BIOARCHAEOLOGY OF JÍCARO: ANALYSIS OF HUMAN SKELETAL REMAINS AND MORTUARY PRACTICES AT A SAPOA PERIOD (A.D. 800/900-1350) SITE IN GREATER NICOYA

By

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ABSTRACT

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This dissertation presents a bioarchaeological study of Jícaro, a village site located on Costa Rica's northwestern coast in the Guanacaste province. Jícaro is located on the Papagayo Peninsula, which forms the northern and northwestern boundaries of the Bahía de Culebra, along the shores of which approximately 60 archaeological sites of varying sizes and periods of occupation have been identified. The Bahía de Culebra and the sites surrounding it are located within an archaeologically defined subregion of the Intermediate Area, the geographical region between Mesoamerica to the north and the Andean cultures to the south, known as Greater Nicoya. Jícaro was occupied between A.D. 800/900 and 1350, according to radiocarbon dates and ceramic typologies. During this time in prehistory, there was substantial interaction between the region in which Jícaro was located and societies to the north and south through extensive land and maritime trade networks. Many researchers also believe that during this time there was an influx of Mesoamericans—or at least an influx of Mesoamerican cultural influence—from the north into Greater Nicoya, based on linguistic and archaeological evidence and changes in mortuary behavior.

Salvage excavations at Jícaro and subsequent laboratory analysis of the artifact assemblage were carried out by archaeologists Felipe Solís Del Vecchio and Anayensy Villalobos Herrera and their team between 2005 and 2008. Excavations at Jícaro yielded a number of distinct habitation and activity areas in addition to 237 burials, with a minimum of approximately 440 individuals, of which 308 were analyzed for the purpose of this research. The research presented in this dissertation builds on analyses of the artifacts and burial treatments conducted by Solís and Herrera, incorporating analyses of the demographic characteristics of the population from Jícaro, an assessment of skeletal markers of health, stress, pathology, trauma, and cultural modifications, and a comparison of the results of the skeletal

analysis with burial treatments. The findings from the bioarchaeological analyses of Jícaro are then compared with published data on the mortuary practices and skeletal analyses from Nacascolo, a nearby, a thoroughly researched archaeological site that had a period of occupation that was contemporary with occupation at Jícaro.

Results of the mortuary analysis at Jícaro, incorporating intra- and inter-site analyses, confirm that mortuary practices at Jícaro are characteristic of the Sapoa Period in the Greater Nicoya region. Skeletal and mortuary data from Jícaro show that this was a relatively egalitarian community with little differentiation among individuals in their burial treatments, except for several classes of grave goods that appear to have been reserved for a particular sex or age cohort, and indications that subadults were more likely to be buried without grave goods than adults. The population appears to have been relatively healthy, except for evidence of a systemic infection among several individuals, possibly related to congenital treponemal infection. Burial practices and cultural modifications at Jícaro are similar to other sites in the immediate vicinity. Differences between burial practices at Nacascolo and Jícaro may be the result of sampling bias at both sites, but they could reveal localized, possibly community-based, decisions regarding social identity and social interactions. While there does appear to be a Mesoamerican presence at the site, the same evidence in support of direct Mesoamerican contact and influence could also be interpreted as evidence for local adaptations with more limited Mesoamerican interaction. Future research at Jícaro should involve molecular and trace element/stable isotope analyses to further explore issues of population relatedness and migration.

To my family.

Dad, Mom, Pete, Julie—Thanks for always believing in me even when it seemed like I might fail, for all of the support, and for being such an altogether amazing family.

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The archaeological data and skeletal material that form the basis of this project were graciously made available by archaeologists Felipe Solís Del Vecchio and Anayensy Villalobos Herrera and by Marlin Calvo, Director of the Departamento de Protección de Patrimonio Cultural at the Museo Nacional de Costa Rica (MNCR). Without their permission to work with the data and the skeletal collection, their generosity regarding laboratory space, time and equipment, and their patience and support, this dissertation project would not have been possible. The Jícaro project was funded by the Ecodesarollo Papagayo S.A., which supported all archaeological fieldwork and subsequent laboratory work (cleaning and temporary storage of artifacts, analysis of excavated material, and involvement of specialists). The primary investigators, Solís and Herrera, made all of their maps, photos, data spreadsheets, and field reports available to me, which were instrumental for every phase of this project. The data collection for the 2008 laboratory season for this project was made possible by a Tinker Field Research Grant, and additional funds were provided by the MSU Department of Anthropology during the 2013 data collection season. All maps in this document were created using ArcGIS® software by Esri.

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Chapter 1: Introduction

Introduction

This research involves the bioarchaeological study of Jícaro, a village site located on Costa Rica's northwestern coast in the Guanacaste Province, with a period of human habitation dating to between AD 800/900 and AD 1350. The site was discovered in the late 1970s by a team of archaeologists led by Frederick Lange, and was excavated by archaeologists Felipe Solís Del Vecchio and Anayensy Herrera Villalobos and their team over three field seasons in 2006, 2007, and 2008. The research presented in this dissertation builds on data and interpretations collected and presented by Solís and Herrera in their site reports (Solís and Herrera, 2007; 2009), and is intended to contribute to a general understanding of Jícaro and its inhabitants. This research incorporates archaeological data made available by Solís and Herrera with data collected directly from the skeletal remains recovered from Jícaro in order to present a multifaceted bioarchaeological study of the site, including the analysis of human skeletal remains, mortuary practices, the spatial distribution of biological and funerary characteristics of the population, and an inter-site comparison with another large archaeological site located nearby.

Bioarchaeology in Central America

There are a number of limitations to this type of study. Bioarchaeology in Central America is complicated because of a number of confounding factors, including generally poor preservation of skeletal material, small sample sizes, sampling bias, and access to skeletal collections. The tropical environment is hostile to the preservation of human skeletal remains, often limiting the questions that can be asked and answered concerning the human biological response to environmental and cultural influences (Hardy, 1992; McCafferty et al., 2011; Obando, 1995; Ubelaker, 1995; Wrobel, 2015). Additionally, as Wrobel (2015) mentions, the recovery and documentation of archaeological remains is often inconsistent, with a great deal of inter- and intra-observer error and a lack of standardization in methods. Wrobel's work focuses on the Maya region, but the same can be said about archaeology throughout Central America. There is also a great deal of salvage archaeology in the region, which affects the research agendas and collection strategies of archaeologists. Wrobel (2015) points out that access to skeletal collections also contributes substantially to the complicated nature of bioarchaeological studies in the Maya and Central American regions. Collections are often housed at universities or museums which affects research agendas in two ways: 1) the universities and museums have control over how the collections are used and therefore may strongly influence research questions; and 2) much of the research concerning the region focuses on certain sites/collections and largely ignores others, simply because some are more readily accessible while others are more restricted as a function of where the artifacts and skeletal remains are curated (Wrobel, 2015).

Jícaro

Jícaro is an archaeological site named for the beach on which it was discovered (Solís and Herrera, 2009), situated toward the western extremity of the Papagayo Peninsula, which forms the northern shore of Bahía de Culebra (Bay of Snakes), a small protected bay on Costa Rica's northwest coast. Jícaro is one of approximately 60 archaeological sites discovered during an extensive survey expedition led by Frederick Lange between 1977 and 1979 (Abel-Vidor 1980; Hardy 1992; Salgado and Vázquez 2006; Vázquez 1980; Herrera and Solís, 2009). Sites along the shores of the bay vary in size from small seasonal settlements to large villages with extended periods of human occupation. Jícaro is among the handful of larger sites determined to have substantial archaeological significance because of their size and duration of occupation.

Jícaro encompasses approximately 4.9 hectares in total area, and is among the largest known archaeological sites in Costa Rica. The long axis of the site is oriented north-to-south; it is bounded on the west by a large, steep hill and on the east by a beach on the shore of Bahía de Culebra. Four seasonal streams divide the site into five subareas, and it is hypothesized that the naturally occurring subareas may have been distinct social or industrial areas during Jícaro's occupation (Herrera and Solís, personal communication). Jícaro is a village site that presents a range of activity and habitation areas, and has a substantial mortuary component. Two hundred thirty-seven burials have been recovered from the site, with an MNI of approximately 440, representing one of the largest burial samples known in Central America. Human occupation at the site is confidently dated within the Sapoa Period (AD 1000 and AD 1350), with possible periodic habitation in the centuries immediately prior to and following the main occupation period (Solís and Herrera, 2009).

While some of the issues inherent with bioarchaeological studies in Central America affect Jícaro, such as differential (often poor) preservation of skeletal material and the salvage nature of the excavation project itself, it is free of many of the other confounding issues. The Museo Nacional de Costa Rica (MNCR) and archaeologists Solís and Herrera have been extremely generous with permission and granting access to the skeletal collection and original archaeological data for the purpose of this research and the quality of the excavations, even though they are limited with regard to the total area of the site that was excavated, were careful, thorough, and well documented.

Research Goals

The main goal of this research is to characterize the population from Jícaro with regard to its demographic composition and mortuary practices, as this is the first large-scale physical anthropological study conducted on the skeletal collection. A paleodemographic study of Jícaro has the potential to serve as a means for exploring mortality, fertility, population dynamics, and how the population interacted with and reacted to the local environment (Meindl and Russel 1998). A paleodemographic analysis also "integrates information concerning the settlement patterns with population structure, thus providing additional insights into the social system of the group" (Green, Green and Armelagos 1974:

297). The mortuary analysis and spatial analysis of the site have the potential to answer questions about group identity and social structure.

A secondary goal for this research is to explore of the plausibility of the assumption that there was an influential Mesoamerican migration into Central America during the first millennium A.D. by examining the relationship between skeletal indicators of health and activity, mortuary practices, and evidence of Mesoamerican cultural identity in the Gran Nicoya region of northwestern Costa Rica. A central aspect of the evaluation of Mesoamerican migrations into Greater Nicoya is the issue of Mesoamerican identity. This study involves an exploration of Mesoamerican identity and the observable biological and social data that may indicate its presence or absence at Jícaro and other sites in the Greater Nicoya region.

Identity, according to Knudson and Stojanowski (2009) is not simply a matter of where people or their ancestors originated. Rather, the identity of past people is what resulted from individual and group perceptions of who people thought they were, how they expressed that to others, and how they were perceived by others (Knudson and Stojanowski, 2009).

Organization of Chapters

The focus of this research is Jícaro and situating the site within the local region regarding the health and demography of its population and the mortuary practices and use of space apparent at the site in order to answer larger questions about the site's social structure. Chapter 2—Background and Research Questions begins with a discussion of the archaeological region in general, describing Mesoamerica and theoretical approaches to archaeological research in the region, then moves on to discussions of increasingly specific regional and sub-regional areas of study, eventually presenting detailed descriptions of the two sites analyzed as part of this research—Jícaro, this project's primary focus, and Nacascolo, a nearby site included as a comparative sample. This chapter also includes discussions of theoretical approaches to the study of identity, bioarchaeology, and mortuary analysis, stressing the importance of multifactorial research and spatial analysis, followed by a brief discussion of the limitations of the data that complicate such analyses, and the presentation of the research questions that guided this research.

Chapter 3—Materials and Methods is a presentation of both the available skeletal data and the available mortuary data used to complete this study. The chapter begins with a discussion of the burial and skeletal data from Jícaro, followed by the presentation of the data and data source for the comparative sample from Nacascolo. Following the introduction of the data sets, the chapter presents methods for data collection and analysis, including sampling strategies, assessments of completeness and inventory, and skeletal data collection methods for age-at-death, sex, cultural modifications (e.g., dental modification), activity, and health. The chapter ends with a presentation of the methods used for statistical and spatial analyses of the data.

Chapter 4—Results of Skeletal Analysis is a presentation of the results of qualitative and quantitative analyses of the skeletal sample from Jícaro. First, the results of the demographic study are presented, followed by a discussion of the relationships between age-at-death and sex and the skeletal indicators of health, activity, and cultural affiliation. The chapter ends with a summary of observations of isolated crania that were discovered with some of the burials—these crania were not included in the demographic assessment of the population, but were considered to be separate individuals by the archaeologists and therefore warranted specific attention.

Chapter 5—Statistical Analysis of Mortuary Practices at Jícaro presents the analyses of the relationships between demographic variables and the treatment of the individuals in death, as well as evaluations of relationships between the mortuary variables themselves, including body disposition (flexed/extended), body position (supine/prone), arm position, leg position, head orientation, and a presence/absence level discussion of the types of grave goods associated with the burials.

Chapter 6—Spatial Analysis of Jícaro is a presentation of the analysis of the spatial distribution across the site of observations of demographic, health, and activity-related characteristics as well as mortuary treatments and differential treatments possibly rooted in the observed biological characteristics. The chapter presents a cluster-based approach to spatial analysis, as opposed to an analysis based on individual graves, for various reasons associated with limitations inherent in the data from Jícaro.

Chapter 7—Osteobiographies presents five individualized analyses/discussions of people from Jícaro. Statistical analyses can reveal a lot about archaeological sites and past populations, but the individuals often get lost. Osteobiographies bring the humans back into focus and provide discussions of their specific burial treatments, health conditions, and possible life experiences.

Chapter 8—Inter-Site Comparison places data and analysis from Jícaro into conversation with data and analyses from Nacascolo. Nacascolo is a well-studied, well understood site with an episode of habitation that would have been contemporary with occupation at Jícaro. This chapter compares the demography of both skeletal samples as well as the mortuary practices from the two sites, noting areas where they are similar and different, in order to situate Jícaro within the local region.

Chapter 9—Discussion and Conclusions summarizes the research project, then moves through a discussion of identity and the possible connections between Jícaro and Mesoamerica, followed by conclusions about the population at Jícaro. This chapter ends with a brief discussion of the limitations of this study and a presentation of possible future research directions.

Chapter 2: Background and Research Questions

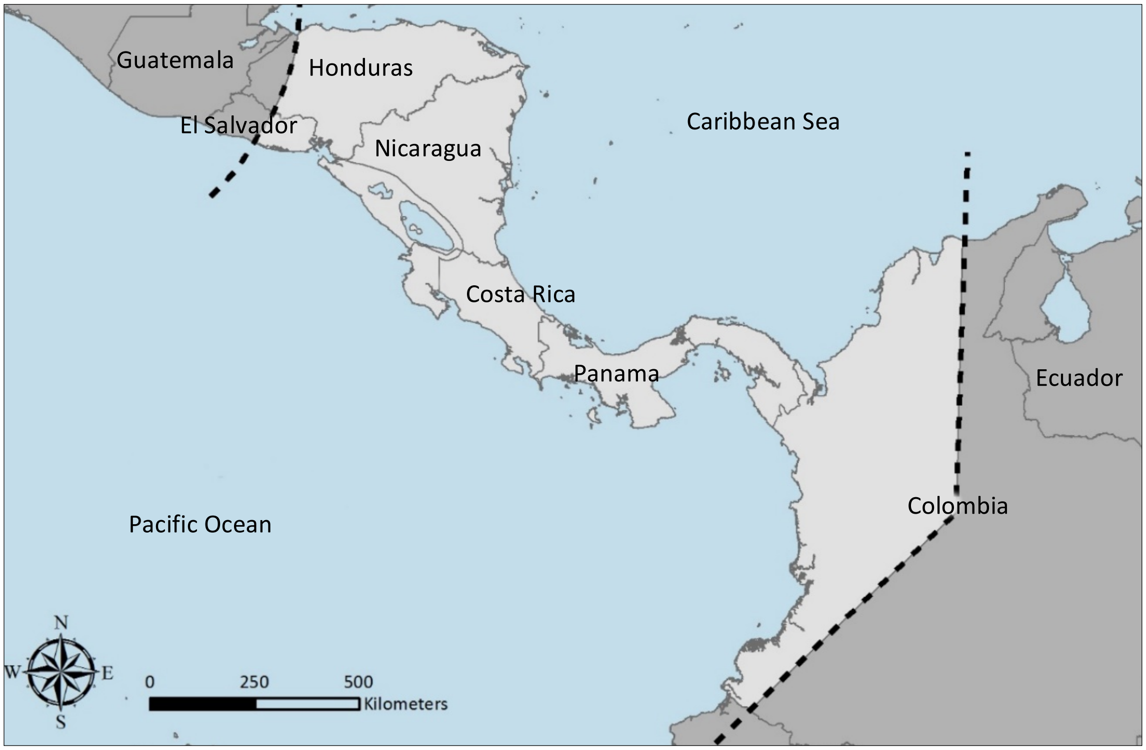
Introduction

This research focuses on an analysis of the demographic composition (including indicators of health and activity) and the mortuary practices of the population that inhabited Jícaro, an archaeological site in northwestern Costa Rica that was inhabited ca. A.D. 800/900 and A.D. 1350. By combining skeletal analysis with an analysis of the burial practices and use of space at the site, this study explores questions related to population dynamics, social structure, and Mesoamerican identity. To contextualize Jícaro geographically, this chapter will begin with a discussion of Central America and the Intermediate Area, followed by a brief discussion of Mesoamerica and its relationship to pre-Colombian Central America and the smaller sub-region where Jícaro is located. Once the site is contextualized geographically, this chapter will present theoretical approaches that are central to this research, followed by a review of the research questions that guided data collection and analysis.

The Intermediate Area

The modern countries of Honduras, Nicaragua, Costa Rica, Panama, Ecuador and Colombia compose the Intermediate area, a geographical/cultural area where human occupation can be dated to as early as 1500 B.C. The Intermediate Area is situated between the pre-Colombian complex societies of Mesoamerica and the Andes, with no relation to modern political boundaries (Lange, 2001). The region lacks many of the features that characterize the areas to its north and south—the development of complex societies, strongly developed temporal horizons, and the basins that may have contributed to concentrations of large populations in prehistory. Rather, the Intermediate Area had its own characteristic cultural development that involved smaller, sub-regional groups that were largely independent, although archaeological evidence suggests they were not without contact (Lange, 2001).

Figure 2.1: Map showing the Intermediate Area (light grey).



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Nicaragua, Costa Rica, Panama, and the northern pacific coast of South America are often considered separately from Mesoamerica and the Andean cultures because pre-Colombian societies in those areas fit more closely with the popular definitions of tribes or chiefdoms, and they never saw the development of state-level societies. Areas outside of complex states are often then classified as peripheries, with the implication that they are in some way “shadows” of those larger societies (Schortman and Urban 1994), which seems to fit the way the Intermediate Area is often viewed. That type of sweeping generalization ignores potentially complex interregional sociopolitical interactions (Schortman and Urban, 1994), and as Drennan (1996) points out, there would have been a substantial amount of complexity and diversity in the region.

State-level societies, like the ones seen to the north and south of the Intermediate area seem to develop out of an apparent need for regulation and protection of the smaller units associated with them; therefore, it is possible that the societies in the Intermediate area may have remained relatively less complex because they were more stable and sustainable and never experienced the needs that would call for the state to develop (Drennan, 1996). Earthquakes and volcanic eruptions are extremely common throughout the intermediate area, as well as in the regions to the north and south, and as Sheets et al. (1991) suggest, it is possible that the pre-Colombian populations in the intermediate area may never have developed large architectural centers or allowed themselves to become dependent on a limited number of cultigens and long-distance trade networks as an adaptation to facilitate returning to "normal" following catastrophic events, such as volcanic eruptions.

Mesoamerica

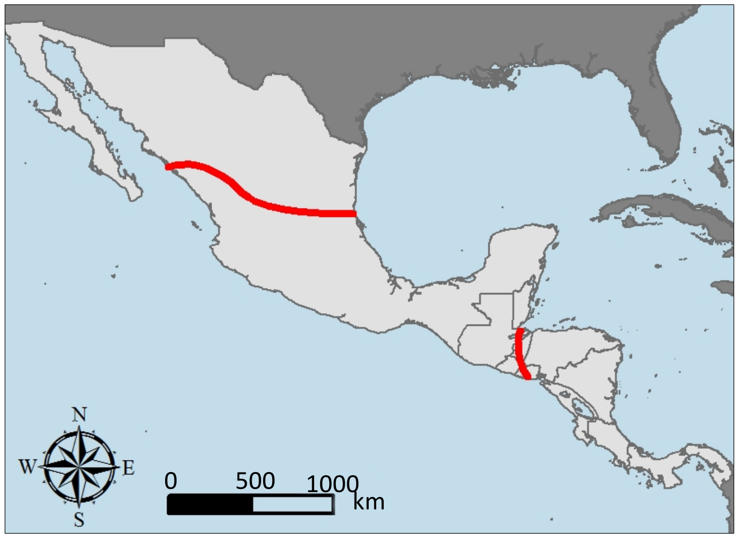
"Mesoamerica" is a rather broadly applied term encompassing and somewhat homogenizing cultural, linguistic, ecological, geographic and temporal characteristics of the many pre-Colombian populations that occupied Mexico, Guatemala, Belize, El Salvador, parts of Honduras, and northern Central America. Boundaries of the Mesoamerican region have been defined and discussed according to various approaches. Perhaps the most widely accepted model for Mesoamerica as a region was developed by Kirchhoff in 1943 (English translation 1966). Kirchhoff looked to define the northern and southern borders of Mesoamerica according to a trait-based analysis, listing traits that he saw as unique to Mesoamerica, those that are common to Mesoamerica and other American regions, and those that are not found in Mesoamerica. Palerm and Wolf (1957) theoretically defined and subdivided Mesoamerica according to climatic/ecological boundaries. They note that the cultural divides do not always fall along the same boundaries as ecological divides, and where that is the case, the boundaries appear to fall along military and political lines, rather than environmental ones. According to Kirchhoff

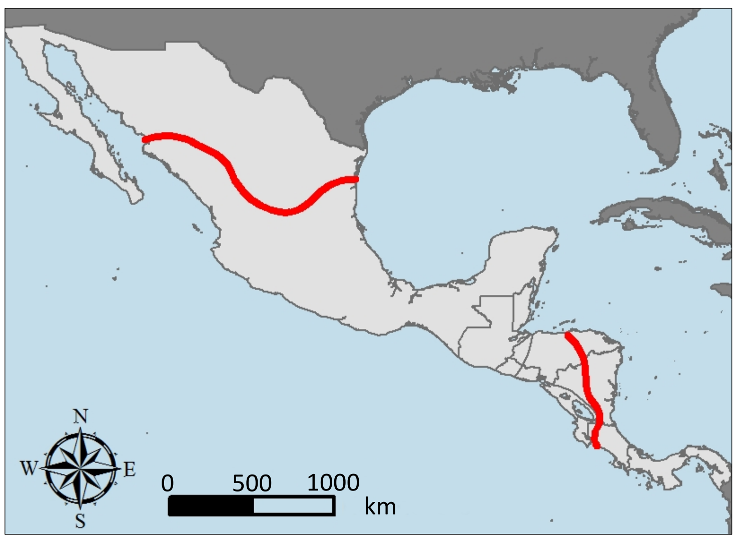
(1943, English translation 1966), contrary to the theoretical approach presented by Palerm and Wolf (1957), the boundaries of Mesoamerica follow modern linguistic divides more closely than they follow cultural or ecological ones.

In 1987, Creamer aimed to define “Mesoamerica,” particularly as the term applies to Central America. Her comparisons are based largely on archaeological evidence, and much less on language or trait similarities/differences. Creamer discusses the various theoretical approaches that previous researchers had used to evaluate relationships among Mesoamerican groups, and concluded that the term, “Mesoamerica,” is relatively fluid—its definition can and does change with various research objectives and theoretical approaches. While many scholars limit Mesoamerica to include areas only as far south as Honduras, Michael Coe’s definition of Mesoamerica extends the southern boundary as far south as Costa Rica (Coe, 1962). Coe bases his argument on linguistic and ethnographic evidence, noting that both indicate Mesoamerican origins for the ancient languages and cultures of northern Costa Rica (at least those that were documented by the Spanish upon their arrival). For example, Chorotegan and Nahua groups were most prevalent in Costa Rica at the time of Spanish contact (ca. 1522), whereas Chibchan language groups, which are more typically associated with northern South America, dominated Central America only as far north as southern Costa Rica.

The regional focus of this research is a small, archaeologically determined area known as Greater Nicoya (discussed in more detail below) that spans portions of southwestern Nicaragua and northwestern Costa Rica. For the purpose of this study, when “Mesoamerica” is referenced, the focus will largely be on the Maya, as it is the Maya and their descendants who are believed to have migrated southward into Central America near the middle of the first Millennium, A.D., bringing with them the language, culture traits, and iconography that are so prevalent in the archaeological record of Greater Nicoya.

Figure 2.2: Mesoamerica according to Kirchhoff (1943) and Creamer (1987), top, and Mesoamerica according to Coe (1962), bottom.





 These maps were created for use in this dissertation by J. Welsh, MSU Department of Geography, RS&GIS (2016).

Greater Nicoya

Greater Nicoya (Spanish: Gran Nicoya) is an archaeologically defined sub-region at the southernmost extremity of Mesoamerica (Coe 1962), spanning small areas of southwestern Nicaragua and northwestern Costa Rica. In 1964, Albert Norweb defined Greater Nicoya as a distinct archaeological region (Figure 2.3, following page) based on the distribution of certain ceramic types that are found almost exclusively in that area (Norweb 1964; Salgado and Vázquez 2006).

Following Norweb, Salgado and Vázquez (2006) and Lange (2006) contend that before A.D. 800, cultural development in Greater Nicoya experienced little Mesoamerican cultural influence, but after approximately A.D. 800, there was a strong Mesoamerican presence in the area, particularly evidenced by Classic Maya ceramic motifs. Because of notable differences among artifact distributions, mortuary treatments, and settlement patterns between the Nicaraguan and the Costa Rican portions of Greater Nicoya, it is often discussed in terms of two sub-regions: a northern sector (southwest Nicaragua) and a southern sector (northwest Costa Rica) (Lange 1984; Salgado and Vázquez 2006). This research is mainly concerned with the southern sector of Greater Nicoya, in Costa Rica's Guanacaste province.

Much of the archaeological work in Greater Nicoya has sought to address two main issues: the sequence and timing of the migrations by Mesoamericans into the region, and the differences in social organization between the northern and southern sectors. It is a popular belief that the interaction spheres of the northern sector of Greater Nicoya (Nicaragua) and the southern sector (Costa Rica) had only limited overlap (McCafferty 2011; McCafferty and Steinbrenner 2009; Salgado and Vázquez 2006; Vázquez et al., 1994). "Mesoamericanization" of Greater Nicoya is said to have taken place during the Sapoa-Ometepe periods, which correspond with the Mesoamerican Postclassic (McCafferty and Steinbrenner 2005, quotation marks theirs), ca. A.D. 800 -1500. Ethnohistoric, linguistic, and ceramic evidence suggest several migrations into Greater Nicoya; much of the archaeological research in the region has been carried out in order to establish a temporal sequence for the migrations. Linguistic evidence suggests, the first people who migrated into the Greater Nicoya subregion were Chibcha speakers, a language family that is believed to have originated as far south as Ecuador and Colombia, who arrived approximately seven thousand years before present (Fowler, 1989; McCafferty et al., 25012; Umaña, 1994). According to McCafferty et al. (2012), although linguistic evidence and the presence of certain ceramic motifs (e.g. the feathered serpent) suggest Mesoamerican influence in the region, the region lacks evidence of several important traits that would otherwise be associated with Mesoamerican identity, including maize and ceremonial architecture.

Figure 2.3: Map showing the Greater Nicoya Subregion of Mesoamerica (light grey).

 This map was created for use in this dissertation by J. Welsh, MSU Department of Geography, RS&GIS (2016).

Linguistic evidence and changes in ceramic styles indicate a second migration occurred in approximately A.D. 400 (Fowler 1989; McCafferty and Steinbrenner 2005; Hoopes and McCafferty 1989; Umaña, 1994), when Chorotega speakers (one of several Oto-Manguean languages) entered into Greater Nicoya from the north. According to Fowler (1989) and Hoopes and McCafferty (1989), this new group likely originated in Central Mexico, and when they migrated into Greater Nicoya, they brought with them many Mesoamerican cultural traits. It is not known if the migration of the Chorotega was a one-time event, or if it was a continuous process over a long period of time (McCafferty and Steinbrenner 2005). Oto-Manguean languages were common throughout western and central Mexico, and extend as far north as the American Southwest and as far south as the Guanacaste region of Costa Rica (Fowler 1989). According to Fowler (1989), the Chorotega influence does not stretch any farther south than northwestern Costa Rica—there is no linguistic, ethnohistoric, or archaeological evidence from other parts of Costa Rica or Panama to suggest their presence.

The most recent pre-Colombian immigrants into Greater Nicoya are believed to have been speakers of Nahuatl, and they entered the area circa A.D. 800, which corresponds with the beginning of the Sapoa Period of Greater Nicoya chronology and the Mesoamerican Postclassic (Salgado González and Vázquez Leiva, 2006). According to Fowler (1989) and McCafferty and Steinbrenner (2005), ethnohistoric sources indicate that a Nahuatl dialect was spoken throughout Greater Nicoya at the time of Spanish contact. The people of Greater Nicoya were also incorporating deities of Mexican origin into their iconography, and they were using the twenty day-names of the Mexican calendar (Hoopes and McCafferty, 1989).

Chronology

There are several published chronological sequences that have been applied to the archaeology of Greater Nicoya. All of the sequences are archaeologically derived, mainly based on changes in the temper, vessel shape, method of production, and iconography of ceramics and verified with C14 dates. This research adheres to the revised temporal sequence for the Greater Nicoya region developed by Guerrero et al. (1994), because it was conceptualized using archaeological data specifically related to Greater Nicoya, and it continues to be referenced in literature relevant to the archaeology of the region

(Corrales and Quintanilla 1996; Obando 1995; Salgado and Vázquez 2006; Solís and Herrera, 2009, 2010).

The sequence is as follows (Guerrero et al. 1994): Tempisque Period (500 B.C. – A.D. 300); Bagaces Period (AD300-800); Sapoa Period (A.D. 800/900-1350); and Ometepe Period (A.D. 1350-1522). Though they are separate in the table below, the Sapoa and Ometepe Periods are often collapsed into a single Sapoa-Ometepe Period (A.D. 800-1522) because there is some debate as to whether or not they are, in fact, distinct.

Prior to the Tempisque Period (500 B.C. – A.D. 300) there is little evidence for human occupation in Greater Nicoya, and the little evidence there is says little about the people who inhabited the region (Lange, 2006). Ceramics that date to the Tempisque Period indicate a range of regional interaction between the people of Greater Nicoya and sites in the Maya region, particularly El Salvador, Honduras, and Guatemala. It is also theorized, based on mortuary treatment, cemetery organization and location, and grave goods that this is the time period when societies began practicing agriculture, ranked social systems began to emerge, and the interaction spheres of northern and southern sectors of Greater Nicoya began to diverge (Lange, 2006). According to Lange (2006), the interaction spheres of the northern and southern sectors of Greater Nicoya further diverged during the Bagaces Period (A.D. 300 – 800), as evidenced by differences in mortuary practices, ceramic traditions and differential distributions of goods associated with elites, and archaeological evidence suggests an increasingly stronger Maya influence in the region. In particular, jade is extremely prevalent in northwestern Costa Rica during the Bagaces Period, but was virtually absent in southwestern Nicaragua during the same time (Herrera, 1998; Lange, 2006). During the Bagaces Period, site sizes increased and coastal villages began to appear in the southern sector (Lange, 2006).

During the Sapoa Period (A.D. 800/900 – 1350) there is a dramatic shift in burial practices in both sectors of Greater Nicoya—in the northern sector, urn burials become prominent, and in the southern sector the most common treatment changes from flexed burials placed in stone-lined pits to extended burials placed in unlined pits (Herrera, 1998; Lange, 2006). This is also the time period during which cranial and dental modification became more common (Herrera and Solís, 2011; Lange, 2006). Ceramic and lithic analyses all indicate an influx of Mesoamerican motifs and techniques; Mesoamerican influence is confirmed through linguistic analyses as well, and it is believed that the most likely scenario for this time period is native and Mesoamerican groups living together in mixed societies that were slightly more complex than the societies from previous time periods (Lange, 2006).

Table 2.1: Chronology Schema for the Greater Nicoya (adapted from Guerrero et al., 1994: 93).

<table>
<tr><th>YEAR</th><th>SEMINAL
(Baudez, 1967)</th><th>MODIFIED SEQUENCE
(Lange, 1990)</th><th>GREATER NICOYA SEQUENCE
(Guerrero et al., 1994)</th><th>MESOAMERICA
(from Evans, 1992)</th></tr>
<tr><td>1500</td><td rowspan="4">Late Polychrome</td><td rowspan="2">Late Polychrome</td><td rowspan="2">Ometepe</td><td rowspan="3">Late Postclassic
(A.D. 1200s-A.D. 1520)</td></tr>
<tr><td>1400</td></tr>
<tr><td>1300</td><td rowspan="6">Middle Polychrome</td><td rowspan="6">Sapoa</td></tr>
<tr><td>1200</td><td rowspan="4">Early Postclassic
(A.D. 900-A.D. 1200)</td></tr>
<tr><td>1100</td><td rowspan="4">Middle Polychrome</td></tr>
<tr><td>1000</td></tr>
<tr><td>900</td></tr>
<tr><td>800</td><td rowspan="2">Late Classic
(A.D. 600-A.D. 800/900)</td></tr>
<tr><td>700</td><td rowspan="3">Early Polychrome</td><td rowspan="3">Early Polychrome</td><td rowspan="5">Bagaces</td></tr>
<tr><td>600</td><td rowspan="3">Early Classic
(A.D. 250/300-A.D. 600)</td></tr>
<tr><td>500</td></tr>
<tr><td>400</td><td rowspan="2">Decor. Lineal</td><td rowspan="10">Zoned Bicrhome</td></tr>
<tr><td>300</td><td rowspan="3">Terminal Formative
(A.D. 1-A.D. 300)</td></tr>
<tr><td>200</td><td rowspan="6">Zoned Bichrome</td><td rowspan="8">Tempisque</td></tr>
<tr><td>AD 100</td></tr>
<tr><td>1</td><td rowspan="3">Late Formative
(300 B.C.-A.D. 1)</td></tr>
<tr><td>100 BC</td></tr>
<tr><td>200</td></tr>
<tr><td>300</td><td rowspan="3">Middle-Late Formative
(600/500 B.C.-300 B.C.)</td></tr>
<tr><td>400</td><td rowspan="7"></td></tr>
<tr><td>500</td></tr>
<tr><td>600</td><td rowspan="5"></td><td rowspan="5">Orosí</td><td rowspan="3">Middle Formative
(900 B.C.-600 B.C.)</td></tr>
<tr><td>700</td></tr>
<tr><td>800</td></tr>
<tr><td>900</td><td rowspan="2">Early Formative
(1200BC-900/800BC)</td></tr>
<tr><td>1000</td></tr>
</table>

The final period of pre-Colombian occupation in Greater Nicoya, the Ometepe Period (A.D. 1350 – 1522), spans from the end of the Sapoa period until Spanish contact. During this time period, there is a shift in ceramic traditions of both the northern and southern sectors, possibly indicating a converging of the interaction spheres of the two subregions (Lange, 2006).

Bahía de Culebra

Bahía de Culebra (English: Bay of Snakes) is one of many small, sheltered bays along Costa Rica's irregular coastline. It is situated on the northwest coast of Costa Rica in the Guanacaste province, on the northern aspect of the Nicoya Peninsula. The mainland borders the bay on the southern and eastern sides, and the northern/northwestern boundary is formed by the Papagayo Peninsula; to its west, the bay opens into the Pacific Ocean. Bahía de Culebra is small, only approximately 3-4 km in diameter with a maximum depth of approximately 7 km, and the nearby terrain features steep cliffs, terraces, valleys and plateaus (Solís and Herrera, 2011). Volcanic activity is responsible for the majority of the topography in the region, with four large volcanoes located within 40 km of Bahía de Culebra (Hardy, 1992).

The coastline of the bay is an ideal habitat for shellfish, including bivalves and other mollusks. There are also numerous other fish species and marine crustaceans available in the bay (Hardy, 1992). Hardy points out that the modern conditions of the shoreline and the availability of certain resources are undoubtedly due to human intervention and likely do not reflect exactly what was available to humans occupying the shores of the bay in prehistory (Hardy, 1992); however, based on artifact assemblages from the sites around the bay, it is obvious that prehistoric people were able to exploit a great deal of marine resources, both for subsistence and the production of goods (Hardy, 1992; Solís and Herrera, 2011). In addition to the available marine resources, numerous terrestrial animals inhabit the area—various monkeys and other small primates, rodents, insects, various species of lizards and snakes, venomous and non-venomous frogs, birds such as parrots, pelicans and many smaller species, and larger mammals such as foxes, coyotes, and deer are also common (Hardy, 1992). There is also an abundance of vegetation, including various tree species and cacti (Hardy, 1992).

Human occupation of land surrounding of the Bahía de Culebra spans approximately 2,000 years. Though the land is fertile, it is difficult to traverse and to farm because of the irregular and mountainous terrain, and any sites along the bay would most likely have been easier to reach by sea than by land (Hardy, 1992; Solís and Herrera, 2009; Solís and Herrera, 2011). It is therefore likely that the populations inhabiting sites along the bay would have had access to and participated in an extensive maritime trade network that archaeological evidence suggests extended between Greater Nicoya small nearby islands throughout prehistory (Creamer, 1992). It is also likely, due to the terrain in the area, that human subsistence strategies would have involved the exploitation of marine resources, particularly fish and shellfish. Archaeological evidence from several sites in the Greater Nicoya region has proven ancient people would collect shellfish and transport them back to their habitation sites where they would then be processed and the shells would be discarded, leading to the eventual accumulation of large shell mounds (*concheros*) (Solís and Herrera, 2011).

F.W. Lange led an extensive archaeological survey project between 1977 and 1979 as part of the Proyecto Turístico Bahía Culebra, leading to the discovery and documentation of 60 archaeological sites along the shores of Bahía de Culebra (Abel-Vidor 1980; Hardy 1992; Salgado and Vázquez 2006; Vázquez 1980; Solís, 1998; Solís and Herrera, 2008, personal communication). Sites along the bay range in size from small, temporary use, possibly seasonal, settlements to large multicomponent settlements with extended periods of human occupation. In anticipation of the construction of a Four Seasons resort that would eventually encompass the entire Papagayo Peninsula, the survey project sought to document the locations and potential importance of any archaeological sites surrounding Bahía Culebra, and to prioritize salvage archaeology projects (Hardy, 1992; Vázquez and Solís, personal communication). The sites that are the focus of this research, Jícaro and Nacascolo, were among the sites discovered during the survey project in the late 1970s. Numerous sites have been documented along the shores of Bahía de Culebra, and salvage archaeology and preservation of them continue as sites are threatened by development along the Papagayo Peninsula as part of the Proyecto Turístico Bahía Culebra (Solís, 1998).

Jícaro

Jícaro is one of the 60 sites discovered and documented by Lange and his team in the late 1970's. It is a multicomponent village site that presents a range of activity and habitation areas, and has a substantial mortuary component, although no organized cemetery has been located. The site is located toward the western extremity of the Papagayo Peninsula, on the north shore of the Bahía de Culebra. Excavations were carried out by archaeologists Felipe Solís Del Vecchio and Anayensy Herrera Villalobos and their team over four field seasons—a survey season in 2005, and a total of 11 months of excavation over three field seasons in 2006, 2007, and 2008 (Solís and Herrera, 2009). Solís and Herrera and their team carried out detailed, thorough excavations, and documented their findings meticulously through photographs and hand-drawn maps and artifact illustrations.

The site of Jícaro is in a small coastal valley, with steep rises on the north, west, and south sides, and Jícaro Beach, the site's namesake, to the east. Jícaro is approximately 4.9 hectares in total area, divided by seasonal streams into five sectors. Sector 1, the northernmost sector, was the site of numerous shovel test pits and several trenches, but no Operations were excavated in Sector 1 and no burials were found there. Sector 2, the next sector south, is the site of 22 excavated Operations, 13 of which yielded a total of 147 Burials and 269 individuals. Sector 3 is the center Sector, from which 10 Operations were excavated, 5 of which yielded a total of 38 Burials and 73 individuals. Sector 4 contains 11 Operations, of which yielded a total of 40 burials and 65 individuals, and finally, Sector 5 contains 2 Operations that yielded 13 burials and 27 individuals. A good portion of the site falls within a protected zone that encompasses the beach area and several meters into the tree line, meaning no excavations could take place on the beach. Jícaro features 31 *concheros* (large shell mounds) that are the result of hundreds of years of humans harvesting shellfish from the bay and discarding the shells after the meat and/or dye had been extracted and consumed. As is typical at sites in the Intermediate Area, no monumental architecture or sculpture are found at Jícaro; however, nine large rocks with carvings (zoomorphic, anthropomorphic, and geometric designs) and the remnants of several clay floors and circles of rocks indicating habitations were discovered during the three archaeological excavation field seasons.

A total area of 1,731 m^2 was excavated (Solís and Herrera, 2009), yielding a total of 237 burials and a minimum number of just over 440 individuals, representing one of the largest burial samples known in Central America. All of the burials discovered at Jícaro have been solidly dated within the Sapoa Period (A.D. 800/900 and A.D. 1350), based on ceramic typology and radiocarbon dates (Solís and Herrera, 2011; Solís and Herrera, 2009). The burials were all discovered in the flat area of the site, not on the hillsides, and they seem to be concentrated very near the habitation and activity areas of the site, as opposed to being placed in a remote location away from where day-to-day life would have occurred. Only a handful of habitation floors were excavated, all of which had burials beneath or at least associated with them, and 31 *concheros* cover most of the surface area of the site. These shell mounds are believed to have been refuse from the local people exploiting the nearby marine resources for food, tool production, and trade (Solís and Herrera, 2011; personal communication 2008). The skeletal sample will be discussed in greater detail in Chapter 3.

Nacascolo

The Nacascolo site is located near Jícaro on the southern shore of the Papagayo Peninsula, and is another of the 60 sites that were located along the shore of the bay by Lange and his team in the late

1970s. Nacascolo was determined to be at high risk for destruction by the project, and was therefore designated as one of the first to be excavated (Hardy, 1992; Vázquez, 1986). The site has been the subject of numerous archaeological and bioarchaeological studies (e.g., Hardy, 1992; Lange, 1979; Norr, 1991; Obando, 1995; Vázquez, 1986; Verano, 1982). Based on surveys and excavations of the site, it is believed that Nacascolo was continuously occupied for approximately 2,000 years until a time just before the arrival of the Spanish, ca. 1522 (Hardy, 1992; Vázquez, personal communication 2008). Salvage excavations were carried out by archaeologists from the MNCR and from the University of California, Los Angeles in 1980, under the direction of Michael Snarskis, Ph.D. (UCLA), Ricardo Vázquez Levia (MNCR) and Brian Dillon, Ph.D. (UCLA) (Hardy, 1992). Much like Jícaro, Nacascolo is bounded on three sides (north, south, and west) by steep hills, and on one side by the beach, and has two seasonal streams that cut through the site. According to Hardy (1992), a large area of Nacascolo is covered by approximately 30 *concheros*, which is similar to Jícaro, as is the fact that a number of the Nacascolo burials were found in association with habitation or activity areas (Vázquez, 11986). Nacascolo also has a cemetery area located on the northern hillside, which is unfortunately not comparable with Jícaro because excavation of the hillsides was beyond the scope of the Jícaro excavations. Large igneous stone columns (*mojones*) and *concheros* which, according to Hardy (1992), were "characteristic of Intermediate Area statuary," were once significant features at Nacascolo and are known to have marked graves at the site, but many have since been lost to an extensive history of looting. Hardy (1992) also notes that according to local legends, the site used to contain *mojones* that were so large they required multiple men to carry them, in addition to numerous jade and gold objects, but no gold was ever excavated from the site.

Two cemetery areas were excavated in 1980, one on the northern hillside dating to the Zoned Bichrome to Early Polychrome periods (Bagaces Period, A.D. 500-800), which yielded no skeletal material except for some fragments of teeth due to preservation issues related to soil acidity. Though no skeletal remains were discovered, the grave outline and funerary object placement indicated the individual had been buried in an extended position with the head to the west (Hardy, 1992). The burial was dated according to the types of grave offerings that were present. The second cemetery area was located during a survey of the beach area and eventually yielded a 7x7 meter pit including 37 burials (Hardy 1992). The following year, a team of UCLA archaeologists and volunteers returned for a second field season that resulted in the excavation of another large pit in the beach area, immediately adjacent to the one that had been excavated the year before, which yielded an additional 77 burials (Hardy, 1992). According to Hardy (1992) and Vázquez (1986), burials dating to the Sapoa and Ometepe peirods have also been discovered in association with habitation structures and beneath *concheros*, similar to many of the burials excavated at Jícaro.

Identity

Much of the research in Latin America has traditionally focused on determining a sequence for cultural development in the region (Armillas, 1948; Blanton et al., 1994; Balkansky, 1998; Evans, 2004; Salgado and Vázquez, 2006; Vaillant, 1939). Scholars who have devoted their attention to Mesoamerica have largely approached their work from a cultural historical perspective, in that they have studied the traits common to particular cultures and how interactions with other cultures have molded and shaped them—or how they influenced other cultures (Blanton, et al., 1994), and studies of Greater Nicoya are no exception to that rule. Beginning with Norweb in 1961 (Lange, 1994), Greater Nicoya was conceptualized as a subregion of Mesoamerica at its southernmost frontier, and cultural development was attributed to the migration of Mesoamericans southward. With that approach comes a focus on large-scale societies, like the Olmec, Maya, and Aztec, and the individual and small community experiences are virtually lost, with much attention paid to migration and outside influence on cultural development and much less attention paid to *in situ* cultural developments (Lange, 2006).

The cultural historical approach asks the question, "who were those people?" (Blanton et al., 1994) from an outside-in perspective. Studies of cultural interaction and behavior according to cultural influences rely on archaeological—mortuary practices, ceramic and lithic industries—and linguistic and ethnographic evidence to explain culture interactions. They ask who the people were and answer that question by looking at their interactions with other people. This study will take a slightly different approach, and answer that question according to how "those people" may have seen themselves.

Bioarchaeology

Knudson and Stojanowski (2009) define identity according to who past people thought they were and, how they expressed it to others, and how others perceived them, not according to where they or their ancestors originated. The Knudson and Stojanowski (2009) volume presents discussions of identity at the community and individual levels, both of which are important for a complete understanding of identity of past people. Bioarchaeoloical studies of past populations are helpful for studying group and individual identity because they incorporate biological and social components, allowing us to look into issues of identity without losing them to an overall sequence, as is the tendency when societies are studied through the cultural historical lens.

Armelagos (2003) simply defines bioarchaeology as the combination of methods derived from skeletal biology and archaeology, and advocates bioarchaeological studies as essential for any analysis of context, social organization, and social identity of past populations. By adopting some of the theory from archaeology, physical anthropologists open their research up to broader, more anthropological questions, such as those involving identity. The field of bioarchaeology involves a synthesis of methods and theory from the hard and social sciences, which enables researchers to ask broader questions about past people than either the biological or social aspects of the science would permit if they were applied independently (Knudson and Stojanowski, 2008). Bioarchaeological studies of archaeological sites facilitate the exploration of past people's physical responses to their natural and cultural environments and the ways in which their social identities may have led them to alter their environments and their bodies.

Theoretical approaches to bioarchaeological research vary. According to Buikstra (2006), many of the early (18^{th} and 19^{th} century) bioarchaeologists, such as Earnest Hooton and Jeffries Wyman, exemplified Armelagos' definition of bioarchaeology—they were not only extremely knowledgeable physical anthropologists, they were also well versed in field methods and excavation skills. That said, their focus was largely on data collection from skeletal samples with emphasis on description and measurement tables (Buikstra, 2006), and much of the work was relegated to appendices in archaeological reports (Saul and Saul, 1989). Larsen's idea of bioarchaeology focuses almost entirely on the skeleton, as Larsen believes that the skeleton can provide all of the information one would need in order to study past populations (Larsen, 1997). Goldstein advocates a multidisciplinary approach to mortuary analysis, with particular emphasis on the return of collaborative efforts between archaeologists and physical anthropologists, in addition to other natural scientists; however, according to Goldstein (2006) physical anthropologists and archaeologists have tended to diverge over the last century. She discusses the relationships between physical anthropologists and mortuary archaeologists and the importance of their cooperation in bioarchaeological studies. While scientists from both disciplines are conducting interdisciplinary work, they are not conducting it with one another and physical anthropologists, with greater and greater focus on the skeletons taken in isolation, are losing sight of the mortuary context from which the remains were recovered. Larsen (2006) also notes the disconnect between physical anthropologists and archaeological excavation. Many physical anthropologists work without the contextual information that Buikstra and Goldstein would see as a key aspect to a bioarchaeological analysis.

Bioarchaeology is well suited as a means for studying Jícaro, contextualizing the site within the region and assessing the presence of a possible Mesoamerican identity because as a discipline bioarchaeology allows for the consideration of multiple facets of individual experience and community structure from temporal, spatial, and biological perspectives (Knudson and Stojanowski, 2009). At the individual level, bioarchaeological study of human skeletal remains provides information regarding age at death, sex, health, and lifestyle choices, such as diet or alterations to their bodies (i.e., dental modification and cranial deformation). At the community or population level, an analysis of the distribution of those individual characteristics is critical for characterizing patterns of lifestyle, behavior, disease, social structure, and other aspects of the lives of past people (Larsen, 1997).

Mortuary Analysis

At site or regional levels, an analysis of mortuary behaviors and the spatial organization of burials can lead to a deeper understanding of a community's social and political organization, and corporate or kin-based claims to the surrounding landscape or to local resources (Goldstein, 1981; Morris, 1991; Saxe, 1970). At the individual level, an analysis of mortuary treatment may shed light on an individual's status within the community (Brown, 1981; O'Shea, 1981) and, depending on the individual's age and/or sex, whether that status was likely ascribed or achieved, his or her role within the society, or gender identity (Arnold, 2007; Knudson and Stojanowski, 2008), though not all aspects of an individual's social roles will necessarily be represented equally (O'Shea, 1981).

It is often assumed that an individual's mortuary treatment reflects that person's social status or identity during life or in some way speaks to the social organization at a particular site (Binford, 1971; Knudson and Stojanowski, 2008; 2009; Saxe 1970), and that increased social complexity may lead to an increased number of possible social identities for the individuals in the society (Saxe, 1970). What must be kept in mind is that burial treatments of a given individual are more a reflection on the living and the way in which they saw fit to treat the deceased than it is a reflection on the deceased and the way he/she would have self-identified (Knudson and Stojanowski, 2009).

There are various perspectives from which mortuary archaeologists have approached the ways in which social identity or rank are communicated by mortuary treatment. For example, Tainter (1975, cited in Parker Pearson, 2001) focused on energy expenditure and proposed that individuals with higher status would have graves that required more energy expenditure—whether that involves burial on a steep hillside, the construction of a tomb, or the inclusion of a large number of grave goods. The locations of burials can also be informative of the society's views of death and the dead and the relationships the living would have maintained with the dead (Parker Pearson, 2001). Placement of the dead in different locations on the landscape—in sacred or secular locations, near or far from habitation sites, or in territories that are potentially contested between different groups—may indicate different roles for the dead, such as ancestors or protectors, which may in turn speak to the society's social and political organization (Parker Pearson, 2001).

Commingling of Remains and Reuse of Burial Features

One of the factors affecting the mortuary analysis of Jícaro is the extensive amount of commingling and reuse at the site. There are a number of double burials, where both individuals appear to have been interred as part of the same burial event, but there are far more burials that initially appeared to be single interments, but upon analysis were found to be associated with elements of anywhere from one to six additional individuals. There is also extensive evidence for intrusion of later burials into earlier burials which may have contributed to commingling of the remains, and the apparent deliberate removal of certain skeletal elements from several individuals (Solís and Herrera, 2006; 2009). According to Martin and Osterholtz (2016), while commingling of remains may present difficulties with regard to identification of specific individuals or their relatedness, the fact that certain individuals are included in the context at all may speak to issues of group identity. The evidence of reuse at Jícaro, particularly in certain areas of the site, may be indicative of group inclusion or cohesion.

Osterholtz et al. (2014) differentiate between three common types of commingling that occur with skeletal assemblages: Long-term Usage, Episodic Usage, and Lab Commingling. The first two categories they mention are related to burial practices and with careful excavation that provides context for the commingled and/or incomplete remains, the very fact that commingling exists in these contexts can add a substantial amount of qualitative information about a population. For example, the commingling of remains at Jícaro is consistent with long-term usage, which is associated with evidence for reuse of burial features, repeated episodes of intrusion, isolated elements included with otherwise complete individuals, and demography reflective of a community. This is in contrast to what Osterholtz et al. (2014) would consider episodic usage of a burial site, which would more likely be the result of an acute widespread disease event or warfare, and would not reflect the demography of a typical community. Lab commingling is also an issue at Jícaro, but will be addressed in Chapter 9—Discussion and Conclusions because the lab commingling does not provide information about mortuary practices.

According to Baustian et al. (2014), assemblages like the Jícaro collection that show evidence of long-term usage of a burial site, are often linked to beliefs involving manipulation and cultural modification, which are common throughout Mesoamerica and the Intermediate Area, and for which there appears to be evidence at Jícaro in the form of ornaments and adornments made from modified human bones and teeth having been found with several adults at the site (Solís and Herrera, 2006; 2009). Baustian also points out that it is important to be aware of both what is recovered from a burial and what is not recovered, as “differential representation of elements reveal more about the culture of the people that are still living than the dead themselves” (Baustian, 2014: 271). It will be important to be mindful of this concept with research at Jícaro as elements missing from one burial may have been repurposed into adornments worn by other individuals.

Limitations of the Jícaro Data

The archaeological data used for this study are derived from original site reports and maps from Jícaro, provided by archaeologists Solís and Herrera. Though their excavations were careful and well documented, the project was a contracted salvage project with a limited timeline and they were not able to excavate 100% of the site. This places limitations on the data available for interpretation. Because only selected areas of the site were excavated, there is an artificial sense of space for the site and burials and artifacts seem to be clustered in certain areas. While the apparent clusters of burials and artifacts may be representative of the use of space at Jícaro during its occupation, it may also introduce a great deal of bias that we can neither be fully aware of nor correct for.

The skeletal data used for this study place further limitations on the possibility for interpretation. Preservation is notoriously poor in the tropics (Ubelaker, 1995; Wrobel, 2015) and Jícaro is no exception. Several of the individuals from Jícaro were very well preserved, with more than 75% of the skeletons remaining intact and observable, but they are not the norm, and many individuals were very poorly preserved with bone so incomplete and fragmentary that they were barely identifiable as bone. For the most part, skeletal remains from Jícaro are approximately 50% complete. Many of the long bones are missing the extremities, making measurements and observations of those key areas for assessment of activity and pathology impossible; many of the crania have been crushed and remain encased in matrix, which obscures intracranial and dental observations and renders measurements impossible; the cortex of many of the bones that are intact is badly degraded, obscuring possible observations of pathology and bone quality. Additionally, the extensive commingling of remains at Jícaro is further complicated because of the incompleteness of so many of the remains. At this time, the commingling issues have yet to be completely sorted and the minimum number of individuals at the site has yet to be confidently determined.

These limitations place constraints on the analysis and interpretation of data excavated from Jícaro and influence the types of research questions that can be asked and answered using the available data. That said, the collection from Jícaro is still the largest skeletal population from the region and the quality of excavation was extremely high, even though the extent of excavation may not have been ideal, which together mean that there is still a great deal of information that can be gleaned from a bioarchaeological study of this kind.

Research Questions and Expectations

Due to the limitations of the data used for this project and to the fact that this is the first extensive study of the Jícaro skeletal sample, the questions guiding this research are largely exploratory in nature. This research is approached from a bioarchaeological perspective that incorporates physical anthropology and the analysis of demographic variables and health with archaeologically derived context, including mortuary treatment and grave goods.

Research Question 1: What is the composition of the population from Jícaro?

Paleodemography is the study of past population dynamics and is based on the assessment of age and sex as determined from skeletal remains (Buikstra, 2006). Paleodemographic studies allow for the exploration of a population's mortality, fertility, population structure, settlement patterns, and the ways in which the population related to and interacted with the local environment (Green et al., 1974; Hassan, 1979; Meindl and Russel, 1998). The environment and available resources, according to Hassan (1979) are critical influences on a population, affecting group size, group movement, the range of group mobility, etc., thereby also influencing group structure, site organization, and social structure.   One aspect of a complete paleodemographic analysis of a population would be a comparison of changing dynamics over time which, unfortunately, is not possible at Jícaro because all of the burials recovered from the site date to the same general time period and at this time there is little information available for determining any site-wide relative dating, aside from isolated cases of later burials intruding on earlier ones.

Expectations: Research Question 1

Based on preliminary skeletal analysis at Jícaro (Wankmiller and Sauer, 2008), and on comparable published studies (Hardy, 1992; Obando, 1995), the demographic analysis is expected to demonstrate a relatively even distribution of adults and subadults; males and females. Due to notoriously poor preservation of skeletal samples in the tropics (Ubelaker, 1995; Wrobel, 2015), preservation is expected to be poor, which has the potential to drastically affect the outcome of a paleodemographic study of the population from Jícaro. Wankmiller and Sauer (2008) noted a very low incidence of traumatic injury, osteoarthritis, and evidence for disease among the small sample analyzed in 2007, and the frequency of these conditions is not expected to change, despite the increase in sample size. This question will also incorporate an assessment of health and activity, which may be informative with regard to the life experiences and general conditions at the site.

Research Question 2: What are the relationships between individuals and mortuary practices at Jícaro?

This question forms the nexus of a bioarchaeological study of the site of Jícaro. A multidimensional bioarchaeological approach, incorporating the analyses of the skeletal material from Jícaro with analyses of mortuary treatments, is expected to provide new insights regarding social organization and the population's views regarding death and the dead. Goldstein (2006) and Buikstra (2006) advocate integration between archaeological fieldwork and physical anthropology, a relationship that is often lacking in bioarchaeological studies in Latin America, particularly in the Maya region (Wrobel, 2015).

Goldstein (1981) advocates multidimensional analysis of mortuary sites, specifically incorporating spatial analysis as a means for examining the organization of a mortuary site and how it relates to the society as a whole. Answering this question will therefore involve statistical analyses as well as spatial analyses of the site.

This research question requires two levels of analysis—an assessment of mortuary practices at the site in general and an evaluation of the existence of any relationships between mortuary treatment and the demographic variables discussed under Research Question 1. These analyses are then subjected to a spatial analysis, to determine whether or not the relationships between mortuary treatments and the individuals' age, sex, health, and activity, involve a spatial component.

Expectations: Research Question 2

Solís and Herrera (2009) have performed a substantial amount of descriptive analyses of the data they collected from the site and have noted no informative mortuary patterns, other than what appears to be an overall lack of noticeable differentiation, except for a handful of exceptional individuals and burials. Further skeletal analyses, including refinement of age and sex categories, as well as a spatial analysis of the mortuary complex is expected to yield patterns where none have been demonstrated. Several of the excavation units yielded series of burials that were essentially stacked on top of one another, demonstrating an extensive amount of reuse of burial areas at the site (Solís and Herrera, 2009), and upon reanalysis patterns are expected to emerge based on vertical spatial relationships, as opposed to relationships across horizontal space at the site.

Research Question 3: Are mortuary treatments and other cultural practices consistent with what is known about Greater Nicoya during the Sapoa Period?

Burial practices at several other southern sector sites are described in Solís (1998) and in depth in Hardy (1992) and Vázquez (1983). Published data from Nacascolo (Hardy, 1992) serves as a comparative sample for Jícaro because of the two sites' relative similarities in location and apparent organization. Jícaro and Nacascolo, in particular, are ideal for a bioarchaeological study that will enhance the general understanding of population demographics, social structure, mortuary behavior, and identity in the southern sector of Greater Nicoya, because of their relatively large sample sizes and well-documented burial contexts. Skeletal and mortuary analyses of Jícaro form the basis for this research, and published skeletal and burial data from Nacascolo (Hardy, 1992) are used as a comparative sample to provide regional context for Jícaro.

McCafferty (2011) discusses the mortuary patterns at sites that were contemporaries of Jícaro in the northern sector of Greater Nicoya (southwestern Nicaragua), which will provide further comparative data to contextualize Jícaro within the larger subregion.

Expectations: Research Question 3

Based on publications about the archaeology and mortuary behavior in the northern and southern sectors of Greater Nicoya (e.g., Hardy, 1992; Lange, 2006; McCafferty, 2011) and the confident Carbon14 dates established by Solís and Herrera (2011) in combination with the documented presence of certain artifact types, Jícaro is expected to be representative of a Sapoa period village site. Jícaro is expected to closely resemble the Sapoa Period Nacascolo population with regard to demography, burial treatments and overall site structure.

Chapter 3: Materials and Methods

Introduction

This chapter describes the skeletal material, mortuary data, and analyses that were used to answer the research questions presented in the previous chapter.

Materials: Burial Data from Jícaro

All of the information included in this study that is related to the excavations, such as burial location (operation, coordinates, depth), burial position (extended/flexed, prone/supine, arm/leg position, head orientation) and descriptions of grave goods (raw material, classification, quantity) were provided by the archaeologists from their site reports and from unpublished tables they maintain for their own analyses (Solís and Herrera, 2007; 2009; personal communications). As stated previously, the original maps from the archaeological excavations, also provided by Solís and Herrera (personal communication) were also used to assess completeness and complexity of the burials and were instrumental in helping to determine sampling strategies and issues of commingling during the skeletal analysis phase of this project. Many of the categories and codes used in the dataset that was completed for this project are largely based on categories and codes used in the original spreadsheets provided by Solís and Herrera.

Materials: Jícaro Skeletal Sample

The skeletal sample from Jícaro provides a unique opportunity to study the largest known skeletal sample in Costa Rica, and one of the largest in Central America. Documentation of the excavations is extremely thorough and the collections of skeletal remains and artifacts has been meticulously packaged and curated. In addition to the quality of information available, access to the information, including original site reports, archaeological data collection and subsequent analyses and personal communications, have been virtually unlimited by archaeologists Solís and Herrera and the Museo Nacional de Costa Rica (MNCR). According to the site reports and unpublished data tables from Solís and Herrera (2007; 2009; personal communications), 238 burials were excavated at Jícaro. Upon reanalysis, it was discovered that due to a miscommunication from one field season to the next, there is actually no Burial 10, leaving a total of 237 excavated burials.

All 237 burials are included in the mortuary analysis of the site, but only the 308 individuals examined during the laboratory data collection portion of this study are used to answer questions about paleodemography and paleopathology. Of those 308 individuals, there are roughly equal numbers of males and females (discussed in Chapter 4), and there is a range of ages-at-death, without any one age cohort being overly represented (discussed in Chapter 4), meaning the skeletal sample is relatively well-balanced and is appropriate for answering the research questions.

Preservation of the Jícaro skeletal material ranges from nearly perfect to extremely poor, with the majority of the skeletons being incomplete, but observable for most of the variables that are important to this study. Completeness of individuals also varies from nearly complete to isolated or scattered elements. The majority of burials at the site are single interments, where a single primary individual is buried in either a supine or prone, extended position; however, there are a number of double burials and commingled burials, thus providing a range of burial treatments and practices for analysis.

Materials: Comparative Sample

Because of the geographic proximity of the site of Nacascolo to the site of Jícaro, and the availability of published literature on skeletal analysis from Nacascolo, it was chosen as a comparative site for the analysis at Jícaro. The two sites are nearly identical in size, composition, and location, only separated on the same shore of the Papagayo Peninsula by a small sandy promontory. It is likely that the inhabitants of both sites were not only aware of one another, but probably interacted regularly as well. In her dissertation, Hardy (1992) presents an appendix including brief descriptions of the individuals from each of the 113 burials discovered at Nacascolo between 1979 and 1981. Her descriptions of the burials include information about preservation, age, sex, position, and grave goods which, when reformatted according to the way in which the Jícaro data is organized for comparison purposes, provides a comparative sample for Jícaro. Hardy organized the individuals from Nacascolo as burials, counting isolated crania within certain burials as burials of their own. In order to adjust this sample to make it comparable with the Jícaro sample, the burial numbers and relationships were reanalyzed and recoded. For example, the Nacascolo Burials 13a and 13b became Burial 13, Individuals 1 and 2, and Burials 18a and 18b, both isolated crania of infants included with Burial 30, became Burial 30, Individuals 2 and 3 while the primary individual from that burial was labeled as Individual 1. Additionally, according to Hardy's descriptions, several of the burials had been located in sidewalls of excavation units and were never fully excavated or burial numbers were inadvertently repeated. All of the burials for which data is missing were removed from the sample for the purpose of this study. The resulting sample from Nacascolo includes 108 individuals from 93 burials. Data as it was adapted from Hardy (1992) for the purpose of this study is available in Appendix D.

Because of the limited information available for the Nacascolo sample, and to make the sample as comparative with Jícaro as possible, the published data was mainly scored as presence/absence except for the age category, as most of the age categories used by Hardy (1992) are similar to those used for the data collection and analysis at Jícaro.

Methods: Data Collection and Sampling Strategies

Data collection for this project took place over four laboratory data collection seasons with slightly different research goals and agendas.

Sampling Strategy: 2007 Laboratory Season

In 2007, Dr. Norman Sauer, Professor Emeritus from Michigan State University, was the primary physical anthropology consultant and I was present as his assistant. The analyses during the 2007 laboratory data collection season (August-October) concentrated on a heavily biased sample that was specifically selected by the archaeologists because they considered each burial/individual anomalous in some way. Many of them were from two of the 46 excavation units (Operation 24 and Operation 31) and many had been excavated from what appeared to be burial fossae that were reused repeatedly over time. Others included individuals who had been buried with artifacts and adornments that were made out of human bones (e.g., Burial 147), individuals who appeared to have had modified crania and/or modified teeth (e.g., Burial 61), isolated skulls for which the archaeologists had not been able to determine age or sex, and individuals for whom sex was difficult to determine either because their skeletally determined sex appeared to contradict their apparent gender (e.g., apparent females whose teeth were modified, which is more typically associated with males from this time period in this region, such as Burial 133, Individual 1) or because their skeletal characteristics appeared ambiguous.

Data collection in 2007 involved skeletal inventory (including an assessment of the overall condition of the skeleton), examination of all observable morphological characteristics that would facilitate age and sex determination, measurements of cranial and postcranial elements for the purpose of sex determination and assessment of variation at the site, documentation of cranial and post-cranial non-metric traits, non-specific health indicators (linear enamel hypoplasia, periostitis, cribra orbitalia, porotic hyperostosis), other health indicators (e.g., assessment of apparent tumors affecting the vertebrae of at least one individual), dental inventory (including assessment of wear, abscess, caries, and calculus), dental measurements (mesiodistal and buccolingual diameters and crown height when possible), and trauma analysis.

During the 2007 season, Dr. Sauer and I examined a total of 51 individuals from 18 burials that were excavated from 9 of the 46 excavation units.

Sampling Strategy: 2008 Laboratory Season

In 2008, I returned to Liberia, Costa Rica, to continue skeletal analysis of the Jícaro material. The 2008 laboratory data collection season lasted 10 weeks, from June through August, during which Dr. Sauer visited for the final week. The 2008 laboratory data collection season was funded by a Tinker Field Research Grant, which provided funding for equipment, lodging and meals. The goal for the 2008 laboratory data collection season was to expand the sample from the previous year and attempt to examine a broader range of individuals in order to gauge the overall demographic composition at the site.

Data collected during the 2008 laboratory data collection season was consistent with the data collection during the 2007 laboratory data collection season and included all of the same methods. During the 2008 season, a total of 61 individuals from 25 burials that were excavated from 8 of the 46 excavation units were studied. Again, the sample was heavily biased in favor of including burials from Operations 24 and 31.

Sampling Strategy: 2009 Laboratory Season

The 2009 laboratory data collection season was very short, only extending over two weeks during the month of June, and had the very specific and limited goal of collecting age and sex data in order to obtain a better idea of the age and sex distribution of individuals from Jícaro, with the goal of assessing the skeletal collection for its appropriateness for a dissertation project. In, in 2009 Dr. Sauer and I decided we would only focus on determining age and sex for as many individuals as we could in a two-week period. We documented limited postcranial measurements (focusing only on the humerus, femur, and tibia, for the purposes of sex and stature determination), and no cranial measurements during this laboratory season. General observations were recorded concerning the overall condition and completeness of the remains, and comments were recorded regarding any obvious non-specific and specific markers of health or trauma that we noted on skeletal elements we examined; however, no complete inventory was completed for any of the individuals examined in 2009 and none of the observations were systematically recorded for the purposes of eventual analysis. When skulls were present and observable, dental inventories were completed, but they were not completed for all individuals. No assessment of non-metric traits or cultural modifications of crania or dentition were systematically recorded.

During the 2009 laboratory season, Dr. Sauer and I conducted these abbreviated examinations on a total of 39 individuals from 14 burials that were excavated from 9 of the 46 excavation units.

Sampling Strategy: 2013 Laboratory Season

The 2013 laboratory season constituted the period during data which were systematically collected to answer the research questions posed by this study. By this time the Jícaro collection had been moved to its permanent curation location in the warehouse at the National Museum of Costa Rica (MNCR), in Pavas, San Jose. Data was collected for 5 days per week for a period of just over five months. The goal was to analyze 100% of the Jícaro skeletal sample. Because analyses during the 2007 and 2008 field seasons had been very thorough and had been conducted by two researchers, the burials/individuals examined during those field seasons were not included on the list of burials to examine in 2013. Because the analyses were so incomplete during the 2009 field season, all of the 2009 burials/individuals were scheduled for reanalysis.

Early on in the 2013 laboratory season it became obvious that time would be a constraint and a 100% analysis would not be possible, so a new sampling strategy was devised. The selection process was prioritized according to individual completeness and complexity of the burial. For example, burials with single interments that appeared to be more than 50% intact according to the burial maps were made the first priority, followed by burials that were slightly less complete and/or double burials, followed by commingled burials, followed by extremely incomplete individuals, and finally followed by the individuals that had already been partially analyzed in 2009. The commingled burials were made a lower priority for the purpose of this study for two reasons: 1) time constraints on the project, and 2) applicability of the information from incomplete/commingled individuals to the research questions. This project had a limited time frame during which a great deal of skeletal analysis and data collection had to occur, and the time it would take to sort out the individuals and attempt to correctly assign the elements would not allow me to look at the maximum number of intact individuals. Additionally, although commingled and disarticulated remains can provide a great deal of information about demography, use and reuse, group identity and cohesion, and the use of space at a site, they are also not often assignable to particular individuals and are often not in their original context with regard to position and grave goods. Because so much focus for this study concerns questions about primary interment contexts such as body position, head orientation, and grave goods, the commingled remains were only peripherally included and should be addressed in a future project.

The priorities for the second sampling strategy are as follows:

Category 1: Highest Priority. These burials consisted of single individuals who appeared on the burial maps to be relatively complete and well-preserved. It was my assumption that they would be the best sources of information regarding age, sex, and health status.

Category 2: High Priority. These burials consisted of single or double interments that appeared on the burial maps to be less well-preserved than those in Category 1, but who appeared to be complete enough to at least assess them for age at death, sex, health, and trauma.

Category 3: Moderate Priority. These were all multiple burials, regardless of their condition. These burials contained a minimum of 3 individuals (according to the burial map) and were expected to be complicated, involving several boxes and commingled remains. These are complex burials that were expected to consume possibly multiple days of analysis and possibly not yield useable information in situations when individuals could not be separated out accurately.

Category 4: Low Priority. These were the most fragmentary and incomplete burials. These burials consisted of individuals whose remains were discovered as surface scatter, apparent secondary treatments, those that had been intruded upon, isolated skeletal elements (or a handful of skeletal elements), and remains that were essentially powdered and were barely recognizable as skeletal elements. These individuals were not expected to yield any useable information regarding age, sex, or health.

Category 5: Lowest Priority. These burials are burials that had already been thoroughly examined and photographed by Dr. Sauer and myself. Reanalysis would have been ideal to minimize intra-observer error, but it was not critical.

Initially the analysis of the burials from Jícaro was conducted in numerical order, beginning with Burial 1, with the goal of examining each burial one-by-one, ending with Burial 238. Aside from a few exceptions, the burials are clustered within the excavation units, so the numerical sequence of burials roughly coincides with the Operation numbers. This means that a sampling strategy involving the analysis of the skeletal material from burials in numerical order may have resulted in the omission of the higher numbered burials and excavation units if time became an issue, which it did. For this reason, a third and final sampling strategy was devised. With the goal of having at least a 70% sample, as of mid-July, 2013, the burials that had yet to be analyzed were sorted according to their Operation numbers. Random burials within each operation were then selected for analysis, ensuring that a minimum of 70% of the burials from each operation was scheduled for analysis. If a skeleton was laid out and was determined to be too incomplete for valuable analysis, that was documented and an alternate burial was selected at random.

During the 2013 season, a total of 177 individuals from 113 burials that were excavated from 18 of the 46 excavation units were analyzed, including the reanalysis of Burial 235 (originally examined in 2008) and six burials (16 individuals) originally examined in 2009.

Data collection in 2013 was based on forms/methods presented by Buikstra and Ubelaker (1994), including a skeletal inventory (with notes on the overall condition of the skeleton), examination of all observable morphological characteristics that would facilitate age and sex determination, measurements of cranial and postcranial elements for the purpose of sex determination and assessment of variation at the site, documentation of cranial and post-cranial non-metric traits, dental inventory (including documentation of dental characteristics such as development, wear, calculus, caries, abscesses, antemortem modification, indicators of activity, and linear enamel hypoplasias), and documentation of other postcranial indicators of health and activity (e.g., evidence for kneeling, spinal pathology, and periostitis), and trauma. By the time the 2013 laboratory season began, preliminary assessment of the Jícaro skeletal collection had demonstrated that the preservation of the skeletal material would be problematic for analyses of several skeletal features that were originally of interest for this study. Due to the overall poor preservation of crania at Jícaro, the documentation of cranial non-metric traits, cranial deformation, and health indicators like cribra orbitalia and porotic hyperostosis was relegated to anecdotal accounts of their presence if it was noted, but too few crania were present and observable for any meaningful systematic documentation and analysis of such traits. Dental measurements were also not taken during the 2013 laboratory season, both in an effort to work within time constraints and because an analysis of the dental measurements that had been taken during the 2007 and 2008 laboratory seasons and their relationship to sex determination was found to be statistically not significant.

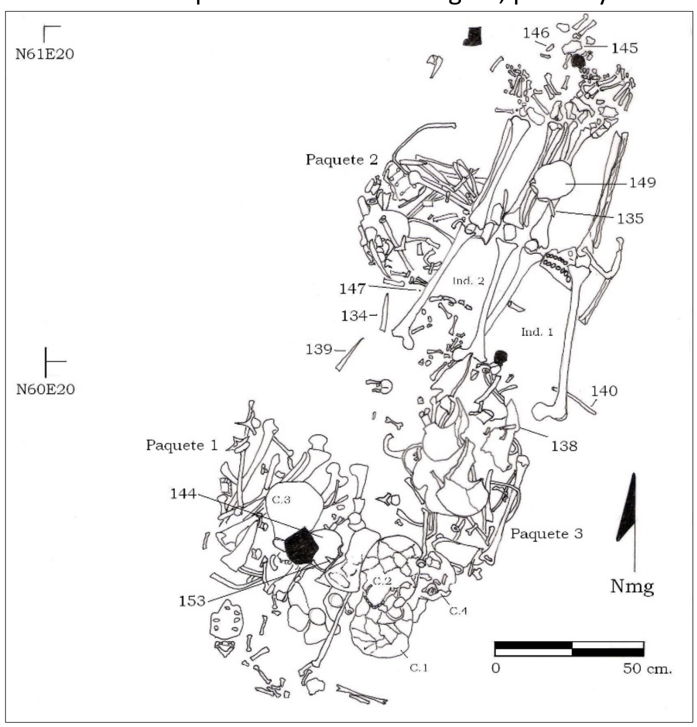
Methods: Skeletal Data Collection

The skeletal analysis portion of this project involved the collection of the following categories of data for all of the adults present at Jícaro: preservation/completeness, skeletal inventory, dental inventory, age at death, sex, long bone length, skeletal indicators of stress, and cultural modifications. Data collected for subadults included: preservation/completeness, skeletal inventory, dental inventory, age at death, long bone length, and skeletal indicators of stress. These variables will contribute to the determination of the MNI at Jícaro as well as to an understanding of the demographic composition of the population at the site.

Assessment of Completeness

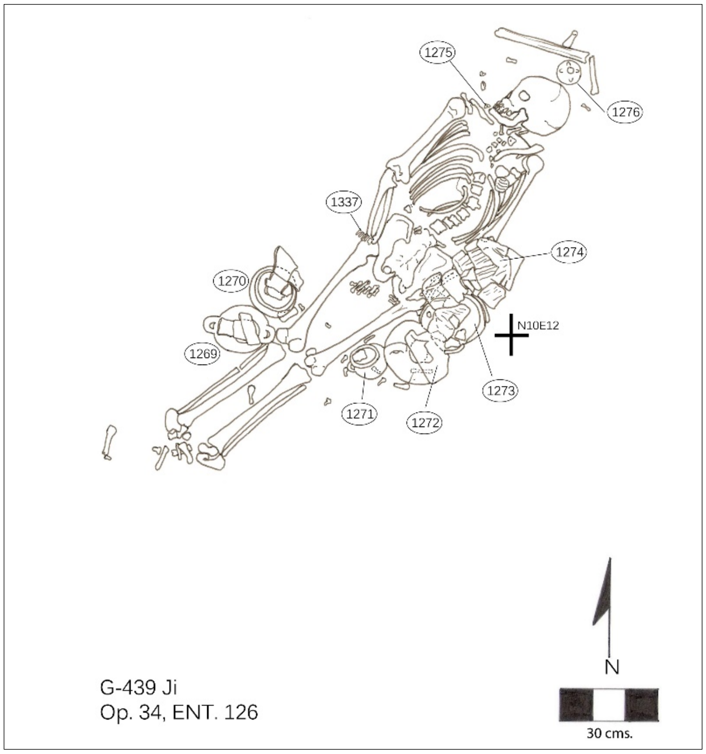
An initial assessment of completeness and complexity of each burial was based on a visual assessment of the burial maps. In 2008, archaeologists Solís and Herrera and their artist completed detailed maps of each burial, including scaled drawings of the skeletal material and artifacts, each with a crosshatch indicating the within-site coordinates, based on the burial's distance from the site's geographical center, and a north arrow. These drawings provided a basis for prioritizing burials based on completeness. For example, see Figures 3.1 to 3.3, below.

Figure 3.1: Detailed burial map. Burial 3—Commingled, partially articulated remains.



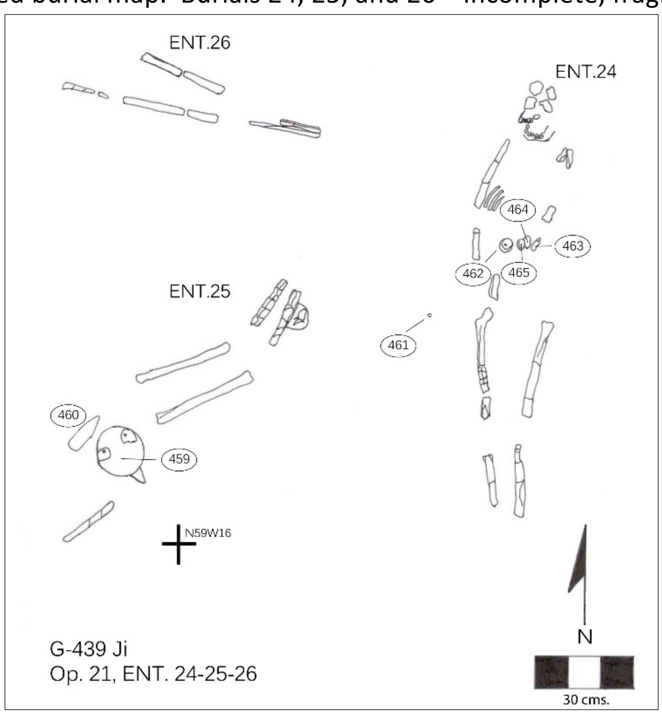
(Image: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

Figure 3.2: Detailed burial map. Burial 126—Single Interment, excellent preservation.



(Image: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

Figure 3.3: Detailed burial map. Burials 24, 25, and 26—Incomplete, fragmentary remains.



(Image: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

Inventory

Each burial that was examined was first laid out in anatomical position on a large table in order to determine whether or not there was any duplication of skeletal elements or any anomalous elements (e.g., isolated adult bones associated with a child skeleton, isolated gracile bones associated with an otherwise robust individual, etc.).

Each laboratory season involved a slightly different method for documenting the skeletal inventory. In 2007 and 2008, skeletal inventories were taken in the form of detailed notes about each bone that was observed in combination with the complete skeleton diagrams provided by Buikstra and Ubelaker (1994). Those notes were then transcribed and put into a standardized template, organized by region of the body (Cranium, Postcranium) and then in order generally from axial skeleton (vertebrae, ribs, sternum) to appendicular skeleton (clavicles, scapulae, upper limbs, pelvis, lower limbs), and superior to inferior. These templates were later translated into a format consistent with the Inventory Recording Form for Complete Skeletons, Chapter 2: Attachment 1 from *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker, 1994). In 2009, only a minimal inventory was taken of the remains that were examined. They were only assessed for presence/absence of crania, teeth, pelvis, and long bones that could be measured to assess sex and stature (humerus, femur, tibia). In 2013, all skeletal inventories were documented using the Inventory Recording Form for Complete Skeletons, Chapter 2: Attachment 1 from *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker, 1994) in combination with complete skeleton diagrams, and were supplemented with written notes.

For the purpose of determining MNI, each individual was given a number according to Burial number and Individual number. For example, Burial 3 is a complicated, commingled burial with a minimum of six individuals. Each individual in that burial was given an individual identifier: 00301, 00302, 00303, etc. Burial 26, on the contrary, is a single interment. That individual was also given an identifier according to Burial number and Individual number (02601). Many of the commingled burials were not examined during the laboratory data collection for this project because 1) time constraints limited the amount of time that could be spent resolving issues of commingling; 2) the extremely commingled burials are clearly examples of reuse at the site, but are not good examples of typical burial practices.

Criteria for Individuals

The minimum number of individuals (MNI) for Jícaro, as determined in the field, is 442. At the burial level, this number is based on the duplication of elements or on the presence of skeletal elements that could not possibly belong to the primary individual/individuals in a given burial (e.g., a burial that contains a single subadult as the primary individual, but also contains an isolated skeletal element from an adult will have an MNI of 2). This MNI is artificially high due to the possibility that some of the isolated skeletal elements found in various burials at the site may come from the same individual. The MNI also does not reflect the actual number of individuals in burials as they were examined for this study. For example, Burial 16 has an MNI of seven individuals. There is actually only one primary individual interred in Burial 16, an adult middle-aged male, with dental modification. This individual was buried with six additional crania arranged intentionally at his shoulders and beside/between his feet and legs. Those six crania contribute to the overall MNI because they are clearly duplicative of the primary individual; however, they are not evidence of a true multiple burial with seven individuals interred during the same burial event. For the reasons described above, a revised MNI was established for the site for the purposes of this research.

A substantial amount of consideration was given to the criteria that would constitute an individual for the purposes of this study. While all of the isolated skeletal elements and crania probably represent individuals who were interred at Jícaro at one time, given the extensive evidence indicating reuse of burial fossae and the likelihood of ancestor veneration (Solís and Herrera, 2011), the analysis of the skeletal remains at Jícaro for the purpose of this study is limited to individuals who appeared to have been in their original burial position at the time of their excavation or individuals who could be discerned from resolving issues of commingling in the case of several of the multiple burials. In situations like Burial 16, the additional six crania are considered artifacts due to their intentional placement around the primary individual, and the primary individual is the only one from that burial who contributes to the revised MNI.

There are several burials at Jícaro that include one or two primary individuals and one to several "*paquetes*" (packets) of human remains. The *paquetes* typically appear to have been bundled or, at a minimum, piled intentionally and are very rarely composed of more than one individual. These appear to be secondary burial treatments, most likely indicative of the reuse of burial fossae. Because the *paquetes* appear non-random and generally contain single individuals or commingled remains of several individuals, and rarely contain isolated elements from additional individuals, the individuals in the *paquetes* are considered individuals for the purpose of an MNI at Jícaro, but are omitted in statistical analyses concerning grave goods and burial positions of primary interments. As many of the disarticulated and commingled remains that are present in the graves at Jícaro were categorized as *paquetes*, future research should include a deeper analysis of those remains—whether they are considered separate archaeological features or as an additional category of burial type.

Preservation at Jícaro is extremely variable at Jícaro, with some individuals having been recognizable as human skeletons with discernable burial positions upon excavation in the field, but due to poor preservation, being reduced to little more than dust following the cleaning process (e.g., Burial 14). Only isolated elements appear to have remained intact for some individuals (e.g., Burial 12, which was composed of only fragments of the cranium and pelvis, fragmentary forearms and lower limbs). Other individuals are so well preserved that their crania and pubic symphyses remained intact and observable, and elements as small as distal hand and foot phalanges were recovered (e.g., Burial 127). Poor preservation was not taken into consideration as long as the element(s) that were present were discovered and excavated in such a way as to indicate the presence of an individual who was intentionally placed in the position in which he/she was found.

All incomplete individuals are not excluded from the sample because of the extent of reuse at Jícaro. A number of individuals who meet the criteria for consideration as individuals are incomplete due to intrusion by other burials. For example, several burials are only composed of lower limbs and feet (e.g., Burial 84) or the upper body, missing the lower limbs (e.g., Burial 50). Although these are little more than isolated skeletal elements, enough of the bodies are intact to indicate burial position and enough elements are in situ as to indicate the presence of an individual, as opposed to disarticulated isolated elements. The criteria for an individual at Jícaro are described in Table 3.1, on the following page.

Table 3.1: Criteria for Individuals at Jícaro.

Individual	**Not an Individual**
1. Three or more regions of the body are represented	1. Less than three regions of the body are represented
2. Burial position is determinable, even if remains are only partial	2. Burial position is not determinable
3. Shows intentional burial treatment	3. No indication of intentional burial treatment

These three criteria allow for individuals to be included who are poorly preserved and incomplete due to intrusion and for the exclusion of individuals who are composed of only single isolated elements or elements from one region (i.e., excluding multiple elements that may compose one limb or multiple cranial elements that may compose only one skull).

For the purpose of this study and the criteria that must be met for human remains at Jícaro to be considered an individual, a region of the body refers to any one of the four limbs, the thorax, pelvic region, or head/neck. Breaking up the body into regions for this purpose allows for the inclusion of individuals whose burials were intruded upon, leaving them incomplete, but represented by both legs or the head and upper torso and for the exclusion of individuals who are represented only because of duplication of dental elements or isolated postcranial elements, and those that were intruded upon and were dispersed to the point that the only remaining elements in the burial are a single element, or a single arm or leg, or an isolated cranium/skull. The main reason for the desire to exclude these scattered elements is the impossibility to assign them to any grave goods or other significant funerary treatments that are part of the spatial and mortuary analysis aspects of this project. These remains will be discussed with regard to their relevance as evidence for burial fossa reuse at Jícaro in Chapter 9—Discussion and Conclusions.

Only 308 of the total number of individuals were examined as part of this study, so a final MNI has not yet been determined; however, based on the criteria outlined above, a reexamination of the archaeological data may reduce the MNI to approximately 400. The number of individuals considered for the various analyses associated with this project changes according to the purpose for the analysis. For example, in situations when age-at-death and sex are critical, only the individuals who were examined during the laboratory data collection portion of this study are used, but in situations when those variables are not critical, all individuals who meet the criteria are included.

Determination of Age at Death: Adults

Numerous methods are available for determining the age-at-death for adults, all of which are dependent on preservation and observability of skeletal (and dental) elements. The pubic symphysis is among the most accurate loci for determining the age at death of adult remains. In 1990, Brooks and Suchey presented a method for age determination from the pubic symphysis that is based on a well-documented known autopsy sample that included males and females with a broad range of ages-at-death. In many cases, especially in a bioarchaeological setting, the remains are fragmentary and the pubic bones are missing, and other methods must be utilized for determining the age at death for the remains. Lovejoy et al. (1985) developed the aging method based on changes of the auricular surface using skeletal material from the Todd Collection, the Libben Collection, and several forensic cases. Buckberry and Chamberlain (2002) build on the Lovejoy et al. (1985) method, by creating a scoring system for individual types of changes (i.e. transverse organization, surface texture, micro and macroporosity, and apical changes) in which the scores are assessed, then added together to create composite scores which fit into revised age-range categories. Their sample of 180 individuals was from the documented Christ Church, Spitalfields, Collection in London, and for that sample Buckberry and Chamberlain found the auricular surface method to be more accurate than the Suchey-Brooks pubic symphysis aging method. Further modifications have been suggested by Osborne et al. (2004) who recommend condensing the number of phases from eight to six, and increasing the range for each phase because the five-year age ranges in the Lovejoy et al. method are extremely narrow.

Several studies have shown that while some methods have relatively high accuracy rates alone, the accuracy of age estimation improves significantly when methods are used in combination. Baccino et al. (1999) tested the accuracy of four independent aging techniques (fourth rib sternal ends, single rooted teeth, femoral cortical remodeling, and pubic symphysis) and three combinations of methods on a sample of 19 modern forensic cases of known ages at death. Lovejoy et al. (1985) present a multifactorial method for determining skeletal age at death, based on five indicators—pubic symphyseal face, auricular surface, radiographs of proximal femur, dental wear, and suture closure. Results from those two studies (Baccino et al., 1999; Lovejoy et al., 1985) indicated that methods used in combination were always more accurate than any individual method. Kimmerle et al. (2008) evaluated five of the most common methods used by anthropologists to determine age at death of unknown remains: the Todd and Suchey-Brooks (1990) methods for evaluating the pubic symphysis; the Lamendin et al. (1992)

method for evaluating root transparency of single-rooted teeth; the Smith (1984) system for evaluating dental wear; and the Iscan et al. (1984, 1985) method for scoring sternal rib ends. They found that there were significant differences among at least some of the investigators for all of the methods; however, they are typically within one phase of one another.

Because preservation varies from individual to individual, the methods used to determine age at death for adults were determined on a case-by-case basis. When possible, multiple age indicators were considered for age determination of adults in the Jícaro sample. In cases where the pubis was present, the pubic symphysis was scored and recorded according to Brooks and Suchey (1990, presented in Buikstra and Ubelaker, 1994). When possible, both pubic symphyseal surfaces (right and left) were scored individually. In cases when the auricular surface was present and intact enough for examination, without excessive deterioration of the articular surface, both the right and left auricular surfaces were scored and recorded, also according to guidelines and forms presented by Buikstra and Ubelaker (1994).

Dental attrition was also assessed for each adult for with visible occlusal surfaces. The wear of anterior teeth was assessed based on the method developed by Murphy (1959) and refined by Smith (1984), as it is presented in Buikstra and Ubelaker (1994). Molar wear was assessed according to Scott (1979) as it is presented in Buikstra and Ubelaker (1994). These methods were applied and recorded according to the data sheets provided by Buikstra and Ubelaker (1994). The Lamendin technique was not applied to the Jícaro sample because of a lack of necessary equipment and sufficient training in the technique, making it a worthwhile study for a future research project.

Cranial suture closure can also be evaluated to determine age-at-death for adult remains, as cranial sutures generally fuse as an individual ages, though there is a substantial amount of variability with regard to the timing of suture closure (Buikstra and Ubelaker, 1994). Because this method is not as reliable as some of the others and because so few crania from Jícaro are intact enough for the analysis of cranial suture closure, the method was applied (as it is presented in Buikstra and Ubelaker, 1994) only in rare cases and is not generally considered as an aging criterion for this sample. Several other features were utilized to determine relative age, such as the bone quality in general, the presence of osteoarthritis and osteophytic lipping at the joints and on the vertebrae, respectively, and bone resorption and tooth loss when no other methods could be applied. Depending upon the preservation, as many methods as possible were utilized to determine the age or relative age of all of the adults. Photographs of all age indicators were taken—in part to maintain a record of which elements were examined for each individual and what their condition was at the time of examination; and in part to have the ability to generate seriations for each of the age indicators in order to potentially develop age ranges that are more specific to the Jícaro sample.

Determination of Age at Death: Subadults

It has been repeatedly established that the age of subadults is most accurately reflected in the stages of development of the dentition. Moorrees, Fanning, and Hunt (1963a) present developmental "norms" for the permanent maxillary incisors and eight mandibular teeth. They scored the development of the maxillary and mandibular incisors according to radiographs of 99 Boston children from the School of Public Health at Harvard University and assigned the scores to age categories, and provide summaries of their findings in a number of graphs. Their developmental stages trace the formation and development of the permanent dentition from the appearance of the first enamel through the closure of the last root, which makes their age charts range from about birth through about 25 years. A second publication by Moorrees, Fanning, and Hunt in the same year focuses on the development of the deciduous canine, first and second molars. Moorrees, Fanning, and Hunt (1963b) examined a series of lateral jaw radiographs from the same individuals they had used for their developmental norms study, paying particular attention to the timing of tooth formation and root absorption. This is perhaps the most widely used age-estimation tool available to anthropologists. With reference to the Moorrees, Fanning, and Hunt (1963a, 1963b) studies, Ubelaker (1989) created a chart for determining age based on dental development.

Scheuer and Black (2000) review the entire growth and development of a child's skeleton, beginning with the earliest stages of embryonic development, through the first bone formation and then the growth and development of bone itself. They follow their early review with detailed summaries of the appearance and development of every bone in the body, including diagrams that illustrate the timing of the appearance of the primary and secondary centers of ossification and the fusion of those centers. Theirs is the most comprehensive text available for the analysis of the growth and development of juvenile remains. Schafer (2009) later developed a lab manual to accompany the Scheuer and Black (2000) volume, which contains numerous charts from various authors, showing the correspondence between skeletal development and long bone length and juvenile age.

