis show the stages of Copan's development. There is architectural evidence showing political links to Tikal. The likely tomb of Yax K'uk' Mo' was discovered below the Acropolis, with the leader's remains still in place. Skeletal features show that this person was male and had a history of healed fractures on his body indicative of a violent lifestyle. These injuries, as well as strontium isotope analyses of his teeth, show that he likely spent his early years in the area of Tikal and came to settle in Copan. Grave goods of jade, shell, and pottery also suggest this person was of great importance in life. The style of pottery and offerings show links to the Tikal and Kaminaljuyu regions of the Maya area. This tomb was the first in a series that were placed atop its location. The last structure of this sequence was built 350 years later. It was the highest point in Copan's acropolis, and it was dedicated to the dynastic founder, K'inich Yax K'uk' Mo'. These tombs and structures were venerated for their connection to dynastic rulers centuries after the deaths of the earliest rulers. The Margarita tomb was likely created for the wife of Yax K'uk' Mo' and the mother of Ruler 2. This dynasty

continued into the Late Classic with fifteen rulers beyond Yax K'uk' Mo' (Sharer and Traxler 2006:344-349).

K'ak Chan Yopaat was the eleventh ruler of Copan and created the East and West courts of the Copan Acropolis. He ruled for forty-six years and further established Copan's influence in the region. Every *Ahau* after K'ak Chan Yopaat oversaw construction of many structures and the expansion of Copan's influence in the region (Sharer and Traxler 2006:476). Stelae were created to commemorate important dates and related to rulers' accomplishments. These included anniversaries, construction projects, births, and deaths. While rulers were having more structures built, there were internal and external forces causing serious problems within the polity. Conflict between sites and elite rule were causing Copan to lose influence and power over non-elites and other sites. The fifteenth ruler, K'ak' Yipyaj Chan K'awiil was able to restore Copan to glory after a defeat by Quirigua and oversaw the construction of the Hieroglyphic Staircase. This massive architectural feat symbolically restored power to Copan's rulers and legitimized rule through depictions and glyphs of lineage leaders (Stuart 2005:376-387). The sixteenth ruler, Yax Pasaj, built Altar Q as a way to legitimize his rule of Copan. He was likely not a direct descendent of Yax K'uk' Mo' but came to power through his lineage. Altar Q depicted the rulers before Yax Pasaj and reminded the people that he held the power of the rulers before him and maintained the right to rule (Sharer and Traxler 2006:487-488; Agurcia Fasquelle and Fash 2005:234-235). Copan's influence was not large after Yax Pasaj, and during the Terminal Classic period Copan was mostly abandoned. Through a myriad of possible causes, such as deforestation, soil erosion, drought, internal and external conflict, Copan could not recover power and population. There was a small repopulation

during the Postclassic with different organization and material culture, however, Copan came to be abandoned not long after the Postclassic repopulation (Sharer and Traxler 2006:491).

Compound 9N-8 was an elite residential compound at Copan. It belonged to the Las Sepulturas enclave on its northeastern end. 9N-8 consisted of 11 courtyards with 40-50 buildings (Figure 9).

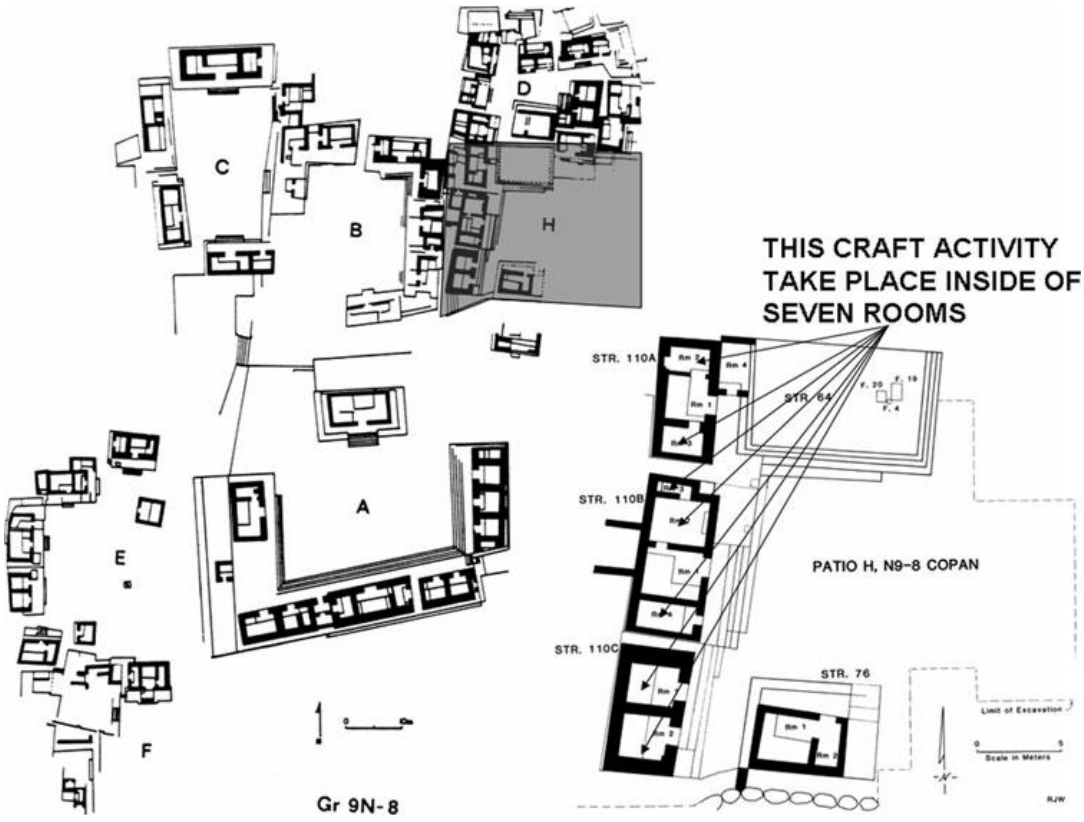

Figure 9: Group 9N-8, Copan
(Adapted from Widmer 2009:175)

Erosion by the adjacent river has washed away most of courtyard to the east of Patio D, parts of Patio H, and several structures of the most elite patio, A (Webster *et al*. 2000:46). This patio likely housed the *Ahau* (Widmer 2009:198). There are differences in

construction quality between compounds. This demonstrates that even elite groups had a range of statuses. The structures of 9N-8 were in use into the Late Classic, and some patios continued to thrive after Copan's collapse and into the Terminal Classic period. 9N-8 likely served as a residential group for a less dominant elite lineage as the architecture, and size does not reach the complexity of the Acropolis group. The construction and arrangement of the entire group suggests elites lived and worked here. The structures are made of cut stone. This is indicative of elite structures. Midden deposits show that domestic refuse, pottery sherds, and tools were present throughout occupation. Sleeping benches are also present throughout the structures of 9N-8. Hundreds of burials have been discovered associated with this compound. These people were likely the residents of their associated patios. Widmer's discovery in Patio H of an elite craft workshop is unique to the 9N-8 group (Webster 1989:12-15). The data gathered from this workshop are central to this research and are summarized in the next section.

IV.2 Group 9N-8, Patio H

According to Widmer (2009), not much archaeological evidence has been found concerning the centers of elite craft specialization. There is obviously evidence for such production as proven by the presence of carved jade jewelry and crafts. Only a few workshops that crafted important ritual jade pieces have been found. A Late Classic jade lapidary crafting area was found next to the site of Yaxha. This site was associated with a community of elites that would have used jade as jewelry, for rituals, and in burials (Widmer 2009:174). At the site of Aguateca in Guatemala, Aoyama, Emery, and Inomata have found evidence of elite artists and craftspeople working in several workshops. Bone,

shell, and stone scraps, as well as hundreds of chert and obsidian tools were found in established elite craft locations. (Aoyama, 2007; Emery and Aoyama, 2007; Inomata 2001). A non-elite craft workshop has been found at Cancuen. Jade beads and pyrite mirrors were found that do not correspond to elite crafts but were spread among the non-elite population. Non-elite craft workshops have been found at Aguateca as well (Aoyama, 2007; Emery and Aoyama, 2007). The discovery of a similar workshop at Copán is an important step in discovering more about whom these craftspeople were and the extent of their work.

The location of the elite craft workshop in Copán is known as 9N-8H. The group 9N-8 consists of several patios and Patio H is where extensive lapidary and shell modification was carried out. Marine shell and exotic stone were the most important elite materials that were manipulated at 9N-8H. There is evidence of other metamorphic stone working, as well as weaving and feather working. There is archaeological and bioarchaeological evidence to support the existence of a lapidary workshop at Patio H. Patio H is northeast of the elevated mound on which Patio A and B, the most elite patios, are built (Figure 9). Patio H consists of three structures named 110A, 110B, and 110C on the western side (Figure 10). There are residential rooms within each of these structures. Staircases in front of Structure 110B and 110C allowed access to these structures.

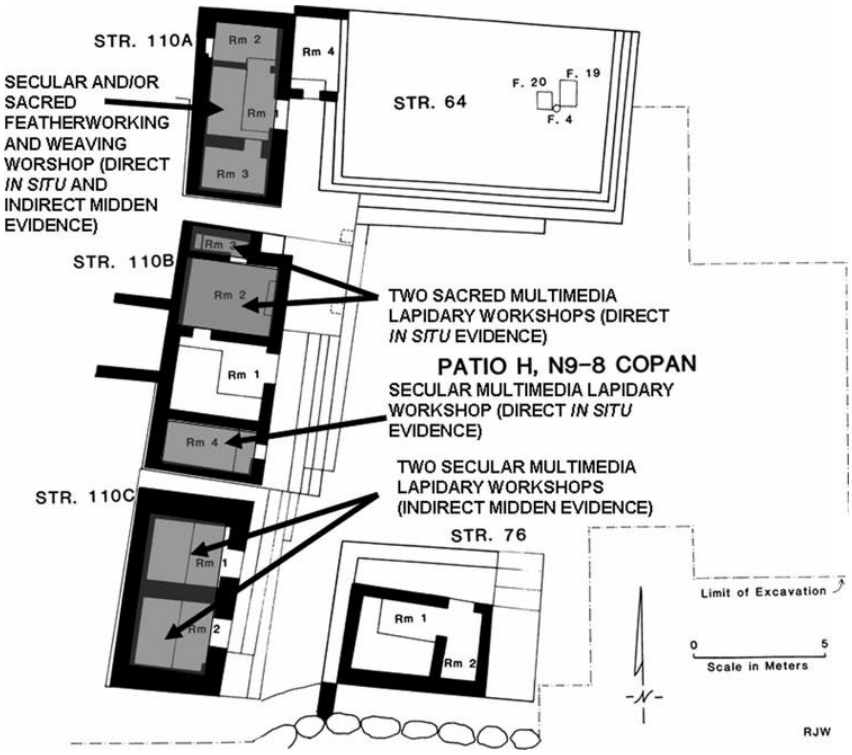

Figure 10: 9N-8, Patio H
(Adapted from Widmer 2009:176)

There are also areas seemingly designated for craft production and religious purposes. *In situ* evidence that exists in Rooms 2 and 3 of Structure 110B suggest these rooms were used for ritual craft purposes. The roofs of Structures 110B and 110A collapsed due to an earthquake and sealed craft materials, tools, and work surfaces within. No later activity could have happened in these spaces as the roof was left in place after it collapsed. There is no artifactual evidence for reinhabitation of these rooms either, although Postclassic period interest was still evident due to a burial in the rubble of Structure 110B. This type of preservation is ideal for studying the layout of a work area, the tools used, and the eventual finished craft (Widmer 2009:177-178).

These structures and Patio H itself has been established as a residential patio for high status elites. Architecture is clearly indicative of high status elite style and

construction. Structures 110A and 110C had vaulted roofs while Structure 110B had a beam and mortar roof. The beam and mortar roof of Structure 110B allowed access to the roof, likely for religious and ritual gatherings (Widmer 2009:177-178). The temple platform of Patio H also indicates high status. It is larger than that temple platform of Patio A, the lineage ruler's residential patio. The large temple platform indicates that Patio H was a place of ritual importance, even more so than the largest and highest ranked patio at 9N-8 (Widmer, personal communication).

Rooms 2 and 3 of Structure 110B present significant evidence for sacred and ritual crafting at Patio H. Room 2 can only be accessed from Room 1 through a small gap and Room 3 can only be accessed from Room 2 through a small gap (Figure 11). These rooms were not meant to be accessible to every person that worked in this structure. Perhaps secretive and esoteric religious work was done by the people that worked in these places (Widmer 2009:177).

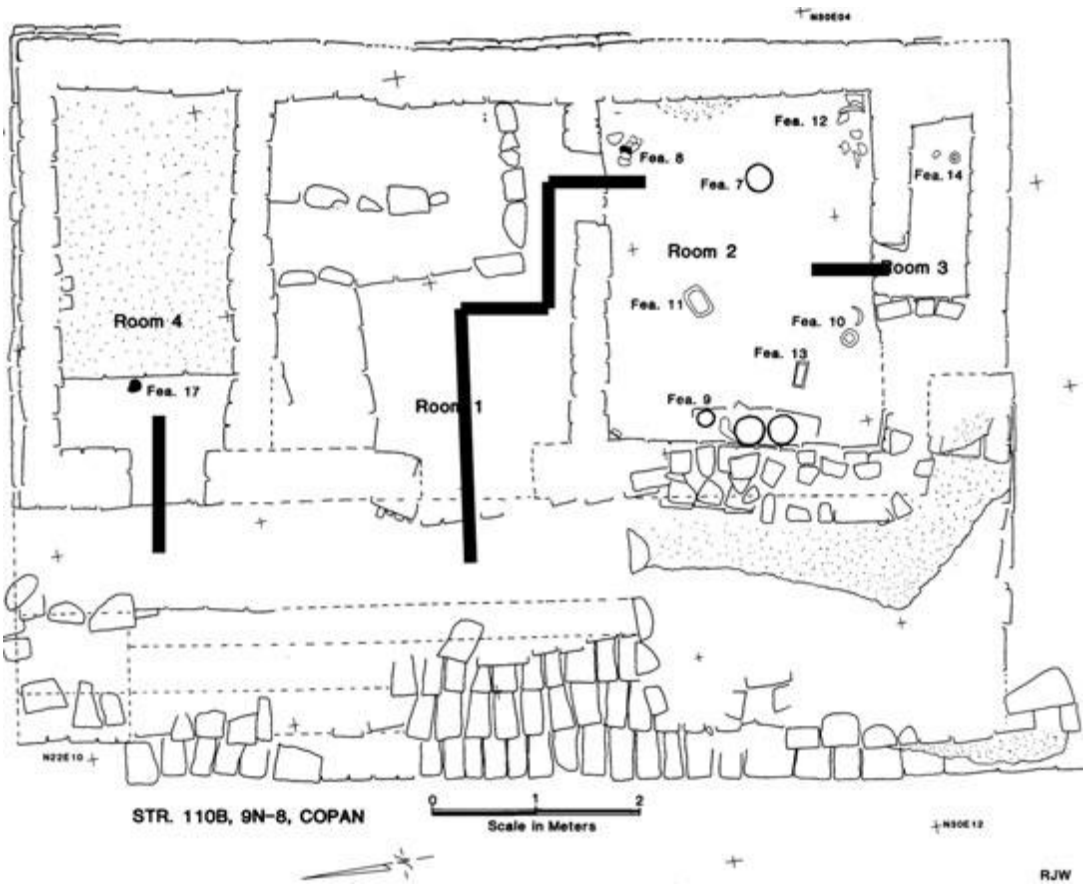

Figure 11: Structure 110B, Patio H
(Adapted from Widmer 2009:183)

Within Room 2 a ceramic censer filled with charcoal was found; it would have held a light-providing torch (Figure 11, Feature 7). No evidence of windows exists within Room 2 so a torch would have been vital to carry out any work during the day or night. An olivine-basalt cobble was found that is considered to be an anvil or platform where materials were cut and carved (Figure 11, Feature 8). The cobble is believed to have served as a cutting platform due to the multidirectional and angular cuts made all over its surface. Obsidian was likely used to carve or cut materials atop the cobble's surface. Feature 8 is considered to be a workstation for craft production (Widmer 2009:178). A second workstation exists in Room 2 with different types of preserved materials. This workstation

included a cylinder made of volcanic tuff that was used as a roller or mold for ceramics (Figure 11, Feature 10). A partial ceramic bowl was found in association with the workstation and its other half was likely found a few meters away near Feature 9 (Figure 12), but confirmation of this has not occurred. A rectangular grinding palette was also found (Figure 11, Feature 11). There were no grinding tools found in association. It is also possible that since it had a concave face that it was used to hold liquids or powders (Widmer 2009:178-179). Inomata found similar palettes at Aguateca that were used for the manufacture of pigments used in scribal works (Inomata 2001:326-328).