Because the epiphyses of individuals under the age of 12 are not typically fused to the diaphyses and because the epiphyses are subject to erosion and disappearance more quickly than the rest of the bone, aging techniques that use the epiphyses to determine the ages of slightly older subadults may not be applicable in many cases (Hoffman 1979). Hoffman compared radiographs showing dental eruption and diaphyseal lengths of long bones against the known chronological ages of 334 test subjects. He concluded that age determinations based on diaphyseal lengths and those based on dental development were very similar, but when given a choice between using dental development and diaphyseal lengths, he would advise turning to the dental development. Lampl and Johnston (1996) point out that using modern developmental standards from Western, developed nations may not be appropriate for determining the ages of ancient remains or the remains of children who may be from a population living in an environment that causes them to be mildly to moderately malnourished. They found that when modern Canadian standards were applied to a small sample of Mexican children, the children were consistently underaged. This is a risk that must be taken, although mistakes in age determination may have detrimental effects on paleodemographic studies (Larsen, 1997).

When the teeth were present and observable, dental development was the primary technique used to assess the ages of any subadults in the sample. Methods such as Moorrees, Fanning, and Hunt (1963a, 1963b) and Ubelaker (1989) are included in the Buikstra and Ubelaker (1994) volume and were the preferred methods for determining subadult ages at death. Because many of the skulls (and therefore teeth) are missing from the burials at Jícaro, due to looting and preservation issues, in many cases the age of subadult remains were determined based on maximum length measurements and comparisons with the measurement tables developed by various researchers, presented by Schaefer et al. (2009). Diaphyseal length, dental development, and epiphyseal closure were evaluated for each of the subadults, where preservation and presence of elements permitted such analysis. All observations were documented according to data sheets provided by Buikstra and Ubelaker (1994).

Assessment of Sex

The sex of adult human skeletal remains can be determined using metric or nonmetric methods. Perhaps the most widely used metric method for determining the sex of an individual was developed by Giles and Elliot in 1963. In 1963, Giles and Elliot published discriminant functions for determining sex of unknown individuals, based on nine measurements (taken in 21 different combinations) of 408 crania from the Terry Collection and archaeological sites. According to Giles and Elliot, the method has an 82-89% accuracy rate and it will still provide relatively accurate results even when applied to populations that were not included in the development of the equations. Discriminant functions, however, do not perform well when applied to remains from populations other than those from which the equations were originally developed (Ubelaker et al. 2002).

Methods that utilize measurements and equations tend to require a relatively high level of preservation in order for the methods to even be applicable. Non-metric, or visual, methods for determining the sex of unknown remains are more applicable in situations where the remains are fragmentary—they also tend to be relatively straight forward. Buikstra and Ubelaker (1994), for example, present a suite of cranial and postcranial features that can be visually assessed in order to determine the sex of adult remains. Walrath et al. (2004) note that such methods are highly reliable; however, there can be substantial disagreement among investigators per trait used if their definitions are not the same. They point out that accuracy may be compromised when dealing with fragmentary remains and that a suite of features should always be taken into account when it is possible.

Phenice (1969) introduced what is probably the most commonly used method for determining the sex of unknown skeletal remains. Making use of three characteristics of the pelvis—the ventral arc, subpubic concavity, and the medial aspect of the ischiopubic ramus—his is a visual method that, according to Phenice, is simple and objective and had over a 95% accuracy rate when tested on 275 individuals from the Terry Collection. MacLaughlin and Bruce (1990) evaluated the Phenice method for determining sex. Their sample was composed of 273 individuals from three documented skeletal collections. They took the three Phenice characters separately, finding that when taken separately, the subpubic concavity is the most useful for determining sex. MacLaughlin and Bruce also introduced a third category, indeterminate, to the Phenice classification system. Rogers and Saunders (1994) examined 49 adults from the St. Thomas Anglican Church skeletal collection to evaluate several morphological traits of the pelvis for their accuracy in sex determination. They found that pelvic morphological traits, when taken in combination, are more accurate for determining sex than when traits are used in isolation. Certain combinations of traits—such as the ventral arc, true pelvis shape, subpubic concavity, pubis shape, sacrum shape, and obturator foramen—seem to predict sex best when taken together.

Because preservation varies from individual to individual, the methods used to determine the sex of the adults at Jícaro were determined on a case-by-case basis, and multiple methods of sex determination were applied whenever it is possible, including morphological assessment of the pelvis (Phenice, 1969), morphological assessment of the cranium (Acsadi and Nemeskeri, 1970, in Buikstra and Ubelaker, 1994), and postcranial metric assessments, particularly of the long bones, such as the femur, tibia, and humerus (Giles and Elliot 1963). Because the greater sciatic notch and the auricular surface are so often found intact, when possible, the arc composé for sex determination was also used (Steckel et al., 2006). The arc composé takes into account the angle of the auricular surface and its position relative to the greater sciatic notch. All of the indicators for sex were systematically recorded during each of the four laboratory seasons according to forms and guidelines presented by Buikstra and Ubelaker (1994), and guidelines presented by Steckel et al., 2006). Sex determination was not attempted for any individuals whose age at death was determined to be in any category younger than Adolescent (Buikstra and Ubelaker, 1994).

For the purpose of this study, adults were assigned to one of six categories: Male, Probable Male, Ambiguous (showing both male and female characteristics), Probable Female, Female, and Indeterminate (too little information present to determine sex). A seventh category for sex in this study is Undetermined: Subadult.

Long Bone Length

Long bone length is known to be highly correlated with stature (Steckel et al. 2006; Trotter and Gleser 1951, 1952), but long bone measurements of adult and subadult remains can also be informative for questions concerning growth and development as it is highly dependent on genetic and environmental factors (Steckel et al. 2002). Stature estimation is often difficult in a bioarchaeological context, but it remains an integral part of the biological profile. Trotter (1970) built on her earlier work with Gleser, and examined a sample of males and females from the Terry Collection, and a sample of male servicemen who died during WWII and the Korean War in order to compare known living stature to the measured stature obtained after death. She developed regression equations from her measurements for White males and females, Negro males and females, Mongoloid males and Mexican males (terms from Trotter 1970). Later studies identified problems with the Trotter and Gleser formulae. Jantz et al. (1995), for example, found that the regression equations are flawed because they are based on erroneous measurements of the maximum tibia length.

Like other methods for age and sex estimation presented above, stature estimations based on populations other than the one being studied can be misleading. As a result, Genoves (1967) presents a slightly different approach to questioning the applicability of regression equations. He calculated the stature and drew blood from a small sample of cadavers from the National School of Medicine in the Federal District of Mexico. From that sample, he determined which individuals would have most closely resembled the indigenous people, and created formulae for determining the stature of Mesoamericans based on measurements of the femur and tibia. While he acknowledges problems inherent in a small sample, he proposes that his formulae are applicable to pre-Colombian skeletal remains.

During the 2007, 2008, and 2013 laboratory seasons, complete postcranial measurements were collected whenever possible; during the 2009 laboratory season, only measurements of the humerus, femur and tibia were collected. Long bone length measurements were used for two different types of analyses. Stature was determined for as many adults as possible according to formulae presented by Genoves (1967). Long bone lengths of subadults were also documented in part to facilitate age determination when teeth were not present, and in part to compare skeletal and dental ages (Hoffman, 1979). Maximum lengths of long bones (or long bone diaphyses, in the case of juveniles) were determined using an osteometric board or sliding calipers, when appropriate.

Intentional Cultural Modifications

The modification of the occlusal edges of maxillary and mandibular teeth was a common practice during the Mesoamerican Postclassic (A.D. 1000-1500), which corresponds with the Sapoa Period of Greater Nicoya chronology, the time period during which Jícaro was inhabited (Romero, 1970). Antemortem dental modification during this time period in this region has been cited as evidence for Mesoamerican identity (Hardy, 1992; Vázquez, 1986). Dental filing was common throughout ancient Mesoamerica and was practiced by males and females alike (Romero 1970), although the types, prevalence, and purpose for modification varied greatly over time and space. However, dental modification is not a common practice in Greater Nicoya—for example, only one of the 113 burials at the nearby site of Nacascolo showed evidence of dental modification. In the field, sex determination for many of the individuals at the site was based on the presence (males) or absence (females) of dental modification (Herrera, personal communication, 2008).

When possible and when relevant, antemortem dental modification for all adults were recorded and scored according to Buikstra and Ubelaker (1994). All permanent anterior teeth in the sample were evaluated for presence or absence of antemortem occlusal edge modification in order to ascertain whether the modifications are related to differences in cultural identity, social status, gender roles, household (possibly familial or lineage identity), or other social factors. Modification was scored and documented according to Romero (1970, in Buikstra and Ubelaker, 1994). Because of small sample sizes, this category was condensed into presence/absence per individual for statistical analysis. Individuals with varying expressions of dental modification are discussed in Chapter #.

When this project was proposed, an assessment of cranial modification was also an expected component of the analysis, but a majority of the crania from the site are crushed or deformed postmortem, which precluded a systematic assessment of antemortem cranial modification.

Activity

Bone, a living tissue, is known to respond to repetitive behavior, for example alterations to muscle attachment sites and joint surfaces, including intervertebral joints. The presence of osteoarthritis is often considered to be directly related to activity, but according to Jurmain (1999), there are many interrelated factors that contribute to the condition. Documentation and analysis of osteoarthritis requires intact joint surfaces, which are unfortunately rare at Jícaro due to differential preservation of the skeletal material. In addition to osteoarthritis, other skeletal features can be just as diagnostic of repeated activity. Ubelaker (1979), for example, noted wear facets on the superior/proximal surface of the first proximal foot phalanx and the superior/distal surfaces of the metatarsals. He first noticed the trait on individuals recovered archaeologically from the Hacienda Ayalan site in Ecuador, in 1973, and attributed the facets to repeated kneeling throughout the lives of those people. After comparing the Ecuador sample to five other Native American samples housed at the Smithsonian Institution, he concluded that similar facets occurred in all of those populations in slightly different places, with different frequencies. The facets on the metatarsal and foot phalanx correlated with alterations to the femoral condyle and, according to Ubelaker, the variations in frequencies and location of the wear facets may indicate differences in position—i.e. kneeling v. squatting in different populations. Boulle (2001) noted similar facets on the tibiae and tali of prehistoric remains from France and from the Hamman-Todd Collection. Boulle attributed the skeletal markers he recorded to the repeated action of squatting among the people he was studying.

The teeth can be excellent indicators of repeated activity, particularly with regard to questions of diet or repeated use of the teeth as tools. For example, Turner and Machado (1983) noted a pattern of "lingual surface attrition of the maxillary teeth (LSAMAT)" affecting the inhabitants of the archaic site of Corondó in Brazil. Turner and Machado (1983) attributed the pattern to the repeated use of the maxillary incisors to scrape or peel some sort of abrasive plant material, likely manioc or a relative.

Similar extreme lingual wear was also noted at a site in Panama that dates to approximately AD 200-1000 (Irish and Turner, 1987) and at the Maya site of Cuello (Saul and Saul, 1989). Occlusal dental wear (wear affecting the chewing surface of the teeth) and interproximal wear (wear affecting the sides of the teeth that touch one another) may be indicative of subsistence strategies, while the abrasion of teeth may indicate the repeated insertion of a foreign object (e.g., a pipe) (Hillson, 2000).

Osteoarthritis

During the 2007 laboratory season working with the human remains from Jícaro, osteoarthritis was documented and scored, when possible, according to Buikstra and Ubelaker (1994). Although preservation is extremely good in certain areas of the site, it is generally not good enough for systematic documentation of osteoarthritis. Many of even the best-preserved individuals are missing the extremities of the long bones, and the vertebral column seems to be particularly adversely affected by conditions at Jícaro. Osteoarthritis was not systematically documented in subsequent laboratory seasons, though observations of specific individuals do include anecdotal descriptions of osteoarthritis if it I was observed.

Other Activity

During all four seasons of data collection for this project, indicators of activity, such as the expression of muscle attachments and evidence for kneeling were documented in the field notes, but were not systematically scored according to any standard of measurement. This is an area for future research on this skeletal sample. Early in the 2007 laboratory season, it became obvious that some of the individuals from Jícaro displayed some of the characteristics of kneeling discussed by Boule (2001) and Ubelaker (1979). These attributes, including facets on the anterior femoral necks and anterior distal tibiae were scored as present or absent per individual. Due to problematic preservation, making many of the long bone extremities unobservable, for the purpose of statistical analysis, these observations were eventually condensed into one variable: Evidence for Kneeling.

The incidence of fractures was found to be so low during preliminary laboratory data collection from the remains that the prevalence of fractures or differential distribution of fractures among different sexes or age cohorts was not expected to be a significant contributor to any further understanding of the population at Jícaro. Trauma, like osteoarthritis, is mentioned anecdotally in field notes when it is observed, but it was not systematically documented.

Non-Specific Stress

Stress, according to Goodman et al. (1988), is a critical influence on the body's response to the natural and cultural environments, including the body's response to pathological conditions. It is important to keep in mind that the indicators of stress that are observable on a particular skeleton may not reflect stressors at the population level, but may be more indicative of that particular individual's level of stress and his/her access to resources, possibly illustrating his/her marginalized position within the society. Paleopathological studies are also necessarily interpreted cautiously because the presence of skeletal lesions may not, in fact, indicate that a particular individual was less susceptible to disease than other individuals who may have died as a result of the disease before any skeletal indicators were able to develop (Wood et. al., 1992). This caveat may be mitigated by relying on a suite of skeletal indicators of stress, rather than individual indicators, as proposed by Goodman (1993).

Documenting and interpreting the presence and expression of the nonspecific indicators of stress in a population can be useful for assessing levels of childhood stress in past populations, especially those associated with events in children's lives, such as the weaning period. For example, Obando (1995) examined skeletal material from two sites, Nacascolo (Beach Cemetery) and Vidor on the shores of the Bahía de Culebra. She used data on the prevalence of porotic hyperostosis and percent femoral cortical thickness in order to assess health and weaning conditions for children in northwestern Costa Rica. Her research provides insight into the understanding of childhood stress and adaptive responses and is used in this research for comparison with data and analysis of Jícaro.

Non-Specific Stress: Skeletal Indicators

Porotic hyperostosis and cribra orbitalia result from hypertrophy of the bone of the cranial vault and orbits, respectively, and are often considered to be evidence for anemia in prehistoric populations (Stuart-Macadam 1992; Sullivan, 2005; Ubelaker, 1992; Walker et al., 2009), though their causes and etiologies may be very different (Walker et al., 2009). The anemia however can be the result of a number of conditions, such as chronic infectious disease, nutritional deficiencies, and parasites. Evidence presented by Ubelaker (1992) suggests that porotic hyperostosis appears to be the result of anemia that is brought on by a number of factors acting together. Ubelaker (1992) concluded that the anemia was less likely to have had a dietary basis and was more likely the result of chronic infectious disease resulting from poor sanitation associated with increased sedentism and population density; however parasitic infection, particularly hookworm, is also a likely contributor. Sullivan (2005) also describes multiple possible etiologies for anemia leading to cribra orbitalia in a medieval population from York, England: inadequate absorption of iron, chronic disease (microbial invasion), and insufficient absorption of vitamin B12 (folic acid). Walker et al. (2009) present an alternative theory to the long-held belief that iron-deficiency anemia, regardless of the etiology, is responsible for conditions such as cribra orbitalia and porotic hyperostosis. According to Walker et al. (2009), such conditions are more likely caused by megaloblastic or hemolytic anemias that would cause the premature death of red blood cells and are possibly related to nutritional deficiencies that would include scurvy. Their rationale for the alternative interpretation is that iron deficiency anemia would actually inhibit the production of red blood cells and therefore could not be responsible for the hypertrophic osseous response in the orbits and cranial vault bones that are so commonly associated with the conditions.

Due to problematic preservation, particularly with regard to fragmentation and cortical degradation of the crania, porotic hyperostosis was not recorded as part of this research, contrary to the initial plan. Poor preservation of crania also complicated the documentation of cribra orbitalia because so few orbits are present for individuals in this sample. When possible, presence/absence of orbits was documented, as well as the presence or absence of cribra orbitalia and the appearance of the reaction (healed, healing/combination, active).

Non-Specific Stress: Dental Indicators

Due to the often poor preservation of prehistoric skeletal remains, the dentition is frequently a major source of information for a bioarchaeologist about the general health and stress levels in past populations. Though the recovery of teeth is sometimes incomplete, teeth are generally less susceptible to the taphonomic forces that can cause severe degradation of bone. Enamel hypoplasias are often indicative of severe childhood stress, be it nutritional deficiency, illness, or any number of other stressors. Goodman and Rose (1990) discuss the sensitive, permanent, however non-specific, nature of enamel defects in teeth. They point out the usefulness of looking at enamel defects for answering questions about the lives of past people—noting that depending on the research question, it may be necessary to look at different teeth based on their susceptibility to hypoplastic events (Goodman and Rose, 1990; Hillson, 2000). Linear enamel hypoplasias (LEH) are scored for the population of Jícaro to explore questions related to childhood health, possibly differences between males and females, and possibly differences between age cohorts at the site.

Other forms of dental pathology may also provide evidence of the diet or other behaviors of past people. Though it is important to be mindful of variables that would cause a given individual to be predisposed to developing caries, such as weak enamel, eating or processing foods with high sugar contents may lead to long-term plaque accumulation, which then mineralizes and turns into calculus, trapping bacteria that demineralize the tooth enamel, thereby leading to dental caries (Hillson, 2000). Temple and Larsen (2007) discuss caries prevalence among populations where agriculture has been well developed. Their study showed that females whose work would have involved processing harvested grains, giving them ready access to the carbohydrate-rich food source, had a higher frequency of dental caries when compared to their male counterparts who had less access to grain and displayed fewer dental caries overall. Temple and Larsen (2007) also demonstrate that in societies where non-intensive agriculture is the common practice, the prevalence of caries among males and females tends to be more evenly distributed. Dental caries were assessed for the Jícaro sample as a means for exploring differences in diet and activity between males and females at the site.

A complete dental inventory was recorded for each individual according to the appropriate collection methods and forms provided by Buikstra and Ubelaker (1994) for permanent and deciduous dentition. This inventory included documentation of presence/absence of the tooth and observations about development (when possible), wear (when possible), dental caries (when possible), abscesses (when possible), and calculus (when possible). In addition to the standard dental inventory, during the 2007 and 2008 laboratory seasons, complete dental measurements were also recorded according to methods and forms presented by Buikstra and Ubelaker (1994). All observations of dental caries, abscesses, and calculus accumulation were documented on forms and diagrams provided by Buikstra and Ubelaker (1994), according to their standard guidelines.

All anterior maxillary and mandibular teeth (canine-to-canine) were evaluated for presence/absence of linear enamel hypoplasias (LEH). The teeth were examined using strafing light, and when a defect was observed, a LEH was counted as present if it was palpable with a fingernail (Steckel et al., 2006). If multiple LEHs were present on a particular tooth, all of them were recorded. When possible, the distance of the center of the LEH from the center of the cementoenamel junction was measured using digital sliding calipers. LEHs were considered unscorable on teeth that were either excessively worn, modified, or had unobservable cementoenamel junctions due to the presence of calculus or matrix. When possible, crown height measurements were taken of the teeth, but very few teeth were in appropriate condition for this measurement. Because of the small sample size of individuals with observable anterior teeth, and within that sample, the even smaller number of individuals with anterior teeth for which LEH could be scored, LEH are presented in the analysis portion of this study as present/absent per individual and not per tooth. LEHs were recorded on forms provided by Buikstra and Ubelaker (1994).

Paleopathology

Paleopathological studies are also essential for understanding the interplay between cultural attributes and the evolution and effects of disease processes on past populations (Lovell, 2000; Ortner, 2003). The effects of health, activity, nutrition, trauma, infection (localized, parasitic, etc.) and disease (infectious, congenital, etc.) and genetic disorders can be assessed through the analysis of numerous skeletal indicators. Some skeletal indicators can be attributed to specific environmental factors or pathogens, while other conditions do not result from such singular etiologies and may be related to nutritional or pathological stress or to any number of other factors (Ortner, 2003). Many other pathological processes will never manifest in the bone, and many pathogens themselves are not preserved—only their effects can be observed and studied.

Periostitis

Periostitis becomes visible as the periosteum is stimulated to deposit new bone following an episode of trauma or infection (Ortnerr, 2003). When it is related to acute trauma, periostitis is typically observed in an isolated location surrounding the area of skeletal trauma with the formation of a callus, while periostitis that is related to an infection may appear on bones throughout the body (Ortner, 2003). Infection can result from a disease process related to specific pathogens, such as treponemal infections, or it can be a result of a systemic infection related to biocultural stress. Ortner (2003) notes that syphilis particularly affects the bones that are close to the surface of the skin, such as the tibia and cranial vault; however, periostitis in those locations is not necessarily diagnostic of the condition. Generalized periostitis is less useful as a diagnostic tool than it is as an indicator of general stress and is less useful for determination of the presence of specific etiologies (Ortner, 2003).

As this study involves a characterization of the population of Jícaro, all evidence of non-specific periosteal reaction was recorded, without selecting specific regions of certain bones or describing lesions in detail in an attempt to diagnose specific conditions (Buikstra and Ubelaker, 1994). Periostitis was recorded by skeletal element and location and was coded by appearance as "woven," "sclerotic," or "mixed" expression. For the purpose of statistical analysis, the periostitis categories were consolidated into a single presence/absence variable, but individual expressions are discussed in Chapter **#**. Other evidence for pathology, such as lytic lesions affecting the crania and spinal columns of several individuals were documented in the field notes and were coded per individual as present/absent.

Methods: Analysis

Goldstein (1981) advocates multidimensional analysis of mortuary sites, specifically incorporating spatial analysis as a means for examining the organization of a mortuary site and how it relates to the society as a whole. The burials that have been excavated from Jícaro were not recovered from an organized cemetery; however, the same assumptions about burial treatments and mortuary patterns providing information about social organization apply to the mortuary treatment and the spatial distribution of the burials at Jícaro as would apply to an organized cemetery. In keeping with

Goldstein (1981), mortuary analysis of Jícaro involved qualitative and quantitative analyses of burial treatments—body position, body orientation, articulation, grave type, grave location, and presence and type of grave goods—as they relate to data collected from the skeletal sample as well as a spatial analysis component.

Methods: Intra-site Statistical Analysis

The variables collected during the four seasons of laboratory data collection for this study were coded and entered into an Excel spreadsheet that was imported into SPSS for analysis. Descriptive statistics, such as histograms, Chi-square and Fisher's Exact tests, and frequencies were used to evaluate whether any significant associations between variables that were included in the dataset. These analyses were conducted at the individual level, at the burial level, at the operation (excavation unit) level, and at the sector level. Though the operations are useful for the purpose of studying groupings of variables, because their placement is somewhat arbitrary, based on surface survey and shovel test pits, as opposed to placement according to known cemetery structure, and because the site was not 100% excavated, analysis at this level is not expected to be meaningful in and of itself; it is, however expected to be meaningful when operations are considered together at the sector level.

Using R Studio, tetrachoric correlations and correspondence analysis were carried out upon completion of the descriptive analyses. Variables were selected for these analyses if descriptive analyses demonstrated significant associations or when the associations were not significant, but observations of frequencies and co-occurrence indicated relationships. Excel spreadsheets with only the selected variables were converted to text files and were reformatted to make them appropriate for analysis in R. The tetrachoric correlations were expressed both visually (matrices of color indicating positive and negative correlations) and numerically (matrices showing the r value calculated for each positive or negative correlation). The variables included in the correspondence analysis were plotted and ellipses were drawn around clusters of variables that appeared to correspond more closely with one another than with other variables.

One variable, stature, was evaluated using an Independent Samples T-test, with significance set at $p \leq 0.05$. Because so few individuals had long bones intact enough to measure for stature determination, and because some individuals were missing one or more long bones, for the stature determination aspect of this study it was important to determine if the resulting stature calculations could be used for either the femur or the tibia without a statistically significant difference. Stature calculations were also subjected to Independent Samples T-test in SPSS to evaluate whether or not there is a significant difference between statures of males and females in this sample.

Methods: Inter-site Statistical Analysis

Due to the fact that the comparative data for Jícaro and Nacascolo are necessarily coded into nominal categories of presence/absence, limited statistical analyses could be performed. The Nacascolo data was combined with the Jícaro data, separating the sites using a code for Site Number, into an SPSS dataset. The variables for both sites were recoded as necessary to make them as comparable as possible, and only variables recorded for both sites were included. SPSS was used to calculate the statistical analyses for this portion of the study, which are limited to descriptive statistics, including histograms, Chi-square and Fisher's Exact tests, and frequencies.

Methods: Spatial Analysis

Archaeologists Solís and Herrera provided an overview map of the site of Jícaro for the purpose of this project. The map was originally created in a CAD program by a surveyor for the Papagayo Project, the development project that funded the archaeological salvage excavations, and is both proprietary and unavailable to the archaeologists and the MNCR (Solís, personal communication, 2008).

The map was provided to Solís and Herrera for use in their reports in JPG format and was not useful for spatial analysis because it is an overall view of the nearly five-hectare site and there is no data associated with it. Though some information about the locations of artifact concentrations and large features at the site including excavation units, shell piles, sculpture, the site outline and the limits of the area that could be excavated are visible, it could not be used for this study.

For the purpose of this study, a new map based on the JPEG image of the original map provided by Solís and Herrera was created in ArcGIS 10.3, with the assistance of MSU RSGIS staff. To create the new map, the coordinates were first geolocated so the new site map would have the potential to be located in actual space. Once the map was georeferenced, each feature depicted in the map was traced with as much precision as possible. Because the archaeologists' maps of their excavation units and burials each contain hash marks indicating the north/south and east/west coordinates nearest each burial according to its relative distance from the geographical center of the site, it was possible to import each of their maps into the new site map to geolocate each of the excavation units (operations), burials, and individuals (e.g., the nearest coordinate for Burial 48 is N50E12, meaning this burial is located roughly 50 meters north and 12 meters east of the site's geographic center). Shape files were created for each burial and individuals within the burials were marked by points. For individuals with crania, the points were placed at about the center of the head; for individuals without crania (e.g., individuals that are represented by only the lower limbs) the points were placed at the most cranial aspect of the elements that are present (i.e., the part of the body that would have been closest to the head); in cases of commingled burials with labeled individuals, the points were placed at the center of each cranium or bundle (when present); and in cases of commingled burials where no individuals could be determined by looking at the burial maps, the points were evenly distributed throughout the burial shape file.

Variables from the dataset were linked with each of the shape and point files in ArcGIS 10.3 and their spatial distribution was visually assessed. SPSS calculations of frequencies from the descriptive statistical analysis phase of the project were also consulted for this portion of the study.

Chapter Summary

The data collection for this project took place over several laboratory seasons, each with a different research agenda, which resulted in the employment of several different data collection and sampling strategies. An estimated 442 individuals were excavated from Jícaro over the three archaeological field seasons, and only 308 were analyzed during the laboratory data collection portion of this study, but all of the individuals could not be incorporated into all of the analyses due to preservation issues and missing information. The data collection methods used for this study are largely based on forms and standards published by Buikstra and Ubelaker (1994), to make the data as comparable with other sites as possible for future analyses. Data collection from skeletal material made use of as many methods as possible for obtaining information about age, sex, and cranial and postcranial measurements, but were limited by preservation issues and the most appropriate method for each variable had to be determined on a case-by-case basis. The analytical methods employed for this study include a combination of descriptive statistical analyses and visual assessments, and in many cases were necessarily conducted at a general—presence/absence—level.

Chapter 4: Results of Skeletal Analysis of the Jícaro Sample

Introduction

This chapter presents results of the statistical analyses of skeletal data collected from the Jícaro sample. The following analyses characterize the population that lived at Jícaro--according to demographic variables (age-at-death and sex) as they relate to activity, stress, and cultural modifications. A discussion of additional observations recorded about the Jícaro population is presented in Chapter 8. These analyses are directly related to Research Question 1 of this study, presented in Chapter 2: **What is the composition of the population at Jícaro?**

Demographic Variables

Of the 442 individuals from Jícaro, 308 were examined over the 4 seasons of laboratory work for this study. Of the 308 individuals who were examined, 166 are adults and 118 are subadults, and 24 could not be categorized as adult or subadult due to insufficient information (mainly due to poor preservation).

Age Determination: Adults

Preservation of skeletal remains at Jícaro proved to be more problematic than expected, and age indicators of adults are particularly affected. Only in rare instances were the pelves observable to any degree, and when they were, the pubic symphysis was only present for 12 of the 167 adults who were examined as part of this study. Though the auricular surface is often better preserved than the pubic symphysis, only 12 individuals had observable auricular surfaces, four of which also had observable pubic symphyses. The crania are also in generally poor condition; many are fractured to the point that they are not observable. Because of problematic preservation, more often than not a suite of age indicators was used to determine the age of adults in this sample. An inventory of individuals and a summary of the methods used to determine age and sex for each is presented in Appendix B.

The adolescents included in Table 4.1, below, are in their upper teenage years and are considered to be on the cusp of the Young Adult category, and are considered among the 167 adults in the examined sample. As Table 4.1 shows, there approximately equal numbers of Young Adults and Middle Adults represented in the Jícaro sample, and about half as many Older Adults. The most substantial portion of the Adults in the sample could not be confidently assigned to an age category because of insufficient preservation or observability of skeletal elements.

Table 4.1: Adult ages-at-death.

Age Category	Count	*Freq.%*
Young Adult	33	*19.8*
Middle Adult	39	*23.0*
Older Adult	15	*9.0*
Undetermined: Adult	78	*47.0*
No Information	2	*1.2*
Total	167	*100.0*

Sex Determination: Adults

One aspect of this research involved the reassessment of age and sex from what was determined by the archaeologists in the field. There are two reasons for doing this: 1) it was important to be able to know if the archaeologists assessment of sex could be used reliably for the mortuary analysis of individuals who were not directly examined during the data collection phase of this study; and 2) through personal communication with the archaeologists, Solís and Herrera, it became known that when skeletal determination of sex was not possible, they were determining sex based on cultural modifications (cranial and dental), and it was important for this research to assess whether or not those variables could be used reliably for sex determination. Originally, as discussed in the previous chapter, assessment of sex was broken down into seven categories (Male, Probable Male, Ambiguous, Probable

Female, Female, Indeterminate, and Undetermined: Subadult). In the field, the archaeologists only used three categories (Male, Female, and Undetermined). To make the categories comparable, in situations where the archaeologists had determined the age to be a subadult (adolescent or younger), the sex determination for those individuals was changed to "Undetermined: Subadult." The categories of "Ambiguous" and "Indeterminate" from the data collection phase of this study were also collapsed into a single "Undetermined: Adult" category to increase the comparability of the two datasets.

Of the 166 adults, the sex determined as part of this study and the sex determined in the field by the archaeologists is the same in 71 cases (19 Males, 18 Females, and 34 Undetermined: Adults). If the categories of Male/Probable Male and Female/Probable Female are collapsed, then the sex determination is consistent in 105 cases (41 Males/Probable Males, 30 Females/Probable Females, and 34 Undetermined: Adults).

Based on skeletal analysis including an assessment of cranial and/or postcranial morphology and postcranial measurements, sex was changed from Male to Female/Probable Female in 11 cases, from Female to Male/Probable Male in 2 cases, and in 26 cases sex went from being undetermined to determined (9 Male/Probable Male, and 17 Female/Probable Female). Four individuals who were previously considered to be subadults were determined to be adults upon reanalysis, and their sex was changed from Undetermined: Subadult to Probable Male (N=1) and Probable Female (N=3).

Table 4.2: Sex Determination in the Field and in the Lab.

Sex (Field)	Sex (Lab)	Count
Male	**Male**	**19**
	Probable Male	**22**
	Undetermined: Adult	13
	Probable Female	8
	Female	3
	Undetermined: Subadult	0

Table 4.2 (cont'd).

Sex (Field)	Sex (Lab)	Count
Female	Male Probable Male Undetermined: Adult **Probable Female** **Female** Undetermined: Subadult	1 1 6 **12** **18** 0
Undetermined: Adult	Male Probable Male **Undetermined: Adult** Probable Female Female Undetermined: Subadult	2 7 **34** 16 1 23
Undetermined: Subadult	Probable Male Probable Female	1 3

The table below summarizes the sex categories as they were assigned according to data collected during the laboratory work portion of this study.

Table 4.3: Sex categories for Jícaro sample.

Sex Category	Count	*Freq.%*
Male	22	*13.3*
Probable Male	32	*19.3*
Ambiguous	31	*18.7*
Probable Female	44	*26.5*
Female	15	*9.0*
Indeterminate	2	*1.2*
No information	5	*3.0*
Total	166	*100.0*

Because the sample sizes become extermely small when the above data have to be subdivided, the Male and Probable Male categories, the Female and Probable Female categories were consolidated into two categories, Male/Probalbe Male (MPM) and Female/Probable Female (FPF). Because analyses of the relationships between demographic variables and cultural variables are meaningless when age and/or sex cannot be assigned, the Ambiguous and Indeterminate categories are removed from any further comparisons when Sex is one of the variables being evaluated. Those two categories are included in the analysis when general comparisons are made between adults and subadults. The table below summarizes the determination of sex when MPM and FPF are consolidated.

Table 4.4: Consolidated sex categories for statistical analysis.

Sex Category	**Count**	***Freq.%***
MPM	54	*32.5*
FPF	59	*35.5*
Undetermined	53	*31.9*
Total	166	*100.0*

Metric Assessment of Sex

When possible, postcranial measurements were taken for all adults in the sample according to guidelines and forms provided by Buikstra and Ubelaker (1994). The three most consistently measurable features of the adult long bones were the vertical head diameter of the humerus, the maximum head diameter of the femur, and the midshaft circumference of the femur. Other postcranial measurements, particularly those of the radius and ulna, tibia and fibula are unreliable because very few of those bones survive intact enough to measure, although they are still observable for other variables (e.g., periostitis). Table 4.5 is a comparison of the means for males and females for each of those three measurements. Sex, as it is presented in the following tables, only includes individuals who could be confidently assigned to either the Male or Female categories, excluding Probable Males and Probable Females.

To evaluate whether or not these measurements could be used reliably to determine the sex of undetermined remains, boxplots were used to determine whether or not there was overlap between the ranges for the male and female samples for each measurement. Figures 4.1, 4.2, and 4.3 illustrate the means and ranges for each sex category for each of the three measurements: Humerus Vertical Head Diameter, Femur Maximum Head Diameter, and Femur measurement for each sex category, the shaded boxes represent one quartile above and below the median, and the whiskers represent the extent of the ranges above and below the median measurements, excluding outliers. Outliers appear as stars or dots outside of the ranges indicated by the boxes and whiskers.

Table 4.5: Mean postcranial measurements used for sex determination.

Sex		Measurement		
		Humerus Vertical Head Diameter	Femur Maximum Head Diameter	Femur Midshaft Circumference
Male	Mean	44.510	45.803	85.35
	N	6	18	20
	Std. Deviation	2.218	4.759	5.194
Female	Mean	36.046	38.669	77.07
	N	5	14	14
	Std. Deviation	2.248	1.878	3.99

Table 4.6: Mean postcranial measurements used for sex determination, shown with their ranges calculated to two standard deviations.

Measurement		2 Std. Dev. Below	Mean	2 Std. Dev. Above
Males	Humerus Vertical Head Diameter	40.07354	44.510	48.94646
	Femur Maximum Head Diameter	36.28508	45.803	55.32152
	Femur Midshaft Circumference	74.962	85.35	95.738
Females	Humerus Vertical Head Diameter	31.54996	36.046	40.54204
	Femur Maximum Head Diameter	34.91374	38.669	42.42486
	Femur Midshaft Circumference	69.09	77.07	85.05

Humerus Vertical Head Diameter

The box-plots in Figure 4.1, below, demonstrates that the median measurements for Males and Probable Males are nearly identical, and all of the Probable Males' humerus head diameter measurements fall within the Male range. Females and Probable Females are not as clear-cut. The median measurements for Probable Females and Females are closer than the median measurements for either female category with either male category; however, there is virtually no overlap between the

Probable Female and Female samples. It appears as though all of the Probable Female humerus head diameter measurements fall into an intermediate range between the Male and Female samples. This indicates that the humerus vertical head diameter may be a diagnostic measurement if the measurement falls within the Male range, but it is less useful for confidently placing an individual into the Female category. Only one Ambiguous and one Indeterminate individual are represented on the graph, both of which are very near the median measurement for Males.

Figure 4.1: Humerus Vertical Head Diameter box plot.

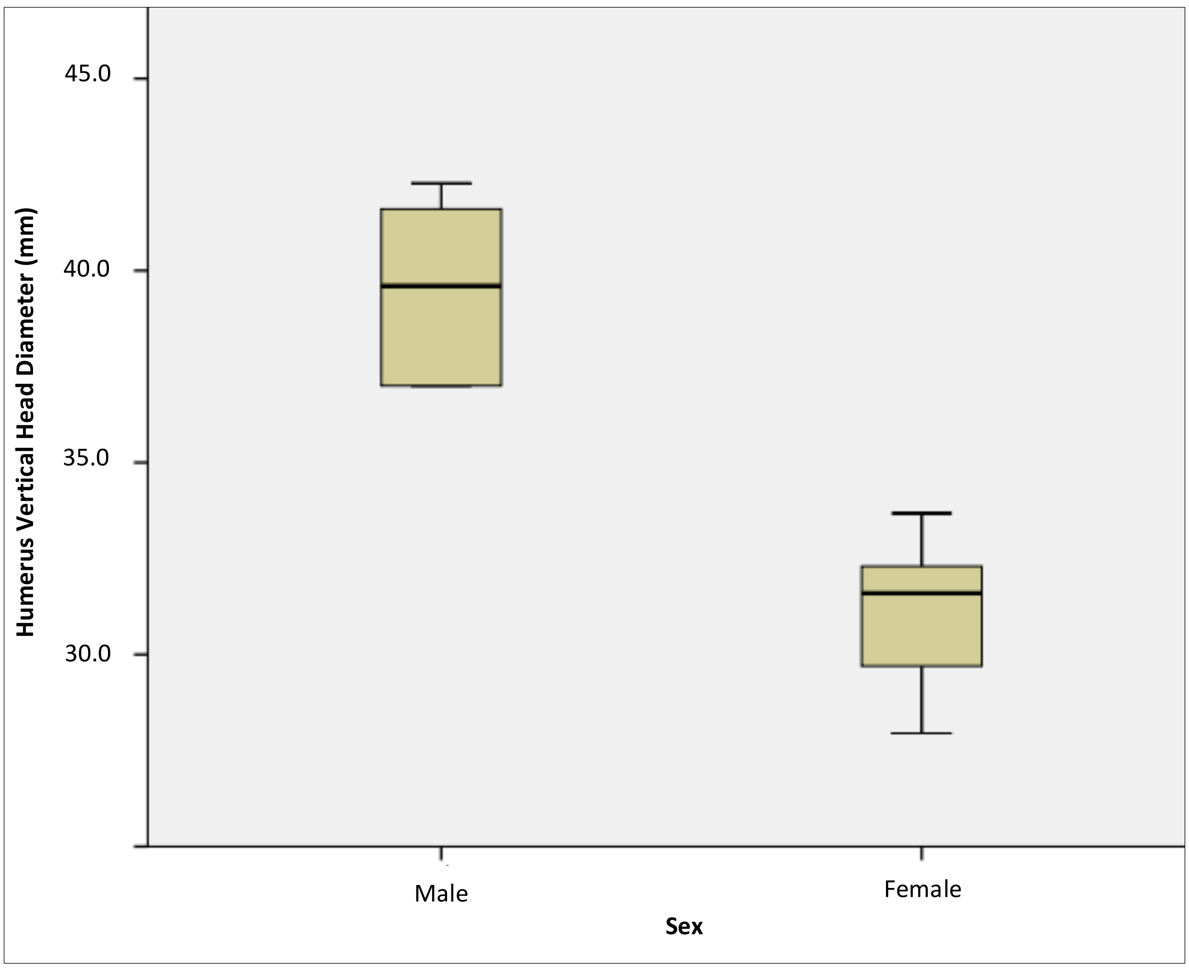
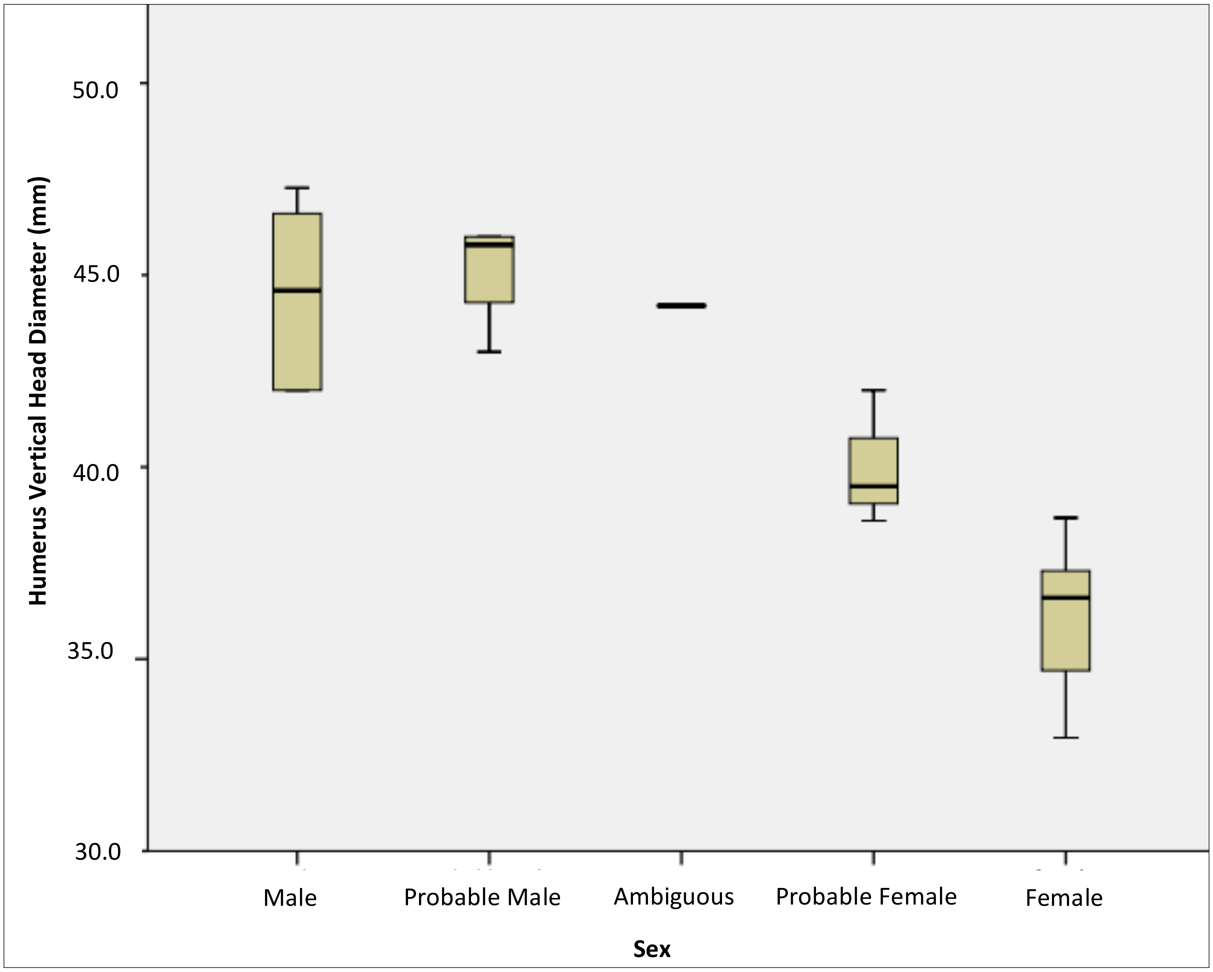


Figure 4.1 (cont'd).



Femur Maximum Head Diameter

Figure 4.2, below, portrays box-plots of the femur maximum head diameter measurements. The box-plots show that there is no overlap between the ranges of Male and Female measurements or between Probable Male and Female measurements of the femoral maximum head diameter, but again, the range of measurements for the Probable Female sample overlaps with both the Male and Female samples. There is little difference between the median measurements for the Male, Probable Male, and Ambiguous samples, all of which have overlapping ranges. There is also a wider range of possible values for the femoral head diameter, and the ranges are so clustered about similar medians that the maximum femoral head diameter may not be a useful measurement for determining sex.

Figure 4.2: Maximum Femoral Head Diameter box plot.

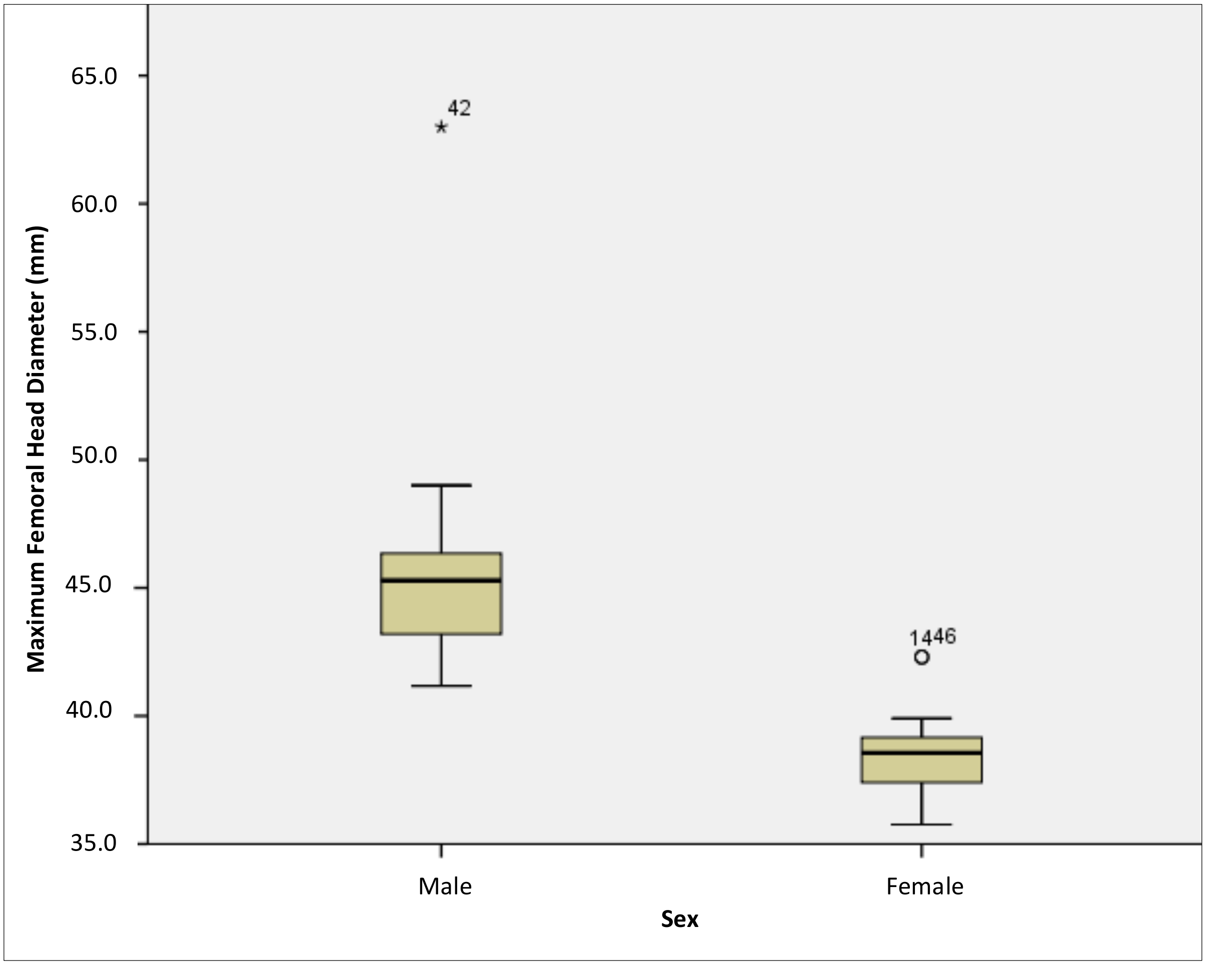
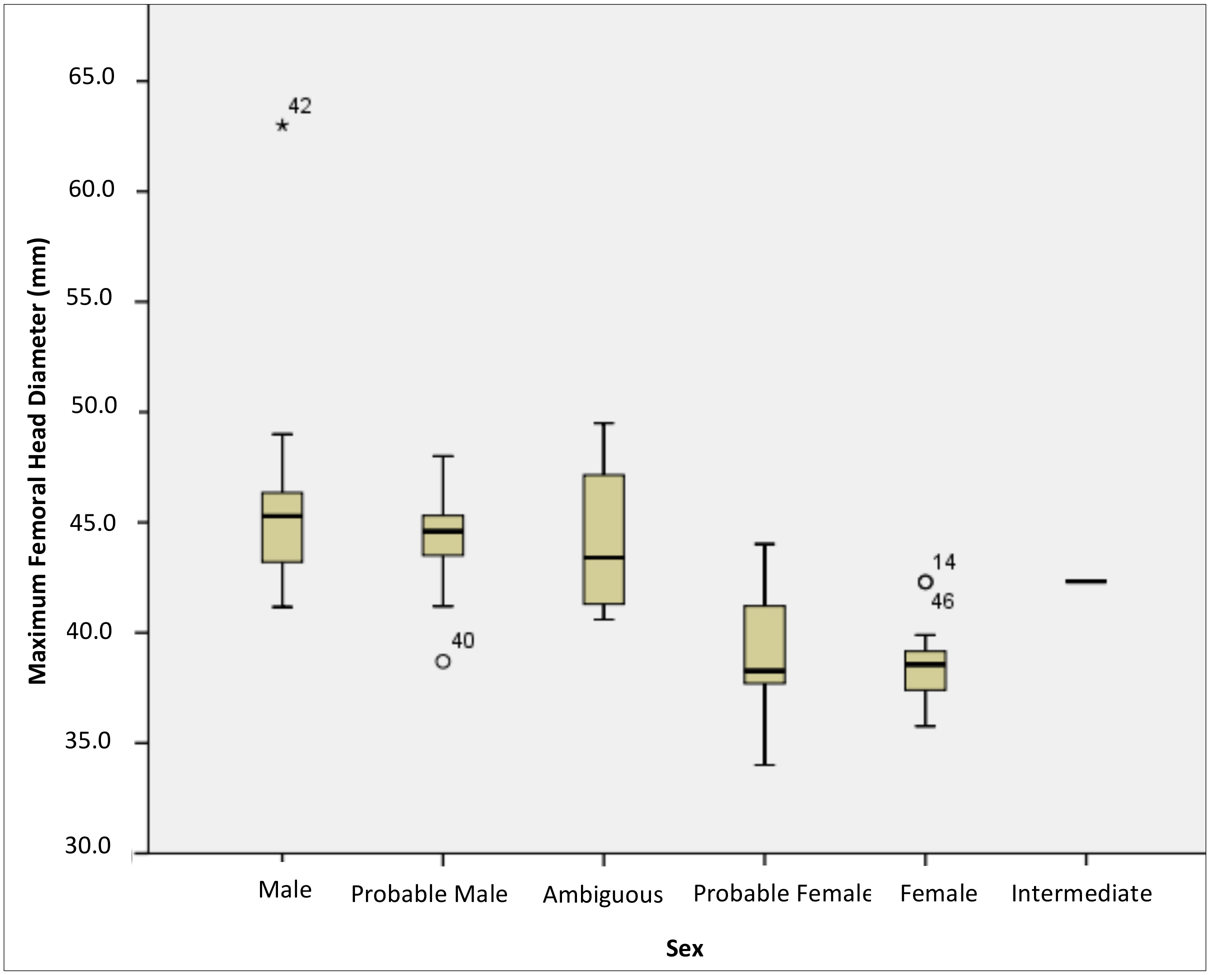


Figure 4.2 (cont'd).



Femur Circumference at Midshaft

Figure 4.3 shows box-plots of femoral midshaft circumference measurements including all of the Sex categories shows that the Male sample has a great deal of variability at both the high and low ends of the range of measurements, as does the Probable Male sample, but the ranges for the two samples overlap nearly completely, indicating that measurements of individuals assigned to each of those categories are consistent. The median measurements for the Female and Probable Female categories are nearly identical, but outside of the first quartile above or below the median, there is a large amount of variability. Just as the categories suggest, the measurements for the Ambiguous and Indeterminate samples are intermediate between the Male/Probable Male and Female/Probable Female ranges.

Figure 4.3: Femoral Midshaft Circumference box plot.

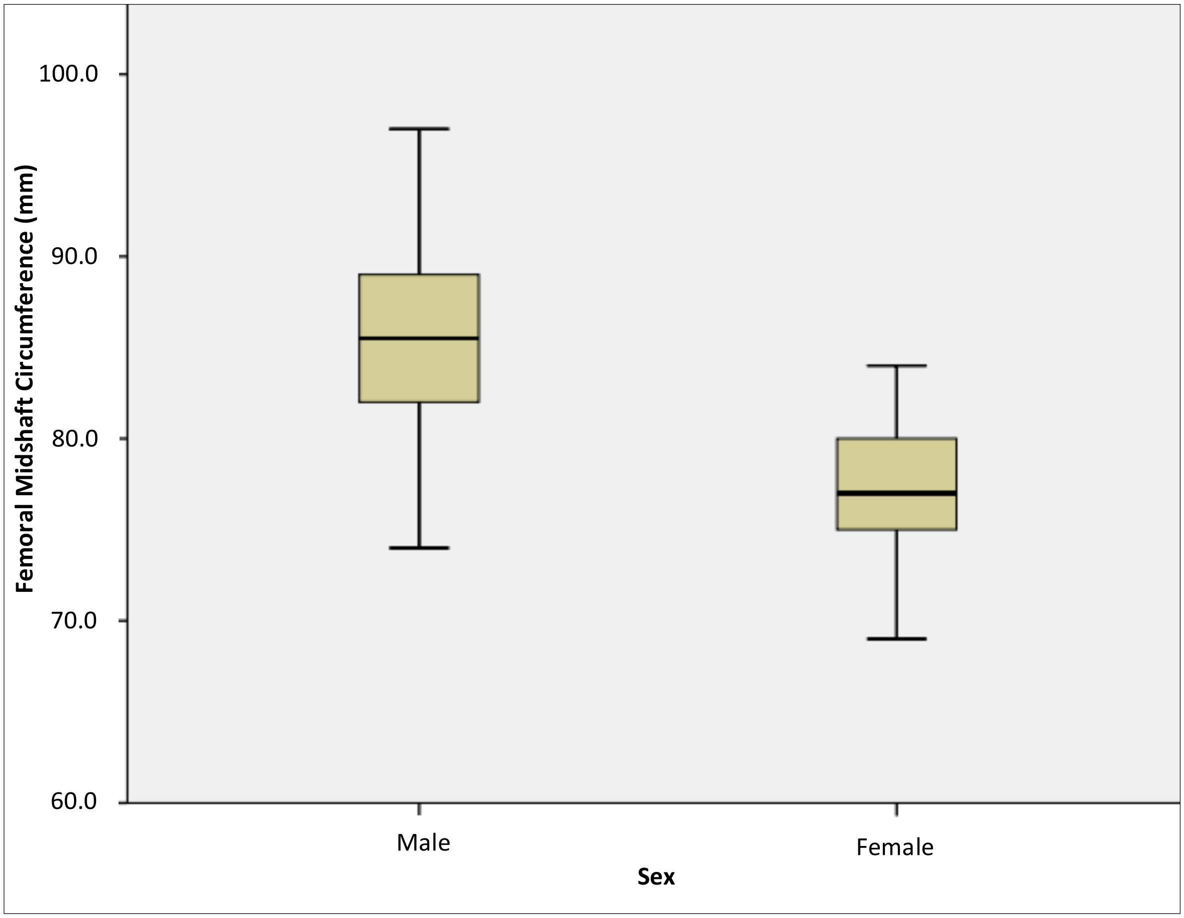
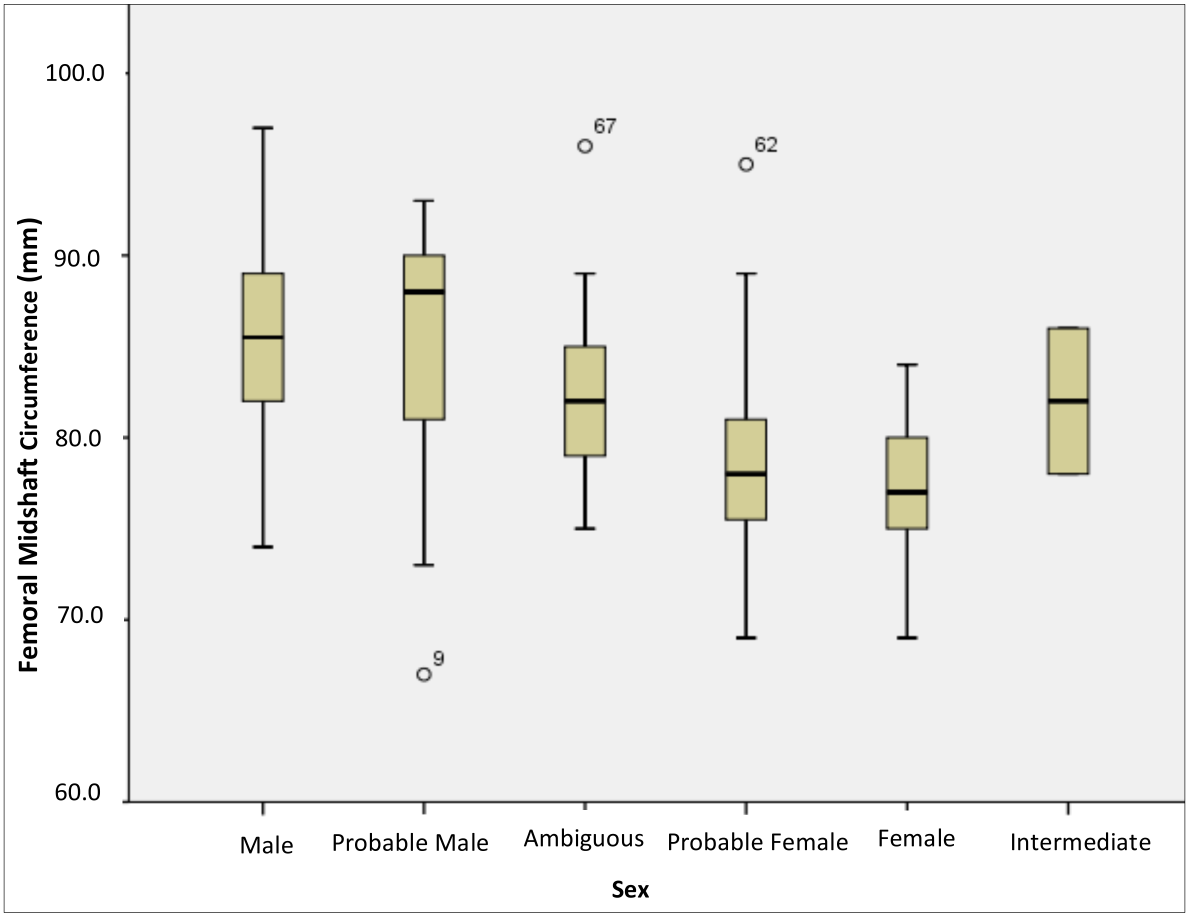


Figure 4.3 (cont'd).



Summary of Postcranial Measurements used for Sex Determination

The substantial overlap between the Probable Female sample and the Male and Female samples for all three measurement sites may indicate that some of the Probable Females in this sample have been incorrectly assigned, which may affect interpretations of demographic variables and relationships between biological data and mortuary data. The close relationships between the Male and Probable Male categories with regard to all three measurements confirms that individuals who are assigned to the Probable Male category are probably Male. Variation in the medians and ranges (and number of individuals) from the Ambiguous and Indeterminate samples confirms their placement in those categories, and while the individuals who fall within the second quartile below the medians for these measurements can probably be confidently considered Female, just as those who fall within the second quartile above the medians for these measurements can probably be considered Male, for the purpose of comparative analyses they are not assigned to a particular category and remain excluded.

Age-at-Death and Sex

In order to be able to tell a complete story about the demography at Jícaro, the relationship between ages-at-death and sex was evaluated. SPSS was used to conduct a Pearson's Chi-square test to evaluate the relationship between age-at-death and sex for the adult sample. Results of the Chi-square test indicate a significant relationship between age-at-death and sex (X^2=7.551, df = 3) with significance at the $p < 0.05$ level.

Table 4.7: Cross-tabulation of Age-at-Death and Sex.

Age Category	**Sex**				**Total**	***Freq.%***
	MPM	*Freq.%*	FPF	*Freq.%*		
Young Adult (18-35)	8	*29.6*	19	*70.4*	27	*23.9*
Middle Adult (35-50)	22	*62.9*	13	*37.1*	35	*31.0*
Older Adult (50+)	8	*57.1*	6	*42.9*	14	*12.4*
Undetermined: Adult	16	*43.2*	21	*56.8*	37	*32.7*
Total	54	*47.8*	59	*52.2*	113	*100.0*

In the sample of adults who could be confidently assigned to both an age and a sex category (N=113), there are 27 Young Adults, 8 Males and 19 Females, possibly indicating that more females at Jícaro died during young adulthood than males. The numbers reverse in the Middle Adult category (N=35), where 22 Males and 13 Females are assigned, possibly indicating that more males than females at Jícaro died during middle adulthood. The numbers are similar between Males and Females for the Older Adult category, with only 8 and 6 individuals, respectively, assigned to that age category. The sample size for this evaluation is small and may not be representative of the site as a whole.

Age Determination: Subadults

Of the 308 individuals who were examined for this study, 118 are subadults, 103 of which could be assigned to an age category. Age categories used for the purpose of this analysis are: Fetal/Neonate (0-6 months), Infant/Toddler (6 months-3 years), Child (3-12 years); Adolescent (12-18 years). The age of subadults was determined primarily by using dental development as the main criterion, in part because preservation issues precluded measurements of postcranial elements and assessment of epiphyseal closure for the majority of subadults in this sample, and in part because dental development is known to be among the most reliable indicators of subadult age (Buikstra and Ubelaker, 1994; Moorrees et al. 1963a, 1963b; Ubelaker, 1989). In several cases, when there were no teeth present, but there were long bones, postcranial measurements compared to published charts for age estimation based on the based on the maximum length of long bones for age determination (Fazekas and Kosa (1978) in Schaefer (2009) for fetal remains and Maresh (1970), in Shaefer (2009) for postnatal remains). The following table represents the subadult ages-at-death.

Table 4.8: Subadult ages-at-death.

Age Range	**Count**	***Freq.%***
Fetal/Neonate	22	*18.6*
Infant/Toddler	30	*25.4*
Child	44	*37.3*
Adolescent	7	*5.*
No Information	15	*12.7*
Total	118	*100.0*

The Child (3-12 years) category is extremely broad and potentially homogenizes a range of ages-at-death that may have been associated with different activities. The table, below, shows the Child category broken down into more refined age groups, beginning with 3 years and increasing in two-year increments.

Table 4.9: Child category ages-at-death.

Age Range	**Count**	***Freq.%***
3-5 years	23	*52.3*
5-7 years	10	*22.7*
7-9 years	4	*9.1*
9-12 years	7	*15.9*
Total	44	*100.0*

It is clear from the above table that the vast majority of children in this sample were under 5 years of age at the time of their deaths. This may indicate that a particular type of play or work that was accessible to young children at the site was particularly hazardous to them, or it may indicate a susceptibility to death for children of a young age due to biocultural stressors.

Long Bone Length: Adults

Long bone length was measured for adults as a means for evaluating sexual dimorphism and stature. Stature was calculated using the formulae developed by Genoves (1967) for an indigenous Mexican population. Maximum lengths of the femur and/or tibia were used to calculate stature for 22 individuals (12 Males, 10 Females) for whom sex could be confidently determined as either Male or Female, based on multiple lines of morphological and metric evidence.

Table 4.10: Mean Stature—Males and Females.

Sex	**Count**	**Femur**		**Tibia**	
		Mean Max. Length	Mean Stature	Mean Max. Length	Mean Stature
Male	12	419.55	161.20 cm	352.50	162.84 cm
Female	10	397.88	152.79 cm	331.14	153.85 cm

A Mann-Whitney U test was calculated to determine whether a significant difference exists between stature calculated for males using the femur and stature calculated for males using the tibia. Results of the Mann-Whitney U test indicate no statistically significant difference between male stature calculated using the femur and the tibia for this sample (U=25.00, p=0.421). A Mann-Whitney U test was also calculated to determine whether a significant difference exists between stature calculated for females using the femur and stature calculated for females using the tibia. Results of the Mann-Whitney U test indicate no statistically significant difference between female stature calculated using the femur and the tibia for this sample (U=47.00, p=0.820).

Because there is no statistically significant difference between statures calculated for males and females using the femur and the tibia, stature calculations for each sex were collapsed into a single larger sample (N=32, 17 males and 15 females). An independent samples t-test was calculated in SPSS to determine whether there is a statistically significant difference between the mean statures of males and females at Jícaro. Results of the t-test indicate that males have a significantly higher stature (M=161.78, SD=3.58) than females (M=153.29, SD=6.62), t(32)=4.592, p=0.039).

Long Bone Length: Subadults

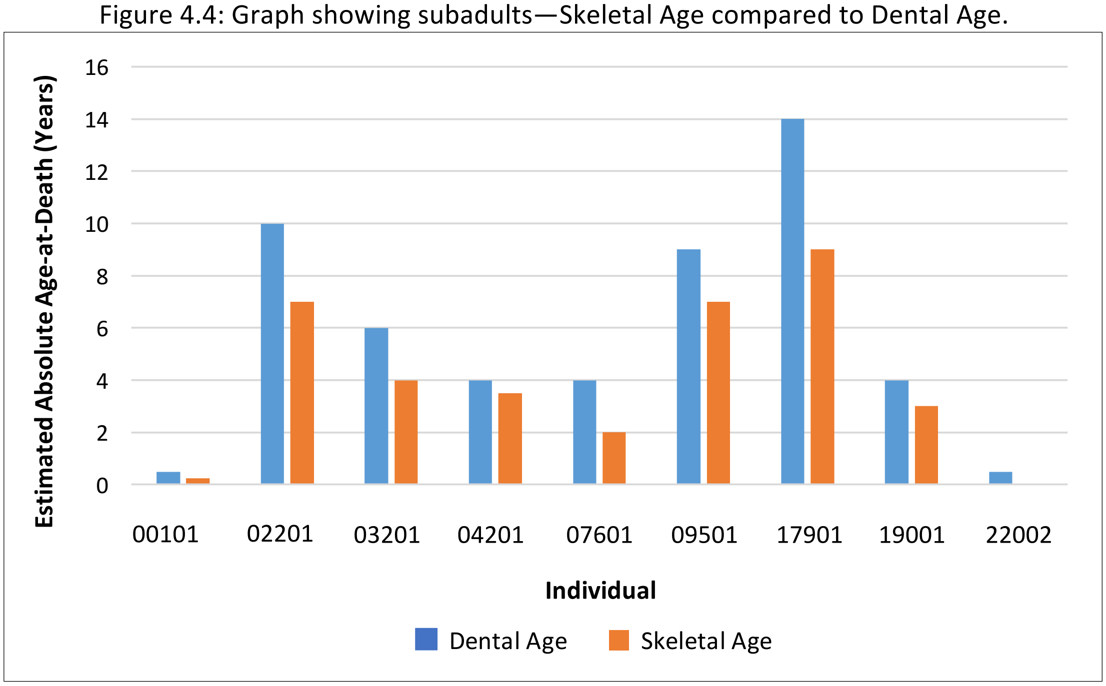
Long bone length was measured whenever possible for subadults in the Jícaro sample as a means for determining age-at-death and for a comparison against dentally determined age-at-death to evaluate childhood growth and development at the site. Only nine subadults in the sample had both long bones and teeth available for a comparison of age determination based on the two methods, and their age estimates are provided in the table, below. Mean age was calculated for each individual after their age range was determined so the information in the table, below, could be represented visually. Mean ages are presented in terms of years, so if the approximate age of an individual is 6 months, mean age is expressed as 0.5 (years). Individual 22002 shows a mean skeletal age of 0.001, which is representing an age of birth (or fetal).

Table 4.11: Subadult dental age compared with skeletal age.

Individual	Dental Age	Mean Dental Age	Skeletal Age	Mean Skeletal Age
00101	6 mos +/-3mos	0.5	3mos	0.25
02201	10yrs +/- 12mos	10	Approximately 7yrs	7
03201	6yrs +/-24mos	6	Approximately 4yrs	4
04201	4yrs +/-12mos	4	Approximately 3.5yrs	3.5
07601	4yrs +/-12mos	4	Approximately 2yrs	2
09501	9yrs +/-24mos	9	Approximately 7yrs	7
17901	14yrs +/-36mos	14	Approximately 9yrs	9
19001	4yrs +/-12mos	4	Approximately 3yrs	3
22002	6mos +/-3mos	0.5	Approximately at birth	0.001

The graph below shows a visual summary of the data presented above. The graph demonstrates that the skeletal age estimates for the nine subadults with both measurable long bones and observable dentition are consistently younger than the dental age estimates for this sample, by an average of approximately 2years.

Figure 4.4: Graph showing subadults—Skeletal Age compared to Dental Age.



Summary of Demographic Variables

Assuming the sample analyzed from Jícaro is representative of the population, the above analyses indicate that mortality for subadults spikes between the ages of 5 and 7 years, and then again for adult females during young adulthood and for adult males during middle adulthood. Based on the number of subadults and young and middle adults present, and the small number of older adults, it may be the case that the average life expectancy at Jícaro was quite short. It appears as though males and females have similar mortality rates when both survived into older adulthood. The mean stature of males was significantly taller than that of females, although there is some overlap between the ranges of stature for both, and postcranial measurements are more reliable for determining sex for males than they are for determining sex for females. Additionally, if age determination according to dental development is reliable for this population, then the skeletal age of subadults is consistently about 2 years younger than their dental ages, indicating either population-specific growth charts need to be developed for archaeological populations in this region or the growth and development of children in this population was adversely affected by conditions at the site.

Health and Activity

Skeletal analysis of the human remains from Jícaro also involves evaluations of skeletal and dental indicators of stress, activity, and health during childhood and adulthood in addition to cultural practices. The following section presents results that address the second part of Research Question 1 by further exploring the health and activity of the population that lived at Jícaro.

Linear Enamel Hypoplasia

Presence or absence and location of linear enamel hypoplasias (LEH) were documented for the anterior teeth (maxillary and mandibular canine-to-canine) for all individuals with permanent teeth

(N=122). An LEH was considered present if it was visible as a horizontal line in the tooth under strafing light and was palpable with a fingernail. Pearson's Chi-square tests were calculated in SPSS to evaluate the significance of any relationships between LEH and age-at-death and sex, with significance for all tests at the $p < 0.05$ level. For the purpose of the following analyses, LEH are presented as present or absent per individual and individual LEH scores are not included.

Figure 4.5: Example of LEH (left central and lateral maxillary incisors, Individual 17901).

(Photo: Wankmiller, 2013)

Table 4.12: LEH—Adults and Subadults.

Age Category	**LEH**				**Total**	**Freq.%**
	Present	Freq.%	Absent	Freq.%		
Subadults	8	*40.0*	12	*60.0*	20	*16.4*
Adults	41	*40.2*	61	*59.8*	102	*83.6*
Total	49	*40.2*	73	*59.8*	122	*100.0*

Results of a Chi-square test indicate there is no statistically significant relationship between the presence/absence of LEH and whether an individual at Jícaro died as an adult or subadult (X^2=0.001, df=1, p=0.987, with significance at the p<0.05 level).

Table 4.13: LEH—Subadults.

Age Category	LEH				Total	Freq.%
	Present	Freq.%	Absent	Freq.%		
Child (3-12 years)	5	*38.5*	8	*61.5*	13	*68.4*
Adolescent (12-18 years)	2	*33.3*	4	*66.6*	6	*31.6*
Total	7	*36.8*	12	*63.2*	19	*100.0*

Results of a Chi-square test indicate there is no statistically significant relationship between the presence/absence of LEH and the age-at-death of subadults (X^2=0.046, df=1, p=0.829, with significance at the p<0.05 level). Only subadults for whom age-at-death could be determined were included in this analysis (N=19).

Table 4.14: LEH—Adults.

Age Category	LEH				Total	Freq.%
	Present	Freq.%	Absent	Freq.%		
Young Adult	10	*38.5*	16	*61.5*	26	*40.6*
Middle Adult	16	*51.6*	15	*48.4*	31	*48.4*
Older Adult	2	*28.6*	5	*71.4*	7	*10.9*
Total	28	*43.7*	36	*56.2*	64	*100.0*

Results of a Chi-square test indicate there is no statistically significant relationship between the presence/absence of LEH and the age-at-death of adults (X^2=1.730, df=2, p=0.421, with significance at the p<0.05 level). Only adults for whom age-at-death could be determined were included in this analysis (N=64).

Table 4.15: LEH—Males/Probable Males and Females/Probable Females.

Sex	LEH				Total	Freq.%
	Present	Freq.%	Absent	Freq.%		
MPM	18	*52.9*	16	*47.1*	34	*43.0*
FPF	20	*44.4*	25	*55.5*	45	*57.0*
Total	38	*48.1*	41	*51.9*	79	*100.0*

Results of a Chi-square test indicate there is no statistically significant relationship between the presence/absence of LEH and sex for the adult sample (X^2=0.560, df=1, p=0.454, with significance at the p<0.05 level). Only adults for whom sex could be determined were included in this analysis (N=79).

Summary of LEH

Results of Chi-square tests for significance showed no indication of a significant relationship between the presence of LEH and either age-at-death or sex. This indicates that male and female children at Jícaro experienced similar levels of stress and neither sex appears to have been differentially buffered from or prone to the type of severe stress and, in fact, when the total examined sample is considered (N=122), with a total of 49 (40.2 %) individuals with at least one LEH compared with 73 (59.8 %) individuals with no observed LEH, it appears as though the majority of individuals who survived childhood, male and female, did not suffer a disruption in their growth and development that led to LEH.

Cribra Orbitalia

When possible, cribra orbitalia was recorded for adults and subadults in the Jícaro sample. Each individual examined during the laboratory data collection phase of this research was scored for presence/absence of the right and left orbits. Cribra orbitalia was considered present if either orbit was present and observable and showed indications of active, healing, or healed cribra orbitalia. Cribra orbitalia was not assessed for orbits that were present but were unobservable for any reason (e.g., matrix still covered orbit surface and could not be removed).

Of the 308 individuals examined during the laboratory data collection portion of this study, 224 were scored for presence/absence of orbits. The others were either examined during the first field season, during which presence/absence of cribra orbitalia was documented, but presence/absence of the orbits was not, or it was not possible to determine whether or not orbits were present (e.g., the cranium was missing or the cranium was present and appeared complete, but large areas were still encased in matrix and were not observable). Of the 222 individuals scored for presence/absence of orbits, 179 (80.6 %) did not have any orbits and 43 (19.4 %) did. Of the 43 individuals with orbits, 25 (58.1 %) showed some evidence of cribra orbitalia (active, healing, or healed in at least one orbit) and 18 (41.9 %) showed no evidence of cribra orbitalia. Age-at-death could be determined for 41 of the 43 observable individuals.

Figure 4.6: Example of Cribra Orbitalia (left orbit, Individual 4501).

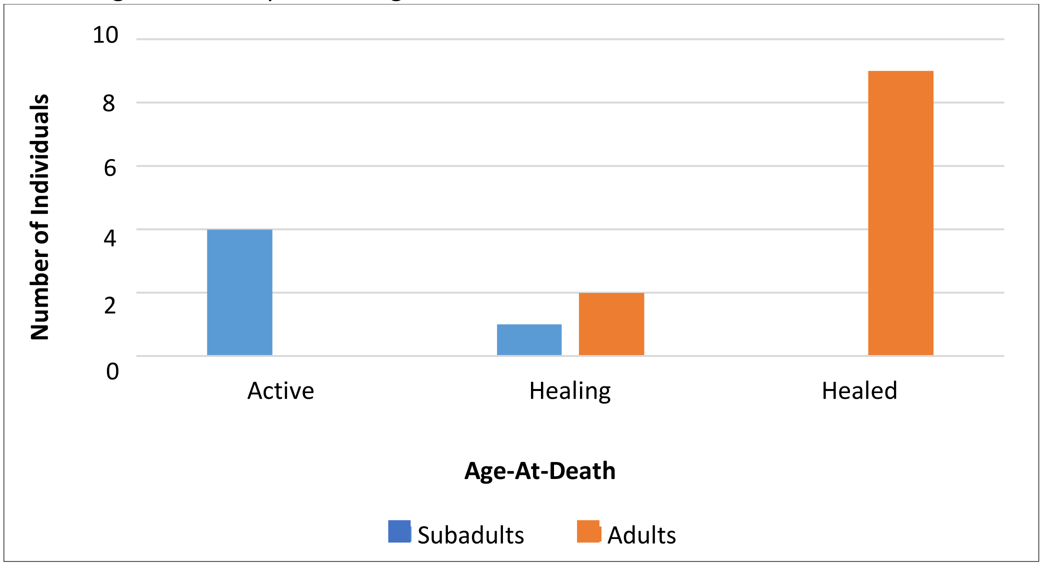
(Photo: Wankmiller, 2013)

Table 4.16: Cribra Orbitalia—Adults and Subadults.

Age Category	**Cribra Orbitalia**				**Total**	**Freq.%**
	Present	Freq.%	Absent	Freq.%		
Subadults	5	*55.6*	4	*44.4*	9	*22.0*
Adults	12	*37.5*	20	*62.5*	32	*78.0*
Total	17	*41.5*	24	*58.5*	41	*100.0*

Results of a Fisher's Exact test indicate no significant relationship between age-at-death and the presence of cribra orbitalia in at least one orbit among individuals who had at least one orbit present ($p=0.450$, with significance at the $p<0.05$ level).

Figure 4.7: Graph showing cribra orbitalia scores—Adults and Subadults.



The graph above illustrates the distribution of cribra orbitalia scores for the small number of individuals with observable orbits. Cribra orbitalia was active at the time of death for 4 (80%) of the 5 subadults, while the fifth (20%) showed evidence of healing. Of the 12 adults with cribra orbitalia present, 3 (25 % %) show that the condition was healing and the other 9 (75 %) are healed. This is not unexpected, as cribra orbitalia occurs most frequently among children (Walker et al., 2009).

Table 4.17: Cribra Orbitalia and sex.

Sex	**Cribra Orbitalia**				**Total**	**Freq.%**
	Present	Freq.%	Absent	Freq.%		
MPM	7	*46.7*	8	*53.3*	15	*46.9*
FPF	6	*35.3*	11	*64.7*	17	*53.1*
Total	13	*40.6*	19	*59.4*	32	*100.0*

Results of a Chi-square test indicate no significant relationship between the presence of healed or healing cribra orbitalia among adults and their sex (X^2=427, df=1, p=0.513, with significance at the p<0.05 level), indicating males and females appear to have been similarly affected by cribra orbitalia during childhood, further indicating that they may have had similar childhood experiences and one sex was not differentially buffered from systemic stress.

Periostitis

To assess periostitis, each long bone was inventoried and locations and descriptions of periostitis were assessed and described. For the purpose of this analysis, periostitis is considered present for an individual if it was observed on any part of any postcranial element and absent if the postcranial skeleton was complete enough and well enough preserved to observe the bone cortex and no periostitis was observed. Subadults in the Jícaro sample were generally not well enough preserved for observations of periostitis to be possible, so only adults were included in this analysis.

Figure 4.8: Example of periostitis (posterior distal right humerus, Individual 6202).

(Photo: Wankmiller, 2013)

Figure 4.9: Example of periostitis (posterior right tibia, Individual 11101).

(Photo: Wankmiller, 2013)

Figure 4.10: Detail—Periostitis (posterior right tibia, Individual 11101).

(Photo: Wankmiller, 2013)

Table 4.18: Periostitis—Males/Probable Males and Females/Probable Females.

Sex	**Periostitis**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	16	*80.0*	4	*20.0*	20	*41.7*
FPF	20	*71.4*	8	*28.6*	28	*58.3*
Total	36	*75.0*	12	*25.0*	48	*100.0*

Results of a Chi-square test indicate there is no statistically significant relationship between the presence/absence of periostitis and sex for the adult sample (X^2=0.457, df=1, p=0.499, with significance at the $p<0.05$ level). Only adults for whom sex could be determined were included in this analysis (N=48). That said, it is clear that the majority of individuals in the adult sample show periostitis affecting at least one skeletal element, with a ratio of individuals with periostitis to individuals without periostitis of nearly 3:1.

Table 4.19: Periostitis—Adults.

Age Category	**Periostitis**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Young Adult	9	*69.2*	4	*30.7*	13	*31.7*
Middle Adult	17	*85.0*	3	*15.0*	20	*48.8*
Older Adult	5	*62.5*	3	*37.5*	8	*19.5*
Total	31	*75.6*	10	*24.4*	41	*100.0*

Only adults for whom age-at-death could be confidently determined and for whom observations of periostitis were possible were included in this analysis (N=41). There are approximately as many Middle Adults (N=20) as there are Young Adults and Older Adults combined (N=21) in the adult sample. Chi-square tests for significance were calculated to evaluate whether there is a significant relationship between adult age category and the presence of periostitis. Results of the Chi-square tests show that there is no statistically significant relationship between age category and presence of periostitis (X^2=1.989, df=2, p=0.370, with significance at the p<0.05 level). The Middle Adult sample is larger than the other two adult age category samples, but it is no more likely for a middle adult to be affected by periostitis than either of the other age categories.

Table 4.20: Periostitis affecting males and females by age category.

Age/Periostitis		**Sex**		**Total**
		MPM	FPF	
Young Adult	Present	1	7	8
	Absent	0	4	4
	Total	1	11	12
Middle Adult	Present	10	5	15
	Absent	2	1	3
	Total	12	6	18
Older Adult	Present	3	1	4
	Absent	0	3	3
	Total	3	4	7
	Total	32	42	74

The above table includes only individuals whose age-at-death and sex could be determined and observations of periostitis could be documented (N=74). Results of Chi-square tests indicate no significant relationship between sex and age-at-death in the Young Adult and Middle Adult categories (Young Adults: X^2=0.545, df=1, p=0.460, Middle Adults: X^2=0.0001, df=1, p=1.000, with significance at the p<0.05 level), meaning that males and females in those two age categories are equally likely to show evidence of periostitis on at least one skeletal element. Results of a Chi-square test does indicate a significant relationship between age-at-death and sex for the Older Adult category (X^2=3.938, df=1, p=0.047, with significance at the p<0.05 level). The Older Adult sample is small (N=7), which may affect the results of the Chi-square test, but if this small sample is representative of the population at Jícaro, then it appears as though older adult females may have been protected from the type of systemic infection that would have led to the manifestation of periostitis in their postcranial skeleton.

Table 4.21: Periostitis and LEH.

LEH	**Periostitis**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Present	10	*62.5*	6	*37.5*	16	*37.2*
Absent	24	*88.9*	3	*11.1*	27	*62.8*
Total	34	*79.1*	9	*20.9*	43	*100.0*

A Pearson's Chi-square test was calculated in SPSS to explore whether or not a relationship exists between the presence of periostitis and the presence of LEH among adults at Jícaro. Results of the Chi-square test show that there is a significant relationship between the presence of periostitis and LEH (X^2=4.227, df=1, p=0.040, with significance at the p<0.05 level). A significantly greater number of adults who experienced severe stress during childhood that resulted in LEH affecting the anterior teeth also experienced a systemic disease or infection that resulted in at least one postcranial element developing a periosteal reaction.

Table 4.22: Periostitis/LEH and Sex.

Sex	**LEH**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	5	*45.5*	6	*54.5*	11	*39.3*
FPF	5	*29.4*	12	*70.6*	17	*60.7*
Total	10	*35.7*	18	*64.3*	28	*100.0*

Table 4.22, above, includes only individuals with periostitis. A Chi-square test was calculated using SPSS to determine if a significant relationship existed between males and females with periostitis and whether or not they also experienced childhood stress that resulted in LEH. Results of the Chi-square test indicate no significant relationship between sex and whether or not childhood stress was

related to systemic stress experienced during adulthood (X^2=0.749, df=1, p=0.387, with significance at the $p<0.05$ level).

Summary of Periostitis

Results of Chi-square tests for significance indicate that among adults at Jícaro, males in the older adult category are more frequently affected by periostitis than older adult females, but there is no statistically significant relationship between sex or age-at-death among Young Adults and Middle Adults. Additionally, there is no statistically significant relationship between age-at-death and the presence of periostitis. There is a statistically significant relationship between the presence of LEH on at least one anterior tooth and the presence of periostitis affecting at least one postcranial element. This relationship may suggest that the same individuals who experienced severe stress during childhood may also have been susceptible to an illness or systemic infection that led to the development of periostitis later in life.

Dental Conditions

A complete dental inventory was taken for each adult and subadult who were examined and had teeth present, including—when possible—documentation of development, wear, caries, abscesses, and calculus. Of the 199 adults who were examined, 130 (65.3%) were associated with any permanent teeth (59 FPF and 71 MPM). There are a total of 2,803 permanent teeth present (1,930 in alveolus, 873 loose) for the adult sample at Jícaro.

Abscesses

There is an overall low incidence of abscesses among the Jícaro population. Of the 1,930 permanent teeth still in the alveolus, 1,864 of them can be assessed for abscess—the remaining 66 teeth may still be in the alveolus, but the presence of matrix or postmortem damage precludes observations of abscesses. Of those 1,864 teeth, only 30 teeth from 25 individuals (8 FPF and 17 MPM) are associated with abscesses. The most frequently affected tooth is Tooth #32 (N=3, 2 MPM and 1FPF), with all 3 individuals showing abscesses on the buccal aspect of the alveolus. Interestingly, tooth #32 is also the least frequently occurring tooth in the sample, with only 36 present and in the alveolus. Only two adults, both Middle Adult males, each had a single lingual abscess, one affecting Tooth #12 and one affecting Tooth #25.

Caries

Dental caries are not prevalent among the Jícaro population. Of the 2,803 permanent teeth present, 1,813 were observable for dental caries—others were either damaged or observations were obscured by matrix. Of the 1,813 observable teeth from 130 individuals, only 179 teeth from 72 individuals were affected by carious lesions—131 molars and only 48 anterior teeth. The majority of individuals have caries affecting only one or two teeth, with the most commonly affected teeth being Tooth #2 and Tooth #31, both of which are affected in 16 individuals. The other molars are also commonly affected. Anterior teeth are much less frequently affected by caries than posterior teeth.

Table 4.23: Molars affected by caries.

Tooth	Count	Count with Caries	*Freq.% (per tooth)*
1	47	11	*23.4*
2	89	16	*18.0*
3	101	7	*6.9*
14	100	6	*6.0*
15	96	12	*12.5*
16	59	15	*25.4*
17	47	9	*19.1*
18	87	14	*16.1*
19	110	6	*5.5*
30	102	7	*6.9*
31	84	16	*19.0*
32	44	12	*27.3*
Total	966	131	*13.6*

Table 4.24: Caries—Males/Probable Males and Females/Probable Females.

Sex	Caries				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	28	*57.1*	21	*42.9*	49	*48.5*
FPF	30	*57.7*	22	*42.3*	52	*51.5*
Total	58	*57.4*	43	*42.6*	101	*100.0*

Table 4.24, above, includes only adults for whom sex could be determined. Results of a Chi-square test indicate no significant relationship between sex and the presence of caries among adults in this sample (X^2=0.003, df=1, p=0.955, with significance at the p<0.05 level). This may indicate similar diets and/or activities among males and females at Jícaro.

Caries are known to result from the breakdown of enamel by bacteria that feed on starchy residues left by certain foods and/or fibers (Hillson, 2000; Ubelaker, 1995). The following sections address one of the common activity-related findings from the Jícaro sample that may have contributed to the presence of caries.

Lingual Surface Attrition of the Maxillary Teeth

Observations of extreme lingual wear affecting the anterior maxillary teeth, similar to the wear pattern noted by Turner and Machado (1983), were documented with the dental inventory. To maintain consistency with earlier research, this pattern will be referred to as “lingual surface attrition of the maxillary teeth (LSAMAT)” for the remainder of this document. LSAMAT was considered present if a tooth was observable, regardless of whether or not it was loose or within the alveolus, and if the lingual surface of at least one anterior maxillary tooth appeared to be more worn on the lingual surface than on the occlusal surface. LSAMAT was considered absent if none of the maxillary teeth for a given individual showed signs of differential wear.

Figure 4.11: Burial 101—anterior teeth showing extreme wear affecting maxillary anterior teeth.

(Photos: Wankmiller, 2013)

Of the 308 individuals examined for this study, 99 (32.14%) had observable anterior teeth that could be included in this section. Only permanent teeth that could be associated with individuals and only individuals whose age could at least be determined as Adult or Subadult are included in this analysis.

Table 4.25: LSAMAT—Adults and Subadults.

Age Category	LSAMAT				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	3	*33.3*	6	*66.6*	9	*9.0*
Adults	47	*51.6*	44	*48.4*	91	*91.0*
Total	50	*50.0*	50	*50.0*	100	*100.0*

Only three subadults, two adolescents (Individuals 8201 and 22403) and one child of approximately 4 years of age (Individual 6501) show LSAMAT—the adolescents show LSAMAT affecting permanent dentition and the 4-year-old shows LSAMAT affecting the deciduous maxillary anterior teeth. Table 4.25, above, shows that approximately half of the adults from Jícaro with observable anterior maxillary teeth show evidence of LSAMAT. Results of a Chi-square test indicate no significant relationship between age-at-death and the presence of LSAMAT (X^2=1.099, df=1, p=0.295, with significance at the p<0.05 level) because approximately half of the observable adults and subadults show LSAMAT and half do not.

Of the 99 individuals with observable anterior maxillary teeth, sex could be determined for 80 (80.8%), 38 Males/Probable Males and 42 Females/Probable Females. Only individuals whose sex could be determined are included in Table 4.26, below.

Table 4.26: LSAMAT—Males/Probable Males and Females/Probable Females.

Sex	LSAMAT				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	17	*44.7*	21	*55.3*	38	*47.5*
FPF	22	*52.4*	20	*47.6*	42	*52.5*
Total	39	*48.7*	41	*51.3*	80	*100.0*

A Chi-square test was calculated using SPSS, with significance set at the p<0.05 level, to explore any possible relationship between the presence of LSAMAT and sex. Results of the Chi-square test indicate no significant relationship between LSAMAT and sex (X^2=0.467, df=1, p=0.495, with significance at the p<0.05 level). This wear pattern is believed to result from using the anterior maxillary teeth to either process a fibrous plant material for use or for consumption (Saul and Saul, 1989; Turner and Machado, 1983; Turner et al., 1987). With no significant relationship between LSAMAT and sex, it appears as though Males/Probable Males and Females/Probable Females at Jícaro participated in similar work-related activities and/or consumed similar diets.

Table 4.27: LSAMAT—Adult Age Categories.

Age Category	**LSAMAT**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Young Adult	11	*45.8*	13	*54.2*	24	*35.4*
Middle Adult	19	*55.9*	15	*44.1*	34	*51.5*
Older Adult	6	*75.0*	2	*25.0*	8	*12.1*
Total	36	*54.5*	30	*45.5*	66	*100.0*

Results of a Chi-square test indicate no significant relationship between the presence of LSAMAT and age-at-death among adults (X^2=2.109, df=2, p=0.348, with significance at the p<0.05 level). Only adults who could be confidently assigned to an age category were included in this analysis (N=66). This indicates that the activity that leads to the LSAMAT is something started early in life and is not restricted to older individuals in the society.

Table 4.28: LSAMAT—Excessive Calculus.

Age Category	**LSAMAT**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	3	*33.3*	6	*66.6*	9	*9.0*
Adults	47	*51.6*	44	*48.4*	91	*91.0*
Total	50	*50.0*	50	*50.0*	100	*100.0*

A Chi-square test was calculated to evaluate whether or not a significant relationship exists between the presence of LSAMAT and the presence of excessive calculus affecting the mandibular anterior teeth. It was frequently observed during the laboratory data collection for this study that individuals with LSAMAT also seemed to have an excessive amount of calculus affecting their mandibular anterior teeth. Excessive calculus was considered present if a moderate or large amount of calculus was observed on two or more surfaces of any anterior mandibular tooth. Excessive calculus was considered absent if only a small or moderate amount of calculus was observed on all anterior mandibular teeth. Calculus was scored according to Buikstra and Ubelaker (1994). Results of the Chi-square test indicate a significant relationship between LSAMAT and excessive calculus (X^2=9.066, df=1, p=0.003, with significance at the p<0.05 level). A greater number of individuals with LSAMAT also had an excessive amount of calculus affecting their anterior mandibular dentition than individuals without LSAMAT.

Table 4.29: LSAMAT--Caries

LSAMAT	**Caries**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Present	3	*33.3*	6	*66.6*	9	*9.0*
Absent	47	*51.6*	44	*48.4*	91	*91.0*
Total	50	*50.0*	50	*50.0*	100	*100.0*

Results of a Chi-square test calculated to examine whether or not there is a significant relationship between the presence of LSAMAT and presence of caries indicates no significant relationship (X^2=0.108, df=1, p=0.742, with significance at the p<0.05 level).

Table 4.30: Excess Calculus—Caries.

Excess Calculus	**Caries**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Present	37	*62.7*	22	*37.3*	59	*66.3*
Absent	18	*60.0*	12	*40.0*	30	*33.7*
Total	55	*61.7*	34	*38.2*	89	*100.0*

A Chi-square test was calculated to evaluate whether there is a relationship between the presence of excessive calculus and the presence of caries. Results of the test indicate that there is no significant relationship between excessive calculus and caries (X^2=0.062, df=1, p=0.803, with significance at the p<0.05 level).