A storage bench was also present in Room 2 (Figure 11, Feature 9, and Figure 12). Three ceramic vessels were found that contained crafting tools and raw materials. One vessel contained ten obsidian blade sections, many of which had been used to cut or carve (Table 1). Some had not been used. Modified and unmodified shells were found in another vessel. A deer antler was found that had been worked to a point through its use as a tool. A partially finished shell gorget was found within another vessel (Figure 13). It was carved into a star shape through the use of obsidian tools, possibly the ones found in the first vessel (Widmer 2009:180-182). This gorget is important in demonstrating sacred craft production and a link to Patio A, as will be discussed.

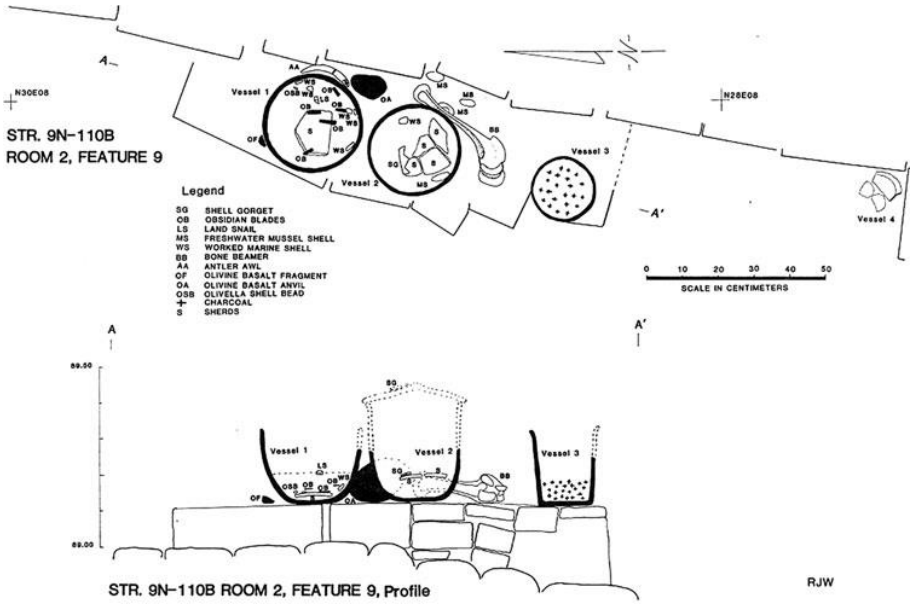

Figure 12: Feature 9 of Room 2 in Structure 110B (Adapted from Widmer 2009:181)

	Specimen	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)	Blade	Edge-wear	
							Edge 1	Edge 2
Recovered from Soil Matrix	A	59.0	12.4	2.9	3.22	midsection	shallow, heavy dense sawing	shallow, heavy dense sawing
	B	26.5	13.2	2.8	1.12	midsection	deep, light sawing	deep, light sawing
	C	20.0	11.4	2.4	.64	distal	none	none
	D	22.8	14.5	3.2	1.15	platform	none	light slicing
	E	13.9	14.3	3.1	.77	midsection	shallow, moderate, dense sawing	none
Plotted *in situ*	1	32.5	13.6	2.7		midsection	shallow, moderate sawing	very shallow, moderate sawing
	2	38.9	14.6	3.8		midsection	heavy, dense, shallow sawing	planning over very dense sawing
	3	48.0	9.0	2.3		distal	dense, shallow (plunge core) sawing	light shallow sawing[1]
	4	57.1	11.9	3.2		distal	dense, shallow sawing	dense, shallow sawing
	5	29.8	1.06	3.6		platform[2]	dense, shallow sawing	dense, shallow sawing

[1]Concentrated away from the distal end; also a single notch, perhaps for hafting
[2]Two notches on opposite edges just below the platform for apparent hafting

Table 1: Obsidian from vessel at Feature 2 of Structure 110B (Adapted from Widmer 2009:181)

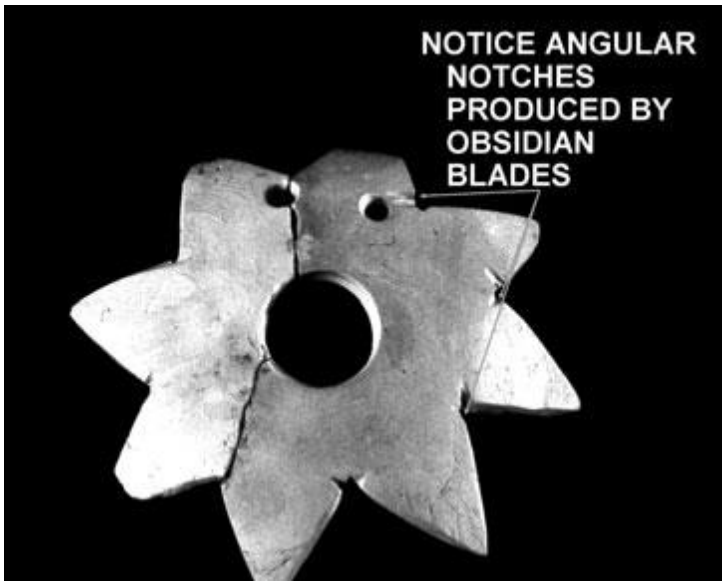

Figure 13: Star-shaped shell gorget from Room 2 of Structure 110B (Adapted from Widmer 2009:182)

These elite crafters' methods have been called into question because of the difficulty involved in cutting with obsidian. Obsidian is a volcanic glass. Its molecular matrix is disorganized due to quick cooling and it can be cleaved easily into a knife shape. The disorganized molecular nature of obsidian made these blades very brittle but very sharp. The work involved in carving a shell gorget like the one found would have required multiple blades because of the incidence of blade breakage and the hardness of the shell (Widmer 2009:182). The Maya are known to have used tools made of stronger material that could hold up to use. Chert was readily available and harder. Crafters in other locations used mostly chert because it was hard and could be sharpened. It is believed the craftspeople in Patio H chose to use obsidian tools for a ritual purpose. The more effort that went into an object the more valuable it became (Widmer 2009:182-188). Marine shells, like the one the gorget was carved from, had to be brought into the city from the Caribbean Sea and Pacific Ocean a fair distance away (Widmer 2009:182). This geographical distance gave it ritual value because it was seen as foreign and exotic. Carving the shell added value

and when done with great hardship the shell became very ritually significant. There was not a strong demand by the people for objects like this. The shell and stone objects carved by these people were made by the elites, for the elites (Widmer 2009:182, 185-188, 194-197). Time and effort were poured into each creation. Each piece was viewed with reverence. This is probably why this workshop was found to have no windows. The ritual space needed to stay secluded and ritually pure. The room might also have been considered a gateway to the underworld. The link between the underworld and workshop would be provided by the ancestors buried beneath (Widmer 2009:196).

Room 3 of Structure 110B lacked the number of tools and materials of Room 2. However, a stone cup and olivine-basalt hacha were found that were unique to this room (Figure 11, Feature 14). They likely served a ritual purpose but it is unknown. Room 4 contained tools and materials that showed that non-ritual craft production occurred in this room. Another olivine-basalt cobble anvil was found in Room 4 that had been disturbed during the earthquake that unsettled the area (Figure 11, Feature 17). Marine shells with gouges and carvings were found here as well. Structures 110A and 110C are discussed less but it is thought that lapidary work was not necessarily carried out here. Weaving, embroidering, and feather working were likely carried out in these buildings because of the bone needles, a feather spatula, and spindle whorls that were found. The bone spatula that was recovered is known to have been used in the application of feathers to fabric. This same type of tool and process was used by the Aztecs. Objects were mostly absent from 110C because it was open to the air and could have been accessed after the earthquake that collapsed the roof of the adjacent building. Work benches are present and sheet refuse was abundant outside the building (Widmer 2009:183-185).

According to midden and sheet refuse deposits outside each structure, a great range of crafting was going on in 110A and 110C. Exotic materials were found in the midden consisting of marine shells and exotic stone fragments. While jade was an elite craft material, no definitive jade or greenstone detritus or artifacts have been found in the context of it being a worked material at Patio H. Jade artifacts were present in some workshop burials in Patio H, but it is unknown if these were made in this location. Exotic stone is apparent and is recognized in the midden deposits of this patio. The volume of refuse found outside 110C was much larger compared to the refuse found outside 110B and 110A (Figure 14). The index of activity is greatest for 110C. Secular activity would have been more frequent in 110C than ritual production would have been in 110B (Widmer 2009:185).

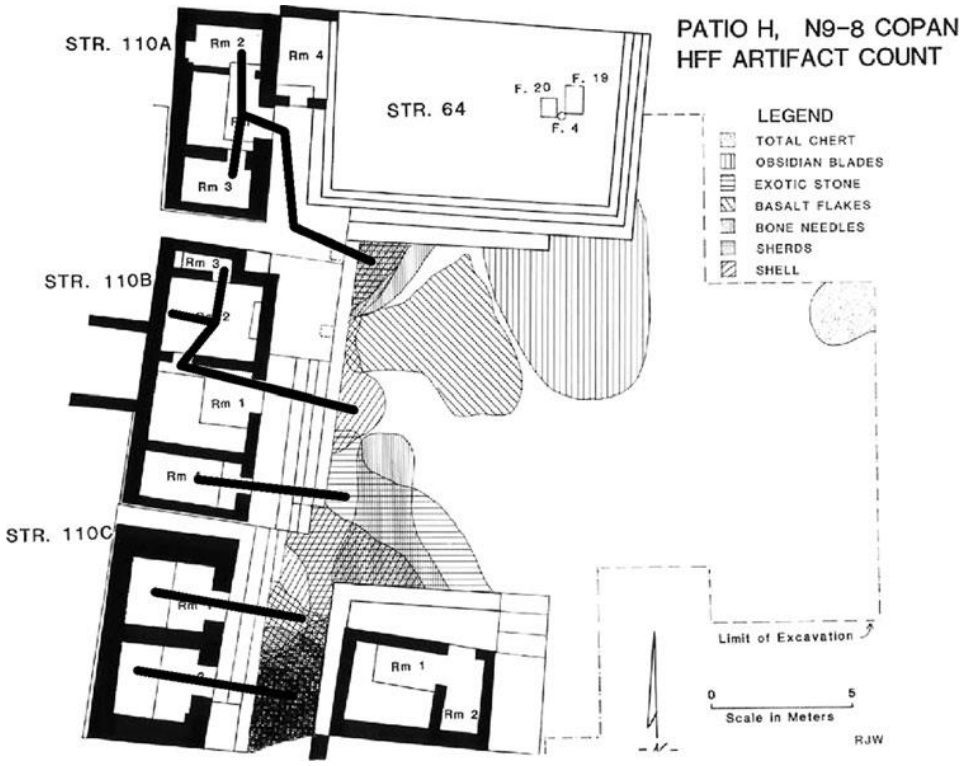

Figure 14: Midden deposits from the workshops of Patio H (Adapted from Widmer 2009:192)

The different rates of deposit and amounts of material present lead to several hypotheses. The first hypothesis is that there was a type of crafting focused on ritual characteristics of the products happening in Rooms 2 and 3 of Structure 110B. The output of this type of crafting was low and reserved for only the most important purposes and people, likely the *Ahau*. The second hypothesis is that another type of crafting was going on that did not have a ritual purpose. Work was done with the same materials but with no ritual purpose. These pieces were still meant for the elite but the ritual nature was not important. The output of these crafts would have been much higher due more demand and less stringent ritual practices needed to form each piece (Widmer 2009:188).

Patio H not only served as an area for the crafting of elite goods, but also as a burial ground. Burials are present in and around Patio H itself and the workshop structures of 110A, 110B, and 110C. Only Structures 110A and 110B contain burials and tombs below their floors, while Structure 110C lacks any type of burial beneath its floor. There are nine males and females in total, buried in and adjacent Structures 110A and 110B. Each individual was given an identification number. The males are 22-34, 22-36, 22-38A, 22-40, 22-41. The females are 22-21A, 22-28A, 22-35, 22-39. A large and well-constructed tomb was discovered under Room 2 of 110B. The tomb was excavated during the time of workshop occupation and four individuals were interred there (Widmer 2009:188). These were the males 22-40 and 22-41 and the females 22-38A and 22-39 (Figure 15). An earthen pit burial was excavated right outside 110B that contained the remains of a female labeled 22-21A. This grave contained two shell earrings, a shell collar, and loose shell offerings. A grave was discovered in the rubble of Room 3 as well. This burial was unique in that it was

the burial of a child from the Postclassic period, possibly sometime after the abandonment of the structure (Widmer 2009:188). This child was not used in the study.

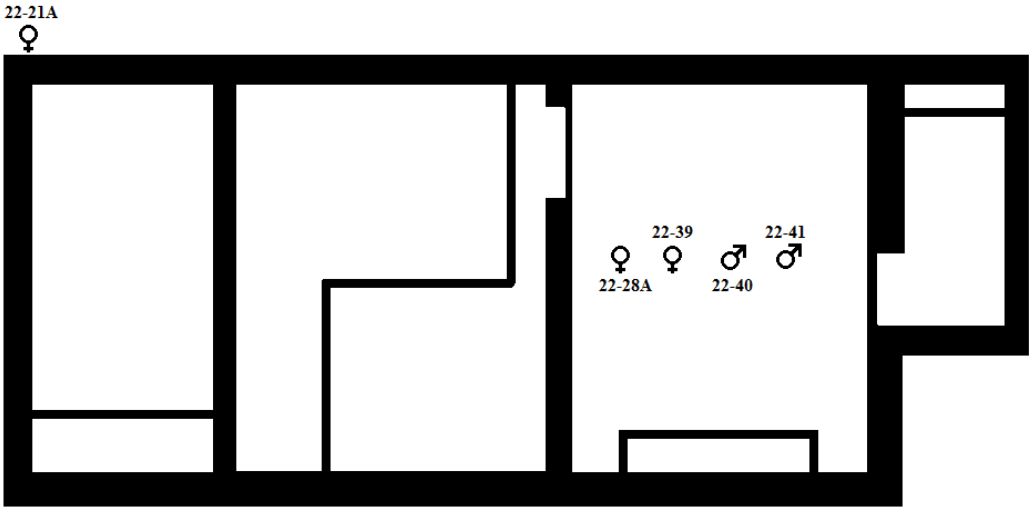

Figure 15: Burials associated with Structure 110B

The rubble of the structure was dug through in order to create this tomb. The presence of this burial near the tomb of the four older burials indicates that this place was a sacred site. Either the site itself was seen as sacred, the people buried there were venerated, or both. Extravagant grave goods were discovered in the large tomb beneath Room 2, further indicating a site of ritual significance (Widmer 2009:188-190). Additional, non-ritual, explanations could account for the presence of the Postclassic burial. Since this burial occurred so long after initial occupation this location may just have been convenient for burial. No link to ancestor veneration or ritual importance could have been made in the decision to bury a person in this location. A tomb and separate burial exist in Structure 110A as well (Figure 16). Four adults, three males and one female, were interred in Room 2 of this structure. The female, 22-35, and males 22-34 and 22-38A were interred in a tomb

beneath a workbench. The female was buried with a jade pendant. This is indicative of her high status in life (Widmer 2009:196).

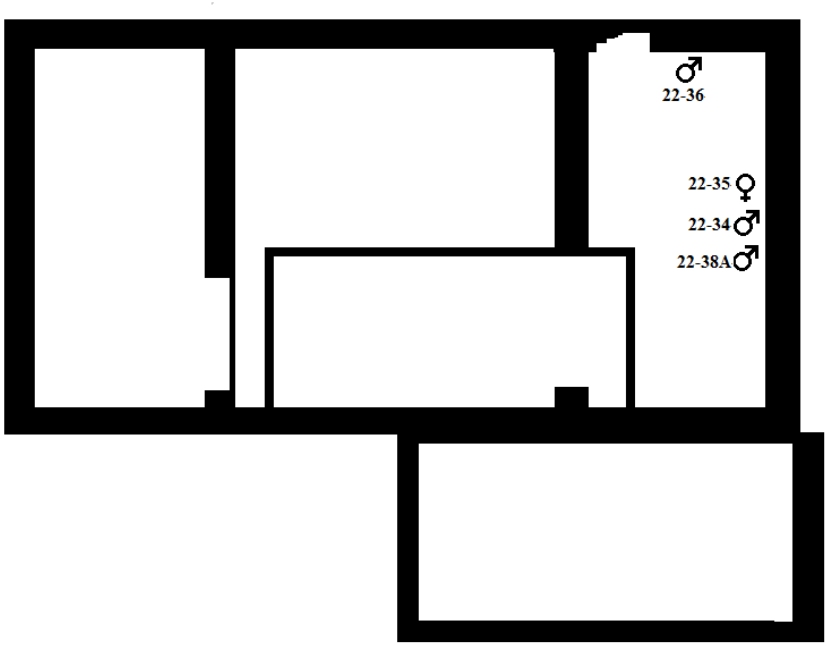

Figure 16: Burials associated with Structure 110A

The number of craftspeople working at Patio H is up for debate. There could have been one craft specialist per structure or per room. The sleeping and work benches may be indicative of how many people worked in each structure and in each room. Several benches exist in a few rooms where a few people could have worked at the same time. The people that crafted ritual and secular pieces were closely linked with the ruler of Patio A. The ruler, or *Ahau*, would have provided the materials and guidance for elite crafting. The craft specialists of Patio H were also likely related to the *Ahau* by blood or by marriage (Widmer 2009:198). Males and females trained in lapidary, weaving, feather working, and carving crafts would have been a major asset for the *Ahau* since they provided ritual and secular jewelry and garb (Widmer 2009:194). There could have also been a priest of the *Ahau* that

oversaw crafting or participated himself. His role would have been important in the production of sacred goods, but it is unknown what his role would have actually been (Widmer 2009:195).

The link between Patio H and Patio A is believed to be one of kin relationships. During the Terminal Classic, 9N-8 and Copan were part of a chiefdom. And compounds like 9N-8 would have consisted of patios that housed different ranks within the *Ahau*'s lineage. The *Ahau*, the highest ranked member of the lineage, lived at Patio A. The *Ahau* would reside in the largest patio as a sign of rank. Iconography demonstrates the high status of Patio A. The star-shaped gorget recovered from the workbench in Room 2 of Structure 110B is demonstrative of the relationship between patios at 9N-8 The star-shaped gorget is associated with Pauah Tuns, the patron god of scribes and painters. Patio A would have been associated with scribes, and the Pauah Tuns are depicted on the hieroglyphic bench. The craftspeople at Patio H were likely closely related to the scribe or lineage leader living at Patio A. The star-shaped gorget shows that craft specialists would make this important symbol for Patio A. In the iconography it is not depicted on any living person, only deities. It would represent a link to the ancestors and the underworld. Having this symbol would link the founding ancestor of the lineage with the living lineage head. Another possible mortuary link exists between Patio A and Patio H. No elite burials have been discovered under the principal room with the hieroglyphic bench in Patio A. Elites from Patio A could have been buried in the workshops of Patio H. It is possible that even the *Ahau* was buried in this location (Widmer 2009:190-197).

Overall, Patio H in Copán served as elite craft specialist housing and workshops. There was secular production of elite goods such as jewelry, shell decoration, cloth

weaving, and feather decoration. Ritual production was also carried out in seclusion in different rooms with different layouts. There were no windows for these rooms and the crafter probably worked constantly on important ritual pieces with obsidian tools. The use of obsidian tools would have made the crafted piece more valuable and ritually important because of the effort needed to use obsidian to carve shell or manipulate stone. The burials at Structure 110B provide further evidence that the people working in the workshop above were important and elite craftspeople.

Chapter Five- Bioarchaeological and Osteological Background

It is known that musculo-skeletal markers can indicate what activities an individual carried out constantly over his or her lifetime. Hawkey and Merbs state in an approach to one of their studies that:

> "This approach is based on the understanding that strenuous muscle activity can result in bone remodeling taking place at sites of muscle-to-bone and tendon-to-bone attachments. Increased activity at these sites leads to an increase in the number of capillaries that supply the periosteum, and this increased blood flow in turn stimulates osteon remodeling." [Hawkey and Merbs 1995:325]

Many studies have been successfully carried out (Hawkey and Merbs, 1995; Cashmore and Zakrzewski, 2011; al-Oumaoui, Jiménez-Brobeil, and du Souich, 2004) using the principles of increasing robusticity associated with certain activities. Hawkey and Merbs' description of bone remodeling due to activity is all based on Wolff's Law. This biological and physical law simply seeks to explain that bone will respond to continuous stress placed upon it. For example, if a child carries a heavy load on their head from town to town then as they get older, the bones that mostly support the heavy load, such as bones in the neck and legs, will increase in size and density to better cope with the physical load. Ruff, Holt, and Trinkaus believe a good term for this behavior would be "bone functional adaptation" (Ruff *et al.* 2006:484-487). This definition makes it clear that bone will adapt to its environment if not pushed to the breaking point. This kind of adaptation is also known to be more prominent in young people because their bones are still growing. The growth

plates of the long bones have not fused. Adult bone growth has stopped but mass can be added if a strenuous activity is done for long enough. Bone functional adaptation is the basis of this study and Stone Lee (1995) gathered important information concerning bone adaptation in her Master's thesis at the University of Houston.

Stone Lee (1995) acquired a large portion of the data necessary for my study. Her thesis on differential food access among elites and lower status groups in Copán made it necessary to gather skeletal measurements of many individuals and examine them for evidence of nutrient deficiencies and robusticity. Lee found that high statues males had the highest amount of robusticity in the legs compared to middle and low class Maya of Copán. She also found that the arm bones of high class males were less robust than the lower class males that were measured, but elite and non-elite groups were very close in maximum diameters of their long arm bones (Stone Lee 1995:110). This indicates that these men were doing some type of strenuous activity over a long period of time that showed up easily in their arm and leg bones. Elite females were found to have the lowest amount of robusticity in their arms and legs compared to middle and lower class females (Stone Lee 1995:113).

It is likely that the lower status males of Copán were lifelong agricultural workers. They would have spent much of the day on their feet working strenuously in the fields. Bending over, planting, and weeding would have been done constantly by these men. With such activity their muscles would strengthen and grow, leading to increased muscle mass overall and these large muscles would need larger attachment sites on the skeleton in order to function properly. Bone density and size would have increased, leading to strong bones. Middle class males likely did some agricultural work, but not as intensely. They engaged in other, less physically demanding occupations. Perhaps they were merchants, crafters, or

something similar. Some elite males were likely crafters. Stone Lee does not make this assumption in her thesis but it seems like a likely conclusion according to Widmer (2009). The upper and lower bodies of elite males were more robust overall, likely a result of participating in the Maya ball game and climbing temple stairs (Stone Lee 1995:110).

Females tended to be less skeletally and physically robust than males due to sexual dimorphism. If they participated in similar activities to males their bones would have been more robust than normal but less so than a male's bones. The elite, medium, and lower status women of Copán were found to be less robust in the arms and legs. The low status females that were measured were found to have great femoral strength due to carrying large loads long distances. Medium status females were more robust in the upper body, likely due to grinding corn. Elite females were the least robust likely due to their elite crafting occupation. Sewing and craft making of the Maya variety would not have required much strength of the upper or lower body (Stone Lee 1995:111). These findings correspond to archaeological findings by Widmer (2009) that demonstrate that elite men were crafters of stone and shell that would have required upper body strength and endurance while women were feather crafters, embroiderers, and weavers.

Baker *et al.* (2012) studied Cypriot burials and found a female from between the seventh and eleventh centuries. She had grave goods indicative of her craft occupation. Her skeleton showed signs of her occupation. Grooves and striations on the incisors and canines indicated that thread or fiber was run through the teeth. Wear also indicates that this woman held material in her teeth. Her hands display a condition called "seamstress's fingers", which is simply the presence of more developed muscle attachments on the metaca*rpals of the right hand. Her right clavicle was also more robust than the left

clavicle and showed signs of osteoarthritis. Her leg and feet morphology indicate that she squatted or kneeled while working (Baker *et al.* 2012:155-156). Ethnographic and iconographic evidence shows that Maya women used a backstrap loom to weave cloth and kneeled or sat in front of the loom (Figures 17 and 18). This position was likely similar to the position the Cypriot seamstress took while sewing.

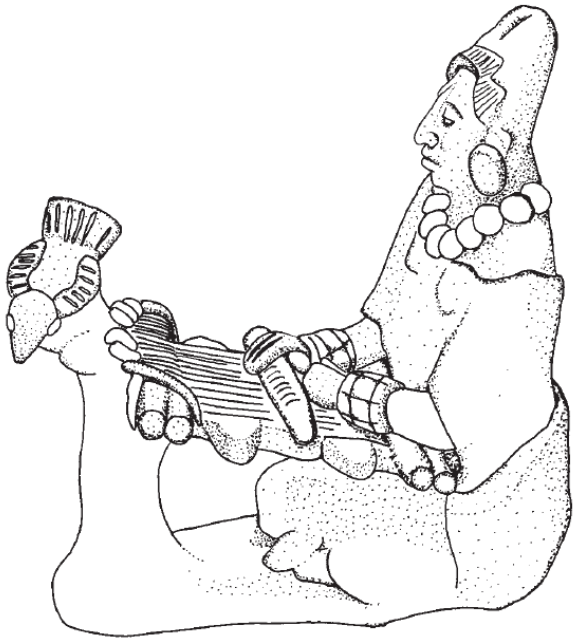

Figure 17: Classic Maya figurine depicting a woman weaving on a backstrap loom
(Adapted from Halperin 2008:113)

Figure 18: Woman weaving on a backstrap loom
(Adapted from O'Donnell 2010:87)

Robusticity is not the only indicator of long-term physical activity on the skeleton. The presence of enthesophytes, enthesopathies and osteoarthritis has also been known to indicate long-term physical activity. The presence of these markers can indicate that activity load was high at some point in a person's life but activity type is hard to determine in skeletal remains outside of an anthropological and archaeological context. "Enthesopathies are skeletal manifestations associated with tendinous or ligamentous insertions" (Jurmain 1999:142). The ligament insertion site is an enthesis. Enthesophytes and enthesopathies occur on bone at sites of stressed tendon or ligament activity. An enthesophyte is a bony projection at an enthesis but an enthesopathy is the disorder resulting from too much stress upon on enthesis. Mechanical stress at these sites of connection requires reinforcement in order for joints to stay functional. Long-term and

repetitive actions have been shown to induce change with an increase according to age (Villotte *et al*. 2010:228-229).

Villotte *et al.* used populations from the Christ Church Spitalfields collection, Portugal, and Italy to determine if enthesopathies were more common among different professions as opposed to others. These collections provided information for some samples regarding occupation and these were included in this study. They found that enthesopathies were more often present on manual workers involved with forceful tasks and heavy loads, such as carpenters, masons, and day laborers. Enthesopathies were much less common on nonmanual workers and tailors, weavers, and shoemakers. This study came to these conclusions because Villotte *et al*. used only enthesopathies of fibrocartilaginous sites where other studies used fibrocartilaginous and fibrous enthesopathies. The entheses they studied that apply to my thesis are the vertebral and upper limb insertion sites of *M. brachialis, M. biceps brachii,* and the ligaments of the proximal interphalangeal joints, for example (Villotte *et al*. 2010:231-232). Shuler *et al.* found that at Moundville in the Southeastern United States entheseal changes occurred in males and females as the result of the adoption of agriculture. This is because both sexes had to constantly work hard and repetitively in order to grow and process food (Shuler *et al.* 2012:415,430). This study is important because it can show skeletal change from less mechanical stress of the upper body to more stress and its effects. Most studies (cited and not) have found that enthesopathies occur mostly on the right side no matter the population or culture. I believe this is because most people were right handed, as in modern times. Left side enthesopathies occur but the presence is less because fewer people were left handed.