Dental Modification

Dental modification is an important aspect of this study as it may be associated with a Mesoamerican influence on the population at Jícaro and it was used as a criterion for determining sex in the field when other sex indicators were not available. Dental modification was considered present when at least one anterior maxillary or mandibular tooth could be directly associated with a particular individual and showed evidence of intentional occlusal edge modification. Dental modification was considered absent when at least one anterior maxillary or mandibular tooth could be directly associated with a particular individual and showed no evidence of intentional occlusal edge modification. Observations of dental modification were not documented for individuals who could not be confidently associated with anterior teeth or for teeth that could not be observed due to damage or obstruction (e.g., matrix covering the occlusal surface of the tooth). Dental modification was not observed on any subadult deciduous or permanent teeth, so all of the following analyses include only adults.

Table 4.31: Modification—Males/Probable Males and Females/Probable Females.

Sex	**Modification**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	9	*28.1*	23	*71.9*	32	*45.1*
FPF	10	*25.6*	29	*74.4*	39	*54.9*
Total	19	*26.8*	52	*73.2*	71	*100.0*

A Chi-square test was calculated using SPSS to examine whether or not a significant relationship exists between the presence of dental modification and whether the individual is a Male/Probable Male or Female/Probable Female. Results of the Chi-square test indicate no significant relationship exists between sex and dental modification (X^2=0.055, df=1, p=0.814, with significance at the $p<0.05$ level).

Table 4.32: Modification—Males and Females.

Sex	Modification				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Males	3	*21.4*	11	*78.6*	14	*51.9*
Females	2	*15.4*	11	*84.6*	13	*48.1*
Total	5	*18.5*	22	*81.5*	27	*100.0*

Table 4.33: Modification—Probable Males and Probable Females.

Sex	Modification				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	6	*33.3*	12	*66.6*	18	*40.9*
FPF	8	*30.8*	18	*69.2*	26	*59.1*
Total	14	*31.8*	30	*68.2*	44	*100.0*

Chi-square tests were calculated to explore whether there is a significant relationship between the presence of dental modification and sex if the sex categories are broken down into Males/Females and Probable Males/Probable Females. Results of the Chi-square tests (with significance at the p<0.05 level) indicate no significant relationship between sex and dental modification, even when Males/Females (X^2=0.163, df=1, p-0.686) and Probable Males/Probable Females (X^2=0.032, df=1, p=0.858) are separated.

Table 4.34: Dental Modification—Adult Age Categories.

Age Category	Modification				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Young Adult	6	*25.0*	18	*75.0*	24	*25.8*
Middle Adult	7	*23.3*	23	*76.7*	30	*32.3*
Older Adult	0	*0.0*	8	*100.0*	8	*8.6*
Undetermined	14	*45.2*	17	*54.8*	31	*33.3*
Total	27	*29.0*	66	*71.0*	93	*100.0*

Table 4.34, above, shows that the Young Adults and Middle Adults in the sample have modified teeth, but the Older Adults in this sample do not. It is possible that the smaller sample of observable Older Adult teeth is due to antemortem loss or extreme wear that precludes observations of occlusal edge modification. Or it is possible that they are from a different social group, different status, etc.

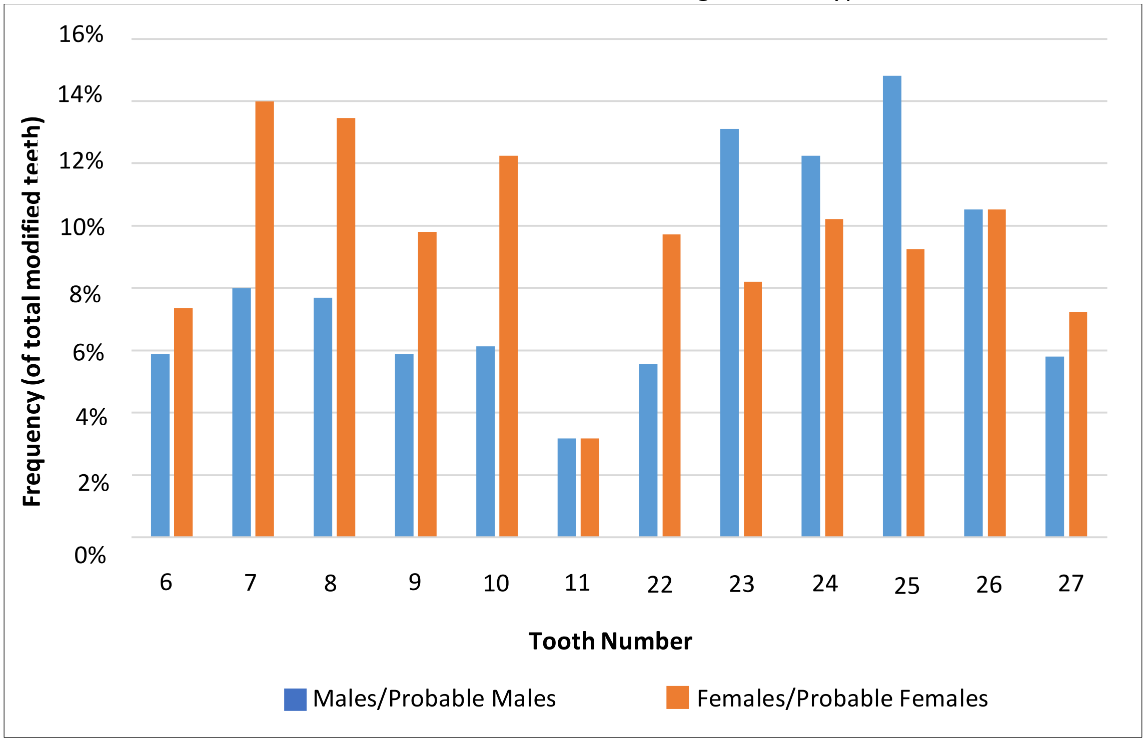
While significant relationships between sex and dental modification were not detected when dental modification was listed as present or absent, interesting sex-related patterns become apparent when sex is compared against dental modification when it is broken down according to tooth type and modification type.

Table 4.35, below, shows the numbers corresponding to the maxillary (6-11) and mandibular (22-27) anterior teeth in the left-hand column. Under each sex category, from left to right, is the number of modified teeth that are present for that sex, followed by the percent of modified teeth represented by that number. The columns at the right show the total number of modified teeth, the total number of each tooth type present and observable, and the frequency of total modified teeth relative to total number of teeth.

Table 4.35: Frequency of modification according to tooth type—MPM and FPF.

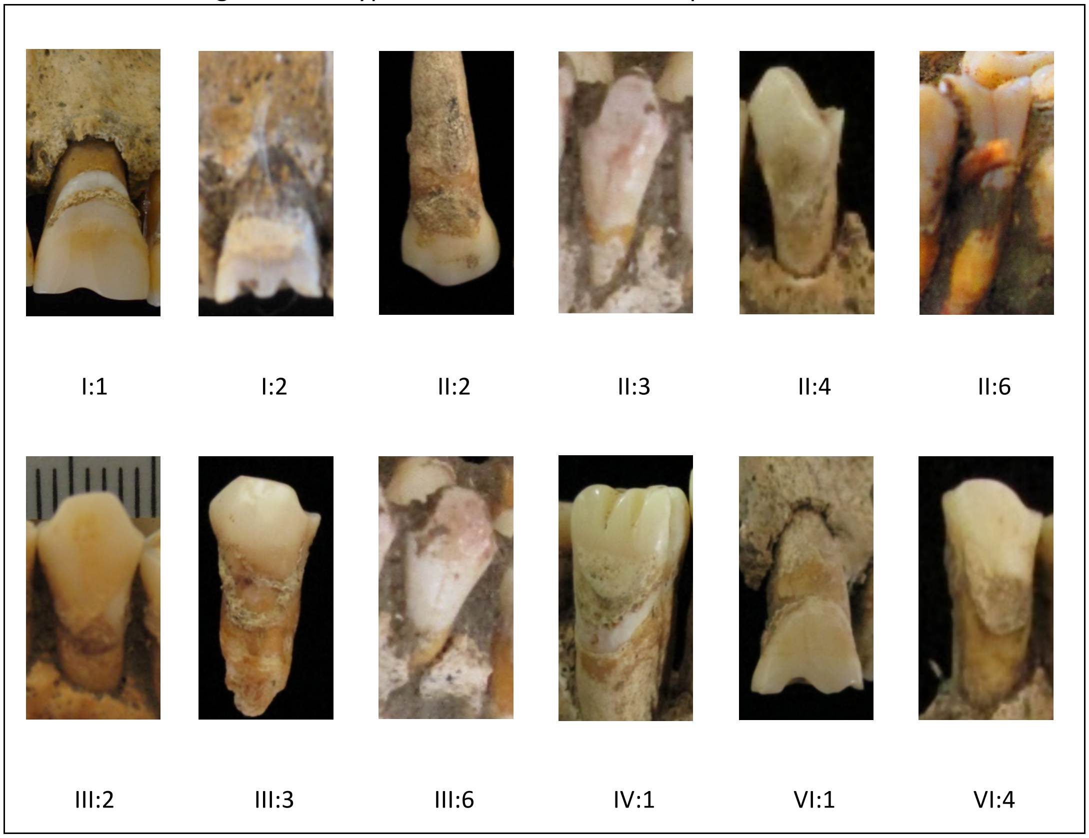
Tooth Number	**Sex**				**Total Modified**	**Total Present**	***Total Freq.% Modified***
	FPF		**MPM**				
	Number Modified	*Freq.%*	Number Modified	*Freq.%*			
6	5	*7.4*	4	*5.9*	9	68	*13.2*
7	7	*14.0*	4	*8.0*	11	50	*22.0*
8	7	*13.5*	4	*7.7*	11	52	*21.2*
9	5	*9.8*	3	*5.9*	8	51	*15.7*
10	6	*12.2*	3	*6.1*	9	49	*18.4*
11	2	*3.2*	2	*3.2*	4	63	*6.3*
22	7	*9.7*	4	*5.6*	11	72	*15.3*
23	5	*8.2*	8	*13.1*	13	61	*21.3*
24	5	*10.2*	6	*12.2*	11	49	*22.4*
25	5	*9.3*	8	*14.8*	13	54	*24.1*
26	6	*10.5*	6	*10.5*	12	57	*21.1*
27	5	*7.2*	4	*5.8*	9	69	*13.0*
Total	65	*53.7*	56	*46.3*	121	695	*17.4*

Figure 4.12: Graph showing frequency of modification among Males/Probable Males and Females/Probable Females according to tooth type.



The graph in Figure 4.12 shows that the maxillary teeth are more frequently modified among females and probable females while the mandibular teeth are more frequently modified among males. Tables showing the frequencies of dental modification types per tooth, per sex, are provided in Appendix C.

Figure 4.13: Types of dental modification present at Jícaro.



(Photos: Wankmiller 2008 & 2013. Reference: Romero, 1970, in Buikstra and Ubelaker, 1994)

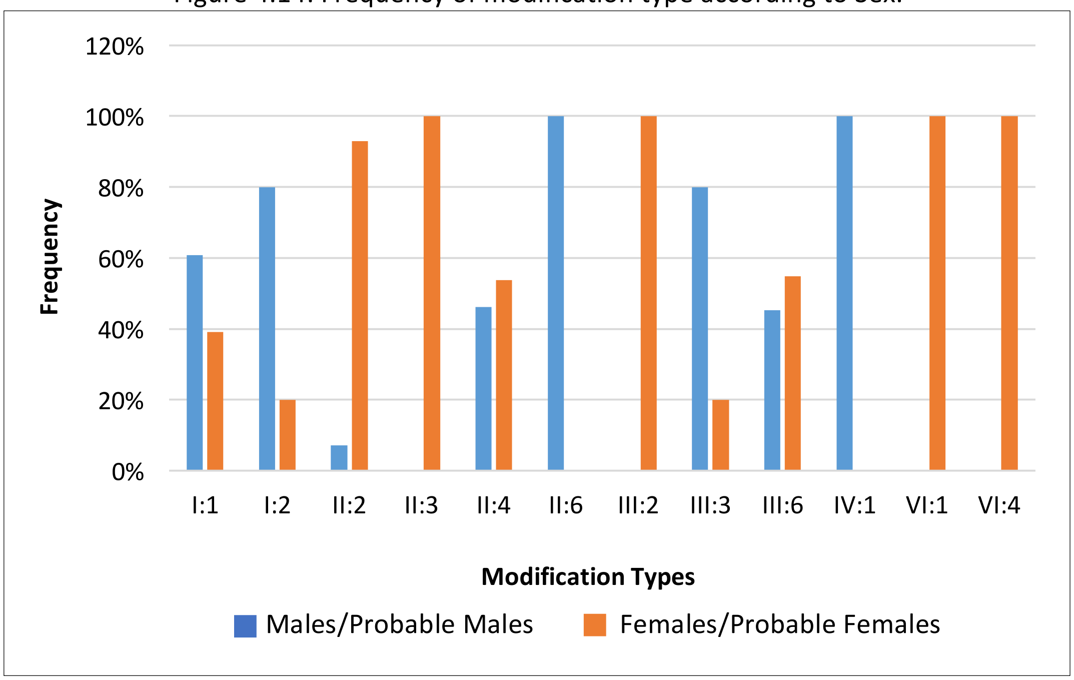
Table 4.36: Frequency of modification type according to sex.

Modification Type (Romero, 1970)	**Sex**				**Total**	***Freq.%***
	MPM		**FPF**			
	Count	*Freq.%*	Count	*Freq.%*		
I:1	14	*60.8*	9	*39.1*	23	*19.3*
I:2	8	*80.0*	2	*20.0*	10	*8.4*
II:2	1	*7.1*	13	*92.9*	14	*11.8*
II:3	0	*0.0*	1	*100.0*	1	*0.8*
II:4	6	*46.2*	7	*53.8*	13	*10.9*
II:6	3	*100.0*	0	*0.0*	3	*2.5*
III:2	0	*0.0*	6	*100.0*	6	*26.1*
III:3	4	*80.0*	1	*20.0*	5	*3.4*
III:6	14	*45.2*	17	*54.8*	31	*2.5*
IV:1	4	*100.0*	0	*0.0*	4	*19.3*
VI:1	0	*0.0*	6	*100.0*	6	*8.4*
VI:4	0	*0.0*	3	*100.0*	3	*11.8*
Total	56	*46.3*	65	*53.7*	119	*100.0*

Table 4.36, above, shows each of the types of dental modification present at Jícaro in the left-hand column (Romero, 1970). The number of times each type of modification was documented is then presented according to sex, followed by the frequency of modified teeth per sex category relative to the total number of teeth with each modification type. Figure 4.14 is a visual representation of the information in Table 4.36.

Table 4.36 and Figure 4.9 show that certain modification types are more common among males (e.g., I:1, I:2, and III:3), while some are more common among females (e.g., II:2 and III:6), and some modification types are exclusive to males (II:6 and IV:1) or females (II:3, III:2, VI:1, and VI:4).

Figure 4.14: Frequency of modification type according to Sex.



Summary of Dental Modification

Results of statistical tests show that there is no significant relationship between the presence of dental modification and sex, but when dental modification is present, there is a significant relationship between the type and location of dental modification and sex. Females more frequently have modified maxillary dentition while males more frequently have modified mandibular dentition. Certain types of dental modification are also more commonly found among males or females. This analysis may be affected by incorrect assessment of sex for probable males and probable females included in this sample as well as by interpretations of the dental modification styles and their application to this sample.

Additional Skeletal Features

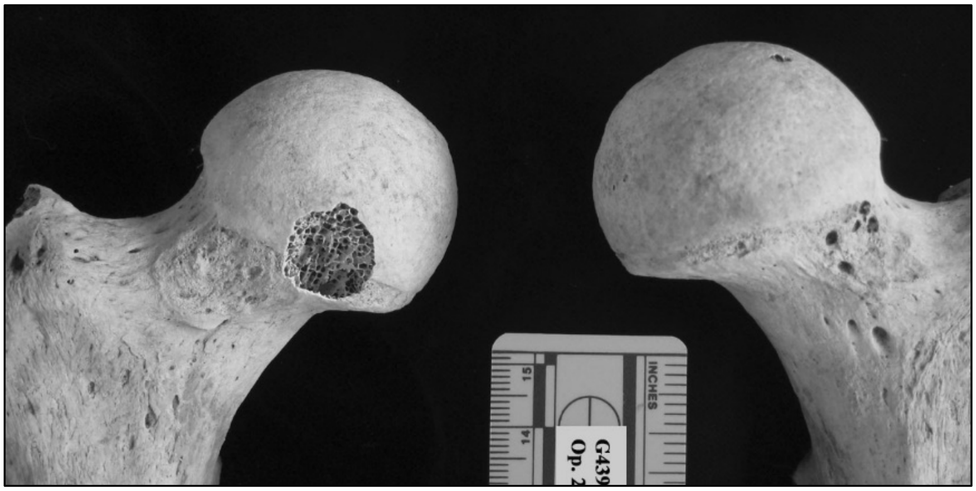
There are several additional skeletal characteristics that occur at Jícaro with some frequency and, although not in great enough numbers to warrant statistical analysis. These features are mainly associated with evidence for activity, pathology, and trauma and were each only observed on a handful of skeletons among the 308 analyzed for this study.

Activity

Eight individuals, all adults (5.2% of the 308 examined), at Jícaro displayed various markers for kneeling or squatting, including facets on the anterior femoral necks, flattened areas on the femoral condyles, and/or facets on the anterior distal tibiae and superior tali. These features were rarely ever observable on the same individuals because of differential preservation of most of the skeletal elements that left many long bones without extremities and resulted in extremely degraded tarsals. Data concerning evidence for kneeling was collected anecdotally in the field notes and is not appropriate for statistical analyses.

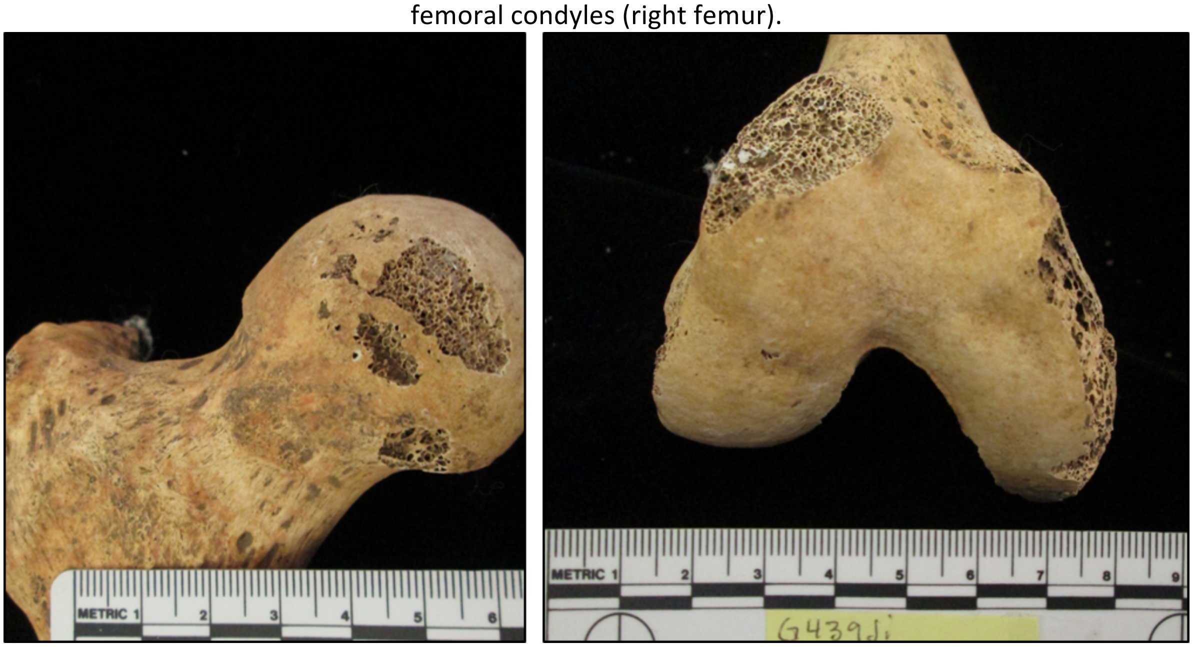
Of the 15 individuals who displayed evidence for kneeling, 6 (40%) are MPM and 9 (60%) are FPF. Without having an account of the actual presence/absence from all of the examined individuals, these numbers cannot possibly speak to the overall prevalence of kneeling at the site, but its presence—and its relatively equal distribution among the documented males and females is worth noting.

Figure 4.15: Burial 61, Individual 1—Example of anterior femoral neck facets.



(Photo: Wankmiller and Sauer, 2008)

Figure 4.16: Burial 58, Individual 1—Example of anterior femoral neck facet and flattened areas affecting femoral condyles (right femur).



(Photos: Wankmiller and Sauer, 2008)

Pathology

Nine individuals (4 FPF and 5 MPM) show evidence of a spinal pathology that primarily affected the lower thoracic and lumbar spines and the pelvis. Only 53 (17.2%) of the 308 examined individuals had spines intact enough to assess for the presence/absence of this pathology, as the axial skeleton was typically poorly preserved at Jícaro.

Table 4.37: Spinal pathology frequency according to sex.

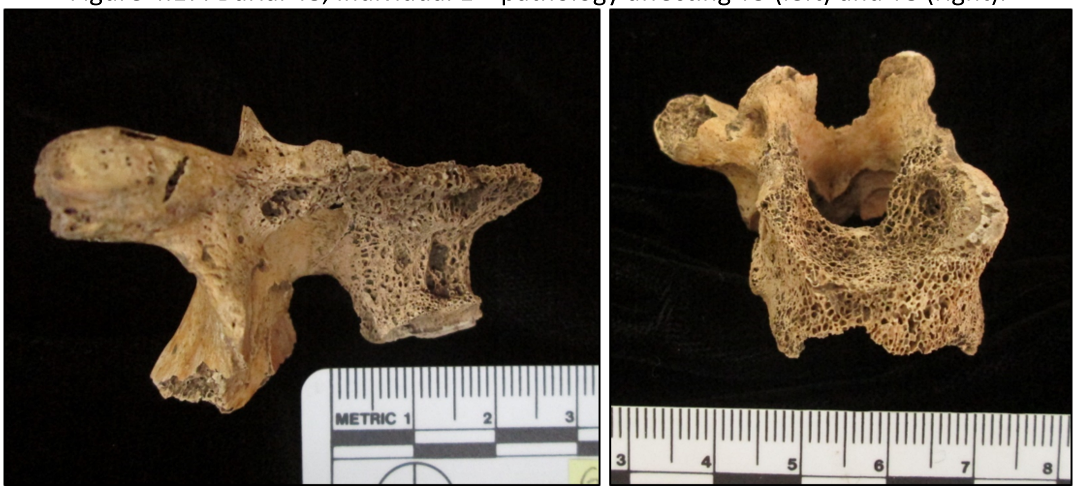
Sex	Spinal Pathology				Total	Freq.%
	Present	Freq. %	Absent	Freq. %		
MPM	5	*20.8*	19	*79.2*	24	*45.3*
FPF	4	*13.8*	25	*86.2*	29	*54.7*
Total	9	*17.0*	44	*83 .0*	53	*100.0*

A Fisher's Exact test indicates no statistically significant relationship between sex and the presence of this pathology (p=0.715, with significance at the p<0.05 level). The pathology appears to be a type of mycotic infection (Ortner, 2003) that is associated with lytic lesions affecting mainly the vertebral bodies of the affected individuals, but the lesions are also found on the ilium and the ischium, and in one case on the distal femur, and two individuals also showed areas of reactive bone affecting the visceral surfaces of their lower ribs. Examples of the appearance of this infection in three individuals are presented in Figures 4.17, 4.18 and 4.19, below. Three individuals were chosen because their burial circumstances and the expression of the pathology is slightly different for all three.

Burial 48

Burial 48 is a single interment of a young adult female. Her burial was located in Operation 26 in Sector 2. Her skeleton was more than 75% complete, allowing for thorough skeletal observations and she is one of the few individuals for whom stature could be calculated: 149.98 cm +/- 3.816 cm, or approximately 57inches to 61 inches (Genoves, 1967). She was buried in an extended supine position with her head oriented toward the east, her legs were extended and parallel to one another, her left arm extended at her side (her right arm was missing), and she was buried with two ceramic vessels. This individual is one of the individuals whose femora show evidence of kneeling or squatting, and shows sclerotic periostitis affecting her right and left tibia and fibula.

Figure 4.17: Burial 48, Individual 1—pathology affecting T5 (left) and T8 (right).



(Photos: Wankmiller, 2013)

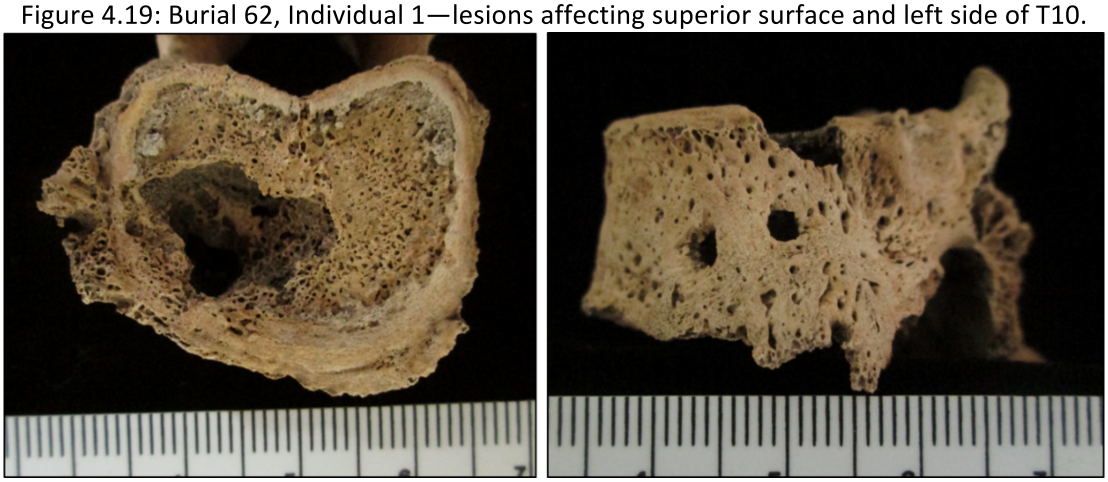
Figure 4.18: Burial 48, Individual 1—reactive bone on visceral surface of lower left rib.

(Photo: Wankmiller, 2013)

Burial 62, Individual 1

Burial 62 contains two individuals, although they are separated in space by more than ½ meter and they were buried in two very different positions, so it is likely that they were actually not part of the same burial event. Individual 1 was approximately ½ meter north of Individual 2, and both are older adult males. The upper torso and cranium of Individual 1 were in poor condition due to an intrusive tree root cutting through the burial, but his skeleton was still more than 75% complete, allowing for thorough skeletal observations and, like Burial 48, he is one of the few individuals for whom stature could be calculated: 151.01 cm +/- 3.417 cm, or approximately 57inches to 61 inches (Genoves, 1967). This individual was buried in an extended position with the head oriented toward the west, the legs extended and parallel, the left arm extended at his side (his right arm was missing), and he was buried with 5 shell beads and one shell columela. This individual is among the individuals with observable LSAMAT.

Figure 4.19: Burial 62, Individual 1—lesions affecting superior surface and left side of T10.

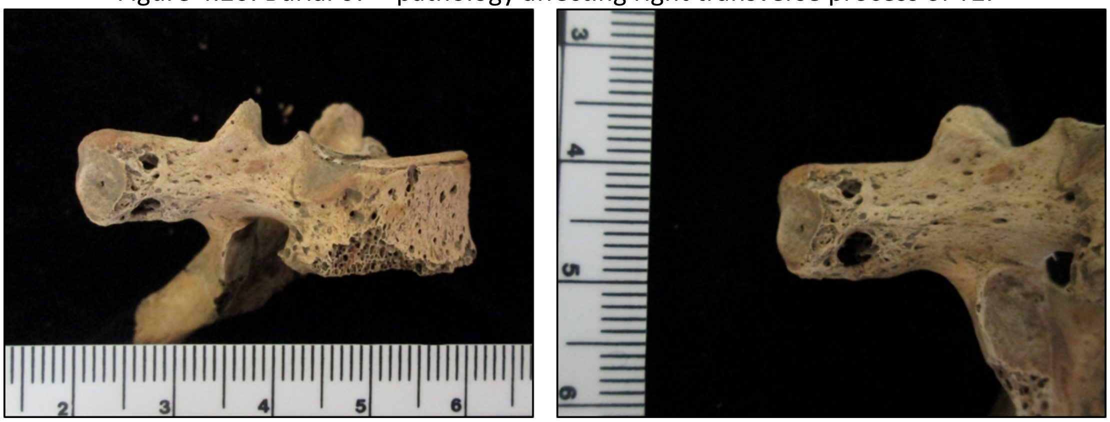


(Photos: Wankmiller, 2013)

Burial 67

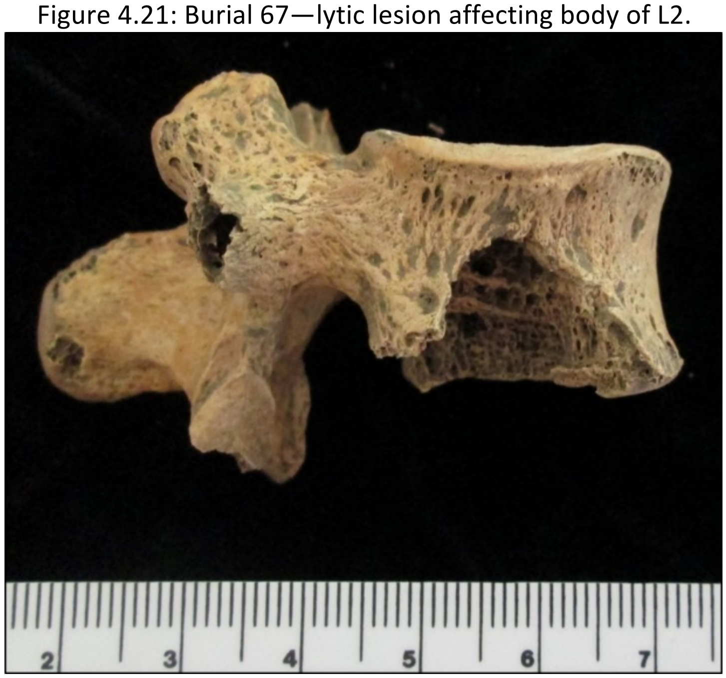
Burial 67 is the single interment of a young adult female whose skeleton was more than 75% complete, allowing for detailed observations. She was buried in an extended supine position with the legs extended and parallel and the arms extended at the sides, and her head oriented toward the southwest. She was buried with a single deer metapodial. This individual was also complete enough for stature estimation: 143.241 cm +/- 3.816 cm, or approximately 54 inches to 58 inches (Genoves, 1967). Both of her orbits show healed cribra orbitalia, suggesting she suffered from a serious systemic illness during childhood, although her teeth showed no signs of LEH. Both her right and left tibiae also showed periostitis with a woven appearance. She is among the individuals with observable LSAMAT.

Figure 4.20: Burial 67—pathology affecting right transverse process of T2.



(Photos: Wankmiller, 2013)

Figure 4.21: Burial 67—lytic lesion affecting body of L2.



(Photo: Wankmiller, 2013)

Figure 4.22: Burial 67—lesion affecting right ilium at sacroiliac joint (observation affected by degraded surface of the bone in this area).

(Photo: Wankmiller, 2013)

Human Remains as Artifacts

Fifteen of the burials from Jícaro contained artifacts made from human bone, including jewelry made out of human teeth that had been perforated and apparently strung together to form necklaces and bracelets; human mandibles that had been scored and broken at the ramus, some of which were perforated and apparently worn as ornaments; a human maxilla that was cut and had holes drilled through it so it could be worn, apparently as a headdress; several elongated rectangular pendants; cylindrical bone combs; and in one case, whole human bones that had apparently been used as a tool or instrument. The frequency of human remains as artifacts with regard to age-at-death, sex, and burial position is addressed in an earlier section of this chapter. The human remains that were treated as artifacts within the burials at Jícaro are not included in the demographic analysis or mortuary analyses.

The human tooth beads, pendants, combs, and tools were not analyzed directly as part of this analysis because they were considered to be artifacts by the archaeologists and were not included with the skeletal collection. The isolated crania, however, were considered to be separate individuals by the archaeologists and are therefore included as part of this analysis.

Isolated Crania

There are a total of 34 isolated crania associated with 16 burials at Jícaro. The criteria to be considered an isolated cranium for the purpose of this study include apparent intentional placement within the grave and no associated postcranial elements within the grave or grave fill. Not all of the crania fit the criteria to be considered isolated for the purpose of this study. Only the truly isolated crania are analyzed; the others are summarized below.

Burials with Extra Crania

Burial 6

Burial 6 is a commingled burial with an MNI of 5. Among the remains within Burial 6 are five disarticulated and incomplete subadults and infants, and an isolated cranium. The isolated cranium is consistent in age with several of the other postcranial remains and does not appear to be intentionally placed, indicating probable reuse of the fossa. For those reasons, this cranium does not fit the criteria to be considered an isolated cranium for the purpose of this study.

Table 4.38: Burial 6—Isolated Cranium.

Burial 6					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 1	Child	Undetermined	No	Fragmentary, in matrix	Reuse

Burial 7

Burial 7 is a commingled burial containing an MNI of 6. The primary individual is an adult of undetermined sex, and two of the other five individuals are isolated crania associated with the primary individual. The additional three individuals are subadults who were disarticulated and extremely incomplete. The isolated crania are those of adults, both of undetermined sex, one showing evidence of dental modification. The primary individual is in relatively anatomical position and there are paquetes of bones from the left and right sides of the body of an additional individual to his/her right and left sides, respectively, making it appear as though an earlier individual may have been moved out of the way to make room for the primary individual. An additional scattered individual is clustered near the leg region of the primary individual. There are two isolated crania associated with this burial, one beside the skull of the primary individual and one in the region of the primary individual's knees. Because there are so many disarticulated postcranial remains in this burial and because the isolated crania do not appear intentionally placed as offerings, they are more likely to represent reuse of the burial fossa than they are to be truly isolated crania.

Table 4.39: Burial 7—Isolated Crania.

Burial 7					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 1	Adult	Undetermined	Yes	Fragmentary	Reuse
Cráneo 2	Adult	Undetermined	No	Fragmentary	Reuse

Burial 16

Burial 16 is the double burial of two adults, a probable male of undetermined age and a middle adult probable female, with isolated postcranial elements of a toddler in the grave fill. The two primary individuals are buried with three extra crania. One of the crania (*Cráneo 3*) is associated with a paquete of bones at the feet of the primary individuals and is likely more of an indicator of secondary treatment than it is of an offering. The other two crania are not associated with postcranial elements and are placed near the heads of the primary individuals (*Cráneo 2*) and near the right knee of Individual 2 (*Cráneo1*).

Table 4.40: Burial 16—Isolated Crania.

Burial 16					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 1	Adult	Probable Female	No	No information	Offering
Cráneo 2	Adult	Probable Female	No	No information	Offering
Cráneo 3	Probable Adult	Undetermined	No	No information	Reuse

Burial 39

Burial 39 is a single burial of an adult female of undetermined age. This burial is superimposed over Burial 44, which was discovered immediately beneath Burial 39. There are several dispersed postcranial elements associated with this burial as well. The extremely close proximity of Burial 44, the presence of dispersed skeletal elements, and the fact that the extra cranium in this burial does not appear to have been intentionally placed, indicates that this cranium is more likely the result of reuse of a burial fossa than it is of an isolated cranium.

Table 4.41: Burial 39—Isolated Cranium.

Burial 39					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 1	Adult	Ambiguous	No	No information	Reuse

Burial 58

Burial 58 is a commingled burial containing an MNI of four—two primary individuals, an adult male for whom age could not be determined and a middle adult male, one neonate represented by several postcranial fragments, and one adult probable female, represented by a cranium only. There is no distinct organization to this burial and the remains were not easily sorted. The condition of this burial is suggestive of secondary treatment associated with reuse and the isolated cranium of the adult female does not appear to be an offering as much as it appears to be evidence of reuse and commingling of elements.

Table 4.42: Burial 58—Isolated Cranium.

Burial 58					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 1	Adult	Probable Female	No	No information	Reuse

Burial 61

Burial 61 is a single interment of an older adult probable male. There is a large paquete of disarticulated postcranial elements beneath the knees of the primary individual and there are three isolated crania associated with the cluster of bones. Because of the placement of the cluster of bones at the primary individual's knees, the fact that all three of the isolated crania were in extremely close proximity to the cluster, and because the crania include a probable female and a child, it is more likely that their presence is reflective of reuse of a burial fossa and less likely the result of them being present solely as offerings. The crania for this burial are numbered as if the cranium of the primary individual is *Cráneo 1*.

Table 4.43: Burial 61—Isolated Crania.

Burial 61					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 2	Adult	Probable Male	Yes	Mostly complete, fragmentary	Reuse
Cráneo 3	Adult	Probable Female	No	Fragmentary	Reuse
Cráneo 4	Child	Undetermined	No	Fragmentary, in matrix	Reuse

Burial 68

Burial 68 is the single interment of an older adult male who has a single isolated cranium and a cluster of postcranial remains associated with him. The isolated cranium appears to be that of an adult male and the postcranial remains (elements of theupper and lower limbs) were detrermined to be those of a probable male. Because there appears to be only a single individual in addition to the primary individual, and given the condition of the additional individual—remians concentrated near the right shoulder of the primary individual—the isolated cranium in this case appears to be more likely associated with an earlier individual and does not appear to be in the burial as an artifact.

Table 4.44: Burial 68—Isolated Cranium.

Burial 68					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 1	Adult	Male	No	No information	Reuse

Burial 79

Burial 79 is a double interment of an adult of undetermined age and ambiguous sex (Individual 1) and an adult male of undetermined age (Individual 2). Individual 1 is approximately 50% compete and is represented by all body regions, although most of the elements are incomplete. Individual 2 is approximately 75% complete with all regions of the body represented and the bones in slightly better condition than those of Individual 1. Solís and Herrera (2009) believe Individual 1 to be an artisan, as he was buried in association with a number of lithic artifacts, including a piece of sculpture, percussion flakes, numerous faunal artifacts, and several human remains artifacts in addition to the isolated cranium, including a long pendant believed to be made out of a human fibula. The two primary individuals are associated with two fragmentary crania that were placed above their heads. The crania are extremely fragmentary and incomplete, but they do appear to have been placed in the grave intentionally and do not appear to be associated with any postcranial elements.

Table 4.45: Burial 79—Isolated Cranium.

Burial 79					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Individual 3	Adult	Ambiguous	No	Fragmentary	Offering
Individual 4	Adult	Probable Male	No	Fragmentary	Offering

Burial 110

Burial 110 was very closely associated with Burial 106 in that they overlap in space to a large degree and their remains were commingled during the excavation and cleaning in the laboratory. They are even mapped together in the field maps. Burial 110 contains an MNI of 3, an older adult male, a child, and the isolated cranium of an adult probable female. The remains of the primary individual, the older adult male, are only approximately 25-50% complete and were not laid out in an extended position as so many of the burials at Jícaro are—this individual was essentially a cluster beneath and to the left of the legs of Burial 6. The extra cranium of an adult probable female was found in association with the remains of Burial 110, but as this burial is located at the bottom of a burial area that was apparently reused repeatedly over time (See Operation 24, Chapter 6), it is more likely that this isolated cranium is not an offering but is an element from remains of an individual who was disturbed upon the interment of Burial 110 or another burial in the same area. The crania of Burial 110 are numbered as though the primary individual's cranium is *Cráneo 1*.

Table 4.46: Burial 110—Isolated Cranium.

Burial 110					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 2	Adult	Probable Female	No	Fragmentary	Reuse

Burial 130

Burial 130 is the single interment of a middle adult male with modified teeth. His remains are approximately 75% complete and in good condition. This individual was found in association with two additional individuals—a fetal/neonate who is approximately 25% complete, represented by fragments of the mandible, cranium, axial skeleton, and upper and lower limbs from the right side; and the isolated cranium of a child, missing the maxilla and mandible. The child cranium that is present was located near the right hand of the primary individual. The placement of this cranium and the lack of any additional postcranial elements from an individual of comparable age indicate that it may be present as an offering. See Figure 4.23 on the following page (isolated cranium indicated by the white arrow).

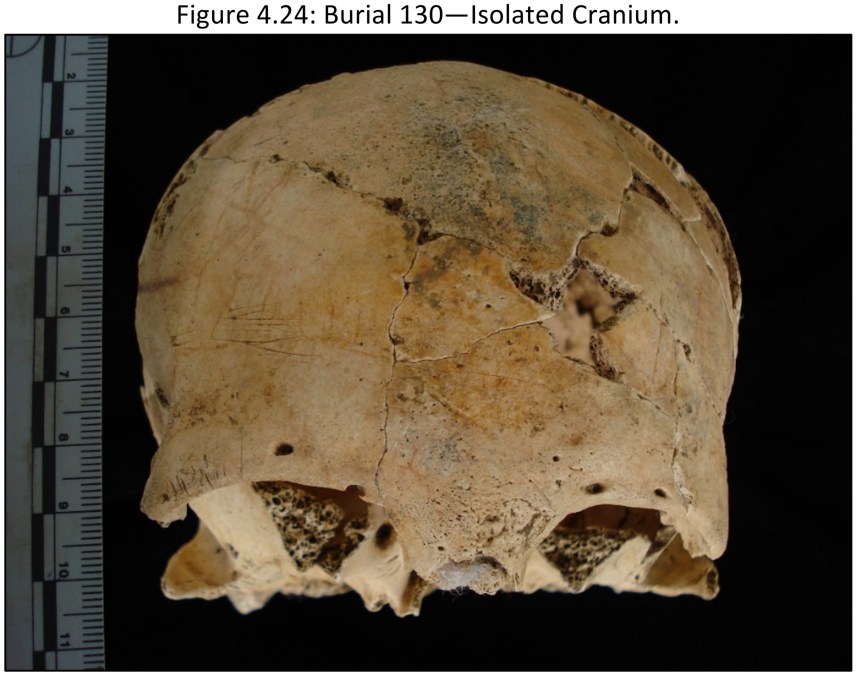
Table 4.47: Burial 130—Isolated Cranium.

Burial 130					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 1	Child	Undetermined	No	Fragmentary	Offering

Figure 4.23: Burial 130.

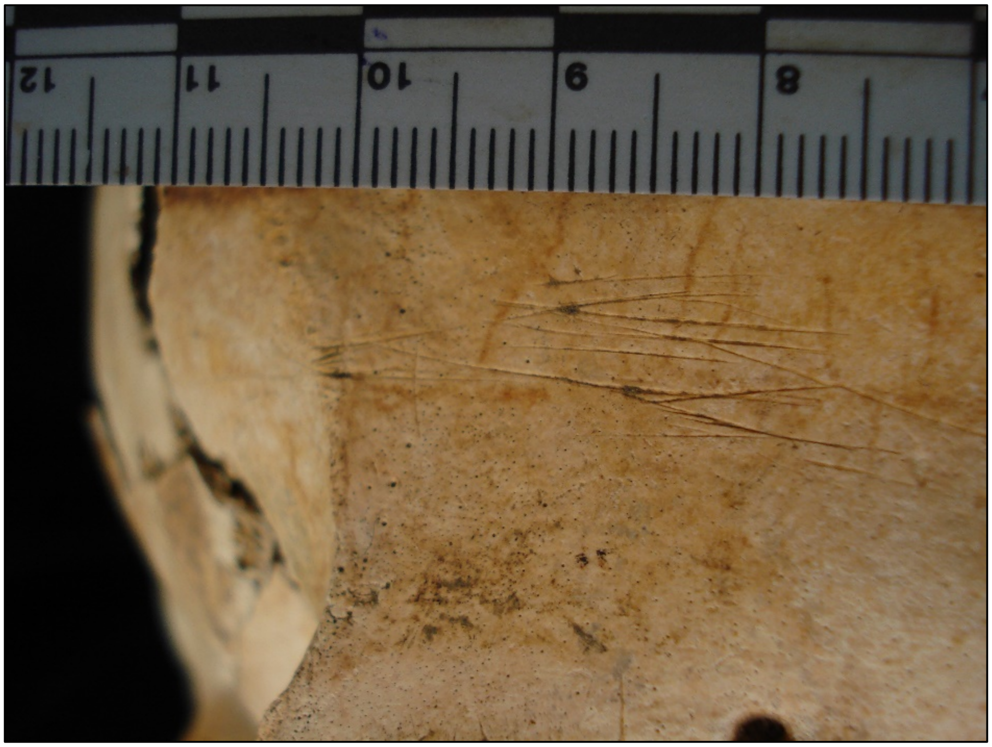
(Photo: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

Figure 4.24: Burial 130—Isolated Cranium.



(Photo: Wankmiller, 2008)

Figure 4.25: Burial 130—Detail of cutmarks on isolated cranium.



(Photo: Wankmiller, 2008)

Burial 147

Burial 147 is the single interment of a middle adult probable male with modified teeth. This is one of the better preserved skeletons from the Jícaro collection, with most of the cranial and postcranial elements present and intact enough for observations and measurement. This male was buried with an iguana near the pelvic region and an isolated cranium between his feet, facing away from the body (See Figure 4.26). This isolated cranium of a young adult probable male, missing the maxilla and mandible, is not associated with any additional postcranial elements. The isolated cranium shows a series of cutmarks on the right parietal and its placement suggests it is an offering.

Table 4.48: Burial 147—Isolated Cranium.

Burial 147					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo1	Young Adult	Probable Male	No	Fragmentary, cutmarks	Offering

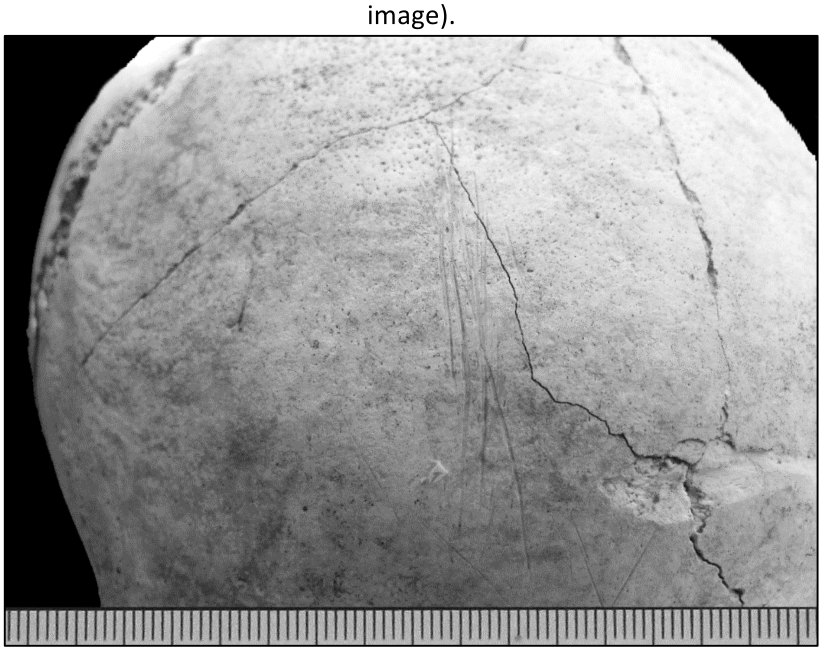
Figure 4.26: Burial 147—Isolated Cranium as offering.

(Photo: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

Figure 4.27: Burial 147—Isolated Cranium.

(Photo: Wankmiller and Sauer, 2008)

Figure 4.28: Burial 147—Isolated Cranium, Detail of Cut Marks (anterior is toward the lower right of the image).



(Photo: Wankmiller and Sauer, 2008)

Burial 155

Burial 155 is the double interment of an older adult female (Individual 1) and a middle adult male (Individual 2). Individual 1 is in poor condition, with only approximately 25 % of the skeleton intact, while Individual 2 is in better condition, with about 50-75% of the skeleton intact. The individuals' bodies are parallel with one another and their heads are turned toward one another. Two isolated crania are associated with Individual 2—one is placed by his right hip (Individual 3) and the other is placed by his right knee (Individual 4). There is no other evidence for isolated or clustered postcranial remains associated with Burial 155. Because there are no other skeletal elements present and the crania appear to be intentionally placed next to Individual 2, these two crania appear to be offerings. The cranium labeled as Individual 3 shows cut marks on the frontal bone and a lesion above the right orbit; the cranium labeled as Individual 4 is extremely fragmentary and not observable for age, sex, or pathology.

Table 4.49: Burial 155—Isolated Crania.

Burial 155					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Individual 3	Adult	Probable Male	No	30+ fragments	Offering
Individual 4	Adult	Ambiguous	Unknown	50+ fragments	Offering

Figure 4.29: Individual 3—Right orbit showing lesion and cutmarks on frontal bone.

(Medial is toward the right, lateral is toward the left.)
(Photo: Wankmiller, 2013)

Burial 160

Burial 160 is the single interment of a young adult probable male with modified teeth who was interred with four additional crania placed around his head and shoulder area. None of the additional crania appear to be associated with postcranial remains, although toward the primary individual's feet there is a cluster of isolated postcranial elements. The apparent intentional placement of the isolated crania around the head and shoulder region and their lack of association with postcranial elements suggest that they are offerings, as opposed to secondary treatments of individuals whose burials were intruded upon by Burial 160.

Table 4.50: Burial 160—Isolated Crania.

Burial 160					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 1	Adult	Ambiguous	Unknown	100+ fragments	Offering
Cráneo 2	Adult	Ambiguous	No	100+ fragments	Offering
Cráneo 3	Young Adult	Ambiguous	Yes	100+ fragments	Offering
Cráneo 4	Adult	Ambiguous	No	Intact, powdery cortex	Offering
Cráneo 5	Adult	Ambiguous	Unknown	100+ fragments	Offering

Burial 208

Burial 208 is the single interment of an older middle adult probable male. The skeleton is approximately 25% complete with fragmentary axial skeleton, pelvis and limbs, and the cranium is missing, with a ceramic vessel in its place. This individual is associated with three additional crania, two of undetermined sex, one of which has modified teeth, and one young adult probable male. These crania are placed at the level of the knees and feet of the primary individual and are in close proximity with two deer extremity bones. None of them appear to be associated with postcranial elements and their placement suggests that they may have been offerings.

Table 4.51: Burial 208—Isolated Crania.

Burial 208					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 1	Undetermined	Undetermined	Unknown	Fragmentary	Offering
Cráneo 2	Young-Middle Adult	Probable Male	Unknown	Fragmentary	Offering
Cráneo 3	Adolescent-Young Adult	Undetermined	Yes	Fragmentary	Offering

Burial 212

Burial 212 is the single interment of a middle aged adult of ambiguous sex. This individual was interred with four isolated crania that were placed in the region of the primary individual's lower legs, two on the right side and two on the left side. The placement and location of these remains and the fact that they are not associated with postcranial remains indicates that they were offerings. Only three of the four isolated crania are actually crania—one is cranial, but it is a mandible, not a cranium, and may actually belong with one of the other three crania.

Table 4.52: Burial 212—Isolated Crania.

Burial 212					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	
Cráneo 1	Young Adult	Probable Male	Yes	Intact	Offering
Cráneo 2	Middle Adult	Probable male	No	Mandible missing	Offering
Cráneo 3	Adult	Undetermined	Unknown	Mandible missing	Offering
Cráneo 4	Adult	Probable Male	No	Mandible only	Offering

Burial 224

Burial 224 is a commingled burial with an MNI of five. There is one primary individual buried in an extended supine position, an adult of ambiguous sex (Individual 1), and a second adult of ambiguous sex (Individual 2) to the primary individual's right who is partially articulated and shows charring of the right upper extremity. Individual 3, adolescent of undetermined sex, is a level below individuals 1 and 2, and is largely intact. Individual 4 is reportedly represented by a cranium only, but there are a number of clustered postcranial elements that may be associated with this cranium. The isolated cranium is relatively complete and remains encased in matrix. There is also an isolated mandible associated with this burial. Because there are so many postcranial remains associated with this burial and because the crania are not placed in areas that are consistent with other offerings—beside the head or knees, for example—it is more likely that the isolated crania from this burial are evidence of reuse as opposed to offerings.

Table 4.53: Burial 224—Isolated Crania.

Burial 224					
Isolated Cranium	**Age**	**Sex**	**Dental Modification**	**Condition**	**Context**
Cráneo 1	Adolescent	Undetermined	No	Fragmentary	Reuse
Cráneo 2	Adult	Probable Male	No	Encased in matrix	Reuse
Cráneo 3	Young Adult	Undetermined	No	Mandible only	Reuse

Summary of Isolated Crania

Of the 34 documented isolated crania that were included within 16 graves at Jícaro, 14 (41.1%) appear to be evidence of reuse of the same burial fossa because the burials are also associated with clusters or paquetes of disarticulated postcranial elements. The majority of the isolated crania are of undetermined age and sex because they are extremely fragmentary and incomplete and the diagnostic features for age and sex are not observable. Five of the isolated crania are associated with teeth and have modified teeth—three young adults and two for which age could not be determined; one probable male and four for which sex could not be determined. One of the isolated crania (Burial 155, Individual 3) has an area of reactive bone affecting the superior right orbit and a series of cut marks on the frontal just supero-medial to the lesion. For the most part, the isolated crania are cranial vaults, many associated with matrix, and there is unfortunately very little information that can be learned from them, aside from their presence being evidence of either extensive reuse of burial fossae at Jícaro or evidence of offerings, possibly related to ancestor veneration (See Chapter 8).

Chapter Summary

This chapter presents results of quantitative analyses of data collected from the Jícaro skeletal sample. Results of the analyses show that the population at Jícaro is relatively balanced, with no significant difference between the number of adults and subadults, males and females in the sample. Subadults appear to have a spike in mortality at approximately 5-7 years of age, adult females have a spike in mortality in young adulthood, adult males have a spike in mortality during middle adulthood, and the small number of older adults in the sample may indicate a short life expectancy for the population. More subadults are affected by active cribra orbitalia than adults and more adults show signs of healed cribra orbitalia than subadults, which is to be expected because cribra orbitalia primarily affects subadults. Males and females appear to be equally affected by LEH, caries, and LSAMAT, possibly indicating that there is little differentiation in their roles within the community. Males and females are significantly different with regard to stature, with males being significantly taller than females, and males and females show different patterns of dental modification, although their likelihood of having any dental modification is about the same and there is no relationship with presence of any dental modification and age-at-death among adults. Although the population seems generally healthy, several individuals do show some evidence of systemic infections, some of which appear to be related to a treponemal infection while others appear related to a mycotic infection.

Chapter 5: Statistical Analysis of Mortuary Practices at Jícaro

Introduction

The previous chapter presented statistical analyses of the data collected from the skeletal material from Jícaro. In order to complete the characterization of the population and of the site as a whole, and complete the bioarchaeological analysis of the site, the mortuary behavior of the Jícaro population must also be characterized. This chapter presents results of statistical tests as well as spatial analyses of mortuary data and address Research Question 2 of this study, presented in Chapter 2:

What are the relationships between individuals and mortuary practices at Jícaro?

Expectations

Based on reports and publications by archaeologists Solís and Herrera, very little social differentiation was expected to be evident in the burial practices at Jícaro. This chapter is intended to investigate relationships between biological variables, mortuary variables, and the use of space at Jícaro.

Quantitative Analyses of Mortuary Data

The first section of this chapter presents results of statistical tests used to evaluate whether significant relationships exist between demographic variables and burial treatments at Jícaro.

The MNI for Jícaro prior to the laboratory analysis was 440. During the skeletal analysis portion of this study, the MNI for some burials was reduced based on the ability to make physical matches between separate skeletal elements and because of a change in the criteria for what constitutes an individual (See Chapter 3). The MNI was increased for other burials based on the determination that some skeletal elements did not belong to the individuals to which they had been assigned or because additional individuals were identified based on presence of cranial fragments, teeth, or duplicated elements. The final MNI for Jícaro is 442, although the mortuary data are largely based on the original assessment of the burials and not on the data collected for the purpose of this study. Because some of the variables are necessarily derived from the site reports and other variables are necessarily derived from the skeletal analysis, various analyses take into consideration different subgroups of the Jícaro sample. A description of the portion of the sample used for a given analysis is provided in association with all tables and figures in this section.

Because of the nature of the data that was available and analyzed for this study, specifically because for the most part the goal of the analysis was to ascertain whether or not significant relationships exist between demographic variables and mortuary variables, and between individual mortuary variables, which are all qualitative in nature, Pearson's Chi-square tests for independence were selected as the primary method for analysis. Reliability of Chi-square results is dependent on sample size and in many instances when the Jícaro samples were subdivided for the purpose of statistical analysis the sub-groups were too small for Chi-square to be applicable. When the sample sizes were insufficient to satisfy the requirements for Chi-square, specifically when the sample sizes resulted in more than 20% of the cells having an expected value of less than 5, and the variables allowed for 2x2 tables, Fisher's Exact tests were calculated. All statistical tests for independence were calculated in SPSS.

Burial Disposition

Information about burial disposition is derived from the original site reports and spreadsheets compiled by Solís and Herrera (2006, 2009, personal communication). "Burial Disposition" is the way in which the archaeologists refer to the individuals as having been 1. Extended; 2. Flexed, 3. Semiflexed, 4. *Paquete* ("packet" or "bundle"), 5. Dispersed, 6. Inside an artifact, or 7. Undetermined (Solís and

Herrera, 2006; 2009) and the same language is used in this section to maintain consistency with their records.

Table 5.1: Burial dispositions of individuals from Jícaro.

Burial Disposition	**Number of Individuals**	***Freq.%***
Extended	221	*50.2*
Flexed	1	*0.2*
Semiflexed	15	*3.4*
Paquete	73	*16.6*
Dispersed	107	*24.3*
Inside Artifact	7	*1.6*
Undetermined	16	*3.6*
Total	440	*100.0*

All data presented in Table 5.1, above, is derived from the original archaeological field data (Solís and Herrera, 2006; 2009) and does not include any data collected during the laboratory phase of this study. The objective for analyzing burial disposition for the purpose of this study is to examine the disposition in which the individuals at Jícaro were originally buried. Because such a vast majority of individuals at Jícaro were buried in an extended disposition and so few were in a flexed or semiflexed disposition, for the purpose of this analysis, the flexed and semiflexed dispositions were collapsed into a single group. Because the *paquetes* appear to be secondary treatments and are therefore more likely evidence of reuse at Jícaro than they are of original burial placement, the *paquete* burials are excluded from this analysis. The Dispersed and Undetermined burial dispositions were also excluded because they do not offer any information about burial disposition at the time of interment. Finally, all seven individuals found inside artifacts are infants and are disarticulated, so they are also excluded from the analysis of burial disposition (infants that were discovered in anatomical position as single interments are included in this analysis).

Table 5.2: Burial Disposition—Age-at-death.

Age Category	Burial Disposition				Total	*Freq.%*
	Extended	*Freq.%*	Other	*Freq.%*		
Subadults	39	*65.0*	21	*35.0*	60	*29.3*
Adults	119	*82.1*	26	*17.9*	145	*70.7*
Total	158	*77.1*	47	*22.9*	205	*100.0*

A Chi-square test was calculated using SPSS to determine if there is a significant relationship between burial disposition and age-at-death. Only individuals who were examined during the laboratory data collection phase of this project and for whom age category and body disposition could be determined (N=205) were included in this analysis. Results of the Chi-square test show that there is a significant relationship between burial disposition and age-at-death (X^2=6.997, df=1, p=0.008, with significance at the p<0.05 level). Subadults are nearly as likely to be buried in an extended disposition as they are in another disposition, while the majority of adults were buried in extended dispositions.

Table 5.3: Burial Disposition—Adults.

Age Category	Burial Disposition				Total	*Freq.%*
	Extended	*Freq.%*	Other	*Freq.%*		
Young Adult	26	*89.7*	3	*10.3*	29	*36.3*
Middle Adult	34	*91.9*	3	*8.1*	37	*46.3*
Older Adult	12	*85.7*	2	*14.3*	14	*17.5*
Total	72	*90.0*	8	*10.0*	80	*100.0*

Only adults who were examined during the fieldwork for this project and for whom age category could be determined (N=80) were included in this analysis. Results of the Chi-square test show that there is not a significant relationship between burial disposition and age-at-death (X^2=0.437, df=1, p=0.804, with significance at the p<0.05 level). This test shows that all adults, regardless of age category, were more likely to be buried in an extended disposition than a flexed or semiflexed disposition.

Table 5.4: Burial Disposition—Sex.

Sex	**Burial Disposition**				**Total**	***Freq.%***
	Extended	*Freq.%*	Other	*Freq.%*		
MPM	38	*82.6*	8	*17.4*	46	*45.5*
FPF	49	*89.1*	6	*10.9*	55	*54.5*
Total	87	*86.1*	14	*13.9*	101	*100.0*

A Chi-square test was calculated using SPSS to determine if there is a significant relationship between burial disposition and sex. Only individuals who were examined during the laboratory data collection phase of this project and for whom sex could be determined (N=101) were included in this analysis. Results of the Chi-square test show that there is no significant relationship between burial disposition and sex (X^2=0.882, df=1, p=0.348, with significance at the p<0.05 level).

Table 5.5: Burial Disposition—Grave Goods.

Burial Disposition	**Grave Goods**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	156	*70.9*	64	*29.1*	220	*76.1*
Other	21	*30.4*	48	*69.6*	69	*23.9*
Total	177	*61.2*	112	*38.8*	289	*100.0*

A Chi-square test was calculated using SPSS to determine if there is a significant relationship between burial disposition and whether or not grave goods were present. Because both of these data were archaeologically determined and are unrelated to analyses conducted specifically for this study, all individuals for which information about burial disposition and grave goods was recorded (Solís and Herrera, 2006; 2009) were included in this analysis (N=289). Results of the Chi-square test show that there is a significant relationship between burial disposition and presence of grave goods (X^2=36.252, df=1, p=0.0001, with significance at the p<0.05 level). The test indicates that there is a relationship between the presence of grave goods and burial disposition. In this sample, the number of extended individuals with grave goods is more than twice the number of extended individuals without grave goods, while the number of flexed/semiflexed individuals without grave goods is more than twice the number of individuals in flexed or semiflexed positions with grave goods.

Chi-square and Fisher's Exact tests were calculated using SPSS to determine if there are significant relationships between burial disposition and the presence of particular grave goods. Only individuals with grave goods present were included in the following analyses (N=177). In each of the following category, a grave good type is considered present if at least one artifact of that type is present and associated with a particular individual and a grave good type is considered absent under one of two conditions: either there were no grave goods of that type present in a given burial or no grave goods of that type could be assigned to a particular individual within a burial.

Table 5.6: Burial Disposition—Beads.

Burial Disposition	**Beads**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	63	*40.4*	93	*59.69*	156	*88.1*
Other	3	*14.3*	18	*85.7*	21	*11.9*
Total	66	*37.3*	111	*62.7*	177	*100.0*

Results of the Chi-square test show that there is a significant relationship between burial disposition and presence of beads (X^2=5.391, df=1, p=0.020, with significance at the p<0.05 level). The proportion of individuals buried in an extended position that also have beads is greater than the proportion of extended individuals who don't have beads, and the proportion of individuals buried in a flexed/semiflexed position who were buried without beads is larger than the proportion of flexed/semiflexed individuals buried with beads.

Table 5.7: Burial Disposition—Shell Artifacts.

Burial Disposition	**Shell**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	60	*38.5*	96	*61.5*	156	*88.1*
Flexed	6	*28.6*	15	*71.4*	21	*11.9*
Total	66	*37.3*	111	*62.7*	177	*100.0*

Results of the Chi-square test show that no significant relationship exists between burial disposition and presence of shell artifacts (X^2=0.774, df=1, p=0.379, with significance at the p<0.05 level). Shell artifacts are found in relatively low frequencies with individuals in both extended and flexed positions.

Table 5.8: Burial Disposition—Ceramic Artifacts.

Burial Disposition	**Ceramics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	130	*83.3*	26	*16.7*	156	*88.1*
Other	16	*76.2*	5	*23.8*	21	*11.9*
Total	146	*82.5*	31	*17.5*	177	*100.0*

Results of a Fisher's Exact test show that no significant relationship exists between burial disposition and presence of ceramic artifacts (p=0.377, with significance at the p<0.05 level). A much higher frequency of individuals were buried with at least one ceramic artifact, regardless of whether their burial disposition was extended or other.

Table 5.9: Burial Disposition—Human Remains as Artifacts.

Burial Disposition	**Human Remains**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	13	*8.3*	143	*91.7*	156	*88.1*
Other	0	*0.0*	21	*100.0*	21	*11.9*
Total	13	*7.3*	164	*92.7*	177	*100.0*

Results of a Fisher's Exact test show that no significant relationship exists between burial disposition and presence of artifacts made from human remains (not including isolated crania) (p=0.370, with significance at the p<0.05 level). The frequency of individuals with human remains as artifacts is extremely low, regardless of whether they were buried in extended or other dispositions.

Table 5.10: Burial Disposition—Faunal Artifacts (non-shell).

Burial Disposition	**Faunal**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	66	*42.3*	90	*57.7*	156	*88.1*
Other	10	*47.6*	11	*52.4*	21	*11.9*
Total	76	*42.9*	101	*57.1*	177	*100.0*

Results of a Chi-square test show that no significant relationship exists between burial disposition and presence of faunal (non-shell) artifacts (X^2=0.213, df=1, p=0.644, with significance at the p<0.05 level). The frequency of individuals being buried with faunal remains as artifacts is similar regardless of whether the individuals were buried in extended or other dispositions.

Table 5.11: Burial Disposition—Lithic Artifacts.

Burial Disposition	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	17	*10.9*	139	*89.1*	156	*88.1*
Other	0	*0.0*	21	*100.0*	21	*11.9*
Total	17	*9.6*	160	*90.4*	177	*100.0*

Results of a Fisher's Exact test show that no significant relationship exists between burial disposition and presence of lithic artifacts (p=0.228, with significance at the p<0.05 level). There is generally a low frequency of lithic artifacts among burials at Jícaro and neither the individuals buried in an extended position nor the individuals buried in a flexed/semiflexed position show a higher or lower frequency than what is common at the site.

Summary of Burial Disposition

Burial disposition was documented by the archaeologists (Solís and Herrera, 2006; 2009) and was consolidated for the purpose of this analysis into two categories: 1. Extended, and 2. Other. No significant relationships exist between burial disposition and adult age-at-death or sex because the vast majority of adults were buried in an extended disposition, but subadults from the Jícaro sample are more variable and were nearly as likely to be buried in an extended disposition as in an "other" disposition. There is no statistically significant relationship between burial disposition and the presence of grave goods in general or the presence of shell, ceramic, human, faunal, or lithic artifacts, but there is a significant relationship between burial disposition and the presence of beads. Beads were more often found with individuals in extended dispositions than with individuals in other dispositions.

Burial Position

Information about burial position is derived from the original site reports and spreadsheets compiled by Solís and Herrera (2006, 2009, personal communication). "Burial Position" is the way in which the archaeologists refer to the individuals as having been 1. Supine; 2. Prone, 3. Right Side, 4. Left Side, or 5. Other (Solís and Herrera, 2006; 2009) and the same language is used in this section to maintain consistency with their records.

Table 5.12: Burial positions of individuals from Jícaro.

Burial Position	**Number of Individuals**	***Freq.%***
Supine	218	*90.5*
Prone	17	*7.1*
Left Side	3	*1.2*
Right Side	1	*0.4*
Other	2	*0.8*
Total	241	*100.0*

All data presented in Table 5.12, above, is derived from the original archaeological field data (Solís and Herrera, 2006; 2009) and does not include any data collected during the laboratory phase of this study. Table 5.12 presents the number of individuals for each body position category for which the body position could be determined. Because so few individuals were discovered on the left side, right side, or in and "other" position, those individuals will be discussed individually in Chapter 8. Only the individuals who were buried supine (N=218) or prone (N=17) were included in analyses involving burial position.

Table 5.13: Burial Position—Burial Disposition.

Burial Position	**Burial Disposition**				**Total**	***Freq.%***
	Extended	*Freq.%*	Other	*Freq.%*		
Supine	196	*92.9*	15	*7.1*	211	*91.7*
Prone	17	*89.5*	2	*10.5*	19	*8.3*
Total	213	*92.6*	17	*7.4*	230	*100.0*

A Fisher's Exact test was calculated to determine if there is a significant relationship between burial position and burial disposition at Jícaro. Only individuals for which both burial position and burial disposition could be determined are included in this analysis (N=229). Results of the test show that there is no significant relationship between burial position and burial disposition ($p=0.638$, with significance at the $p<0.05$ level). The majority of individuals at Jícaro were buried in an extended disposition and neither supine nor prone individuals show a higher or lower frequency of extended or flexed/semiflexed burial disposition than what is common in general at the site.

Table 5.14: Burial Position—Age-at-death.

Age Category	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
Subadults	42	*93.3*	3	*6.7*	45	*26.6*
Adults	112	*90.3*	12	*9.7*	124	*73.4*
Total	154	*91.1*	15	*8.9*	169	*100.0*

A Fisher's Exact test was calculated using SPSS to determine if there is a significant relationship between burial position and age-at-death. Only individuals who were examined during the laboratory data collection phase of this project and for whom age category and burial position could be determined (N=169) were included in this analysis. Results show that no significant relationship exists between burial position and age-at-death ($p=0.762$, with significance at the $p<0.05$ level).

Table 5.15: Burial Position—Adults.

Age Category	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
Young Adult	24	*92.3*	2	*7.7*	26	*34.2*
Middle Adult	32	*86.5*	5	*13.5*	37	*48.7*
Older Adult	12	*92.3*	1	*7.7*	13	*17.1*
Total	68	*89.5*	8	*10.5*	76	*100.0*

A Chi-square test was calculated using SPSS to determine if there is a significant relationship between burial position and adult age-at-death. Only adults who were examined during the laboratory data collection phase of this project and for whom age category could be determined (N=75) were included in this analysis. Results of the Chi-square test show that no significant relationship exists between burial position and adult age-at-death (X^2=0.683, df=2, p=0.711 with significance at the p<0.05 level).

Table 5.16: Burial Position—Sex.

Sex	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
MPM	45	*91.8*	4	*8.2*	49	*55.7*
FPF	34	*87.2*	5	*12.8*	39	*44.3*
Total	79	*89.8*	9	*10.2*	88	*100.0*

A Fisher's Exact test was calculated using SPSS to determine if there is a significant relationship between burial position and sex. Only individuals who were examined during the laboratory data collection phase of this project and for whom sex and burial position could be determined (N=88) were included in this analysis. Results of the Fisher's Exact test show that there is no significant relationship between sex and burial position (p=0.502, with significance at the p<0.05 level). The table above shows that the majority of individuals at Jícaro were buried in a supine position, regardless of sex.

Table 5.17: Burial Position—Grave Goods.

Burial Position	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Supine	157	*73.0*	58	*27.0*	215	*91.9*
Prone	11	*57.9*	8	*42.1*	19	*8.1*
Total	168	*71.8*	66	*28.2*	234	*100.0*

A Chi-square test was calculated using SPSS to determine if there is a significant relationship between burial position and whether or not grave goods were present. Because both of these data were archaeologically determined and are unrelated to analyses conducted specifically for this study, all individuals for which information about burial position and grave goods was recorded (Solís and Herrera, 2006; 2009) were included in this analysis (N=233). Results of the Chi-square test show that no significant relationship exists between burial position and presence of grave goods (X^2=2.496, df=1, p=0.114, with significance at the p<0.05 level).

Chi-square and Fisher's Exact tests were calculated using SPSS to determine if there are significant relationships between burial position and the presence of particular grave goods. Only individuals with grave goods present were included in the following analyses (N=167). In each of the following category, a grave good type is considered present if at least one artifact of that type is present and associated with a particular individual and a grave good type is considered absent under one of two conditions: either there were no grave goods of that type present in a given burial or no grave goods of that type could be assigned to a particular individual within a burial.

Table 5.18: Burial Position—Beads.

Burial Position	Beads				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Supine	62	*39.5*	95	*60.5*	157	*93.5*
Prone	3	27.3	*8*	72.7	*11*	*6.5*
Total	65	*38.7*	103	*61.3*	168	*100.0*

Results of a Fisher's Exact test show that there is no significant relationship between burial position and presence of beads (p=0.532, with significance at the p<0.05 level). Beads are found with the same frequency among individuals buried in supine and prone positions.

Table 5.19: Burial Position—Shell Artifacts.

Burial Position	**Shell**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Supine	57	*36.3*	100	*63.7*	157	*93.5*
Prone	6	*54.5*	5	*45.5*	11	*6.5*
Total	63	*37.5*	105	*62.5*	168	*100.0*

Results of a Fisher's Exact test show that no significant relationship exists between burial position and presence of shell artifacts (p=0.334, with significance at the p<0.05 level). Shell artifacts are found with the same frequency among individuals buried in prone or supine positions.

Table 5.20: Burial Position—Ceramic Artifacts.

Burial Position	**Ceramics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Supine	134	*85.4*	23	*14.6*	157	*93.5*
Prone	6	*54.5*	5	*45.5*	11	*6.5*
Total	140	*83.3*	28	*16.7*	168	*100.0*

Results of a Fisher's Exact test show that there is a significant relationship between burial position and presence of ceramic artifacts (p=0.020, with significance at the p<0.05 level). This test indicates that while ceramics are present at the overwhelming majority of supine burials, among prone burials the individuals are as likely as not to be buried with at least one ceramic artifact.

Table 5.21: Burial Position—Human Remains as Artifacts.

Burial Position	**Human Remains**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Supine	13	*8.3*	144	*91.7*	157	*93.5*
Prone	0	*0.0*	11	*100.0*	11	*6.5*
Total	13	*7.7*	155	*92.3*	168	*100.0*

Results of a Fisher's Exact test show that no significant relationship exists between burial position and presence of artifacts made from human remains (not including isolated crania) (p=1.000, with significance at the p<0.05 level). This test shows that both prone and supine burials are unlikely to include artifacts made from human bone.

Table 5.22: Burial Position—Faunal Artifacts (non-shell).

Burial Position	**Faunal**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Supine	66	*42.0*	91	*58.0*	157	*93.5*
Prone	7	*63.6*	4	*36.4*	11	*6.5*
Total	73	*43.5*	95	*56.5*	198	*100.0*

Results of a Fisher's Exact test show that there is no significant relationship between burial position and presence of faunal (non-shell) artifacts (p=0.212, with significance at the p<0.05 level). The table above shows a slightly higher frequency of faunal artifacts among prone individuals than the frequency of faunal artifacts among supine individuals, but the relationship is not significant.

Table 5.23: Burial Position—Lithic Artifacts.

Burial Position	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Supine	14	*8.9*	143	*91.1*	157	*93.5*
Prone	2	*18.2*	9	*81.8*	11	*6.5*
Total	16	*9.5*	152	*90.5*	168	*100.0*

Results of a Fisher's Exact test show that there is no significant relationship between burial position and presence of lithic artifacts (p=0.282, with significance at the p<0.05 level). There is a very low frequency of lithic artifacts in general at the site and neither the prone nor supine individuals shows a higher frequency than what is expected based on the overall frequency at the site.

Summary of Burial Position

Burial position was documented by the archaeologists (Solís and Herrera, 2006; 2009) and was consolidated for the purpose of this analysis into two categories: 1. Supine and 2. Prone. Tests show that there is no statistically significant relationship between burial position as supine or prone and age-at-death (adult/subadult or between adult age categories), sex, or the presence of any grave goods. The only significant relationship detected in this section is an association between the presence of ceramic artifacts and burial position. At least one ceramic artifact is found with the vast majority of individuals at Jícaro with any grave goods (N=139 out of 177 total), but when burial position is considered, while individuals buried in a supine position are more likely to be buried with at least one ceramic artifact than not, individuals buried in a prone position are as likely as not to be buried with at least one ceramic artifact.

Head Orientation

Information about head orientation is derived from the original site reports, field drawings and spreadsheets compiled by Solís and Herrera (2006, 2009, personal communication). The archaeologists (Solís and Herrera, 2006; 2009) documented the orientation of the longitudinal axis of the body (in degrees) and the orientation of the head in terms of North (N), Northeast (NE), East (E), Southeast (SE), South (S), Southwest (SW), West (W), and Northwest (NW). Solís and Herrera (2009) present an analysis of head orientation, but because some of the skeletal variables were reassessed during the laboratory data collection phase of this study, head orientation was analyzed separately for this project and a comparison with Solís and Herrera's findings is presented in Chapter 8. For the purpose of this study, Head Orientation refers to the direction in which the individual would be facing, which is generally 180^{o} (opposite) from the direction in which the head is physically located.

Table 5.24: Head Orientation of individuals from Jícaro.

Head Orientation	**Number of Individuals**	***Freq.%***
N	35	*15.5*
NE	19	*8.4*
E	19	*8.4*
SE	8	*3.5*
S	11	*5.3*
SW	13	*5.8*
W	54	*23.9*
NW	67	*29.6*
Total	226	*100.0*

All data presented in Table 5.24, above, is derived from the original archaeological field data (Solís and Herrera, 2006; 2009) and does not include any data collected during the laboratory phase of this study. Table 5.24 presents the number of individuals for each body position category for which the head orientation could be determined. It is clear based on the numbers of individuals that the majority of the individuals from Jícaro were buried with their heads facing the west, northwest, or north.

Only individuals whose head orientation and burial disposition could be determined were included in this analysis (N=218). The table below presents the frequencies with which individuals were buried with each head orientation and the frequencies of extended and flexed/semiflexed burials within them.

Table 5.25: Head Orientation—Burial Disposition.

Head Orientation	**Burial Disposition**				**Total**	***Freq.%***
	Extended	*Freq.%*	Other	*Freq.%*		
N	30	*88.2*	4	*11.8*	34	*15.6*
NE	17	*89.5*	2	*10.5*	19	*8.7*
E	18	*94.7*	1	*5.6*	19	*8.7*
SE	9	*100.0*	0	*0.0*	9	*4.1*
S	9	*90.0*	1	*10.0*	10	*4.6*
SW	11	*91.7*	1	*8.3*	12	*5.5*
W	47	*88.7*	6	*11.3*	53	*24.3*
NW	60	*96.8*	2	*3.2*	62	*28.4*
Total	201	*92.2*	17	*7.8*	218	*100.0*

Table 5.26: Head Orientation—Burial Position.

Head Orientation	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
N	33	*94.3*	2	*5.7*	35	*16.1*
NE	18	*94.7*	1	*5.3*	19	*8.8*
E	16	*84.2*	3	*15.8*	19	*8.8*
SE	8	*1*	0	*0*	8	*3.7*
S	10	*1*	0	*0*	10	*4.6*
SW	11	*84.6*	2	*15.4*	13	*6.0*
W	51	*94.4*	3	*5.6*	54	*24.9*
NW	52	*88.1*	7	*11.9*	59	*27.2*
Total	199	*91.7*	18	*8.3*	217	*100.0*

A Chi-square test was calculated to evaluate whether or not a significant relationship exists between burial position and head orientation. Only individuals who were examined during the laboratory data collection phase of this project and for whom age category and head orientation could be determined (N=211) were included in this analysis. As has been established, the overwhelming majority of individuals at Jícaro were buried in a supine position, and there is no one head orientation that is associated with a frequency of individuals buried in prone or supine positions other than what is expected for the site as a whole.

Table 5.27: Head Orientation—Age-at-death.

Head Orientation	**Age Category**				**Total**	***Freq.%***
	Subadult	*Freq.%*	Adult	*Freq.%*		
N	11	*32.4*	23	*67.6*	34	*16.1*
NE	4	*21.1*	15	*78.9*	19	*9.0*
E	4	*23.5*	13	*76.5*	17	*8.1*
SE	2	*25*	6	*75*	8	*3.8*
S	5	*45.5*	6	*54.5*	11	*5.2*
SW	4	*40.0*	6	*60.0*	10	*4.7*
W	12	*23.1*	40	*76.9*	52	*24.6*
NW	22	*36.7*	38	*63.3*	60	*28.4*
Total	64	*30.3*	147	*69.7*	211	*100.0*

Only individuals who were examined during the laboratory data collection phase of this project and for whom age category and head orientation could be determined (N=211) were included in this analysis. The table above indicates no discernable relationship between age-at-death and head orientation, except that a slightly higher frequency of subadults appear to be buried with their heads oriented toward the south or southwest, compared with the other head orientation possibilities.

Table 5.28: Head Orientation—Adults.

Head Orientation	**Age Category**						**Total**	***Freq.%***
	Young Adult	*Freq.%*	Middle Adult	*Freq.%*	Older Adult	*Freq.%*		
N	5	*41.7*	5	*41.7*	2	*16.7*	12	*15.8*
NE	2	*40.0*	3	*60.0*	0	*0.0*	5	*6.6*
E	3	*37.5*	2	*25*	3	*37.5*	8	*10.5*
SE	2	*100.0*	0	*0.0*	0	*0.0*	2	*2.6*
S	1	*20.0*	4	*80.0*	0	*0.0*	5	*6.6*
SW	0	*0.0*	2	*66.7*	1	*33.3*	3	*3.9*
W	8	*34.8*	12	*52.2*	3	*13.0*	23	*30.3*
NW	5	*27.8*	9	*50.0*	4	*22.2*	18	*23.7*
Total	26	*34.2*	37	*48.7*	13	*17.1*	76	*100.0*

The majority of the population at Jícaro were buried with their heads facing the west, northwest, and north, and the table above shows that regardless of the age category, the frequency of individuals buried with their heads facing a given direction is similar to what would be expected based on what is known about the site in general. One exception is the southeast, where 100% of the individuals' heads are oriented; that sample size is only two individuals, so having 100% of them with their heads buried in a given direction may be a factor of sampling bias. Only adults who were examined during the laboratory data collection phase of this project and for whom age category and head orientation could be determined (N=76) were included in this analysis.

Table 5.29: Head Orientation—Sex.

Head Orientation	Sex				Total	*Freq.%*
	MPM	*Freq.%*	FPF	*Freq.%*		
N	8	*50.0*	8	*50.0*	16	*17.6*
NE	1	*20.0*	4	*80.0*	5	*5.5*
E	3	*30.0*	7	*70.0*	10	*11.0*
SE	1	*25.0*	3	*75.0*	4	*4.4*
S	2	*40.0*	3	*60.0*	5	*5.5*
SW	1	*50.0*	1	*50.0*	2	*2.2*
W	11	*42.3*	15	*57.7*	26	*28.6*
NW	13	*56.5*	10	*43.5*	23	*25.3*
Total	40	*44.0*	51	*56.0*	91	*100.0*

As has been established, the most common head orientations at Jícaro are toward the west, northwest, and north. When head orientations are compared with the sex of the individuals, it does not appear as though any one head orientation stands out as differing from what is expected, except perhaps for the south and southeast—a slightly higher frequency of females appear to be buried with their heads facing the south and southeast than the frequency of males. Only individuals who were examined during the laboratory data collection phase of this project and for whom sex and head orientation could be determined (N=89) were included in this analysis.

Table 5.30: Head Orientation—Grave Goods.

Head Orientation	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
N	24	*66.7*	12	*33.3*	36	*16.1*
NE	10	*52.6*	9	*47.4*	19	*8.5*
E	17	*89.5*	2	*10.5*	19	*8.5*
SE	3	*33.3*	6	*66.7*	9	*4.0*
S	6	*54.5*	5	*45.5*	11	*4.9*
SW	9	*69.2*	4	*30.8*	13	*5.8*
W	44	*81.5*	10	*18.5*	54	*24.1*
NW	51	*81.0*	12	*19.0*	63	*28.1*
Total	164	*73.2*	60	*26.8*	224	*100.0*

Because both of these data were archaeologically determined and are unrelated to analyses conducted specifically for this study, all individuals for which information about head orientation and grave goods was recorded (Solís and Herrera, 2006; 2009) were included in this analysis (N=224). The table above shows that a greater proportion of individuals buried with their heads oriented toward the west or northwest were buried with grave goods, when compared to individuals buried with their heads oriented toward other directions.

The following tables present comparisons between head orientation and the presence of particular grave goods. Only individuals with grave goods present were included in the following analyses (N=164). In each of the following category, a grave good type is considered present if at least one artifact of that type is present and associated with a particular individual and a grave good type is considered absent under one of two conditions: either there were no grave goods of that type present in a given burial or no grave goods of that type could be assigned to a particular individual within a burial.

Table 5.31: Head Orientation—Beads.

Head Orientation	**Beads**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
N	7	*29.2*	17	*70.8*	24	*14.6*
NE	2	*20.0*	8	*80.0*	10	*6.1*
E	8	*47.1*	9	*52.9*	17	*10.4*
SE	1	*33.3*	2	*66.7*	3	*1.8*
S	2	*33.3*	4	*66.7*	6	*3.9*
SW	4	*44.4*	5	*55.6*	9	*26.8*
W	17	*38.6*	27	*61.4*	44	*26.8*
NW	23	*45.1*	28	*54.9*	51	*31.1*
Total	64	*39.0*	100	*61.0*	164	*100.0*

Beads are more frequently absent from burials at Jícaro than present in them, and the data presented in the table above appear to show that beads are not found in a higher or lower frequency than what would be expected at the site in association with any one head orientation.

Table 5.32: Head Orientation—Shell Artifacts.

Head Orientation	**Shell Artifacts**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
N	4	*16.7*	20	*83.3*	24	*14.6*
NE	2	*20.0*	8	*80.0*	10	*6.1*
E	13	*76.5*	4	*23.5*	17	*10.4*
SE	1	*33.3*	2	*66.7*	3	*1.8*
S	2	*33.3*	4	*66.7*	6	*3.7*
SW	3	*33.3*	6	*66.7*	9	*5.5*
W	20	*45.5*	24	*54.5*	44	*26.8*
NW	18	*35.3*	33	*64.7*	51	*31.1*
Total	63	*38.4*	101	*61.6*	164	*100.0*

Based on Table 5.32, above, it appears as though more individuals with their heads oriented toward the east were buried with shell artifacts than without, while more individuals with their heads buried in the west, northwest and north are buried without shell artifacts. This pattern is contrary to the overall pattern of a greater number of artifacts generally associated with individuals with their heads facing the west, northwest, and north.

Table 5.33: Head Orientation—Ceramic Artifacts.

Head Orientation	**Ceramics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
N	22	*91.7*	2	*8.3*	24	*14.6*
NE	9	*90.0*	1	*10.0*	10	*6.1*
E	12	*70.6*	5	*29.4*	17	*10.4*
SE	2	*66.7*	1	*33.3*	3	*1.8*
S	5	*83.3*	1	*16.7*	6	*3.7*
SW	5	*55.6*	4	*44.4*	9	*5.5*
W	39	*88.6*	5	*11.4*	44	*26.8*
NW	43	*84.3*	8	*15.7*	51	*31.1*
Total	137	*83.5*	27	*16.5*	164	*100.0*

The table above shows that the frequency of individuals with ceramic artifacts is higher than the frequency of individuals without ceramic artifacts, regardless of their head orientation.

Table 5.34: Head Orientation—Human Remains as Artifacts.

Head Orientation	**Human Remains**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
N	4	*16.7*	20	*83.3*	24	*14.6*
NE	1	*10.0*	9	*90.0*	10	*6.1*
E	2	*11.8*	15	*88.2*	17	*10.4*
SE	0	*0.0*	3	*100.0*	3	*1.8*
S	1	*16.7*	5	*83.3*	6	*3.7*
SW	0	*0.0*	9	*100.0*	9	*5.5*
W	2	*4.5*	42	*95.5*	44	*26.8*
NW	3	*5.9*	48	*94.1*	51	*31.1*
Total	13	*7.9*	151	*92.1*	164	*100.0*

There are very few individuals with human remains as artifacts (N=13), and based on the data presented in the above table, it appears as though their head orientations are not concentrated in any one direction or limited number of directions.

Table 5.35: Head Orientation—Faunal Artifacts (non-shell).

Head Orientation	**Faunal**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
N	11	*45.8*	13	*54.2*	24	*14.6*
NE	3	*30.0*	7	*70.0*	10	*6.1*
E	7	*41.2*	10	*58.8*	17	*10.4*
SE	1	*33.3*	2	*66.7*	3	*1.8*
S	2	*33.3*	4	*66.7*	6	*3.7*
SW	6	*66.7*	3	*33.3*	9	*5.5*
W	22	*50.0*	22	*50.0*	44	*26.8*
NW	21	*41.2*	30	*58.8*	51	*31.1*
Total	73	*44.5*	91	*55.5*	164	*100.0*

Faunal artifacts are not overly common at Jícaro, and it appears as though a slightly higher frequency of faunal artifacts were associated with individuals who were buried with their heads oriented toward the southwest and west than other head orientation directions. This may indicate a relationship between the two variables, even if statistical significance is not established.

Table 5.36: Head Orientation—Lithic Artifacts.

Head Orientation	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
N	1	*4.2*	23	*95.8*	24	*14.6*
NE	1	*10.0*	9	*90.0*	10	*6.1*
E	0	*0.0*	17	*100.0*	17	*10.4*
SE	0	*0.0*	3	*3.0*	3	*1.8*
S	3	*50.0*	3	*50.0*	6	*3.7*
SW	2	*22.2*	7	*77.8*	9	*5.5*
W	3	*6.8*	41	*93.2*	44	*26.8*
NW	8	*15.7*	43	*84.3*	51	*31.1*
Total	18	*11.0*	146	*89.0*	164	*100.0*

The majority of individuals were buried with their heads oriented toward the west, northwest, and north and unlike other artifact types, there are disproportionately fewer individuals buried with their heads oriented toward those directions with no associated lithic artifacts.

Summary of Head Orientation

Archaeologists (Solís and Herrera, 2006; 2009) documented head orientation in the field during excavations whenever possible. Although the number of categories for head orientation (N=8) likely affects statistical analysis because the expected values in many of the Chi-square cells drop to below 5 when the sample is subdivided, any consolidation of the sample into fewer categories would have been arbitrary and may have affected both the intra-site analyses. Chi-square tests that were calculated to evaluate the presence of relationships between head orientation and other mortuary treatment variables indicate no significant relationships between head orientation and age-at-death, sex, whether the individuals were buried in a prone or supine position, or the presence of beads, ceramic artifacts, human remains artifacts, or faunal artifacts. Significant relationships were identified between head orientation and whether the individuals were buried in an extended or other disposition and whether or not they were buried with grave goods in general and with shell or lithic artifacts, in particular. The majority of the population from Jícaro were buried in an extended position and a significant majority of them were found to have their heads facing the west, northwest, or north. Significantly more individuals with their heads oriented to the north and west were found with grave goods when compared with the other head orientations; however, disproportionately few of those individuals were found in association with lithic artifacts. Shell artifacts stand out from the other artifact types because a significantly higher proportion of individuals with their heads oriented toward the east were found in association with shell artifacts than the proportion of individuals with shell artifacts whose heads were oriented in other directions.

Arm Position

Information about arm position is derived from the original site reports and spreadsheets compiled by Solís and Herrera (2006, 2009, personal communication). Solís and Herrera (2006; 2009) considered each arm separately and documented their individual positions as one of seven possibilities: 1. Extended parallel to the torso; 2. Flexed over the pelvis (right or left, depending on the arm); 3. Flexed beneath the pelvis (right or left, depending on the arm); 4. Flexed over the chest; 5. Flexed over itself; 6. Other; and 7. Absent.

For the purpose of this study, the arms were first analyzed for presence/absence. Only individuals with both arms present are included in this analysis. For individuals with both arms present, the arm positions were reevaluated and consolidated into four possible positions under a single category: 1. Both arms at sides; 2. Left arm crosses body plane, right arm straight; 3. Right arm crosses body plane, left arm straight; and 4. Both arms cross body plane. Because sample sizes become very small very quickly when the sample is subdivided, the arm position category was further refined to two possibilities for the purpose of this analysis: 1. One arm extended, one arm crossing body plane; and 2. Both arms in similar position (either extended or crossing the body plane).

Table 5.37: Arm Position—Age-at-Death.

Age Category	**Arm Position**				**Total**	***Freq.%***
	Similar	*Freq.%*	Different	*Freq.%*		
Subadults	16	*66.7*	8	*33.3*	24	*18.9*
Adults	65	*63.1*	38	*36.9*	103	*81.1*
Total	81	*63.8*	46	*36.2*	127	*100.0*

Results from a Chi-square test indicate no significant relationship between age-at-death and arm position (X^2=0.107, df=1, p=0.744, with significance at the p<0.05 level). Both adults and subadults are more frequently buried with their arms in similar positions than with their arms in different positions.

Table 5.38: Arm Position—Adult Age-at-Death.

Age Category	**Arm Position**				**Total**	***Freq.%***
	Similar	*Freq.%*	Different	*Freq.%*		
Young Adult	13	*65.0*	7	*35.0*	20	*29.4*
Middle Adult	21	*60.0*	14	*40.0*	35	*51.5*
Older Adult	9	*69.2*	4	*30.8*	13	*19.1*
Total	43	*63.2*	25	*36.8*	68	*100.0*

Results from a Chi-square test indicate no significant relationship between adult age-at-death and arm position (X^2=0.385, df=2, p=0.825, with significance at the p<0.05 level). Adults, regardless of age category, are more frequently buried with their arms in similar positions than with their arms in different positions.

Table 5.39: Arm Position—Sex.

Sex	**Arm Position**				**Total**	***Freq.%***
	Similar	*Freq.%*	Different	*Freq.%*		
MPM	27	*73.0*	10	*27.0*	37	*45.7*
FPF	26	*59.1*	18	*40.9*	44	*54.3*
Total	53	*65.4*	28	*34.6*	81	*100.0*

Results from a Chi-square test indicate no significant relationship between sex and arm position (X^2=1.520, df=1, p=0.218, with significance at the p<0.05 level). Both MPM and FPF are more frequently buried with their arms in similar positions than with their arms in different positions.

Table 5.40: Arm Position—Burial Disposition.

Arm Position	**Burial Disposition**				**Total**	***Freq.%***
	Extended	*Freq.%*	Other	*Freq.%*		
Similar	96	*92.3*	8	*7.7*	104	*65.4*
Different	52	*94.5*	3	*5.5*	55	*34.6*
Total	148	*93.1*	11	*6.9*	159	*100.0*

Results of a Fisher's Exact test indicate no significant relationship between burial disposition and arm position (p=0.749, with significance at the p<0.05 level). The majority of the individuals at Jícaro were buried in an extended position with their arms in similar positions, but in the few instances when individuals were buried in a flexed/semiflexed disposition, the majority still have their arms in similar positions.