While Villotte's study shows a correlation between enthesopathies and activity other studies do not and it is important to consider these during study. Cardoso and Henderson found no relationship between humeric enthesopathies and known occupation. However, they also conclude that better approaches need to be made in studies such as these in order to suitably classify and analyze enthesopathies and their causes (Cardoso and Henderson 2010:556-558).

Osteoarthritis is traditionally understood to be indicative of activity, as well as of age. Crubézy *et al.* (2002) found patterns of osteoarthritis among a Neolithic European population to be similar to modern populations. The prevalence of elbow osteoarthritis among the Neolithic population was higher but other types were in similar frequency to modern day, suggesting a genetic factor behind the susceptibility of a person to osteoarthritis (Crubézy *et al*. 2002:588). However, Debono *et al.* (2004) found that it is easier to see osteoarthritis in the elbows in paleopathological samples because close observation of the bone is possible where it is not possible in a clinical setting (Debono *et al*. 2004:399). Waldron and Cox (1989) studied the Spitalfields samples and focused on weavers and the presence of osteoarthritis in the hands. These people's occupations are known because burial records document sex, age, and occupation. They found that weavers were mostly men and osteoarthritis did not occur in a majority of subjects. Age was more correlated to the presence of osteoarthritis in the hands than occupation was (Waldron and Cox 1989:422). Studies such as these show that activity may affect osteoporosis' manifestation according to the area that is mechanically stressed but age and genetics also affect its appearance and severity.

Chapter Six-Methodology

VI.1 Methodology

This study was designed to determine if the people buried in the tombs below Structures 110A and 110B in 9N-8, Patio H in Copan were craft specialists. The elite Maya craft specialists that worked in these workshops would have either have been full-time crafters dedicated to their occupation without other responsibilities, part-time crafters who participated in other activities besides crafting day to day, or non-crafters who were important ancestors that were venerated by later generations. Osteological data were used to determine the nature of the skeletal evidence concerning activity-induced morphology. Together with archaeological data, osteological measurements will determine if the entombed individuals were craft specialists dedicated to full-time craft production or if they dedicated only some of their time to craft production. It is possible that osteological measurements will show that individuals buried in the Patio H workshop tombs were not lapidary craftspeople, or weavers, and were perhaps high-ranking elites that participated in low intensity craft activities or were just ancestors buried in this location for the purpose of their veneration.

VI.2 The Sample

The sample consists of men and women buried in the tombs beneath Structures 110A and 110B in Patio H, 9N-8. Four burials exist in Tomb 4 beneath 110B and one burial exists in a separate part in the floor of this structure. Female burials number three and male burials number two. The tomb and other burials beneath 110A contained one

female and three males. These nine individuals were compared with other individuals from all around 9N-8, including Patios A, B, C, D, E, F, H, and J. Although the 9N-8 compound is an elite compound not all of the people interred in the compound are considered to have been elites. Stone Lee (1995) determined status of individuals in 9N-8 based on burial type. She designated low status, medium status, and high status groups of males and females. She determined skeletal size robusticity was not affected by differential access to food resources. She did find differences in activity level by sex and status level. The individuals buried in the workshops of Patio H were determined to have been of high status. Analysis has been done independent of statuses established by Stone Lee (1995). The people buried beneath Structures 110A and 110B are considered to have belonged to one population for this study and the comparison population is the rest of 9N-8, regardless of status. Statistical comparisons within the high status group were deemed impossible due small sample size and lack of necessary measurements to carry out analysis. Comparisons by burial location give a larger sample size and allowed statistical analysis to take place because more measurements were available.

The burials of Structures 110A and 110B are located within an area that non-elite people would not normally have had access to. These burials date to the Terminal Classic. The few individuals interred in the tombs of the Patio H workshops were compared to other individuals interred in other parts of Patio H and the 9N-8 compound. The sample size of burials numbered 140 individuals before any consideration of necessary arm and upper body measurements were accounted for (Table 2). Table 2 shows the distribution of individuals by sex throughout Patio H and the rest of 9N-8, before eliminating unusable samples due to a lack of all necessary measurements. After reduction, the sample size was

99 individuals, 56 females and 43 males (Table 3). Sex was determined by Storey according to pelvic and skull features, as well as discriminant analysis.

Table 2
Study sample prior to exclusion of unfit samples

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	female	77	55.0	55.0	55.0
	male	63	45.0	45.0	100.0
	Total	140	100.0	100.0	

Table 3
Actual study sample

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	female	56	56.6	56.6	56.6
	male	43	43.4	43.4	100.0
	Total	99	100.0	100.0	

Individuals in the workshop tombs of Patio H ranged from young adulthood to older adults. Ages were not available for most burials outside of the workshop burials. Every measurement was taken by either Storey or Stone Lee. This study is dependent on accurate measurements and multiple measurements of the same part were taken to insure accuracy (Stone Lee 1995:57-58). The sample was split by sex due to skeletal differences caused by sexual dimorphism. Females tend to be smaller than males, and that was reflected in the data.

VI.3 Variables

Osteological measurements, pathologies, and muscle markers make up the variables for study. Measurements and observations were taken from notes and databases provided by Storey. More measurements were taken from Stone Lee's Master's thesis as she took them herself from this Copan population for a later study. Measurements of the shoulders and arms were used in this study as these are the bones most involved in crafting, were better preserved, and were easier to observe in context. Measurements of the wrist and hand were not done with metric values. Measurements were taken in terms of the presence of osteoarthritis, enthesopathies, and enthesophytes. No metric measures were available for these bones from any dataset. Not every skeleton had every measure available due to the absence of the necessary bone. Siding of the bones was not accounted for when recording data, just the applicable measurement was taken. Bone siding was recorded in Storey's notes when the correct side was known and when it was pertinent due to differing morphologies on the right and left sides. Table 4 contains the possible measurements made from skeletal remains.

Table 4:
Osteological Measurements

mincirhu	Minimum circumference of the humerus
radcirm	Circumference of the radius midshaft
APClMD	Anterior to posterior diameter of the clavicle
VerDClMd	Vertical diameter of the clavicle midshaft
MinCirCl	Minimum circumference of the clavicle
CirHumMd	Circumference of the humerus at midshaft
MxDHumMd	Maximum diameter of the humerus at midshaft
CirUlMd	Circumference of the ulna at midshaft

MLDUlMd	Medial to lateral diameter of the ulna at midshaft
ulnad	Proximal diameter of the ulna
glenbr	Breadth of the glenoid fossa
clavcir	Circumference of the clavicle
humhead	Diameter of the humerus head
ulnamin	Minimum circumference of the ulna

Clavicle measurements include anterior to posterior diameter of the clavicle (APClMD), vertical diameter of the clavicle at midshaft (VerDClMd), minimum circumference of the clavicle (MinCirCl),and circumference of the clavicle (clavcir) (Figure 19).

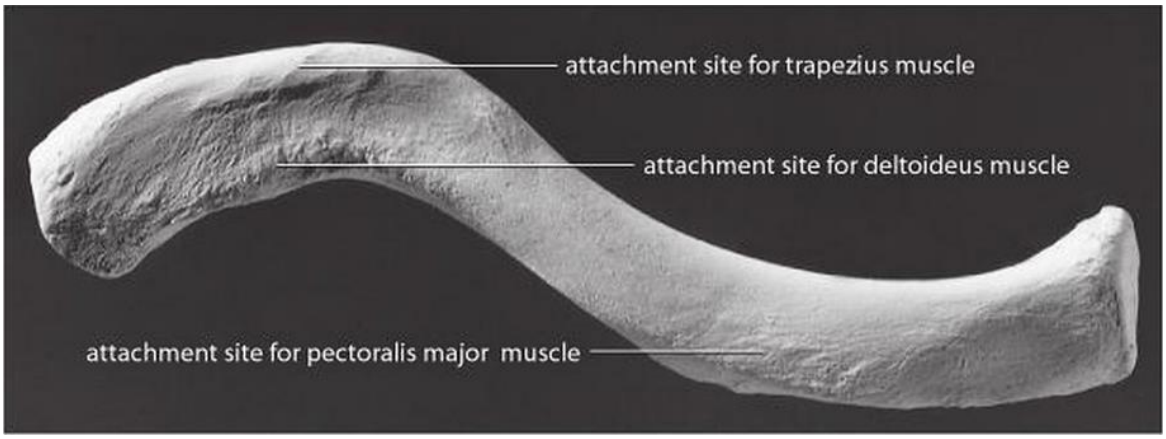

Figure 19: Right clavicle, superior side
(Adapted from White and Folkens 2005:194)

Only one measure of the scapula was used, glenoid fossa breadth (glenbr). The glenoid fossa is the articulation zone for the humerus to form the shoulder joint. The glenoid fossa is highlighted by the white square in Figure 20.

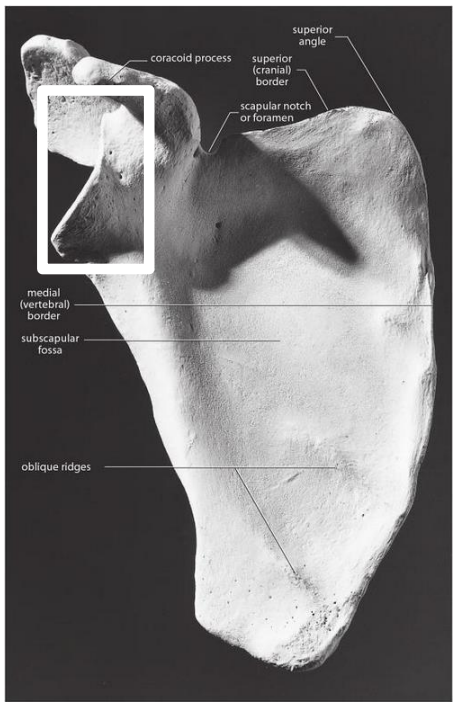

Figure 20:
Right scapula, anterior aspect (Adapted from White and Folkens 2005:196)

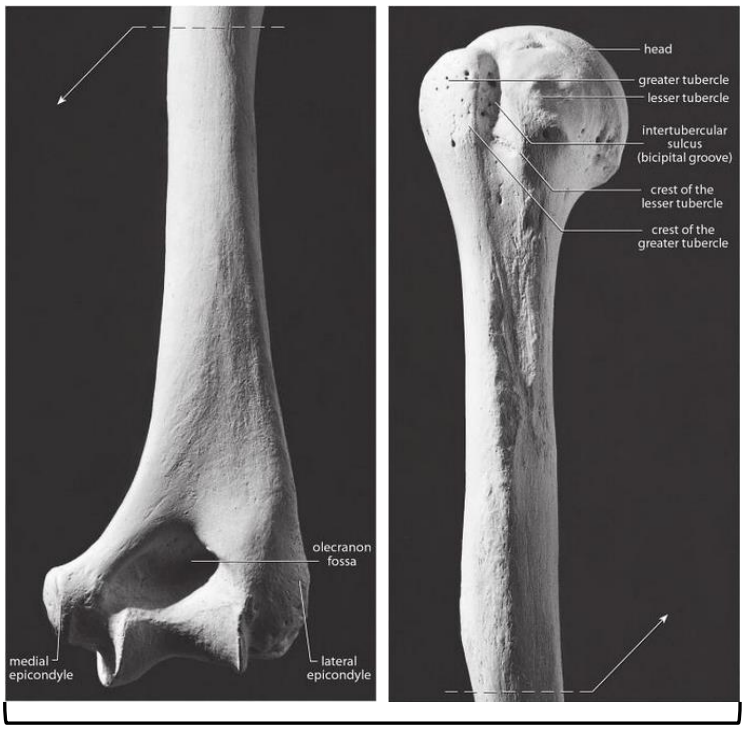

Figure 21:
***Left*: Right humerus, posterior, distal end**
***Right*: Right humerus, anterior, proximal end**
(Adapted from White and Folkens 2005:207,204)

Measurements of the humerus include minimum circumference of the humerus (mincirhu), circumference of the humerus at midshaft (CirHumMd), maximum diameter of the humerus at midshaft (MxDHumMd), and diameter of the humerus head (humhead) (Figure 21).

Only one radius measurement was taken, the circumference of the radius midshaft (radcirm) (Figure 22).

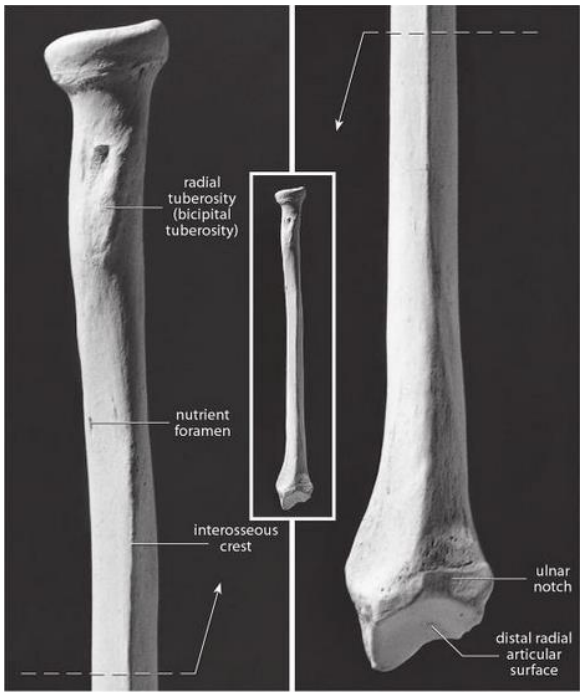

Figure 22:
Right radius, medial aspect
***Left*: proximal end; *Right*: distal end**
(Adapted from
White and Folkens 2005:218)

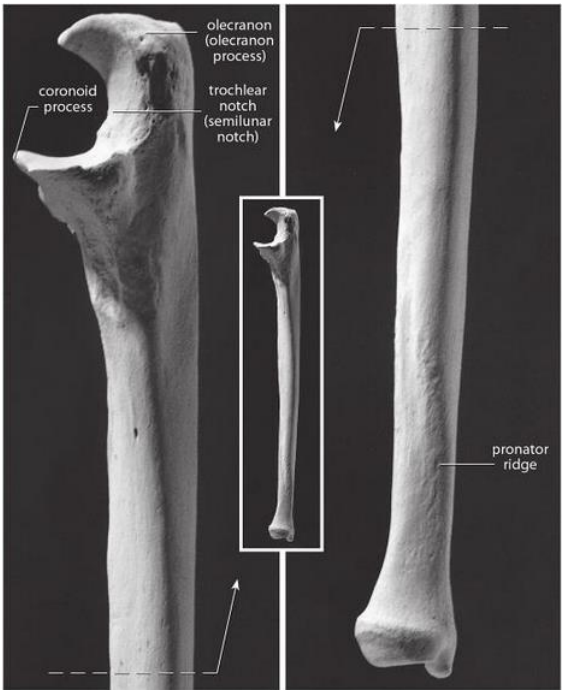

Figure 23:
Right ulna, medial aspect
***Left*: proximal end; *Right*: distal end**
(Adapted from
White and Folkens 2005:222)

Ulnar measurements include the proximal diameter of the ulna (ulnad), minimum circumference of the ulna (ulnamin), Circumference of the ulna at midshaft (CirUlMd), and medial to lateral diameter of the ulna at midshaft (MLDUlMd) (Figure 23).