Table 5.41: Arm Position—Burial Position.

Arm Position	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
Similar	95	*93.1*	7	*6.9*	102	*65.0*
Different	50	*91.0*	5	*9.0*	55	*35.0*
Total	145	*92.4*	12	*7.6*	157	*100.0*

Results of a Fisher's Exact test indicate no significant relationship between burial position and arm position (p=0.754, with significance at the p<0.05 level). The majority of the individuals at Jícaro were buried supine with their arms in similar positions, but in the few cases when individuals were buried prone, the majority still have their arms in similar positions.

Table 5.42: Arm Position—Head Orientation.

Head Orientation	Arm Position				Total	*Freq.%*
	Similar	*Freq.%*	Different	*Freq.%*		
N	8	*44.4*	10	*55.6*	18	*14.3*
NE	4	*44.4*	5	*55.6*	9	*7.1*
E	5	*41.7*	7	*58.3*	12	*9.5*
SE	2	*66.7*	1	*33.3*	3	*2.4*
S	3	*50.0*	3	*50.0*	6	*4.8*
SW	4	*66.7*	2	*33.3*	6	*4.8*
W	26	*74.3*	9	*25.7*	35	*27.8*
NW	28	*75.7*	9	*24.3*	37	*29.4*
Total	80	*63.5*	46	*36.5*	126	*100.0*

Individuals with their heads buried in the north appear to have a slightly higher frequency of burial with their arms in different positions than the rest of the sample, but the rest of the sample appears consistent in that the majority were buried with their arms in similar positions, regardless of their head orientation.

Table 5.43: Arm Position—Grave Goods.

Arm Position	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Similar	84	*80.8*	20	*19.2*	104	*65.4*
Different	41	*74.5*	14	*25.5*	55	*34.6*
Total	125	*78.6*	34	*21.4*	159	*100.0*

Results of s Chi-square test indicate that there is no significant relationship between arm position and presence of grave goods (X^2=0.829, df=1, p=0.363, with significance at the $p<0.05$ level). The majority of individuals were buried with at least one artifact, regardless of their arm position.

Chi-square tests were calculated using SPSS to determine if there are significant relationships between arm position and the presence of particular grave goods. Only individuals with grave goods present were included in the following analyses (N=125). In each of the following categories, a grave good type is considered present if at least one artifact of that type is present and associated with a particular individual and a grave good type is considered absent under one of two conditions: either there were no grave goods of that type present in a given burial or no grave goods of that type could be assigned to a particular individual within a burial.

Table 5.44: Arm Position—Beads.

Arm Position	**Beads**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Similar	38	*45.2*	46	*54.8*	84	*67.2*
Different	11	*26.8*	30	*73.2*	41	*32.8*
Total	49	*39.2*	76	*60.8*	125	*100.0*

Results of the Chi-square test indicate a significant relationship between arm position and presence of beads (X^2=3.918, df=1, p=0.048, with significance at the $p<0.05$ level). Individuals buried with their arms in similar positions are more likely to be found associated with beads and individuals with their arms in different positions are more likely to have no associated beads.

Table 5.45: Arm Position—Shell Artifacts.

Arm Position	**Shell Artifacts**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Similar	32	*38.1*	52	*61.9*	84	*67.2*
Different	16	*39.0*	25	*61.0*	41	*32.8*
Total	48	*38.4*	77	*61.6*	125	*100.0*

Results of the Chi-square test show that no significant relationship exists between burial disposition and presence of shell artifacts (X^2=0.010, df=1, p=0.920, with significance at the $p<0.05$ level).

Table 5.46: Arm Position—Ceramic Artifacts.

Arm Position	**Ceramics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Similar	74	*88.1*	10	*11.9*	84	*67.2*
Different	30	*73.2*	11	*26.8*	41	*32.8*
Total	104	*83.2*	21	*16.8*	125	*100.0*

Results of the Chi-square test indicate a significant relationship exists between arm position and presence of ceramic artifacts (X^2=4.391, df=1, p=0.036, with significance at the p<0.05 level). A greater proportion of the individuals with their arms in different positions were also buried without ceramic artifacts than the proportion of individuals with their arms in similar positions who were buried without ceramic artifacts.

Table 5.47: Arm Position—Human Remains as Artifacts.

Arm Position	**Human Remains**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Similar	7	*8.3*	77	*91.7*	84	*67.2*
Different	5	*12.2*	36	*87.8*	41	*32.8*
Total	12	*9.6*	113	*90.4*	125	*100.0*

Results of a Fisher's Exact test show that no significant relationship exists between arm position and presence of artifacts made from human remains (not including isolated crania) (p=0.527, with significance at the p<0.05 level). The majority of individuals at Jícaro were buried without human remains as artifacts.

Table 5.48: Arm Position—Faunal Artifacts (non-shell).

Arm Position	**Faunal**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Similar	42	*50.0*	42	*50.0*	84	*67.2*
Different	20	*48.9*	21	*51.2*	41	*32.8*
Total	62	*49.6*	63	*50.4*	125	*100.0*

Results of the Chi-square test show that there is no significant relationship between arm position and presence of faunal (non-shell) artifacts (X^2=0.016, df=1, p=0.898, with significance at the p<0.05 level). Approximately half of the individuals buried with their arms in either position were buried with or without faunal artifacts.

Table 5.49: Arm Position—Lithic Artifacts.

Arm Position	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Similar	11	*13.1*	73	*86.9*	84	*67.2*
Different	5	*12.2*	36	*87.8*	41	*32.8*
Total	16	*12.8*	109	*87.2*	125	*100.0*

Results of the Chi-square test show that there is no significant relationship between arm position and presence of lithic artifacts (X^2=2.532, df=1, p=0.112, with significance at the $p<0.05$ level). Regardless of arm position, individuals at Jícaro were unlikely to be buried with lithic artifacts.

Summary of Arm Position

For the purpose of this study, arm position is categorized as either "both arms in similar positions" (can be crossing body plane or extended at sides) or "arms in different positions" (one arm extended, the other crossing the body plane). Results of Chi-square tests for relationships indicate no significant association between arm position and either age-at-death, sex, whether the body was buried in a flexed/extended disposition or a prone or supine position, head orientation, or the presence of grave goods (specifically the presence of shell, human remains, faunal and lithic artifacts). There are significant associations between arm position and the presence of beads and ceramics. The proportion of individuals buried with their arms in similar positions (both crossing the body plane or both extended at the sides) found in association with beads or ceramics is significantly greater than the proportion of individuals with their arms in different positions (one crossing the body plane, one extended) found in association with beads or ceramics.

Leg Position

Information about leg position is derived from the original site reports and spreadsheets compiled by Solís and Herrera (2006, 2009, personal communication). Solís and Herrera (2006; 2009) considered each leg separately and documented their individual positions as one of seven possibilities: 1. Extended parallel to the other leg; 2. Flexed to the same side as the leg; 3. Other; 4. Absent; 5. Flexed to the opposite side as the leg (e.g., left leg flexed toward the right side of the body); 6. Left (or right) tibia crossed over right (or left) tibia; and 7. Left (or right) tibia crossed under right (or left) tibia.

For the purpose of this study, the legs were first analyzed for presence/absence. Only individuals with both legs present are included in this analysis. For individuals with both legs present, the leg positions were reevaluated and consolidated into a single category with two possibilities: 1. One or both legs flexed; and 2. Both legs extended (may be crossed at the tibia or parallel).

Table 5.50: Leg Position—Arm Position.

Leg Position	**Arm Position**				**Total**	***Freq.%***
	Similar	*Freq.%*	Different	*Freq.%*		
Other	6	*66.7*	3	*33.3*	9	*5.9*
Extended	94	*65.7*	49	*34.3*	143	*94.1*
Total	100	*65.8*	52	*34.2*	152	*100.0*

Only individuals with both arms and legs are included in Table 5.50, above. Results of a Chi-square test indicate no significant relationship between arm position and leg position as they are categorized for the purpose of this study (X^2=0.003, df=1, p=0.954, with significance at the p<0.05 level). The overwhelming majority of individuals at Jícaro were buried with their legs in a generally extended position, and the majority of those individuals were buried with their arms in similar positions (either both extended or both crossing the body plane over/under the pelvis or chest).

Table 5.51: Leg Position—Age-at-Death.

Age Category	**Leg position**				**Total**	***Freq.%***
	Extended	*Freq.%*	Flexed	*Freq.%*		
Subadults	29	*82.9*	6	*17.1*	35	*22.7*
Adults	113	*95.0*	6	*5.0*	119	*77.3*
Total	142	*92.2*	12	*7.8*	154	*100.0*

Results from a Fisher's Exact test indicate a significant relationship between age-at-death and leg position (p=0.030, with significance at the p<0.05 level). The percentage of individuals among subadults with their legs in a flexed position is greater than the percentage among adults with their legs in a flexed position.

Table 5.52: Leg Position—Adult age-at-death.

Age Category	**Variable**				**Total**	***Freq.%***
	Extended	*Freq.%*	Flexed	*Freq.%*		
Young Adult	24	*100.0*	0	*0.0*	24	*33.3*
Middle Adult	35	*97.2*	1	*2.8*	36	*50.0*
Older Adult	11	*91.7*	1	*8.3*	12	*16.7*
Total	70	*97.2*	2	*2.8*	72	*100.0*

No statistical test for the presence of relationships was conducted for the analysis of the data in Table 5.52 because the sample size is inappropriately small for Chi-Square, the table is 2x3, making it inappropriate for Fisher's Exact, and correspondence analysis is more appropriately applied to data sets involving more than two variables. Data presented in Table 5.52, above, indicate that adults, regardless of age category, are more frequently buried with their legs in an extended position than with their legs in a flexed position.

Table 5.53: Leg Position—Sex.

Sex	**Leg Position**				**Total**	***Freq.%***
	Extended	*Freq.%*	Flexed	*Freq.%*		
MPM	38	*97.4*	1	*2.6*	39	*45.9*
FPF	45	*97.8*	1	*2.2*	46	*54.1*
Total	83	*97.6*	2	*2.4*	85	*100.0*

SPSS was used to calculate a Fisher's Exact test, results of which indicate no significant relationship between sex and leg position (p=1.000, with significance at the p<0.05 level). Both MPM and FPF are more frequently buried with their legs in an extended position than with their legs in a flexed position.

Table 5.54: Leg Position—Burial Disposition.

Leg Position	**Burial Disposition**				**Total**	***Freq.%***
	Extended	*Freq.%*	Other	*Freq.%*		
Extended	139	*97.9*	3	*2.1*	142	*92.2*
Flexed	1	*8.3*	11	*91.7*	12	*7.8*
Total	140	*90.9*	14	*9.1*	154	*100.0*

Results of a Fisher's Exact test indicate a significant relationship between burial disposition and leg position (p=0.0001, with significance at the p<0.05 level). This result is not surprising. The majority of the individuals at Jícaro were buried in an extended position and the leg position plays a major role in that determination. It also follows that the majority of individuals who are classified as having a flexed/semiflexed disposition also have flexed legs.

Table 5.55: Leg Position—Burial Position.

Leg Position	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
Extended	130	*92.9*	10	*7.1*	140	*92.7*
Flexed	10	*90.9*	1	*9.1*	11	*7.3*
Total	140	*92.7*	11	*7.3*	151	*100.0*

Results of a Fisher's Exact test indicate no significant relationship between burial position and leg position (p=0.098, with significance at the p<0.05 level). A majority of the individuals at Jícaro were buried supine and a majority of individuals were buried with their legs extended.

Table 5.56: Leg Position—Head Orientation.

Head Orientation	**Leg Position**				**Total**	**Freq.%**
	Extended	*Freq.%*	Flexed	*Freq.%*		
N	28	*15.4*	3	*20.0*	31	*15.7*
NE	17	*9.3*	2	*13.3*	19	*9.6*
E	15	*8.2*	2	*13.3*	17	*8.6*
SE	9	*4.9*	0	*0.0*	9	*4.6*
S	7	*3.8*	1	*6.7*	8	*4.1*
SW	9	*4.9*	1	*6.7*	10	*5.1*
W	42	*23.1*	4	*26.7*	46	*23.4*
NW	55	*30.2*	2	*13.3*	57	*28.9*
Total	182	*92.4*	15	*7.6*	197	*100.0*

No statistical test for the presence of relationships was conducted for the data in Table 5.56 because too many cells would have an expected value of less than 5, making Chi-Square inappropriate, the table contains too many cells for a Fisher's Exact test to apply, and correspondence analysis is more appropriately applied to data sets involving more than two variables. The data presented in Table 5.56, above, demonstrate that the majority of individuals at Jícaro, regardless of head orientation, are buried with their legs in an extended position.

Table 5.57: Leg Position—Grave Goods.

Leg Position	**Grave Goods**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	107	*75.4*	35	*24.6*	142	*92.2*
Flexed	10	*83.3*	2	*16.7*	12	*7.8*
Total	117	*75.8*	37	*24.2*	154	*100.0*

Results of a Fisher's Exact test indicate that there is no significant relationship between leg position and presence of grave goods ($p=0.764$, with significance at the $p<0.05$ level). The majority of individuals were buried with at least one artifact, regardless of their leg position.

Chi-square and Fisher's Exact tests were calculated using SPSS to determine if there are significant relationships between leg position and the presence of particular grave goods. Only individuals with grave goods present and discernable leg position were included in the following analyses (N=117). In each of the following categories, a grave good type is considered present if at least one artifact of that type is present and associated with a particular individual and a grave good type is considered absent under one of two conditions: either there were no grave goods of that type present in a given burial or no grave goods of that type could be assigned to a particular individual within a burial.

Table 5.58: Leg Position—Beads.

Leg Position	**Beads**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	45	*42.1*	62	*57.9*	107	*91.5*
Flexed	1	*10.0*	9	*90.0*	10	*8.5*
Total	46	*39.3*	71	*60.7*	117	*100.0*

Results of the Chi-square test indicate a significant relationship between leg position and presence of beads (X^2=3.939, df=1, p=0.047, with significance at the p<0.05 level). The proportion of individuals with flexed legs who are buried with beads is smaller than the proportion of individuals with extended legs who are buried with beads.

Table 5.58: Leg Position—Shell Artifacts.

Leg Position	**Shell**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	43	*40.2*	64	*59.8*	107	*91.5*
Flexed	3	*30.0*	7	*70.0*	10	*8.5*
Total	46	*39.3*	71	*60.7*	117	*100.0*

Results of the Chi-square test show that no significant relationship exists between burial disposition and presence of shell artifacts (X^2=0.398, df=1, p=0.528, with significance at the p<0.05 level). The frequency of shell artifacts being present in burials is slightly lower than the frequency of burials without shell artifacts, and those frequencies do not change with leg position.

Table 5.59: Leg Position—Ceramic Artifacts.

Leg Position	**Ceramics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	91	*85.0*	16	*15.0*	107	*91.5*
Flexed	8	*80.0*	2	*20.0*	10	*8.5*
Total	99	*84.6*	18	*15.4*	117	*100.0*

Results of the Fisher's Exact test indicate no significant relationship exists between leg position and presence of ceramic artifacts (p=1.000, with significance at the p<0.05 level). The majority of individuals at the site were buried with at least one ceramic artifact, and this test shows that the frequency of presence/absence of at least one ceramic artifact is the same for individuals with flexed or extended legs.

Table 5.60: Leg Position—Human Remains as Artifacts.

Leg Position	**Human Remains**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	12	*11.2*	95	*88.8*	107	*91.5*
Flexed	0	*0.0*	10	*100.0*	10	*8.5*
Total	12	*10.3*	105	*89.7*	117	*100.0*

Results of the Fisher's Exact test show that no significant relationship exists between leg position and presence of artifacts made from human remains (not including isolated crania) ($p=0.601$, with significance at the $p<0.05$ level). The majority of individuals at Jícaro were buried without human remains as artifacts, and regardless of whether individuals were buried with legs in extended or flexed positions, that frequency remains low.

Table 5.61: Leg Position—Faunal Artifacts (non-shell).

Leg Position	**Faunal**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	53	*49.5*	54	*50.5*	107	*91.5*
Flexed	4	*40.0*	6	*60.0*	10	*8.5*
Total	57	*48.7*	60	*51.3*	117	*100.0*

Results of the Fisher's Exact test show that there is no significant relationship between leg position and presence of faunal (non-shell) artifacts ($p=1.000$, with significance at the $p<0.05$ level). Approximately half of the individuals buried with their legs in either position were buried with or without faunal artifacts.

Table 5.62: Leg Position—Lithic Artifacts.

Leg Position	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Extended	14	*13.1*	93	*86.9*	107	*91.5*
Flexed	0	*0.0*	10	*100.0*	10	*8.5*
Total	14	*12.0*	103	*88.0*	117	*100.0*

Results of the Fisher's Exact test show that there is no significant relationship between leg position and presence of lithic artifacts ($p=0.615$, with significance at the $p<0.05$ level). Regardless of leg position, individuals at Jícaro were unlikely to be buried with lithic artifacts.

Summary of Leg Position

For the purpose of this study, leg position is categorized as either "both extended" or "one or both flexed." Chi-square tests for relationships between leg position and other mortuary treatments indicated no significant association between leg position and arm position, adult age-at-death, sex, whether the individual was buried prone or supine, or the presence of grave goods (specifically, the presence of any ceramics, human remains, faunal or lithic artifacts). The majority of individuals at Jícaro were buried with their legs in an extended position (which may or may not involve the legs crossed at the tibiae), and all of the variables mentioned above are also found in proportionally high frequencies. This finding is consistent with the overwhelming majority of individuals having been buried in an extended burial disposition, as determination of burial disposition is highly dependent on leg position. There is a significant association between leg position and whether the individuals were adult or subadult in that a greater proportion of subadults were found with one or both of their legs in flexed positions than the proportion of adults with one or both of their legs in flexed positions. Again, this is consistent with the results of the statistical tests concerning burial disposition. Only one significant relationship was detected between leg position and grave goods. The proportion of individuals with flexed legs who were also found in association with beads is significantly smaller than the proportion of individuals with extended legs who were found in association with beads.

Grave Goods

Individuals are associated with grave goods based on data provided by Solís and Herrera (2006; 2009). The presence/absence of grave goods was addressed in the previous sections with respect to several other mortuary treatment variables, such as body position, body disposition, head orientation, and arm and leg position, all also derived from the data provided by Solís and Herrera (2006; 2009). The current section addresses the relationships between age-at-death and sex as determined during the laboratory work portion of this study and the presence of grave goods, both in general and with regard to specific artifact types. Only individuals who were examined during the laboratory work portion of this study are included in the following analyses.

Table 5.63: Grave Goods—Age-at-death.

Age Category	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	39	*33.6*	77	*66.4*	116	*40.8*
Adults	102	*60.7*	66	*39.3*	168	*59.2*
Total	141	*49.6*	143	*50.4*	284	*100.0*

Results of a Chi-square test indicate a significant relationship between the presence of grave goods and whether the individual was an adult or subadult (X^2=20.149, df=1, p=0.0001, with significance at the $p<0.05$ level). A greater frequency of subadults were buried without any grave goods, while a higher frequency of adults were buried with grave goods than without.

Grave Goods: General

Grave goods are recorded as present if even one artifact was present in a given burial. Grave goods include beads and artifacts made from various raw materials—ceramic, shell, faunal remains, human remains, and lithics.

Table 5.64: Grave Goods—Adults.

Age Category	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Young Adult	21	*61.8*	13	*38.2*	34	*38.8*
Middle Adult	29	*74.4*	10	*25.6*	39	*44.3*
Older Adult	13	*86.7*	2	*13.3*	15	*17.0*
Total	63	*71.6*	25	*28.4*	88	*100.0*

Results of a Chi-square test indicate no significant relationship exists between the presence of grave goods and adult age-at-death (X^2=3.427, df=2, p=0.179, with significance at the p<0.05 level). Regardless of their age cohort, adults in this sample are more likely to be buried with grave goods than without.

Table 5.65: Grave Goods—Sex.

Sex	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	35	*64.8*	19	*35.2*	54	*47.4*
FPF	39	65.0	*21*	35.0	*60*	52.6
Total	74	*64.9*	40	*35.1*	114	*100.0*

Results of a Chi-square test indicate no significant relationship exists between the presence of grave goods and sex (X^2=0.056, df-1, p=0.813, with significance at the p<0.05 level). It is more common among both males and females in this sample to be buried with grave goods than it is for either sex to be buried without, and approximately the same proportion of males and females from this sample are associated with grave goods.

Grave Goods: Beads

Bead types and raw materials are extremely varied at Jícaro. Raw materials for beads include shell, ceramic, jade, pearl, coral, and shell. Various forms include teardrops, discs, tubes, cylinders, cubes, spheres, and anthropomorphic shapes (Solís and Herrera, 2006; 2009).

Table 5.66: Beads—Age-at-death.

Age Category	**Beads**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	13	*33.3*	26	*66.7*	39	*27.7*
Adults	45	*44.1*	57	*55.9*	102	*72.3*
Total	58	*41.1*	83	*58.9*	141	*100.0*

Results of a Chi-square test indicate no significant relationship between the presence of beads and whether the individual was an adult or subadult (X^2=1.355, df=1, p=0.244, with significance at the p<0.05 level). A slightly larger proportion of adults, relative to the total number of adults, were buried in association with beads than the proportion of subadults, but the difference between them is not significant.

Table 5.67: Beads—Adults.

Age Category	**Beads**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Young Adult	8	*38.1*	13	*61.9*	21	*33.3*
Middle Adult	14	*48.3*	15	*51.7*	29	*46.0*
Older Adult	9	*69.2*	4	*30.8*	13	*20.6*
Total	31	*49.2*	32	*50.8*	63	*100.0*

Results of a Chi-square test show that there is no significant relationship between adult age-at-death and the individual's association with beads (X^2=3.133, df=2, p=0.209, with significance at the p<0.05 level). Slightly fewer young adults were buried with beads, relative to the total number of young adults, and a slightly greater number of older adults were buried with beads, relative to the total number of older adults, but the differences are not significant.

Table 5.68: Beads—Sex.

Sex	**Beads**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	17	*48.6*	18	*51.4*	35	*47.3*
FPF	19	*48.7*	20	*51.3*	39	*52.7*
Total	36	*48.6*	38	*51.4*	74	*100.0*

Results of a Chi-square test show that there is no significant relationship between sex and the association with beads (X^2=0.0001, df=1, p=0.990, with significance at the $p<0.05$ level). Males and females are approximately evenly distributed in both number and proportion of the sample that were buried with beads.

Grave Goods: Shell Artifacts

Examples of shell artifacts at Jícaro include pearl oyster shells and other bivalve and mollusk shells, either with or without function, columellas, bead preforms, and other ornaments (Solís and Herrera, 2006; 2009).

Table 5.69: Shell Artifacts—Age-at-death.

Age Category	**Shell Artifacts**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	16	*41.0*	23	*59.0*	39	*27.7*
Adults	42	*41.2*	60	*58.8*	102	*72.3*
Total	58	*41.1*	83	*58.9*	141	*100.0*

Results of a Chi-square test show that there is no significant relationship between the presence of shell artifacts and whether the individual was an adult or subadult (X^2=0.0001, df=1, p=0.987, with significance at the $p<0.05$ level). Similar frequencies of adults and subadults were buried in association with (and without) shell artifacts.

Table 5.70: Shell Artifacts—Adults.

Age Category	**Shell Artifacts**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Young Adult	7	*33.3*	14	*66.7*	21	*33.3*
Middle Adult	16	*55.2*	13	*44.8*	29	*46.0*
Older Adult	8	*61.5*	5	*38.5*	13	*20.6*
Total	31	*49.2*	32	*50.8*	63	*100.0*

No statistical test for the presence of relationships was conducted for the data in Table 5.70 because the sample size is inappropriately small for Chi-Square, the table contains too many cells for a

Fisher's Exact test to apply, and correspondence analysis is more appropriately applied to data sets involving more than two variables. The data presented in Table 5.70, above, show that the middle adult category contains approximately as many individuals buried without shell artifacts as with them; the young adult category shows a greater number of individuals without shell artifacts relative to the number of individuals with them and the older adult category shows contains a greater frequency of individuals with shell artifacts than the frequency of individuals without shell artifacts, but the differences between the age groups are not drastic.

Table 5.71: Shell Artifacts—Sex.

Sex	**Shell Artifacts**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	17	*48.6*	18	*51.4*	35	*47.3*
FPF	18	*46.2*	21	*53.8*	39	*52.7*
Total	35	*47.3*	39	*52.7*	74	*100.0*

Chi-square test results indicate no significant relationship between sex and the presence of shell artifacts (X^2=0.043, df=1, p=0.835, with significance at the $p<0.05$ level). The sample of adults is divided approximately equally between males and females, and the numbers of males and females with and without shell artifacts is also approximately equal.

Grave Goods: Ceramics

Examples of ceramic artifacts present at Jícaro include ceramic vessels (round pots, effigy bowls, and various types of polychrome and bichrome pottery), zoomorphic whistles, and figurines. The vast majority of ceramic artifacts at Jícaro are ceramic vessels (Solís and Herrera, 2006; 2009).

Table 5.72: Ceramics—Age-at-Death.

Age Category	Ceramics				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	31	*79.5*	8	*20.5*	39	*27.7*
Adults	83	*81.4*	19	*18.6*	102	*72.3*
Total	114	*80.9*	27	*19.1*	141	*100.0*

Results of a Chi-square test indicate no statistically significant relationship between the presence of ceramic artifacts and whether the individuals were adults or subadults (X^2=0.065, df=1, p=0.799, with significance at the p<0.05 level). A greater frequency of both adults and subadults were buried with at least one ceramic artifact than the frequency of either buried without any ceramic artifacts.

Table 5.73: Ceramics—Adults.

Age Category	Ceramics				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Young Adult	18	*85.7*	3	*14.3*	21	*33.3*
Middle Adult	24	*82.8*	5	*17.2*	29	*46.0*
Older Adult	9	*69.2*	4	*30.8*	13	*20.6*
Total	51	*81.0*	12	*19.0*	63	*100.0*

No statistical test for the presence of relationships was conducted for the analysis of the data in Table 5.73 because the sample size is inappropriately small for Chi-Square, the table is 2x3, making it inappropriate for Fisher's Exact, and correspondence analysis is more appropriately applied to data sets involving more than two variables. That said, data presented in Table 5.73, above, indicate that all adults, regardless of age category, are more frequently buried with at least one ceramic artifact than without any ceramic artifacts.

Table 5.74: Ceramics—Sex.

Sex	Ceramics				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	28	*80.0*	7	*20.0*	35	*47.3*
FPF	31	*79.5*	8	*20.5*	39	*52.7*
Total	59	*79.7*	15	*20.3*	74	*100.0*

Results of a Chi-square test show that no statistically significant relationship exists between sex and the presence of ceramic artifacts ($X^2=0.0001$, df=1, p=1.000, with significance at the $p<0.05$ level). Ceramic artifacts are present in a majority of the burials at Jícaro, regardless of the sex of the individual.

Grave Goods: Human Remains

Artifacts made from human bones and teeth were found with several individuals at Jícaro. Examples of human bone artifacts include human mandibles and a human maxilla that appear to have been worn as ornaments, long cylindrical combs, rectangular pendants, and human teeth that have had holes drilled through them so they could be used as beads (Solís and Herrera, 2006; 2009).

Table 5.75: Human Remains Artifacts—Age-at-death.

Age Category	**Human Remains**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	0	*0.0*	39	*100.0*	39	*27.7*
Adults	12	*11.8*	90	*88.2*	102	*72.3*
Total	12	*8.5*	129	*91.5*	141	*100.0*

Results of a Fisher's Exact test indicate a significant relationship between the presence of human remains artifacts and whether individuals are adults or subadults (p=0.037, with significance at the $p<0.05$ level). All of the human remains artifacts (human tooth beads, combs, pendants, maxilla, mandibles) were found with adults, none with subadults.

Table 5.76: Human Remains Artifacts—Adults.

Age Category	**Human Remains**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Young Adult	0	*0.0*	21	*100.0*	21	*33.3*
Middle Adult	4	*13.8*	25	*86.2*	29	*46.0*
Older Adult	6	*46.2*	7	*53.8*	13	*20.6*
Total	10	*15.9*	53	*84.1*	63	*100.0*

No statistical test was conducted for the analysis of the data in Table 5.76 because the sample size is inappropriately small for Chi-Square, the table is 2x3, making it inappropriate for Fisher's Exact, and correspondence analysis is more appropriately applied to data sets involving more than two variables. Data presented in Table 5.76, above, show that there were no human remains artifacts present with any of the Young Adults, but there were human remains artifacts associated with both Middle and Older Adults. This suggests that there may be an age-related criterion regarding the eligibility for being buried with objects or ornaments made from human remains.

Table 5.77: Human Remains Artifacts—Sex.

Sex	**Human Remains**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	8	*22.9*	27	*77.1*	35	*47.33*
FPF	2	*5.1*	37	*94.9*	39	*52.7*
Total	10	*13.5*	64	*86.5*	74	*100.0*

Results of a Fisher's Exact test calculated using SPSS show that there is a significant relationship between sex and the presence of human remains artifacts ($p=0.040$, with significance at the $p<0.05$ level). Only two FPF (both Probable Females, discussed in Chapter 8) were found with human remains artifacts, while the majority of human remains artifacts were associated with males, although the greatest frequency of MPM and FPF were not associated with any human remains artifacts.

Grave Goods: Faunal (non-shell) Artifacts

Examples of faunal artifacts in the Jícaro sample include deer bones, mainly metapodials and other extremity bones, vertebrae from terrestrial and marine animals, fangs from large terrestrial animals, skeletons and isolated bones from large birds and lizards, and worked artifacts such as bone needles, bone awls, and polished discs, presumably made from turtle shells. Most individuals who are buried with faunal artifacts are buried with a deer metapodial or other extremity; only a handful of the other types of skeletal elements and worked artifacts are present in the sample (Solís and Herrera, 2006; 2009).

Table 5.78: Faunal (non-shell) Artifacts—Age-at-death.

Age Category	**Faunal**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	11	*28.2*	28	*71.8*	39	*27.7*
Adults	53	*52.0*	49	*48.0*	102	*72.3*
Total	64	*45.4*	77	*54.6*	141	*100.0*

Results of a Chi-square test indicate that there is a significant relationship between the presence of human remains artifacts and whether the individual was an adult or subadult (X^2=6.423, df=1, p=0.011, with significance at the $p<0.05$ level). Adults in the Jícaro sample are nearly as likely to be buried with a faunal artifact as not, while faunal artifacts are more likely to be absent from subadult burials.

Table 5.79: Faunal (non-shell) Artifacts—Adults.

Age Category	**Faunal**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Young Adult	9	*42.9*	12	*57.1*	21	*33.3*
Middle Adult	20	*69.0*	9	*31.0*	29	*46.0*
Older Adult	7	*53.8*	6	*46.2*	13	*20.6*
Total	36	*57.1*	27	*42.9*	63	*100.0*

Results of a Chi-square test indicate no significant relationship between adult age-at-death and the presence of faunal artifacts (X^2=3.463, df=2, p=0.177, with significance at the $p<0.05$ level). This suggests that among adults there does not appear to be an age-related criterion for being buried with objects or ornaments made from faunal bones and teeth.

Table 5.80: Faunal (non-shell) Artifacts—Sex.

Sex	**Faunal**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	21	*60.0*	17	*40.0*	35	*47.3*
FPF	19	*48.7*	20	*51.3*	39	*52.7*
Total	40	*54.1*	34	*45.9*	74	*100.0*

Results of a Chi-square test indicate no significant relationship between sex and the presence of faunal artifacts (X^2=0.753, df=1, p=0.385, with significance at the p<0.05 level). Males and females are approximately equally represented in the Jícaro sample, and they are as likely as one another to be buried with any faunal artifacts.

Grave Goods: Lithics

Lithic grave goods at Jícaro are extremely variable. Raw materials include limestone, sandstone, quartz, quartzite, jasper, and various igneous rocks (brecchia, basalt, ignimbrite, etc.). Artifact types include sculpture, unworked stones, polished stones, cores, flakes, worked bifaces, polished discs, ornaments including ear spools, and tools/weapons including scrapers, grinding stones, nutting stones, mallets, manos and metates—although no intact metates were recovered from any of the graves (Solís and Herrera, 2006; 2009; personal communication).

Table 5.81: Lithics—Age-at-Death.

Age Category	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	2	*5.1*	37	*94.9*	39	*27.7*
Adults	14	*13.7*	88	*86.3*	102	*72.3*
Total	16	*11.3*	125	*88.7*	141	*100.0*

Results of a Fisher's Exact test indicate no significant relationship between the presence of any lithic artifacts and whether the individual was an adult or subadult (p=0.235, with significance at the p<0.05 level). Lithic artifacts are extremely uncommon in adult and subadult burials at Jícaro, compared with artifacts made from other raw materials.

Table 5.82: Lithics—Adults.

Age Category	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Young Adult	2	*9.5*	19	*90.5*	21	*33.3*
Middle Adult	7	*24.1*	22	*75.9*	29	*46.0*
Older Adult	2	*15.4*	11	*84.6*	13	*20.6*
Total	11	*17.5*	52	*82.5*	63	*100.0*

No statistical test was conducted for the analysis of the data in Table 5.82 because the sample size is inappropriately small for Chi-Square, the table is 2x3, making it inappropriate for Fisher's Exact, and correspondence analysis is more appropriately applied to data sets involving more than two variables. The data presented in Table 5.82, above, indicate that lithic artifacts are infrequently buried with adults, regardless of their age category.

Table 5.83: Lithics—Sex.

Sex	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	6	*17.1*	29	*82.9*	35	*47.3*
FPF	7	*17.9*	32	*82.1*	39	*52.7*
Total	13	*17.6*	61	*82.4*	74	*100.0*

Results from a Chi-square test show that no significant relationship exists between the presence of any lithics in a grave and the individual's sex (X^2=0.008, df=1, p=0.928, with significance at the p<0.05 level). The adult sample is relatively evenly divided between MPM and FPF, and neither group is more likely than the other to be buried with lithic artifacts.

Summary of Grave Goods

There is an enormous variety of grave goods at Jícaro, made from various raw materials. The analysis of the presence or absence of common types of grave goods relative to various other burial treatments and demographic variables is a means for exploring social difference among the population at Jícaro. The above analyses revealed very few statistically significant relationships between the presence of particular grave goods and demographic variables. There is a significant association between age-at-death and presence of grave goods, in that subadults are significantly less likely to be buried with any grave goods than adults. Additionally, human remains artifacts are almost exclusively found with males; none were found with young adults or subadults.

Figure 5.1: Graph showing Grave Goods according to Sex.

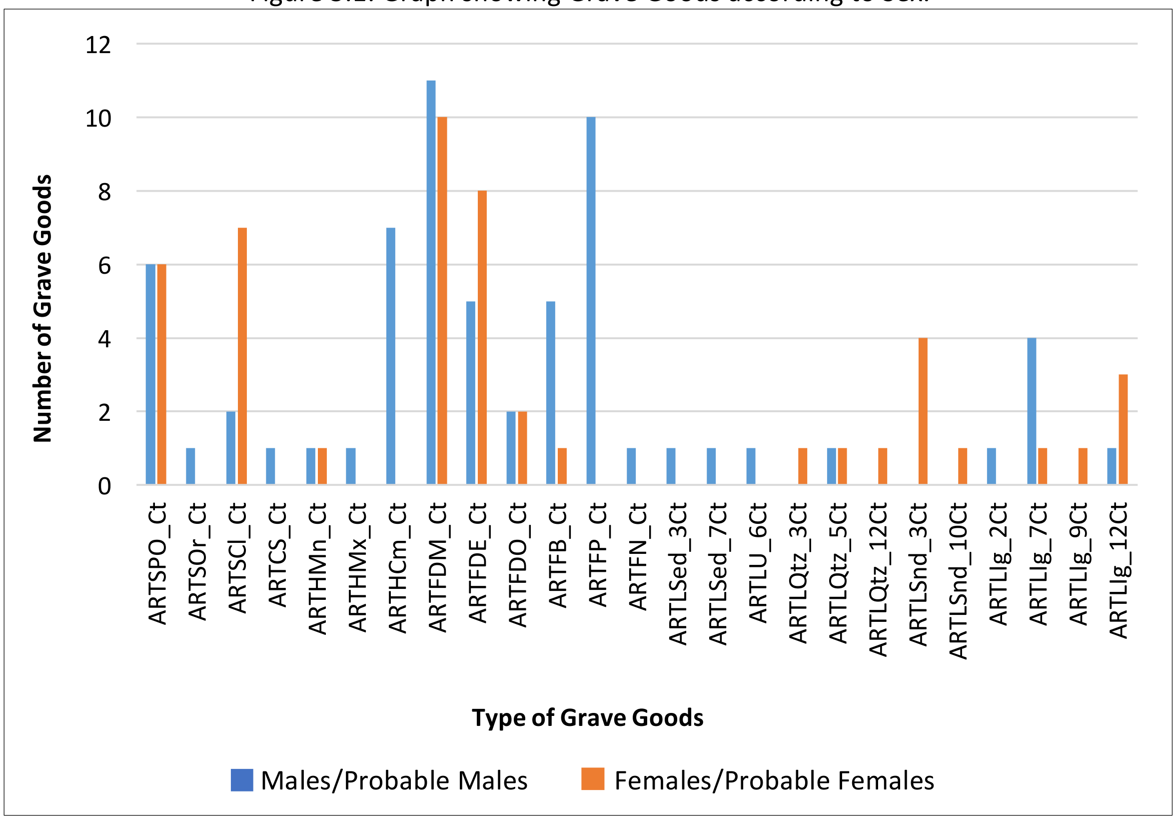


Figure 5.1, above, shows a distribution of artifact types (X axis) and their cumulative totals for males and females in the Jícaro sample. The chart excludes ceramic vessels because the quantities of those particular artifacts are so great that their presence in the graph obscured other artifact counts. Although there is no significant relationship between the presence of artifacts and sex at the site, the graph illustrates some difference in the quantity and type of grave goods found with males and females. For example, both males and females are frequently found with pearl oyster shells, deer metapodials, and other deer extremities. The human bone artifacts, such as the combs made from human long bones

and human maxillae are exclusively found with males, as are faunal artifacts such as bone needles and pendants and several of the lithic artifacts (unworked sedimentary rocks, polished petaloid artifacts and ornaments made from an unidentified lithic material). Quartz tools, polished sandstone rocks, sandstone tablets, and metate fragments are found with females.

Tetrachoric Correlations

With the assistance of Dr. Joseph Hefner, using the open source statistical software, R Studio, tetrachoric correlation matrices were calculated to enhance the depth of analysis and understanding of the Chi-square and Fisher's Exact test results presented above. Where the Chi-square and Fisher's Exact tests are able to indicate the presence of relationships between variables, results from such tests do not indicate the strength of the relationships, or whether the relationships are positive (consistently occur together) or negative (consistently do not occur together). The tetrachoric correlations presented below expand on the relationships indicated by the previous tests and provide an indication of both the direction and the strength of relationships between variables.

In all four of the following figures, visual representations of the strength of positive or negative correlations between variables are presented as a gradient from red to blue, with the darkest red indicating a strong negative correlation (where one or the other variable occurs frequently, the other does not), white indicating the lack of a correlation, and the darkest blue indicating a strong positive correlation (where both variables frequently occur together). A strong positive correlation will have a correlation coefficient (*r*) value approaching one (1), whereas a negative correlation will have a correlation coefficient (*r*) value approaching negative one (-1), and where no correlation exists, the correlation coefficient will approach zero (0). The numeric matrices showing the strength of the correlations for each of the relationships presented in the following illustrations are provided in Appendix E.

Figure 5.2: Tetrachoric correlation matrix. Burial data only.

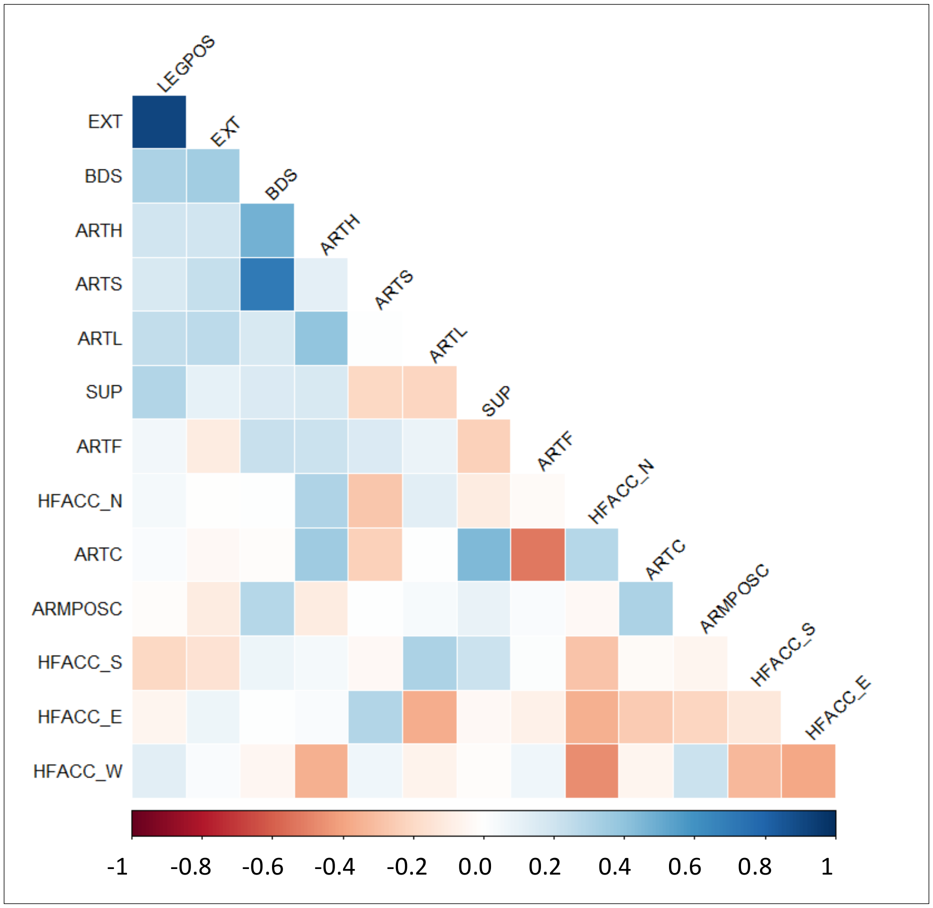


Figure 5.2, above, presents a tetrachoric correlation graph between various burial features, without taking into consideration age-at-death or sex. All of the variables were considered "1" (present for a particular individual) or "0" (absent for a particular individual). When only variables associated with burial context are considered, several of the positive and negative correlations are noteworthy. For example, a strong positive correlation exists between the presence of beads (BDS) and the presence of shell artifacts (ARTS) (*r*=0.708). This correlation is somewhat misleading in that it is not, in fact reflective of co-occurrence of these variables, rather it is reflective of the fact that the vast majority of the beads recovered from Jícaro were made from shell. A strong negative correlation exists between the presence of faunal artifacts (ARTF) and the presence of ceramic artifacts (ARTC) (*r*=-0.523). This negative correlation does not represent an apparent choice upon the burial of individuals to include

either ceramics or faunal artifacts; rather, it represents the fact that the majority of burials have ceramics while the majority do not have faunal artifacts. The small number of burials with faunal artifacts may mean that those burials are somehow similar to one another and different from others at the site for other reasons, which warrants further exploration in a future research project.

Figure 5.3: Tetrachoric correlation matrix. Age Category (Adult/Subadult) with burial data.

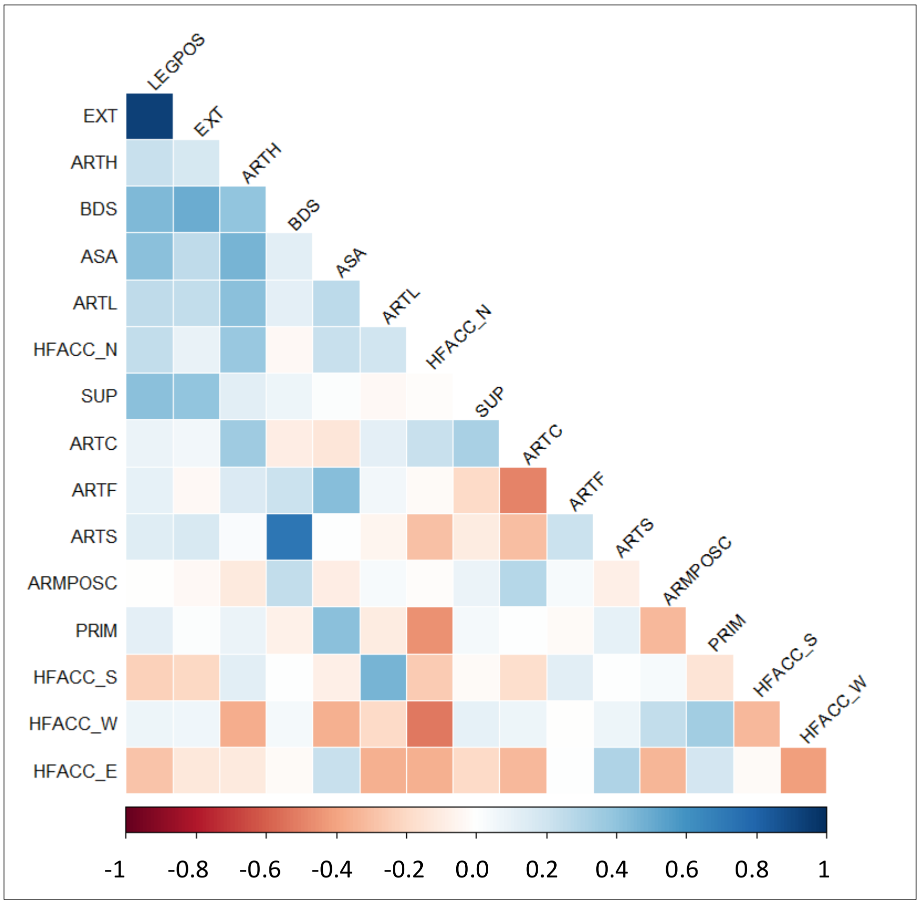


Figure 5.3, above, presents a tetrachoric correlation graph between various burial features, such as burial disposition, burial position, arm and leg position, and the direction of head orientation among individuals whose age-at-death could be determined as Adult or Subadult. For the purpose of calculating the correlations, Adults were considered “1” (i.e., present for being Adult) and Subadults were considered “0” (i.e., absent for being Adult). All other variables were considered as “1” (present for a particular individual) or “0” (absent for a particular individual). Several strong relationships are

indicated by the correlation that warrant additional discussion. The strongest positive correlations between artifact types and age-at-death occur between age-at-death and the presence of lithic artifacts (ARTL), the presence of faunal artifacts (ARTF), and the presence of primary interments (PRIM). For all three of these burial classes, the presence of lithic (r=0.263) or faunal artifacts (r=0.424) in burials and the condition of the body as being evidently in a primary interment (as opposed to being bundled, dispersed, or paced within an artifact), are all strongly correlated with Adults, meaning that these features are largely absent for Subadults.

Figure 5.4: Tetrachoric correlation matrix. Sex (Male-Probable Male/Female-Probable Female) with burial data.

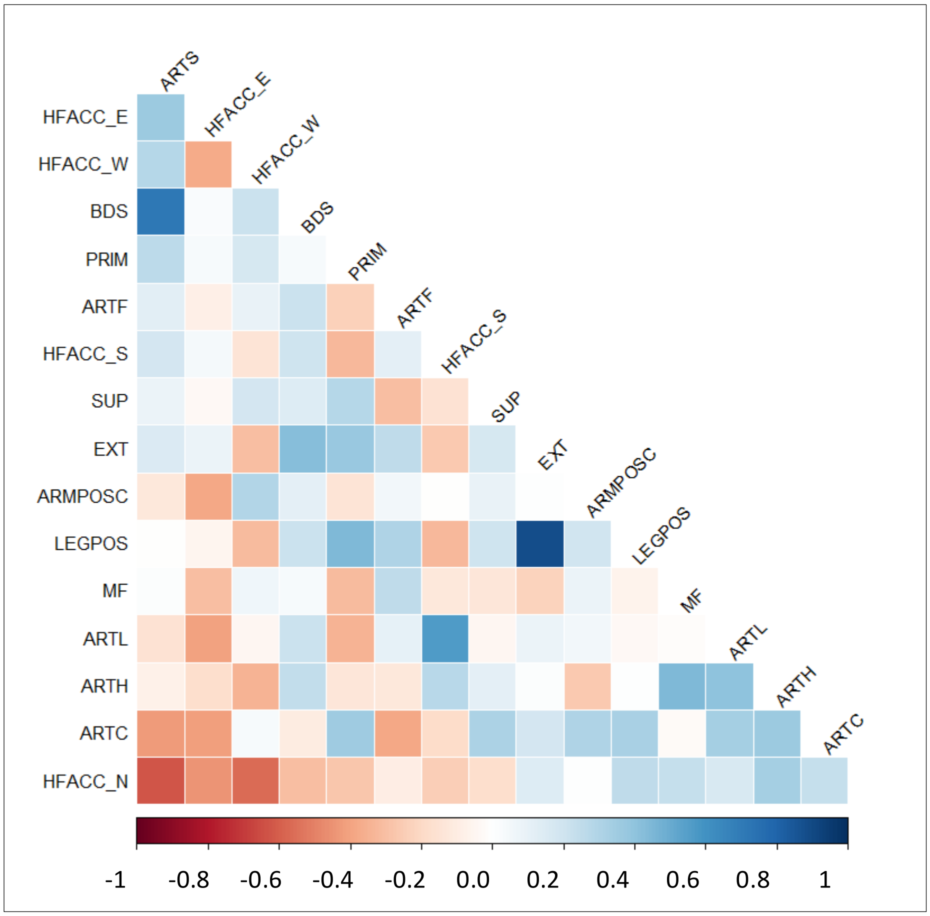


Figure 5.4, above, presents a tetrachoric correlation graph between various burial features, such as burial disposition, burial position, arm and leg position, and the direction of head orientation among

individuals whose sex could be determined as Male (including Males and Probable Males) or Female (including Females and Probable Females) (MF). For the purpose of calculating the correlations, Males/Probable Males were considered "1" (i.e., present for being Male) and Females/Probable Females were considered "0" (i.e., absent for being Male). All other variables were considered as "1" (present for a particular individual) or "0" (absent for a particular individual). Not surprisingly, artifacts made from human remains (ARTH) are positively correlated with Males (*r*=0.447), as only males and two probable females (who could possibly have been mis-assigned) were buried with such artifacts. Strong negative correlations are present for relationships between sex and being buried with the head facing east (HFACC_E) (*r*=-0.301) and sex and primary burial (PRIM) (*r*=-0.315). In the case of head orientation, Table 5.29 shows that of the 10 individuals with their heads buried facing the east, 70% (n=7) are Female/Probable Female while only 30% (n=3) are Male/Probable Male, so the negative correlation between those two variables is not surprising. Though no significant relationship exists between sex and primary treatment (Fisher's Exact, df=1, p=0.249, with significance at the p<0.05 level), the tetrachoric correlation calculation reveals a negative correlation between those two variables. Of the 110 individuals for whom sex could be determined and burial treatment could be assessed, 87 (79.1%), 50 FPF (57.5%) and 37 MPM (42.5%), appeared to be primary treatments and 23 (20.9%), 10 FPF (43.5%) and 13 MPM (56.5%) appeared to be secondary or other types of treatments.

Table 5.84: Sex—Burial Treatment.

Sex	**Burial Treatment**				**Total**	***Freq.%***
	Primary	*Freq.%*	Other	*Freq.%*		
MPM	37	*42.5*	13	*56.5*	60	*54.5*
FPF	50	*57.5*	10	*43.5*	50	*45.5*
Total	87	*79.1*	23	*20.9*	110	*100.0*

The proportions of males and females who were recovered in apparently primary treatments are very similar, while the proportion of individuals with apparently primary treatments is greater than the proportion of individuals with other types of treatment, regardless of sex. Burial treatment, therefore, is not significantly related to sex, and it appears as though the tetrachoric correlation picked up on the slightly higher proportion of females than males who were recovered from what appeared to be primary contexts and the slightly lower proportion of females than males who were recovered from other burial contexts.

Figure 5.5: Tetrachoric correlation matrix. Age Category/Sex with burial data.

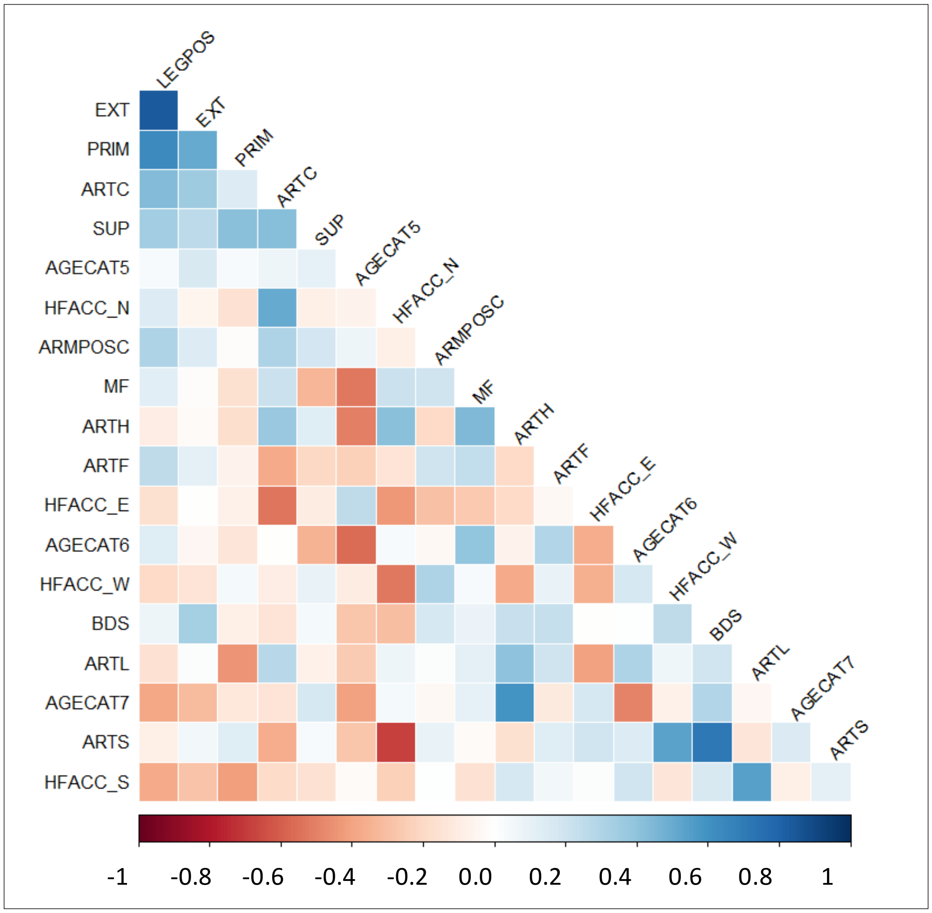


Figure 5.5, above, presents a tetrachoric correlation graph between various burial features, such as burial disposition, burial position, arm and leg position, and the direction of head orientation among adults whose sex could be determined as Male (including Males and Probable Males) or Female (including Females and Probable Females) (MF) and whose age could be determined as Yong Adult (AGECAT5), Middle Adult (AGECAT6), or Older Adult (AGECAT7). For the purpose of calculating the

correlations, Males/Probable Males were considered "1" (i.e., present for being Male, Females/Probable Females were considered "0" (i.e., absent for being Male), and all other variables, including the age categories were considered as "1" (present for a particular individual) or "0" (absent for a particular individual).

A strong positive correlation is indicated (*r*=0.594) for the relationships between Older Adults (AGECAT7) and the presence of artifacts made from human remains (ARTH), which is reflected in the results from Table 5.76, which indicates that 60% (n=6) of the 10 individuals found with human remains as artifacts were older adults. Strong negative correlations are present for Young Adults (AGECAT5) and both artifacts made from human remains (ARTH) (r=-0.501) and sex (MF) (*r*=-0.524). This finding reflects the results of Table 5.76, which shows zero human remains artifacts having been associated with Young Adults. It is also reflective of the much larger proportion of females than males in the Jícaro sample who died as young adults (shown in Table 4.7).

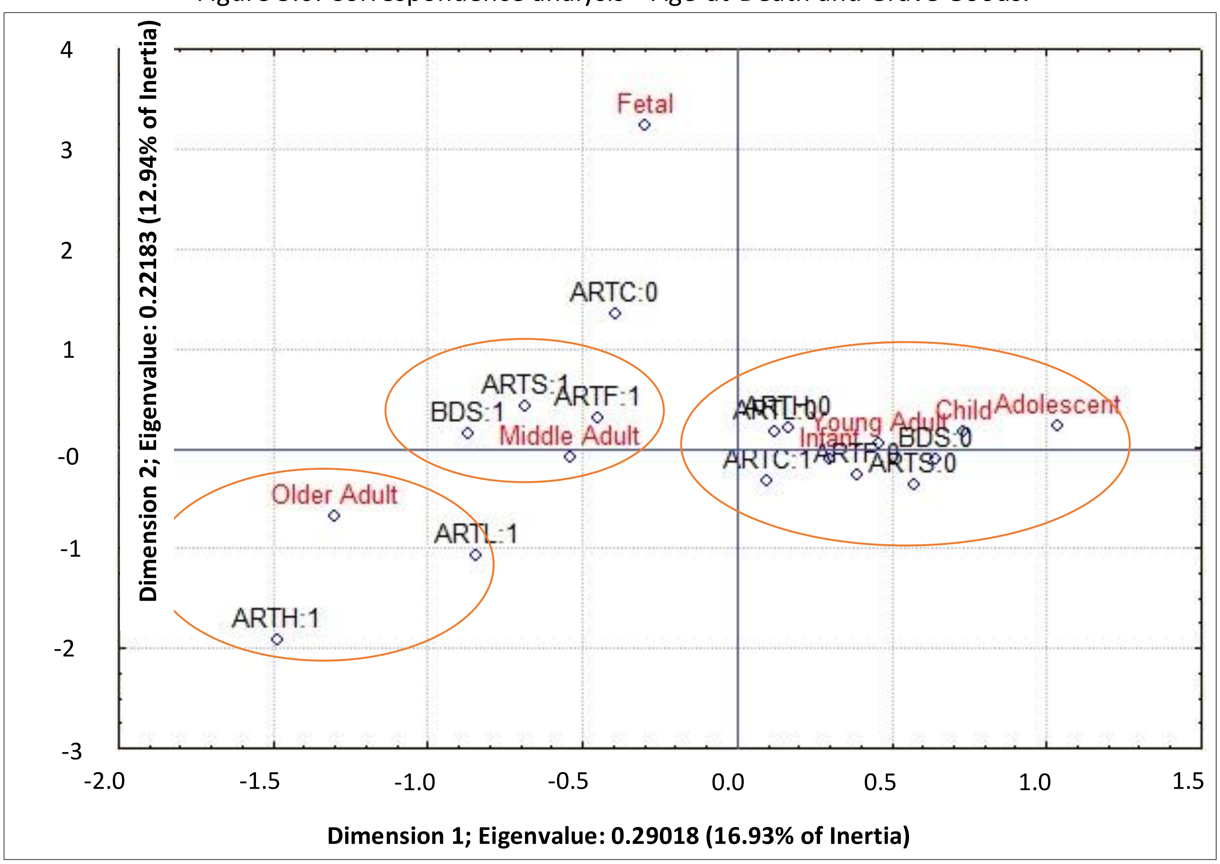
Correspondence Analysis

Using the open source statistical software, R Studio, correspondence analyses were calculated and plotted to further explore the relationships between age-at-death, sex, and types of grave goods found within burials. Figure 5.6 (following page) shows three clusters that indicate close associations between several of the age-at-death categories and grave goods, while two variables appear to have very little association with any of the others. The associations are discussed from left to right. For a complete list of variable abbreviations and codes, see Appendix A.

Lithic artifacts and artifacts made from human remains—particularly those made from human remains—are more closely associated with older adults than any other age group. The older adult age group is also less closely associated with ceramic artifacts than middle adults, young adults, children, adolescents or infants. Shell artifacts, faunal artifacts, and beads are more closely associated with middle adults than any other age group. Middle adults are less closely associated with lithic artifacts, but their proximity indicates some association.

Young adults, adolescents, children and infants are nearly as often associated with ceramic artifacts as they are associated with having no artifacts at all, whereas middle adults and older adults are more often found with artifacts than without. Shell artifacts, beads, and faunal artifacts have a close association with one another and the three together are associated with the absence of ceramic artifacts, while the presence of ceramic artifacts is closely associated with the absence of all other types of artifacts. This is likely because so many people are buried with ceramic artifacts and so few are buried with any of the other types of artifacts.

Figure 5.6: Correspondence analysis—Age-at-Death and Grave Goods.



Fetal/Neonate remains are not associated with artifacts. This should be stated with a caveat—many of the fetal/neonate remains were located within ceramic urns which is an artifact in itself; however, none of them were found in association with additional artifacts that appeared intentionally placed within the burials.

Figure 5.7: Correspondence analysis—Age-at-Death and Grave Goods.

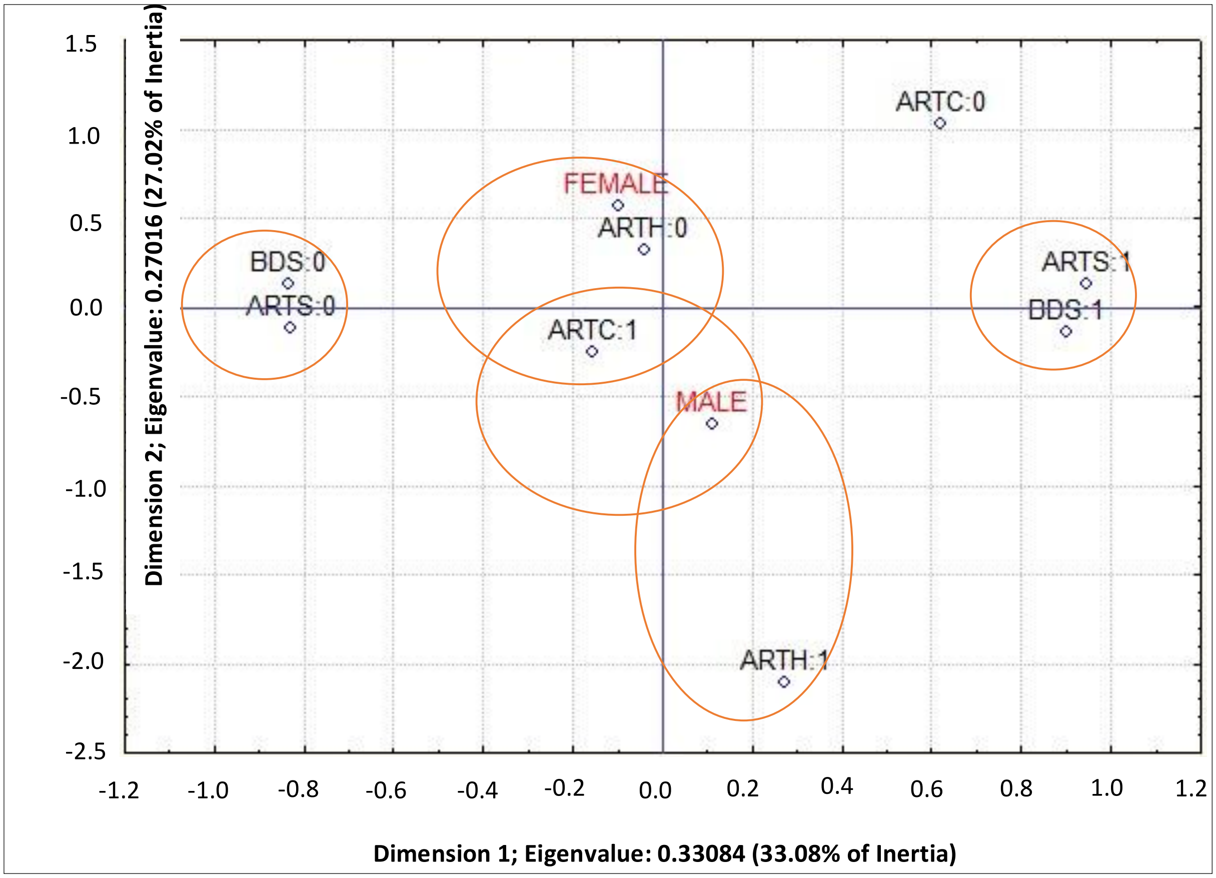


Figure 5.7, above, shows two distinct sex-related clusters and provides a visualization for several other relationships.

The association of ceramic artifacts with males and females is about equal—both males and females are relatively closely associated with ceramic artifacts and neither males nor females is associated with the absence of ceramic artifacts. To the contrary, the absence of human remains artifacts is very closely associated with females, indicating that females are not found with human remains artifacts. The presence of human remains as artifacts is clearly more associated with males than it is with females, but the distance between the variables in Figure 5.7 indicates a weak association even between them (which is consistent with the presence of very few artifacts made from human remains and the fact that they are mainly found with males).

Also consistent with other analyses, Figure 5.7 shows that the presence of shells is closely associated with the presence of beads while the absence of shell artifacts is closely associated with the absence of beads. Additionally, while there is a slightly closer association between females and the lack of both shell artifacts and beads, and between males and the presence of shell artifacts and beads, both of those associations are extremely weak, indicating that both males and females are nearly as likely to be buried with or without shells and with or without beads.

Mortuary Treatments, Health and Identity

The previous sections addressed the relationships between demographic variables (age and sex) and mortuary treatments, such as burial in an extended or flexed disposition, a prone or supine position, head orientation, and arm and leg position, and grave goods. The following section addresses the relationships between indicators of health and activity relative to the mortuary treatment variables analyzed in the previous sections.

Three indicators of health and activity were chosen for comparison with the mortuary treatments discussed in this chapter: Periostitis, LSAMAT, and presence of dental modification. Those three variables in particular are frequent at Jícaro among adults, with relatively equal occurrence among males and females, and they are associated with health, possibly even the individuals' health at or near the time of their deaths (periostitis), frequent activity possibly related to diet or industry (LSAMAT), and cultural identity (dental modification).

Periostitis and Mortuary Treatment

Periostitis was found to affect adult males and females similarly at Jícaro, with no statistically significant difference between the number of males and the number of females who have at least one affected skeletal element. Periostitis is a non-specific indicator of a systemic infection, possibly originating from a localized infection that spread or from a disease process. Either etiology would suggest that the presence of periostitis may indicate an individual whose body was fighting a systemic, prolonged infection at or near the time of their deaths. Pearson's Chi-square tests were calculated to evaluate whether or not significant relationships exist between the presence of periostitis—possibly indicating the individual experienced an infection or disease process near the time of their deaths—and mortuary treatment.

Table 5.85: Periostitis—Burial Disposition.

Periostitis	**Burial Disposition**				**Total**	***Freq.%***
	Extended	*Freq.%*	Other	*Freq.%*		
Present	39	*86.7*	6	*13.3*	45	*76.3*
Absent	13	*92.9*	1	*7.1*	14	*23.7*
Total	52	*88.1*	7	*11.9*	59	*100.0*

Results from the Chi-square test indicate no statistically significant relationship between burial disposition and whether or not an individual showed signs of periostitis (X^2=0.391, df=1, p=0.532, with significance at the $p<0.05$ level). Periostitis was present for the majority of the individuals with discernable burial positions and individuals with periostitis were not treated differently than those without it.

Table 5.86: Periostitis—Burial Position.

Periostitis	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
Present	35	*81.4*	8	*18.6*	43	*76.8*
Absent	13	*100.0*	0	*0.0*	13	*23.2*
Total	48	*85.7*	8	*14.3*	56	*100.0*

Results of the Chi-square test show that there is no statistically significant relationship between burial position and whether or not an individual showed signs of periostitis (X^2=2.822, df=1, p=0.093, with significance at the p<0.05 level). Individuals whose skeletons show evidence of periostitis were not buried in different positions than individuals whose skeletons do not show periostitis.

Table 5.87: Periostitis—Head Orientation.

Head Orientation	Periostitis				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
N	8	*18.2*	3	*23.1*	11	*19.3*
NE	6	*13.6*	1	*7.7*	7	*12.3*
E	3	*6.8*	2	*15.4*	5	*8.8*
SE	2	*4.5*	0	*0.0*	2	*3.5*
S	2	*4.5*	0	*0.0*	2	*3.5*
SW	1	*2.3*	0	*0.0*	1	*1.8*
W	13	*29.5*	5	*38.5*	18	*31.6*
NW	9	*20.5*	2	*15.4*	11	*19.3*
Total	44	*77.2*	13	*22.8*	57	*100.0*

Results from a Chi-square test indicate no significant relationship between the presence of periostitis and head orientation (X^2=3.116, df=7, p=0.874, with significance at the p<0.05 level). Individuals with or without periostitis were equally likely to be buried with their heads oriented toward the west, northwest, and north, which is consistent with the rest of the Jícaro population.

Table 5.88: Periostitis—Arm Position.

Periostitis	Arm Position				Total	*Freq.%*
	Similar	*Freq.%*	Different	*Freq.%*		
Present	22	*62.9*	13	*37.1*	35	*76.1*
Absent	5	*45.5*	6	*54.5*	11	*23.9*
Total	27	*58.7*	19	*41.3*	46	*100.0*

A Chi-square test shows that there is no statistically significant relationship between the presence of periostitis and arm position (X^2=1.046, df=1, p=0.307, with significance at the p<0.05 level). More individuals at Jícaro were buried with their arms in similar positions than in different positions and the presence of periostitis (or the disease process that led to periostitis) did not affect that pattern.

Table 5.89: Periostitis—Leg Position.

Periostitis	**Leg Position**				**Total**	***Freq.%***
	Extended	*Freq.%*	One or both flexed	*Freq.%*		
Present	39	*90.7*	4	*9.3*	43	*79.6*
Absent	11	*100.0*	0	*0.0*	11	*20.4*
Total	50	*92.6*	4	*7.4*	54	*100.0*

Results of a Fisher's Exact test show that there is no statistically significant relationship between the presence of periostitis and leg position ($p=0.566$, with significance at the $p<0.05$ level). The majority of individuals at Jícaro were buried with their legs in an extended position, and individuals who had experienced a disease or infectious process that resulted in periostitis affecting at least one of their skeletal elements were no more likely to be buried with their legs in a different position than those who had not.

Table 5.90: Periostitis—Grave Goods.

Periostitis	**Grave Goods**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Present	34	*75.6*	11	*24.4*	45	*72.6*
Absent	14	*82.4*	3	*17.6*	17	*27.4*
Total	48	*77.4*	14	*22.6*	62	*100.0*

Results of a Chi-square test indicate no significant relationship exists between the presence of periostitis and the presence of grave goods in a burial ($X^2=0.326$, $df=1$, $p=0.568$, with significance at the $p<0.05$ level. The majority of individuals at Jícaro were buried with at least one artifact, and individuals who had experienced a disease or infectious process that resulted in periostitis affecting at least one of their skeletal elements were no more likely to be buried with or without any artifacts than those who had not.

Lingual Surface Attrition of the Maxillary Anterior Teeth and Mortuary Treatment

Lingual Surface Attrition of the Maxillary Anterior Teeth (LSAMAT) was found to be present/absent with approximately equal frequencies among males and females and all adult age groups at Jícaro. Presence of the condition was only documented on three subadults, two adolescents and one child (approximately 4 years of age). This suggests that the material the people of Jícaro were processing and the act of processing it, either as part of their diet or as a function of a work-related activity, was processed throughout their lives and was not restricted to one sex or one adult age group. Pearson's Chi-square tests were calculated to evaluate whether a relationship exists between whether or not social differences that may have been present during life for those who did and did not participate in the activity that led to LSAMAT were expressed in their burial treatment.

Table 5.91: LSAMAT—Burial Disposition.

LSAMAT	**Burial Disposition**				**Total**	***Freq.%***
	Extended	*Freq.%*	Flexed	*Freq.%*		
Present	43	*91.5*	4	*8.5*	47	*51.1*
Absent	38	*84.4*	7	*15.6*	45	*48.9*
Total	81	*88.0*	11	*12.0*	92	*100.0*

Results from a Fisher's Exact test indicate no statistically significant relationship between the presence of LSAMAT and whether individuals were buried in extended or flexed positions ($p=0.679$, with significance at the $p<0.05$ level). The majority of individuals at Jícaro were buried in an extended position, and approximately as many individuals with and without LSAMAT were buried in an extended position, meaning that individuals who practiced the activity that led to LSAMAT were not buried with a different disposition than those who did not.

Table 5.92: LSAMAT—Burial Position.

LSAMAT	Burial Position				Total	*Freq.%*
	Supine	*Freq.%*	Prone	*Freq.%*		
Present	39	*86.7*	6	*13.3*	45	*52.3*
Absent	39	*95.1*	2	*4.9*	41	*47.7*
Total	78	*90.7*	8	*9.3*	86	*100.0*

A Fisher's Exact test indicates no significant relationship exists between the presence of LSAMAT and whether the individuals were buried in supine or prone positions (p=0.203, with significance at the p<0.05 level). The majority of individuals were buried in a supine position, and individuals who were buried supine were equally likely to have had LSAMAT or not to have had it—meaning there appears to be no difference in the burial positions of individuals who practiced the activity that led to the LSAMAT and those who did not.

Table 5.93: LSAMAT—Head Orientation.

Head Orientation	LSAMAT				Total	Freq.%
	Present	Freq.%	Absent	Freq.%		
N	7	*15.2*	5	*11.6*	12	*13.5*
NE	3	*6.5*	2	*4.7*	5	*5.6*
E	6	*13.0*	7	*16.3*	13	*14.6*
SE	3	*6.5*	1	*2.3*	4	*4.5*
S	3	*6.5*	2	*4.7*	5	*5.6*
SW	2	*4.3*	2	*4.7*	4	*4.5*
W	10	*21.7*	14	*32.6*	24	*27.0*
NW	12	*26.1*	10	*23.3*	22	*24.7*
Total	46	*51.7*	43	*48.3*	89	*100.0*

No statistical test for the presence of relationships was conducted for the data in Table 5.92 because the sample size is inappropriately small for Chi-Square, the table contains too many cells for a Fisher's Exact test to apply, and correspondence analysis is more appropriately applied to data sets involving more than two variables. The data presented in Table 5.93 indicate that individuals who practiced the activity that led to LSAMAT among the population at Jícaro appear to have been as likely as those who did not to be buried with their heads oriented in any direction, with most oriented facing the west, northwest, and north.

Table 5.94: LSAMAT—Arm Position.

LSAMAT	**Arm Position**				**Total**	***Freq.%***
	Similar	*Freq.%*	Different	*Freq.%*		
Present	26	*60.5*	17	*39.5*	43	*54.4*
Absent	21	*58.3*	15	*41.7*	36	*45.6*
Total	47	*59.5*	32	*40.5*	79	*100.0*

A Chi-square test indicates no significant relationship between arm position and the presence of LSAMAT (X^2=0.037, df=1, p=0.848, with significance at the p<0.05 level). Individuals who practiced the activity that led to LSAMAT were as likely as individuals who did not to be buried with their arms in similar positions, which is the pattern for most of the population at Jícaro.

Table 5.95: LSAMAT—Leg Position.

LSAMAT	**Leg Position**				**Total**	***Freq.%***
	Extended	*Freq.%*	One or both flexed	*Freq.%*		
Present	42	*95.5*	2	*4.5*	44	*52.4*
Absent	37	*92.50*	3	*7.50*	40	*47.6*
Total	79	*94.0*	5	*6.0*	84	*100.0*

Results of a Fisher's Exact test show that there is no significant relationship between LSAMAT and leg position (p=0.665, with significance at the p<0.05 level), meaning that individuals who practiced or did not practice the activity that led to LSAMAT were treated equally with regard to leg position.

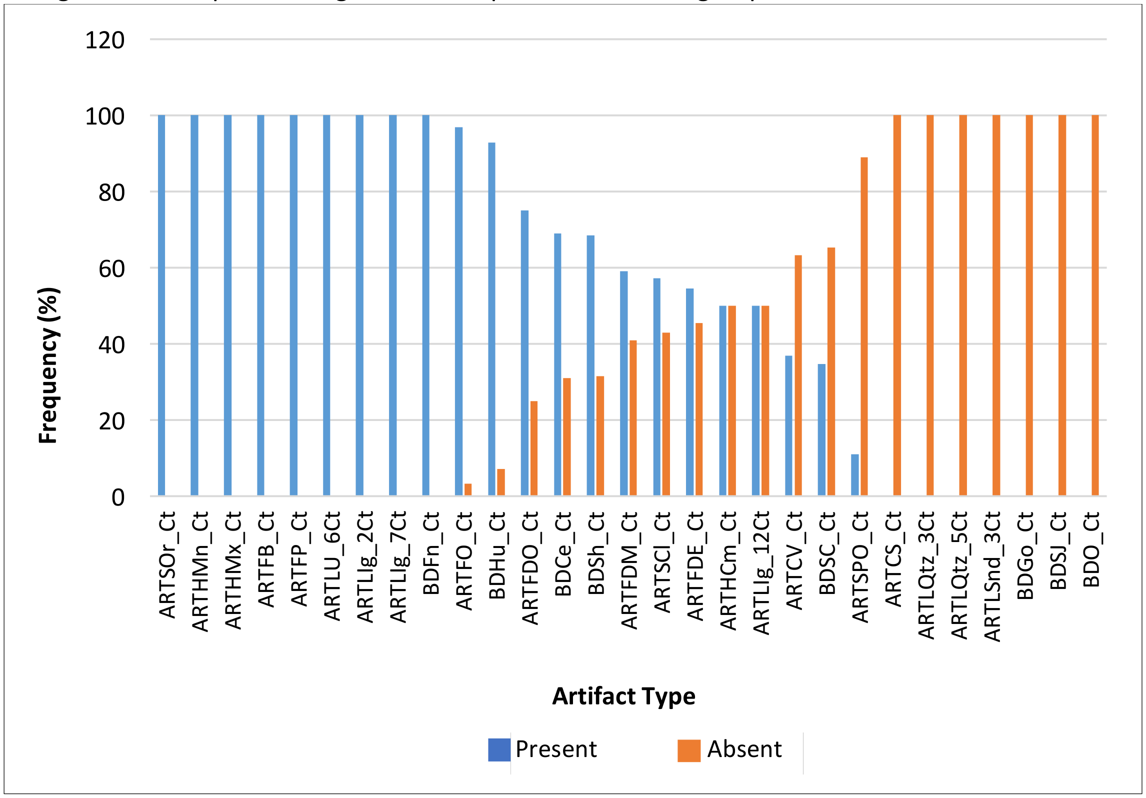
Table 5.96: LSAMAT—Grave Goods.

LSAMAT	**Grave Goods**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Present	38	*55.1*	31	*44.9*	69	*66.3*
Absent	12	*34.3*	22	*62.9*	35	*33.7*
Total	50	*48.1*	54	*52.9*	104	*100.0*

Results from a Chi-square test indicate a statistically significant relationship exists between the presence of LSAMAT and the presence of grave goods (X^2=0.4.019, df=1, p=0.045, with significance at the $p<0.05$ level). A greater number of individuals buried with grave goods of some kind also showed evidence of LSAMAT than individuals who showed no evidence of LSAMAT.

The graph in Figure 5.8, below, shows the frequency of different artifact types that were found associated with individuals who showed evidence of LSAMAT (blue) and individuals who showed no evidence of LSAMAT (orange). Only individuals who were examined for the purpose of this study and had observable anterior maxillary teeth are included in the graph (N=104). The graph shows that not only were individuals with LSAMAT more likely to be buried with any grave goods than individuals without LSAMAT, but the types of artifacts they were buried with also varied. Artifacts such as (left to right) shell ornaments, human mandibles, human maxilla, faunal bones (other than deer metapodials and other extremities), faunal bone pendants, stone ornaments, unworked igneous rock, polished petaloid igneous rock artifacts, and beads made from faunal remains (e.g., fangs or vertebrae) were exclusively found in burials where the individuals showed evidence of LSAMAT. Artifacts such as (left to right) ceramic spindles, polished quartz stones, quartz flakes, polished sandstone, the only gold bead, jade beads, and beads made from undetermined materials were found exclusively in association with individuals who showed no evidence of LSAMAT. Other artifacts were present in varying frequencies in association with individuals who showed or did not show evidence of LSAMAT, such as (left to right), "other" faunal artifacts (e.g., animal skeletons, unidentified worked bone), human tooth beads, deer bones (other than metapodials and extremities), ceramic beads, shell beads, deer metapodials, shell columelas, deer extremity bones (other than metapodials), cylindrical combs made from human bone, tools/weapons made from igneous rock, ceramic vessels, combinations of shell and ceramic beads, and pearl oyster shells.

Figure 5.8: Graph showing artifact frequencies according to presence/absence of LSAMAT.



Dental Modification and Mortuary Treatment

Because dental modification is often viewed as evidence for the presence of Mesoamericans in Greater Nicoya (Hardy, 1992; Solís and Herrera, 2011), and because such an identity may be represented in burial practices (Knudson and Stojanowski, 2009), Pearson's Chi-square tests were calculated to explore whether any significant relationships exist between burial treatments and whether or not the individuals showed evidence of dental modification. Only individuals who were examined as part of this study and had observable anterior teeth were included in these analyses (N=107, total, although the number of individuals analyzed varies according to observability of the mortuary variables).

Table 5.97: Dental Modification—Burial Disposition.

Dental Modification	Burial Disposition				Total	*Freq.%*
	Extended	*Freq.%*	Other	*Freq.%*		
Present	23	*92.0*	2	*8.0*	25	*25.8*
Absent	63	*87.50*	9	*12.50*	72	*74.2*
Total	86	*88.7*	11	*11.3*	97	*100.0*

Results of a Chi-square test indicate no significant relationship between an extended or other burial disposition and whether or not an individual showed evidence of dental modification (X^2=0.374, df=1, p=0.541, with significance at the p<0.05 level). A greater number of individuals both with and without dental modification were buried in extended dispositions than they were in flexed/semiflexed dispositions.

Table 5.98: Dental Modification—Burial Position.

Dental Modification	Burial Position				Total	*Freq.%*
	Supine	*Freq.%*	Prone	*Freq.%*		
Present	22	*100.0*	0	*0.0*	22	*23.9*
Absent	65	*92.9*	5	*7.1*	70	*76.1*
Total	87	*94.6*	5	*5.4*	92	*100.0*

Results of a Fisher's Exact test show that there is no significant relationship between the presence of dental modification and whether the individuals were buried supine or prone (p=0.330, with significance at the p<0.05 level). The majority of individuals at Jícaro were buried supine, and their burial in that position is unrelated to whether or not their teeth were modified.

Table 5.99: Dental Modification—Head Orientation.

Head Orientation	Dental Modification				Total	Freq.%
	Present	Freq.%	Absent	Freq.%		
N	8	*34.8*	5	*6.9*	13	*13.7*
NE	1	*4.3*	3	*4.2*	4	*4.2*
E	0	*0.0*	10	*13.9*	10	*10.5*
SE	2	*8.7*	3	*4.2*	5	*5.3*
S	1	*4.3*	3	*4.2*	4	*4.2*

Table 5.99 (cont'd).

Head Orientation	**Dental Modification**				**Total**	**Freq.%**
	Present	Freq.%	Absent	Freq.%		
SW	1	*4.3*	3	*4.2*	4	*4.2*
W	7	*30.4*	25	*34.7*	32	*33.7*
NW	3	*13.0*	20	*27.8*	23	*24.2*
Total	23	*24.2*	72	*75.8*	95	*100.0*

No statistical test for the presence of relationships was conducted for the data in Table 5.98 because too many cells would have an expected value of less than 5, making Chi-Square inappropriate, the table contains too many cells for a Fisher's Exact test to apply, and correspondence analysis is more appropriately applied to data sets involving more than two variables. The data presented in Table 5.99, above, show that a majority of individuals at Jícaro were buried with their heads oriented toward the west, northwest, and north. A slightly higher frequency of individuals with modified teeth were found with their heads oriented toward the north than any other orientation, and no individuals with modified teeth were buried with their heads oriented toward the east, possibly indicating a group affiliation or identity that involves modified teeth and head orientation toward the north.

Table 5.100: Dental Modification—Arm Position.

Dental Modification	**Arm Position**				**Total**	***Freq.%***
	Similar	*Freq.%*	Different	*Freq.%*		
Present	9	*50.0*	9	*50.0*	18	*21.6*
Absent	42	*65.6*	22	*34.4*	64	*78.0*
Total	51	*62.2*	31	*37.8*	82	*100.0*

Results from a Chi-square test show that there is no statistically significant relationship between the presence or absence of dental modification and arm position (X^2=1.459, df=1, p=0.227, with significance at the $p<0.05$ level). Individuals with or without dental modification were more likely to be buried with their arms in similar positions than with their arms in different positions, which is consistent with the majority of the sample from Jícaro.

Table 5.101: Dental Modification—Leg Position.

Dental Modification	Leg Position				Total	*Freq.%*
	Extended	*Freq.%*	One or both flexed	*Freq.%*		
Present	23	*100.0*	0	*0.0*	23	*25.8*
Absent	60	*90.9*	6	*9.0*	66	*74.2*
Total	83	*93.3*	6	*6.7*	89	*100.0*

Fisher's Exact test results indicate no statistically significant relationship between dental modification and leg position ($p=0.332$, with significance at the $p<0.05$ level). Individuals with or without dental modification were more likely to be buried with their legs extended than with their legs flexed, which is consistent with the majority of the sample from Jícaro.

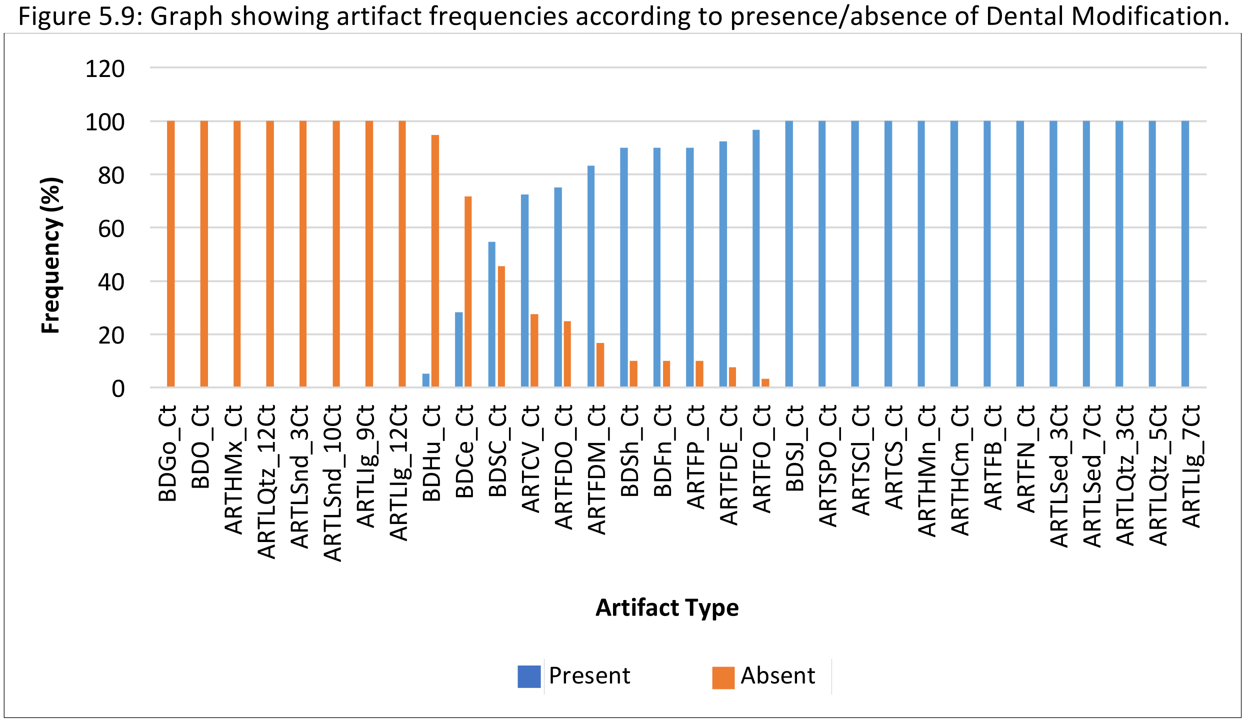
Table 5.102: Dental Modification—Grave Goods.

Dental Modification	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Present	14	*48.3*	15	*51.7*	29	*27.6*
Absent	61	*80.3*	15	*19.7*	76	*72.4*
Total	75	*71.4*	30	*28.6*	105	*100.0*

Results from a Chi-square test indicate a significant relationship exists between the presence of dental modification and the presence of any grave goods ($X^2=10.524$, $df=1$, $p=0.001$, with significance at the $p<0.05$ level). Of the 30 adults with no grave goods, half showed evidence of modified teeth and half did not, and of the approximately 30 individuals with modified teeth, half were buried with grave goods and half were not. A larger number of individuals without dental modification were buried with grave goods than the number of individuals with dental modification or without grave goods.

The graph in Figure 5.9, below, shows the frequency of artifacts associated with individuals who had modified teeth (orange) and individuals who did not have modified teeth (blue). Individuals with dental modification were less frequently associated with grave goods than individuals without dental modification, and the graph shows that their associated artifact types also varied. Artifacts such as (left to right) the only gold bead found at the site, beads of indeterminate raw material, human maxilla, quartz tools/weapons, polished sandstone, sandstone tablet/preform, mano/mano fragments, and tools/weapons made from igneous rock were found only in association with individuals who had dental modification. Artifacts such as (left to right) jade beads, pearl oyster shells, shell columellas, ceramic spindles, human mandibles, cylindrical combs made from human bone, faunal bones, faunal bone needles, polished sedimentary rocks, polished petaloid artifacts made out of sedimentary rock, polished quartz, quartz flakes, and polished petaloid artifacts made out of igneous rock were found only in association with individuals who did not have modified teeth. A small number of artifacts were found in association with individuals with or without modified teeth, such as human tooth beads (more frequently found with individuals who had modified teeth), ceramic beads, shell and ceramic beads in combination, ceramic vessels, deer bones (other than metapodials and other extremities), deer metapodials, shell beads, faunal beads, faunal bone/tooth pendants, deer extremity bones (other than metapodials), and other faunal artifacts.

Figure 5.9: Graph showing artifact frequencies according to presence/absence of Dental Modification.



Summary of Mortuary Treatments, Health and Activity

Very few significant relationships were detected among the skeletal indicators of health and activity and mortuary treatments. The majority of individuals at Jícaro were buried in extended, supine positions, with their arms in similar positions and their legs extended, and their heads oriented toward the west, northwest, or north. The presence of periostitis is used here as evidence of a systemic infection or disease process that would likely have affected the quality of the individual's life near the time of his/her death, based on the assumption that for an infection to reach the point that it was affecting the skeleton it must have been prolonged and somewhat severe (Ortner, 2003). Although the individuals who show evidence of periostitis would probably have had externally visible evidence of their ailments, there does not appear to be any significant relationship between their affliction and differential mortuary treatment.

Individuals who show evidence of LSAMAT would have participated in an activity that involved processing a material, probably a plant fiber of some kind, either for a work- or diet-related purpose (Saul and Saul, 1989; Turner and Machado, 1983; Turner et al. 1987), and repeated activity related to diet or work is also likely related to an individual's social role or identity. Individuals who showed evidence of LSAMAT did not receive different mortuary treatments with regard to their body position and orientation than those without evidence of LSAMAT, but the quantity and type of grave goods varies between the two groups.

Dental modification is also a potential indicator of social difference, as it is not a characteristic shared by the majority of the individuals at Jícaro. No significant relationships were detected with regard to body position and whether individuals had modified teeth or not, but there is a relationship between the body orientation and dental modification. Individuals at Jícaro were more likely to have their heads oriented toward the west, northwest, or north (although some individuals were buried in each of the 8 possible directions), but a disproportionate number of individuals with modified teeth were buried with their heads facing the north and none of the 19 individuals buried with their heads facing the east had modified teeth. There is also a significant relationship between the presence of grave goods and dental modification in that a greater number of individuals without dental modification were buried with grave goods than the number of individuals with dental modification but no artifacts or the number of individuals with artifacts but no modified teeth. While this relationship is significant, it is not surprising. The majority of individuals at Jícaro were buried with grave goods and a majority of the individuals at the site did not have modified teeth, so it follows that a disproportionately large group would have grave goods and no modified teeth.

Chapter Summary

This chapter presented the results of statistical analyses intended to characterize the relationships between mortuary treatments, demographic variables (age and sex), and skeletal indicators of health and identity. Very few statistically significant relationships were discovered among the variables presented in this chapter. The majority of individuals at Jícaro were buried in extended, supine positions, with their arms either both extended or both crossing the body plane and their legs extended, with their heads oriented toward the west, northwest, or north, and most were buried with at least one artifact.

Results of Pearson's Chi-square tests indicate significant relationships between several of the body treatments and the presence or absence of grave goods. Individuals in extended positions are more likely to have been buried with their arms in similar positions (both crossing the body plane or both extended), and a larger proportion of extended individuals were found in association with grave goods than without. A larger number of individuals with grave goods also showed LSAMAT, and a larger number of individuals without grave goods did not show evidence of LSAMAT.

Adults were almost invariably buried in extended dispositions while subadults were split into equal groups of extended or other dispositions, and beads were more frequently encountered with adults and individuals in extended dispositions than with subadults or individuals in other dispositions. Burial position was significantly related to the presence of ceramic artifacts—the majority of individuals buried in a supine position also had ceramic artifacts while individuals buried in prone positions were just as likely to have been buried with ceramic artifacts as without. Unlike the extended or other disposition, no relationship was found between a supine or prone position and age-at-death or sex.

The majority of individuals at the site were buried with their heads facing the west, northwest, or north, regardless of their age-at-death, sex, or health. A disproportionately small number of individuals with their heads facing the west, northwest and north were buried with lithic artifacts of any kind. Shell artifacts were most frequently associated with individuals whose heads were oriented toward the east, compared with other directions, and interestingly none of the 19 individuals with dental modification were buried with their heads facing the east.

Artifacts made from human remains were exclusively found with adults, mostly males and two probable females (though it is possible that sex was not determined correctly for the probable females, which would change this result from mostly males with human remains as artifacts to all males). These artifacts were only found in association with middle and older adults, no young adults, suggesting a possible age-related criterion for including the artifacts made from human remains. Faunal bone artifacts are also consistently absent from subadult burials.

This chapter shows that mortuary treatments are generally similar for most adults/subadults, males/females and for people who may have had different roles within the society, based on evidence of repeated activity (LSAMAT), health (periostitis), and identity (dental modification), though there are some significant relationships between those variables and the presence or absence of certain grave goods and the orientation of their heads facing certain directions.

Chapter 6: Spatial Analysis of Jícaro

Introduction

The previous two chapters focused on the analysis of the individuals from Jícaro and provided an overview of the types of burial treatments that were common at the site during its occupation. For the most part, males and females, subadults and adults were treated very similarly in death, at least with regard to their burial positions and the artifacts that survived in the ground and did not decompose. While the data presented in the previous chapters is valuable at the individual and burial levels, it says nothing about how the individuals and burials were related to one another with regard to space. Spatial analysis of burials at archaeological sites can provide insights regarding group identity, individual or group status, and possibly differential mortuary behaviors based on demographic or health characteristics. If the inhabitants of a site were making decisions regarding mortuary treatments based on such criteria, then they should be noticeable visually.

Jícaro is approximately 4.9 hectares in total area. Archaeologists excavated 46 units (operations) over three field seasons, 25 of which contained burials. Jícaro is divided into five sectors (north-to-south) by four seasonal streams and, according to archaeologists Solís and Herrera (personal communication 2008), during the initial survey phase of the project, differences in artifact distributions were identified from sector-to-sector.

No formal cemetery was identified at Jícaro, rather the burials were distributed throughout the site, some under or near house structures, others in what appear to have been more open areas; some in areas that appear to have been reused for many years, indicating a long-lasting social memory of their locations, others that were eventually covered by *concheros* and possibly forgotten; most on the valley floor, others at higher elevations on the hillside. There is a great deal of diversity of burial contexts and very little evidence for any organized mortuary complex at Jícaro, which complicates interpretations of the use of space at the site.

Figure 6.1: Map showing the site of Jícaro.

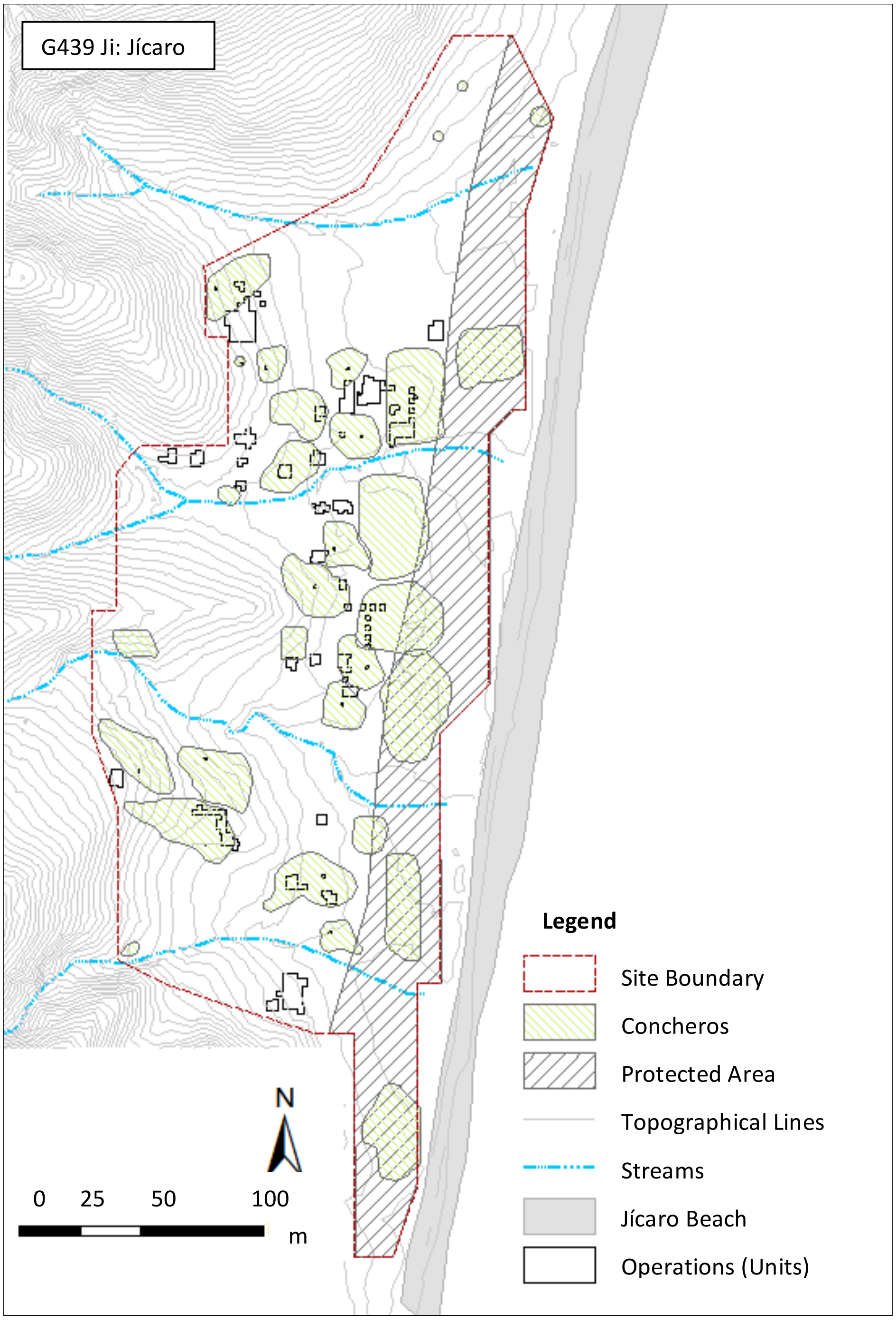


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Table 6.1: Number of burials per operation.

Operation	Burials	*Freq.%*	Operation	Burials	*Freq.%*
2	2	*0.8*	34	7	*3.0*
3	5	*2.1*	35	3	*1.3*
8	1	*0.4*	36	1	*0.4*
19	6	*2.5*	37	6	*2.5*
21	16	*6.8*	38	4	*1.7*
22	30	*12.7*	39	6	*2.5*
24	53	*22.4*	41	7	*3.0*
26	8	*3.4*	42	5	*2.1*
28	3	*1.3*	43	4	*1.7*
29	11	*4.6*	44	1	*0.4*
30	11	*4.6*	45	6	*2.5*
31	23	*9.7*	46	17	*7.2*
33	1	*0.4*	Total	237	*100.0*

The spatial analysis at Jícaro is also affected by the way in which the site was excavated. The excavations were part of a salvage archaeology project with a limited timeline and the archaeological team was forced to prioritize areas of the site to excavate, so their excavations focused on areas where they identified increased densities of artifact concentrations during a survey season in 2005. Because 100% of the site was not excavated and excavation operations were placed in strategic (although scattered) locations throughout the site, any interpretation of the use of space at the site is inevitably biased. The burials appear to be clustered according to operation, but because it is not possible to know how many burials were not encountered during the excavations at the site, it is not possible to know how meaningful the clusters of burials are at the operation level. It is also possible that the burials reflect sector-level differences, possibly related to group identities based on activity/work or family units.

Operation-Level Analysis

Operation 24 yielded a disproportionately large number of burials compared with the rest of the operations (N=53), with the next highest number of burials from Operations 22 (N=30) and 31 (N=23). This operation is interesting in itself because a number of the burials were concentrated in one area, essentially stacked in a column with several of them having been intrusive into others, suggesting reuse of the same burial fossa over time. While the evidence for reuse is an interesting aspect of Operation 24 and will be addressed below, the presence of nearly twice as many burials in that operation compared with the next closest number of burials in an operation affects the potential for meaningful analyses of space at the site based on distributions of individuals, cultural modifications, burial practices and artifacts because no matter which variable is selected for assessment, Operation 24 shows the highest frequency. Similarly, Operations 22 and 31, because of the number of burials and individuals discovered in those areas, also show higher frequencies of any variables being assessed for spatial relationships than the operations with smaller numbers of burials. For this reason, operation-level analysis was not practical and a different sampling strategy for spatial analysis based on clusters of burials was developed.

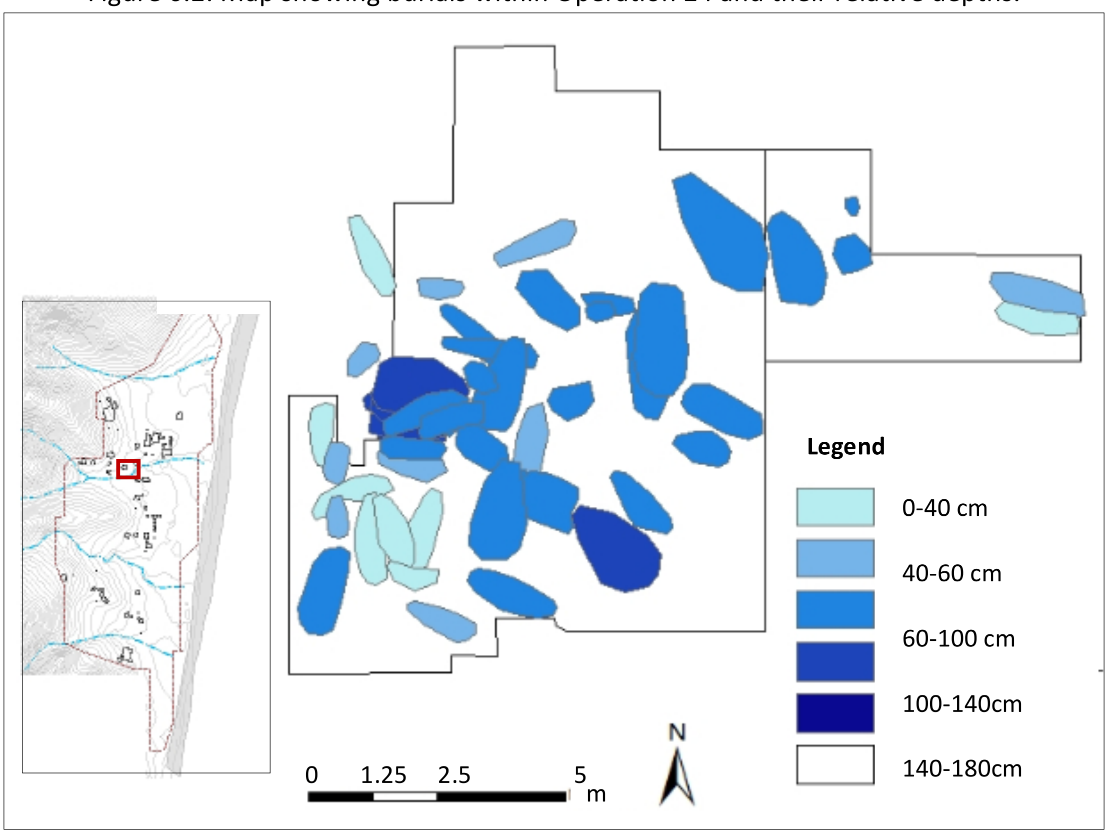
Operation 24

Reuse is common at Jícaro, mainly in the form of what appear to be secondary treatments of individuals who were found in association with other individuals who appeared to have been in a position of primary interment. According to Hardy (1992), similar burial practices were noted at the site of Nacascolo. Primary individuals at Jícaro are typically interred in an extended disposition, supine, with their arms extended at the sides, while apparent secondary treatments involve clusters or bundles of bones beneath or beside the primary individual(s) or scatters of human remains that appear to have been pushed out of the way to make room for the primary individual(s), which is also noted at

Nacascolo and has been documented in the Maya region (Wrobel et al., 2015) and in tombs that were used for generations throughout Mesoamerica (e.g., Mountjoy et al., 2007). The apparent reuse of the same space over time is a special feature of Operation 24 which is located in a relatively flat area in Sector 2, approximately 80 meters north and 30 meters east of the site's geographical center. This was an area that yielded artifacts with domestic and funerary significance during the survey season, and it is one of the few locations where a relatively intact floor, possibly from a domestic structure, was discovered.

Operation 24 is exceptional at Jícaro because of the number of burials within it and because of the concentration of burials in the western portion. For this reason, a separate analysis of Operation 24 was conducted.

Figure 6.2: Map showing burials within Operation 24 and their relative depths.



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Operation 24 (Figure 6.1) has a concentration of burials at its western extremity that may indicate substantial reuse of a burial area. The concentration (black circle) is the location of the burials presented in Table 6.2, below.

Table 6.2: Burials in area of reuse from Operation 24.

Burial	MNI	Depth	Age	Sex	Condition
49	1	71-80 cm	Adult	Probable Female	Scatter
57	1	79-98 cm	Middle Adult	Male	Articulated, with extra elements
83	6	112-121 cm	Ind.1: Young Adult	Probable Female	Articulated
			Ind. 2-6: fetal/infants	Undetermined	Disarticulated, fragmentary
99	1	115-138 cm	Young Adult	Probable Female	Articulated
100	1	120-148 cm	Young Adult	Probable Male	Articulated
103	1	120-135 cm	Middle Adult	Male	Articulated
104	1	130-148 cm	Older Adult	Female	Articulated, intruded upon
105	2	132-149 cm	Ind. 1: Middle Adult	Male	Articulated
			Ind. 2: Young Adult	Female	Articulated
106	1	131-149 cm	Young Adult	Female	Articulated, intruded into 104
110	3	132-143 cm	Older Adult	Male	Disarticulated
			Child (3-5 years)	Undetermined	Disarticulated
			Adult	Probable Female	Disarticulated

The individuals in this concentration (N=10 burials, 18 individuals) are mostly young-to-middle adults 7 FPF, 5 MPM, and no undetermined adults, with 6 subadults (1 child, 5 fetal/infants). The male in Burial 57 was buried with three isolated crania which, for the purpose of this study, are not considered separate individuals, but are being treated as artifacts. Results from a Chi-square test show that no significant relationship exists between being buried as part of the cluster or elsewhere in Operation 24 and age-at-death (X^2=0.229, df=1, p=0.632, with significance at the p<0.05 level) or sex (X^2=3.665, df=1, p=0.056, with significance at the p<0.05 level). Body disposition, position and head orientation could be determined for 10 of the individuals in this concentration, and of those 10 individuals all but 2 were buried in an extended position with their arms at the sides, which is consistent with other burials in the Operation. Of the 10 individuals whose head orientation could be determined, 7 (70%) were buried with their heads to the west, and one was buried with the head in the east, southeast, and northwest. The individuals who were buried within Operation 24 and who were not part of the concentration (N=40) were mostly buried with their heads to the north (N=11, 27.5%) or northwest (N=11, 27.5%) and only 5 (12.5%) were buried with their heads toward the west, which sets the concentration apart from the rest of the area.

When artifact distributions in the operation are examined, Chi-square and Fisher's Exact test results indicate no significant relationships between burial in the concentration and the presence of ceramic artifacts, human remains artifacts, faunal artifacts, or lithics (tables provided in Appendix F); however, significant relationships were indicated between burial in the concentration and the presence of beads and shell artifacts.

Table 6.3: Beads within/outside reuse concentration in Operation 24.

Operation 24	**Beads**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Concentration	9	*81.8*	2	*18.2*	11	*22.4*
Outside Concentration	15	*39.5*	23	*60.5*	38	*77.6*
Total	24	*49.0*	25	*51.0*	49	*100.0*

Table 6.4: Shell within/outside reuse concentration in Operation 24.

Operation 24	**Shell Artifacts**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Concentration	11	*100.0*	0	*0.0*	11	*22.4*
Outside Concentration	13	*34.2*	25	*65.8*	38	*77.6*
Total	24	*49.0*	25	*51.0*	49	*100.0*

The tables above show results from Chi-square tests that indicate significant relationships between burial in the concentration and presence of beads (X^2=6.121, df=1, p=0.013) and shell artifacts (X^2=14.775, df=1, p=0.000). Though the concentration sample is extremely small (N=11), the tests indicate that a greater proportion of concentration burials contained beads and shell artifacts than the proportion of burials outside the concentration that contained beads and shell artifacts.

Cluster-Level Analysis

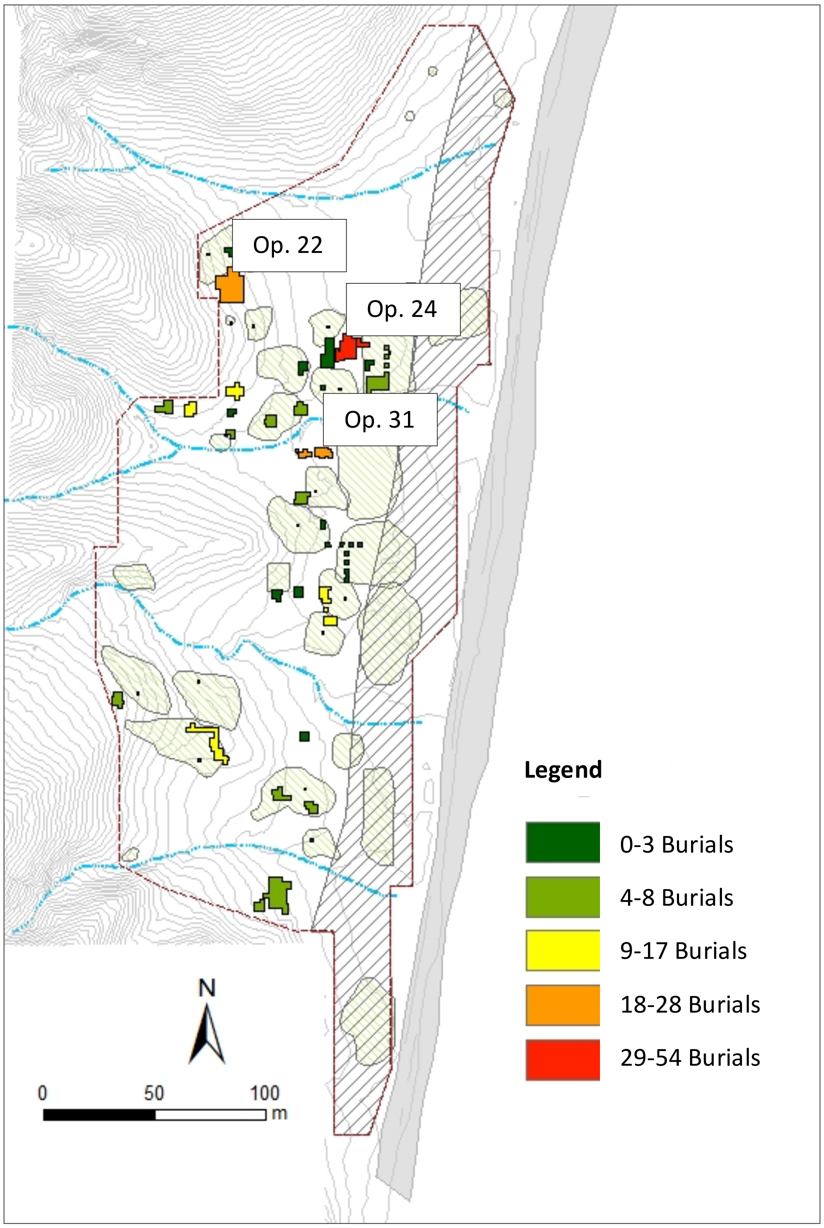
Because of the potential for bias at the operation level and the artifact evidence for possible sector-related relationships, clusters of burials were identified for the purpose of a spatial analysis of Jícaro. At the nearby site of Nacascolo, burials of individuals who were believed to have been elites were discovered at higher elevations on the hillside than those who were believed to have been commoners (Hardy, 1992), so elevation was considered as a criterion for identification of clusters at Jícaro. Nine clusters were identified based on proximity of burial concentrations and their elevations, all of which were assessed for frequency of males/females, adults/subadults, health conditions, cultural modifications, and mortuary treatments (see Figure 6.2 on the following page). The clusters are based purely on visual inspection of the distribution of burials and may not reflect the intentional groupings of the inhabitants of Jícaro.

The clusters are numbered and organized from north-to-south, with Cluster 1 being the northernmost (in Sector 2) and Cluster 9 being the southernmost (in Sector 5). The circles that indicate the clusters may cross the natural divisions between sectors created by the seasonal streams that cut through the site, but none of the actual burial clusters cross different sectors. This was done intentionally to have the cluster analysis remain consistent with and have some foundation in the natural site organization. The results of spatial analysis of Jícaro based on clusters of burials is presented in this section.

The clusters are numbered and organized from north-to-south, with Cluster 1 being the northernmost (in Sector 2) and Cluster 9 being the southernmost (in Sector 5). The circles that indicate the clusters may cross the natural divisions between sectors created by the seasonal streams that cut

through the site, but none of the actual burial clusters cross different sectors. This was done intentionally to have the cluster analysis remain consistent with and have some foundation in the natural site organization. The results of spatial analysis of Jícaro based on clusters of burials is presented in this section.

Figure 6.3: Map of Jícaro showing burial concentrations.



 This map was created by J. Wankmiller for the purpose of this document and is adapted from a map of Jícaro in Solís and Herrera (2008).

Table 6.5: Clusters with frequencies of Operations, Burials and Individuals.

Cluster	Operations	Burials	*Freq.%*	Individuals	*Freq.%*
1	22	30	*12.7*	46	*19.4*
2	2, 3, 24, 26, 28, 44	72	*30.4*	153	*64.6*
3	8, 19, 21, 29, 37, 43	44	*18.5*	70	*29.5*
4	31, 34, 36	31	*13.1*	57	*24.1*
5	30, 33, 35	15	*6.3*	24	*10.1*
6	39	6	*2.5*	15	*6.3*
7	46	17	*7.2*	32	*13.5*
8	38, 42	9	*3.8*	10	*4.2*
9	41, 45	13	*5.5*	27	*11.4*
Total		237	*100.0*	434	*100.0*

Table 6.5, above, only includes lists of the operations per cluster that included burials, although additional operations may be included in the visual representation of the clusters in the map presented in Figure 6.3, below. Cluster 6 (Operation 39, 6 burials, 15 individuals) is located on the hillside at a substantially higher elevation than the rest of the clusters/operations. The MNI may be slightly off because the final MNI for the examined sample of 308 individuals changed following the laboratory analysis of the human skeletal remains, but much of the spatial analysis of Jícaro is based on archaeological data that was recorded prior to the analysis that was conducted for this project. The MNI is not ever more than about 10 individuals different from one estimate to another and is not believed to affect the overall analysis, as the discrepancies lie in whether or not isolated crania and postcranial elements were considered separate individuals. No actual burials or individuals who meet the criteria for an individual (see Chapter 3) were excluded from this analysis.

Table 6.6: Clusters with number of individuals examined for this study.

Cluster	Individuals				Total	*Freq.%*
	Examined	*Freq.%*	Not Examined	*Freq.%*		
1	31	*67.4*	13	*28.3*	46	*10.6*
2	124	*81.0*	29	*19.0*	153	*35.2*
3	49	*70.0*	21	*30.0*	70	*16.1*
4	37	*64.9*	20	*35.1*	57	*13.1*
5	14	*58.3*	10	*41.7*	24	*5.5*

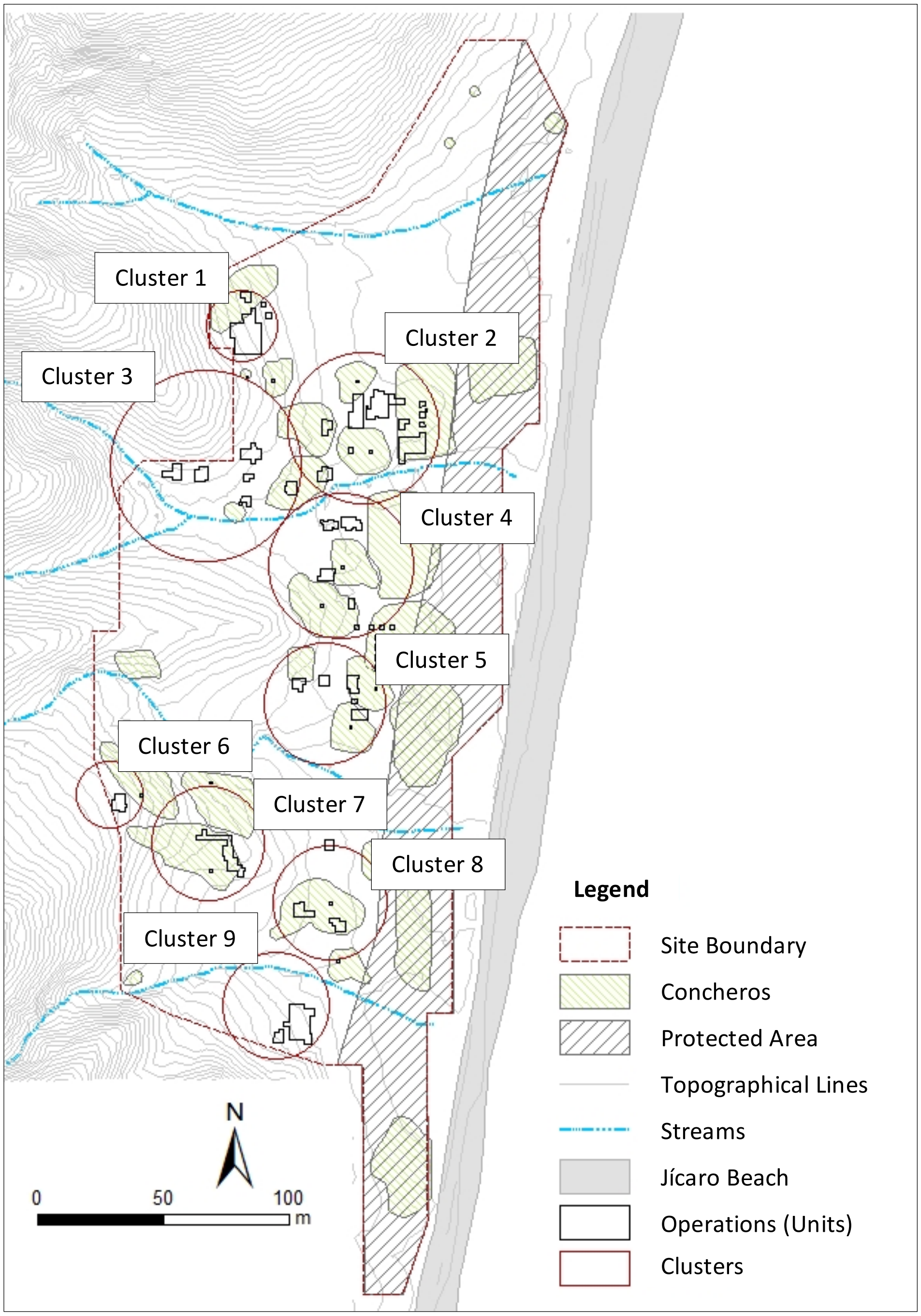
Table 6.6 (cont'd).

Cluster	**Individuals**				**Total**	***Freq.%***
	Examined	*Freq.%*	Not Examined	*Freq.%*		
6	1	*6.7*	14	*93.3*	15	*3.5*
7	29	*90.6*	3	*9.4*	32	*7.4*
8	6	*60.0*	4	*40.0*	10	*2.3*
9	17	*63.0*	10	*37.0*	27	*6.2*
Total	308	*71.0*	126	*29.0*	434	*100.0*

Of the 434 individuals documented at Jícaro, only 308 (71%) were analyzed during the fieldwork portion of this study; the other 126 (29%) remain unexamined by a physical anthropologist. For the purposes of the spatial analyses that follow, only the 308 examined individuals are included in analyses regarding age-at-death and sex, but the entire sample of burials is considered when analyses involve funerary treatments, such as body disposition, position, head orientation, and associated grave goods. The sole individual from Cluster 6 who was identified during the fieldwork portion of this study was not observable for many biological characteristics and is omitted from analyses involving variables that could not be observed.

Burials were not discovered in all 46 operations at Jícaro and those without burials were not included in the spatial analysis of Jícaro.

Figure 6.4: Map of Jícaro showing locations of excavation units and clusters.



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Spatial Analysis of Demographic and Health Variables

The clusters were compared with regard to demographic variables of the burials/individuals contained within them, cultural modifications (dental modification, LSAMAT), and burial treatment. The following section presents the results of those analyses.

Figure 6.5: Maps showing distribution of FPF (left) and MPM (right) at Jícaro.

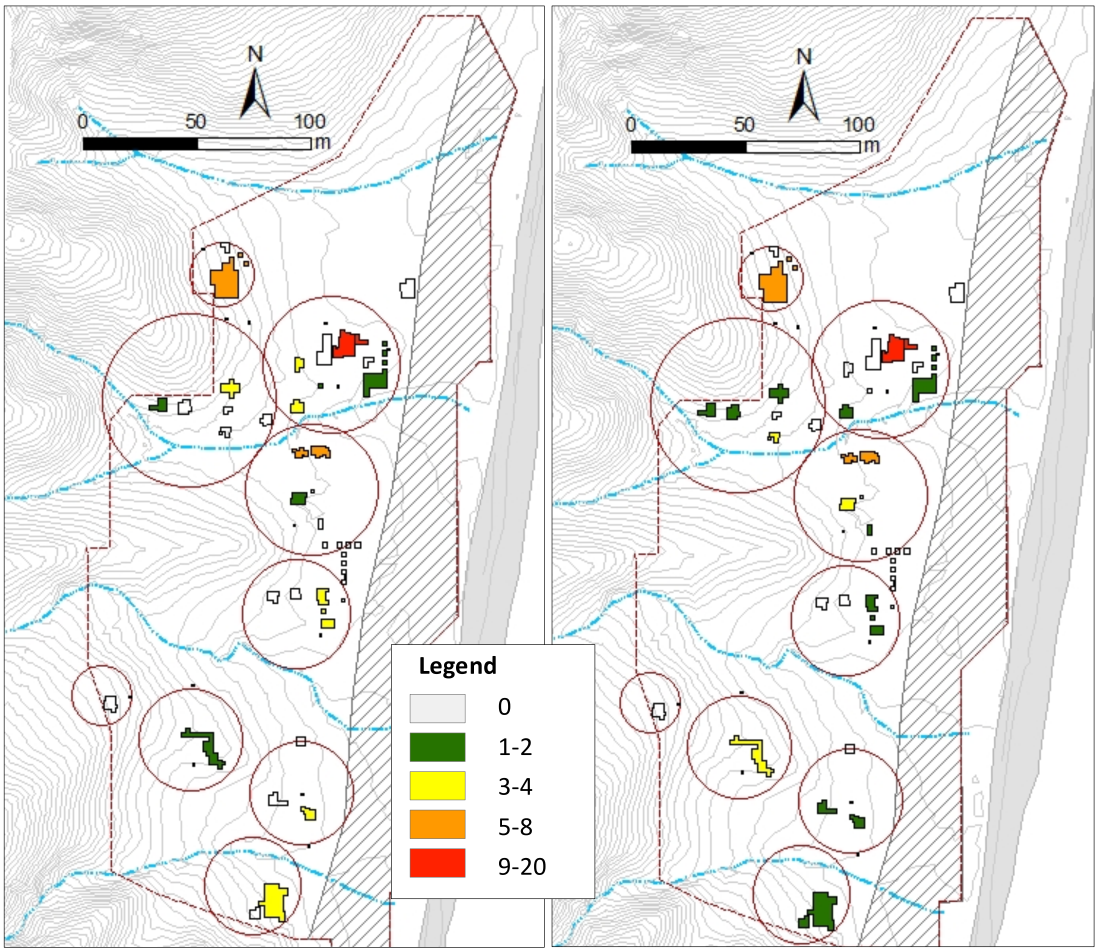

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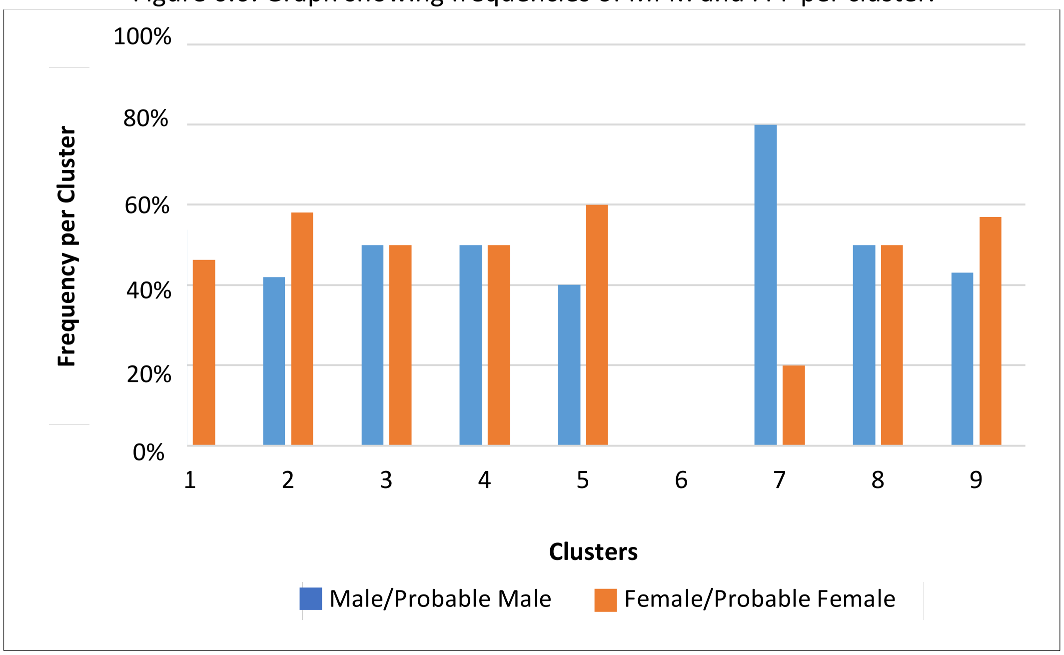
Table 6.7: Sex distribution according to cluster.

Cluster	Sex				Total	*Freq.%*
	MPM	*Freq.%*	FPF	*Freq.%*		
1	7	*53.8*	6	*46.2*	13	*10.8*
2	21	*42.0*	29	*58.0*	50	*41.7*
3	6	*50.0*	6	*50.0*	12	*10.0*
4	11	*50.0*	11	*50.0*	22	*18.3*
5	2	*40.0*	3	*60.0*	5	*4.2*
7	4	*80.0*	1	*20.0*	5	*4.2*
8	3	*50.0*	3	*50.0*	6	*5.0*
9	3	*43.0*	4	*57.0*	7	*5.8*
Total	57	*47.5*	63	*52.5*	120	*100.0*

Figure 6.6: Graph showing frequencies of MPM and FPF per cluster.



Sex could only be determined for 120 of the 156 adults who were analyzed during the fieldwork phase of this study. When the clusters are analyzed for the frequency of males and females present in each, there are approximately 50% M/F, except for Clusters 6 and 7. Though 15 individuals were recovered from Operation 39 (Cluster 6), only one of them was analyzed as part of this research and that individual was of undetermined sex. As a result, because these analyses focus only on individuals for whom sex could be determined, it appears as though there are no individuals in Cluster 6. Cluster 7 contains 14 adults, but sex could be determined for only 5 of them, so while it appears as though there are four times as many males as females in that cluster, those numbers may not be representative of the cluster as a whole. This brings up an important point. The relatively even distribution of males and females in each cluster may change if/when sex can be determined for the remaining adults in the sample. The graph in Figure 6.6 shows a visual representation of the information provided in Table 6.7. While there appears to be a larger proportion of males relative to females in Cluster 7, generally males and females are relatively equally represented throughout all 8 clusters that contained observable individuals, which is what we would expect if they represent households over time.

Figure 6.7: Maps showing distribution of Subadults (left) and Adults (right) at Jícaro.

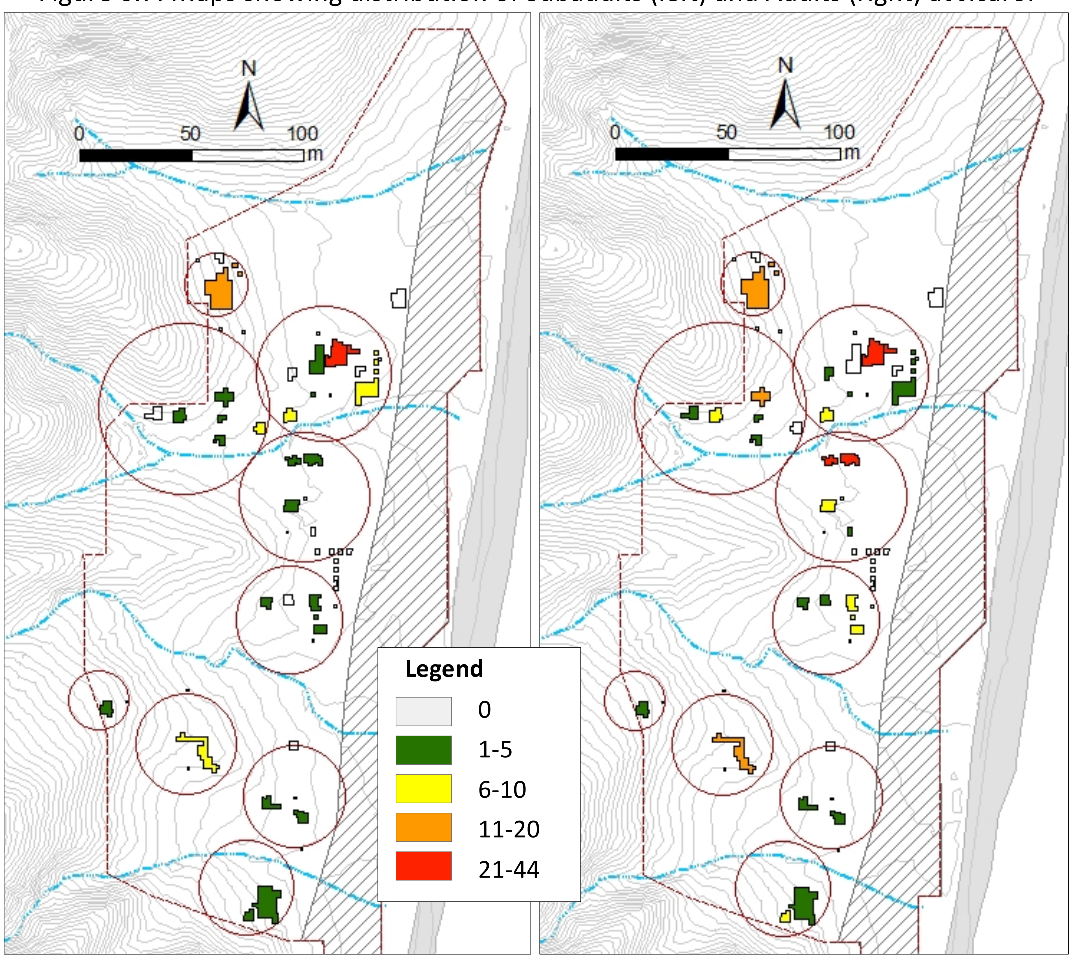


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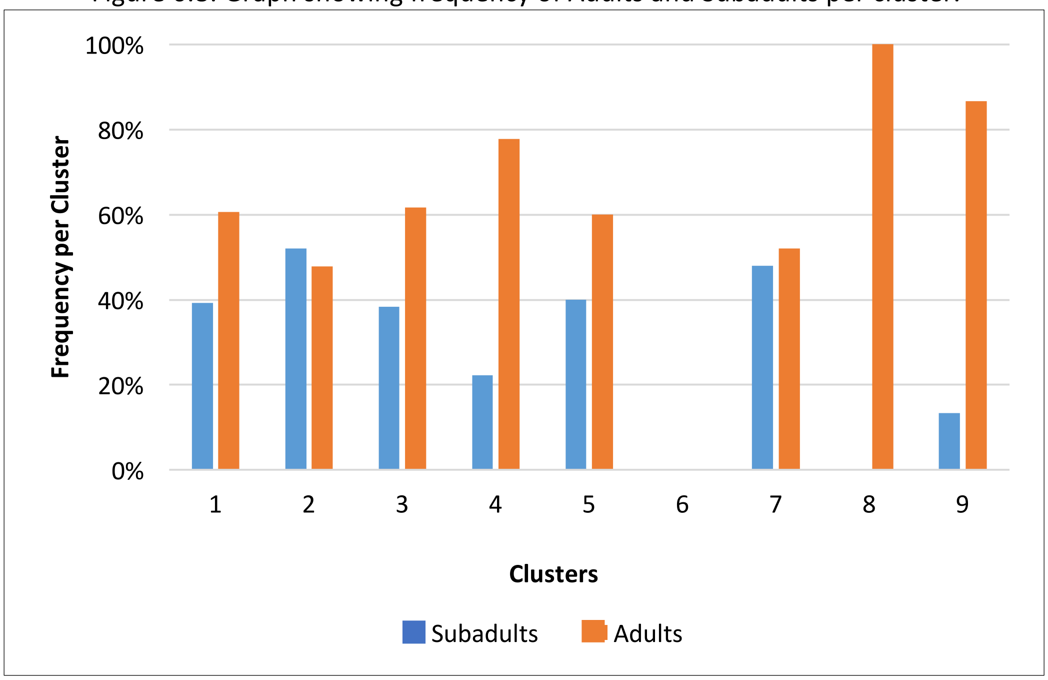
Table 6.8: Age Category distribution according to cluster.

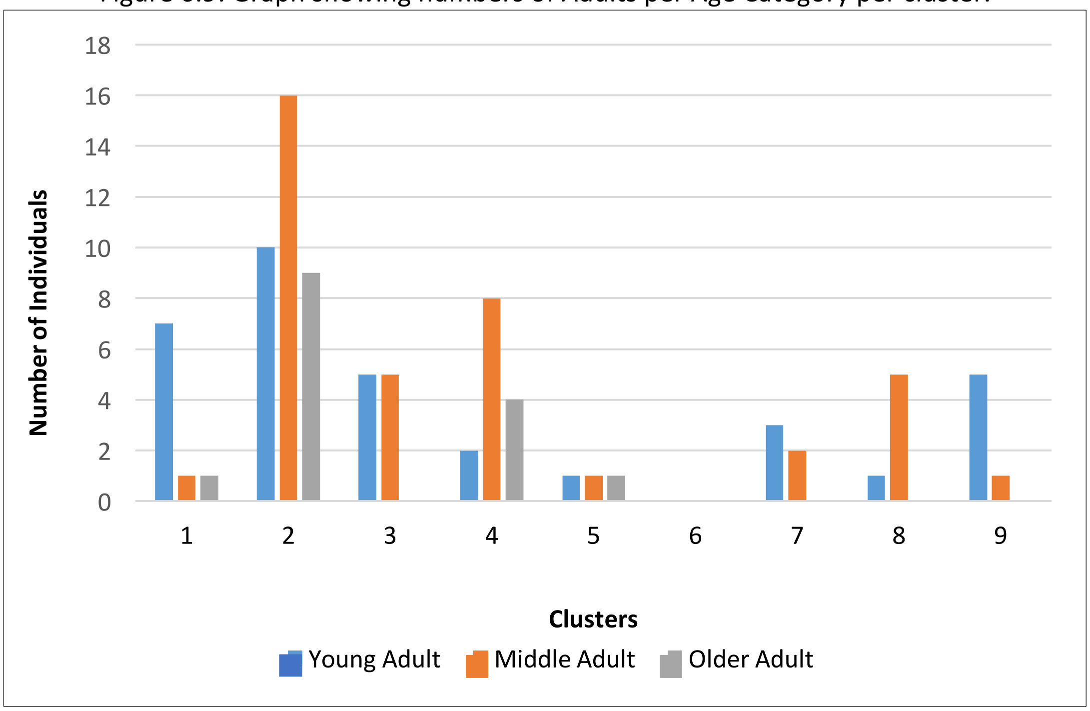
Cluster	Age Category				Total	*Freq.%*
	Subadult	*Freq.%*	Adult	*Freq.%*		
1	11	*39.3*	17	*60.7*	28	*9.9*
2	61	*52.1*	56	*47.9*	117	*41.2*
3	18	*38.3*	29	*61.7*	47	*16.5*
4	8	*22.2*	28	*77.8*	36	*12.7*
5	4	*40.0*	6	*60.0*	10	*3.5*
6	0	*0.0*	0	*0.0*	0	*0.0*
7	12	*48.0*	13	*52.0*	25	*8.8*
8	0	*0.0*	6	*100*	6	*2.1*
9	2	*13.3*	13	*86.7*	15	*5.3*
Total	116	*40.8*	168	*59.2*	284	*100.0*

Figure 6.8: Graph showing frequency of Adults and Subadults per cluster.



Age-at-death could be determined for 284 (92.2%) of the 308 individuals who were analyzed during the fieldwork phase of this study. When the clusters are analyzed for the frequency of adults and subadults associated with them, there is slighlty more variability than with sex distribution for the adults. Clusters 1, 2, 3, 5 and 7 show a relatively even distribution of adults and subadults, whereas the majority of the individuals for whom age could be determined are adults in Clusters 4, 8, and 9. Again, although 15 individuals were recovered from Operation 39 (Cluster 6), only one of them was analyzed as part of this research and that individual was of undetermined age-at-death, and as the ages-at-death of more individuals are determined in the future, the distributions of adults and subadults per cluster may change. Clusters 8 and 9 show a disproportionately high frequency of adults compared to subadults, which may indicate areas within those clusters could have been reserved for individuals who reached adulthood. The graph in Figure 6.8, above, provides an illustration of the frequency of adults and subadults per cluster, but does not appear to demonstrate a pattern related to the use of space at the site.

Figure 6.9: Graph showing numbers of Adults per Age Category per cluster.



The graph in Figure 6.8 shows the number of adults from each age category (Young Adult, Middle Adult, Older Adult) according to cluster. Some of the sample sizes are so small that a graph based on frequencies per cluster would have been misleading, so for this variable the number of individuals was chosen to be represented. Figure 6.8 shows that the largest number of individuals at Jícaro were associated with Cluster 2, which has been well established. This graph shows that Cluster 1 and Cluster 9 contained a disporportionately high number of young adults compared with middle adults, and no older adults were discovered in the southernmost extremity of the site. Eighty-eight of the 308 examined individuals are included in Figure 6.9, above; adults whose age could not be determined are not included in this analysis. That said, the sample sizes for each Cluster are relatively small which may affect interpretations of the distribution of adult age cohorts throughout the site.

Cultural Characteristics, Health, and Activity

The clusters were also assessed for their respective distributions of cultural characteristics (e.g. dental modification), indicators of health (e.g., evidence of trauma, periostitis, and LEH), and activity (LSAMAT) as a way to explore whether or not indivduals were buried in different locations based on their health and activities that would have led to the skeletal evidence of those traits. Cultural modifications and activity may speak to group identity, while pathological conditions may have affected the individuals' role wtihin the community. The single individual from cluster 6 (Operation 39) who was observed during the fieldwork portion of this study was not observable for any of the health or activity indicators and for that reason is excluded from the following comparisons. It should be noted that for the following comparisons, the a single individual may have expressed more than one of the following physical characteristics.

Table 6.9: Dental Modification distribution according to cluster.

Cluster	**Dental Modification**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
1	1	*6.7*	14	*93.3*	15	*14.2*
2	5	*13.9*	31	*86.1*	36	*34.*0
3	5	*35.7*	9	*64.3*	14	*13.2*
4	5	*38.5*	8	*61.5*	13	*12.3*
5	3	*37.5*	5	*62.5*	8	*7.5*
7	4	*36.4*	7	*63.6*	11	*10.4*
8	2	*50.*0	2	*50.*0	4	*3.8*
9	4	*80.*0	1	*20.*0	5	*4.7*
Total	29	*27.4*	77	*72.6*	106	*100.0*

Figure 6.10: Graph showing the frequency of Dental Modification per cluster.

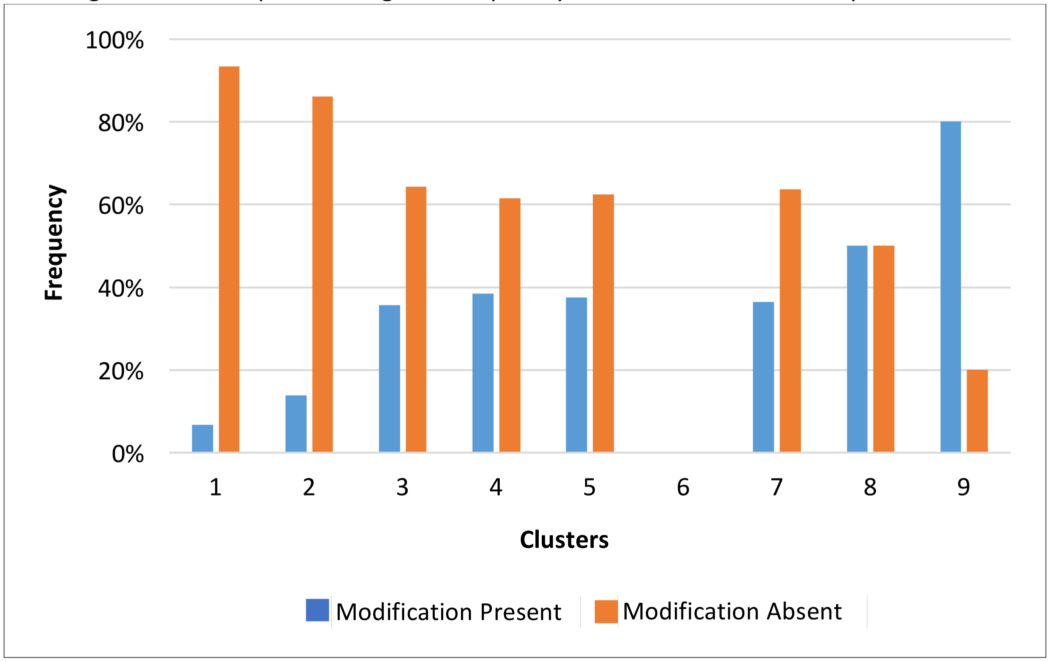


Table 6.9, above, shows the frequency of individuals with dental modification within each burial cluster. Dental modification may be an indication of group or family identity or an indivdual having achieved a particular rite of passage. For those reasons, burial placement of those indivdiuals in specific locations at the site would be understandable. The single individual from Cluster 6 who was anlayzed for this study could not be assessed for dental modification and is therefore not included in this analysis. One-hundred-six of the 308 examined individuals (34.4%) had teeth sufficient for assessment of dental modification. Clusters 1-7 (excluding Cluster 6) show a greater proportion of individuals without dental modification than with dental modification, which is consistent with the overall population from Jícaro. Clusters 8 and 9, both in the southernmost sector, are slightly different. While their sample sizes are extremely small (Cluster 8, N=4; Cluster 9, N=5), there are proportionally more individuals with dental modification than would be expected, based on knowledge of the overall proportion of individuals with and without dental modification at the site.

As the clusters of burials are numbered and arranged from north to south, Figure 6.10, the graph above, appears to illustrate a general incline in the frequency of dental modification and a decrease in the freqency of individuals without dental modification from north-to-south, possibly indicating a shift in status or identity toward the southern end of the site.

Table 6.10: LSAMAT distribution according to cluster.

Cluster	**LSAMAT**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
1	2	*16.7*	10	*83.3*	12	*11.5*
2	20	*50.0*	19	*50.0*	39	*37.5*
3	3	*33.3*	6	*66.7*	9	*8.7*
4	9	*56.3*	7	*43.8*	16	*15.4*
5	5	*71.4*	2	*28.6*	7	*6.7*
7	5	*50.0*	5	*50.0*	10	*9.6*
8	4	*66.7*	2	*33.3*	6	*5.8*
9	2	*40.0*	3	*60.0*	5	*4.8*
Total	50	*48.1*	54	*51.9*	104	*100.0*

Figure 6.11: Graph showing frequency of LSAMAT per cluster.

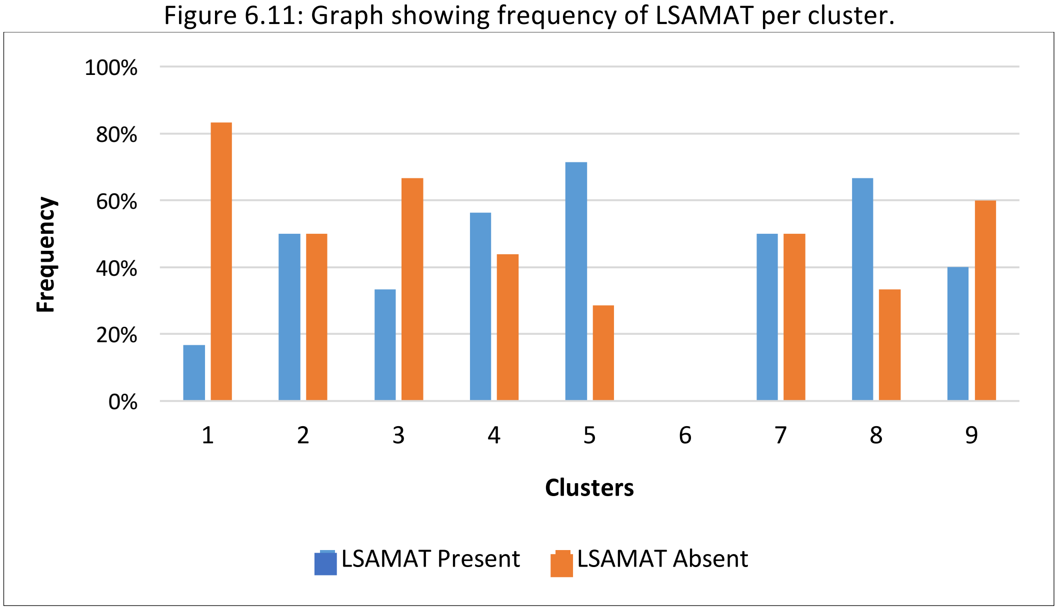


Table 6.10, above, shows the frequency of individuals with lingual surface attrition of the maxillary anterior teeth (LSAMAT) within each burial cluster. Only 104 of the 308 examined individuals

(33.8 %) had teeth observable for LSAMAT. The majority of individuals were located in Cluster 2, which shows a 50/50 distribution among indivduals with and without LSAMAT and is consistent with what would be expected at the site based on analyses presented in Chapter 4. Cluster 7, although it has a substantially smaller sample of burials/individuals, also shows a 50/50 distribution of observable individuals with and without LSAMAT. Clusters 4, 8, and 9 also show a nearly even distribution of observable individuasl with and without LSAMAT. Cluster 5 deviates from the expected distribution in that there is a higher frequency of individuals with LSAMAT than without, and Clusters 1 and 3 show just the opposite—in those two clusters, there is a lower frequency of findividuals with LSAMAT than without. The graph in Figure 6.11 illustrates the frequency of LSAMAT per cluster and while certain clusters appear to have higher frequencies of LSAMAT than others, there does not appear to be a spatially relevant pattern to the distribution of LSAMAT.

Table 6.11: LEH distribution according to cluster.

Cluster	**LEH**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
1	6	*30.*0	14	*70.*0	20	*15.7*
2	20	*46.5*	23	*53.5*	43	*33.9*
3	7	*43.8*	9	*56.3*	16	*12.6*
4	8	*44.4*	10	*55.6*	18	*14.2*
5	2	*25.*0	6	*75.*0	8	*6.3*
7	2	*16.7*	10	*83.3*	12	*9.4*
8	1	*25.*0	3	*75.*0	4	*3.1*
9	4	*66.7*	2	*33.3*	6	*4.7*
Total	50	*39.4*	77	*60.6*	127	*100.0*

Figure 6.12: Graph showing frequency of LEH per cluster.

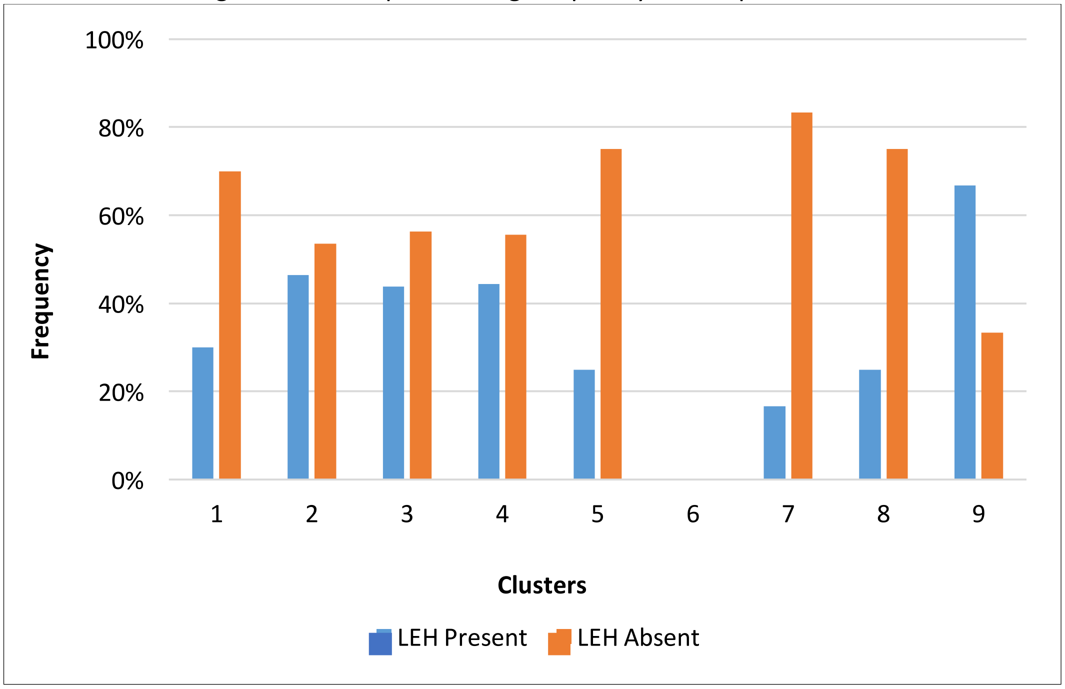


Table 6.11, above, shows the frequency of individuals with linear enamel hypoplasia (LEH) within each burial cluster. In chapter 4, only indiviudals for whom age and sex could be determined were considered (N=122)—individuals with unknown or undetermined age and sex are included in the present analyses (N=127, 41.2% of the 308 examined individuals). Results from Chapter 4 indicate that only about 40% of individuals from Jícaro showed evidence of LEH, while 60% of the observed individuals did not show evidence of LEH. Clusters 2, 3, and 4 show LEH frequencies of 46.5 %, 43.8 %, and 44.4 %, respectively, which are similar to what would be expected at the site in general. Clusters 1, 5, 7, and 8 show much lower frequencies than what would be expected, possibly indicating some sort of buffering against the severe stress that would have led to the expression of LEH on the teeth among the indiviudals who were buried in those areas. Cluster 9 is unusual in that a greater proportion of the observable indiviuals buried within that cluster show evidence of LEH than the proportion of individuals with on LEH, possibly suggesting that indiviudals who were buried within that cluster, at the southern extremity of the site, may have experienced less of a buffer from the stressor that would have led to

LEH. The graph in Figure 6.12 shows higher frequencies of LEH in the northern and southehrn sectors of the site and a lower frequency of LEH toward the center of the site. These differences may reflect differences in diet and access to resources, which may suggest differences in status or group identity, but sampling bias cannot be ruled out.

Table 6.12: Cribra Orbitalia distribution according to cluster.

Cluster	**Cribra Orbitalia**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
1	1	*50.0*	1	*50.0*	2	*4.7*
2	9	*45.0*	11	*55.0*	20	*46.5*
3	20	*50.0*	2	*50.0*	4	*9.3*
4	5	*55.6*	4	*44.4*	9	*20.9*
5	0	*0.0*	1	*100.0*	1	*2.3*
7	1	*25.0*	3	*75*	4	*9.3*
8	0	*0.0*	1	*100.0*	1	*2.3*
9	0	*0.0*	2	*100.0*	2	*4.7*
Total	18	*41.9*	25	*58.1*	43	*100.0*

Figure 6.13: Graph showing frequency of Cribra Orbitalia per cluster.

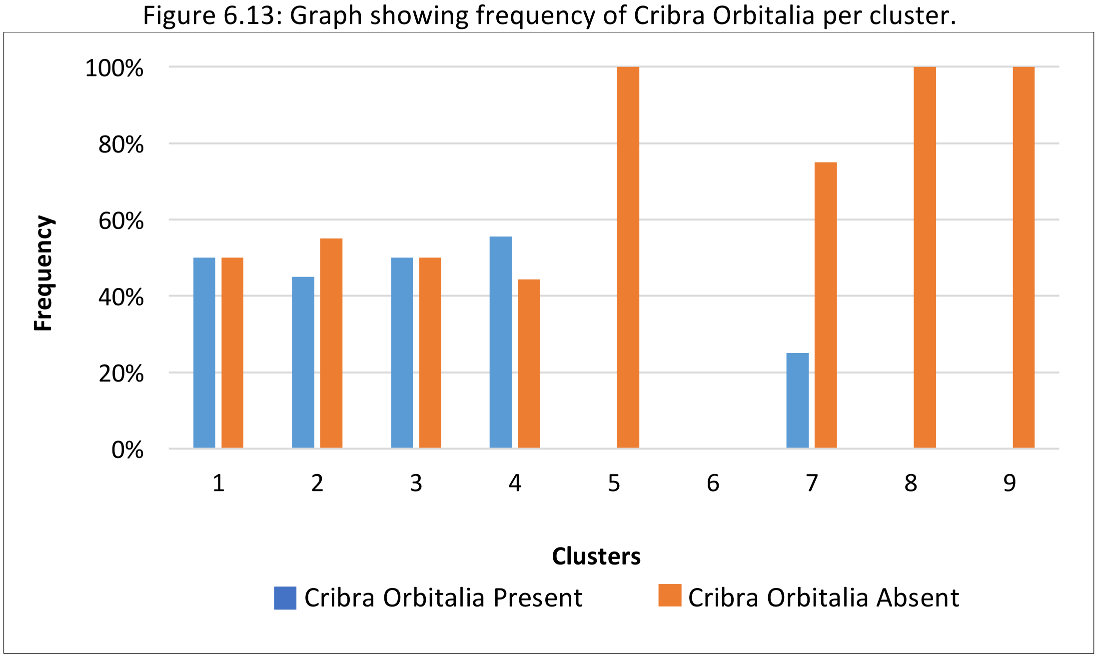


Table 6.12, above, shows the frequency of individuals with cribra orbitalia within each burial cluster. Forty-three of the 308 individuals (14%) were observable for cribra orbitalia. At least one

observable individual was located in each cluster (excluding Cluster 6 for reasons mentioned above). This analysis does not take into consideration the expression of cribra orbitalia, only its presence or absence. According to results from Chapter 4, among observable individuals at Jícaro approximately 60% (adults and subadults combined) show some evidence of cribra orbitalia and 40% show no evidence of cribra orbitalia. With that in mind, Cluster 4, with 55.6 % of the indivdiuals showing evidence of cribra orbitalia, is consistent with what would be expected at the site. All of the other burial clusters show a lower frequency than what would be expected, based on the knowledge of the site's overall frequency of cribra orbitalia. Clusters 1, 2, and 3 show about 50/50 proportion of observable individuals with and without evidence cribra orbitalia, while Clusters 5, 7, 8, and 9 appear to show much lower frequencies of cribra orbitalia; however, the sample sizes in those clusters are N=1, N=4, N=1, and N=2, respectively, so it is entirely possible that the samples are not representative of the population in those areas. Figure 6.13 is a visual representation of the data presented in Table 6.12 and it shows that there is a higher prevalence of cribra orbitalia toward the northern end of the site and what appears to be a lower pervalence of cribra orbitalia toward the soutehrn end of the site.

Table 6.13: Periostitis distribution according to cluster.

Cluster	**Periostitis**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
1	2	*100.0*	0	*0.0*	2	*3.2*
2	16	*64.4*	9	*36.*0	25	*40.3*
3	4	*100.0*	0	*0.0*	4	*6.5*
4	14	*82.4*	3	*17.6*	17	*27.4*
5	4	*100.0*	0	*0.0*	4	*6.5*
7	3	*60.*0	2	*40.*0	5	*8.1*
8	3	*100.0*	0	*0.0*	3	*4.8*
9	2	*100.0*	0	*0.0*	2	*3.2*
Total	48	*77.4*	14	*22.6*	62	*100.0*

Figure 6.14: Graph showing frequency of Periostitis per cluster.

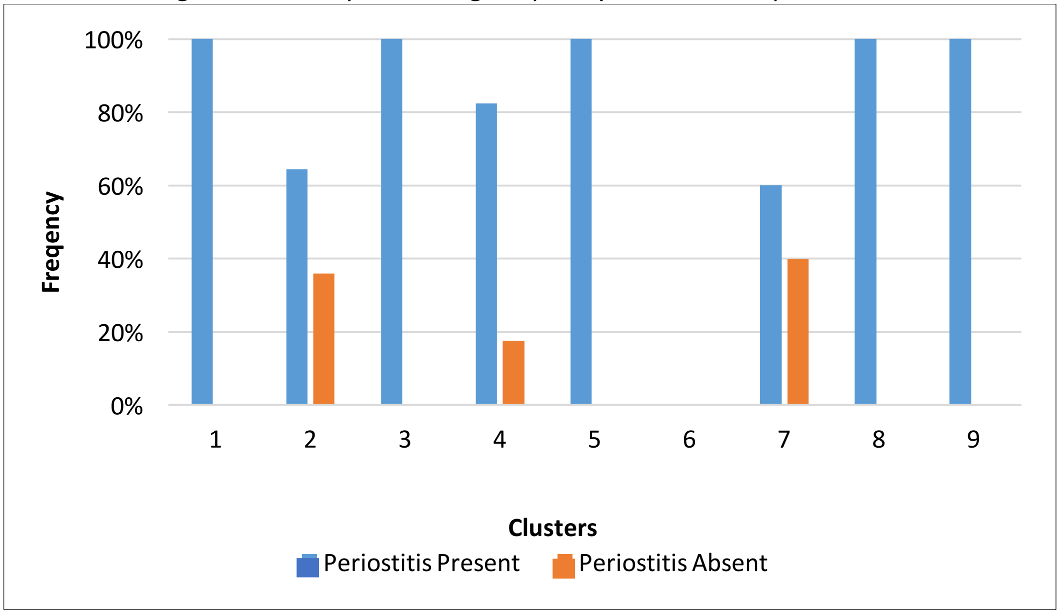


Table 6.13, above, shows the frequency of observable individuals with periostitis within each burial cluster. Of the 308 examined individuals from Jícaro, 62 (20.12 %) had long bones that were intact enough to evaluate for the presence or absence of periostitis. Analysis of periostitis according to age-at-death and sex is presented in Chapter 4. Overall at Jícaro, approximately 23 % of observable individuals show evidence of periostitis and 77 % show no evidence of periostitis. Clusters 1, 3, 5, 8, and 9 show a much higher frequency of periostitis than would be expected based on what is known about the site as a whole, but upon examining the numbers more closely, the sample sizes from those operations are all 5 or fewer, and they may not be representative of the populations buried in those areas. Cluster 2 (N=25) shows a slightly lower frequency of periostitis than would be expected and Cluster 4 (N=17) shows a slighlty higher frequency of periostitis than would be expected. The graph in Figure 6.14 shows high frequencies of periostitis in every cluster for which there is information, possibly indicating widespread affliction by a disease process. Just as the data from the table must be viewed witih caution, the graph may be showing frequencies that are affected by the extremely small sample sizes of observable individuals in many of the clusters.

Table 6.14: Spinal Pathology distribution according to cluster

Cluster	Spinal Pathology				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
1	1	*20.0*	4	*80.0*	5	*6.4*
2	6	*16.7*	30	*83.3*	36	*46.2*
3	0	*0.0*	3	*100.0*	3	*3.8*
4	0	*0.0*	15	*100.0*	15	*19.2*
5	0	*0.0*	6	*100.0*	6	*7.7*
7	0	*0.0*	7	*100.0*	7	*9.0*
8	1	*25.0*	3	*75.0*	4	*5.1*
9	1	*50.0*	1	*50.0*	2	*2.6*
Total	9	*11.5*	69	*88.5*	78	*100.0*

Figure 6.15: Number of Individuals with/without Spinal Pathology per cluster.

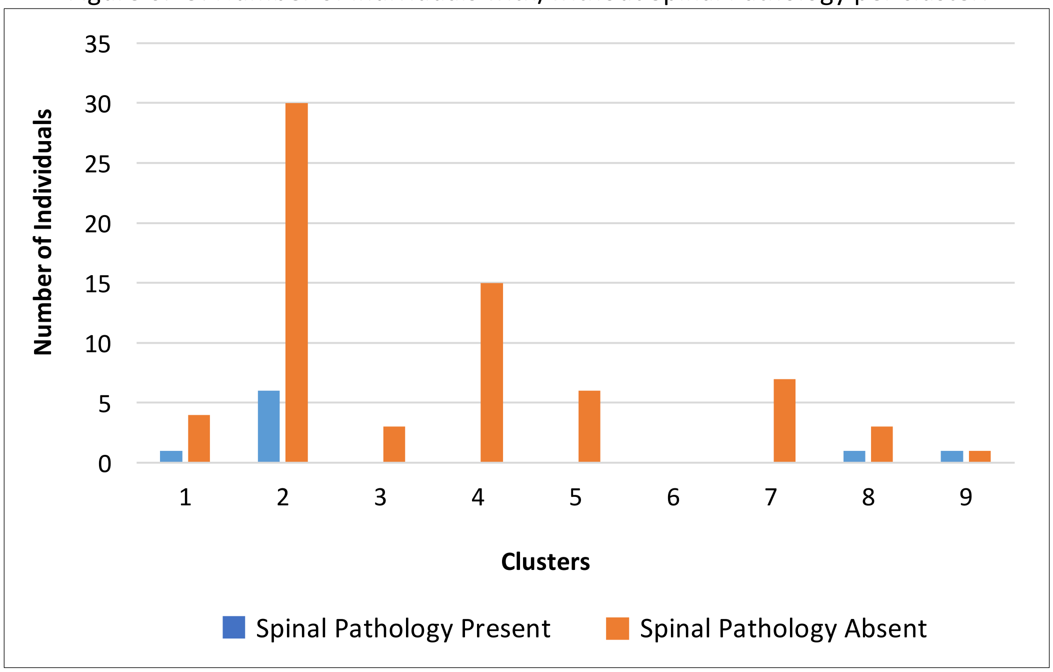


Table 6.14, above, shows the frequency of individuals with spinal pathology within each burial cluster. Seventy-eight (25.3 %) of the examined individuals had spines intact enough to evaluate for the presence of the spinal pathology that was documented at the site. Only nine (11.5 %) of those 78 individuals showed evidence of the spinal pathology—all adults, and for the purpose of this analysis they are not divided according to age-at-death or sex. Clusters 3, 4, 5 and 7 did not contain any observable individuals with evidence of the spinal pathology. Clusters 1, 8, and 9 contained 5, 4, and 2 observable

individuals, respectively, and of them only one individual per cluster showed evidence of spinal pathology. Cluster 2 contains the largest number of burials and shows a frequency of spinal pathology of approximately 17 %. This is below the overall expectation for the site, but still indicative of far fewer individuals with spinal pathology than without.

The graph in Figure 6.15, above, shows such low sample sizes that a graph based on the percent of the sample with/without spinal pathology, as the other graphs in this section have presented, would have appeared misleading. By looking at the graph, it appears as though the spinal pathology that has been observed at the site was only observed in the northern and southern areas of the site and was not observed in the center portion.

Spatial Analysis of Burial Practices

A spatial analysis was also conducted for several of the mortuary practices at Jícaro in an attempt to explore spatial relationships between biological and health variables and mortuary treatments across the site. The following section presents the results of the spatial analysis of the mortuary treatments. All of these variables cross-cut the biological variables from the previous section and there may be individuals who received more than one of the burial treatments analyzed below. For the purpose of this section, each of the mortuary variables is analyzed in isolation and will be discussed further in the Chapter Summary and Chapter 8. The same mortuary varaibles are considered in this chapter as were considered in Chapter 5; however for the purpose of the spatial analysis, they are only considered in terms of presence/absence and are not analyzed for the quantity or proportion of each varaible relative to the others.

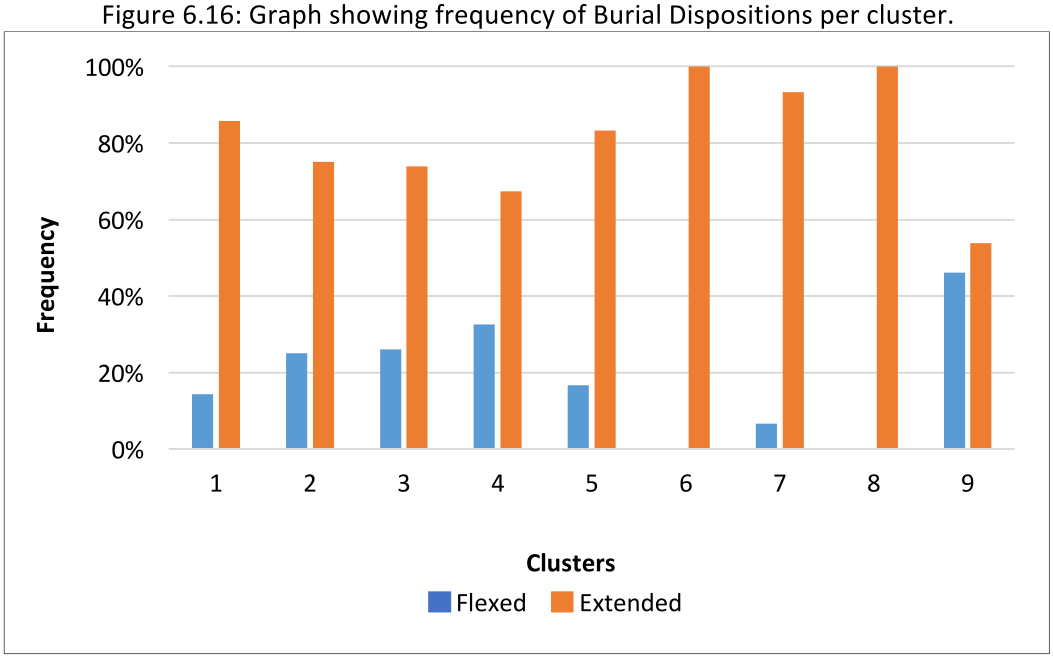
Burial Disposition

For the purpose of the spatial analysis section, burial disposition (extended or flexed) is analyzed according to frequency per cluster, as opposed to frequency per cluster compared with the other clusters.

Table 6.15: Burial Dispositions according to cluster.

Cluster	**Burial Disposition**				**Total**	***Freq.%***
	Extended	*Freq.%*	Flexed	*Freq.%*		
1	30	*85.7*	5	*14.3*	35	*12.1*
2	66	*75.0*	22	*25.0*	88	*30.4*
3	34	*73.9*	12	*26.1*	46	*15.9*
4	29	*67.4*	14	*32.6*	43	*14.9*
5	15	*83.3*	3	*16.7*	18	*6.2*
6	8	*100.0*	0	*0.0*	8	*2.8*
7	14	*93.3*	1	*6.7*	15	*5.2*
8	10	*100.0*	0	*0.0*	10	*3.5*
9	14	*53.8*	12	*46.2*	26	*9.0*
Total	220	*76.1*	69	*23.9*	289	*100.0*

Figure 6.16: Graph showing frequency of Burial Dispositions per cluster.



The data from Table 6.15 and Figure 6.16, above, show that in all clusters except for Cluster 9, the frequency of extended burials is greater than the frequency of flexed burials by a wide margin. The sample sizes in several of the clusters is very small (i.e., Cluster 6 where N=8), which may affect the interpretive value of these data. That said, Cluster 9 differs from the others in that the proportion of flexed (N=12, 46.2%) and extended (N=14, 53.8%) individuals even whereas throughout the rest of the site the frequency of extended burials far exceeds the frequency of flexed burials.

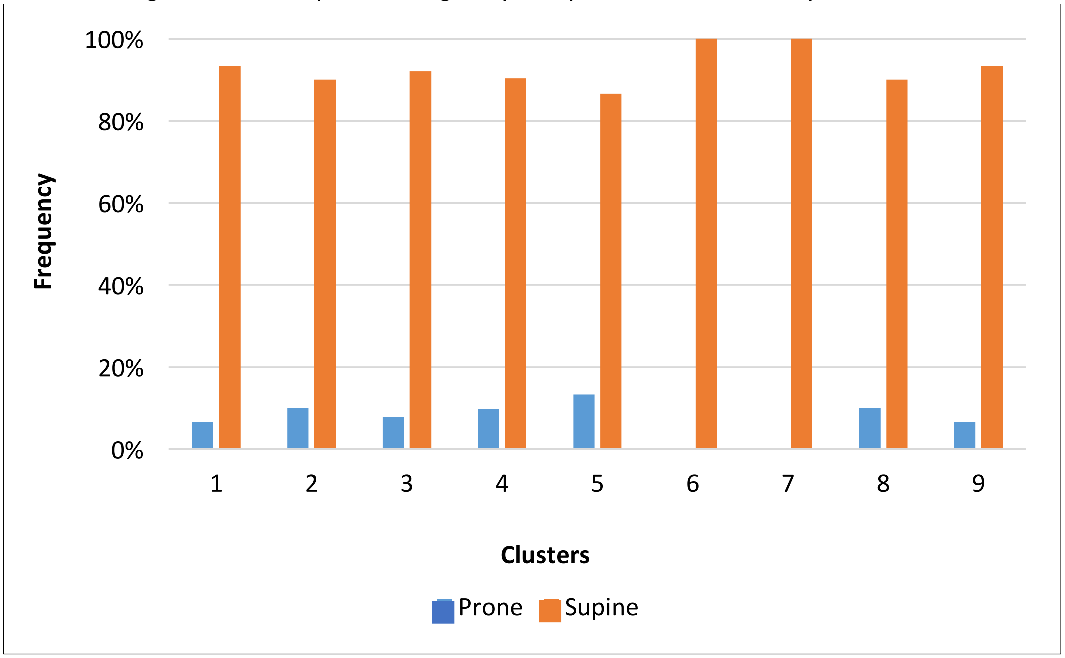
Burial Position

For the purpose of the spatial analysis section, burial position (supine or prone) is analyzed according to frequency per cluster, as opposed to frequency per cluster compared with the other clusters.

Table 6.16: Burial positions according to cluster.

Cluster	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
1	28	*93.3*	2	*6.7*	30	*12.8*
2	63	*90.0*	7	*10.0*	70	*29.9*
3	35	*92.1*	3	*7.9*	38	*16.2*
4	28	*90.3*	3	*9.7*	31	*13.2*
5	13	*86.7*	2	*13.3*	15	*6.4*
6	8	*100.0*	0	*0.0*	8	*6.4*
7	17	*100.0*	0	*0.0*	17	*7.3*
8	9	*90.0*	1	*10.0*	10	*4.3*
9	14	*93.3*	1	*6.7*	15	*6.4*
Total	215	*91.9*	19	*8.1*	234	*100.0*

Figure 6.17: Graph showing frequency of Burial Positions per cluster.



Data from Table 6.16 and the graph in Figure 6.17, above, show that across the site, the frequency of supine burials is far greater than the freqeuncy of prone burials, and no one burial position is concentrated in any particular region of the site, aside from Clusters 6 and 7 containing no individuals buried in prone positions.

Arm Position

For the purpose of the spatial analysis section, arm position (similar or different) is analyzed according to frequency per cluster, as opposed to frequency per cluster compared with the other clusters.

Table 6.17: Arm position according to cluster.

Cluster	**Arm Position**				**Total**	***Freq.%***
	Similar	*Freq.%*	Different	*Freq.%*		
1	13	*54.2*	11	*45.8*	24	*15.1*
2	37	*71.2*	15	*28.8*	52	*32.7*
3	14	*73.7*	5	*26.3*	19	*11.9*
4	19	*73.1*	7	*26.9*	26	*16.4*

Table 6.17 (cont'd).

Cluster	Arm Position				Total	*Freq.%*
	Similar	*Freq.%*	Different	*Freq.%*		
5	6	*66.7*	3	*33.3*	9	*5.7*
6	5	*100.0*	0	*0.0*	5	*3.1*
7	2	*33.3*	4	*66.7*	6	*3.8*
8	4	*44.4*	5	*55.6*	9	*5.7*
9	4	*44.4*	5	*55.6*	9	*5.7*
Total	104	*65.4*	55	*34.6*	159	*100.0*

Figure 6.18: Graph showing frequency of Arm Positions per cluster.

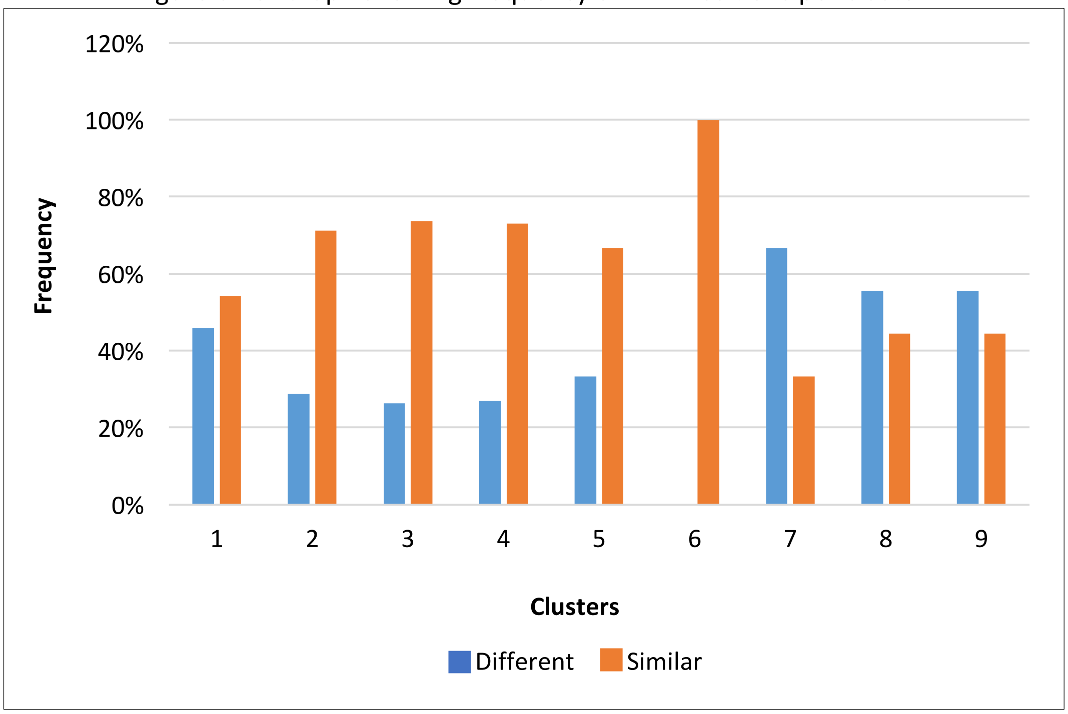


Table 6.17 and the graph in Figure 6.18, above, show that in most of the clusters, there is a greater frequency of individuals buried with their arms in similar positions (either both crossing the body plane or both extended) than there is of individuals buried with their arms in different positions (one crossing body plane, one extended). Only individuals who had both arms present and observable are included in this analysis. Cluster 6 contained only individuals with their arms in similar positions. In Clusters 7, 8, and 9, there appears to be a greater frequency of individuals buried with their arms in different positions than the frequency of individuals with their arms buried in similar positions, which is

a notable difference between the northern and southern aspects of the site. The observed frequencies may be affected by small sample size and may not be representative of the population as a whole.

Head Orientation

For the purpose of the spatial analysis section, head orientation (N, NE, E, SE, S, SW, W, NW) is analyzed according to frequency per cluster, as opposed to frequency per cluster compared with the other clusters. Only individuals for whom head position could be determined are included in the following analysis (N=224).

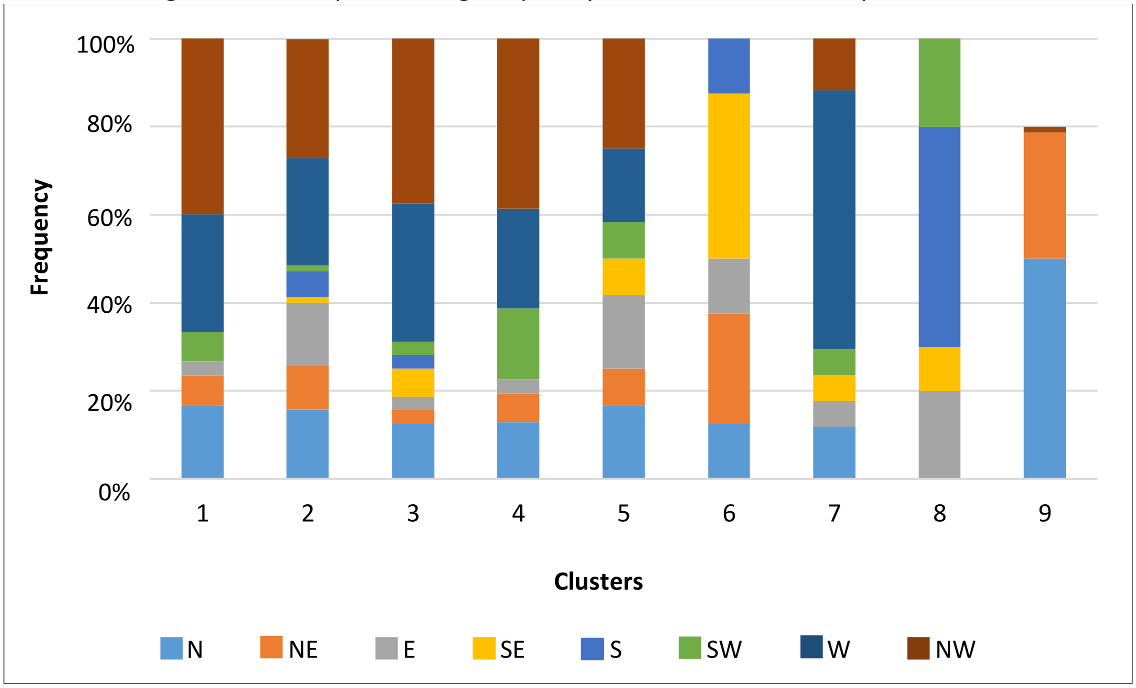
Table 6.18a: Head orientations according to cluster (N, NE, E, SE).

Cluster	**Head Orientation**								**Total**	***Freq.%***
	N	*Freq.%*	NE	*Freq.%*	E	*Freq.%*	SE	*Freq.%*		
1	5	*16.7*	2	*6.7*	1	*3.3*	0	*0.0*	30	*13.4*
2	11	*15.7*	7	*10.0*	10	*14.3*	1	*1.4*	70	*31.3*
3	4	*12.5*	1	*3.1*	1	*3.1*	2	*6.3*	32	*14.3*
4	4	*12.9*	2	*6.5*	1	*3.2*	0	*0.0*	31	*13.8*
5	2	*16.7*	1	*8.3*	2	*16.7*	1	*8.3*	12	*5.4*
6	1	*12.5*	2	*25.0*	1	*12.5*	3	*37.5*	8	*3.6*
7	2	*11.8*	0	*0.0*	1	*5.9*	1	*5.9*	17	*7.6*
8	0	*0.0*	0	*0.0*	2	*20.0*	1	*10.0*	10	*4.5*
9	7	*50.0*	4	*28.6*	0	*0.0*	0	*0.0*	14	*6.3*
Total	36	*16.1*	19	*8.5*	19	*18.5*	9	*4.0*	224	*100.0*

Table 6.18b: Head orientations according to cluster (S, SW, W, NW).

Cluster	**Head Orientation**								**Total**	***Freq.%***
	S	*Freq.%*	SW	*Freq.%*	W	*Freq.%*	NW	*Freq.%*		
1	0	*0.0*	2	*6.7*	8	*26.7*	12	*40.0*	30	*13.4*
2	4	*5.7*	1	*1.4*	17	*24.3*	19	*27.1*	70	*31.3*
3	1	*3.1*	1	*3.1*	10	*31.3*	12	*37.5*	32	*14.3*
4	0	*0.0*	5	*16.1*	7	*22.6*	12	*38.7*	31	*13.8*
5	0	*0.0*	1	*8.3*	2	*16.7*	3	*25.0*	12	*5.4*
6	1	*12.5*	0	*0.0*	0	*0.0*	0	*0.0*	8	*3.6*
7	0	*0.0*	1	*5.9*	10	*58.8*	2	*11.8*	17	*7.6*
8	5	*50.0*	2	*20.0*	0	*0.0*	0	*0.0*	10	*4.5*
9	0	*0.0*	0	*0.0*	0	*0.0*	3	*1.3*	14	*6.3*
Total	11	*4.9*	13	*5.8*	54	*24.1*	63	*28.1*	224	*100.0*

Figure 6.19: Graph showing frequency of Head Orientations per cluster.



The graph in Figure 6.19, above, shows each possible head direction in a different color, beginning with north at the bottom of each column, followed by northeast, then east and so on as the columns are stacked vertically. Data provided in Table 6.18 and the graph in Figure 6.18, above, show that in most of the clusters, the greatest frequency of individuals have their heads oriented toward the north, west, and northwest. Cluster 6 and Cluster 8 are exceptions in that they both have higher frequencies of individuals with their heads buried in directions other than north, west, and northwest. Cluster 6 (N=8) shows that the greatest frequency of individuals are buried with their heads oriented toward the southeast (N=3, 37.5%), while no individuals from that cluster were bureid with their heads toward the west, or northwest. Similarly, the head direction with the highest frequency in Cluster 8 (N=10) is the heads toward the south (N=5, 50%), also with no one buried with their heads toward the north, west, or northwest.

Several of the clusters have very small sample sizes and head orientatin could not be determined for nearly half of the individuals at Jícaro, so it is possible that these interpretations are based on a biased sample.

Grave Goods

For the purpose of the spatial analysis section, the presence or absence of grave goods is analyzed according to frequency per cluster, as opposed to frequency per cluster compared with the other clusters. Only grave goods that were assigned to an indiviual, as opposed to grave goods that were recovered from grave fill that could not be associated with a particular individual, are included in this analysis.

Table 6.19: Grave goods according to cluster.

Cluster	**Grave Goods**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
1	25	*55.6*	20	*44.4*	45	*10.3*
2	71	*46.1*	83	*53.9*	154	*35.2*
3	31	*41.9*	43	*58.1*	74	*16.9*
4	21	*36.2*	37	*63.8*	58	*13.3*
5	12	*52.2*	11	*47.8*	23	*5.3*
6	4	*28.6*	10	*71.4*	14	*3.2*
7	15	*46.9*	17	*53.1*	32	*7.3*
8	5	*50.0*	5	*50.0*	10	*2.3*
9	14	*51.9*	13	*48.1*	27	*6.2*
Total	198	*45.3*	239	*54.7*	437	*100.0*

Figure 6.20: Graph showing frequency of Grave Goods per cluster.

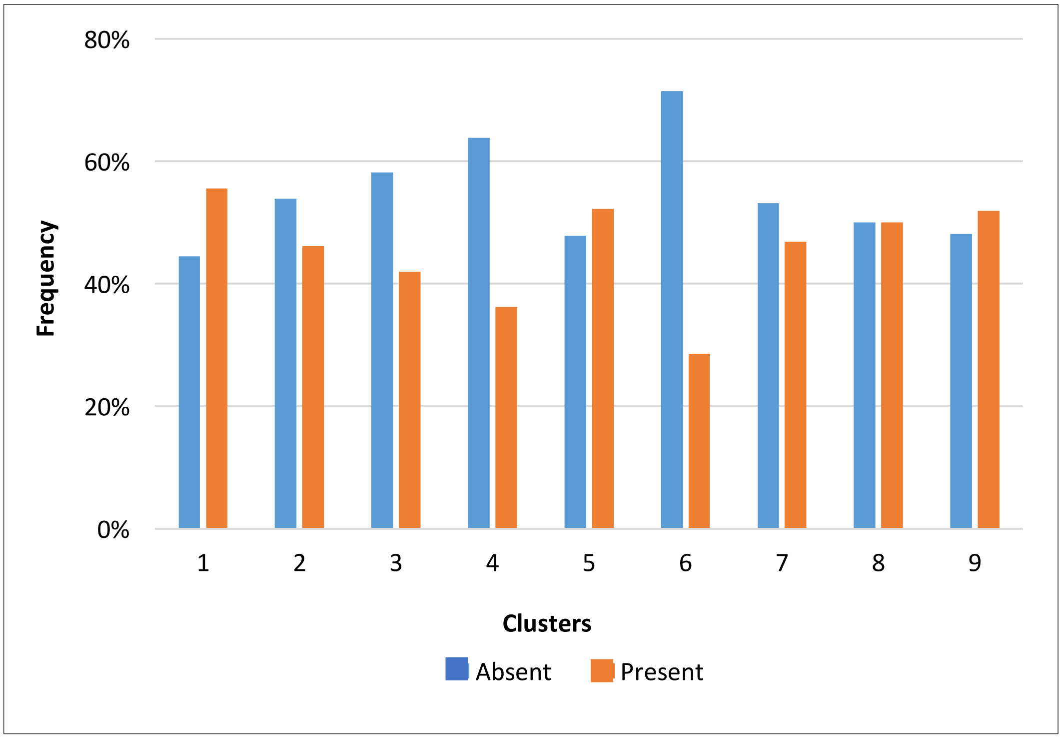


Table 6.19 and the graph in Figure 6.20, above, show a higher frequency of individuals buried without grave goods than with grave goods in most of the clusters. Of the 437 individuals from Jícaro, the majority (N=239, 54.7%) were buried with no associated grave goods while 198 (45.3%) were buried with at least one artifact. Cluster 1 at the far north end of the site, Cluster 5 toward the middle of the site, and Cluster 9 at the far south end of the site show slightly higher frequencies of individuals buried with grave goods than without. No distinct pattern emerges with any one or group of clusters having a disproportionately high or low frequency of individuals buried with or without grave goods, probably indicating that whatever slight differences between the frequencies of individuals with or without grave goods are apparent in Clusters 1, 5, and 9, the presence/absence of grave goods at Jícaro is relatively evenly distributed and no one area appears to be the location of elites (based on this variable alone).