The presence of osteoarthritis, enthesophytes, and enthesopathies are recorded according to apparent severity on the skeleton. Both the arms and legs were studied to determine the presence and severity of osteoarthritis in the workshop burial group. Osteoarthritis and muscle attachment pathologies are measured in stages from zero to four. A pathology determined by the observer to be at Stage 1 will show slight presence of the

pathology, osteoarthritis or enthesopathies in this case. Stages 2 and 3 will be more severe, while Stage 4 will be the most severe and likely seriously affected the person's daily life. Examples of severe osteoarthritis are shown in Figure 24 and examples of enthesophytes and enthesopathies are shown in Figure 25.

Figure 24:
Severe osteoarthritis of the humerus, radius, and ulna (Adapted from Klaus *et al.* 2009:211)

Figure 25:
Enthesopathies of the arm bones (Adapted from Villotte *et al.* 2010:227)

Osteoarthritis goes through a progression of stages, becoming more severe in higher stages. As the disease progresses bone projections form that are called osteophytes. These are the result of bone surfaces rubbing together and the body responding by building up bone in the area of stress. Osteophytic lipping best defines the appearance of osteoarthritis at joints. Bone forms on the joint and around it in order to cope with mechanical stress. At the later stages of osteoarthritis eburnation occurs. Eburnation occurs when joint cartilage is eroded and the bone surface is exposed and possible rubbing of the bones of the joint occurs. The articulation area looks eroded and takes on a shiny appearance. A porous surface and pitting develop on bones affected by osteoarthritis. The Kellgren and Lawrence Scale provides a system to judge the presence of osteoarthritis based on the presence of osteophytes. Grade 0 means there is no indication of osteophyte presence. Grade 1 shows possible osteophytic lipping, but very slight. Grade 2 consists of definite osteophyte formation, more noticeable than Grade 1. Grade 3 displays multiple areas of osteophytic lipping at a joint with slight eburnation. Grade 4 means osteophytes and lipping are abundant and large and eburnation is major (Petersson *et al.* 1997).

Robusticity and strength of the arms and shoulders was established by the means of each feature's measurements. Values for strength and robusticity of a bone were taken from Stone Lee's (1995) thesis as a way to measure activity level. These values were determined by calculating the means of the clavicle, humerus, and ulna measurements together, according to each bone. The measurements used from the clavicle are APDCLMd, VerDClMd, and MinCirCl. The measurements from the humerus include CirHumMd and MxDHumMd. The measurements of the ulna used are CirUlMd and MLDUlMd.

VI.4 Tests and Comparisons

The data were analyzed by the Statistical Package for the Social Sciences (SPSS) 22. The Student's t-test and One-Way ANOVA statistical tests were used for comparisons. The males from the workshop burials were compared with the males from the rest of 9N-8, and the females from the workshop burials were compared with females from the rest of 9N-8. Significant differences between these two groups, according to the appropriate osteological measurements, were determined using the Student's t-test. This test was used as it is powerful when analyzing unequal sample sizes. The null hypothesis for this research problem would be that the sample all belonged to the same population. A significance of 0.05 was used to reject the null hypothesis. The One-Way ANOVA test was also utilized, maintaining the use of a 0.05 probability.

The presence of osteoarthritis and muscle markers add data to this study for the workshop population. The presence of osteoarthritis and muscle markers could not be ascertained from burials outside of Patio H. SPSS was not used to analyze the presence of osteoarthritis, enthesophytes, or enthesopathies due to a small sample size. Analyses of these skeletal features were carried out for the workshop burials only and comparisons between individuals were judged for their presence and severity.

Chapter 7-Results

The results of this study are presented in Tables 5-8 and Figures 26-36. Any values determined to be significant are noted for each measurement. For every measurement one group, the workshop burials or the rest of 9N-8 burials has a larger mean measurement. That difference, however, is not always significant and therefore is not noted in the table or figure. The Student's t-test compared the nine individuals from the workshop burials with the 90 other individuals from around 9N-8, regardless of status.

VII.1 Student's t-test

Males

Table 5:
Comparison of Males by Structure Using Osteological Measurement Means

	Patio H Burials	9N-8 Burials
Mincirhu	62.70	61.16
Radcirm	45.33	45.13
APClMD	10.90	10.99
VerDClMd	9.50	8.70
MinCirCl	30.0	35.70
CirHumMd	57.70	62.90
MxDHumMd	20.10	20.86
CirUlMd	47.20	49.09

MLDUlMd	16.20	16.21
ulnad	20.67	19.41
glenbr	28.50	25.75
clavcir	36.50	37.73
humhead	-	42.88
ulnamin	-	36.00

No significant difference is believed have to have existed between the males buried in the workshops of Patio H at 9N-8 and other males buried elsewhere in the compound, according to the Student's t-test. None of the means of the calculated measurements were determined to be significant with a 0.05 probability level. For the most part the measurements of the shoulders and arms were all smaller in the workshop burials than in the larger 9N-8 population. Sample size was small for each measurement for the workshop burials but the Student's t-test is powerful for samples of differing size. Only one individual, although different per measurement, from the workshop burials contained the necessary bones to record a measurement for APClMD, VerDClMd, MinCirCl, CirHumMd, MxDHumMd, CirUlMd, MLDUlMd, and glenbr. No measurements existed for workshop burials for humhead and ulnamin. Only four measurements could have their significance assessed because due to the existence of only one individual that contributed the data per variable. Minimum circumference of the humerus (CirHumMd) had a probability of 0.134, the circumference of the radius at the midshaft (radcirm) had a probability of 0.369, the proximal diameter of the ulna (ulnad) had a probability of 0.571,

and the circumference of the clavicle (clavcir) had a probability of 0.416. None of these measurements reach the necessary 0.05 probability to be significant. Looking at just the mean measurements will give different insight into size (Table 5, Figures 26-30). Patio H workshop burials were larger for Mincirhu, Radcirm, VerDClMd, ulnad, and glenbr. However, as stated before, none of these differences are statistically significant.

The strengths of the clavicle, humerus, and ulna are all higher in the non-workshop, 9N-8 burials. However, only one workshop individual provided the necessary bone measurements, so the mean of the workshop burials is the result of one individual being measured (Table 6). No measurement was statistically significant. The means table and charts (Table 6 and Figure 31) are included to show means of both groups even though the Student's t-test was not applicable.

Table 6:
Comparison of Males by Structure Using Calculated Strength Means

	Patio H Burials	9N-8 Burials
Clavicle	16.80	18.56
Humerus	38.90	41.88
Ulna	31.70	32.65