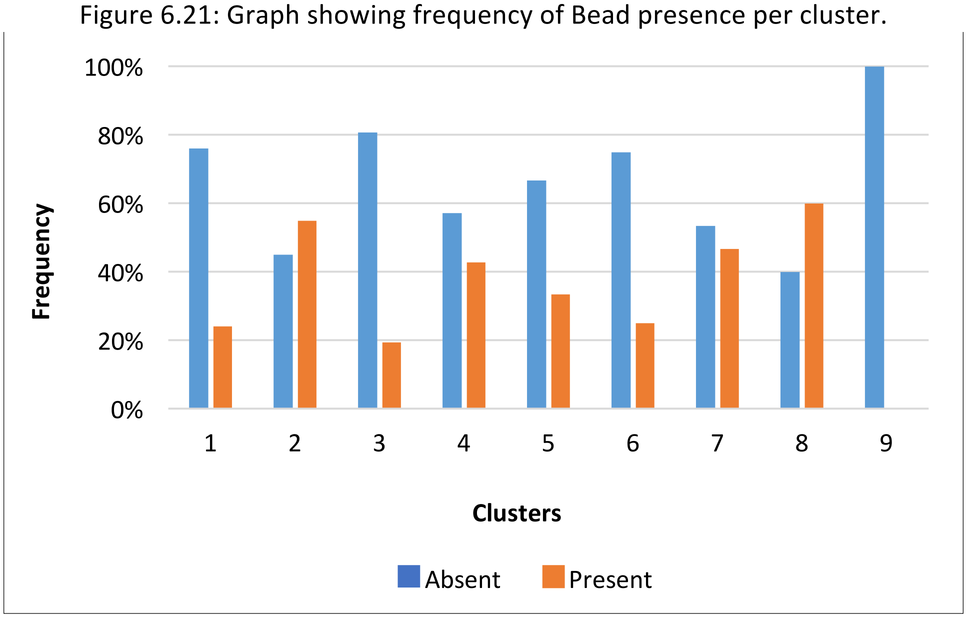
Beads

For the purpose of spatial analysis, the presence or absence of beads is analyzed according to frequency per cluster, as opposed to frequency per cluster compared with the other clusters. Only the individuals who were found to have been buried with grave goods are included in this analysis (N=198). In general at Jícaro, 123 (62.1 %) of the 198 individuals with artifacts were buried without any associated beads, while only 75 (37.9%) of individuals did have assocaited beads.

Table 6.20: Beads according to cluster.

Cluster	**Beads**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
1	6	*24.0*	19	*76.0*	25	*12.6*
2	39	*54.9*	32	*45.1*	71	*35.9*
3	6	*19.4*	25	*80.6*	31	*15.7*
4	9	*42.9*	12	*57.1*	21	*10.6*
5	4	*33.3*	8	*66.7*	12	*6.1*
6	1	*25.0*	3	*75.0*	4	*2.0*
7	7	*46.7*	8	*53.3*	15	*7.6*
8	3	*60.0*	2	*40.0*	5	*2.5*
9	0	*0.0*	14	*100.0*	14	*7.1*
Total	75	*37.9*	123	*62.1*	198	*100.0*

Figure 6.21: Graph showing frequency of Bead presence per cluster.



Data from Table 6.20 and the graph in Figure 6.21, above, show that across the site, in 7 of the 9 clusters, there was a greater frequency of individuals buried without beads than the frequency of individuals buried with beads. Cluster 3 shows an exceptionally low frequency of individuals buried with beads, while Cluster 2 and Cluster 8 show slightly elevated frequencies of individuals with beads relative to the frequencies of individuals wtihout beads. While those three clusters appear to be different from the others, no clear pattern emerges based on the spatial layout of the site relative to the presence or absence of beads.

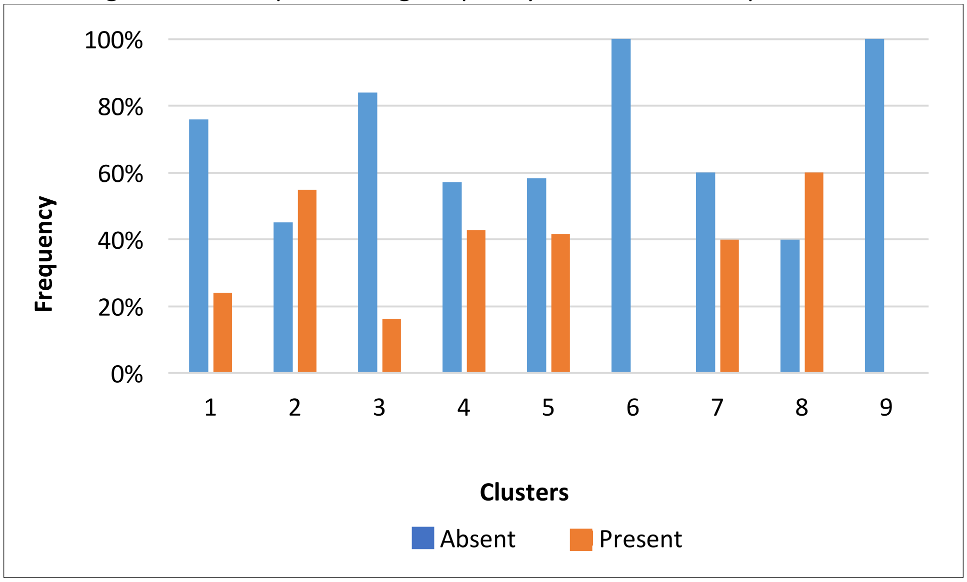
Shell Artifacts

For the purpose of spatial analysis, the presence or absence of shell artifacts is analyzed according to frequency per cluster, as opposed to frequency per cluster compared with the other clusters. Only the individuals who were found to have been buried with grave goods are included in this analysis (N=198). The various types and quantities of shell artifacts are not included in the spatial analysis.

Table 6.21: Shell artifacts according to cluster.

Cluster	**Shell Artifacts**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
1	6	*24.0*	19	*76.0*	25	*12.6*
2	39	*54.9*	32	*45.1*	71	*35.9*
3	5	*16.1*	26	*83.9*	31	*15.7*
4	9	*42.9*	12	*57.1*	21	*10.6*
5	5	*41.7*	7	*58.3*	12	*6.1*
6	0	*0.0*	4	*100.0*	4	*2.0*
7	6	*40.0*	9	*60.0*	15	*7.6*
8	3	*60.0*	2	*40.0*	5	*2.5*
9	0	*0.0*	14	*100.0*	14	*7.1*
Total	73	*36.9*	125	*63.1*	198	*100.0*

Figure 6.22: Graph showing frequency of Shell Artifacts per cluster.



There is a relatively low incidence of shell artifacts in general at Jícaro, and data from Table 6.21 and Figure 6.22, above, show that most of the clusters show a low frequency of individuals buried with shell artifacts compared with the frequency of individuals with shell artifacts, with the excetion of Cluster 2 and Cluster 8. Overall, of the 198 individuals who were discovered with associated grave goods, 125 (63.1%) did not have shell artifacts assocaited with them and only 73 (36.9%) did. Operations 1, 4, 5, and 7 show that between about 30 and 40 % of the individuals were buried with shell artifacts, which is not far from the expected frequency for the site as a whole. Cluster 2 (N=71) has a slightly higher percentage of individuals buried with some sort of shell artifact, with a nearly 50%/50% split between individuals buried with and without shell artifacts, while the graph and the frequencies from Cluster 8 seem to show a similar frequency of individuals with and without shell artifacts, when the sample size is considered (N=5) it is less marked of a difference from the overall frequency at the site than it initially appears.

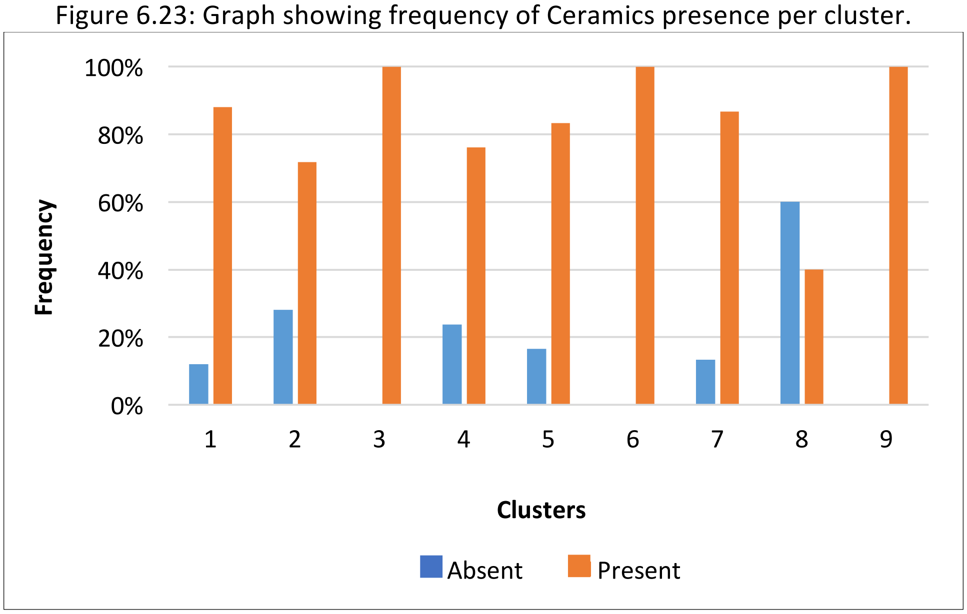
Ceramic Artifacts

For the purpose of spatial analysis, the presence or absence of ceramic artifacts is analyzed according to frequency per cluster, as opposed to frequency per cluster compared with the other clusters. Only the individuals who were found to have been buried with grave goods are included in this analysis (N=198).

Table 6.22: Ceramics according to cluster.

Cluster	**Ceramics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
1	22	*88.0*	3	*12.0*	25	*12.6*
2	51	*71.8*	20	*28.2*	71	*35.9*
3	31	*100.0*	0	*0.0*	31	*15.7*
4	16	*76.2*	5	*23.8*	21	*10.6*
5	10	*83.3*	2	*16.7*	12	*6.1*
6	4	*100.0*	0	*0.0*	4	*2.0*
7	13	*86.7*	2	*13.3*	15	*7.6*
8	2	*40.0*	3	*60.0*	5	*2.5*
9	14	*100.0*	0	*0.0*	14	*14*
Total	163	*82.3*	35	*17.7*	198	*100.0*

Figure 6.23: Graph showing frequency of Ceramics presence per cluster.



As Table 6.22 shows, of the 198 individuals with grave goods, 163 (82.3%) were associated with at least one ceramic artifact while only 35 (17.7%) were associated with no ceramic artifacts. It appears as though the individuals with no associated ceramic artifacts were concentrated in the areas of Clusters 1, 2, 4, 5, 7 and 8. Only in Cluster 8 is there a larger frequency of individuals without ceramic artifacts than the frequency of individuals with ceramic artifacts. Otherwise, no clear pattern is apparent with regard to areas of the site where frequencies of ceramic grave goods are higher or lower than others.

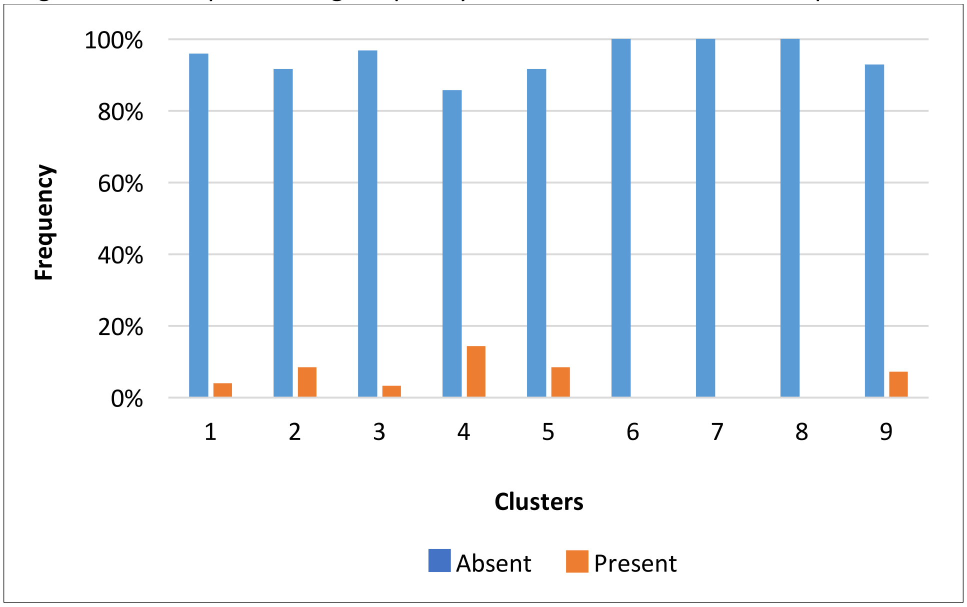
Human Remains Artifacts

For the purpose of spatial analysis, the presence or absence of artifacts made from human remains is analyzed according to frequency per cluster, as opposed to frequency per cluster compared with the other clusters. Only the individuals who were found to have been buried with grave goods are included in this analysis (N=198). This analysis does not consider the presence of isolated crania, only the presence of ornaments and worked human bone (see Chapter 4).

Table 6.23: Human remains artifacts according to cluster.

Cluster	**Human Remains**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
1	1	*4.0*	24	*96.0*	25	*12.6*
2	6	*8.5*	65	*91.5*	71	*35.9*
3	1	*3.2*	30	*96.8*	31	*15.7*
4	3	*14.3*	18	*85.7*	21	*10.6*
5	1	*8.3*	11	*91.7*	12	*6.1*
6	0	*0.0*	4	*100.0*	4	*2.0*
7	0	*0.0*	15	*100.0*	15	*7.6*
8	0	*0.0*	5	*100.0*	5	*2.5*
9	1	*7.1*	13	*92.9*	14	*7.1*
Total	13	*6.6*	185	*93.4*	198	*100.0*

Figure 6.24: Graph showing frequency of Human Remains artifacts per cluster.



Very few individuals at Jícaro were found in association with human remains as artifacts (N=13, 6.6% of the total 198 individuals with artifacts). The majority of the individuals with human remains artifacts are located in Cluster 2, which is expected based on the number of individuals contained within that cluster, but the frequency of human remains artifacts in that cluster is actually lower than the frequency of human remains artifacts in Cluster 4. Human remains artifacts are found in different areas of the site and no clear pattern is evident with regard to their distribution.

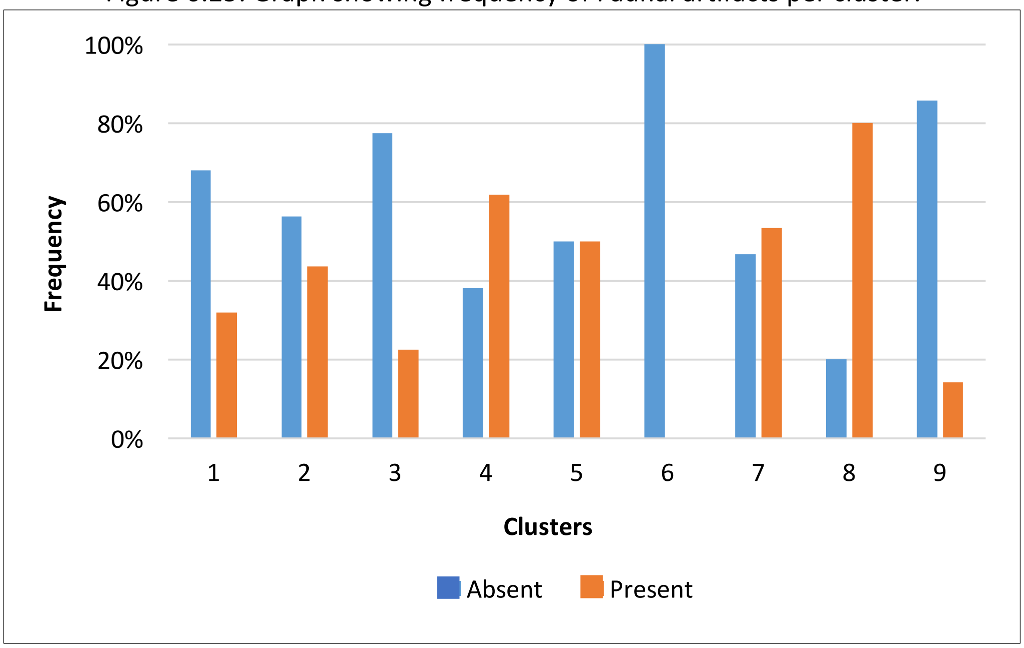
Faunal Artifacts

For the purpose of spatial analysis, the presence or absence of artifacts made from faunal bones and teeth is analyzed according to frequency per cluster, as opposed to frequency per cluster compared with the other clusters. Only the individuals who were found to have been buried with grave goods are included in this analysis (N=198).

Table 6.24: Faunal artifacts according to cluster.

Cluster	Faunal Artifacts				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
1	8	*32.0*	17	*68.0*	25	*12.6*
2	31	*43.7*	40	*56.3*	71	*35.9*
3	7	*22.6*	24	*77.4*	31	*15.7*
4	13	*61.9*	8	*38.1*	21	*10.6*
5	6	*50.0*	6	*50.0*	12	*6.1*
6	0	*0.0*	4	*100.0*	4	*2.0*
7	8	*53.3*	7	*46.7*	15	*7.6*
8	4	*80.0*	1	*20.0*	5	*2.5*
9	2	*14.3*	12	*85.7*	14	*7.1*
Total	79	*39.9*	119	*60.1*	198	*100.0*

Figure 6.25: Graph showing frequency of Faunal artifacts per cluster.



Of the 198 individuals with grave goods at Jícaro, 119 (60.1%) were not found in association with faunal remains while 79 (39.9%) were found with associated faunal artifacts. Data presented in Table 6.24 and the graph in Figure 6.25, above shows the frequencies of faunal artifacts in each cluster. Clusters 1, 2, and 3 show frequencies of faunal remains similar to the overall frequency at the site level, while Clusters 6 and 9 show lower frequencies of faunal artifacts than the frequency at the site level.

Clusters 4 and 8 show a higher frequency of individuals with faunal artifacts relative to the frequency of individuals in each of those clusters buried without faunal artifacts.

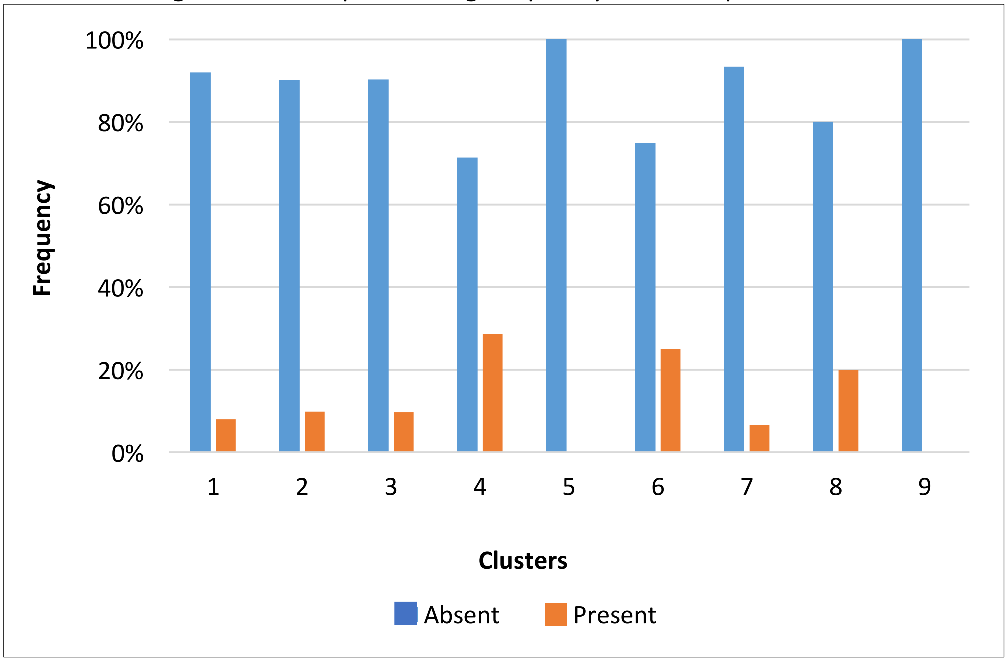
Lithics

For the purpose of spatial analysis, the presence or absence of artifacts made from stone is analyzed according to frequency per cluster, as opposed to frequency per cluster compared with the other clusters. This analysis does not take into consideration the many types of raw materials, types of lithic artifacts, or the number of lithic artifacts per burial. This analysis is purely based on the presence/absence of any lithic artifacts associatd with individuals in the various clusters.

Table 6.25: Lithics according to cluster.

Cluster	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
1	2	*8.0*	23	*92.0*	25	*12.6*
2	7	*9.9*	64	*90.1*	71	*35.9*
3	3	*9.7*	28	*90.3*	31	*15.7*
4	6	*28.6*	15	*71.4*	21	*10.6*
5	0	*0.0*	12	*100.0*	12	*6.1*
6	1	*25.0*	3	*75.0*	4	*2.0*
7	1	*6.7*	14	*93.3*	15	*7.6*
8	1	*20.0*	4	*80.0*	5	*2.5*
9	0	*0.0*	14	*100.0*	14	*7.1*
Total	21	*10.6*	177	*89.4*	198	*100.0*

Figure 6.25: Graph showing frequency of Lithics per cluster.



There is a generally low frequency of lithic artifacts associated with individuals at Jícaro, with lithics associated with only 21 (10.6%) of the individuals and 177 (89.4%) of the individuals without associated lithics. Table 6.25 and the graph in Figure 6.26, above, show that the highest relative frequency of individuals with lithic artifacts were from Cluster 4, toward the center of the site, while Clusters 5 and 9 did not contain any individuals associated with lithic artifacts. Cluster 6 shows a relatively high frequency of individuals with lithic artifacts, but there is also an extremely small sample from Cluster 6 (N=4), so the appearance of that high frequency may be misleading. Overall, there does not appear to be a distinct pattern related to the frequency of lithic artifacts according to cluster.

Chapter Summary

The spatial analysis of Jícaro is complicated by several factors, the most influential among them being the incomplete excavation of the site, which affects the apparent distribution of graves and artifacts and the differential preservation of the skeletal material which affects the potential for interpretation of variables that may have meaningful spatial distributions. There is also an issue with regard to how the spatial analysis was conducted in that although the clusters were identified based on visual assessment of the site, at the end of the day, while they are non-random, they are arbitrary and may not reflect burial clusters as the inhabitants of Jícaro would have identified them, further complicating the outcome of any analyses in this chapter.

A spatial analysis of the demographic variables and the indicators of cultural identity (dental modification) and activity (LSAMAT) reveals several patterns. Adult males and females are nearly equally represented throughout all 9 clusters, while adults and subadults are more variable and without a distinct pattern, except that in Cluster 2 there is a slightly higher frequency of subadults relative to adults than expected. When only adult age-at-death is considered, it appears as though younger adults are concentrated in the far north of the site and the far south of the site, with very few in the middle portion, and older adults are only found in the northern areas of the site with zero older adults having been recovered from Cluster 9/Sector 5, the southernmost area. The distribution of the frequency of dental modification appears to be directly related witih the area of the site in that the frquency of dental modification increases toward the south. Cribra orbitalia and LEH appear to have relatively higher frequencies in the northern areas of the site, but in the southern area of the site cribra orbitalia has a lower frequency while thefrequency of LEH increases. Additionally, the frequency of individuals with spinal pathology, although the sample is very small, appears to increase toward the middle region of the site and decreases toward the northern and southern extremities.

The spatial analysis of mortuary practices as they relate to clusters also revealed some notable results. Burial dispositions at Jícaro are mostly extended, and the frequency of flexed and extended burials in most of the clusters is exaclty what would be expected, but in Clusters 4 and 9 there are disproportionately higher frequencies of individuals buried in flexed positions. No clear patterns were noted with regard to location at the site and burial position as prone or supine. Cluster 6 has an exceptionally low frequency of individuals associated with any grave goods, except all 4 who were included in this analysis were buried with ceramic artifacts. Finally, Cluster 8, near the southern end of the site has a higher frequency of individuals buried with their heads buried facing the south with no indiviudals with their heads facing the west or northwest, which are the most common head orientations at the site (See Chapter 5). Cluster 8 is also assocaited with an abnormally high frequency of faunal remains.

Based on the spatial analyses presented in this chapter, it appears as though very few clear cut patterns exist with regard to mortuary practices at Jícaro. For the most part, it appears as though the people were similarly treated in death.

Chapter 7: Osteobiographies

Introduction

In 1961, inspired by previous scholars like physical anthropologist Lawrence Angel and physician Calvin Wells, whose work incorporated traditional methods for studying human skeletal remains, such as documenting scores of cranial and postcranial measurements, with more interpretive yet equally scientific analyses, F. P. Saul introduced the concept of Osteobiography (Greek *osteon* = *bone*, Greek *bios* = *life*, Greek *graphia* = *to write*) to ensure that individuals and their stories were not lost amid endless seas of numerical data (Saul and Saul, 1989). The previous chapters have addressed results from the analysis of data collected from the individuals buried at Jícaro, all of which are discussed at the site and regional levels, potentially causing the individuals and their experiences to be lost.

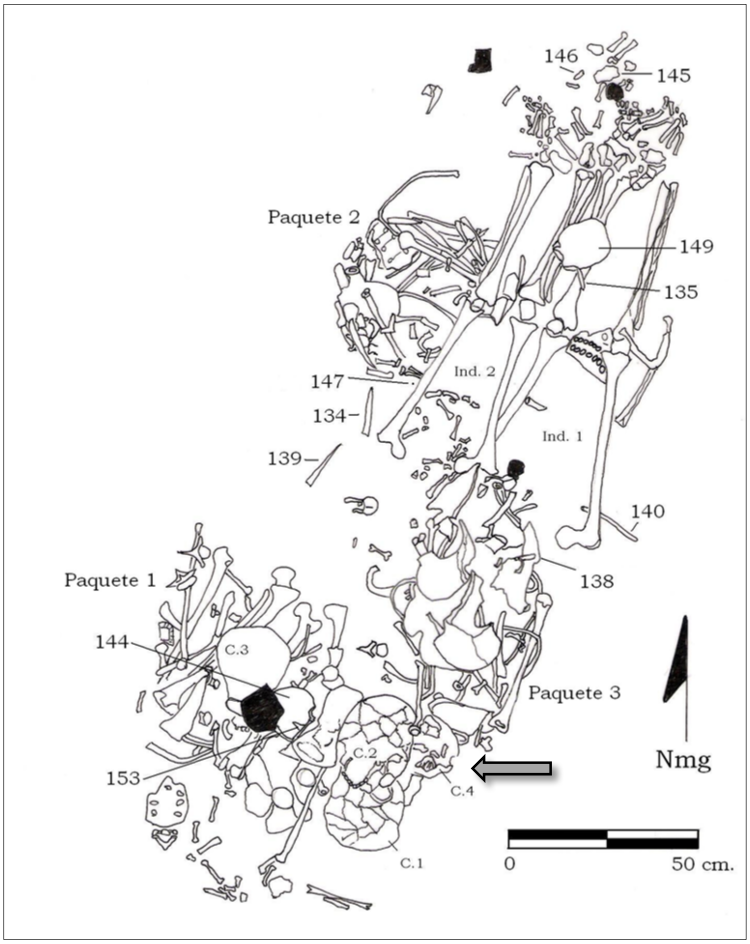
This chapter presents a selection of adults and subadults representing the various mortuary treatments and apparent life experiences of the individuals who lived in the village at Jícaro. At the population level, there are few significant differences between males and females, or between the different age cohorts with regard to mortuary treatment at Jícaro. The population from Jícaro appears to have been relatively healthy, with little evidence of specific and non-specific indicators of stress; however, as is mentioned in Chapter 4, treponemal infection and a spinal pathology do seem to have affected a number of the inhabitants. Mortuary treatments are also similar throughout the site, with a large amount of reuse of burial fossae and the disruption of previous burials being commonplace. The individuals presented in this chapter include some who appear to represent average burial treatments and life experiences for the people of Jícaro. A chapter like this is important because with the site- and inter-site level statistical and spatial analyses, the individuals and the human experience often become lost and/or homogenized. This presentation of osteobiographies is intended to bring the people and their individual experiences into clearer focus and to ensure they are not lost amid the statistical and site-level analyses.

The burials in this chapter are presented in numerical order, according to the order in which they were discovered and excavated by the archaeologists.

Burial 3, Cráneo 4

Burial 3 is one of only two burials excavated from Operation 2, a small 2m x 2m Operation located approximately 60 meters north and 20 meters east of Jícaro's geographic center. This is a commingled burial with an MNI of 5 individuals that were not possible to sort out because all of the adults are of similar ages and condition, and except for the crania, there is little duplication of skeletal elements. There are two distinct individuals whose lower limbs and pelves remain in anatomical position (Individuals 1 and 2); the remaining individuals are identified by numbered crania only. The position of the two somewhat intact individuals indicates that the orientation of the burial would have been roughly southwest-to-northeast, with the heads in the southwest. None of the isolated crania in this burial appear to be offerings as is the case for isolated crania in other burials. The crania in this burial do not appear to be intentionally placed and, due to the fact that there is such extensive commingling of postcranial remains, it is more likely that the crania in this burial were at one time associated with postcranial remains. This burial demonstrates the common practice of reusing burial fossae at Jícaro, and was also unfortunately looted by collectors at some point prior to the site's archaeological excavation. This resulted in relatively few artifacts that could be associated with any individual in particular, and none could be assigned specifically to *Craneo 4*. The other burial from this Operation, Burial 1, was located just superficial to the southeast concentration of skeletal elements associated with Burial 3, possibly indicating an additional more recent episode of reuse of the same burial fossa.

Figure 7.1: Map of Burial 3, showing location of *Cráneo 4.*



(Image: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

Cráneo 4 of Burial 3 was initially believed by the archaeologists to be that of a developmentally challenged young male who may have been hit repeatedly in the head with non-lethal blows, due to the presence of defects affecting the cranial vault and mandible (Herrera, 2008, personal communication). Osteological analysis of this cranium revealed that *Cráneo 4* is a Young-to-Middle Adult (20-40 years) Probable Female. Her cranial vault is intact, with complete frontal, parietals, and about ¾ of the occipital. The temporals are also present, but they are less complete. An associated mass of matrix containing a partial maxilla, sphenoid, ethmoid, and the right orbital plate of the frontal is also present, as is a complete mandible. Cráneo 4 was largely edentulous, with all but a few teeth lost antemortem despite her young age, and the single tooth that remained of her anterior mandibular dentition was a single underdeveloped incisor that she probably didn't even know she had because in all likelihood it never broke through the gums.

Judging by the appearance of her condition, *Cráneo 4* likely suffered from a treponemal infection that she may have contracted as a young child through skin-to-skin contact with infectious lesions (Powell and Cook, 2005). *Cráneo 4* would have developed initial lesions, probably on her legs, and then would have had periods over the next several years of active lesions followed by periods of remission. She may have had painful lesions on the soles of her feet, which may have affected her ability to walk, and she would most certainly have had visible ulcerated soft-tissue lesions throughout her body (Powell and Cook, 2005). Her condition would have been visible to others in her community because she would have had soft tissue ulcerated lesions on her head and face that would have left the stellate lesions that are visible on her cranial vault, and postcranially her long bones would likely have been affected by a generalized osteitis including periosteal reactions particularly affecting the tibiae and causing a "saber shin" appearance to her lower legs (Ortner, 2003; Powell and Cook, 2005).

Several stellate lesions affect the cranial vault and mandible of *Cráneo 4*, which supports the likelihood of a possible treponemal infection. There are 6 lesions affecting the frontal bone, one over the right orbit, one just left of midline at approximately the center of the frontal bone, one just anterior to the right side of the coronal suture, one at the coronal suture just right of midline, one just left of midline anterior to the coronal suture, and one just posterior to the left zygomatic process of the frontal. A seventh lesion affects the left parietal near the anatomical landmark, euryon. On the mandible, at the mental eminence, there is a lesion (approximately 11x17mm) showing what would have been an active bony response at the time of her death.

Figure 7.2: Frontal bone of *Cráneo 4*, showing stellate lesions.

(Photo: Wankmiller, 2013)

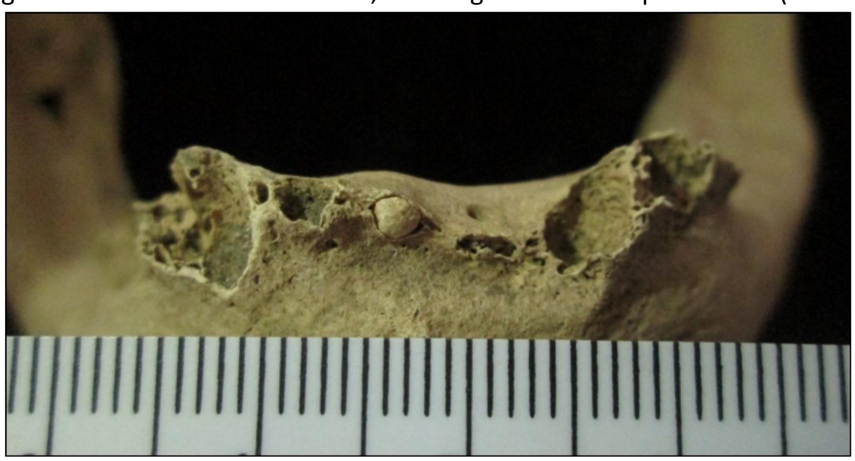
Figure 7.3: Superior right orbit of *Cráneo 4*, showing stellate lesion.

(Photo: Wankmiller, 2013)

Figure 7.4: Mandible of *Cráneo 4*, showing lesion at mental eminence.

(Photo: Wankmiller, 2013)

Figure 7.5: Mandible of *Cráneo 4*, showing underdeveloped incisor (Detail).



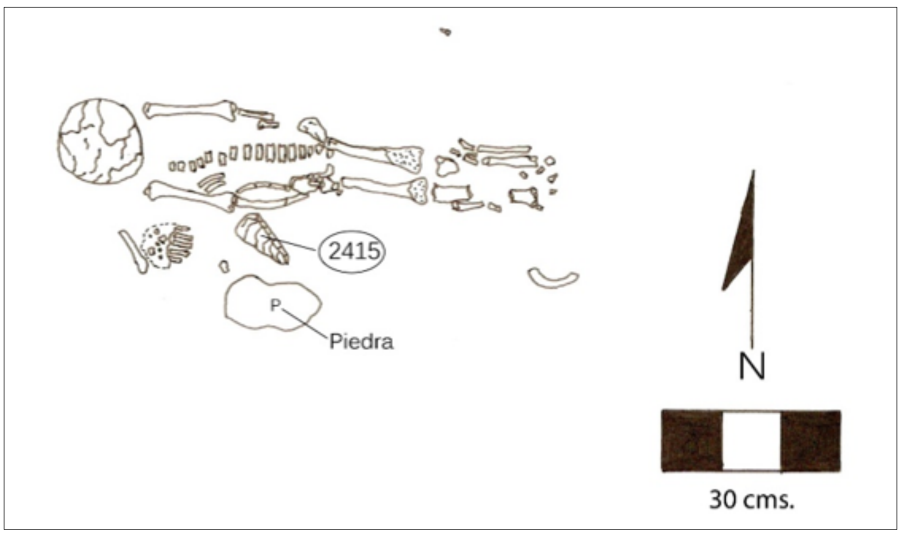
(Photo: Wankmiller, 2013)

Cráneo 4 was largely edentulous at the time of her death and the majority of her remaining dentition as lost postmortem, so observations of her teeth were not possible, except she did have a single pearl-like mandibular incisor, which may be further evidence of an early-childhood onset of her condition that affected her dental development. Her dental condition would almost certainly have affected her diet and her nutritional and social stress levels, and her open lesions would have increased her susceptibility to additional infectious agents in her environment (Powell and Cook, 2005), both of which may have contributed to a below-average quality of life and her early death.

Burials 65

Burial 65 is the single interment of a child, approximately 4 years old at the time of death. This burial was discovered in Operation 24, a large operation of just over 100m^2 that yielded 53 of the 237 burials, located approximately 80 meters north and 30 meters east of the site's geographical center. Burial 65 was discovered at a depth of approximately 70cm below datum (Solís and Herrera, 2009).

Figure 7.6: Map of Burial 65.



(Image: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

The skeletal remains of *Burial 65* are approximately 25% complete, represented by several fragments of the cranial vault and dentition, several vertebrae, a fragmentary pelvis, and fragments of the upper and lower limbs. The burial does not appear to have been disturbed or intruded upon, and poor preservation in this case appears to be due to conditions associated with the soil. The child's body is in an extended, supine position, with the legs parallel to one another and the arms at the sides; the body orientation is west-to-east, with the head in the west, which is a body position and orientation typical of the population from Jícaro. Only one artifact is associated with this burial, an unmodified shell (*Strombus galeatus*, a species of marine mollusk that is readily available in the local waters)—this does not account for any artifacts or adornments, including clothing, that may have accompanied the child but decomposed without leaving a trace. The single artifact and the burial location, position, and orientation, all suggest that this child and his/her family probably did not have a special or elevated status within the community.

The age for this child was determined by dental development (Buikstra and Ubelaker, 1994). None of the long bones are complete enough for the diaphyseal length to be measured, so a comparison of skeletal and dental age is not possible. There is no evidence of periosteal reaction affecting the postcranial elements, and unfortunately the skull is too fragmentary and the cortex is too damaged for any assessment of porotic hyperostosis or cribra orbitalia. The crowns of several permanent teeth have begun to develop, all of which are free of enamel defects (at least to the extent of their development).

Burial 65's deciduous maxillary incisors show evidence of lingual surface attrition of the maxillary anterior teeth (LSAMAT), which except for this child, was only observed on adult permanent dentition at Jícaro. The labial surface of the deciduous incisors appears intact and in relatively good condition with little occlusal wear, while the lingual surface shows an excessive amount of wear, particularly on the mesial aspects.

Figure 7.7: Burial 65, maxillary incisors with LSAMAT.

(Photos: Wankmiller, 2013)

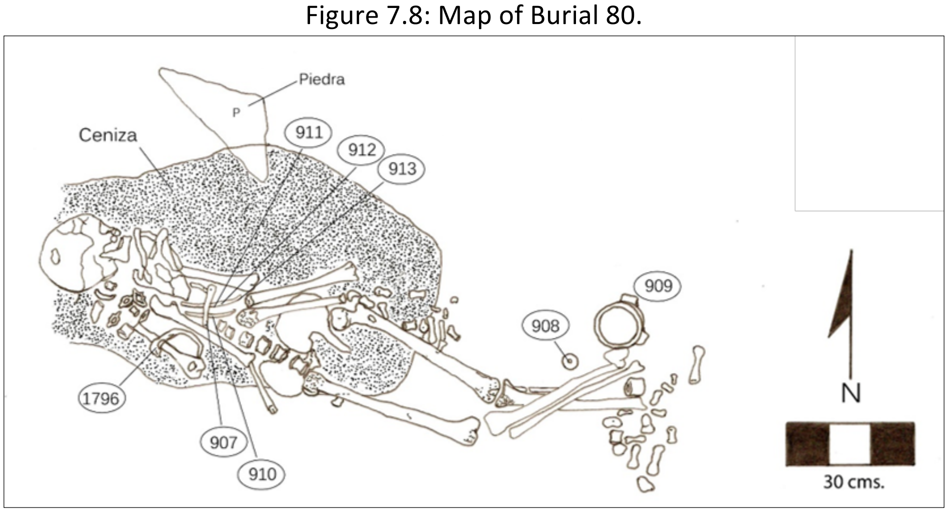
This wear pattern, generally present in combination with the presence of excessive calculus affecting the anterior mandibular dentition and a high incidence of dental caries, has been observed at other archaeological sites in Latin America and is thought to be the result of repeated use of the upper teeth to "peel an abrasive plant matter for dietary or industrial or both purposes" (Turner and Machado 1983: 128). The observations presented by Turner and Machado (1983) indicate a dietary purpose for the use of the teeth to process an abrasive plant matter (most likely manioc) at the site of Corondó, Brazil, because in their opinion, if there were a purely industrial purpose for the activity, they would expect to see different frequencies among males and females or among different age cohorts, but they did not observe such differences. The same is probably true at Jícaro, as there are no significant associations between LSAMAT and age-at-death or sex among adults (See Chapter 5).

At his/her age, and based on the presence of LSAMAT affecting his/her maxillary teeth, this child was probably regularly assisting his/her parents with their work—most likely his/her mother, as children's work often reflects women's work in agricultural societies (Bradley, 1987), although at Jícaro, adult males and adult females show about the same frequency of LSAMAT so it is difficult to say whether this child would have been assisting his/her mother, father, or both. Ethnographic accounts of modern indigenous communities from this region suggest that in prehistory this child would have spent part of his/her days on the beach, helping to collect shellfish during low tide with his/her family (Herrera, 2002). This child is one of seven children in the 3-to-5-year-old age group (15.6% of the Children (3-12 years) excavated at Jícaro) and one of 23 subadults discovered at Jícaro between the ages of 2 and 6 years (20.2% of the total number of subadults, N=114). Many children in prehistoric societies experienced a great deal of systemic stress during this time in their lives that often left its mark in the form of dental enamel defects among individuals who survived into adulthood (Boldsen, 2007). The few permanent teeth that remained in this child's maxilla and mandible did not show hypoplastic events affecting the dentition, which may mean that he/she died as a result of an acute illness or injury or as a result of a disease process that would have left evidence on his/her dentition if he/she had survived. It is possible that this child was a victim of the same infectious process that Burial 3, *Cráneo 4* would have contracted as a young child.

Burial 80

Burial 80 is the single interment of a Middle-to-Older Adult (40+ years) Male, buried prone in an extended position, with the legs crossed at the ankles and the arms crossed under the body; the body is oriented roughly west to east with the head in the west. The remains of this male are approximately 75% complete, represented by a fragmentary cranium and axial skeleton, the diaphyses of all of the long bones of the limbs, and fragments of the pelvis, both hands and feet. This burial was discovered in the northernmost section of Operation 30, the southeast corner of which is located approximately 35 meters south and 20 meters east of the site's geographic center and, together with the two other sections of the operation, yielded 11 burials over three field seasons. As is the case with many of the Operations at Jícaro, Operation 30 is associated with one of the large shell mounds at the site, *Conchero* 14.

Figure 7.8: Map of Burial 80.



(Image: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

The prone disposition of this individual is unusual for Jícaro, as 215 (92%) of the individuals for which position could be determined are buried in a supine position, and all but two of the remaining 18 (8%) of the individuals were buried prone. There is no significant association between osseous manifestation of pathological conditions, cultural modifications, or the presence of certain artifacts and whether the individuals at Jícaro are buried supine or prone (See Chapter 5); that said, it is possible that the individuals who do not display any pathology may not have suffered from their afflictions long enough to have it affect the bone (Wood et al. 1992) and it is not possible to know if there was a significant relationship between a prone position and artifacts made of perishable materials that may have decomposed without leaving evidence of their presence. There is no obvious reason, therefore, for this individual to have been buried in this position.

Burial 80 was buried with several artifacts made from human remains—a rectangular pendant made from a human long bone (probably a femur), a toothpick-like filament, possibly from a long cylindrical comb made from a human long bone (probably a humerus), and a mandible that was scored and broken at the ramus on both sides and then had holes drilled through the body so it could be worn as an ornament. He was also buried with a single ceramic vessel, three faunal bone needles, and a single shell discoidal bead. His artifact assemblage is somewhat unique in that the three faunal bone needles are three of only nine found at the site, and only 12 other individuals, 11 males and a probable female, were buried with artifacts made from human remains. This male stands out as an exception to the Jícaro population with his artifact assemblage and his burial in a prone position, indicating he may have held an elevated status or possibly just a unique status within the community, such as a venerated (or feared) religious leader (or deviant).

Burial 80 is one of the few individuals at Jícaro whose skeleton shows any evidence of trauma. His cervical spine shows at least one healed compression fracture of the right side of the C3 centrum, which is associated with a slightly collapsed centrum and extensive osteophytic lipping and a similar healed compression fracture affecting the right side of the C4 centrum. He has a healed fracture of the right fifth metacarpal, which resulted in noticeable disfigurement of the bone, and healed fractures of the medial aspect of the left patella and the proximal left humerus. His injuries may have been the result of a fall that occurred years previously and was likely unrelated to his death—although he probably had limited mobility of his neck/head and right hand for the remainder of his life.

Figure 7.9: Burial 80, C3 and C4.

(Photo: Wankmiller, 2013)

Figure 7.10: Burial 80, right fifth metacarpal.

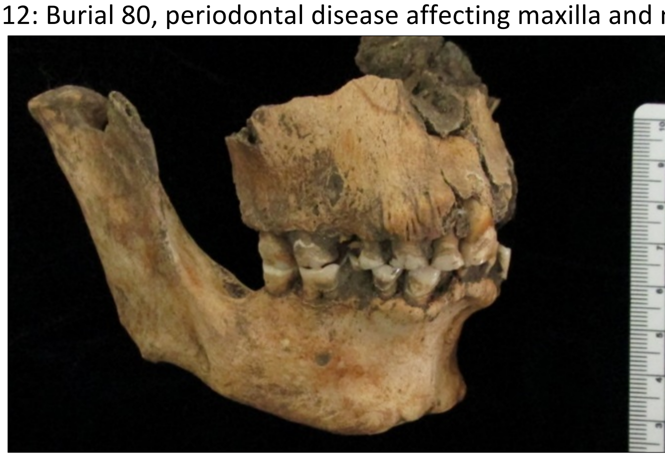
(Photos: Wankmiller, 2013)

Figure 7.11: Burial 80, healed fracture of left humerus (with detail of internal surface, right).

(Photos: Wankmiller, 2013)

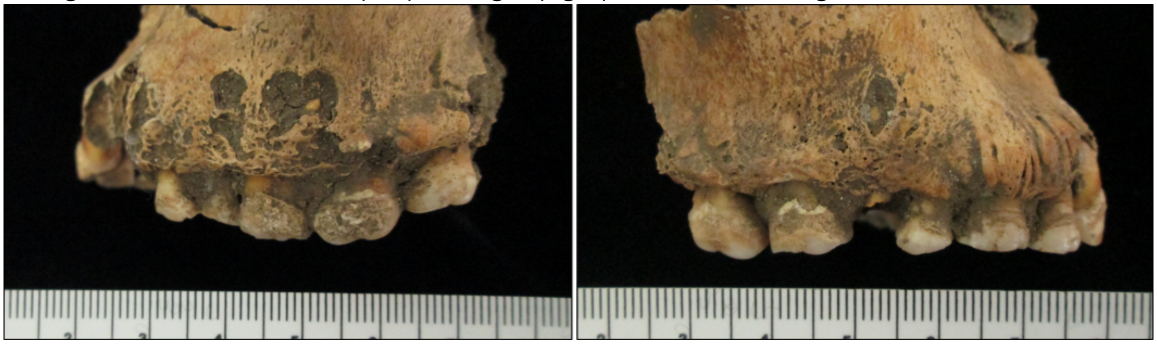
Burial 80's anterior teeth show more extensive attrition than his posterior teeth, possibly suggesting he was either using his anterior teeth as tools or, as a colleague suggests (Fowler, 2016, personal communication), he may have habitually ground his anterior teeth—either repeated activity may have led to irritation and eventual infection of the periodontal ligament. Burial 80's dental health is marginal at best—he as a great deal of calculus affecting his teeth, severe periodontitis affecting both his maxillary and mandibular alveolar processes, with what appears to be a related periosteal reaction affecting much of the anterior surface of the mandible, two large abscesses affecting the buccal surface of the maxilla in the region of a carious left second premolar and first molar, an abscess associated with a carious right maxillary second premolar, and dental crowding, which may be related to his periodontitis.

Figure 7.12: Burial 80, periodontal disease affecting maxilla and mandible.



(Photo: Wankmiller, 2013)

Figure 7.13: Burial 80, left (left) and right (right) maxillae, showing calculus and abscesses.



(Photo: Wankmiller, 2013)

Figure 7.14: Burial 80, showing the occlusal surfaces of the maxilla (left) and mandible (right).

(Photo: Wankmiller, 2013)

Periodontal disease and poor dental hygeine and health, like that of Burial 80, have been linked to systemic infections and coronary heart disease in modern populations (DeStefano et al., 1993). His conditions may have seriously affected Burial 80's quality of life, in that he would likely have been in quite a bit of pain due to the inflammation of the periodontal ligaments and his abscesses, which would have affected the surrounding soft tissue as well, and may have even contributed to his death.

Burial 133, Individual 1

Burial 133 is both exceptional and typical of burials at Jícaro for various reasons. This burial is located within Operation 31, an excavation unit that yielded 23 of the 237 burials. The southwest corner of Operation 31 is located approximately 30 meters north and 10 meters east of the geographic center of the site, in an area where Phase I shovel test pits dug in 2005 yielded evidence of domestic activities. Burial 133 contains three individuals, the conditions of which appear indicative of reuse, as opposed to a single-event multiple interment. Individual 1 appears to be in anatomical position and does not appear to have been disturbed, except both of the humeri are missing (discussed in greater detail, below). Individual 2 appears as a scatter of disarticulated remains that was encountered superficial to Individual 1. This burial appears to have been disturbed when Individual 1 was interred. Individual 3 also appears to have been disturbed upon the interment of Individual 1. Individual 3 is also disarticulated, but the skeleton appears to have been essentially pushed to the side of Individual 1 and is arranged in an arc-like distribution adjacent to the right shoulder of Individual 1. Individuals 2 and 3, a middle adult male and an older adult female, respectively, are incomplete and scattered, leaving little information for interpretation of their skeletal remains or individual burial treatments.

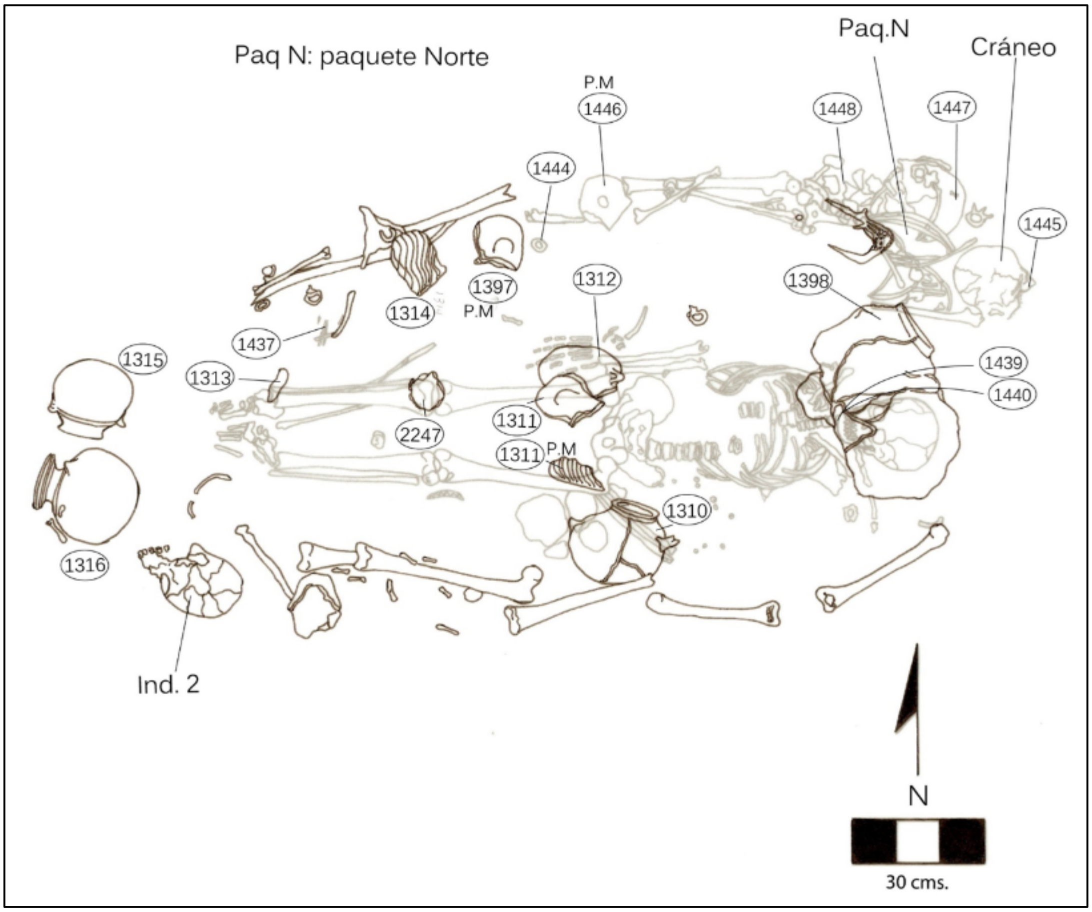
Individual 1 is a Middle Adult (35-50 years) Female, buried in a supine, extended position, with the legs parallel and the arms extended at the sides, and a body orientation of 269 degrees, with the head in the west, which is the most common burial position and orientation at Jícaro. The skeleton is greater than 75% complete, and is in very good condition. Cranial and postcranial morphology and measurements indicate this individual is female, and based on calculations using the maximum length of her left femur, her stature is estimated to have been approximately 160.335 cm, +/- 3.18cm (Genoves, 1967), which is slightly taller than the mean stature of other females at Jícaro (n=17, females with measurable stature) of 151.522 cm, +/-3.18 cm. Radiocarbon dates indicate that Burial 133, Individual 1 would have been interred in the later years of Jícaro's occupation, between A.D. 1160 and 1280 (Herrera and Solís, 2009).

This female shows one LEH affecting Tooth 11 and Tooth 27, possibly indicating a period of severe, acute stress during her early childhood, but she does not show any evidence of cribra orbitalia and her long bone measurements do not appear to reflect any stunting of her growth. Her left and right radii, right ulna, left and right tibiae and fibulae show sclerotic periosteal reactions along the diaphyses, possibly indicating that she may have suffered from a severe, potentially long-lasting systemic infection near the time of her death (Ortner, 2003). It is possible, given the prevalence of what appears to be treponemal infection among the population at Jícaro that this individual was not spared the affliction.

In figure 7.15, below, Individual 1 is shown in light gray across the center of the scattered remains. The body appears to be in anatomical position and is oriented with the head in the east. Individual 2 is shown in black. Individual 2 is disarticulated and appears to be scattered in a roughly oval distribution. This individual was located superficial to Individuals 1 and 3. Individual 3 is shown in light gray as a cluster of bones in the northeast corner of the burial, labeled "Paq.N."

Figures 7.15 and 7.16, below, show the relative locations of Individuals 1, 2, and 3 within the Burial 133 fossa.

Figure 7.15: Map of Burial 133, showing Individuals 1, 2, and 3.



(Image: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

Figure 7.16: Burial 133, showing Individuals 1 and 3.

(Photo: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

Burial 133, Individual 1 is set apart from other burials, and other females, particularly, in that she shows evidence of fronto-occipital cranial deformation (Buikstra and Ubelaker, 1994; Solís and Herrera, 2009) and antemortem intentional modification of the anterior maxillary dentition. She has a variation of modification styles: teeth 7 to 11 (tooth 6 is missing with no associated alveolar bone) show modification in the form of II:7 (Romero, 1970); her mandibular canines show occlusal modification in the form of III:1, and the occlusal edges of her mandibular incisors are modified in the form of III:6 (Romero, 1970), and she lacks any evidence of extreme lingual wear affecting the maxillary anterior teeth or excessive calculus affecting the mandibular anterior teeth, which are both common among the people of Jícaro.

Figure 7.17: Burial 133, Individual 1—Skull.

(Photo: Wankmiller and Sauer, 2008)

This individual was buried with a variety of artifacts, including six ceramic vessels, one pearl oyster shell (without use), one shell spatula preform (made from a bivalve, *Strombus peruvianus*, which locally abundant), one oyster shell with a perforation that would have been used to top a ceramic vessel, several pieces of silicified sandstone of various colors (white, yellow, red and green, believed to be a collection that may have at one time been contained within a sac made of an organic material because of the variety of shapes and colors and their close concentration with one another), one nose pendant made of shell, and a polished animal bone toothpick (Herrera and Solís, 2009; Solís and Herrera, 2011). She was also found in association with the only gold bead and four of the pearls that were discovered from Jícaro, and her head was covered by a large ceramic vessel (Herrera and Solís, 2009). The large number and variety of artifacts, particularly the presence of gold and pearls in association with this individual, along with the apparent cranial and dental modification set this female apart from other individuals at Jícaro. Solís and Herrera (2009; 2011) propose that she may have had an elevated status within the community as a political or religious leader (Solís and Herrera, 2009; personal communication, 2008).

Among the most interesting features of this individual is that she was discovered in nearly perfect anatomical position, except both of her humeri are missing. According to Solís and Herrera (2009), it appears that the remains would have been decomposed and all or most of the soft tissue would have been gone prior to the removal of the humeri because there is no evidence of cutmarks or major disruption of adjacent skeletal elements (clavicles, scapulae, radii, ulnae), which is supported by the lack of any evidence for disarticulation observed during the skeletal analysis phase of this study. This may indicate that the people at Jícaro had some social memory of *Burial 133, Individual 1's* burial location and they would have known where to find her to extract her humeri sometime after she decomposed. According to Boz and Hager (2014), such removal of elements is not always planned, but it is always intentional, so even if there was no direct knowledge of *Individual 1's* burial location, the fact that they removed her humeri when they encountered her burial still suggests that her remains held some significance to the people of the community and they may have been retrieved for use as relics (Osterholtz et al., 2014).

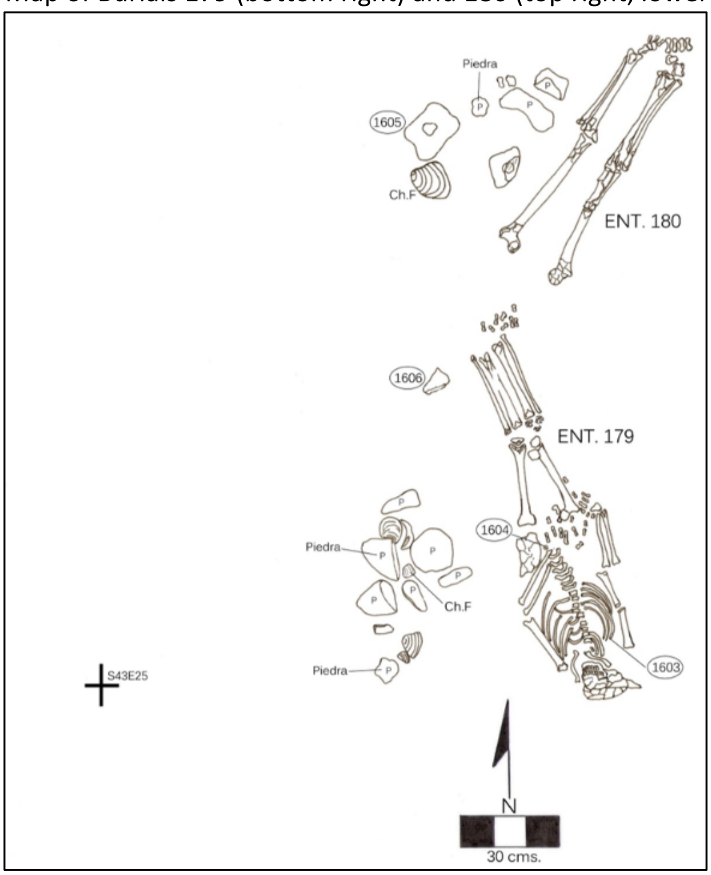
The use of human bones and teeth as adornments or the placement of human bones in graves as offerings is not uncommon in the region or at Jícaro, and based on their size and shape, several ornaments that were discovered in graves at Jícaro could only have been made from humeri or femora.

Additionally, Solís and Herrera (2009; 2011) propose a Mesoamerican form of ancestor worship as a likely reason for the use of human bones as artifacts and adornments. It is possible, therefore, that the humeri of *Burial 133, Individual 1*, were removed postmortem specifically to be used as the raw material for adornments, possibly due to her elevated status or her affiliation with a particular lineage.

Burial 179

Burial 179 is the single interment of an adolescent, approximately 14-years-old at the time of his/her death. This burial was discovered approximately 13 meters south of Burial 80 in the southernmost section of Operation 30, the southeast corner of which is approximately 45 meters south and 25 meters east of the site's geographical center.

Figure 7.18: Map of Burials 179 (bottom right) and 180 (top right, lower limbs only).



(Image: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

The skeletal remains of *Burial 179* are approximately 75% complete, with a fragmentary cranium. This individual was buried in an extended supine position with the left arm crossed over the pelvis and the right arm extended toward the side and the head oriented generally toward the south. This is an unusual position for individuals at Jícaro, as most were buried with their arms in similar positions (either both extended or both crossed over the body), and their heads oriented toward the west, northwest, or north. This is the only one of the 11 burials in Operation 30 with the head oriented facing the north, but there is no consistency among the others, either, so it is not an outlier from any distinct pattern. Burial 180 is in very close proximity to Burial 179, just to the northwest, and is represented by the lower limbs only (femora, tibiae, fibulae, and feet), with no evidence of the upper body. It is apparent that when Burial 179 was interred, the burial disturbed the earlier interment of Burial 180, possibly indicating that this is an area of the site where there was some social memory of the location of burials and the later burials were buried very near (and in this case through) earlier burials.

Burial 179's dental development indicates that he/she was approximately 14-years-old at the time of death, but measurements of the two long bones that were intact enough to measure (the left clavicle and the left radius), his/her skeletal age is between 9 and 11 years of age. This is slightly atypical for subadults at Jícaro in that the long bone lengths average approximately 2 years of age difference from the dental age, which may be indicative of a period of stunted growth due to an illness or malnutrition, but the discrepancy may also have to do with the bones measured because more reliable bones, such as the femora, were too incomplete to measure. The few epiphyseal surfaces that are present (distal radius, distal humerus, greater trochanter of the femur) are not fused, indicating that its individual would have been younger than 14 years of age.

Figure 7.19: Burial 179, distal left humerus epiphyseal surface.

(Photo: Wankmiller, 2013)

This adolescent was buried with nine shell beads (3 of various shapes, 6 discoidal), a porous lava metate platform and a vacuous lava "*rompecoyol*" (coyol breaker) (a coyol is the fruit of a species of palm native to the local area with a nutlike center). The metate platform is an unusual artifact to be buried with at Jícaro, as normally only their supports or fragments of grinding surfaces were found at the site, presumably because they were not easily made and were passed down and used until their grinding surfaces were no longer useable (Solís and Herrera, 2008, personal communication). *Burial 179* was also buried with burned fragments of what appear to be an adult femur and tibia—all of the fragments appear to have been burned after the bones were completely skeletal, and all are generally a uniformly bluish-brown color with patches of periwinkle blue and white. Burned bones are rare at the site, but not uncommon in Mesoamerica in general, and their presence may be indicative of this adolescent's family or group identity (Osterholtz et al., 2014). This may be related to a form of ancestor veneration that is believed to have been practiced at Jícaro (Solís and Herrera, 2011).

It is difficult to commit to a sex determination based on the artifacts present with any confidence because there appears to be very little variation among males and females at Jícaro with regard to artifact assemblages, health, burial treatments, or cultural modifications. That said, an individual of this age would likely have begun taking on the work of the same-sex parent as is the case in many agricultural societies (Bradley, 1987), and based on ethnographic accounts of local indigenous people (REFERENCE), the food processing would likely have been carried out by females, so it follows that if the artifacts included with this adolescent are representative of his/her work, and if the work he/she was performing was most like the same-sex parent, then it is likely that this adolescent was a female.

Figure 7.20: Burial 179, burned adult bones.

(Photos: Wankmiller, 2013)

This individual shows evidence of skeletal and dental pathologies that would suggest a period of childhood stress and a period of stress at or near the time of death. Burial 179's anterior maxillary and mandibular dentition show multiple linear enamel hypoplasias affecting several teeth (see Figure #, below), which indicate that he/she survived a period of extreme stress in early childhood (Boldsen, 2007; Ortner, 2003).

Figure 7.21: Burial 179, right and left maxillae.

(Photos: Wankmiller, 2013)

Figure 7.22: Burial 179, anterior mandibular teeth.

(Photo: Wankmiller, 2013)

Healed cribra orbitalia affecting the left orbit is further evidence of childhood stress. The maxillary dentition is associated with reactive alveolar bone, suggestive of periodontitis, and the curved, misshapen roots of the teeth and apparent reactive bone surrounding the nasal aperture may be suggestive of a congenital treponemal infection (Ortner, 2003).

Figure 7.23: Burial 179, maxillae and nasal aperture.

(Photo: Wankmiller, 2013)

The conditions experienced as a child may have weakened Burial 179's resistance to environmental stressors, and if the childhood stress was the result of a disease process such as a treponemal infection, it is highly likely that the disease has gone through periods of activity and remission (Powell and Cook, 2005), and may have had a resurgence at or near the time of this individual's death.

Chapter Summary

Because there is so little variation between males and females and among adult age cohorts with regard to burial treatment, position, orientation, and grave goods (see Chapter 5), individuals were chosen for this chapter who could provide glimpses into individual life experiences, activity, status, and typical burial practices at the site. This chapter presents individuals from different age categories that were chosen because they are all representative of typical burial practices and skeletal/health conditions in addition to contributing something unique to the story of Jícaro's population.

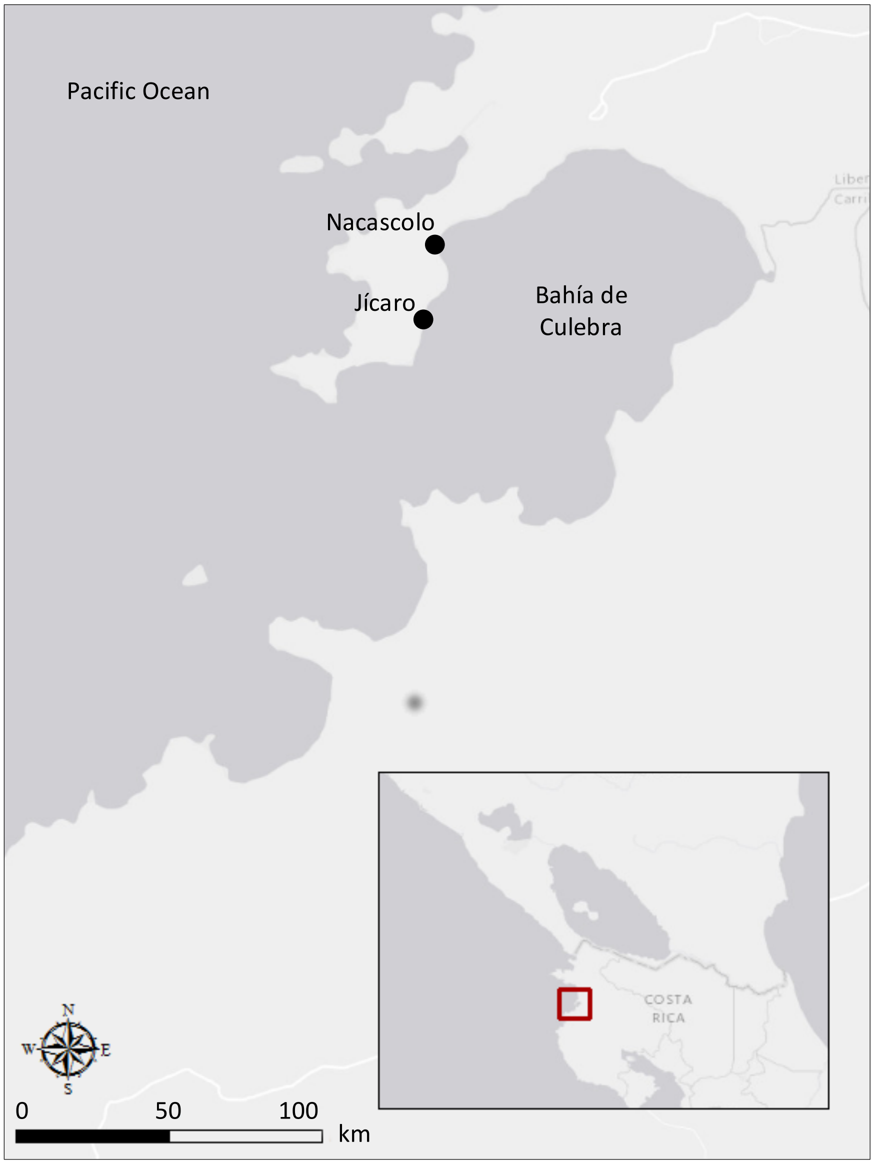
Chapter 8: Inter-Site Comparison

Introduction

In order to contextualize Jícaro spatially and temporally, data from the nearby site of Nacascolo was chosen as a comparative sample. Nacascolo (described Chapter 2) was primarily excavated in the early 1980s, with subsequent excavations in 1989 and conservation efforts beginning in 1993 (Solís, 1998), and has been the subject of several intensive research projects and publications (e.g., Hardy, 1992: Norr, 1990; Obando, 1995; Vázquez, 1986). Not only is there a great deal of information about Nacascolo available, but the site has also been well studied, it is known to have had a period of human occupation coincident with that of Jícaro, and it has been cited as a representative example of the southern sector of Greater Nicoya (discussed in Chapter 2) (Hardy, 1992; Obando, 1995). Tables showing the frequencies of variables and the results from the Chi-square and Fisher's Exact tests included in this chapter are available in Appendix G.

Nacascolo and Jícaro are both located approximately mid-way along the southern shore of the Papagayo Peninsula, which forms the northwestern boundary of the Bahía de Culebra; Nacascolo is only about 1.2 kilometers east of Jícaro, and they are separated only by a small promontory that extends out into the bay. The two sites also have a period of contemporaneous human occupation, although Nacascolo is also known to have been occupied consistently for nearly 1000 years prior to that period (Hardy, 1992). The two sites also yielded much larger skeletal collections than any other sites in the local region, both of which appear to have similar demographic compositions, and preservation.

Figure 8.1: Map showing the Bahía de Culebra and the locations of Jícaro and Nacascolo on the Papagayo Peninsula.



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Skeletal and burial information from Nacascolo was adapted from Hardy (1992). Hardy's "Appendix I: Nacascolo Beach Cemetery (OP.8A-M) Burial Descriptions and Skeletal Analysis" (Hardy, 1992: 360-406) provides a description of each burial with information about age, sex, whether it was a multiple or single burial, the presence of isolated crania, body orientation, completeness, grave goods and time period. Before the Nacascolo data could be used as a comparison for Jícaro, that sample had to be characterized with respect to both the demographic variables and the burial practices. The following section provides the Nacascolo burials and those that could be assigned to a particular time period were included in this study. In her study, Hardy assigned burials to time periods based on a chronological sequence of ceramic typologies that was originally developed by Baudez in 1967 and was later modified by Lange in 1990 (Hardy, 1992, presented in Chapter 2). More recently, Guerrero et al. (1994) presented a chronological sequence specific to Greater Nicoya, which is the sequence primarily used for this study. A more complete discussion of regional chronology is presented in Chapter 2, but for clarity in the present section, a summary of the corresponding time periods is presented in Table 8.1, below. A table including all of the data adapted from Hardy (1992) can be found in Appendix D.

Table 8.1: Correspondence between temporal sequences for Jícaro and Nacascolo (adapted from Guerrero et al., 1994: 93).

<table>
<tr><th>Year</th><th>Modified Sequence (Lange, 1990)</th><th>Greater Nicoya Sequence (Guerrero et al., 1994)</th></tr>
<tr><td>1500</td><td rowspan="2">Late Polychrome</td><td rowspan="2">Ometepe</td></tr>
<tr><td>1400</td></tr>
<tr><td>1300</td><td rowspan="6">Middle Polychrome</td><td rowspan="6">Sapoa</td></tr>
<tr><td>1200</td></tr>
<tr><td>1100</td></tr>
<tr><td>1000</td></tr>
<tr><td>900</td></tr>
<tr><td>800</td></tr>
<tr><td>700</td><td rowspan="3">Early Polychrome</td><td rowspan="5">Bagaces</td></tr>
<tr><td>600</td></tr>
<tr><td>500</td></tr>
<tr><td>400</td><td rowspan="10">Zoned Bichrome</td></tr>
<tr><td>300</td></tr>
<tr><td>200</td><td rowspan="8">Tempisque</td></tr>
<tr><td>AD 100</td></tr>
<tr><td>1</td></tr>
<tr><td>100 BC</td></tr>
<tr><td>200</td></tr>
<tr><td>300</td></tr>
<tr><td>400</td></tr>
<tr><td>500</td></tr>
</table>

Burials from Nacascolo date to the Zoned Bichrome (500 BC – AD 500), Early Polychrome (AD 500 – 800), and Middle Polychrome (AD 800 – 1400) Periods. All burials from Jícaro date to the Sapoa Period (AD 800/900 – 1350). In Table 8.1, above, the shaded region indicates the period during which Jícaro was inhabited, showing that it corresponds with the Middle Polychrome Period. For the purpose of this study, Nacascolo burials dating to the Middle Polychrome Period are considered contemporaries of burials from Jícaro and are classified as Sapoa Period; Nacascolo burials dating to the Early Polychrome and Zoned Bichrome Periods are treated as a comparative sample, possibly from an earlier occupation, and are classified as Pre-Sapoa Period.

Demography of Nacascolo

Ninety-six of the 113 individuals from Nacascolo who could be assigned to a particular time period (based on artifacts present with the burials) were included in this analysis, 57 adults (59.4%), 33 subadults (34.4%), and 6 (6.3%) individuals for whom age and sex could not be determined. A summary of the adults and subadults from the total Nacascolo sample is provided in the table below.

Table 8.2: Adults and Subadults at Nacascolo from the Sapoa and Pre-Sapoa Periods.

Time Period	**Age Category**				**Total**	***Freq.%***
	Subadults	*Freq.%*	Adults	*Freq.%*		
Pre-Sapoa Period	29	*39.7*	44	*60.3*	73	*81.1*
Sapoa Period	5	*29.4*	12	*70.6*	17	*18.9*
Total	34	*37.8*	56	*62.2*	90	*100.0*

Of the 57 adults, 26 (45.6%) are Male or Probable Male (MPM), 23 (40.35%) are Female or Probable Female (FPF), and sex could not be determined for 8 (1.4%) of the adults. A summary of the adult sample is provided in Table 8.3, below. For the purpose of this section, adults who could not be assigned to a sex category were not included in any analysis involving sex as a variable.

Table 8.3: Males and Females at Nacascolo from the Sapoa and Pre-Sapoa Periods.

Time Period	Sex						Total	Freq.%
	MPM	Freq.%	FPF	Freq.%	U	Freq.%		
Pre-Sapoa Period	17	*44.7*	19	*50.0*	2	*5.3*	38	*66.7*
Sapoa Period	9	*47.4*	4	*21.1*	6	*31.6*	19	*33.3*
Total	26	*45.6*	23	*40.4*	8	*14.0*	57	*100.0*

When the sample of 96 individuals from Nacascolo are separated by time period, it becomes clear that there is a larger sample at Nacascolo from the earlier time period (ca. AD 300-800) than there is from the period during which Jícaro was occupied (ca. AD 800/900-1350). These analyses are consistent with the findings presented by Hardy (1992) regarding the demography of the population at Nacascolo.

Mortuary Practices at Nacascolo

Because the Nacascolo sample reportedly includes burials representative of two different time periods, before the sample could be compared with Jícaro for the purpose of this study, the apparent differences in burial practices had to be evaluated. The following section provides an overview of burial treatments at Nacascolo for subadults and adults, males (and probable males), and females (and probable females) during each time period. All frequencies of mortuary practices are presented in terms of percent per time period, as opposed to percent per category.

The terminology for each section is based on the terminology used by Solís and Herrera (2007; 2009). Hardy (1992) discusses the potential for a hierarchy of burial treatments, with the beach cemetery possibly being a place for commoner burial, as it was used for the duration of human occupation at the site, with the more inland valley floor and hillsides being reserved for individuals of higher status, as is indicated both by the energy expenditure that would have been required to bury people in those locations and by the associated artifact assemblages and burial positions. Hardy (1992) notes that earlier burials at Nacascolo were often flexed and placed in stone-lined cists, while later burials were extended. She proposes that it is possible that the extended position may have originated for elites and was later adopted by individuals of lesser status, resulting in its prevalence during the later occupation period.

Burial Disposition at Nacascolo

According to Lange (2006) and personal communications with archaeologists Herrera, Solís, and Vázquez, one of the most dramatic and obvious differences between burials from the Pre-Sapoa (Tempisque and Bagaces Periods) and Sapoa Periods is that during the Pre-Sapoa Periods the bodies were often tightly flexed and were placed in stone-lined pits, while during the Sapoa Period the bodies were most often interred in extended positions in unlined pits.

Burial disposition could be determined for 69 (71.9%) of the 96 individuals from Nacascolo who are included in this study. Of the 69 individuals for whom position could be determined, 53 (76.8%) date to a Pre-Sapoa and 16 (23.2%) date to the Sapoa Period. Although the sample size is relatively small, the number of flexed and extended burials from each time period appears to support the expectation that burials from the earlier time period would be predominantly flexed, while those from the Sapoa Period would be predominantly extended.

Table 8.4: Burial Disposition at Nacascolo from the Sapoa and Pre-Sapoa Periods.

Time Period	**Burial Disposition**				**Total**	***Freq.%***
	Extended	*Freq.%*	Flexed	*Freq.%*		
Pre-Sapoa Period	3	*5.7*	50	*94.3*	53	*76.8*
Sapoa Period	14	*87.5*	2	*12.5*	16	*23.2*
Total	17	*24.6*	52	*75.4*	69	*100.0*

A Fisher's Exact test confirms that there is a statistically significant relationship between time period and whether individuals were primarily buried in a flexed or extended disposition at Nacascolo ($p=0.000$, with significance at the $p<0.05$ level). A greater proportion of individuals during the Pre-Sapoa

Period were buried in a flexed disposition, and a greater proportion of individuals during the Sapoa Period were buried in an extended disposition. The pattern holds true when the samples are broken down according to age-at-death and sex categories. Fisher's Exact tests confirm that there is no significant relationship between age-at-death and burial disposition during either the Pre-Sapoa (Fisher's Exact p=0.470) or Sapoa Periods (Fisher's Exact p=0.450), or sex and burial disposition during the Sapoa Period (Fisher's Exact p=0.308). All of the individuals from the Pre-Sapoa sample and who would be included in a test to evaluate whether or not a relationship existed between sex and burial disposition during that time period were buried in a flexed position (N=34, 17 MPM and 17 FPF), making the test unnecessary. It is clear just based on the frequency that there is no relationship between sex and burial disposition during the Pre-Sapoa Period.

Burial Position at Nacascolo

There is substantially less discussion in the literature about whether interments from a given time period were placed in supine or prone positions. Of the individuals for which a supine or prone position could be determined (N=73), 57 (78.1%) date to the earlier time period and 16 (21.9%) date to the Sapoa Period. Of the 57 earlier burials, 43 (75.4%) were buried supine and 14 (24.6%) were buried prone, while 7 (43.8%) of the Sapoa period burials were buried supine and 9 (56.2%) were buried prone.

Table 8.5: Burial Position at Nacascolo from the Sapoa and Pre-Sapoa Periods.

Time Period	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
Pre-Sapoa Period	43	*75.4*	14	*24.6*	57	*78.1*
Sapoa Period	7	*43.8*	9	*56.3*	16	*21.9*
Total	50	*68.5*	23	*31.5*	73	*100.0*

A Chi-square test confirms that there is a statistically significant relationship between time period and whether individuals were primarily buried in a supine or prone position at Nacascolo

(X2=5.813, df=1, p=0.016, with significance at the p<0.05 level). A greater proportion of individuals during the Pre-Sapoa Period were buried in a supine position, and although the sample size is small, it appears as though the proportion of individuals buried in prone and supine positions is about the same during the Sapoa Period. The pattern holds true when the samples are broken down according to age-at-death and sex categories. Fisher's Exact tests, with significance at the p<0.05 level, confirm that there is no significant relationship between age-at-death and burial position during either the Pre-Sapoa (p=0.161) or Sapoa Periods (p=0.262), or sex and burial position during the Pre-Sapoa (p=1.00) or Sapoa Periods (p=1.000).

Table 8.6: Burial Position at Nacascolo according to Age—Pre-Sapoa Period.

Age Category	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
Adult	9	*60.0*	6	*40.0*	15	*26.3*
Subadult	34	*81.0*	8	*19.0*	42	*73.7*
Total	43	*75.4*	14	*24.6*	57	*100.0*

Table 8.7: Burial Position at Nacascolo according to Age—Sapoa Period.

Age Category	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
Adult	3	*75.0*	1	*25.0*	4	*25.0*
Subadult	4	*33.3*	8	*66.7*	12	*75.0*
Total	7	*43.8*	9	*56.3*	16	*100.0*

Table 8.8: Burial Position at Nacascolo according to Sex—Pre-Sapoa Period.

Age Category	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
FPF	14	*77.8*	4	*22.2*	18	*51.4*
MPM	13	*76.5*	4	*23.5*	17	*48.6*
Total	27	*77.1*	8	*22.9*	35	*100.0*

Table 8.9: Burial Position at Nacascolo according to Sex—Sapoa Period.

Age Category	**Burial Position**				**Total**	***Freq.%***
	Supine	*Freq.%*	Prone	*Freq.%*		
FPF	2	*50.0*	2	*50.0*	4	*30.8*
MPM	3	*33.3*	6	*66.7*	9	*69.2*
Total	5	*38.5*	8	*61.5*	13	*100.0*

Although no statistically significant relationships were present between the demographic variables and burial position, it does appear as though a greater proportion of the subadult sample was buried prone than the proportion of the adult sample at Nacascolo during the Pre-Sapoa period, whereas during the Sapoa period the proportions of the two samples buried prone or supine are very similar. Similarly, even though there is no indication of a statistically significant relationship and the sample size for this test is extremely small, if Table 8.9, above, is representative of the population at the site at that time, it appears as though females in the sample were equally likely to be buried prone or supine, but more males were buried in a prone position during the Sapoa period than in a supine position.

Head Orientation at Nacascolo

Hardy (1992) provides the orientation of the head for burials from Nacascolo in terms of North (N), Northeast (NE), East (E), Southeast (SE), South (S), Southwest (SW), West (W), Northwest (NW), and Undetermined (U). The individuals with undetermined head orientation are included in the summary table for head orientation at the site (Table 8.10, below) and in analyses regarding burial position and artifacts, but those individuals are excluded from further analyses of relationships between demographic variables and head position.

Table 8.10: Head Orientations at Nacascolo from the Pre-Sapoa and Sapoa Periods.

Head Orientation	**Time Period**				**Total**	***Freq.%***
	Pre-Sapoa	*Freq.%*	Sapoa	*Freq.%*		
N	18	*37.5*	1	*7.7*	19	*31.1*
NE	3	*6.3*	0	*0.0*	3	*4.9*
E	8	*16.7*	5	*38.5*	13	*21.3*
SE	3	*6.3*	0	*0.0*	3	*4.9*
S	9	*18.8*	3	*23.1*	12	*19.7*
SW	2	*4.2*	0	*0.0*	2	*3.3*
W	3	*6.3*	4	*30.8*	7	*11.5*
NW	2	*4.2*	0	*0.0*	2	*3.3*
Total	48	*78.7*	13	*21.3*	61	*100.0*

Table 8.10, above, shows that none of the individuals from the Sapoa period were interred with their heads in directions other than the four cardinal directions, while there appears to be more variation in head orientation during the earlier time period. This apparent difference may be due to the way in which head orientation was recorded for burials during a particular field season, but it may also represent a real difference.

A summary table of all individuals dating to the Sapoa Period for whom age-at-death (at least with regard to adult or subadult, even if a more specific age determination could not be made) and head orientation could be determined is presented in Table 8.11, below.

Table 8.11: Head Orientation of Adults and Subadults at Nacascolo—Pre-Sapoa Period.

Head Orientation	**Age Category**				**Total**	***Freq.%***
	Adult	*Freq.%*	Subadult	*Freq.%*		
N	16	*88.9*	2	*11.1*	18	*38.3*
NE	2	*66.7*	1	*33.3*	3	*6.4*
E	4	*57.1*	3	*42.9*	7	*14.9*
SE	2	*66.7*	1	*33.3*	3	*6.4*
S	6	*66.7*	3	*33.3*	9	*19.1*
SW	1	*50.0*	1	*50.0*	2	*4.3*
W	2	*66.7*	1	*33.3*	3	*6.4*
NW	0	*0.0*	2	*100.0*	2	*4.3*
Total	33	*70.2*	14	*29.8*	47	*100.0*

By looking at the information in Table #, above, it is apparent that a greater proportion of adults are buried with their heads to the north when compared with all other directions, and the subadult sample appears to be more variable with similar numbers of individuals with their heads oriented toward each direction.

Table 8.12: Head Orientation of Adults and Subadults at Nacascolo—Sapoa Period.

Head Orientation	**Age Category**				**Total**	***Freq.%***
	Adult	*Freq.%*	Subadult	*Freq.%*		
N	1	*100.0*	0	*0.0*	1	*7.7*
NE	0	*0.0*	0	*0.0*	0	*0.0*
E	3	*60.0*	2	*40.0*	5	*38.5*

Table 8.12 (cont'd).

Head Orientation	Age Category				Total	*Freq.%*
	Adult	*Freq.%*	Subadult	*Freq.%*		
SE	0	*0.0*	0	*0.0*	0	*0.0*
S	3	*100.0*	0	*0.0*	3	*23.1*
SW	0	*0.0*	0	*0.0*	0	*0.0*
W	3	*75.0*	1	*25.0*	4	*30.8*
NW	0	*0.0*	0	*0.0*	0	*0.0*
Total	10	*76.9*	3	*23.1*	13	*100.0*

None of the individuals from the Sapoa Period were buried with their heads in any direction other than the four cardinal directions, the majority of the individuals were buried with their heads toward the east, and none of the three subadults were buried with their heads toward the north or south.

Table 8.13: Head Orientation according to Sex at Nacascolo—Pre-Sapoa Period.

Head Orientation	Sex				Total	*Freq.%*
	MPM	*Freq.%*	FPF	*Freq.%*		
N	6	*46.2*	7	*53.8*	13	*48.1*
NE	0	*0.0*	1	*100.0*	1	*3.7*
E	4	*100.0*	0	*0.0*	4	*14.8*
SE	0	*0.0*	1	*100.0*	1	*3.7*
S	1	*20.0*	4	*80.0*	5	*18.5*
SW	0	*0.0*	1	*100.0*	1	*3.7*
W	2	*100.0*	0	*0.0*	2	*7.4*
NW	0	*0.0*	0	*0.0*	0	*0.0*
Total	13	*48.1*	14	*51.9*	27	*100.0*

Table 8.13 shows that the majority of the sample from this time period were buried with their heads in the north, and the number of males and females is approximately the same. Fewer individuals were buried with their heads in the other directions, but it appears as though more males were buried with their heads in the east and west, while more females were buried with their heads in the south. No individuals from the Pre-Sapoa period at Nacascolo were found with their heads in the northwest.

Table 8.14: Head Orientation according to Sex at Nacascolo—Sapoa Period.

Head Orientation	**Sex**				**Total**	***Freq.%***
	MPM	*Freq.%*	FPF	*Freq.%*		
N	1	*100.0*	0	*0.0*	1	*9.1*
NE	0	*0.0*	0	*0.0*	0	*0.0*
E	1	*33.3*	2	*66.7*	3	*27.3*
SE	0	*0.0*	0	*0.0*	0	*0.0*
S	3	*100.0*	0	*0.0*	3	*27.3*
SW	0	*0.0*	0	*0.0*	0	*0.0*
W	3	*75.0*	1	*25.0*	4	*36.4*
NW	0	*0.0*	0	*0.0*	0	*0.0*
Total	8	*72.7*	3	*27.3*	11	*100.0*

Though this sample is extremely small, it appears as though females were not buried with their heads to the north or south, but were buried with their heads to the east or west, and while more males were buried with their heads to the south and west, the north and east were represented for the male sample as well.

During the Pre-Sapoa Period at Nacascolo, the most common head orientation is toward the north regardless of age-at-death (adult/subadult) or sex, and at least one person's head was oriented in each of the other seven directions; however, none of the adults were buried with their heads oriented toward the northwest. During the Sapoa Period, burials were only documented as having their heads in one of the four cardinal directions, and the most common head orientation is toward the east, which is a dramatic change from the earlier time period. There is no major difference between head orientations of adults and subadults, males and females, but according to Tables 8.13 and 8.14, above, no females or subadults were buried with their heads toward the north or south. This observation could be an example of a distinction between males and females and subadults, but it could also be due to sampling or documentation bias.

Arm Position at Nacascolo

Hardy (1992) provides general information about the position of each arm for each individual and describes their positions, rather than classifying their positions into categories, as the archaeologists did for the Jícaro data. To maintain consistency for comparative analyses, for the purpose of this study, the arm positions were first interpreted from Hardy (1992) and then were classified into the same two categories used to characterize the Jícaro burial data. Arm position is identified as either 1) both arms in a similar position (extended at sides or crossing the body plane), or 2) the arms are in different positions (one extended, one flexed or crossing the body plane).

Table 8.15: Arm Positions by Time Period at Nacascolo.

Time Period	**Arm Position**				**Total**	***Freq.%***
	Similar	*Freq.%*	Different	*Freq.%*		
Pre-Sapoa Period	34	*85.0*	6	*15.0*	40	*76.9*
Sapoa Period	8	*66.7*	4	*33.3*	12	*23.1*
Total	42	*80.0*	10	*19.2*	52	*100.0*

A Fisher's Exact test indicates that there is no significant relationship between time period and whether the arm positions of individuals are similar or different (p=0.212), with individuals more commonly buried with their arms in similar positions than with their arms in different positions during both the Pre-Sapoa and Sapoa Periods. During both the Pre-Sapoa and Sapoa Periods, there is virtually no difference between the arm positions of adults and subadults or MPM and FPF, as is demonstrated by Fisher's Exact tests between arm position and age-at-death (Pre-Sapoa Period: p=1.000, Sapoa Period: p=0.491) and sex (Pre-Sapoa Period: p=1.000, Sapoa Period: p=1.000).

Table 8.16: Similar Arm Positions by Time Period at Nacascolo.

Time Period	**Arm Position**				**Total**	***Freq.%***
	Crossing Body Plane	*Freq.%*	Extended at Sides	*Freq.%*		
Pre-Sapoa Period	33	*97.1*	1	*2.9*	34	*81.0*
Sapoa Period	2	*25.0*	6	*75.0*	8	*19.0*
Total	35	*83.3*	7	*16.7*	42	*100.0*

When only similar arm positions are considered (N=42), a Fisher's Exact test indicates there is a significant relationship between arm position and time period at Nacascolo (p=0.000). During the Pre-Sapoa period, a larger proportion of individuals were buried with both arms crossing the body plane, while a greater proportion of individuals were buried with their arms extended at their sides during the Sapoa Period, even though the sample from the Sapoa Period is extremely small and may not be representative of the entire Sapoa Period population at Nacascolo.

Leg Position at Nacascolo

Hardy (1992) indicates the position of the body as extended or flexed, which is largely dependent on the position of the legs, but does not go into detail about the position of each leg. For that reason, relationships between Leg Position and demographic variables were not explored and will not be among the comparisons with data collected from Jícaro. The transition from flexed to extended dispositions (discussed above) between the Pre-Sapoa and Sapoa Periods speaks to a general transition in leg position from flexed to extended as well.

Grave Goods at Nacascolo

Hardy (1992) provided a summary of grave goods with each of the burials from her Nacascolo data set, including specific details about the types of ceramics, but little detail about the raw materials for some of the other artifacts, such as bead types. For the purpose of this study and to make the Nacascolo data comparable with the Jícaro data, the grave offerings were classified as simply present or absent for any artifacts at all, and then present or absent for beads, ceramics, shell, faunal bone artifacts, human bone artifacts, and lithics.

Table 8.17: Grave Goods Presence/Absence according to Time Period at Nacascolo.

Time Period	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Pre-Sapoa Period	60	*82.2*	13	*17.8*	73	*80.2*
Sapoa Period	12	*66.7*	6	*33.3*	18	*19.8*
Total	72	*79.1*	19	*20.9*	91	*100.0*

A Fisher's Exact test indicates there is no significant relationship between time period and whether or not individuals at Nacascolo were buried with grave goods (p=0.194). During both periods the majority of individuals at the site were buried with some sort of grave offering, although the sample size from the Sapoa Period is extremely small. There is also no significant relationship indicated by Fisher's Exact tests of age-at-death compared with the presence of artifacts for either the Pre-Sapoa (p=0.514) or the Sapoa (p=0.280) Periods. Similarly, when the adult samples are broken down into male and female, Fisher's Exact tests indicate no statistically significant relationship between sex and the presence of any grave goods during the Pre-Sapoa (p=0.603) or Sapoa (p=1.000) Periods.