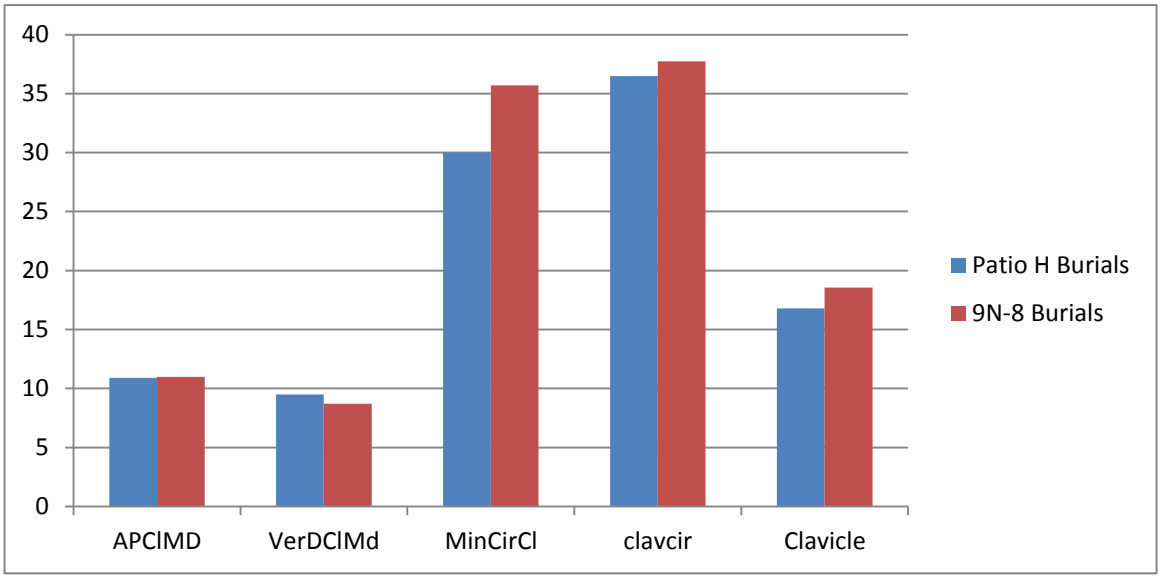

Figure 26: Male Clavicle Means

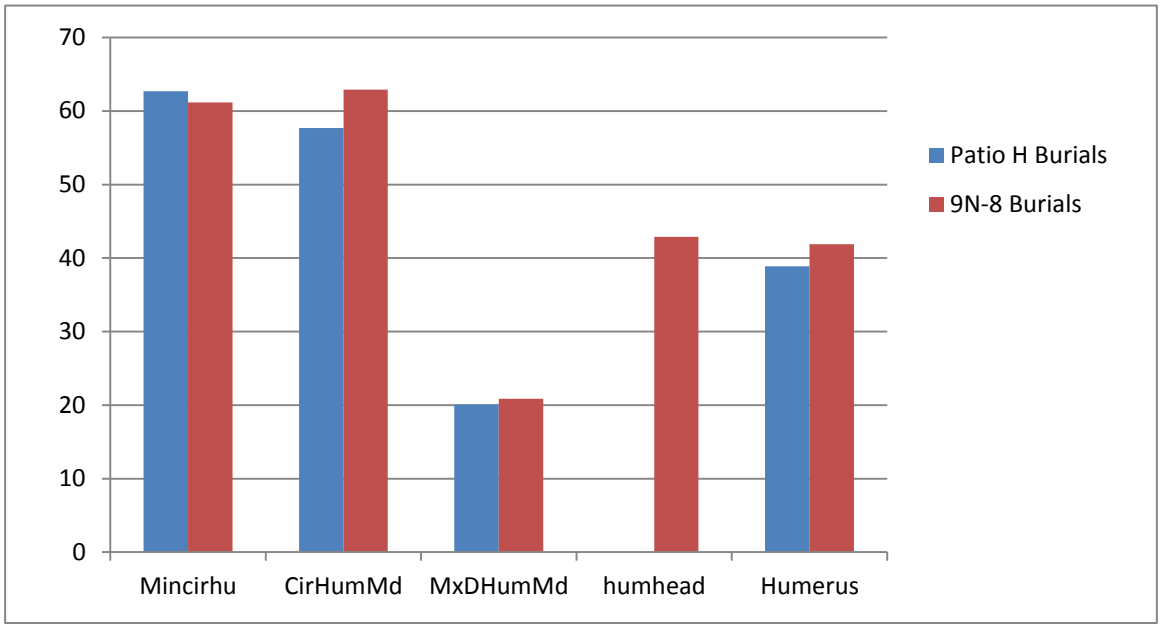

Figure 27: Male Humerus Means

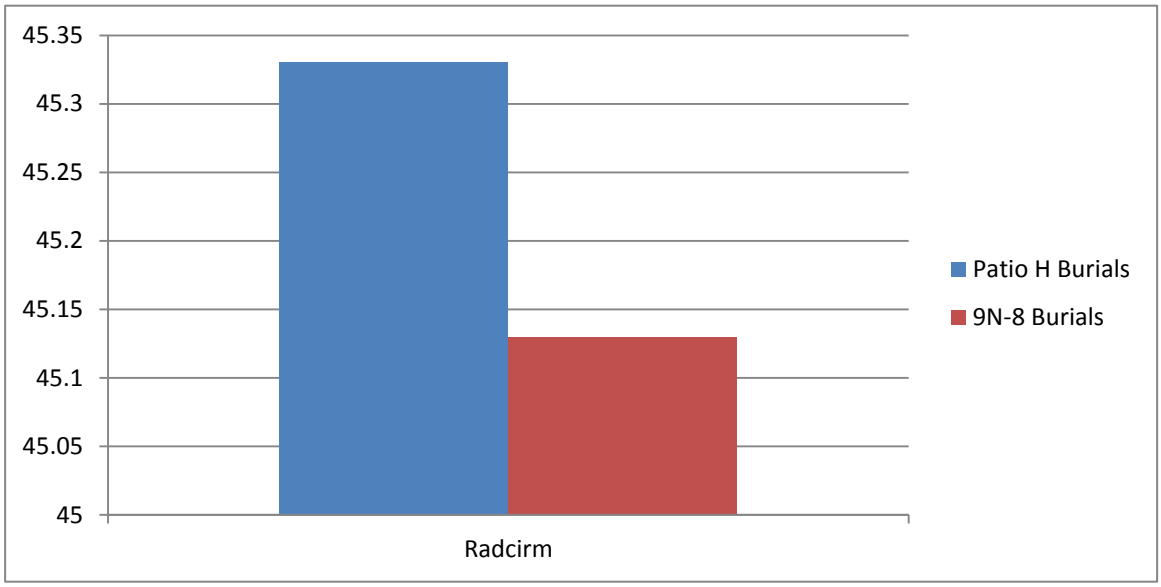

Figure 28: Male Radius Means

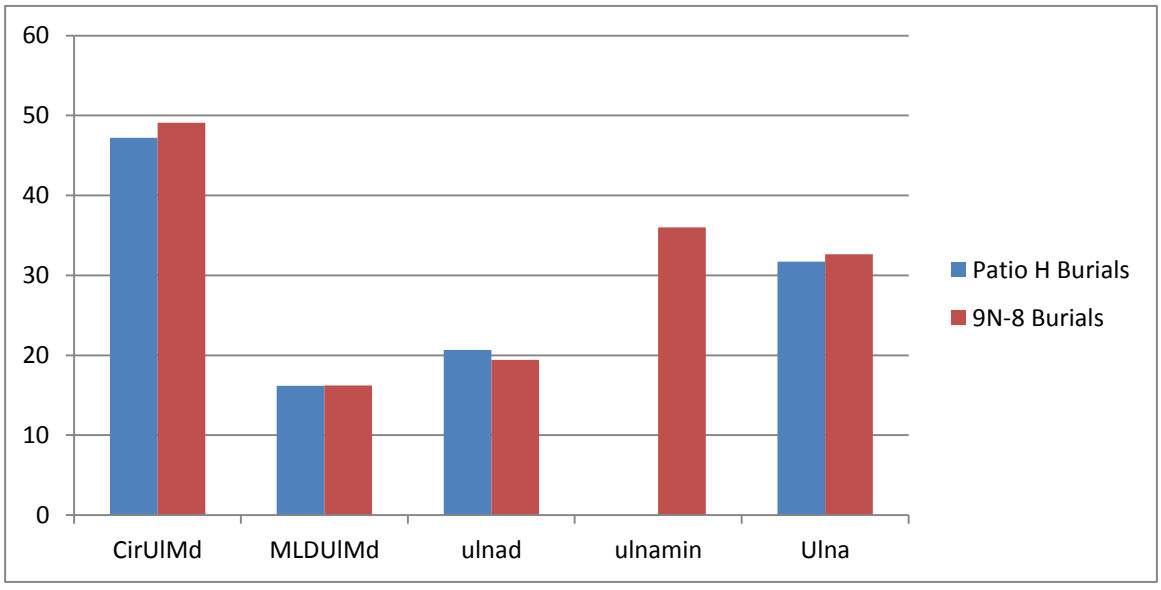

Figure 29: Male Ulna Means

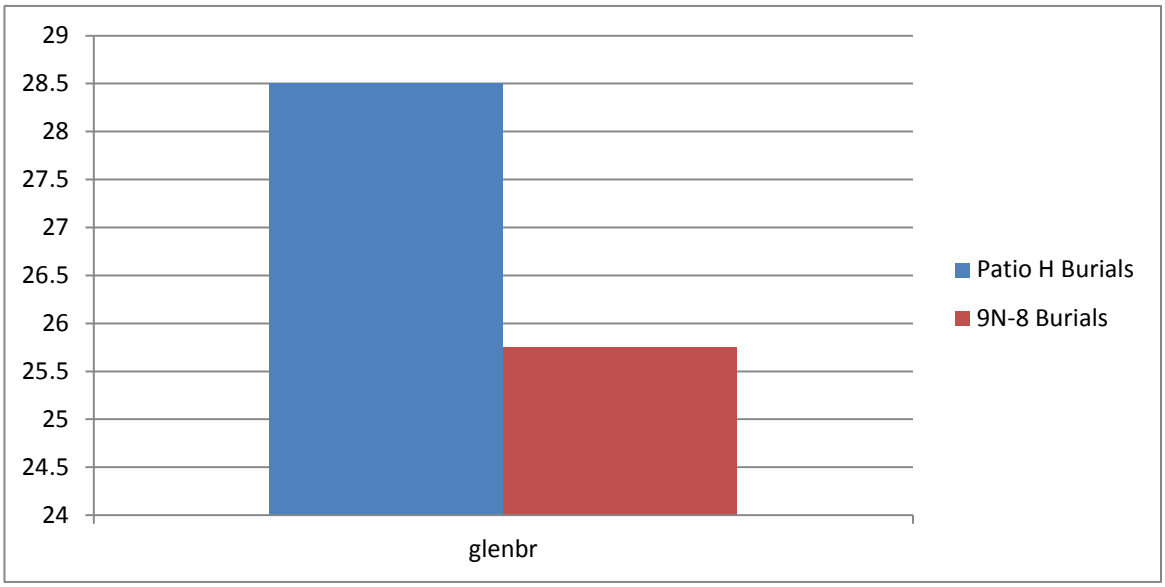

Figure 30: Male Scapula Means

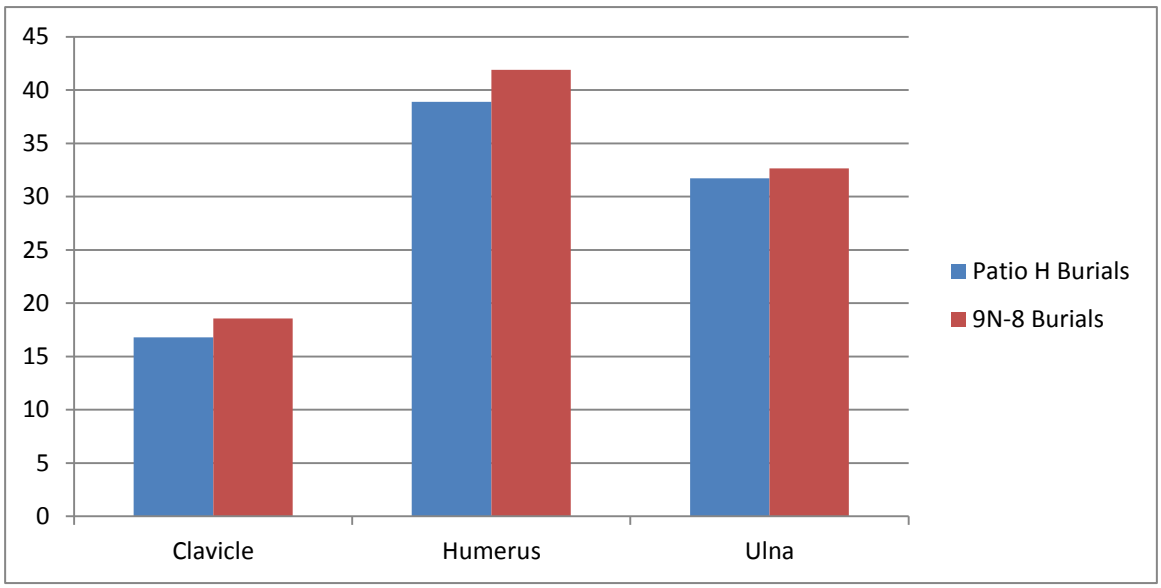

Figure 31: Male Strength Means

Females

Table 7:
Comparison of Females by Structure Using Osteological Measurement Means

	Patio H Burials	9N-8 Burials
Mincirhu	56.00	54.23
Radcirm	41.50	40.53
APClMD	10.23	9.5
VerDClMd	9.33	8.09
MinCirCl	31.78	31.10
CirHumMd	55.70	54.58
MxDHumMd	18.80	19.60
CirUlMd	42.85	42.04
MLDUlMd	14.85	13.97
ulnad	16.83	16.57
glenbr	24.00	23.29
clavcir	31.00	35.07
humhead	36.33	37.79
ulnamin	-	27.00

For females, only one measurement does not pass the Levene test, the proximal diameter of the ulna (ulnad). However, there is no statistically significant difference between these two groups as the t-test significance for the assumption of unequal variances is 0.489, well above a probability of 0.05. No other measurements were deemed to be statistically significant as their probabilities were all above 0.05. No workshop samples exist for the minimum circumference of the ulna (ulnamin) so no statistical analysis could be carried out for this variable. Only one individual could be analyzed for mincirhu, glenbr, and clavcir.

Table 8:
Comparison of Females by Structure Using Calculated Strength Means

	Patio H Burials	9N-8 Burials
Clavicle	17.11	16.07
Humerus	37.25	36.85
Ulna	28.85	27.98

The strength and robusticity means of the clavicle, humerus, and ulna were calculated for females as well. These means were able to use more than one individual's measurements. Since the female burial sample of the workshop burials still only numbers four, the means are still skewed. The means of the clavicle, humerus, and ulna were all larger for the workshop variables (Table 8 and Figure 36). None were determined to be statistically significant.

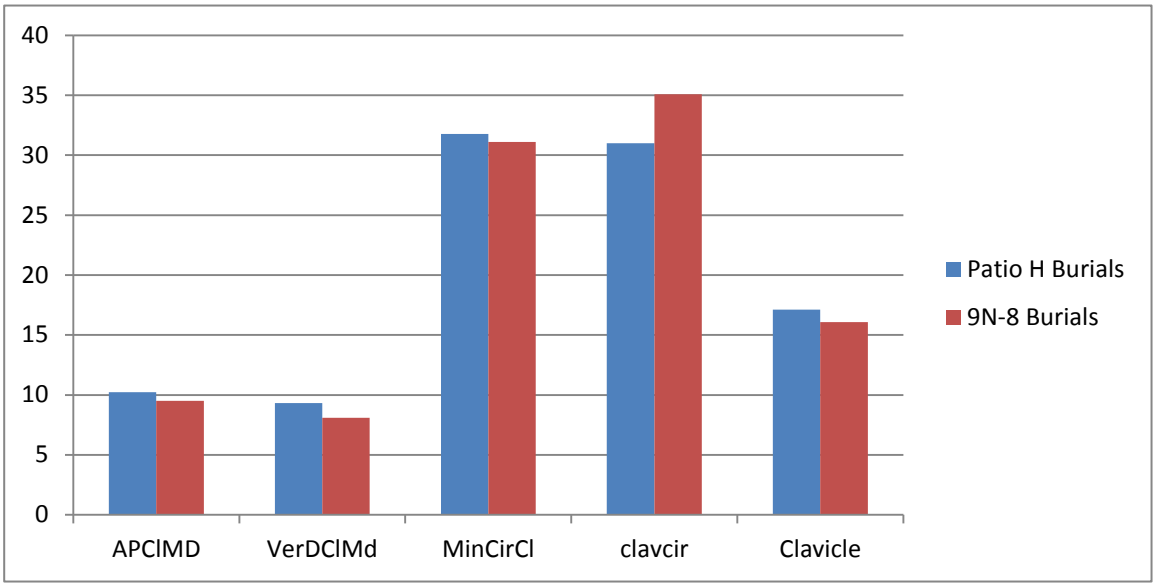

Figure 32: Female Clavicle Means

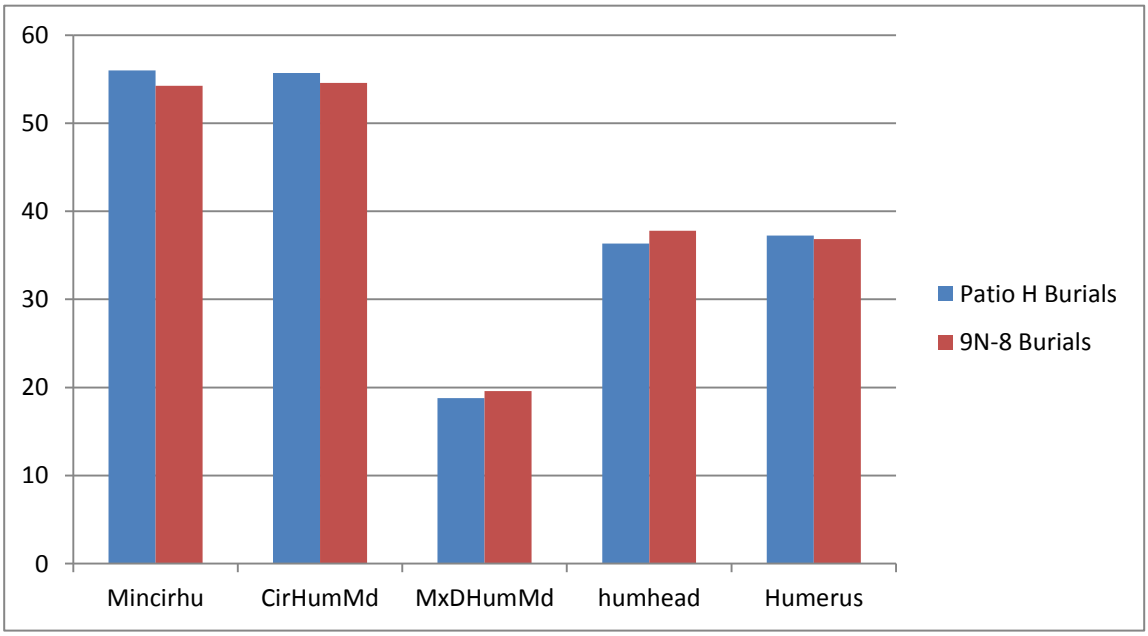

Figure 33: Female Humerus Means

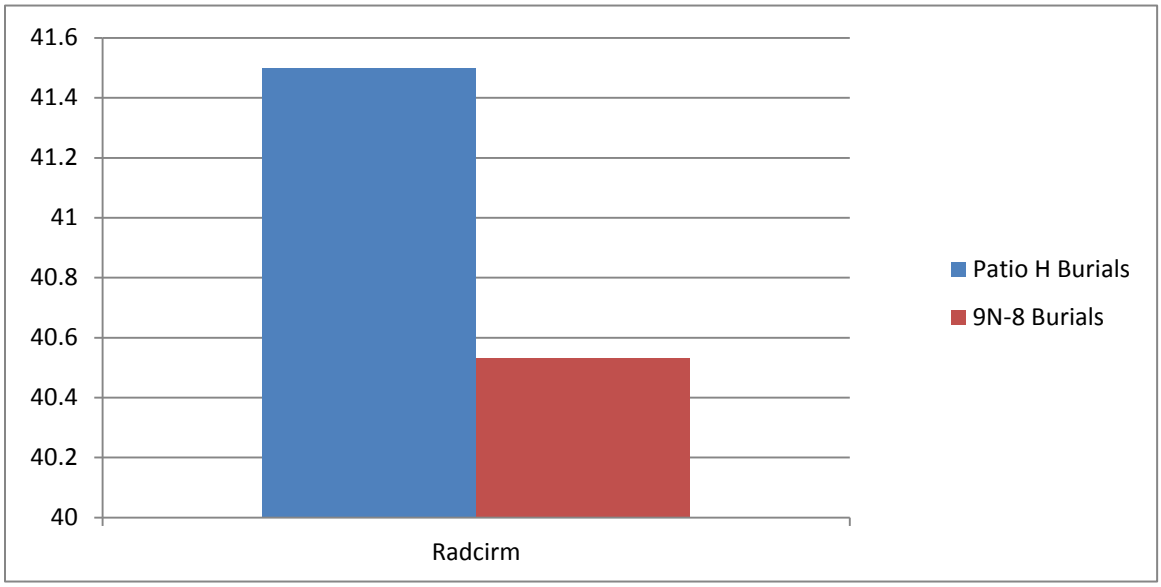

Figure 34: Female Radius Means

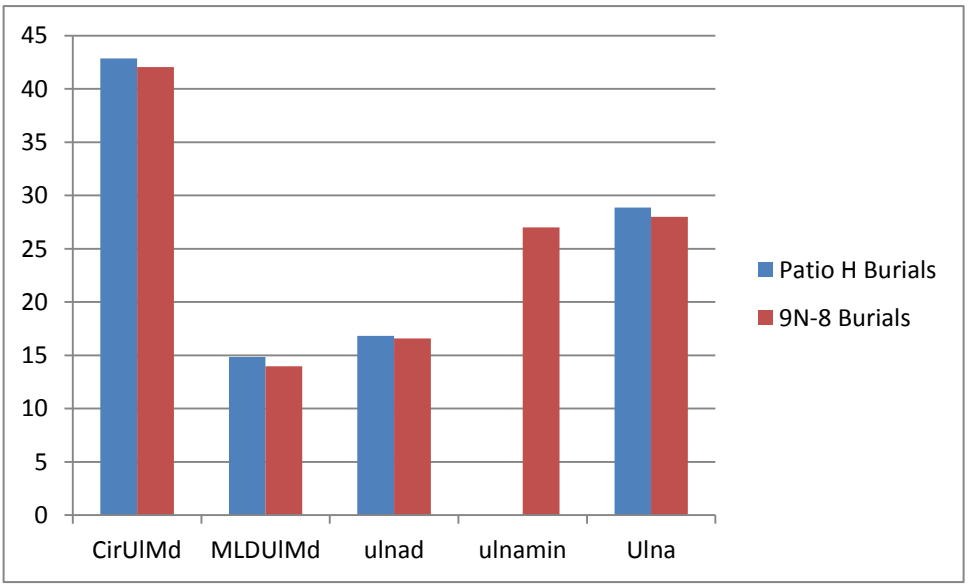

Figure 35: Female Ulna Means

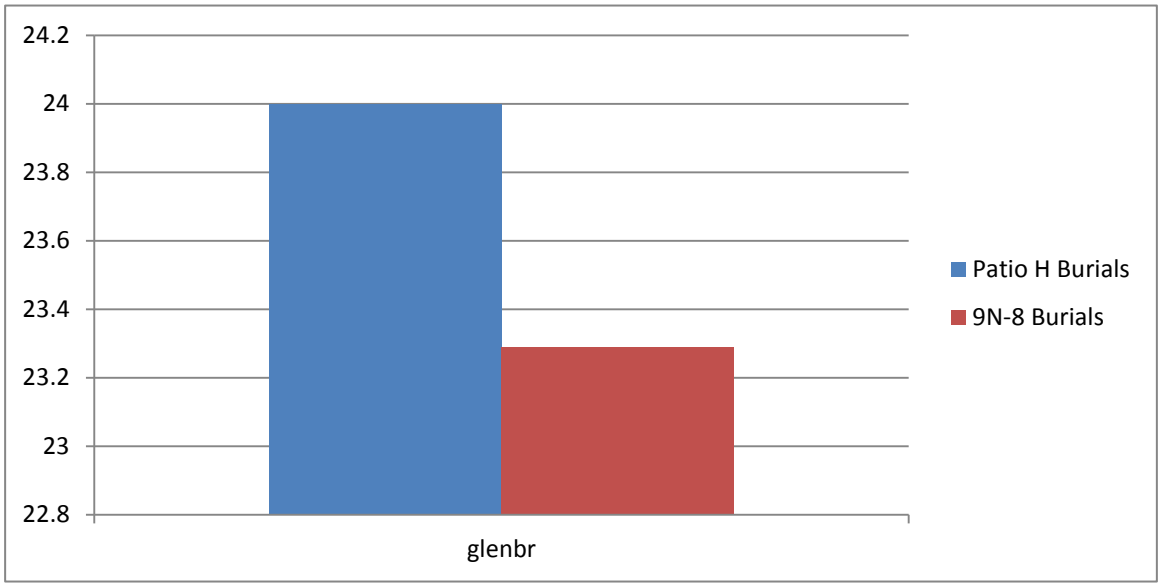

Figure 36: Female Scapula Means

VII.2 One-Way ANOVA

Males and Females

A One-Way ANOVA test was carried out for males and females of the workshop burials and 9N-8. Only one measurement for males and females is seen to differ significantly between the two groups with a probability of 0.037. The F-ratio for the vertical diameter of the clavicle at midshaft is high at 5.153. However, this measurement passed Levene's test at 0.701 and the Welch and Brown-Forsythe tests for robust tests of the equality of means at 0.059, a probability very close to significant. This variable is nowhere near significant in males.

The results from statistical analysis show that there is no difference between the workshop burial population and the 9N-8 population based on metric measurements of the

shoulders and arms. Observations of enthesophytes, enthesopathies, and osteoarthritis were used in addition to statistical analysis. Observations were taken for each individual and will be assessed for activity patterns based on these observations. All skeletal observations were recorded by Rebecca Storey and this study utilizes these observations.

VII.3 Skeletal Observations

Males

22-34: This individual was buried beneath Structure 110A. Judging by tooth wear and the auricular surface of the pelvis he was an older adult, possibly 50 years old. Stage 3 porosity was present in the lateral end of the clavicle. There was no porosity present on the glenoid, humerus, or ulna. Only slight porosity was present on the available hand bones. Arthritis was mostly present in the lower body of this individual. The thoracic vertebrae show Stage 4 osteophyte presence. The lumbar vertebrae displayed Stage 3 osteoarthritis. Muscle markings were considered to be present and the available long bones were robust in the legs.

22-36: This individual was buried beneath Structure 110A. Pelvic measurements indicate that this is an older individual. Very little porosity and osteophytic lipping are present on the humeral head and elbow. Stage 1 lipping exists on the ulna. Stage 1 lipping exists on several articular surfaces of the phalanges of the hand. Arthritis of the spine and lower body is more advanced than in the upper body. The acetabulum shows Stage 3 porosity and the femoral head shows Stage 3 lipping. Very little lipping and porosity in the knees and spine.

22-38A: This individual was buried beneath Structure 110A. According to tooth wear, this individual was middle-aged. Stage 3 lipping is present on the humeral head with slight porosity. The ulna has slight lipping and porosity on the lunar notch, but a very small amount. The hip and vertebrae display high degrees of osteoarthritis. The femur has Stage 3 lipping on the head. The lumbar vertebrae display Stage 4 osteophyte presence and even one fusion of one vertebrae to another.

22-40: This individual was interred in Tomb 4 in Room 2, beneath Structure 110B. Pelvic features place this individual in the middle-age range. The humeral heads and hands show slight porosity. When comparing the ulnae and radii, the right radius and ulna are larger. The right side's bones have more enthesophytes and muscle markings. A large enthesophyte is present on the right radius and curves of this bone are more square than round. The ulna has a pronounced interosseous crest and a bump near the distal end. Figure 37 shows the radius, ulna, and humerus, and the robusticity of the radius and ulna especially. The hip shows Stage 2 porosity and erosion on the acetabulum and femoral head. The distal end of the femur shows Stage 2 erosion and some porosity with Stage 1 erosion on the tibia and patella. Stage 4 erosion exists on the cervical vertebrae. Stage 2 lipping exists on some lumbar vertebrae.

Figure 37: Radius, Ulna, and Humerus of the male, 22-40

22-41: This individual was interred in Tomb 4 in Room 2, beneath Structure 110B. The clavicle and tooth wear indicate that this person was middle-aged at death. Stage 2 porosity is present on the clavicle. Stage 3 lipping and robusticity of the glenoid is also present. A large, spine is present on the vertebral border of the right scapula. This is larger than the normal projection. An extra projection and facet is present on the inferior edge resting on the sternum. The right humerus has Stage 2 porosity while the left has only light porosity at the elbow. At the elbow, the right ulna has Stage 2 porosity and the right radius shows Stage 3 osteoarthritis. The left radius shows earlier stages of osteoarthritis. The bones of the wrist show slight lipping on both the right and left sides. Both radii and ulnae show large ridges and enthesophytes. The phalanges show slight lipping and are "scooped" out at articulation points. The left phalanges show Stage 2 lipping while the right fingers have only slight lipping. Stage 2 and 3 lipping and porosity are present on every bone in the legs.

Every area of the spine shows between Stage 2-3 porosity and lipping. A Schmorl's node is present on a lumber vertebra and Stage 4 osteophytes are present on the thoracic vertebrae.

Females

22-21A: This individual was interred beneath Structure 110B. According to pelvic features and suture fusion this individual was likely in her early to mid-30s. Stage 1-2 lipping is present on the glenoid centers. Stage 1 lipping and porosity are also present on the humeral heads. Stage 1 lipping is present on the right hand, more so than the left hand. The rest of the body shows between Stages 1-2 lipping porosity. The knees, thoracic, and lumbar vertebrae show more advanced signs of osteoarthritis.

22-28A: This individual was interred beneath Structure 110B. She was likely middle-aged according to tooth wear. Very little bone was recovered from this burial but Stage 1 lipping at the distal end of an ulna is present. The recovered second metacarpal also shows Stage 1 porosity. The vertebrae display some porosity.

22-35: This individual was interred beneath Structure 110A. Pelvic features and tooth wear place this person into middle age or older. Stage 2 lipping and erosion is present on the glenoid. The humerus shows slight erosion at the proximal end. The distal end of the humerus is more robust at the trochlea with Stage 2. The radius and ulna show between Stage 1 and 2 osteoarthritis and increased thickness and robusticity. The right phalanges show Stage 2 and 3 lipping and Stage 1 on the left phalanges. Slight porosity and lipping also exists on the carpals. The legs and lumbar vertebrae show severe porosity and lipping. The acetabulum and femoral head show Stage 3 lipping and erosion. The distal end of the

femur displays Stage 4 porosity and erosion. Eburnation on the proximal end of the tibia is beyond Stage 4 with Stage 4 porosity. The distal end of the tibia shows Stage 3 lipping. The feet show Stage 2 and 3 lipping and porosity. The thoracic vertebrae show Stage 2 osteophyte development and some porosity. The lumbar vertebrae show extreme eburnation and erosion.

22-39: This individual was interred in the tomb beneath Room 2 of Structure 110B. Aged 18 or so years old due to cranial sutures and erupting third molar. The only evidence for osteoarthritis in the upper limbs exists on the hands. Stage 1 porosity and lipping is present on the phalanges. The legs, feet, and vertebrae show very little lipping and porosity, but it is present.

Chapter 8-Discussion

VIII.1 Discussion

No measurements of the shoulders or arms were determined to be significant between the workshop burial group and the rest of 9N-8 for males, according to the Student's t-test or On-Way ANOVA. Although some means of these measurements were larger for the workshop burial group: VerDClMd, Mincirhu, radcirm, ulnad, and glenbr, none of these were significantly larger than the 9N-8 group. The other metric and strength measurements were all larger for the 9N-8 population, although, not significantly so. Strength measurements for the clavicle, humerus, and ulna were all larger for the workshop female population compared to 9N-8 females.

Females also showed no statistically significant difference between groups. However, females from Patio H were larger than the 9N-8 population for more measurements than males. APClMD, VerDClMd, MinCirCl, Mincirhu, CirHumMd, radcirm, CirUlMd, MLUlMd, ulnad, and glenbr were all larger for the workshop sample.

The presence of osteoarthritis, enthesophytes, and increased robusticity were assessed for just the workshop burial group. Consideration of age was included in the assessment of each individual to determine if the presence of osteoarthritis was due to age alone or activity as well. Each individual will be reviewed.

22-34: Older male. Stage 3 porosity on clavicle, none on arm bones, and some on hands. Strong muscle markers. Advanced osteoarthritis arthritis in the spine.

22-36: Older male. Stage 0-1 porosity and lipping on humerus, ulna, and phalanges. Advanced osteoarthritis in the hips. Very little osteoarthritis elsewhere.

22-38A: Middle-aged male. Stage 3 lipping on humeral head, with slight porosity. Very small amount of lipping and porosity on lunar notch of ulna. The hip and vertebrae display advanced stages of osteoarthritis.

22-40: Middle-aged male. Humeral heads and hands show slight porosity. Right ulna and radius are larger and more robust than left with more enthesophytes and muscle markers. Stage 1 and 2 osteoarthritis in the legs and more advanced in the spine.

22-41: Middle-aged male. Stage 2 lipping on clavicle, Stage 3 lipping on glenoid with increased robusticity and enthesophytes. Stage 2 porosity on right humerus, with only slight porosity on left humerus. Right ulna and radius show Stage 2 and 3 porosity, respectively. Left radius, early stages of osteoarthritis. Both left and right radii and ulnae display large muscle markers and enthesophytes. Left phalanges show Stage 2 lipping, while right shows only slight lipping. Phalange articulation surfaces are "scooped: out." Advanced osteoarthritis in the spine and Stage 2-3 osteoarthritis in the legs.

22-21A: Female in her mid-30s. Stage 1-2 lipping on centers of glenoids. Stage 1 lipping and porosity on humeral heads. Stage 1 lipping on right hand, slight lipping on left. Some osteoarthritis in legs and spine.

22-28A: Middle-aged female. Stage 1 lipping on distal ulna. Stage 1 porosity on second metacarpal. Some porosity in vertebrae.

22-35: Middle-aged to older female. Stage 2 lipping and erosion on glenoid. Slight erosion on proximal humerus. Humerus is robust at trochlea with Stage 2 osteoarthritis. Radius and ulna between Stage 1 and 2 osteoarthritis with increased robusticity. Right phalanges show

Stage 2 and 3 lipping with Stage 1 on left. Slight porosity on carpals. Severe osteoarthritis in the legs and lower spine.

22-39: Young adult female. Stage 1 porosity and lipping on phalanges. None elsewhere in upper body. Very little osteoarthritis in spine and legs.

VIII.2 Activity Type

Five models were presented in Chapter One, Section Four that should provide an answer about the occupations of the people buried under the workshops of Patio H. Results from statistical analysis and observations will determine which model, if any, was the most reasonable to apply to these burials.

Model I states that the males and females buried in the tombs below Structures 110A and 110B were full-time craft specialists of elite goods, both ritual and secular, independent of traditional Maya gender roles. Men and women worked equally on crafting jade and marine shell, as well as weaving, hide working, and feather working. They did not participate in other daily activities such as food production and processing, or any other non-crafting activities. This model requires that shoulder and arm measurements be significantly larger in the workshop burial population than the 9N-8 population. Statistical analysis shows that males from the workshop burials were mostly smaller than other 9N-8 males and the strength measurements of the shoulder and arms were all smaller as well, although not significantly so. Females from the workshop burial population were larger in more areas and in shoulder and arm strength than other 9N-8 females, although not significantly so. Judging by the presence of osteoarthritis, enthesophytes, and robusticity

only two males could be considered to have significant activity-induced skeletal pathologies and features. Burial 22-40 is middle-aged with porosity on the humeral heads with a right forearm that was larger than the left. The ulna and radius were robust with developed enthesophytes and obvious muscle markers. Burial 22-41is middle-aged and shows middle to late stages of porosity and lipping on every bone of the shoulders and arms. The right arm bones show more advanced stages of osteoarthritis and increased robusticity over the left arm bones. Both radii and ulnae display larger-than-average enthesophytes. One female, Burial 22-35 is the only female considered to have activity-induced skeletal markers. Early to middle stages of porosity, lipping, and erosion are present in the shoulders, arms, hands, fingers, legs, and spine . Increased robusticity of the humerus at the elbow is likely another activity-induced feature. While males and females differ due to sexual dimorphism if both sexes worked equally in every craft activity, then the one female determined to have been a crafter would show more robusticity in her arms, more signs of enthesophytes, and more osteoarthritis. Model I was rejected, as both sexes do not display similar enough characteristics to have been considered equal opportunity crafters.