When the frequencies of different artifact types were evaluated using Fisher's Exact tests to explore whether significant relationships existed between time period and type of artifacts included in the graves, no significant relationships were found between time period and the presence of beads, shell, ceramic, faunal or lithic artifacts. No evaluation of a change in frequency of human remains as artifacts between the Pre-Sapoa Period and the Sapoa Period was carried out because only one individual was buried with any human remains as an artifact, a male dating to the Sapoa Period, who was buried with a human maxilla that was scored and broken and then perforated so it could be worn as an ornament. This, according to Hardy (1992) may have been a symbol of ancestor veneration or a trophy.

When the time periods were separated and demographic variables were compared with artifact types to explore whether their distributions were age- or sex-related, no significant relationships were found for the Pre-Sapoa Period between age-at-death or sex and the presence of beads, shell, ceramic or faunal artifacts. All of those artifacts were found in low frequencies among both adults and subadults. No human remains as artifacts were included with burials dating to the Pre-Sapoa Period. A significant relationship does exist between age-at-death and the presence of lithic artifacts during the Pre-Sapoa period (Fisher's Exact test, p=0.002). During the Pre-Sapoa Period, lithic artifacts were exclusively found with adults, meaning possibly their presence indicates an elevated achieved status, or they could relate to the adults' functions in the community.

No statistically significant relationships were discovered between sex and the presence of beads, shell, faunal remains, human remains, or lithic artifacts for Sapoa Period burials at Nacascolo, either. In general, a larger proportion of the entire sample was buried without such artifacts than the proportion of the sample that was buried with them, and males and females do not appear to have been treated differently. A Fisher's Exact test indicates a significant relationship between sex and the presence of ceramic artifacts during the Sapoa Period (p=0.033). Only the individuals for whom sex could be determined were included in this analysis (N=10), so the sample size is very small, which may affect the results of statistical tests. Of the 10 individuals for whom sex could be determined, 3 (30%) are FPF and 7 (70%) are MPM. All three of the FPF in the sample were buried with ceramic artifacts, while only one of the seven males were buried with ceramic artifacts, possibly indicating a sex-related association with ceramic artifacts during the Sapoa Period. This is slightly contradictory to Hardy's (1992) findings, in that she supposed the presence of ceramic artifacts during the Sapoa Period was status-based and not sex-based.

Summary of Nacascolo

While it is well known that there was a shift in burial practices and artifact assemblages between the Pre-Sapoa Periods and the Sapoa Period in the Greater Nicoya region (Hardy, 1992; Lange, 2001; 2006; Solís and Herrera, 2011), a brief re-evaluation of the burial practices at Nacascolo were revisited to confirm the presence of such a shift at that site and to confirm the site's comparability with Jícaro. It was found that there are some marked differences between the earlier period and the Sapoa Period with respect to burial disposition, burial position, head orientation of burials, arm position, and the types of grave goods associated with adults and subadults, males and females. During the Pre-Sapoa Period, the most common burial disposition is flexed and there is a greater proportion of burials in a supine position than in a prone position; head orientation is found most commonly toward the north, but among males the majority are to the east and west while the majority of females were oriented toward the south. The majority of the individuals were buried with their arms in similar positions, and the majority of those similar positions crossed the body plane. Most individuals were found with some sort of associated grave goods, with a statistically significant relationship between age-at-death and the presence of lithics, and no one from the Pre-Sapoa Period was buried with human remains as artifacts. During the Sapoa Period, the most common disposition is extended, and although there are still more individuals buried in a supine position, the proportion of supine to prone burials is smaller than the proportion from the Pre-Sapoa Period. Head orientation was only documented for the four cardinal directions, with most of the individuals buried with their heads toward the east and no females and subadults buried with their heads toward the north or south. Most individuals were buried with their arms in similar positions, and the majority of those similar positions are extended at the sides. Most individuals are also found with some sort of grave goods, but there appears to be a statistically significant relationship between sex and the presence of ceramics, and during this time period a single individual was found with an artifact made from human bone.

Inter-Site Comparison

Despite the differences in the sample sizes, Jícaro and Nacascolo are both relatively well balanced with regard to demographic variables. At both sites, there is a spike in mortality among young children between the ages of 2 years and 6 years (Hardy, 1992), adults outnumber subadults by a slight margin, and among adults, the number of males and females is approximately even. Skeletal indicators of health and activity at Nacascolo were not evaluated as part of this study. Burial treatments at Nacascolo were interpreted from Hardy (1992) and were re-coded to make them appropriate for analyses and comparisons with the Jícaro sample. As was stated above, there are some shifts in burial position, disposition, head orientation, and presence of grave goods between the Pre-Sapoa Period and the Sapoa Period at Nacascolo. With this difference confirmed and with the knowledge that all of the burials from Jícaro date to the Sapoa Period, an inter-site comparison was conducted between Jícaro and only the Sapoa Period sample from Nacascolo. All frequencies in this section are presented in terms of percent of individuals per site, as opposed to percent of individuals per category.

Burial Disposition

Only individuals for whom burial disposition could be determined are included in this section (Jícaro: N=237; Nacascolo: N=16).

Table 8.18: Burial Disposition—Jícaro and Nacascolo.

Site	**Burial Disposition**				**Total**	***Freq.%***
	Extended	*Freq.%*	Flexed	*Freq.%*		
Jícaro	220	*93.8*	17	*7.2*	237	*93.7*
Nacascolo	14	*88.0*	2	*12.0*	16	*6.3*
Total	234	*92.5*	19	*7.5*	253	*100.0*

Figure 8.2: Graph showing frequency of Burial Dispositions according to Age-at-Death at Jícaro.

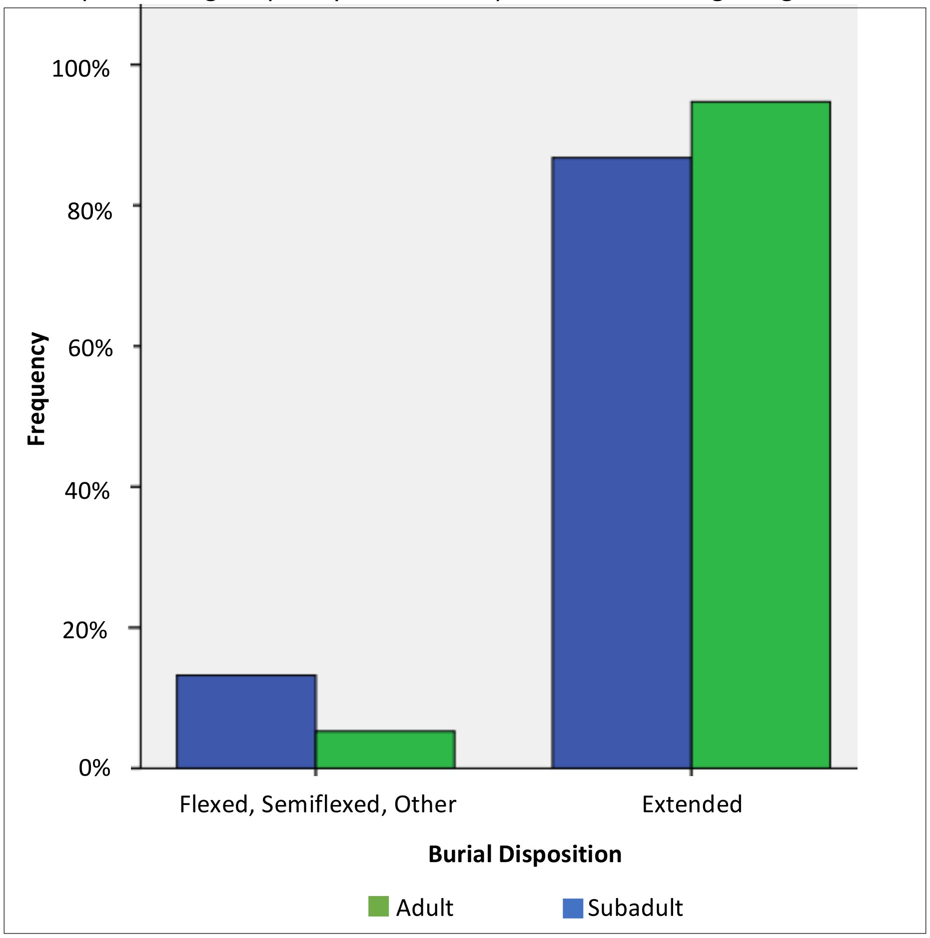
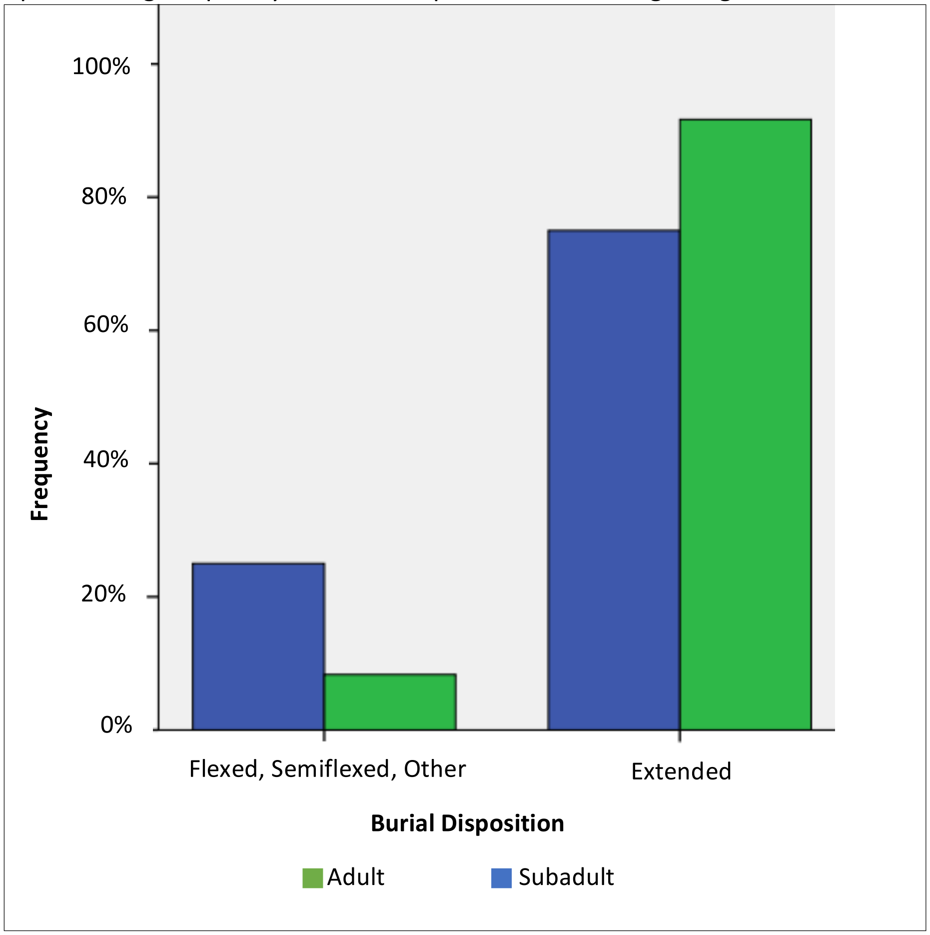


Figure 8.3: Graph showing frequency of Burial Dispositions according to Age-at-Death at Nacascolo.



In the above graphs (Figures 8.2 and 8.3), the bars represent the percent of subadults (blue) and adults (green) in a flexed disposition (left in each graph) or extended disposition (right in each graph). The graphs indicate that at both sites during the Sapoa Period the vast majority of both adults and subadults were buried in extended dispositions.

Figure 8.4: Graph showing frequency of Burial Dispositions according to Sex at Jícaro.

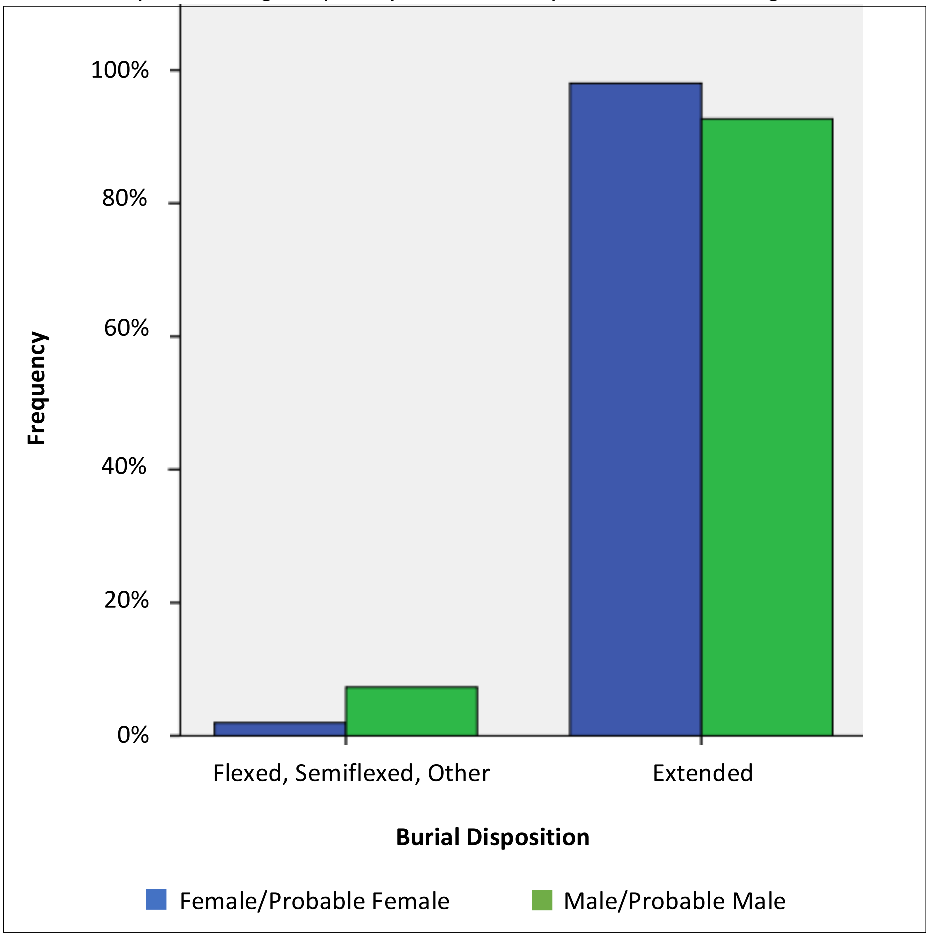
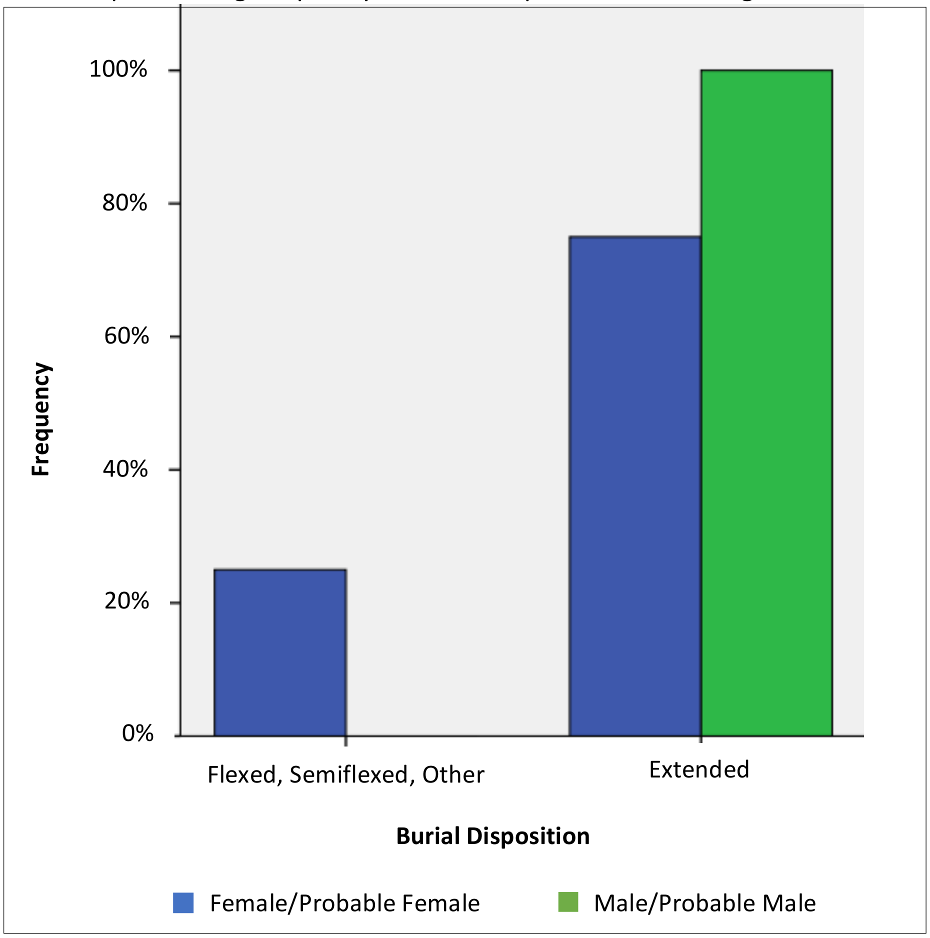


Figure 8.5: Graph showing frequency of Burial Dispositions according to Sex at Nacascolo.



In the above graphs (Figures 8.4 and 8.5), females are shown in blue and males are shown in green, and they are clustered according to whether they were buried in a flexed (left in each graph) or extended (right in each graph) disposition. At both sites, the majority of the individuals were buried in extended dispositions—the graphs may be slightly misleading in that at Nacascolo, only two individuals from the Sapoa Period were buried in flexed dispositions and both were females. The overall sample size from that site during that time period is extremely small (N=16), so it is possible that sampling bias affects the distribution of observable males and females in extended and flexed dispositions. The observed similarity is confirmed by a Fisher Exact test (p=0.342), which indicates no significant relationship between site and burial disposition.

Burial Position

Only individuals for whom burial position could be determined are included in this section (Jícaro: N=234; Nacascolo: N=17).

Table 8.19: Burial Position—Jícaro and Nacascolo.

Site	**Burial Position**				**Total**	**Freq.%**
	Supine	Freq.%	Prone	Freq.%		
Jícaro	216	*92.3*	18	*7.7*	234	*93.2*
Nacascolo	8	*47.1*	9	*52.9*	17	*6.8*
Total	224	*89.2*	27	*10.8*	251	*100.0*

Nacascolo individuals were buried in supine and prone positions. A Fisher's Exact test indicates a significant relationship between site and burial position (p=0.000). According to Table 8.19, above, a higher frequency of individuals were buried in a supine position at Jícaro, while at Nacascolo, the frequency of prone and supine burials are about the same.

Figure 8.6: Graph showing frequency of Burial Positions according to Age-at-Death at Jícaro.

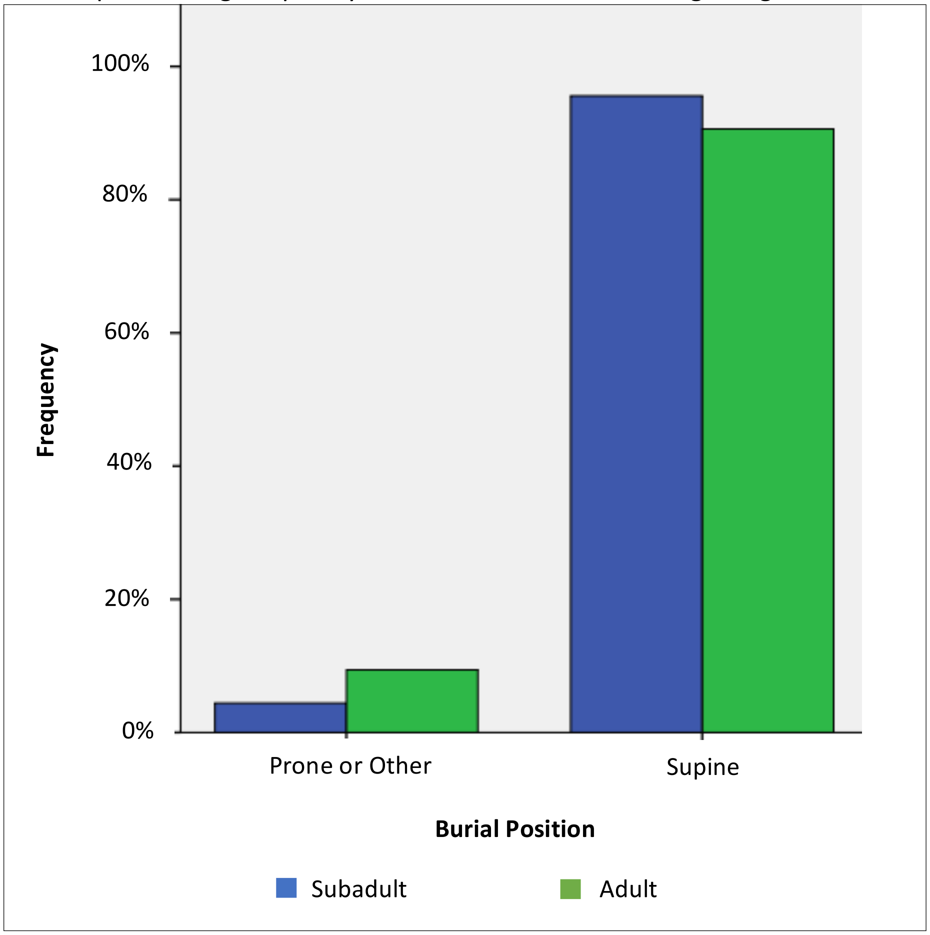
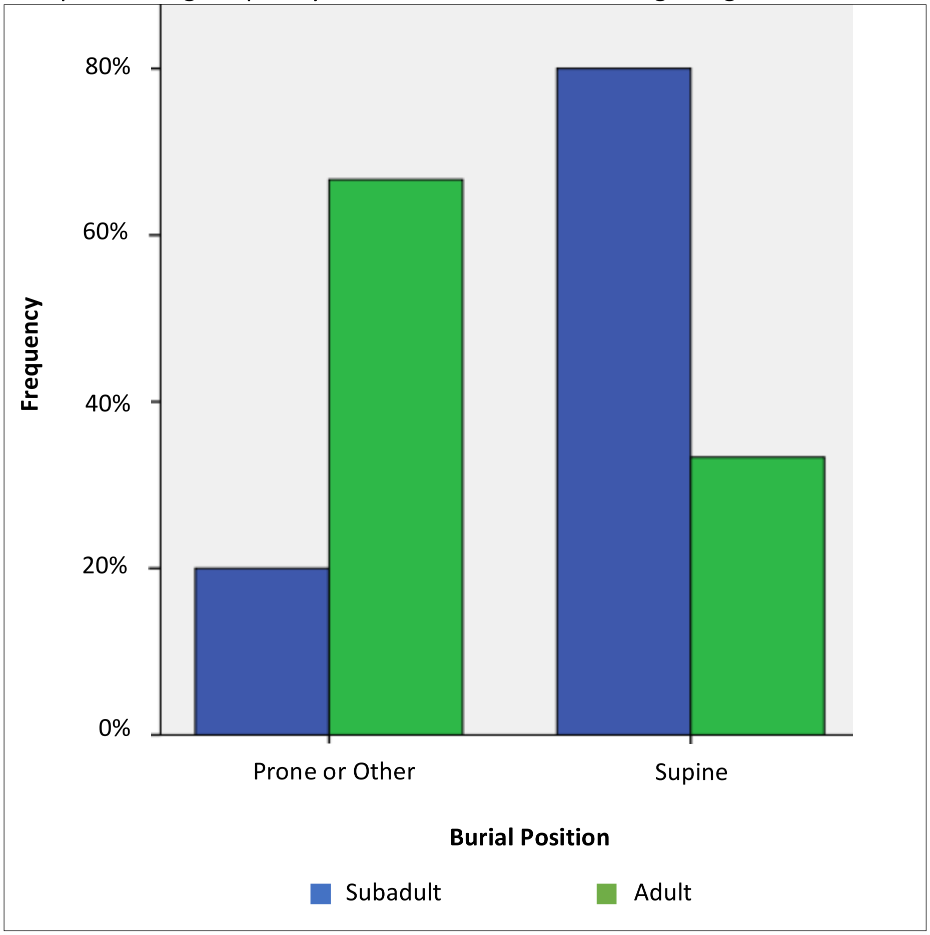


Figure 8.7: Graph showing frequency of Burial Positions according to Age-at-Death at Nacascolo.



In the above graphs (Figures 8.6 and 8.7), subadults are represented in blue and adults are represented in green. The bars represent the percent of subadults (blue) and adults (green) in a prone (or other) position (left in each graph) or supine position (right in each graph). These graphs illustrate that at Jícaro, a greater portion of the sample were buried in a supine position and that adults and subadults were treated relatively equally, with a slightly greater proportion of adults than subadults having been buried in a prone position. The Nacascolo graph tells a different story. A greater proportion of subadults at Nacascolo were buried in a supine position and a greater proportion of adults were buried in a prone position.

Figure 8.8: Graph showing frequency of Burial Positions according to Sex at Jícaro.

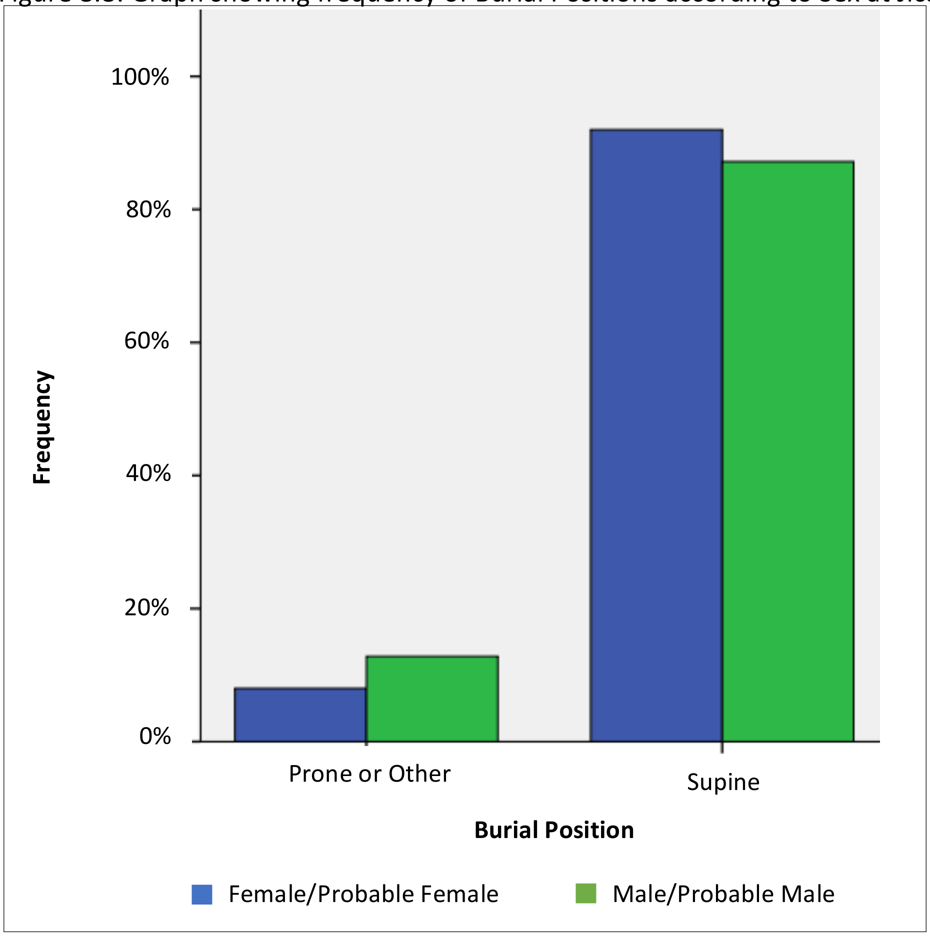
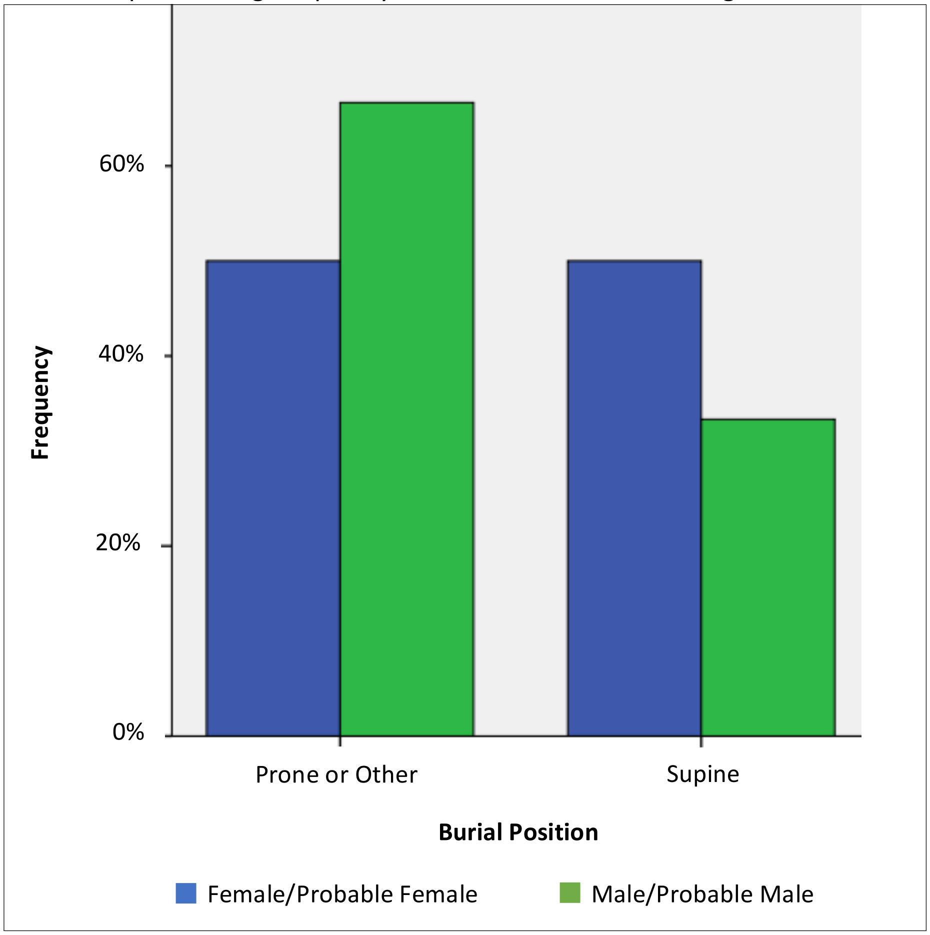


Figure 8.9: Graph showing frequency of Burial Positions according to Sex at Nacascolo.



In the above graphs (Figures 8.8 and 8.9), the bars represent the percent of females/probable females (blue) and males/probable males (green) in a prone (or other) position (left in each graph) or supine position (right in each graph). These graphs illustrate that at Jícaro, a greater portion of the sample were buried in a supine position and that males and females were treated relatively equally, with a slightly greater proportion of females than males having been buried in a prone position. At Nacascolo, however, a greater proportion of males were buried in a prone (or other) position.

Head Orientation

This analysis only includes individuals for whom head orientation could be determined (Jícaro, N=224; Nacascolo, N=14). Significant relationships were not found between head orientation and age-at-death or sex at either site; however, Nacascolo does show a significant relationship between time period and head orientation, in that none of the individuals from the Sapoa period at Nacascolo were buried with their heads oriented in any direction other than the four cardinal directions.

Table 8.20: Burial Position—Jícaro and Nacascolo.

Head Orientation	**Site**				**Total**	**Freq.%** (of total)
	Jícaro	Freq.% (w/in site)	Nacascolo	Freq.% (w/in site)		
N	36	*16.1*	1	*7.7*	37	*15.6*
NE	19	*8.5*	0	*0.0*	19	*8.0*
E	19	*8.5*	5	*38.5*	24	*10.1*
SE	9	*4.0*	0	*0.0*	9	*3.8*
S	11	*4.9*	3	*23.1*	14	*5.9*
SW	13	*5.8*	0	*0.0*	13	*5.5*
W	54	*24.1*	4	*30.8*	58	*24.5*
NW	63	*28.1*	0	*0.0*	63	*26.6*
Total	224	*94.5*	13	*5.5*	237	*100.0*

Figure 8.10: Graph showing frequency of Head Orientations at Jícaro (left) and Nacascolo (right).

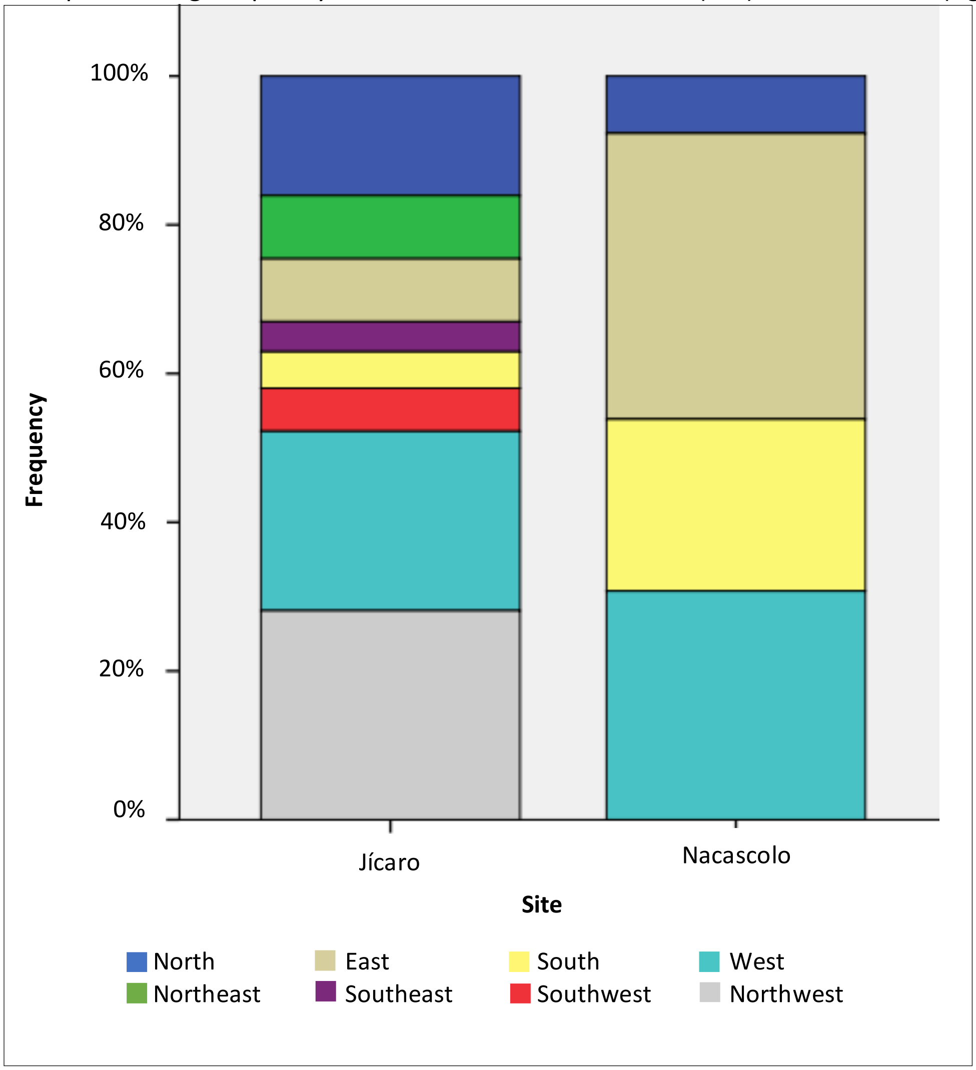


Table 8.20 and Figure 8.10, above, show that there are two major differences between Nacascolo and Jícaro with regard to head position of the burials. The most obvious difference between the sites is that at Jícaro, although several head orientations are clearly favored by the population, all 8 possible directions are represented among burials at the site. This is not true for Nacascolo, as none of the individuals who would have been contemporaries of the population at Jícaro were buried with their heads oriented toward any directions other than north, east, south, and west. The second difference is in the proportions of individuals with their heads buried in those directions. If we consider only north, east, south, and west, it is clear that a larger proportion of individuals from Jícaro were buried with their

heads in the north than the proportion of individuals buried with their heads toward the north at Nacascolo; the proportion of individuals with their heads toward the east is far greater at Nacascolo than it is at Jícaro, as is the proportion of individuals with their heads buried to the south, but both sites have a similarly large proportion of individuals with their heads oriented toward the west.

Figure 8.11: Graph showing frequency of Head Orientations according to Sex at Jícaro.

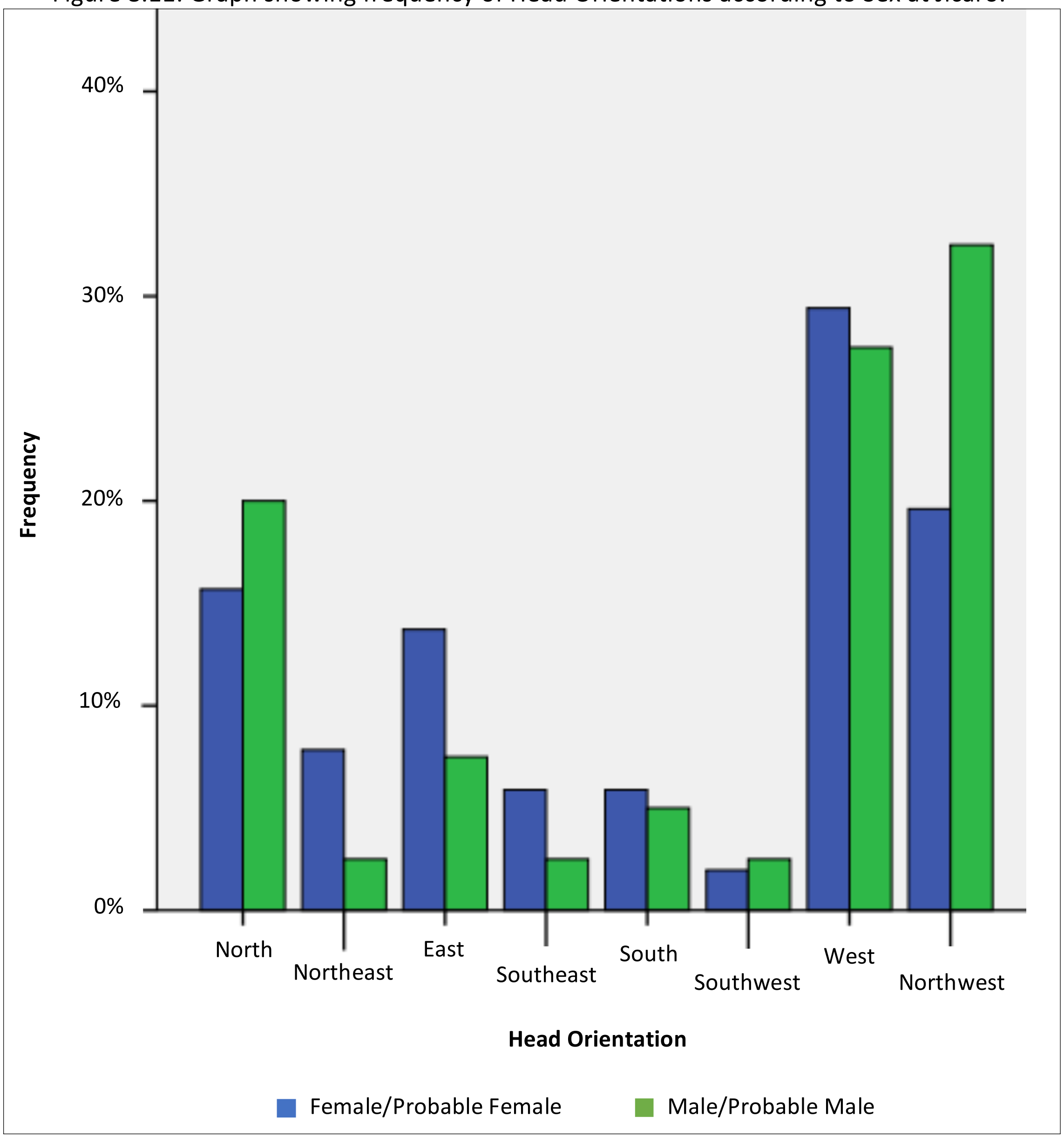


Figure 8.11: Graph showing frequency of Head Orientations according to Sex at Nacascolo.

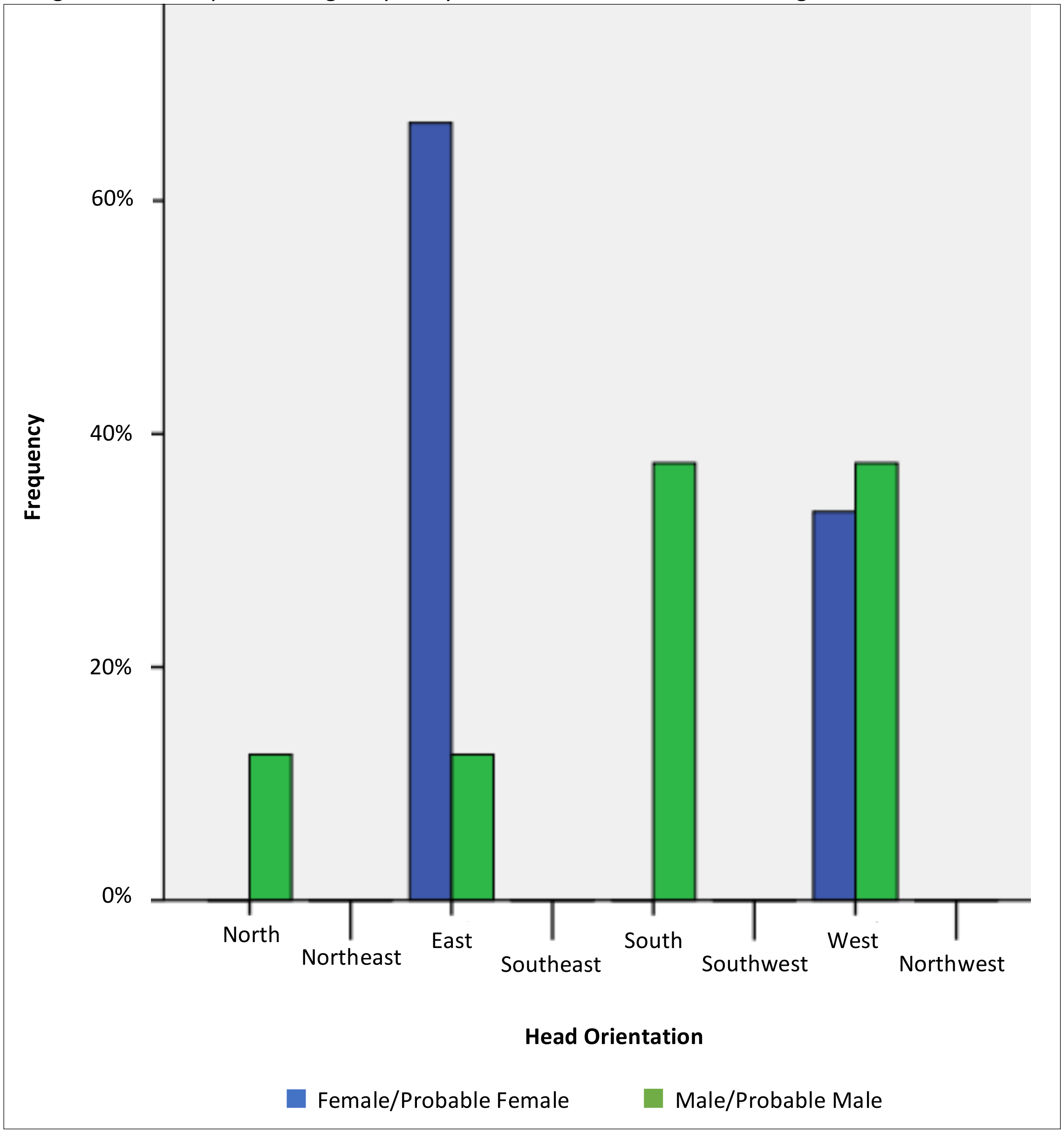


Figure 8.12: Graph showing frequency of Head Orientations according to Age-at-Death at Jícaro.

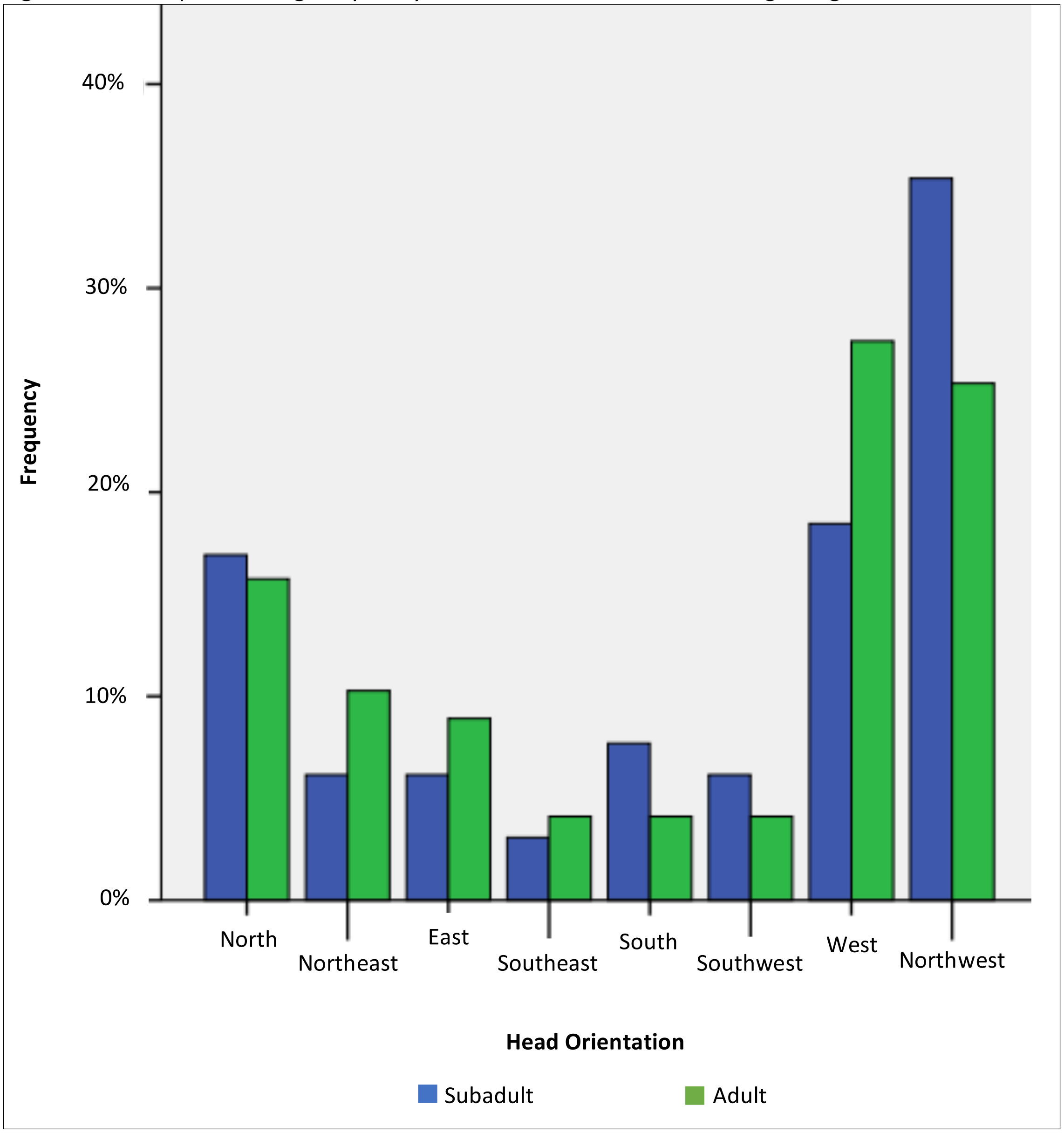
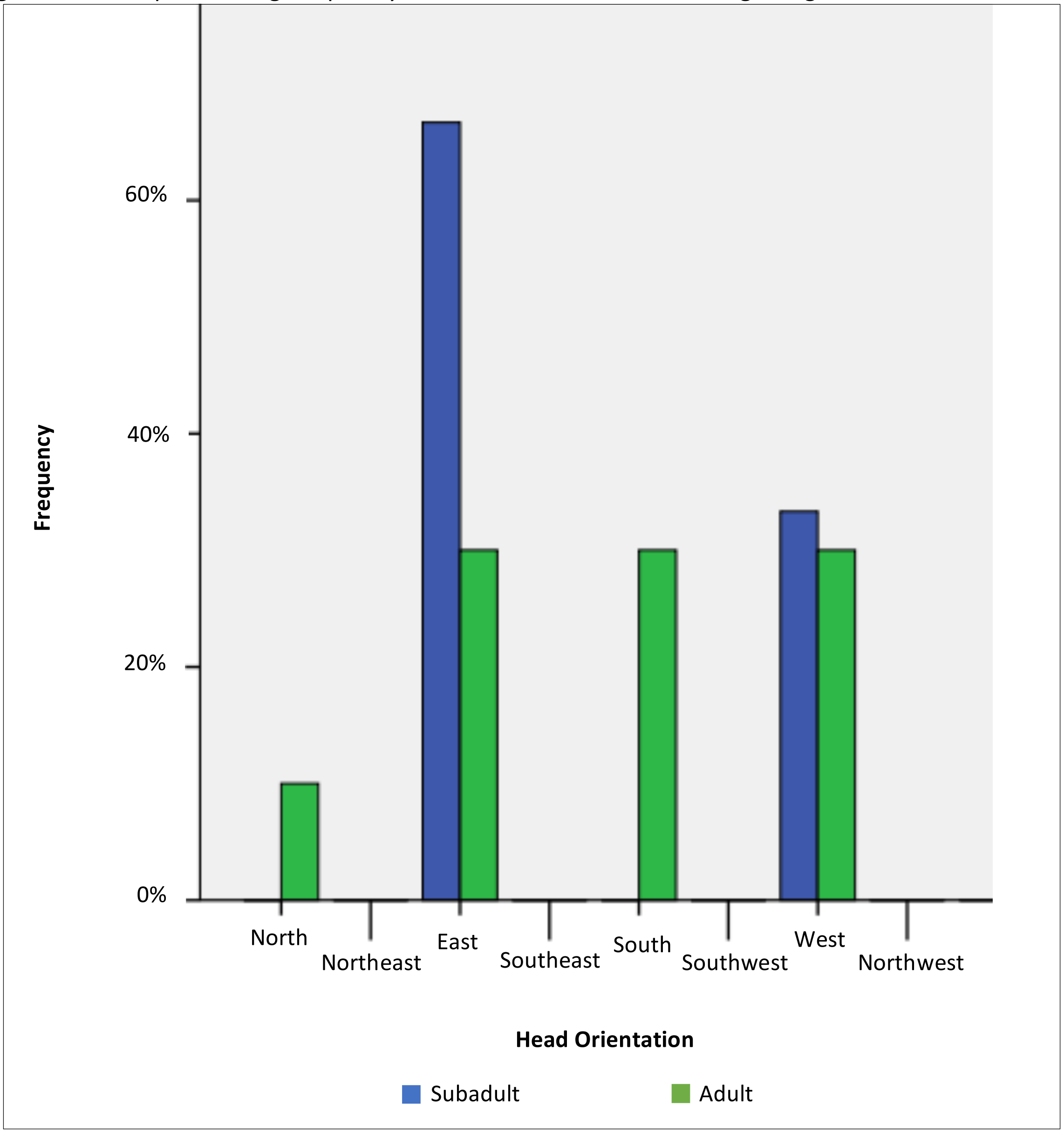


Figure 8.12: Graph showing frequency of Head Orientations according to Age-at-Death at Nacascolo.



In the above graphs showing head orientations by sex, MPM are represented by the green bars and FPF are represented by the blue bars; in the graphs showing head orientations by age, subadults are represented by blue bars and adults are represented by green bars. The above graphs are a visual representation of the populations from Jícaro and Nacascolo of how head orientations are broken down into age-at-death (Adult, Subadult) and sex (MPM, FPF) categories.

At Jícaro it appears as though a greater proportion of the individuals buried with their heads to the north and northwest are males, while a greater proportion of the individuals buried with their heads to the northeast, east, southeast, and west are females. When only north, south, east, and west are considered to make the frequencies of males and females with their heads buried in certain directions comparable with the data from Nacascolo, the graph indicates that a smaller proportion of females than males were buried with their heads toward the north, but a larger proportion of females than males were buried with their heads toward the east, south, and west. The sample size from Nacascolo is extremely small and may affect interpretations of head orientation. None of the adult females recovered from Nacascolo were buried with their heads oriented toward the north or south, only to the east and west, and the largest percentage of females were buried with their heads oriented toward the east. Males were buried with their heads toward each of the four cardinal directions, with smaller proportions buried with their heads to the north and east and larger proportions with their heads toward the south and west.

Among adults and subadults, it appears that at Jícaro, a greater proportion of individuals buried with their heads toward the south, southwest and northwest are subadults, while greater proportions of adults are found with their heads toward the northeast, east, and west. When only the four cardinal directions are considered for the sake of comparison with Nacascolo, approximately the same proportion of individuals with their heads toward the north are adults or subadults; the proportion of subadults buried with their heads toward the east and west are smaller than the proportions of adults for those two head orientations, and a greater proportion of subadults than adults were buried with their heads toward the south. At Nacascolo, subadults were only found with their heads buried in the east and west and adults were buried with their heads toward each of the cardinal directions, with the smallest proportion with their heads in the north.

At Jícaro, it appears as though the proportions of adult males and subadults with their heads buried in each direction are similar, except for the south and northwest, which show a higher proportion of females and subadults. At Nacascolo, however, it appears as though females and subadults were both buried with their heads toward the east and west, while males and adults were buried with their heads in any of the four cardinal directions.

Arm Position

This comparison only includes individuals for whom the position of both arms could be determined (Jícaro, N=159; Nacascolo, N=12). Arm position was specifically recorded by archaeologists for both sites, but was consolidated into two basic categories—either both arms were in similar positions (at the sides or crossing the body plane) or they were in different positions (one extended at the side, one crossing the body plane). A further comparison of Jícaro and Nacascolo in cases where the arms were in similar positions was conducted as well, comparing the frequencies of individuals with both arms extended and both arms crossing the body plane.

Table 8.21: Arm Position (Similar/Different)—Jícaro and Nacascolo.

Site	**Arm Position**				**Total**	***Freq.%***
	Similar	*Freq.%*	Different	*Freq.%*		
Jícaro	106	*67.1*	52	*32.9*	159	*92.9*
Nacascolo	8	*66.7*	4	*33.3*	12	*7.1*
Total	114	*67.1*	56	*32.9*	170	100.0

Table 8.22: Arm Position (Similar only)—Jícaro and Nacascolo.

Site	**Arm Position**				**Total**	***Freq.%***
	Extended	*Freq.%*	Crossing Body	*Freq.%*		
Jícaro	86	*81.5*	20	*18.9*	106	*93.0*
Nacascolo	6	*75.0*	2	*25.0*	8	*7.0*
Total	92	*80.7*	22	*19.3*	114	100.0

Fisher's Exact tests indicated no significant relationship between the site and whether the arms were positioned in similar or different positions ($p=1.000$, with significance at the $p<0.05$ level) or between the site and whether arms that were buried in similar positions were extended or crossing the body plane ($p=0.650$, with significance at the $p<0.05$ level. At both sites, the greater proportion of individuals were buried with their arms in similar positions, and among the individuals with their arms in similar positions, the greater proportion were buried with their arms extended at their sides, as opposed to crossing the body plane.

Grave Goods

The comparison of grave goods between the two sites is complicated because of the need to make the samples from the two sites comparable. For example, the ceramics at both sites are condensed into a single presence/absence category, "ceramic vessels," that does not take into account the number of ceramic vessels or their size, style, decoration, or purpose. Similarly, there are various types of bead styles and raw materials, different types of shell and faunal species and purposes, and multiple different types of lithic raw materials and classes of artifacts at each site. The following comparisons are at a relatively superficial level, and would probably benefit from deeper analyses in the future. Each of the grave goods is considered separately for these comparisons, but there may be individuals included in each category that also had grave goods from a different category included in the burial.

Table 8.23: Grave Goods—Jícaro and Nacascolo.

Site	**Grave Goods**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Jícaro	198	*45.3*	239	*54.7*	437	*96.0*
Nacascolo	12	*66.7*	6	*33.3*	18	*4.0*
Total	210	*46.2*	245	*53.8*	455	*100.0*

Only individuals who were buried with some type of grave goods are included in the following comparisons (Jícaro, N=198; Nacascolo, N=12). Although the total number of individuals who were buried with any grave goods is 210, only 207 are included in most of the tables, below. This is because the presence/absence of any grave goods takes beads into consideration, but once beads are removed (as is the case with the remaining artifact types), the total number of individuals in the sample from both sites is reduced to 207 (Jícaro, N=195; Nacascolo, N=12).

Table 8.24: Grave Goods/Beads—Jícaro and Nacascolo.

Site	**Beads**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Jícaro	75	37.9	123	62.1	198	*94.3*
Nacascolo	1	8.3	11	91.7	12	*5.7*
Total	76	36.2	134	63.8	210	*100.0*

Table 8.25: Grave Goods/Shell—Jícaro and Nacascolo.

Site	**Shell**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Jícaro	56	*28.7*	139	*71.3*	195	*94.2*
Nacascolo	3	*25.0*	9	*75.0*	12	*5.8*
Total	59	*28.5*	148	*71.5*	207	*100.0*

Table 8.26: Grave Goods/Ceramics—Jícaro and Nacascolo.

Site	**Ceramics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Jícaro	151	*77.4*	44	*22.6*	195	*94.2*
Nacascolo	5	*41.7*	*7*	*58.3*	12	*5.8*
Total	156	*75.4*	51	*24.6*	207	*100.0*

Table 8.27: Grave Goods/Human Remains Artifacts—Jícaro and Nacascolo.

Site	**Human Remains**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Jícaro	9	*4.7*	186	*95.4*	195	*94.2*
Nacascolo	1	*8.3*	11	*91.7*	12	*5.8*
Total	10	*4.8*	197	*95.2*	207	*100.0*

Table 8.28: Grave Goods/Faunal Artifacts—Jícaro and Nacascolo.

Site	**Faunal**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Jícaro	79	*40.5*	116	*59.5*	195	*94.2*
Nacascolo	3	*25.0*	9	*75.0*	12	*5.8*
Total	82	*39.6*	125	*60.4*	207	*100.0*

Table 8.29: Grave Goods/Lithics—Jícaro and Nacascolo.

Site	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Jícaro	19	*9.7*	176	*90.3*	195	*94.2*
Nacascolo	5	*41.7*	7	*58.3*	12	*5.8*
Total	24	*11.6*	18/3	*88.4*	207	*100.0*

Fisher's Exact and Chi-square tests, all with significance at the p<0.05 level, were calculated in SPSS to evaluate relationships between the archaeological site and the presence of grave goods found in association with the burials. No statistically significant relationship was determined to exist between site and the presence of any grave goods (X2=3.173, df=1, p=0.075), the presence of beads (Fisher's Exact, p=0.059), shell (Fisher's Exact, p=1.000), human remains (Fisher's Exact, p=0.430), or faunal remains (Fisher's Exact, p=0.371). These results indicate that the proportion of individuals buried with or without each of those artifact types at Jícaro is similar to the proportion of individuals buried with or without each of those artifact types at Nacascolo.

Figure 8.1: Graph showing the frequency of artifact types at Jícaro.

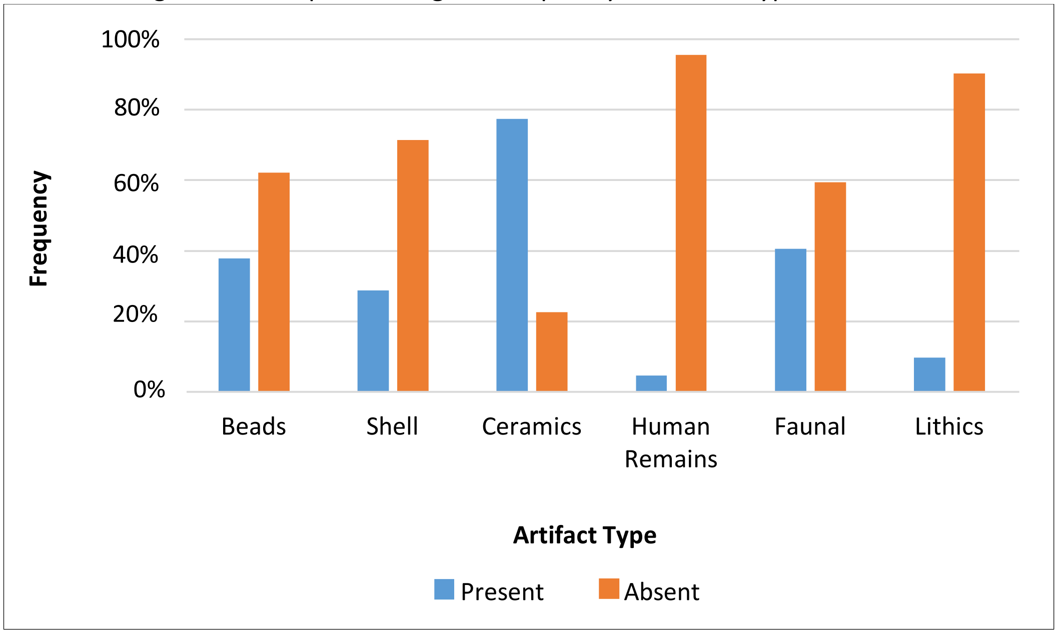
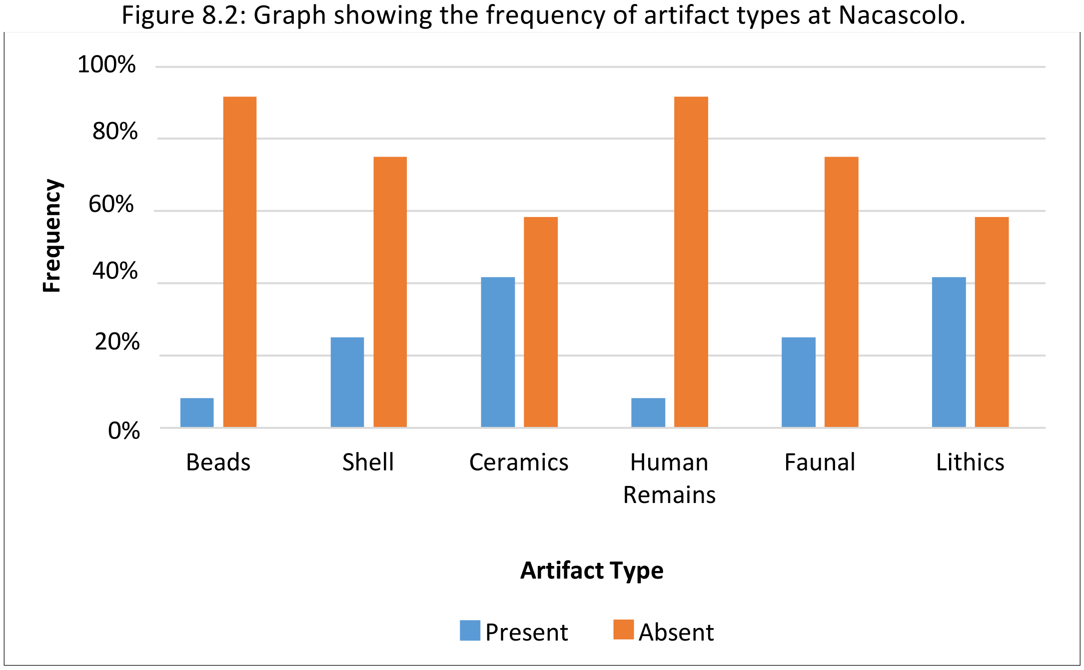


Figure 8.2: Graph showing the frequency of artifact types at Nacascolo.



Significant relationships were found between site and the presence of ceramics (Fisher's Exact, p=0.011) and site and the presence of lithics (Fisher's Exact, p=0.0006). At Jícaro, it is more common to find burials with at least one ceramic vessel than it is to find burials without any ceramic artifacts. The table and graphs above shows that there is a higher frequency of burials with ceramics relative to the frequency of burials without ceramics at Jícaro, while at Nacascolo there is a higher frequency of burials without ceramics than the frequency of burials with them. It is possible that the small sample size from Nacascolo affects this comparison. Similarly, lithic artifacts are extremely uncommon at Jícaro, and there is a greater frequency of individuals buried without lithics than the frequency of individuals buried with lithics. At Nacascolo, there is a higher frequency of individuals buried with lithics than without them, but again, the sample size is so small that it may affect this comparison.

Other Comparisons

Skeletal Conditions

Preservation is similarly differential at both sites, meaning the sites are similar with regard to the fact that there is a wide range of preservation levels, from extremely good to extremely poor. Many of the remains from the Nacascolo beach cemetery were covered in a concretion of some kind, which is not the case at Jícaro—none of the bones had any adhering material that obscured observations. This is likely because of the locations of the excavations of the bones—the burials from Jícaro were located in the forested area of the site, while the Nacascolo burials were mostly recovered from the beach area.

Both populations, aside from an occasional healed, non-lethal fracture, and at Jícaro the presence of a spinal pathology and noticeable wear affecting the lingual surface of the anterior maxillary teeth, appear to be generally healthy, with very little evidence of disease or trauma. Hardy notes that two individuals from Nacascolo were found to have had periosteal reactions consistent with congenital syphilis or yaws, which is similar to a condition observed on a number of the skeletons from the Jícaro collection. Similar to Jícaro, several of the Nacascolo burials were reportedly associated with isolated crania which, as Hardy (1992) suggests, may be related to ancestor worship, or may be related to cannibalism or sacrifice, both of which were reportedly common in the region during the Sapoa Period (Hardy, 1992).

Hardy makes no mention of the appearance of LSAMAT affecting any of the individuals at Nacascolo, but she does mention one individual who showed the A-1 form of dental modification (Hardy, 1992; Romero, 1970), which is also the most common form seen at Jícaro.

Use of Space

At Jícaro it was found that there was an apparent shift in either status or group identity from north to south, based on the presence of a higher frequency of individuals with dental modification toward the southern region of the site; a higher frequency of individuals with cribra orbitalia in the northern area of the site and a higher frequency of individuals showing LEH toward the southern area; and the fact that older individuals were only found in the northern portion of the site, while young adults were concentrated in the northern and southern sectors of the site and were found in far fewer numbers in the middle sector.

According to Hardy (1992), at Nacascolo the mountain slopes and inland valleys are believed to have been reserved for elites, while the beach was more likely a corporately owned cemetery area where commoners were buried. Only the valley floor and a short way up the slopes of the cliffs in some areas were excavated at Jícaro, so a comparison of the types of space used at the sites cannot be made. The beach area at Jícaro is known to contain burials because they have been looted repeatedly (Hardy, 1992; Solís and Herrera, personal communication 2008). It is possible that evidence for an earlier occupation may be located in burials under the Jícaro beach, but those excavations may never be permitted, as the area is protected by the government.

Chapter Summary

This chapter has presented a brief summary of the demographic composition and mortuary practices at Nacascolo in order to lay a foundation for comparisons between the demographic composition of Jícaro and Nacascolo. Nacascolo has a much longer known human occupation, dating to well before the Sapoa Period (AD 800/900-1350), so a comparison was made between the two time periods to evaluate whether they could be lumped together as one comparative sample or if Jícaro had to be compared with the portion of the Nacascolo sample that would have been contemporary with the population at Jícaro. Statistically significant differences were detected between mortuary practices during the Pre-Sapoa and Sapoa periods, so for the purpose of inter-site comparison, only the Sapoa Period sample from Nacascolo was compared with Jícaro, as it is well documented that all of the burials examined as part of this research date to that period. This left a very small Nacascolo skeletal sample for comparison with Jícaro, (N=12).

The Sapoa Period sample from Nacascolo and the sample from Jícaro are nearly identical demographically in that both have approximately equal frequency of adults and subadults, and among adults an approximately equal frequency of males and females. Hardy (1992) notes that there would likely have been a low life expectancy at Nacascolo, based on the absence of many older adult remains, which is very similar to the population at Jícaro. Both sites show evidence of periostitis, although overall both samples appear to have come from relatively healthy populations with very low frequencies of extreme stress.

The most drastic difference between the two sites is in regard to head orientation. At Nacascolo, it appears as though females and subadults were buried with their heads in the same orientations (east and west), while males were buried with their heads in all of the four cardinal directions. At Jícaro, it appears as though the frequencies of males and subadults are higher in the same directions than the frequencies of females and subadults, and the most common head orientations are in the west, northwest, and north. All eight possible directions of head orientation are found at Jícaro, whereas during the Sapoa Period at Nacascolo, burials were oriented toward only the four cardinal directions.

This chapter has presented similarities and differences between contemporary components of the human occupations at Jícaro and Nacascolo. The sites appear very similar demographically and with regard to typical burial treatments, but they are also very different with regard to two of the artifact types included in the burials and the overall pattern of head orientation, possibly suggesting that although these communities were close neighbors, they may have identified themselves differently.

Chapter 9: Discussion and Conclusions

Introduction

The main purpose of this dissertation is to characterize the population that lived at Jícaro, based on a bioarchaeological study incorporating data collected directly from the skeletal remains of the individuals who lived in the community and data provided by the archaeologists about the mortuary practices at the site. The skeletal analysis took into account a number of variables, including preservation and completeness, assessments of skeletal indicators of age-at-death, sex, and stress. The mortuary analysis was twofold, first involving a statistical analysis of the relationships between demographic data from the skeletal collection and mortuary treatments, such as body position (extended/flexed, supine/prone), arm and leg positions, head orientation, and the presence of several common types of grave goods. The same variables were then incorporated into a spatial analysis of the site in an attempt to characterize the community's use of space in a mortuary context. Following the analysis of the biological data from the skeletal remains and the statistical and spatial analyses of the mortuary practices, Jícaro was compared with the nearby site of Nacascolo, which is ideal for comparison with Jícaro because it had a contemporaneous occupation and the preservation and quality of excavations were comparable.

Discussion

This portion of this chapter is intended to provide a broader context for the analyses and results presented in Chapters 4—Skeletal Analysis of the Jícaro sample, 5—Mortuary Analysis of Jícaro, 6—Spatial analysis of Jícaro, and 8—Inter-site Comparison between Jícaro and Nacascolo.

Limitations of this Research

The Jícaro skeletal collection is among the largest in the region and was carefully excavated and documented by the archaeologists, making it nearly ideal for the type of bioarchaeological study included in this research. That said, there are a number of limitations that placed constraints on the data collection and analyses, which will be discussed prior to deeper discussions of the implications of this research because the limitations inevitably affect the available data and any possible interpretations that derive from them.

Excavations

The excavations at Jícaro were carried out as a salvage archaeology project and 100% excavation was neither expected nor possible given the time and budgetary constraints placed on the archaeological team by the development firm that hired them to conduct the work. According to surface survey and artifacts recovered from shovel test pits during Phase I of the Jícaro project in 2005, the total area of the site is 49,223.24 m^2. A large portion of the total area (13,368.63 m^2), including the beach area, could not be excavated by law because it is protected public land. This places two limitations on the research, affecting spatial and temporal contexts. The excavations at Jícaro were extremely thorough and well-documented, and any statement about the limitations inherent in the excavations is not a reflection on the work that was performed by the archaeologists. That said, of the 35,854.61 m^2 of total area with the potential to be excavated, only 1,731.50 m^2 were actually excavated (Herrera and Solís, 2009), due to the time and budgetary constraints mentioned above. The archaeologists were careful in their selection of areas to excavate, based on the Phase I surveys, but it there is no denying that it is possible a great deal of information was missed. The shovel test pits dug during Phase I of the Jícaro project were dug at intervals of 5 m, which enabled the archaeologists to determine various habitation areas, activity areas, and areas where they were likely to encounter burials. This undoubtedly led to some sampling bias in that certain areas were preferentially selected for excavation, while areas between the shovel test pits that may have contained additional material were not excavated. In fact, during the final field season the archaeological team believes they may have located what could have been a ceremonial center to the site that was not indicated by the surface and shovel test pit surveys. The area is believed to have been a ceremonial center based on a similar organization of space and artifact distribution to the ceremonial center discovered at Nacascolo, but the archaeologists were not granted additional time to fully explore the newly discovered area (Herrera and Solís, personal communication 2008). It is possible that additional burials and other indications of site use and organization may change the interpretations of the site. The exclusion of the beach area also places a temporal constraint on data collection from the site. There are many similarities between Jícaro and Nacascolo, and a large component of the burials recovered from Nacascolo were excavated from the beach. The beach burials are known to be earlier than the more inland burials, giving Nacascolo more apparent time depth than Jícaro. The inland burials that were excavated from Jícaro all date to the same time period (Sapoa-Ometepe Periods), and evidence from Phase I shovel test pits indicate the presence of a mortuary component in the protected (beach) area of Jícaro, which is believed to represent an earlier occupation (Bagaces Period), much like the one that was excavated at Nacascolo (Herrera and Solís, personal communication 2008). Unfortunately, data from the (presumed) earlier occupation at Jícaro may never be collected.

Another limitation affecting the excavation of the site and therefore the data analysis that followed is the type of soil in which the burials were interred. Much of the soil is sandy, which obscures grave outlines and the delineations between overlapping features (Herrera and Solís, 2009). This complicates interpretation of the temporal sequence of the interments and episodes of reuse.

Preservation of Skeletal Material

Preservation is notoriously poor in tropical regions, and while preservation of skeletal remains at Jícaro is quite good compared with other sites, badly degraded cortical bone and fragmentary skeletal elements, especially with regard to the crania and extremities of long bones, limit the data that could be collected and the depth of analysis that could be performed on this sample. Similar to conditions Hardy (1992) noted at Nacascolo, in addition to the tropical environment, problems affecting preservation of skeletal remains at Jícaro also include the intrusion of tree roots and animal burrows (rodents, land crabs, etc.) through burials. A number of the individuals whose postcranial bones are well preserved in some aspects--their bone cortex is generally intact, the bone quality remains relatively good, and the bones are clearly still in anatomical position—are extremely fragmented, as are most of the crania. This phenomenon may be attributable to the high incidence of seismic activity in the area—with the movement and shifting of the ground, the bones would have been jostled and broken while remaining in their original positions. Further complicating the preservation of skeletal material at Jícaro is the extensive amount of reuse of burial fossae. Each time a burial is intruded upon by another burial, and each time the remains of the previous individual were disturbed and bundled or piled to make room for the more recent burial, skeletal elements may have been broken, and if any movement of the body to a new location was involved, elements may have been left behind. All of these factors act on the skeletal remains from Jícaro, causing a great deal of differential preservation between burials and often within single burials, similar to observations by Hardy (1992).

In addition to the abundantly poor preservation of skeletal material, there were several instances of commingling issues being introduced after the burials were excavated, most likely while the remains were being cleaned and sorted in the laboratory (i.e. "Lab Commingling" according to Osterholtz, 2014). For example, Burial 62 contained the remains of two individuals. According to the burial diagram, the two individuals are separated by nearly 1m and there were no commingling issues upon their excavation. During the skeletal analysis phase of this burial, it was discovered that the vertebrae from these two individuals had been packaged in such a way that they were nearly impossible to reassign to the correct individuals. Burial 60, also a double burial, is another example of post-excavation commingling, where one individual was assigned two left radii and the other was not assigned a left radius. The commingling issues for Burials 60 and 62 were resolved, but it is possible that commingling issues affect other burials, which may also affect the interpretations of skeletal analyses.

Skeletal Data Collection and Analysis

There is overwhelming evidence for reuse of burial fossae at Jícaro, which probably represent areas where households were located or familial lineages were buried (Herrera and Solís, 2009; Hardy, 1992). Skeletal data collection did not include systematic documentation of skeletal markers, such as non-metric traits, that may have contributed to a deeper analysis of relatedness. In part, this is due to problems with preservation affecting the skeletal material, and in part to the original focus of this study being an overall demographic study and assessment of health and identity.

Though the skeletal sample from Jícaro is the largest known sample in Central America, because of the problematic preservation, sub-samples of age and sex cohorts quickly become very small. Additionally, the large proportion of individuals with incomplete long bones and degraded cortex also affected the size of the observable skeletal sample. These restrictions affected data collection and analysis of the Jícaro skeletal material, meaning some of the methods for data collection (e.g., many of the collection standards presented by Buikstra and Ubelaker 1994) were adapted to make them applicable to this sample, which may affect the comparability of the data from this sample to other skeletal samples in the region. For example, some skeletal markers of health, such as LEH and periostitis, were necessarily condensed into categories of presence/absence. Due to the constraints affecting the observable skeletal sample, statistical analyses were largely limited to descriptive statistics.

The overwhelmingly poor preservation of crania at Jícaro also limits interpretation of several important variables, such as the presence and presentation of cribra orbitalia in the orbits and porotic hyperostosis affecting the cranial vault, both of which would provide valuable information as to the life experiences of juveniles and adults at the site. It also limits the possibility to observe and interpret possible indications of cranial deformation. Some of the crania have been reconstructed, but the vast majority of them are so fragmentary that it is not possible to observe presence or absence of this trait with any reliability.

Additionally, accurate assignment of age and sex are essential for demographic studies of past populations, and the combination of poor preservation of skeletal remains at Jícaro and a lack of population-specific methods for determining age and sex (Knudson and Stojanowski, 2008) may have compromised such analyses. Paleodemography studies are population-based, so this type of study at Jícaro is by nature limited in that the extent of the population is unknown.

Skeletal Analysis of the Jícaro Sample

Despite the limitations of this research, Jícaro is still among the largest, best preserved, most carefully excavated, documented and analyzed skeletal collections from the American subtropical region. Data collection and analysis of the skeletal remains from Jícaro were associated with the first of three questions: *What is the composition of the population at Jícaro?*

This question was addressed by collecting data directly from the skeletal remains of the population that inhabited Jícaro and analyzing it for relationships and patterns between demographic characteristics and skeletal indicators of health, activity, stress, and identity. It is clear from the skeletal analysis that while the population at Jícaro appears to have been somewhat buffered from extreme stress during childhood, given the low incidence of LEH, and that they generally seem to have been healthy, although the life expectancy at the site appears to have been somewhat low—with a very small sample of older adult individuals having been recovered—and several individuals appear to have been afflicted with some rather serious pathological conditions. It appears as though there is a congenital treponemal infection present in the community, as is evidenced by the proportion of the population who showed evidence of osteomyelitis and periostitis, and several individuals appear to have suffered from a form of mycotic infection, as is evidenced by lytic lesions affecting the lower vertebrae.

The teeth of the individuals at Jícaro have been extremely informative of their activity and life experiences. Dental hygiene and related conditions appear to have been a problem among the inhabitants of the community, in that while the frequency of caries and abscesses is low for the population as a whole, where there are incidences of caries, abscesses, and periodontitis (and possibly related bony responses to the infection), they are rather severe. Valerio-Alfaro (2012) studied the dental modification present at Jícaro and determined that the patterns of modification present at the site may suggest a Mesoamerican connection. Analyses of dentition for the purpose of this study also show that the dental modification styles present at Jícaro are consistent with styles popular throughout Mesoamerica (Romero, 1970). The dentition and the presence of LSAMAT among so many individuals are highly indicative of a common process carried out by relatively equal frequencies of adult males and females, with evidence even among children, that is likely related to the work of adults. If this practice had a purely dietary purpose, the expectation would be that more children would show the wear pattern on their deciduous teeth.

Mortuary Analysis of the Jícaro Sample

The data presented in the two mortuary analysis chapters, dedicated to statistical and spatial analyses of mortuary practices at Jícaro, are associated with the second of three research questions guiding this project. Research Question 2, as presented in Chapter 2 asks: *What are the relationships between individuals and mortuary practices at Jícaro?* The results presented in these two chapters are rather superficial in that they deal a lot with presence/absence of artifacts and broad categories of artifact types, but to not go into any detail about the types of artifacts. This is intentional, as this project is mainly focused on the skeletal material and the relationship of biological characteristics to mortuary treatments, and archaeologists Solís and Herrera have already extensively classified and analyzed the artifacts from the site (Solís and Herrera, 2007; 2009; 2011), but some of the artifacts warrant special consideration.

Faunal Remains as Artifacts

The analysis of the presence/absence of faunal remains at Jícaro does not do justice to the variety of animal remains that were found within burials at the site. Analysis of the artifacts themselves is not a focus of this study; however, the very presence of some of the faunal artifacts may be informative regarding group identity of the population that inhabited Jícaro. For example, a (large bird) bone was found with (Burial). The (bird) is a local species, so in that it is not remarkable to find one associated with a burial, but birds are often featured in Maya iconography and some are considered to have medicinal purposes or are associated with rites of passage (Hardy, 1992).

Burial 147, the middle adult male who was buried in association with one of the isolated crania that shows cutmarks and was clearly intentionally placed within the grave, as opposed to being evidence of reuse of a burial fossa, was also associated with the skeleton of an iguana. According to Hardy (1992), iguanas are known to burrow, so it is possible that the iguana whose skeleton is associated with Burial 147 is coincidental, but it appears to be intentionally placed in the region of the primary individual's pelvis, suggesting that its presence is not a coincidence. Hardy (1992) notes that iguanids and other reptiles often had—and continue to have—ritual significance, and that iguanas in particular are often associated with sacrifices or have medicinal significance (while Hardy's comments are specifically concerned with the Maya, the same can be said for the wider Central American region). This individual was also buried with several other ornaments made from human remains (discussed below). White-tailed deer also feature prominently in local religious beliefs, and the metapodial, according to Hardy (1992) has special significance as a raw material for making tools. According to Hardy, there were skeletons of iguanas and white-tailed deer present among the burials at Nacascolo as well, which may be evidence of a shared belief system between the sites. Their presence, though, is not necessarily an indication of Mesoamerican cultural influence from the north, as white tailed deer and iguanas have been found in funeral contexts at sites in Panama, which is never included within the boundaries of Mesoamerica.

Tools and Ornaments Made from Human Remains

One of the interesting aspects of the Jícaro sample is inclusion of a number of ornaments and tools made out of human bone with several of the individuals. Artifacts made from human bone come in a variety of forms: mandibles that are scored and broken at the ascending ramus, human tooth beads, long rectangular pendants, cylindrical "combs", a human maxilla apparently worn as a headdress, and a matched pair of human radii with the distal extremities cut off that appear to have use-wear, meaning they may have been handled quite a bit. Human remains are found almost exclusively with males at Jícaro; however, two probable females (Burial 64, Individual 1, a middle adult probable female; Burial 155, Individual 1, an older adult probable female) were found in association with a single human tooth bead and a human mandible, respectively.

The figures, below, show examples of the contexts in which human remains were used as ornaments among the community at Jícaro. Figure 9.1 shows the left radius and ulna from Burial 139 with a cluster of human tooth beads at their distal ends. The teeth are all perforated and appear to have been strung together as a bracelet. Laboratory analyses (Herrera, personal communication, 2007) indicate that there are several individuals represented by the teeth, all of which appear to be from adults.

Figure 9.1: Burial 139—Bracelet made from human teeth.

(Photo: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

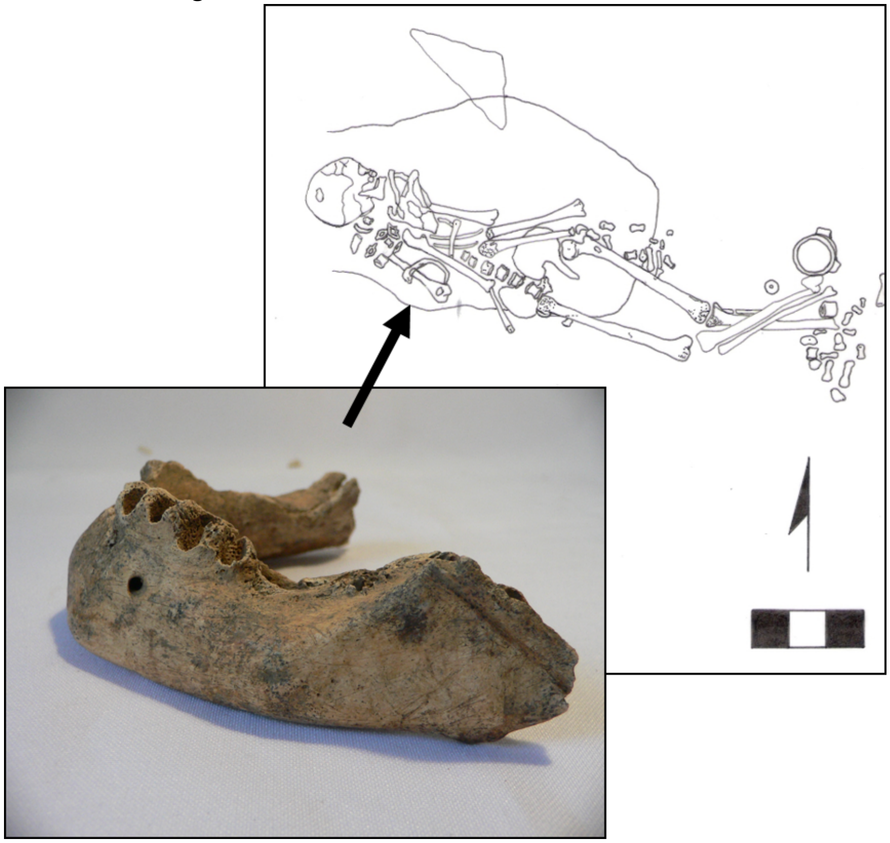
Figure 9.2, below is an illustration of several of the cylindrical combs found in association with a handful of the burials at Jícaro. Their function is not completely clear, but they appear to have been worn as adornments, judging by the holes drilled through their superior portions, which are in most cases carved to reflect nautical or zoomorphic motifs. Small samples of these bones were transported to Michigan State University in 2007 and were examined by Dr. Sauer under a microscope. His histological analysis revealed diagnostic configurations of Haversian systems, enabling Dr. Sauer to conclusively determine these artifacts were made out of human bone, likely human humeri, based on their length and diameter.

Figure 9.2: Tubular bone combs in situ.

(Photo: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

A final example of one of the more common human bone artifacts at Jícaro is presented below in Figure 9.3. Several individuals were buried in association with human mandibles that were scored and broken near the gonial angle where the horizontal body transitions to the vertical ascending ramus. The one pictured below does not show holes drilled through the posterior portion of the mandible, though some did have holes drilled through them. The accompanying map shows the placement of this mandible with Burial 80—it appears as though it had been worn as an ornament on the individual's upper arm.

Figure 9.3: Burial 80 with mandible ornament.



(Photo and Image: Solís and Herrera, 2009; used with permission from Solís and Herrera, who retain copyright)

The modification of human skeletal elements and the use of them as adornments are common throughout Mexico and Mesoamerica, and they are often associated with either ancestor worship/veneration (Hardy, 1992) or sacrifice (Lagunas Rodríguez, 2004; Talavera González, 2003). Ancestor worship is well documented throughout the Intermediate Area, and as far south as Panama, as are practices such as human sacrifice and the taking of trophy heads (Hardy, 1992; Hoopes, 2007).

The trophy skull tradition was prominent throughout Costa Rica in prehistory, beginning in approximately AD 300. Trophy heads are featured in burials and in sculpture throughout the region, and there is evidence of an effigy tradition in which sculptures of heads stood in the place of actual crania in some cases. Trophy heads are often believed to be related to ancestor worship or human sacrifice, much like the beliefs about other human remains worn or used as adornments or tools/instruments (Hardy, 1992). Hoopes (2007), contrary to the common belief that the isolated crania were trophies from embattled enemies, proposes that they may have a metaphysical significance and may be related to shamanistic practices.

According to Solís and Herrera (2011) and direct observations of the crania for the purposes of this study, in some cases, the isolated crania associated with some of the burials (see Chapter 4) appear to have been defleshed shortly after death, and may represent trophy skulls. These skulls certainly appear to be intentionally placed in the burials with which they are associated and do not appear to be evidence of reuse of burial fossae as is a common context for isolated crania and postcranial remains at Jícaro (Solís and Herrera, 2011; personal observations during data collection for this project). Secondary treatments of bundled human remains indicating reuse of burial areas are common throughout the Intermediate area, and have been said to have both a northern and a southern origin of influence (Hardy, 1992). Hardy (1992) proposes that the isolated crania found at Nacascolo (similar to those found at Jícaro) could be indicative of human sacrifice, but could also be evidence of placing prior family members with high status members of the family upon their deaths.

Infant Burials

Infants were not specifically discussed as part of the mortuary analysis chapters, mainly because the sample of infants is small at Jícaro, but they do deserve some attention. Infants were found in different burial contexts—in some burials they were buried as single interments in the same kind of unlined pits that the rest of the population received. Other infant burials involved the placement of the remains in an urn of some kind. The same pattern is noted by Hardy (1992) at Nacascolo, by Vázquez (1980) at the nearby site of Vidor, and by McCafferty et al. (2011) at the site of Santa Isabel, in southwestern Nicaragua. The differences in infant burial treatments may be status-related, in that possibly infants of higher status parents received burials in urns. The urn burials of infants is a common practice throughout Mesoamerica, but it may also have a southern origin (Hardy, 1992).

Jícaro and Greater Nicoya

A comparison between Jícaro and the nearby site of Nacascolo was conducted to answer the third research question that guided this research: *Are mortuary treatments and other cultural practices consistent with what is known about Greater Nicoya during the Sapoa Period?*

This research identified a number of similarities between Jícaro and Nacascolo that indicate the two sites were very similar with regard to their social organization and the life experiences of their inhabitants. Solís and Herrera have taken analyses of Jícaro a step beyond the local comparison and have situated Jícaro within the larger region of northwestern Costa Rica, and note that there is a great deal of similarity between the population at Jícaro and the populations of other prehistoric communities around the Bahía de Culebra (Solís and Herrera, 2011). They mention that burial practices at the site are similar with those from contemporary Sapoa Period sites throughout the region, and note the extensive amount of reuse (Solís and Herrera, 2011). Their analyses of the skeletal collection document the dental modifications present among the population, and mentions cranial modification which was not included in this study because after the crania were taken back to the laboratory and cleaned, they became too fragmentary to assess. As cranial modification must occur during early childhood, it can be valuable evidence for an individual's lifelong social or group identity (Knudson and Stojanowski, 2008), so the loss of so much of this information for the Jícaro sample is unfortunate.

A Shift in Identity

Burial practices, particularly changes in burial practices, can signify group identity or a shift in group identity (Jenny, 2011). That said, individuals may move through multiple identities throughout their lives or may at any given time be manipulating multiple social identities (Knudson and Stojanowski, 2008), and the reflection of their group or personal identity as it is reflected in their burial treatment may only reflect one facet of a very complex whole.

In the Bahía Culebra area, for example, after about the Fifth Century A.D., there is a marked shift in burial practices. The common burial practice during that time involved maintaining separate cemeteries away from habitation sites and placing the decedents, in flexed positions, into stone-lined burial fossae. By about A.D. 1000, the Bahía de Culebra region experienced a rapid population growth, subsistence strategies changed, burial practices changed—burials were located beneath or near habitation structures, burial fossae are reused multiple times, the dominant position is supine/extended as opposed to flexed, and the burials are mostly unlined (Hardy, 1992; Solís and Herrera, 2011).

This shift in burial practices may be the result of the migrations from the north that are thought to have occurred between A.D. 400 and 800. Reuse of burial features, especially by what are believed to be kin groups has been documented in the Maya Region (Wrobel, 2015), and the burial of decedents beneath habitation floors or near habitation sites, as opposed to disposing of the dead in remote locations, is extremely common among known Mesoamerican groups (e.g., Price et al., 2002). Re-use of burial features is also common throughout the Intermediate area, in areas outside of what was considered to have been influenced by Mesoamerican culture (Hardy, 1992).

Were Mesoamericans present at Jícaro?

One of the most prevalent questions guiding research in the Greater Nicoya subregion is the question of Mesoamerican identity, and certainly there is a great deal of evidence to support a Mesoamerican presence (Fowler 1989; Hardy, 1992; Hoopes and McCafferty 1989; McCafferty and Steinbrenner 2005; Lange, 2006; Obando, 1995; Solís and Herrera, 2011; Umaña, 1994 Valerio-Alfaro, 2012). Archaeologists Solís and Herrera (2011) clearly believe that Jícaro shows evidence for the presence of a Mesoamerican identity, and evidence from Jícaro is certainly suggestive of that; however it is also possible that the apparent Mesoamerican identity may be a Sapoa period local cultural development inspired by immigrants (or general contact for trade) from the earlier two time periods, as opposed to the presence of an entirely separate group of immigrants from the north (Hoopes and McCafferty, 2011), Group and individual identity will be explored by examining individual life experiences, burial treatments, grave goods, and site organization.

While it does appear as though there are shared traits between the people of Jícaro and what is believed to be evidence of Mesoamericans, there is also evidence that the local people had their own cultural identity, separate from a Mesoamerican influence. Certain artifact classes and cultural traits that are often seen by scholars familiar with Greater Nicoya as distinctly Mesoamerica are documented at Jícaro, from intentional occlusal edge dental modifications, cranial modification, worked human bone used as ornaments and offerings, and trophy skulls (Hardy, 1992; Lagunas Rodríguez, 2004; Lory and Cuesta, 2008; Romero, 1970) are documented at Jícaro (Solís and Herrera, 2006; 2009; 2011). According to Hoopes and McCafferty (1989), though, many of the Mesoamerican motifs seen on ceramics in the Greater Nicoya region appear to have been locally produced and are more likely evidence of a long chain of communications among people from north to south, as opposed to direct contact with Mesoamerican immigrants into the region or non-locally produced items that were procured through long-distance trade. There is no doubt that there was an extensive network of exchange along the Pacific coast of Central America during prehistory (Creamer, 1992; Solís and Herrera, 2011), so it is possible that the local traditions incorporated ideas and goods from elsewhere, without necessarily having to identify with the nonlocal groups.