Model II states that the males interred below Structures 110A and 110B were lapidary craft specialists that carved and manipulated jade and marine shell objects. The females were weavers, hide workers, and feather workers. They were all full-time craft specialists with occupational roles allocated according to Maya gender and status norms. While not all of the males buried in the workshops of Patio H display signs of activity-induced skeletal features, two do. Burials 22-40 and 22-41 show higher rates of large enthesophytes, robusticity, and osteoarthritis compared to other male workshop burials.

The female, Burial 22-35, shows the most obvious signs of activity-induced skeletal features through more joint erosion, more advanced osteoarthritis, and increased robusticity in the elbow. Her markers differ in severity from the males as she would not have been a part of lapidary crafting activity. She would have kneeled or sat at a loom. Model II is accepted for these three individuals based on the presence of enthesophytes, robusticity, and osteoarthritis. Another model must be considered for the six remaining individuals.

Model III states that both males and females buried interred in Structures 110A and 110B were part-time craft specialists that participated in other elite activities away from crafting responsibilities. Perhaps crafting was done according to a calendrical cycle or for upcoming religious rituals that required newly created objects. Additional possibilities that fall under this model include only males being part-time crafters and only females being part-time crafters. Only one male, Burials 22-38A, could possibly be considered a part-time crafter. He was middle-aged at death, just like Burials 22-40 and 22-41, but he shows fewer signs of osteoarthritis in his arms. One female, 22-21A, displays similar levels of osteoarthritis in her shoulders, arms, hands, legs, and spine. She is younger than the female from Burial 22-35 but shows more signs of osteoarthritis than Burial 22-28A, a middle-aged female. Model III fits the male 22-38A and the female 22-21A based on skeletal characteristics. Four individuals will fall under one of the following models.

Model IV states that all of the people buried in these tombs were buried there for ancestor veneration purposes but were not craft specialists living in Patio H. Instead, they were elites from the high-ranked lineage that lived at Patio A. According to results, most people buried in the Patio H workshops were craft specialists of some kind. Only four individuals have yet to fall under one of these models as they do not show signs of activity-

induced skeletal features. Model IV was rejected as it does not hold true based on this study's findings.

Model V states that only some of the individuals buried in the tombs of the Patio H workshops were crafters of elite goods. They were crafters and deified ancestors buried alongside non-crafting deified ancestors. Two older males could not be considered craft specialists as their upper bodies do not show any signs of advanced osteoarthritis, enthesophytes, or robusticity. Their advanced age and lack of osteoarthritis in the upper limbs show that they did not participate in any strenuous upper body activity for an extended period of time during life. Two females show very little sign of osteoarthritis: one middle-aged female, 22-28A, and one young adult female, 22-39. Model V is accepted because it is obvious that several individuals were full-time or part-time crafters, and the remaining individuals were not crafters and therefore would not have lived in the workshops of Patio H. These people were all buried here for future generations to venerate them. Lineage ties likely linked high-ranking patio groups together, and the lack of elite burials in the higher ranked Patio A could mean that the non-crafters in the workshop burials were in fact the *Ahau* and scribe of Patio A.

Chapter 9-Conclusions

This study was designed as an attempt to apply bioarchaeological methods to a problem only looked at by archaeologists. This study sought to explain the existence of elite Terminal Classic burials beneath the craft workshops of 9N-8, Patio H. Were all of the people interred beneath these structures elite craft-specialists or were they deified ancestors placed here because of links to a high-rank lineage in a different patio?

Maintaining the use of Model V falls in line with Widmer's (2009) hypotheses. Craft production in the workshops of Patio H was slow with low output. Inefficient means of ritual good production with obsidian tools in the lapidary workshop would mean creation of a piece was time-consuming and difficult. Ritual goods would take more time to create than secular goods. Secular goods were also created in this location but with more efficient methods. Output would have been faster for secular craftsmen, and more mechanical stress was likely placed upon their bodies. It appears that three males buried beneath Structure 110B participated in the creation of these elite goods. Two males would have been full-time crafters according to the muscle markers and severity of osteoarthritis. The male part-time crafter could have been the creator of ritual goods at Patio H. His skeleton showed signs of upper body stress but not to the extent of the two other males believed to be crafters. Textile, feather, and hide modification was also likely a full-time endeavor. One female buried in Structure 110A appears to have been one of these crafters. However, another female may have been a part-time weaver or costume maker.

Patio H's link to Patio A exists through the presence of sumptuous goods in an offertory context. Artifacts of jade and marine shell have been found at Patio A that must have been created in Patio H because so far, it is the only elite and residential craft

workshop at 9N-8. Craft specialization within a defined area and the exchange of prestige goods outside of this defined area implies a kin based level of organization. The craft specialists of Patio H provided the *Ahau* of 9N-8 with ritual and prestige goods because they were linked by familial ties. According to Widmer, "In chiefdoms sacred elite craft production has a strong hereditary component" (Widmer 2009:195). The other males and females that were established to have been non-crafters supports Model V and Widmer's hypothesis that these two patios were linked. Patio A could have sent its members to learn how to craft. It is possible that a close relative of the *Ahau* from Patio H was the priestly artisan in charge of elite ritual goods (Widmer 2009:195). With a person of serious religious importance and high rank in charge of ritual production at Patio H, it is very likely that ancestors would be buried here, an area of ritual power, and be venerated as deified persons.

Statistical analysis showed no significant difference between burial populations based on metric measurements of the upper limbs. However, pathologies, differences in robusticity, and the presence of developed muscle attachments demonstrate the likely burial of five craft specialists beneath Structures 110A and 110B. The four other individuals were likely not crafters, based on skeletal observations, but relatives of those working at Patio H or Patio H.

The author acknowledges that this study was not without limitations. Many burials lacked the preservation necessary to record any measurements of certain bones. When only one individual could be analyzed for certain measurements, analysis of size and robusticity is not possible. That is why observations of osteoarthritis and entheseal differences were utilized in this study. Further research and archaeological identification of workshop burial

groups in the Maya area will add to the data and conclusions of this study. Bioarchaeological methods should be applied on appropriate populations to determine the effect of craft-specialization on the skeleton.

APPENDIX

Shoulder and Arm Measurements

Location: 1=9N-8

2=Workshop Burials

Measurement Definitions: See Chapter Six, Section Three

Males

Burial #	Location	ClavStr	HumStr	UlnaStr	mincirhu	radcirm	APDClMd	VerDClMd	MinCirCl
17-50	1		40.15	33.55	59	41			
17-19A	1	14.6	32.55	24.9	52	42	8.8	6.8	28.2
17-12B	1		42.75		63	46			
17-61	1		47		68				
17-21A	1					44			
17-8A	1	18.13	42.65	32.75	63	45	9.3	6.4	38.7
17-40	1				58	42			
17-36A	1				64	43			
17-3	1				60				
17-25	1				62	43			
17-21C	1			36.85	67				
22-41	2				57.5	44			
22-40	2	16.8	38.9	31.7	55	44	10.9	9.5	30
22-38A	2				70				
22-36	2				67				
22-34	2				64	48			
8-5	1				60	43			
22-14	1	21.47	44.3	30.9	63	43	13.5	9.6	41.3
15-42	1		39.8	31.35	56				
15-22	1	19.07	44.65	35.7	62	50	12.7	8.5	36
22-37	1			32.05	64				
22-09B	1	18.8	36.75	32.95	56	41	13	8.4	35
16-25	1		45		63	43			
16-23	1		43.95	32.45	63	49			38.8
15-3	1		42.95	33.75	58	41			
15-25B	1		39.8	33.85	59				
8-4	1	17.37	47	36			8.1	9	35
22-15	1		37.4	30	52	37			30.5
21-1a	1	20.5	43.35		63		11.5	12.2	37.8
8-1	1					41.5			
4-13	1					48			
22-11	1				58				
16-04	1				54	47			
15-66	1				68				
15-51	1				62	47			
15-47	1				64	52			
15-43	1				64	57			

15-23	1				63	46			
15-20	1				66	45			
15-17	1								
13-04a	1					48			
13-01	1					46			
04-10	1				62	48			

Burial #	CirHumMd	MxDHumMd	CirUlMd	MLDUlMd	ulnad	glenbr	clavcir	humhead	ulnamin
17-50	61.3	19	50.8	16.3	19.5			41	
17-19A	49.2	15.9	37.5	12.3	13				
17-12B	65.2	20.3			19.5			39	
17-61	69.8	24.2							
17-21A			55.5	18.2	19				
17-8A	63.8	21.5	48.8	16.7	19	24.5		42	
17-40								41.5	
17-36A					21	25.5		41.5	
17-3					22				
17-25					20				
17-21C									
22-41					20	28.5	36		
22-40	57.7	20.1	47.2	16.2			31		
22-38A					20				
22-36					22		41		
22-34							38		
8-5								43.5	
22-14	65.7	22.9	46.2	15.6	20			44	
15-42	59.5	20.1	47.5	15.2					
15-22	67	22.3	54	17.4	21.5		41	45	
22-37			49.3	14.8			36		
22-09B	55.8	17.7	49.7	16.2	19			46.5	
16-25	67.2	22.8			21	25.5		45	
16-23	66.5	21.4	49.2	15.7			40		
15-3	64.5	21.4	51	16.5	17.5		36		
15-25B	60.2	19.4	50	17.7					
8-4	70	24	53	19		27.5			
22-15	55.7	19.1	44.7	15.3					
21-1a	65	21.7		16.2			38		
8-1							34		36
4-13									
22-11									
16-04							33		
15-66									
15-51					21		39		
15-47							38		
15-43					18		41	40	
15-23									
15-20									

15-17						24			
13-04a					20.5				
13-01									
04-10					18.5	27.5	39	45.5	

Females

Burial #	Location	ClavStr	HumStr	UlnaStr	mincirhu	radcirm	APDClMd	VerDCLMd	MinCirCl
17-59	1				66				
17-57	1								
17-56	1	16.53	37.1	26.25	52	36	8	9.9	31.7
17-48	1		31.25		52				
17-39	1	17.63	36.3	26.35	53		11.6	8	33.3
17-36B	1		40.95	28.7	54	38			
17-31	1	16.53	35.5	28.95	50	36	10.2	7.4	32
17-10	1			30.7					
17-7	1				56	42			
17-6	1								
17-4A	1				49				
17-47	1				56				
17-34	1				58	43			
17-20	1				62	46			
17-2	1				48	35			
17-11	1				58	38			
22-21A	2	17.9	37.45	29.4	56	42	10.1	10.1	33.5
22-35	2	16.35	37.05	28.3		41	8.5	8.8	31.8
22-39	2	17.07					12.1	9.1	30
22-28A	2								
16-27	1	16.27	39.5	31.3	56	42	10.1	7.9	30.8
16-24	1	16.57	41.15	30.95	57	54	10.1	8.6	31
15-65	1		36.95	25.65	52				32.2
15-62	1			27.3		49			
15-52	1	15.73	37	27.3	54	40	10.2	8	29
15-35B	1		37.45	28.2	54	44			
15-29	1		36.5	27.4	54	46			
15-10	1	15.87	37.2	27.15	54	42	10.4	7.2	30
16-15	1			31.7	53	39			
16-10	1		39.25		55				
15-54	1		39.15	27.8	58	46			32
15-40	1				55	43			35
15-21	1				57	42			
15-11	1	18.57		30.7	59	42	9.6	10.1	36
13-07	1	14.6	35.75	28.6	52	38	8.6	7.2	28
13-04b	1	16.3					10.2	8.2	30.5
13-03	1								
13-02	1	15.43	34.5	25.15	48		9.6	7.7	29
8-34	1				52	36			
8-2	1				56	42			
22-42	1								
16-2	1				52				

16-01	1				50				
15-64	1				56				
15-63	1				54	43			
15-6	1				58				32.5
15-30	1					44			
15-28	1				53	38			
15-18	1				61				
13-10	1								
22-10B	1		43.3	31.3	55	36			
22-10A	1	14.8	32.5	25.6	46	32	9	7.2	28.2
22-23	1	15.07	32.25	24.6	46	36	7.9	7.6	29.7
22-24	1	14.87	32.9	24.9	46	34	8.1	7.8	28.7
22-26A	1	16.23	37.3	26.85	57	34	8.9	8.5	31.3
22-25	1				58	41			

Burial #	CirHumMd	MxDHumMd	CirUlMd	MLDUlMd	ulnad	glenbr	clavcir	humhead	ulnamin
17-59									
17-57		26.5							
17-56	55.2	19	40	12.5			32		
17-48	47.3	15.2							
17-39	54.7	17.9	40	12.7	15				
17-36B	54	27.9	42.7	14.7				37	
17-31	53.3	17.7	43	14.9	16.5	23			
17-10			44.8	16.6		21			
17-7					18	24		38.5	
17-6					21.5				
17-4A									
17-47								36.5	
17-34								39.5	
17-20					19.5				
17-2					14.5				
17-11					18	23.5			
22-21A	56.2	18.7	43.5	15.3	17	24		39	
22-35	55.2	18.9	42.2	14.4	16.5		31	34	
22-39					17				
22-28A								36	
16-27	58.7	20.3	46.7	15.9	18.5		35		
16-24	61.5	20.8	45.8	16.1		23.5	36	36	
15-65	54.8	19.1	41.7	9.6			36		
15-62			40.5	14.1	15.5				
15-52	55	19	41	13.6			32		
15-35B	55.5	19.4	42	14.4	18	25	32		
15-29	55.5	17.5	41.5	13.3	18				
15-10	54.5	19.9	40.5	13.8	15.5	23	37	37	
16-15			47.7	15.7					
16-10	58.5	20							
15-54	59	19.3	41.5	14.1	15.5	24	36	38	
15-40							39		
15-21	58	19.7	44	13.4					
15-11			45	16.4	14.5	23	34	40.5	
13-07	53	18.5	43	14.2	16				

13-04b					15.5	23			
13-03					15.5				
13-02	52	17	37.5	12.8	14			36.5	
8-34									27
8-2					18				
22-42					17	22.5			
16-2									
16-01									
15-64									
15-63					15		33		
15-6					17		34		
15-30						23	38	39	
15-28									
15-18							37		
13-10					17	22.5			
22-10B	58	28.6	46.7	15.9	17				
22-10A	49.2	15.8	38.7	12.5	18	23			
22-23	48.5	16	36.7	12.5	15.5	21.5		31	
22-24	49.8	16	38.3	11.5	14	21.5		35.5	
22-26A	54.8	19.8	39.7	14	16	29		39	
22-25								45	

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