Hoopes and McCafferty (1989) draw on publications by Lange and his coauthors, and raise doubts about the migrations so often considered to be fact in the region. According to Hoopes and McCafferty (1989), the legends of Mesoamerican migrations may have actually happened, or they may be metaphorical legends constructed by the local people as a means for structuring their social identity. Hardy is highly critical of research that builds on previous research or statements that are largely based on assumptions that have not been proven and may be completely unfounded. Hardy (1992), building on Lange (1971) and Sweeney (1975) (both cited in Hardy, 1992), suggests that the cultural practices at Nacascolo are more representative of a local Intermediate Area culture than they are of a Mesoamerican influence because it appears as though most of the decision making takes place at the local level with a great deal of variation among sites, and that including Greater Nicoya as part of Mesoamerica is not sensible. This may explain the slight but significant differences in head orientation between Nacascolo and Jícaro—if decisions regarding treatments were made at the community level, as opposed to a higher state-influenced level, then one would expect slight differences even between sites located that near one another in space. Alternatively, the inconsistencies between sites that are located very near one another along the shores of the Bahía de Culebra (such as the differences noted between Jícaro and Nacascolo) may suggest different expressions of a Mesoamerican identity. According to McCafferty et al., 2012), the ambiguity of the evidence for Mesoamerican influence in Greater Nicoya is not unexpected, given the region's location at the southernmost frontier of Mesoamerica.

Conclusions

Interestingly, some of the same evidence is used to support a theory of Mesoamerican identity in the Bahía de Culebra region as well as a theory emphasizing the presence of a local identity that began to arise as the influence of Mesoamerica in the region began to decline (Hardy, 1992; Hoopes, 2007; McCafferty et al., 2012; Solís and Herrera, 2011), making a conclusion about identity in the region and at Jícaro in particular nearly impossible. This is true for the presence of urn burials of infants, the presence of isolated crania that may be evidence of a trophy skull tradition or a form of ancestor veneration, the presence of certain animal bones included within certain burials and the presence of human bones that have been transformed into ornaments or tools. For that reason, it is not possible at this time to confidently conclude that there is or is not a Mesoamerican identity at Jícaro, based on the information presented in this study.

Skeletal and mortuary data from Jícaro show that this was a relatively egalitarian community with little differentiation among individuals in their burial treatments—though it must be kept in mind that there may have been a great deal more variation among burial treatments in the form of perishable grave goods and offerings that have long since decomposed, leaving only the artifacts that would not break down as quickly. Despite some complications and limitations of the sample, Jícaro has provided new information about burial practices in the region. Burial practices and cultural modifications at the site are clearly similar to other sites in the immediate vicinity, but differences between burial practices at Nacascolo and Jícaro may be the result of sampling bias at both sites, but they could reveal localized, possibly community-based, decisions regarding social identity and social interactions, as Hoopes and McCafferty (1989) and Hardy (1992) would suggest. There is much more work to be done at Jícaro, especially with regard to skeletal analysis. Hopefully this research has met its goal of achieving a deeper understanding of the demography and mortuary practices at Jícaro, and hopefully it can serve as a building block for future research.

Future Research Directions

A great deal of physical anthropological work can and should be conducted on the remains from Jícaro. This study was limited in scope to an assessment of demographic variables and health indicators, and did not take into consideration any of the microscopic or elemental analyses that could potentially yield a deeper understanding of diet, nutrition, growth and development, health, and possibly social organization and group identity. At present, destructive analyses are not permitted on the skeletal sample from Jícaro, but it may be possible to obtain permission for such analyses in the future.

Further Skeletal and Mortuary Analyses

This project and the analyses performed by Solís and Herrera (2006; 2009; 2011), although meaningful, have only skimmed the surface of the potential analyses of mortuary practices at Jícaro. The approximately 80 individuals that were not included in the analyses presented in this dissertation have yet to be examined by a physical anthropologist, and as was presented in Chapter 3, data collection on all 308 individuals who were included in this study was incomplete in many cases. Data collection and documentation of the remainder of the skeletal sample from this site is a necessity. Additionally, the mortuary analysis of the site is incomplete, in part because the skeletal analysis is incomplete. This study did not involve analyses of the human skeletal remains from many of the commingled burial contexts or the *paquetes*, which have the potential to add substantially to our understanding of Jícaro.

Both the taphonomic and lab commingling issues with this sample need to be addressed in a future project. Some of the skeletal material excavated from Jícaro is too fragmentary and incomplete for re-analysis that would facilitate the resolution of commingling issues, but commingling of the more complete skeletal elements can be resolved in a number of ways, such as through trace element analysis, bone thickness analysis, the comparison of bone size/measurements, age-at-death, and sex (Ubelaker, 2002). While it may not ever be possible to sort out individuals or relatedness of elements, at a minimum such analyses would help to refine the MNI for this population. Analyses that include the elements that cannot be assigned to individuals would help to expand our knowledge of the demography of Jícaro and the presence and extent of disease processes in the community (Fox and Marklein, 2014), and resolution of the commingling issues within burials may shed some light on group identity and cohesion (Martin and Osterholtz, 2016).

Skeletal Morphological Analysis

Population affinity and relatedness are likely to be central questions to future research involving the human remains from Jícaro. As non-metric traits were not systematically scored or analyzed for the purposes of this research, a gap is left open for future resaerchers. Although many of the crania are not well preserved, some are and should be examined for the presence of cranial nonmetric traits, which in combination with postcranial and dental traits may enhance our understanding of relatedness (Hauser et. al., 1989; Saunders, 1978; Turner II et. al., 1991) and possibly answer questions about migration (Blom et. al., 1998) at Jícaro and in the Greater Nicoya region. Because cranial deformation and dental modification are well documented in Greater Nicoya and at Jícaro, specifically, any such studies would have to take into consideration that activity and intentional cranial modification may impact the manifestation of non-metric traits (Del Papa and Perez, 2007; Saunders, 1978).

Chronology

Because of the apparent reuse of burial fossae at Jícaro, and because Carbon 14 dating and ceramic typologies can only generally situate the burials from Jícaro to within a several hundred years, utilizing a relative dating technique such as Fluoride dating may be a valuable contribution to the understanding of the chronological sequence at the site. Fluoride is a naturally occurring element in the soil and over time the hydroxide ions in the hydroxyapatite (the crystalline structure of bone) are replaced by fluoride ions (Hogue, 2006), making it possible (potentially) to determine which burials are older or more recent based on the proportion of hydroxide ions to fluoride ions in the bone.

Diet

An individual's diet often reflects their status in a particular society or culturally prescribed behavior and possibly their access to subsistence resources. To evaluate the diets of past populations, researchers often turn to the analysis of trace element ratios and stable isotope ratios within the bone collagen or apatite. The ratios of $^{13}C/^{12}C$ and $^{15}N/^{14}N$ in bone vary according to fluctuations in the environment, types of plants in an area, and trophic level (Schwarcz and Schoeninger, 1991). The differences in the carbon and nitrogen ratios are transferred to animals and humans, changing with respect to the trophic level. Different proportions of carbon and nitrogen are incorporated into plant material, depending on the type of plant and whether it is marine or terrestrial. Norr (1995) conducted a stable isotope analysis involving carbon and nitrogen ratios of the remains from Nacascolo and Vidor, which are both located very near Jícaro on the shores of Bahía de Culebra. Because Jícaro appears to be very similar to the other sites in the area with regard to mortuary behavior, apparent subsistence strategies, population composition, and general health and activity, yet also appears very different from the other sites due to the presence of so many individuals with modified teeth and the quantity of adornments made from human bone and teeth (Herrera and Solís, 2009), it may be interesting to explore the diets of the inhabitants of Jícaro to see if they are comparable similar to or different from the other inhabitants of the Bahía de Culebra. Oxygen stable isotope ratios are directly related to the geological composition of particular regions and can provide information about the relocation of groups of people, which can and have been used to answer questions of identity and migration in past populations (Burton and Price, 2000; Burton et. al., 2003; Katzenberg, 2000; Schwarcz and Schoeninger, 1991). Such analyses of the bones and teeth from the individuals at Jícaro may also yield insight into the presence of people with non-local origins or with non-local diets, and may enhance studies involving the presence of a Mesoamerican identity at the site.

Molecular Studies/DNA

Population genetics and DNA analysis may facilitate a deeper understanding of the genetic interactions between peoples of Greater Nicoya, both within the region and with people from outside of the region (e.g., the Mesoamerican groups that reportedly migrated into the area following the collapse of the Maya Empire). Recent studies have involved approaching questions of migration and social structure from a perspective of population genetics and molecular biology. Baldi (2013) analyzed the mitochondrial (mtDNA) variants to determine the ancestral relationships and divergence of modern populations of Rama Amerindians (Nicaragua) with respect to other groups in the region. Similar analyzes could be applied to Jícaro and other Bahía de Culebra sites to ascertain their relatedness (or divergence) to other local populations and to Mesoamerican populations. A final interesting application for molecular studies may be to isolate and identify the pathogen that caused the lytic lesions affecting the vertebrae and pelves of several individuals from the site. There is precedent for the isolation and identification of infectious agents from archaeological bone (e.g., Mutolo, et al., 2011), and as it is likely that the lesions affecting the people of Jícaro are caused by a mycotic fungal infection, isolating the fungus may enhance our understanding of the pathogen load affecting the Jícaro community.

Regional Comparisons

A great deal of archaeological work is being conducted in southwestern Nicaragua in the northern sector of Greater Nicoya (for example, McCafferty, 2011). The sites in the region are yielding skeletal material and burial data, and an expansion of the Jícaro analysis to include not just Bahía de Culebra and other Costa Rican sites would be ideal for fully exploring the relationships between and among ancient people in the Greater Nicoya region.

APPENDICES

Appendix A: Variables and Data Codes

Table A.1: Variables and data codes.

Variable	Abbreviation	Code
Site	SITE	1 – Jícaro 2 – Nacascolo
Sector	SCT	Not coded, numbered 1-5, depending on the sector in which the burial was located
Cluster - Used for spatial analysis only - Applies to burials	CLSTR	1 – Cluster 1 2 – Cluster 2 3 – Cluster 3 4 – Cluster 4 5 – Cluster 5 6 – Cluster 6 7 – Cluster 7 8 – Cluster 8 9 – Cluster 9
Operation - Excavation Unit	OPN	Not coded, numbered 1-46, according to the operation in which the burial was located
Burial	BUR	Not coded, numbered 1-238, according to the order in which the burials were excavated Due to an oversight during excavations, there is no Burial 10
Individual	IND	Not coded, numbered according to the order of discovery within burials
Examined	EXM	0 – Not examined for this study 1 – Examined for this study
Year - Year fieldwork was conducted and observations were documented	YEAR	Not coded, presented as 2007, 2008, 2009, 2013 or a combination of two years, either 2008/2013 or 2009/2013
Inventory - Documentation of the type and completeness of the skeletal inventory taken	INV	0 – Skeletal inventory not completed 1 – Skeletal inventory completed according to recording forms presented by Buikstra and Ubelaker (1994) 2 – Inventory interpreted from notes and made compatible with forms presented by Buikstra and Ubelaker (1994)

Table A.1 (cont'd).

Variable	Abbreviation	Code
Depth - Measured in centimeters during excavations - Coded according to the depth of the highest aspect of the burial - -Applies to burials only	DEP	1 – 0cm to 20cm 2 – 21cm to 40cm 3 – 41cm to 60cm 4 – 61cm to 80cm 5 – 81cm to 100cm 6 – 101cm to 120cm 7 – 121cm to 140cm 8 – 141cm to 160cm 9 – 161cm to 180cm
Treatment - Primary or other - Applies to individuals	PRIM	0 – Apparent secondary/non-primary treatment 1 – Apparent primary treatment
Single/Multiple Interment - Applies to burials	MLT	0 – Apparent single interment 1 – Apparent multiple interment
Reuse - Applies to burials	REU	0 – No evidence of reuse of burial fossa 1 – Apparent evidence of reuse of burial fossa
Completeness - Proportion of skeleton present - Applies to individuals	COMP	1 – 75% or greater (All regions recovered, may be missing isolated elements) 2 – 50 to 75% (All regions recovered but many are fragmentary) 3 – 25 to 50% (Fragmentary cranium and limbs, may or may not involve axial skeleton) 4 – less than 25% (Fragmentary, missing most of axial skeleton and portions of appendicular skeleton) 5 – Isolated elements (bones and/or teeth)
Head Orientation - Direction the head faces (opposite the direction in which the head is physically located) - Applies to individuals	HEAD	1 – North 2 – Northeast 3 – East 4 – Southeast 5 – South 6 – Southwest 7 – West 8 – Northwest

Table A.1 (cont'd).

Variable	Abbreviation	Code
Isolated Cranium - Applies to individuals	CRAN	0 – An individual or an apparent isolated cranium that may be associated with postcranial remains 1 – An apparent isolated cranium with no associated postcranial remains
Burial Disposition - Extended or Flexed - Applies to individuals	EXT	0 – Flexed 1 – Extended
Burial Position - Prone or Supine - Applies to individuals	SUP	0 – Prone or on one side 1 – Supine
Arm Positions - Left or right arm position - Applies to individuals	LARM or RARM	0 – Missing/unobservable 1 – Extended at side 2 – Crossed over chest 3 – Crossed over pelvis 4 – Crossed under pelvis 5 – Flexed
Arm Position Consolidated - When both arms are present - Applies to individuals	ARMPOSC	0 – One arm extended, one arm crossing body plane 1 – Both arms in similar position (either extended or crossing body plane)
Arm Position Symmetry - When both arms are in similar positions - Applies to individuals	ARMSYM	0 – Both arms crossing body plane 1 – Both arms extended at sides
Leg Presence - Applies to individuals	LEGS	1 – Both legs present (does not imply complete) 2 – Left leg present, right leg missing 3 – Right leg present, left leg missing 4 – Both legs missing
Leg Position - When both legs are present - Applies to individuals	LEGPOS	0 – One or both flexed 1 – Both extended

Table A.1 (cont'd).

Variable	Abbreviation	Code
Sex - Applies to individuals	SEX	1 – Male 2 – Probable Male 3 – Ambiguous (features of both males and females) 4 – Probable Female 5 – Female 6 – Indeterminate (insufficient information) 7 – Undetermined: Subadult
Sex Consolidated - Males and Probable Males combined into one category - Females and Probable Females combined into one category	MF	0 – Females and Probable Females 1 – Males and Probable Males
Sex Criteria - Method or combination of methods used to determine sex - Applies to adults	SEXCRI	1 – Postcranial measurements only 2 – Cranial morphology only 3 – Cranial and pelvic morphology 4 – Cranial morphology and cranial and/or postcranial measurements 5 – Pelvic morphology and cranial and/or postcranial measurements 6 – Pelvic and cranial morphology and cranial and/or postcranial measurements 7 – Overall robusticity 8 – Not applicable: Subadult
Adult or Subadult - Applies to individuals	ASA	0 – Subadult 1 – Adult
Age Category - Applies to individuals	AGECAT	1 – Fetal/neonate (0-6mos) 2 – Infant/toddler (6 months-3 years) 3 - Child (3-12 years) 4 – Adolescent (12-18 years) 5 – Young adult (18-35 years) 6 – Middle adult (35-50 years) 7 – Older adult (50+ years) 8 – Undetermined: Adult 9 – Undetermined: Subadult

Table A.1 (cont'd).

Variable	Abbreviation	Code
Age Criteria - Applies to individuals	AGECRI	1 – Overall bone size 2 – Dental development/eruption 3 – Postcranial measurements 4 – Epiphyseal fusion 5 – Pelvic criteria (pubic symphysis and/or auricular surface) 6 – Cranial suture closure 7 – Dental attrition 8 – Cranial suture closure and pelvic criteria 9 – Dental development and epiphyseal fusion 10 – Epiphyseal fusion and pelvic criteria 11 – Bone quality 12 – Dental development and dental attrition
Dental Measurements: Observation - Documentation of whether or not dental measurements were taken during fieldwork	DENT	0 – Dental measurements not taken/recorded 1 – Dental measurements taken/recorded
Adult Measurements - Documentation of whether or not cranial and/or postcranial measurements could be taken	ADMEAS	0 – Adult, no measurements possible 1 – Adult, measurements possible and recorded 2 – Adult, commingled, elements could not be confidently assigned, no measurements taken 3 – Subadult, not applicable
Stature Based on Femur Length - In centimeters - Formulae: Genoves (1967)	STATFem	Not coded, calculations presented when possible
Stature Based on Tibia Length - In centimeters - Formulae: Genoves (1967)	STATTib	Not coded, calculations presented when possible
Subadult Measurements - Documentation of whether or not cranial and/or postcranial measurements could be taken	SAMEAS	0 – Subadult, no measurements possible 1 – Subadult, measurements possible and recorded 2 – Adult, not applicable

Table A.1 (cont'd).

Variable	Abbreviation	Code
Nonmetric Traits: Observation - Documentation of whether or not nonmetric traits were observed/documented during fieldwork	NONM	0 – Nonmetric traits not observed/documented 1 – Nonmetric traits observed/documented
Nonmetric Traits: Scores	NONMS	Coded according to Buikstra and Ubelaker (1994)
Artifacts - Presence or absence of grave goods, including beads - Applies to individuals or burials	ART	0 – No grave goods assigned to an individual or a burial 1 – At least one artifact assigned to an individual or a burial
Beads - Presence or absence of beads - Applies to individuals or burials	BDS	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Beads: Gold - Presence or absence of gold beads - Applies to individuals or burials	BDGo	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Beads: Jade (only) - Presence or absence of jade beads, not in combination with beads made from other raw materials - Applies to individuals or burials	BDJ	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Beads: Shell (only) - Presence or absence of gold beads, not in combination with beads made from other raw materials - Applies to individuals or burials	BDSh	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Beads: Ceramic (only) - Presence or absence of gold beads, not in combination with beads made from other raw materials - Applies to individuals or burials	BDCe	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial

Table A.1 (cont'd).

Variable	Abbreviation	Code
Beads: Faunal (only) - Presence or absence of beads made from faunal bones or teeth, not in combination with beads made from other raw materials - Applies to individuals or burials	BDFn	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Beads: Human teeth (only) - Presence or absence of beads made from human teeth, not in combination with beads made from other raw materials - Applies to individuals or burials	BDHu	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Beads: Mixed Shell and Ceramic - Undifferentiated in archaeologists' spreadsheet	**BDSC**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Beads: Mixed Shell and Jade - Undifferentiated in archaeologists' spreadsheet	**BDSJ**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Beads: Mixed Jade and Ceramic - Undifferentiated in archaeologists' spreadsheet	**BDJC**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Beads: Other - Other combinations of undifferentiated beads, including beads made from stone	**BDO**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Shell Artifacts	**ARTS**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Shell Artifacts: Pearl Oyster shell (no use)	**ARTSPO**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Shell Artifacts: Pearl Oyster (vessel cap)	**ARTSVC**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial

Table A.1 (cont'd).

Variable	Abbreviation	Code
Shell Artifacts: Other Shell Type	**ARTSOT**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Shell Artifacts: Ornaments	**ARTSOr**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Shell Artifacts: Columela (including preforms)	**ARTSCl**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Shell Artifacts: Other Shell Artifacts	**ARTSO**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Ceramic Artifacts	**ARTC**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Ceramic Artifacts: Figurines	**ARTCF**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Ceramic Artifacts: Vessels	**ARTCV**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Ceramic Artifacts: Spindles	**ARTCS**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Ceramic Artifacts: Ear Spools	**ARTCE**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Ceramic Artifacts: Other Ceramic Artifacts	**ARTCO**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Human Remains Artifacts	**ARTH**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial

Table A.1 (cont'd).

Variable	Abbreviation	Code
Human Remains: Cranium/Crania (offerings)	**ARTHCr**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Human Remains: Ornaments	**ARTHOr**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Human Remains: Mandible(s)	**ARTHMn**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Human Remains: Maxilla/Maxillae	**ARTHMx**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Human Remains: Cylindrical Comb(s)	**ARTHCm**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Human Remains: Pendants and Other	**ARTHO**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Faunal Artifacts	**ARTF**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Faunal Artifacts: Deer Metapodial	**ARTFDM**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Faunal Artifacts: Deer Extremity	**ARTFDE**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Faunal Artifacts: Other Deer Bone	**ARTFDO**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Faunal Artifacts: Other Animal Bone	**ARTFB**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial

Table A.1 (cont'd).

Variable	Abbreviation	Code
Faunal Artifacts: Tooth/Bone Pendant	**ARTFP**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Faunal Artifacts: Bone Needle	**ARTFN**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Faunal Artifacts: Other Faunal Artifacts	**ARTFO**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Lithic Artifacts	**ARTL**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Lithic Artifacts: Mixed Lithics	**ARTLX**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Lithic Artifacts: Sedimentary Rock With Thermal Alteration	**ARTLSed**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Lithic Artifacts: Limestone	**ARTLLim**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Lithic Artifacts: Quartz/Quartzite/Silica	**ARTLQtz**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Lithic Artifacts: Sandstone/Silicified Sandstone	**ARTLSnd**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Lithic Artifacts: Jasper	**ARTLJas**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Lithic Artifacts: Obsidian	**ARTLObs**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial

Table A.1 (cont'd).

Variable	Abbreviation	Code
Lithic Artifacts: Other Igneous Rock Brecchia, Basalt, etc.	**ARTLIg**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Lithic Artifacts: Unidentified Rock	**ARTLU**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Sculpture Sub-category of each rock type	**_1**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Unworked Stone Sub-category of each rock type	**_2**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Polished Stone Sub-category of each rock type	**_3**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Core(s) Sub-category of each rock type	**_4**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Flake(s) Sub-category of each rock type	**_5**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Ornaments Sub-category of each rock type	**_6**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Polished Petaloid Artifact(s)	**_7**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Mano/Mano Fragment Sub-category of each rock type	**_8**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Metate/Metate Fragment Sub-category of each rock type	**_9**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial

Table A.1 (cont'd).

Variable	Abbreviation	Code
Tablet or Tablet Preform Sub-category of each rock type	**_10**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Flaked Object Sub-category of each rock type	**_11**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Tool/Weapon Sub-category of each rock type	**_12**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Type of Tool/Weapon Applies only to tools/weapons	**_Type**	No code, listed the type of weapon or tool
Other Lithic Artifact Sub-category of each rock type	**_13**	0 – None assigned to an individual or a burial 1 – At least one assigned to an individual or a burial
Description Description of certain artifacts Does not apply to every artifact/type	**_Desc**	No code, described the item if it had a description in the field notes
Individual/Not - Applies to all individuals	**SEP**	0 – Does not meet individual criteria 1 – Meets criteria to be considered an individual
Articulated - Applies to all individuals	**ATC**	0 – Disarticulated/disturbed/looted 1 – Articulated/Partially articulated
Pathology - Applies to all individuals	**PATH**	0 – No evidence of pathology on observable skeletal elements 1 – Evidence of pathology present on at least one skeletal element
Permanent Teeth Presence - Applies to all individuals	**PTP**	0 – Individual has no permanent teeth present 1 – Individual has at least one permanent tooth present
Anterior Maxillary Teeth - Presence/Absence	**ANTMX**	0 – No teeth present that would have the potential for LSAMAT 1 – Any teeth present that would have potential for LSAMAT
Lingual Wear (Lingual Surface Attrition of Anterior Maxillary Teeth—LSAMAT) - Applies to all individuals - Maxillary anterior dentition only	**LWE**	0 – None of the observable maxillary teeth show evidence of extreme lingual wear 1 – At least one tooth shows evidence of extreme lingual wear

Table A.1 (cont'd).

Variable	Abbreviation	Code
Anterior Mandibular Teeth - Presence/Absence	**ANTMD**	0 – No teeth present that would have potential for excess calculus 1 – Any teeth present that would have potential for excess calculus
Excess Calculus - Applies to all individuals - Mandibular anterior dentition only	**EXC**	0 – Calculus score of 2 or less on fewer than 2 sides of a given tooth 1 – Calculus score of 2 or more on 2 or more sides of a given tooth
Anterior Maxillary/Mandibular Teeth - Presence/Absence	**ANTTH**	0 – No teeth present that would have potential for modification 1 – Any teeth present that would have potential for modification
Dental Modification - Applies to all individuals with permanent anterior teeth	**MOD**	0 – No evidence for intentional modification on observable teeth 1 – Evidence on at least one anterior tooth of intentional modification
Gold (general) - Applies to all individuals and burials	**Gold**	0 – No gold present or none associated with an individual 1 – Presence of any gold in a burial or associated with an individual
Jade (general) Applies to all individuals and burials	**Jade**	0 – No jade present or none associated with an individual 1 – Presence of any jade in a burial or associated with an individual
Age Range - Applies to all individuals	**AGERANGE**	No code, specific age range applies to individuals according to age indicators
Absolute Age - Applies to all individuals	**ABSAGE**	No code, mean age for a given age range, used for statistical analysis
Trauma (general) - Cutmarks or fractures in any state of healing - Applies to all individuals	**TRAU**	0 – No evidence of fracture and/or cutmarks on any observable skeletal elements 1 – Evidence of fracture and/or cutmarks on any skeletal element
Cutmarks - Applies to all individuals	**CTM**	0 – No evidence of cutmarks on any observable skeletal elements 1 – Evidence of cutmarks on any skeletal element
Fracture - Fracture in any stage of healing, antemortem or perimortem - Applies to all individuals	**FX**	0 – No evidence of fracture on any observable skeletal elements 1 – Evidence of fracture on at least one skeletal element

Table A.1 (cont'd).

Variable	Abbreviation	Code
Kneeling (general) - Possible evidence for kneeling or squatting - Applies to individuals	**KNEL**	0 – No evidence for kneeling or squatting facets on observable skeletal elements 1 – Evidence of kneeling facets affecting skeletal elements that would be expected to have them
Femoral Neck Facets - Applies to all individuals - Evidence of kneeling or squatting	**FEM**	0 – No evidence for facets on observable femoral necks 1 – Evidence for facets affecting the anterior femoral necks
Unusual Patella - Applies to individuals - Evidence of kneeling	**PAT**	0 – No evidence of anomalous patella 1 – Evidence of subchondral pitting or other anomalous condition affecting patella
Treponemal Infection Suspected - Applies to individuals	**TREP**	0 – Individual not suspected of having treponemal infection 1 – Individual suspected of having treponemal infection, based on available skeletal evidence
Left Orbit - Presence/Absence - Applies to all individuals	**LORB**	0 – Left orbit is not present or not observable 1` - Left orbit is present and observable for cribra orbitalia
Right Orbit - Presence/Absence - Applies to all individuals	**RORB**	0 – Right orbit is not present or not observable 1 – Right orbit is present and observable for cribra orbitalia
Left Orbit Cribra Orbitalia - Applies to all individuals with observable orbits	**LORBCO**	0 – No evidence of cribra orbitalia affecting observable orbit 1 – Cribra orbitalia present
Right Orbit Cribra Orbitalia - Applies to all individuals with observable orbits	**RORBCO**	0 – No evidence of cribra orbitalia affecting observable orbit 1 – Cribra orbitalia present
Cribra Orbitalia (score) - Applies to either orbit - Applies to all individuals	**CO**	0 – No evidence of cribra orbitalia 1 – Cribra orbitalia active 2 – Cribra orbitalia healed 3 – Cribra orbitalia combination/healing
Table A.1: Variables and Lower Vertebrae Observability - Applies to adults - Related to Spinal Pathology	**VERTS**	0 – Lower vertebral column not observable for spinal pathology 1 – Lower vertebral column present and observable

Table A.1 (cont'd).

Variable	Abbreviation	Code
Spinal Pathology - Applies to adults	**SPNPTH**	0 – No evidence of spinal pathology on observable vertebrae/pelvis 1 – Evidence of spinal pathology
Long Bones Present - Applies to all individuals	**LNGBNS**	0 – No long bones observable, due to absence or condition 1 – Any long bones present and observable
Periostitis (general) - Applies to all individuals	**PERIO**	0 – No evidence of periostitis on any observable elements 1 – Evidence of periostitis on at least one skeletal element
Periostitis (Left Humerus) - Applies to all individuals	**PERIO _LH**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Periostitis (Right Humerus) - Applies to all individuals	**PERIO _RH**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Periostitis (Left Radius) - Applies to all individuals	**PERIO _LR**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Periostitis (Right Radius) - Applies to all individuals	**PERIO _RR**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Periostitis (Left Ulna) - Applies to all individuals	**PERIO _LU**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Periostitis (Right Ulna) - Applies to all individuals	**PERIO _RU**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone

Table A.1 (cont'd).

Variable	Abbreviation	Code
Table A.1: Periostitis (Left Femur) - Applies to all individuals	**PERIO _LFe**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Periostitis (Right Femur) - Applies to all individuals	**PERIO _RFe**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Periostitis (Left Tibia) - Applies to all individuals	**PERIO _LT**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Periostitis (Right Tibia) - Applies to all individuals	**PERIO _RT**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Periostitis (Left Fibula) - Applies to all individuals	**PERIO _Lfi**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Periostitis (Right Fibula) - Applies to all individuals	**PERIO _RFi**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Periosteal Reaction (Ribs) - Applies to all individuals	**PERIO _RIB**	0 – No evidence for periosteal reaction on observable areas of this specific bone 1 – Any evidence for periosteal reaction on this specific bone
Count - Applies to any variable that is counted for all individuals	**_Ct**	No code, this suffix behind any variable implies a quantity of that variable

Appendix B: Jícaro Demographic Data

Table B.1: Jícaro demographic data and methods summary.

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
101	Ji101	1	Ji1	1	1	2	7	-	9	2	0	2
201	Ji201	2	Ji2	1	1	3	-	-	-	8	1	-
304	Ji304	3	Ji3	1	1	2	4	2	1	8	1	1
301	Ji301	3	Ji3	1	1	2	3	-	-	8	1	7
302	Ji302	3	Ji3	1	1	2	-	-	-	-	1	7
303	Ji303	3	Ji3	1	1	2	-	-	2	-	1	6
305	Ji305	3	Ji3	1	1	2	-	-	-	1	0	7
401	Ji401	4	Ji4	1	1	3	7	-	9	1	0	3
402	Ji402	4	Ji4	1	1	3	7	-	9	2	0	2
403	Ji403	4	Ji4	1	1	3	7	-	9	2	0	4
404	Ji404	4	Ji4	1	1	3	7	-	9	3	0	2
405	Ji405	4	Ji4	1	1	3	-	-	-	-	-	-
406	Ji406	4	Ji4	1	1	3	-	-	-	-	-	-
501	Ji501	5	Ji5	1	1	3	1	1	4	6	1	5
502	Ji502	5	Ji5	1	1	3	7	-	9	2	0	2
601	Ji601	6	Ji6	1	1	3	7	-	9	3	0	2
602	Ji602	6	Ji6	1	1	3	7	-	9	1	0	1
603	Ji603	6	Ji6	1	1	3	7	-	9	1	0	1
604	Ji604	6	Ji6	1	1	3	7	-	9	3	0	2
605	Ji605	6	Ji6	1	1	3	-	-	9	-	0	1
701	Ji701	7	Ji7	1	1	8	3	-	-	8	1	7
702	Ji702	7	Ji7	1	1	8	-	-	-	-	0	7
703	Ji703	7	Ji7	1	1	8	7	-	-	8	1	7
704	Ji704	7	Ji7	1	1	8	7	-	-	8	1	7
705	Ji705	7	Ji7	1	1	8	-	-	-	-	0	7
706	Ji706	7	Ji7	1	1	8	-	-	-	-	0	7
801	Ji801	8	Ji8	1	1	19	-	-	-	-	-	-
901	Ji901	9	Ji9	1	1	19	-	-	-	-	1	-
902	Ji902	9	Ji9	1	1	19	-	-	-	-	-	-
1001	Ji1001	10	Ji10	1	1	19	-	-	-	-	-	-
1101	Ji1101	11	Ji11	1	1	19	2	1	7	8	1	7
1102	Ji1102	11	Ji11	1	1	19	-	-	-	-	-	-
1201	Ji1201	12	Ji12	1	1	19	4	2	7	8	1	7
1301	Ji1301	13	Ji13	1	1	19	7	-	9	3	0	2
1401	Ji1401	14	Ji14	1	1	21	7	-	-	-	-	-
1501	Ji1501	15	Ji15	1	1	19	4	2	1	5	1	7

Table B.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
1602	Ji1602	16	Ji16	1	1	21	2	1	2	8	1	7
1601	Ji1601	16	Ji16	1	1	21	4	2	2	6	1	7
1603	Ji1603	16	Ji16	1	1	21	4	2	-	8	1	7
1604	Ji1604	16	Ji16	1	1	21	4	2	2	8	1	7
1605	Ji1605	16	Ji16	1	1	21	7	-	-	8	1	-
1606	Ji1606	16	Ji16	1	1	21	7	-	9	2	-	2
1701	Ji1701	17	Ji17	1	1	21	-	-	1	8	1	1
1801	Ji1801	18	Ji18	1	1	21	-	-	-	8	1	1
1901	Ji1901	19	Ji19	1	1	22	7	-	9	3	0	2
2002	Ji2002	20	Ji20	1	1	22	2	1	4	8	1	6
2003	Ji2003	20	Ji20	1	1	22	2	1	4	8	1	6
2001	Ji2001	20	Ji20	1	1	22	4	2	1	8	1	1
2004	Ji2004	20	Ji20	1	1	22	7	-	9	4	0	1
2005	Ji2005	20	Ji20	1	1	22	7	-	9	3	0	2
2006	Ji2006	20	Ji20	1	1	22	-	-	-	-	-	-
2007	Ji2007	20	Ji20	1	1	22	-	-	-	-	-	-
2101	Ji2101	21	Ji21	1	1	21	7	-	9	3	0	2
2102	Ji2102	21	Ji21	1	1	21	7	-	9	3	0	2
2201	Ji2201	22	Ji22	1	1	22	7	-	9	3	0	2
2301	Ji2301	23	Ji23	1	1	21	-	-	-	-	1	-
2401	Ji2401	24	Ji24	1	1	21	7	-	-	8	1	7
2501	Ji2501	25	Ji25	1	1	21	7	-	-	8	1	7
2601	Ji2601	26	Ji26	1	1	21	7	-	1	8	1	7
2701	Ji2701	27	Ji27	1	1	22	7	-	9	2	0	4
2801	Ji2801	28	Ji28	1	1	24	6	-	6	6	1	5
2901	Ji2901	29	Ji29	1	1	21	7	-	-	8	1	7
3001	Ji3001	30	Ji30	1	1	21	4	2	5	8	1	-
3002	Ji3002	30	Ji30	1	1	21	7	-	-	8	1	-
3003	Ji3003	30	Ji30	1	1	21	7	-	-	-	-	-
3101	Ji3101	31	Ji31	1	1	21	7	-	9	3	0	2
3102	Ji3102	31	Ji31	1	1	21	7	-	9	3	0	2
3201	Ji3201	32	Ji32	1	1	22	7	-	9	3	0	2
3301	Ji3301	33	Ji33	1	1	22	4	2	3	6	1	5
3401	Ji3401	34	Ji34	1	1	22	2	1	2	5	1	-
3402	Ji3402	34	Ji34	1	1	22	2	1	-	8	1	-
3403	Ji3403	34	Ji34	1	1	22	4	2	-	5	1	-
3501	Ji3501	35	Ji35	1	1	22	7	-	9	3	0	2
3601	Ji3601	36	Ji36	1	1	22	7	-	1	8	1	7
3701	Ji3701	37	Ji37	1	1	26	4	2	4	6	1	7

Table B.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
3702	Ji3702	37	Ji37	1	1	26	7	-	9	2	0	1
3801	Ji3801	38	Ji38	1	1	24	2	1	4	6	1	8
3901	Ji3901	39	Ji39	1	1	24	5	2	4	8	1	7
3902	Ji3902	39	Ji39	1	1	24	3	-	-	8	1	7
4001	Ji4001	40	Ji40	1	1	22	4	2	4	5	1	7
4101	Ji4101	41	Ji41	1	1	24	5	2	6	6	1	7
4201	Ji4201	42	Ji42	1	1	26	7	-	9	3	0	2
4301	Ji4301	43	Ji43	1	1	26	7	-	9	2	0	2
4302	Ji4302	43	Ji43	1	1	26	7	-	9	2	0	-
4401	Ji4401	44	Ji44	1	1	24	7	-	-	4	0	9
4501	Ji4501	45	Ji45	1	1	24	5	2	-	5	1	4
4601	Ji4601	46	Ji46	1	1	26	7	-	9	2	0	3
4701	Ji4701	47	Ji47	1	1	26	4	2	1	8	1	1
4702	Ji4702	47	Ji47	1	1	26	7	-	9	1	0	1
4801	Ji4801	48	Ji48	1	1	26	5	2	4	5	1	10
4901	Ji4901	49	Ji49	1	1	24	4	2	7	8	1	11
5001	Ji5001	50	Ji50	1	1	24	7	-	9	2	0	2
5101	Ji5101	51	Ji51	1	1	24	2	1	4	6	1	4
5102	Ji5102	51	Ji51	1	1	24	7	-	9	2	0	1
5201	Ji5201	52	Ji52	1	1	26	7	-	9	3	0	9
5301	Ji5301	53	Ji53	1	1	21	-	-	-	-	-	-
5401	Ji5401	54	Ji54	1	1	21	-	-	-	-	1	-
5501	Ji5501	55	Ji55	1	1	21	-	-	-	-	1	-
5601	Ji5601	56	Ji56	1	1	21	-	-	-	-	1	-
5701	Ji5701	57	Ji57	1	1	24	1	1	6	6	1	5
5702	Ji5702	57	Ji57	1	1	24	4	2	-	8	-	-
5703	Ji5703	57	Ji57	1	1	24	4	2	-	8	-	-
5704	Ji5704	57	Ji57	1	1	24	7	-	-	9	0	-
5801	Ji5801	58	Ji58	1	1	24	1	1	2	6	1	6
5802	Ji5802	58	Ji58	1	1	24	1	1	2	8	1	6
5803	Ji5803	58	Ji58	1	1	24	4	2	2	8	1	-
5804	Ji5804	58	Ji58	1	1	24	7	-	9	1	0	1
5901	Ji5901	59	Ji59	1	1	24	3	-	1	8	1	7
6001	Ji6001	60	Ji60	1	1	24	7	-	9	2	0	2
6101	Ji6101	61	Ji61	1	1	26	2	1	4	7	1	5
6102	Ji6102	61	Ji61	1	1	26	2	1	2	8	1	7
6103	Ji6103	61	Ji61	1	1	26	4	2	2	8	1	7
6104	Ji6104	61	Ji61	1	1	26	7	-	9	3	0	2
6105	Ji6105	61	Ji61	1	1	26	-	-	-	-	-	-

Table B.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
6201	Ji6201	62	Ji62	1	1	28	4	2	6	7	1	5
6202	Ji6202	62	Ji62	1	1	28	5	2	6	7	1	5
6301	Ji6301	63	Ji63	1	1	24	-	-	-	-	0	-
6401	Ji6401	64	Ji64	1	1	3	4	2	4	6	1	6
6402	Ji6402	64	Ji64	1	1	3	7	-	9	2	0	2
6501	Ji6501	65	Ji65	1	1	24	7	-	9	3	0	9
6601	Ji6601	66	Ji66	1	1	24	7	-	9	3	0	9
6701	Ji6701	67	Ji67	1	1	28	5	2	6	5	1	5
6801	Ji6801	68	Ji68	1	1	24	2	1	3	7	1	5
6802	Ji6802	68	Ji68	1	1	24	1	1	2	8	-	1
6803	Ji6803	68	Ji68	1	1	24	2	1	-	8	-	1
6901	Ji6901	69	Ji69	1	1	29	3	-	-	5	1	7
7001	Ji7001	70	Ji70	1	1	29	3	-	-	8	1	-
7101	Ji7101	71	Ji71	1	1	24	3	-	-	8	1	7
7201	Ji7201	72	Ji72	1	1	30	7	-	9	1	0	1
7202	Ji7202	72	Ji72	1	1	30	7	-	9	1	0	1
7301	Ji7301	73	Ji73	1	1	24	7	-	9	2	0	2
7302	Ji7302	73	Ji73	1	1	24	7	-	9	2	0	2
7303	Ji7303	73	Ji73	1	1	24	7	-	9	9	0	2
7304	Ji7304	73	Ji73	1	1	24	7	-	-	8	0	1
7402	Ji7402	74	Ji74	1	1	29	2	1	-	5	1	7
7401	Ji7401	74	Ji74	1	1	29	3	-	2	6	1	7
7403	Ji7403	74	Ji74	1	1	29	7	-	9	3	0	2
7404	Ji7404	74	Ji74	1	1	29	7	-	9	3	0	2
7501	Ji7501	75	Ji75	1	1	24	7	-	9	9	0	2
7502	Ji7502	75	Ji75	1	1	24	7	-	9	2	0	2
7503	Ji7503	75	Ji75	1	1	24	7	-	9	2	0	2
7504	Ji7504	75	Ji75	1	1	24	7	-	9	3	0	2
7601	Ji7601	76	Ji76	1	1	24	7	-	9	3	0	2
7602	Ji7602	76	Ji76	1	1	24	7	-	9	2	0	2
7603	Ji7603	76	Ji76	1	1	24	7	-	9	2	0	1
7604	Ji7604	76	Ji76	1	1	24	7	-	9	2	0	1
7701	Ji7701	77	Ji77	1	1	29	3	-	1	5	1	1
7801	Ji7801	78	Ji78	1	1	29	3	-	-	8	1	1
7802	Ji7802	78	Ji78	1	1	29	7	-	9	3	0	2
7902	Ji7902	79	Ji79	1	1	24	1	1	2	8	1	7
7904	Ji7904	79	Ji79	1	1	24	2	1	4	8	1	7
7901	Ji7901	79	Ji79	1	1	24	3	-	2	8	1	7
7903	Ji7903	79	Ji79	1	1	24	3	-	2	8	1	7

Table B.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
7905	Ji7905	79	Ji79	1	1	24	7	-	-	1	0	-
8001	Ji8001	80	Ji80	1	1	30	1	1	6	7	1	5
8101	Ji8101	81	Ji81	1	1	29	7	-	-	U	-	-
8201	Ji8201	82	Ji82	1	1	30	4	2	2	4	0	4
8301	Ji8301	83	Ji83	1	1	24	4	2	6	5	1	5
8302	Ji8302	83	Ji83	1	1	24	7	-	-	2	0	-
8303	Ji8303	83	Ji83	1	1	24	7	-	-	1	0	-
8304	Ji8304	83	Ji83	1	1	24	7	-	-	1	0	-
8305	Ji8305	83	Ji83	1	1	24	7	-	-	1	0	-
8306	Ji8306	83	Ji83	1	1	24	7	-	-	1	0	-
8307	Ji8307	83	Ji83	1	1	24	-	-	-	-	-	-
8308	Ji8308	83	Ji83	1	1	24	-	-	-	-	-	-
8401	Ji8401	84	Ji84	1	1	24	3	-	1	8	1	-
8501	Ji8501	85	Ji85	1	1	24	7	-	-	1	0	-
8502	Ji8502	85	Ji85	1	1	24	7	-	-	1	0	-
8503	Ji8503	85	Ji85	1	1	24	7	-	-	1	0	-
8504	Ji8504	85	Ji85	1	1	24	-	-	-	-	-	-
8505	Ji8505	85	Ji85	1	1	24	-	-	-	-	-	-
8506	Ji8506	85	Ji85	1	1	24	-	-	-	-	-	-
8507	Ji8507	85	Ji85	1	1	24	-	-	-	-	-	-
8601	Ji8601	86	Ji86	1	1	29	3	-	-	6	1	7
8701	Ji8701	87	Ji87	1	1	24	5	2	6	6	1	7
8703	Ji8703	87	Ji87	1	1	24	4	2	9	8	1	2
8702	Ji8702	87	Ji87	1	1	24	7	-	5	3	0	7
8801	Ji8801	88	Ji88	1	1	24	7	-	9	4	0	9
8901	Ji8901	89	Ji89	1	1	30	4	2	4	8	1	4
9001	Ji9001	90	Ji90	1	1	29	7	-	-	-	-	-
9101	Ji9101	91	Ji91	1	1	29	-	-	-	-	-	-
9201	Ji9201	92	Ji92	1	1	30	-	-	-	-	-	-
9202	Ji9202	92	Ji92	1	1	30	-	-	-	-	-	-
9203	Ji9203	92	Ji92	1	1	30	-	-	-	-	-	-
9204	Ji9204	92	Ji92	1	1	30	-	-	-	-	-	-
9205	Ji9205	92	Ji92	1	1	30	-	-	-	-	-	-
9301	Ji9301	93	Ji93	1	1	29	-	-	-	-	-	-
9401	Ji9401	94	Ji94	1	1	29	-	-	-	-	-	-
9501	Ji9501	95	Ji95	1	1	24	7	-	9	3	0	9
9502	Ji9502	95	Ji95	1	1	24	7	-	9	3	0	1
9601	Ji9601	96	Ji96	1	1	24	4	2	1	7	1	11
9602	Ji9602	96	Ji96	1	1	24	7	-	9	3	0	2

Table B.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
9603	Ji9603	96	Ji96	1	1	24	7	-	9	1	0	2
9701	Ji9701	97	Ji97	1	1	30	4	2	1	8	1	7
9702	Ji9702	97	Ji97	1	1	30	7	-	9	2	0	2
9801	Ji9801	98	Ji98	1	1	29	-	-	-	-	1	-
9802	Ji9802	98	Ji98	1	1	29	-	-	-	-	1	-
9901	Ji9901	99	Ji99	1	1	24	4	2	3	5	1	9
10001	Ji10001	100	Ji100	1	1	24	2	1	4	5	1	10
10101	Ji10101	101	Ji101	1	1	24	1	1	5	6	1	5
10201	Ji10201	102	Ji102	1	1	31	-	-	-	-	1	-
10202	Ji10202	102	Ji102	1	1	31	-	-	-	-	1	-
10203	Ji10203	102	Ji102	1	1	31	-	-	-	-	1	-
10301	Ji10301	103	Ji103	1	1	24	1	1	-	6	1	5
10401	Ji10401	104	Ji104	1	1	24	5	2	6	7	1	8
10501	Ji10501	105	Ji105	1	1	24	1	1	3	6	1	5
10502	Ji10502	105	Ji105	1	1	24	5	2	6	5	1	6
10601	Ji10601	106	Ji106	1	1	24	5	2	6	6	1	5
10701	Ji10701	107	Ji107	1	1	31	-	-	-	-	0	-
10801	Ji10801	108	Ji108	1	1	31	7	-	9	3	0	2
10901	Ji10901	109	Ji109	1	1	31	4	2	4	6	1	7
11001	Ji11001	110	Ji110	1	1	24	1	1	4	7	1	7
11003	Ji11003	110	Ji110	1	1	24	4	2	9	8	1	2
11002	Ji11002	110	Ji110	1	1	24	7	-	-	3	0	7
11101	Ji11101	111	Ji111	1	1	34	4	2	4	6	1	7
11201	Ji11201	112	Ji112	1	1	33	3	-	-	5	1	7
11301	Ji11301	113	Ji113	1	1	24	4	2	6	6	1	5
11401	Ji11401	114	Ji114	1	1	24	4	2	6	5	1	5
11501	Ji11501	115	Ji115	1	1	35	-	-	-	-	1	-
11601	Ji11601	116	Ji116	1	1	31	-	-	-	-	-	-
11602	Ji11602	116	Ji116	1	1	31	-	-	-	-	-	-
11701	Ji11701	117	Ji117	1	1	31	-	-	-	-	-	-
11801	Ji11801	118	Ji118	1	1	31	1	1	6	5	1	10
11901	Ji11901	119	Ji119	1	1	34	3	-	4	7	1	5
12001	Ji12001	120	Ji120	1	1	34	1	1	4	6	1	10
12101	Ji12101	121	Ji121	1	1	24	2	1	3	7	1	5
12102	Ji12102	121	Ji121	1	1	24	7	-	9	3	0	3
12201	Ji12201	122	Ji122	1	1	24	-	-	-	-	0	-
12301	Ji12301	123	Ji123	1	1	24	7	-	9	3	0	9
12401	Ji12401	124	Ji124	1	1	24	4	2	4	5	1	5
12402	Ji12402	124	Ji124	1	1	24	7	-	-	8	-	-

Table B.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
12501	Ji12501	125	Ji125	1	1	24	7	-	9	3	0	4
12601	Ji12601	126	Ji126	1	1	34	2	1	4	7	1	7
12701	Ji12701	127	Ji127	1	1	31	5	2	6	5	1	10
12702	Ji12702	127	Ji127	1	1	31	7	-	9	1	0	1
12801	Ji12801	128	Ji128	1	1	35	-	-	-	-	1	-
12802	Ji12802	128	Ji128	1	1	35	-	-	-	-	0	-
12901	Ji12901	129	Ji129	1	1	24	4	2	6	5	1	5
12902	Ji12902	129	Ji129	1	1	24	7	-	9	3	0	2
12903	Ji12903	129	Ji129	1	1	24	7	-	9	3	0	2
13001	Ji13001	130	Ji130	1	1	24	1	1	6	6	1	8
13002	Ji13002	130	Ji130	1	1	24	7	-	9	1	0	1
13003	Ji13003	130	Ji130	1	1	24	-	-	9	3	0	1
13101	Ji13101	131	Ji131	1	1	34	4	2	4	8	1	5
13201	Ji13201	132	Ji132	1	1	35	-	-	-	-	0	-
13202	Ji13202	132	Ji132	1	1	35	-	-	-	-	-	-
13203	Ji13203	132	Ji132	1	1	35	-	-	-	-	-	-
13302	Ji13302	133	Ji133	1	1	31	1	1	6	6	1	5
13301	Ji13301	133	Ji133	1	1	31	4	2	4	6	1	5
13303	Ji13303	133	Ji133	1	1	31	5	2	4	7	1	5
13401	Ji13401	134	Ji134	1	1	36	2	1	6	6	1	4
13501	Ji13501	135	Ji135	1	1	34	1	1	4	8	1	6
13601	Ji13601	136	Ji136	1	1	34	7	-	9	1	0	1
13701	Ji13701	137	Ji137	1	1	24	-	-	-	-	0	-
13801	Ji13801	138	Ji138	1	1	24	-	-	-	-	0	-
13904	Ji13904	139	Ji139	1	1	31	2	1	1	8	1	1
13905	Ji13905	139	Ji139	1	1	31	4	2	1	8	1	1
13901	Ji13901	139	Ji139	1	1	31	-	-	1	8	1	1
13902	Ji13902	139	Ji139	1	1	31	3	-	1	8	1	1
13903	Ji13903	139	Ji139	1	1	31	3	-	1	8	1	1
13906	Ji13906	139	Ji139	1	1	31	-	-	9	-	0	1
14001	Ji14001	140	Ji140	1	1	37	-	-	-	-	1	-
14002	Ji14002	140	Ji140	1	1	37	-	-	-	-	-	-
14101	Ji14101	141	Ji141	1	1	37	-	-	-	-	-	-
14201	Ji14201	142	Ji142	1	1	37	-	-	-	-	-	-
14301	Ji14301	143	Ji143	1	1	38	-	-	-	-	1	-
14401	Ji14401	144	Ji144	1	1	39	-	-	-	-	-	-
14501	Ji14501	145	Ji145	1	1	37	1	1	2	6	1	5
14601	Ji14601	146	Ji146	1	1	39	-	-	-	-	-	-
14701	Ji14701	147	Ji147	1	1	37	2	1	3	6	1	8

Table B.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
14702	Ji14702	147	Ji147	1	1	37	2	1	2	5	1	6
14801	Ji14801	148	Ji148	1	1	37	-	-	-	-	0	-
14901	Ji14901	149	Ji149	1	1	39	-	-	-	-	0	-
15001	Ji15001	150	Ji150	1	1	38	-	-	-	-	0	-
15101	Ji15101	151	Ji151	1	1	38	1	1	6	6	1	-
15201	Ji15201	152	Ji152	1	1	31	-	-	-	-	1	-
15301	Ji15301	153	Ji153	1	1	31	-	-	-	-	0	-
15302	Ji15302	153	Ji153	1	1	31	-	-	-	-	0	-
15303	Ji15303	153	Ji153	1	1	31	-	-	-	-	0	-
15401	Ji15401	154	Ji154	1	1	39	-	-	-	-	0	-
15402	Ji15402	154	Ji154	1	1	39	-	-	-	-	0	-
15403	Ji15403	154	Ji154	1	1	39	-	-	-	-	-	-
15404	Ji15404	154	Ji154	1	1	39	-	-	-	-	0	-
15405	Ji15405	154	Ji154	1	1	39	-	-	-	-	0	-
15406	Ji15406	154	Ji154	1	1	39	-	-	-	-	-	-
15407	Ji15407	154	Ji154	1	1	39	-	-	-	-	0	-
15408	Ji15408	154	Ji154	1	1	39	-	-	-	-	0	-
15502	Ji15502	155	Ji155	1	1	31	1	1	4	6	1	6
15503	Ji15503	155	Ji155	1	1	31	2	1	4	8	1	5
15501	Ji15501	155	Ji155	1	1	31	4	2	2	7	1	1
15504	Ji15504	155	Ji155	1	1	31	7	-	-	8	1	1
15505	Ji15505	155	Ji155	1	1	31	-	-	-	-	0	-
15506	Ji15506	155	Ji155	1	1	31	-	-	-	-	0	-
15602	Ji15602	156	Ji156	1	1	31	4	2	-	8	1	7
15601	Ji15601	156	Ji156	1	1	31	7	-	7	8	1	7
15603	Ji15603	156	Ji156	1	1	31	7	-	9	3	0	2
15604	Ji15604	156	Ji156	1	1	31	-	-	-	-	-	-
15701	Ji15701	157	Ji157	1	1	39	-	-	-	-	-	-
15801	Ji15801	158	Ji158	1	1	39	-	-	-	-	1	-
15802	Ji15802	158	Ji158	1	1	39	-	-	-	-	1	-
15803	Ji15803	158	Ji158	1	1	39	-	-	-	-	-	-
15901	Ji15901	159	Ji159	1	1	38	-	-	-	-	1	-
16001	Ji16001	160	Ji160	1	1	41	2	1	1	5	1	7
16002	Ji16002	160	Ji160	1	1	41	3	-	-	8	1	7
16003	Ji16003	160	Ji160	1	1	41	3	-	-	8	1	7
16004	Ji16004	160	Ji160	1	1	41	3	-	2	5	0	7
16005	Ji16005	160	Ji160	1	1	41	3	-	-	8	0	7
16006	Ji16006	160	Ji160	1	1	41	3	-	-	8	1	7
16101	Ji16101	161	Ji161	1	1	31	-	-	-	-	1	-

Table B.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
16102	Ji16102	161	Ji161	1	1	31	-	-	-	-	1	-
16201	Ji16201	162	Ji162	1	1	42	1	1	6	6	1	8
16301	Ji16301	163	Ji163	1	1	30	-	-	-	-	1	-
16401	Ji16401	164	Ji164	1	1	30	1	1	4	6	1	5
16501	Ji16501	165	Ji165	1	1	42	-	-	-	-	0	-
16601	Ji16601	166	Ji166	1	1	42	5	2	4	6	1	5
16701	Ji16701	167	Ji167	1	1	41	-	-	-	-	1	-
16801	Ji16801	168	Ji168	1	1	42	1	1	6	6	1	5
16901	Ji16901	169	Ji169	1	1	31	-	-	-	-	-	-
16902	Ji16902	169	Ji169	1	1	31	-	-	-	-	0	-
17001	Ji17001	170	Ji170	1	1	41	-	-	-	-	1	-
17002	Ji17002	170	Ji170	1	1	41	-	-	-	-	-	-
17003	Ji17003	170	Ji170	1	1	41	-	-	-	-	-	-
17004	Ji17004	170	Ji170	1	1	41	-	-	-	-	-	-
17101	Ji17101	171	Ji171	1	1	41	7	-	1	8	1	1
17201	Ji17201	172	Ji172	1	1	30	6	-	4	8	1	7
17301	Ji17301	173	Ji173	1	1	31	4	2	4	8	1	7
17401	Ji17401	174	Ji174	1	1	41	-	-	-	-	0	-
17501	Ji17501	175	Ji175	1	1	41	-	-	-	-	-	-
17601	Ji17601	176	Ji176	1	1	42	5	2	6	5	1	4
17602	Ji17602	176	Ji176	1	1	42	4	2	6	6	1	7
17701	Ji17701	177	Ji177	1	1	31	1	1	3	6	1	5
17702	Ji17702	177	Ji177	1	1	31	1	1	-	8	-	7
17703	Ji17703	177	Ji177	1	1	31	7	-	-	9	0	-
17801	Ji17801	178	Ji178	1	1	31	4	2	1	8	1	-
17901	Ji17901	179	Ji179	1	1	30	7	-	9	4	0	4
18001	Ji18001	180	Ji180	1	1	30	-	-	-	-	1	-
18101	Ji18101	181	Ji181	1	1	41	2	1	5	8	1	5
18102	Ji18102	181	Ji181	1	1	41	7	-	-	8	1	-
18103	Ji18103	181	Ji181	1	1	41	7	-	9	-	-	-
18104	Ji18104	181	Ji181	1	1	41	7	-	9	-	-	-
18201	Ji18201	182	Ji182	1	1	31	3	-	4	8	1	5
18301	Ji18301	183	Ji183	1	1	31	-	-	-	-	-	-
18401	Ji18401	184	Ji184	1	1	31	-	-	-	-	1	-
18402	Ji18402	184	Ji184	1	1	31	-	-	-	-	-	-
18501	Ji18501	185	Ji185	1	1	31	-	-	-	-	-	-
18601	Ji18601	186	Ji186	1	1	22	-	-	-	-	0	-
18701	Ji18701	187	Ji187	1	1	22	-	-	-	-	0	-
18801	Ji18801	188	Ji188	1	1	22	4	2	4	5	1	12

Table B.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
18901	Ji18901	189	Ji189	1	1	43	7	-	9	2	0	1
18902	Ji18902	189	Ji189	1	1	43	7	-	9	2	0	1
18903	Ji18903	189	Ji189	1	1	43	7	-	9	3	0	1
19001	Ji19001	190	Ji190	1	1	43	7	-	9	3	0	1
19002	Ji19002	190	Ji190	1	1	43	7	-	9	1	0	1
19003	Ji19003	190	Ji190	1	1	43	7	-	9	1	0	1
19101	Ji19101	191	Ji191	1	1	22	2	1	4	8	1	7
19201	Ji19201	192	Ji192	1	1	22	7	-	9	3	0	2
19301	Ji19301	193	Ji193	1	1	43	-	-	-	-	-	-
19401	Ji19401	194	Ji194	1	1	22	7	-	9	3	0	2
19501	Ji19501	195	Ji195	1	1	22	7	-	9	3	0	2
19601	Ji19601	196	Ji196	1	1	22	-	-	-	-	0	-
19701	Ji19701	197	Ji197	1	1	22	-	-	-	-	0	-
19801	Ji19801	198	Ji198	1	1	22	-	-	-	-	0	-
19901	Ji19901	199	Ji199	1	1	22	-	-	-	-	1	-
19902	Ji19902	199	Ji199	1	1	22	-	-	-	-	1	-
19903	Ji19903	199	Ji199	1	1	22	-	-	-	-	1	-
19904	Ji19904	199	Ji199	1	1	22	-	-	-	-	1	-
20001	Ji20001	200	Ji200	1	1	22	3	-	2	8	1	7
20101	Ji20101	201	Ji201	1	1	22	7	-	9	3	0	1
20201	Ji20201	202	Ji202	1	1	22	-	-	-	-	0	-
20202	Ji20202	202	Ji202	1	1	22	-	-	-	-	0	-
20301	Ji20301	203	Ji203	1	1	22	3	-	7	8	1	11
20401	Ji20401	204	Ji204	1	1	22	5	2	3	5	0	5
20402	Ji20402	204	Ji204	1	1	22	7	-	9	3	0	2
20501	Ji20501	205	Ji205	1	1	22	7	-	9	2	0	2
20601	Ji20601	206	Ji206	1	1	22	-	-	-	-	1	-
20701	Ji20701	207	Ji207	1	1	22	-	-	-	-	0	-
20801	Ji20801	208	Ji208	1	1	22	2	1	1	7	1	7
20803	Ji20803	208	Ji208	1	1	22	2	1	-	5	1	-
20802	Ji20802	208	Ji208	1	1	22	7	-	-	-	-	7
20804	Ji20804	208	Ji208	1	1	22	7	-	-	5	1	7
20901	Ji20901	209	Ji209	1	1	46	7	-	9	2	0	2
20902	Ji20902	209	Ji209	1	1	46	7	-	9	3	0	2
21001	Ji21001	210	Ji210	1	1	46	3	-	7	8	1	6
21101	Ji21101	211	Ji211	1	1	46	-	-	-	-	-	-
21202	Ji21202	212	Ji212	1	1	46	2	1	1	5	1	5
21203	Ji21203	212	Ji212	1	1	46	2	1	2	6	1	7
21205	Ji21205	212	Ji212	1	1	46	2	1	2	8	1	6

Table B.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
21201	Ji21201	212	Ji212	1	1	46	3	-	2	6	1	-
21204	Ji21204	212	Ji212	1	1	46	7	-	2	8	1	7
21301	Ji21301	213	Ji213	1	1	46	-	-	-	-	1	-
21401	Ji21401	214	Ji214	1	1	46	7	-	9	4	-	9
21501	Ji21501	215	Ji215	1	1	46	7	-	9	2	0	2
21601	Ji21601	216	Ji216	1	1	46	7	-	9	4	1	7
21701	Ji21701	217	Ji217	1	1	46	3	-	1	5	1	5
21702	Ji21702	217	Ji217	1	1	46	7	-	9	1	0	1
21703	Ji21703	217	Ji217	1	1	46	7	-	9	3	0	2
21801	Ji21801	218	Ji218	1	1	46	7	-	9	2	0	2
21901	Ji21901	219	Ji219	1	1	46	4	2	4	5	1	-
22001	Ji22001	220	Ji220	1	1	46	7	-	9	1	0	3
22002	Ji22002	220	Ji220	1	1	46	7	-	9	2	0	2
22101	Ji22101	221	Ji221	1	1	46	3	-	1	8	1	1
22201	Ji22201	222	Ji222	1	1	46	3	-	1	8	1	1
22202	Ji22202	222	Ji222	1	1	46	7	-	9	1	0	1
22203	Ji22203	222	Ji222	1	1	46	-	-	-	-	-	-
22301	Ji22301	223	Ji223	1	1	46	7	-	9	4	0	4
22405	Ji22405	224	Ji224	1	1	46	2	1	1	8	1	4
22401	Ji22401	224	Ji224	1	1	46	3	-	4	8	1	9
22402	Ji22402	224	Ji224	1	1	46	3	-	4	8	1	7
22403	Ji22403	224	Ji224	1	1	46	7	-	2	4	0	-
22404	Ji22404	224	Ji224	1	1	46	-	-	2	4	-	6
22406	Ji22406	224	Ji224	1	1	46	7	-	-	5	-	2
22501	Ji22501	225	Ji225	1	1	45	-	-	-	-	0	-
22601	Ji22601	226	Ji226	1	1	45	-	-	-	-	-	-
22701	Ji22701	227	Ji227	1	1	46	-	-	-	-	0	-
22801	Ji22801	228	Ji228	1	1	45	-	-	-	-	0	-
22901	Ji22901	229	Ji229	1	1	45	4	2	4	5	1	12
23001	Ji23001	230	Ji230	1	1	24	-	-	-	-	-	-
23002	Ji23002	230	Ji230	1	1	24	-	-	-	-	-	-
23003	Ji23003	230	Ji230	1	1	24	-	-	-	-	-	-
23004	Ji23004	230	Ji230	1	1	24	-	-	-	-	-	-
23005	Ji23005	230	Ji230	1	1	24	-	-	-	-	-	-
23006	Ji23006	230	Ji230	1	1	24	-	-	-	-	-	-
23007	Ji23007	230	Ji230	1	1	24	-	-	-	-	-	-
23101	Ji23101	231	Ji231	1	1	24	-	-	-	-	-	-
23102	Ji23102	231	Ji231	1	1	24	-	-	-	-	-	-
23103	Ji23103	231	Ji231	1	1	24	-	-	-	-	-	-

Table B.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	SEXCRI	AGECAT	ASA	AGECRI
23104	Ji23104	231	Ji231	1	1	24	-	-	-	-	-	-
23201	Ji23201	232	Ji232	1	1	24	2	1	2	7	1	6
23301	Ji23301	233	Ji233	1	1	24	-	-	-	-	-	-
23401	Ji23401	234	Ji234	1	1	44	-	-	-	-	0	-
23501	Ji23501	235	Ji235	1	1	45	5	2	4	5	1	7
23601	Ji23601	236	Ji236	1	1	45	2	1	4	6	1	7
23602	Ji23602	236	Ji236	1	1	45	4	2	2	8	1	12
23603	Ji23603	236	Ji236	1	1	45	4	2	3	5	1	7
23604	Ji23604	236	Ji236	1	1	45	7	-	9	2	0	2
23701	Ji23701	237	Ji237	1	1	43	-	-	-	-	0	-
23801	Ji23801	238	Ji238	1	1	24	-	-	-	-	-	-

Appendix C: Dental Modification Per Tooth According to Sex

Table C.1: Tooth 6 Modification—Sex.

Tooth 6 Modification	Sex				Total	*Freq.%*
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	1	*50.0*	1	50.0	2	*22.2*
I:2	1	*100.0*	0	0.0	1	*11.1*
II:2	0	*0.0*	3	100.0	3	*33.3*
II:3	0	*0.0*	1	100.0	1	*11.1*
II:4	1	*100.0*	0	0.0	1	*11.1*
III:6	1	*100.0*	0	0.0	1	*11.1*
Total	4	*44.4*	5	55.6	9	*100.0*

Table C.2: Tooth 7 Modification—Sex.

Tooth 7 Modification	Sex				Total	*Freq.%*
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	1	*50.0*	1	*50.0*	2	*20.0*
I:2	1	*100.0*	0	*0.0*	1	*10.0*
II:2	0	*0.0*	2	*100.0*	2	*20.0*
II:4	1	*50.0*	1	*50.0*	2	*20.0*
III:6	1	*50.0*	1	*50.0*	2	*20.0*
VI:1	0	*0.0*	1	*100.0*	1	*10.0*
Total	4	*40.0*	6	*60.0*	10	*100.0*

Table C.3: Tooth 8 Modification—Sex.

Tooth 8 Modification	Sex				Total	*Freq.%*
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	1	*33.3*	2	*66.7*	3	*30.0*
I:2	2	*100.0*	0	*0.0*	2	*20.0*
II:2	0	*0.0*	1	*100.0*	1	*10.0*
II:4	0	*0.0*	1	*100.0*	1	*10.0*
III:6	1	*50.0*	1	*50.0*	2	*20.0*
VI:1	0	*0.0*	1	*100.0*	1	*10.0*
Total	4	*40.0*	6	*60.0*	10	*100.0*

Table C.4: Tooth 9 Modification—Sex.

Tooth 9 Modification	**Sex**				**Total**	***Freq.%***
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	1	*50.0*	1	*50.0*	2	*28.6*
I:2	1	*33.3*	2	*66.7*	3	*42.9*
II:2	1	*100.0*	0	*0.0*	1	*14.3*
III:6	1	*100.0*	0	*0.0*	1	*14.3*
Total	4	*57.1*	3	*42.9*	7	*100.0*

Table C.5: Tooth 10 Modification—Sex.

Tooth 10 Modification	**Sex**				**Total**	***Freq.%***
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	1	*100.0*	0	*0.0*	1	*11.1*
I:2	1	*50.0*	1	*50.0*	2	*22.2*
II:2	0	*0.0*	2	*100.0*	2	*22.2*
II:4	1	*100.0*	0	*0.0*	1	*11.1*
III:3	0	*0.0*	1	*100.0*	1	*11.1*
III:6	0	*0.0*	1	*100.0*	1	*11.1*
Total	3	*33.3*	6	*66.7*	9	*100.0*

Table C.6: Tooth 11 Modification—Sex.

Tooth 11 Modification	**Sex**				**Total**	***Freq.%***
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	0	*0.0*	1	*100.0*	1	*25.0*
II:2	1	*50.0*	1	*50.0*	2	*50.0*
II:4	1	*100.0*	0	*0.0*	1	*25.0*
Total	2	*50.0*	2	*50.0*	4	*100.0*

Table C.7: Tooth 22 Modification—Sex.

Tooth 22 Modification	**Sex**				**Total**	***Freq.%***
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	0	*0.0*	1	*100.0*	1	*11.1*
II:2	0	*0.0*	2	*100.0*	2	*22.2*
II:4	0	*0.0*	2	*100.0*	2	*22.2*
III:3	1	*100.0*	0	*0.0*	1	*11.1*
III:6	1	*50.0*	1	*50.0*	2	*22.2*
IV:1	1	*100.0*	0	*0.0*	1	*11.1*
Total	3	*33.3*	6	*66.7*	9	*100.0*

Table C.8: Tooth 23 Modification—Sex.

Tooth 23 Modification	**Sex**				**Total**	***Freq.%***
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	2	*100.0*	0	*0.0*	2	*15.4*
I:2	1	*100.0*	0	*0.0*	1	*7.7*
II:6	1	*100.0*	0	*0.0*	1	*7.7*
III:2	0	*0.0*	1	*100.0*	1	*7.7*
III:3	1	*100.0*	0	*0.0*	1	*7.7*
III:6	2	*40.0*	3	*60.0*	5	*38.5*
IV:1	1	*100.0*	0	*0.0*	1	*7.7*
VI:4	0	*0.0*	1	*100.0*	1	*7.7*
Total	8	*61.5*	5	*38.5*	13	*100.0*

Table C.9: Tooth 24 Modification—Sex.

Tooth 24 Modification	**Sex**				**Total**	***Freq.%***
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	2	*100.0*	0	*0.0*	2	*18.2*
II:6	1	*100.0*	0	*0.0*	1	*9.1*
III:2	0	*0.0*	1	*100.0*	1	*9.1*
III:3	1	*100.0*	0	*0.0*	1	*9.1*
III:6	2	*40.0*	3	*60.0*	5	*45.5*
VI:4	0	*0.0*	1	*100.0*	1	*9.1*
Total	6	*54.5*	5	*45.5*	11	*100.0*

Table C.10: Tooth 25 Modification—Sex.

Tooth 25 Modification	**Sex**				**Total**	***Freq.%***
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	4	*100.0*	0	*0.0*	4	*30.8*
II:6	1	*100.0*	0	*0.0*	1	*7.7*
III:2	0	*0.0*	1	*100.0*	1	*7.7*
III:3	1	*100.0*	0	*0.0*	1	*7.7*
III:6	2	*40.0*	3	*60.0*	5	*38.5*
VI:4	0	*0.0*	1	*100.0*	1	*7.7*
Total	8	*61.5*	5	*38.5*	13	*100.0*

Table C.11: Tooth 26 Modification—Sex.

Tooth 26 Modification	**Sex**				**Total**	***Freq.%***
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	1	*50.0*	1	*50.0*	2	*16.7*
II:4	1	*100.0*	0	*0.0*	1	*8.3*
III:2	0	*0.0*	2	*100.0*	2	*16.7*
III:6	3	*50.0*	3	*50.0*	6	*50.0*
IV:1	1	*100.0*	0	*0.0*	1	*8.3*
Total	6	*50.0*	6	*50.0*	12	*100.0*

Table C.12: Tooth 27 Modification—Sex.

Tooth 27 Modification	**Sex**				**Total**	***Freq.%***
	MPM	*Freq.%*	FPF	*Freq.%*		
I:1	0	*0.0*	1	*100.0*	1	*14.3*
II:2	0	*0.0*	1	*100.0*	1	*14.3*
II:4	1	*50.0*	1	*50.0*	2	*28.5*
III:2	0	*0.0*	1	*100.0*	1	*14.3*
III:6	1	*100.0*	0	*0.0*	1	*14.3*
IV:1	1	*100.0*	0	*0.0*	1	*14.3*
Total	3	*42.9*	4	*57.1*	7	*100.0*

Appendix D: Nacascolo Comparative Data

Table D.1: Nacascolo demographic data.

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	AGECAT	ASA
101	Na101	1	Na1	2	0	-	3	-	5	1
201	Na201	2	Na2	2	0	-	6	-	3	0
301	Na301	3	Na3	2	1	-	5	0	4	1
401	Na401	4	Na4	2	0	-	3	-	6	1
501	Na501	5	Na5	2	0	-	1	1	5	1
601	Na601	6	Na6	2	1	-	-	-	-	-
701	Na701	7	Na7	2	0	-	3	-	8	1
1101	Na1101	11	Na11	2	0	-	5	0	6	1
1102	Na1102	11	Na11	2	0	-	-	-	-	-
1103	Na1103	11	Na11	2	0	-	-	-	-	-
1104	Na1104	11	Na11	2	0	-	-	-	-	-
1301	Na1301	13	Na13	2	0	-	6	-	2	0
1302	Na1302	13	Na13	2	0	-	6	-	2	0
1401	Na1401	14	Na14	2	0	-	3	-	5	1
1501	Na1501	15	Na15	2	0	8A/C	-	-	-	-
1601	Na1601	16	Na16	2	0	8E	6	-	3	0
1701	Na1701	17	Na17	2	0	8C/E	5	0	5	1
1901	Na1901	19	Na19	2	0	8B	6	-	2	0
2201	Na2201	22	Na22	2	1	8E	3	-	5	1
2301	Na2301	23	Na23	2	0	8E	3	-	6	1
2501	Na2501	25	Na25	2	0	-	1	1	7	1
2601	Na2601	26	Na26	2	-	8A/E	3	-	6	1
2602	Na2602	26	Na26	2	-	8E	3	-	5	1
2603	Na2603	26	Na26	2	-	8E	6	-	3	0
2801	Na2801	28	Na28	2	0	8E	5	0	6	1
2901	Na2901	29	Na29	2	0	-	6	-	2	0
3001	Na3001	30	Na30	2	0	8B	3	-	8	1
3002	Na3002	30	Na30	2	0	8A/B	6	-	2	0
3003	Na3003	30	Na30	2	0	8A/B	6	-	2	0
3101	Na3101	31	Na31	2	0	8A/B	1	1	7	1
3201	Na3201	32	Na32	2	0	8E	3	-	8	1
3202	Na3202	32	Na32	2	0	8E	6	-	3	0
3301	Na3301	33	Na33	2	0	8D	2	1	8	1
3401	Na3401	34	Na34	2	0	8D	5	0	6	1
3501	Na3501	35	Na35	2	1	8E	6	-	2	0
3601	Na3601	36	Na36	2	1	8E	4	0	4	0
3602	Na3602	36	Na36	2	1	8E	-	-	-	-

Table D.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	AGECAT	ASA
3701	Na3701	37	Na37	2	-	8F	-	-	-	-
3801	Na3801	38	Na38	2	0	8F	6	-	3	0
3901	Na3901	39	Na39	2	1	8F	4	0	8	1
4101	Na4101	41	Na41	2	-	-	6	-	2	0
4301	Na4301	43	Na43	2	1	8F	2	1	7	1
4401	Na4401	44	Na44	2	0	8F	1	1	5	1
4501	Na4501	45	Na45	2	0	-	6	-	2	0
4601	Na4601	46	Na46	2	0	8F	4	0	6	1
4701	Na4701	47	Na47	2	0	-	5	0	8	1
4801	Na4801	48	Na48	2	0	8F	6	-	2	0
4901	Na4901	49	Na49	2	0	8F	6	-	2	0
5001	Na5001	50	Na50	2	0	8F	6	-	4	0
5101	Na5101	51	Na51	2	0	8F	6	-	2	0
5102	Na5102	51	Na51	2	0	8F	6	-	2	0
5301	Na5301	53	Na53	2	0	8H	1	1	7	1
5401	Na5401	54	Na54	2	1	-	1	1	5	1
5501	Na5501	55	Na55	2	0	8F	5	0	7	1
5502	Na5502	55	Na55	2	0	8F	5	0	6	1
5701	Na5701	57	Na57	2	0	8F	5	0	7	1
5702	Na5702	57	Na57	2	0	8F	5	0	8	1
5901	Na5901	59	Na59	2	0	8F	1	1	6	1
6001	Na6001	60	Na60	2	0	8F	5	0	5	1
6101	Na6101	61	Na61	2	1	8G	5	0	6	1
6401	Na6401	64	Na64	2	0	8F	6	-	3	0
6601	Na6601	66	Na66	2	1	8G	1	1	5	1
6701	Na6701	67	Na67	2	-	8F	5	0	5	1
6801	Na6801	68	Na68	2	1	8G	1	1	5	1
6901	Na6901	69	Na69	2	1	8G	1	1	5	1
7001	Na7001	70	Na70	2	0	8G	6	-	3	0
7101	Na7101	71	Na71	2	0	8F	1	1	7	1
7201	Na7201	72	Na72	2	0	8F	6	-	1	0
7301	Na7301	73	Na73	2	0	8F	5	0	6	1
7401	Na7401	74	Na74	2	0	8F	5	0	5	1
7501	Na7501	75	Na75	2	0	8F	6	-	3	0
7601	Na7601	76	Na76	2	0	8F	1	1	6	1
7701	Na7701	77	Na77	2	0	8F	5	0	7	1
7901	Na7901	79	Na79	2	1	8L	6	-	4	0
8001	Na8001	80	Na80	2	0	-	3	-	5	1
8101	Na8101	81	Na81	2	1	8J	2	1	6	1

Table D.1 (cont'd).

IND	IDENT	BUR	BURID	SITE	TIME	OPN	SEX	MF	AGECAT	ASA
8201	Na8201	82	Na82	2	1	8J	1	1	5	1
8301	Na8301	83	Na83	2	0	8J	5	0	6	1
8401	Na8401	84	Na84	2	1	8J	2	1	5	1
8501	Na8501	85	Na85	2	0	8L	1	1	5	1
8601	Na8601	86	Na86	2	0	8J	6	-	1	0
8701	Na8701	87	Na87	2	0	8J	6	-	1	0
8801	Na8801	88	Na88	2	0	8J	6	-	1	0
9001	Na9001	90	Na90	2	0	8J	2	1	6	1
9101	Na9101	91	Na91	2	-	8J	4	0	5	1
9201	Na9201	92	Na92	2	-	8J	4	0	5	1
9301	Na9301	93	Na93	2	0	8J	6	-	1	0
9401	Na9401	94	Na94	2	0	8J	5	0	5	1
9501	Na9501	95	Na95	2	0	8J	6	-	4	0
9601	Na9601	96	Na96	2	0	8J	1	1	6	1
9701	Na9701	97	Na97	2	0	8J	6	-	1	0
9801	Na9801	98	Na98	2	1	8J	6	-	1	0
9901	Na9901	99	Na99	2	-	8J	6	-	2	0
10001	Na10001	100	Na100	2	-	8J	6	-	1	0
10101	Na10101	101	Na101	2	-	8J	6	-	1	0
10201	Na10201	102	Na102	2	0	8J	5	0	5	1
10301	Na10301	103	Na103	2	0	8J	1	1	5	1
10401	Na10401	104	Na104	2	0	8J	2	1	6	1
10501	Na10501	105	Na105	2	0	8J	4	0	6	1
10601	Na10601	106	Na106	2	0	8J	1	1	6	1
10701	Na10701	107	Na107	2	0	8J	6	-	2	0
10801	Na10801	108	Na108	2	0	8K	5	0	6	1
10901	Na10901	109	Na109	2	0	8J	6	-	2	0
11001	Na11001	110	Na110	2	0	8K	1	1	6	1
11101	Na11101	111	Na111	2	1	8K	1	1	5	1
11201	Na11201	112	Na112	2	0	8J	1	1	6	1
11202	Na11202	112	Na112	2	0	8J	6	-	-	0

Table D.2: Nacascolo burial data.

IND	IDENT	PRIM	EXT	SUP	HEAD	CRAN	LEGPOS	ARMPOS	ARMPOSC
101	Na101	1	-	1	1	0	-	-	-
201	Na201	1	0	1	1	0	0	-	-
301	Na301	1	1	1	5	0	1	1	1
401	Na401	1	0	1	-	0	0	0	1
501	Na501	1	0	1	7	0	0	0	1
601	Na601	-	-	-	-	0	-	-	-
701	Na701	1	-	1	1	0	0	0	1
1101	Na1101	1	0	1	-	-	0	0	1
1102	Na1102	-	-	-	-	0	-	-	-
1103	Na1103	-	1	-	-	0	-	-	-
1104	Na1104	-	-	-	3	0	-	-	-
1301	Na1301	1	0	1	8	0	-	-	-
1302	Na1302	1	-	-	-	-	-	-	-
1401	Na1401	1	-	1	2	0	-	-	-
1501	Na1501	-	-	-	-	-	-	-	-
1601	Na1601	1	0	0	3	0	0	-	-
1701	Na1701	1	0	1	-	0	0	0	1
1901	Na1901	1	0	1	-	0	0	-	-
2201	Na2201	-	1	1	3	0	-	-	-
2301	Na2301	-	0	1	1	0	0	0	1
2501	Na2501	1	0	1	1	0	0	0	1
2601	Na2601	1	1	1	3	0	1	-	-
2602	Na2602	-	-	-	-	1	-	-	-
2603	Na2603	-	-	-	-	-	-	-	-
2801	Na2801	1	0	1	2	0	0	0	1
2901	Na2901	1	-	-	-	0	-	-	-
3001	Na3001	1	0	1	5	0	0	0	1
3002	Na3002	-	-	-	-	1	-	-	-
3003	Na3003	-	-	-	-	1	-	-	-
3101	Na3101	1	0	1	1	0	0	0	1
3201	Na3201	1	1	1	4	0	1	-	-
3202	Na3202	-	0	1	-	-	-	-	-
3301	Na3301	1	0	1	7	0	0	0	1
3401	Na3401	1	0	0	5	0	0	-	0
3501	Na3501	1	0	1	3	0	1	-	-
3601	Na3601	1	1	1	3	0	1	1	1
3602	Na3602	-	-	-	-	-	-	-	-
3701	Na3701	-	-	-	-	-	-	-	-
3801	Na3801	1	0	1	3	0	0	0	1

Table D.2 (cont'd).

IND	IDENT	PRIM	EXT	SUP	HEAD	CRAN	LEGPOS	ARMPOS	ARMPOSC
3901	Na3901	1	0	0	-	0	0	0	1
4101	Na4101	-	-	-	-	-	-	-	-
4301	Na4301	1	1	1	3	0	1	-	-
4401	Na4401	1	0	1	7	0	0	0	1
4501	Na4501	1	-	-	-	0	-	-	-
4601	Na4601	1	0	1	1	0	0	0	1
4701	Na4701	1	0	1	5	0	0	-	0
4801	Na4801	-	-	-	-	-	-	-	-
4901	Na4901	-	-	-	-	-	-	-	-
5001	Na5001	1	0	1	-	0	0	0	1
5101	Na5101	1	0	1	-	0	0	-	-
5102	Na5102	-	-	-	-	0	-	-	-
5301	Na5301	1	0	0	3	0	0	0	1
5401	Na5401	1	1	0	-	0	1	-	-
5501	Na5501	1	0	0	1	0	0	0	1
5502	Na5502	-	0	1	5	0	0	0	1
5701	Na5701	1	0	1	5	0	0	0	1
5702	Na5702	0	-	-	-	1	-	-	-
5901	Na5901	1	0	1	1	0	0	0	1
6001	Na6001	0	-	0	-	-	-	-	-
6101	Na6101	1	1	0	3	0	1	-	0
6401	Na6401	1	-	1	2	-	-	0	1
6601	Na6601	1	1	0	7	0	1	0	1
6701	Na6701	1	0	0	5	0	0	0	1
6801	Na6801	1	1	0	5	0	1	-	0
6901	Na6901	1	1	1	7	0	1	-	0
7001	Na7001	1	0	0	5	0	0	-	-
7101	Na7101	1	0	0	-	0	0	1	1
7201	Na7201	-	-	-	1	0	-	-	-
7301	Na7301	1	0	1	6	0	0	-	-
7401	Na7401	1	0	1	4	0	0	-	-
7501	Na7501	1	0	0	4	1	0	0	1
7601	Na7601	1	0	1	3	0	0	-	0
7701	Na7701	1	0	1	1	0	0	0	1
7901	Na7901	1	1	0	-	0	1	1	1
8001	Na8001	-	-	-	-	-	-	-	-
8101	Na8101	-	1	1	1	0	1	1	1
8201	Na8201	-	1	0	5	0	1	1	1
8301	Na8301	1	0	1	-	0	0	-	0

Table D.2 (cont'd).

IND	IDENT	PRIM	EXT	SUP	HEAD	CRAN	LEGPOS	ARMPOS	ARMPOSC
8401	Na8401	1	1	0	7	0	1	1	1
8501	Na8501	1	0	0	5	0	0	-	-
8601	Na8601	-	0	0	3	0	0	-	-
8701	Na8701	-	1	1	5	0	-	-	-
8801	Na8801	1	0	0	6	0	0	-	-
9001	Na9001	1	0	1	-	0	0	0	1
9101	Na9101	1	0	0	1	0	0	0	1
9201	Na9201	-	-	-	-	0	-	-	-
9301	Na9301	1	-	-	8	0	-	-	-
9401	Na9401	1	0	1	1	0	0	0	1
9501	Na9501	1	0	0	5	0	0	0	1
9601	Na9601	1	0	1	1	0	-	0	1
9701	Na9701	1	-	-	7	0	-	-	-
9801	Na9801	-	-	-	-	0	-	-	-
9901	Na9901	-	0	0	-	0	-	-	-
10001	Na10001	1	1	0	-	0	1	-	0
10101	Na10101	1	0	0	-	0	0	-	0
10201	Na10201	1	0	1	1	0	0	0	1
10301	Na10301	1	0	1	-	0	0	-	0
10401	Na10401	1	0	1	1	0	0	0	1
10501	Na10501	1	0	1	1	0	0	0	1
10601	Na10601	1	0	0	1	0	0	0	1
10701	Na10701	-	-	-	-	0	-	-	-
10801	Na10801	1	0	0	1	0	0	0	1
10901	Na10901	0	-	-	-	0	-	-	-
11001	Na11001	1	0	1	-	0	0	-	0
11101	Na11101	1	1	0	5	0	1	-	0
11201	Na11201	1	0	1	3	0	0	0	1
11202	Na11202	-	-	-	-	1	0	0	1

Table D.3: Nacascolo grave goods data.

IND	IDENT	ART	BDS	ARTS	ARTC	ARTH	ARTF	ARTL	BDJa
101	Na101	0	-	-	-	-	0	-	-
201	Na201	1	0	0	1	0	0	0	0
301	Na301	1	1	1	1	0	1	0	0
401	Na401	0	-	-	-	-	0	-	-
501	Na501	1	0	0	1	0	0	0	0
601	Na601	1	0	0	1	0	0	1	0
701	Na701	1	0	0	1	0	0	0	0
1101	Na1101	1	1	0	1	0	-	1	0
1102	Na1102	1	0	0	1	0	1	0	0
1103	Na1103	1	0	0	1	0	0	0	0
1104	Na1104	0	-	-	-	-	0	-	-
1301	Na1301	1	0	1	1	0	0	0	0
1302	Na1302	-	-	-	-	-	0	-	-
1401	Na1401	0	-	-	-	-	0	-	-
1501	Na1501	1	0	1	1	0	-	0	0
1601	Na1601	1	0	0	1	0	0	0	0
1701	Na1701	0	-	-	-	-	0	-	-
1901	Na1901	1	0	0	1	0	0	0	0
2201	Na2201	1	0	0	0	-	0	1	0
2301	Na2301	0	-	-	-	-	0	-	-
2501	Na2501	1	0	0	1	0	0	0	0
2601	Na2601	0	-	-	-	-	0	-	-
2602	Na2602	0	-	-	-	-	-	-	-
2603	Na2603	0	-	-	-	-	-	-	-
2801	Na2801	1	0	0	1	0	0	0	0
2901	Na2901	1	0	0	1	0	-	0	0
3001	Na3001	1	0	0	1	0	0	0	0
3002	Na3002	1	0	0	1	0	0	0	0
3003	Na3003	-	-	-	-	-	0	-	-
3101	Na3101	1	0	1	1	0	1	1	0
3201	Na3201	1	0	0	1	0	0	0	0
3202	Na3202	0	-	-	-	-	-	-	-
3301	Na3301	1	0	0	1	0	0	0	0
3401	Na3401	1	0	0	1	0	0	0	0
3501	Na3501	0	-	-	-	-	0	-	-
3601	Na3601	1	0	0	1	0	0	0	0
3602	Na3602	-	-	-	-	-	-	-	-
3701	Na3701	1	2	0	-	0	-	0	1
3801	Na3801	0	-	-	-	-	0	-	-

Table D.3 (cont'd).

IND	IDENT	ART	BDS	ARTS	ARTC	ARTH	ARTF	ARTL	BDJa
3901	Na3901	1	0	0	1	0	1	0	0
4101	Na4101	-	-	-	-	-	-	-	-
4301	Na4301	0	-	-	-	-	0	-	-
4401	Na4401	1	0	0	1	0	1	0	0
4501	Na4501	1	0	0	1	0	0	0	0
4601	Na4601	1	0	0	1	0	0	0	0
4701	Na4701	1	0	1	1	0	0	0	0
4801	Na4801	1	0	0	1	0	-	0	0
4901	Na4901	1	0	0	1	0	-	0	0
5001	Na5001	1	0	0	1	0	0	0	0
5101	Na5101	1	0	0	1	0	0	0	0
5102	Na5102	-	-	-	-	-	0	-	-
5301	Na5301	1	0	1	1	0	0	1	0
5401	Na5401	1	0	1	0	0	0	0	0
5501	Na5501	1	0	0	1	0	0	-	0
5502	Na5502	-	-	-	-	-	0	-	-
5701	Na5701	1	0	1	1	0	1	1	0
5702	Na5702	0	-	-	-	-	-	-	-
5901	Na5901	1	0	1	1	0	0	0	0
6001	Na6001	1	0	1	1	0	-	0	0
6101	Na6101	0	-	-	-	-	0	-	-
6401	Na6401	0	-	-	-	-	-	-	-
6601	Na6601	0	-	-	-	-	0	-	-
6701	Na6701	1	0	1	0	0	0	0	0
6801	Na6801	1	0	0	0	1	0	0	0
6901	Na6901	1	0	1	0	0	0	1	0
7001	Na7001	1	0	0	1	0	0	0	0
7101	Na7101	1	0	0	1	0	0	1	0
7201	Na7201	1	0	0	1	0	0	0	0
7301	Na7301	1	0	0	1	0	1	0	0
7401	Na7401	1	0	0	1	0	0	0	0
7501	Na7501	1	0	0	1	0	0	0	0
7601	Na7601	1	0	0	1	0	0	0	0
7701	Na7701	1	0	0	1	0	0	0	0
7901	Na7901	0	-	-	-	-	0	-	-
8001	Na8001	0	-	-	-	-	-	-	-
8101	Na8101	1	0	0	1	0	0	0	0
8201	Na8201	1	0	0	0	0	0	1	0
8301	Na8301	0	-	-	-	-	0	-	-

Table D.3 (cont'd).

IND	IDENT	ART	BDS	ARTS	ARTC	ARTH	ARTF	ARTL	BDJa
8401	Na8401	1	0	0	0	0	1	0	0
8501	Na8501	1	0	1	1	0	0	0	0
8601	Na8601	1	0	0	1	0	0	0	0
8701	Na8701	1	0	1	1	0	0	0	0
8801	Na8801	1	0	0	1	0	0	0	0
9001	Na9001	1	0	1	0	0	0	0	0
9101	Na9101	1	0	0	1	0	0	0	0
9201	Na9201	0	-	-	-	-	0	-	-
9301	Na9301	1	0	0	1	0	0	0	0
9401	Na9401	1	0	0	1	0	1	0	0
9501	Na9501	1	0	0	1	0	0	0	0
9601	Na9601	1	0	0	1	0	1	0	0
9701	Na9701	1	0	0	1	0	0	0	0
9801	Na9801	0	-	-	-	-	0	-	-
9901	Na9901	0	-	-	-	-	0	-	-
10001	Na10001	0	-	-	-	-	0	-	-
10101	Na10101	0	-	-	-	-	0	-	-
10201	Na10201	1	0	1	1	0	0	1	0
10301	Na10301	0	-	-	-	-	0	-	-
10401	Na10401	1	0	1	1	0	0	1	0
10501	Na10501	1	0	0	1	0	0	-	0
10601	Na10601	1	0	0	1	0	0	1	0
10701	Na10701	1	1	0	1	0	0	0	0
10801	Na10801	1	1	0	1	0	0	1	1
10901	Na10901	1	0	0	1	0	0	-	0
11001	Na11001	1	0	1	1	0	0	1	0
11101	Na11101	1	0	0	0	0	0	1	0
11201	Na11201	1	0	0	1	0	0	1	0
11202	Na11202	0	-	0	0	-	-	-	-

Table D.4: Data modified from Hardy (1992) for comparative purposes.

Burial	Adjustments to Make Sample Comparable
12	In wall of excavation unit, per Hardy (1992) not included in burial count
13a & 13b	Names changed to Burial 13, Individual 1 (13a) and Individual 2 (13b)
18a & 18b	Isolated crania associated with Burial 30, names changed to Burial 30, Individual 2 (18a) and Individual 3 (18b)
20	Isolated cranium associated with Burial 26, name changed to Burial 26, Individual 2
21	Isolated cranium associated with Burial 26, name changed to Burial 26, Individual 3
26	Name changed to Burial 26, Individual 1
27	In wall of excavation unit, per Hardy (1992) not included in burial count
30	Name changed to Burial 30, Individual 1
40	Per Hardy (1992), redundant number, not included in burial count
42	In wall of excavation unit, per Hardy (1992) not included in burial count
51	Buried with Burial 52, name changed to Burial 51, Individual 1
52	Buried with Burial 51, name changed to Burial 51, Individual 2
55	Buried with Burial 56, name changed to Burial 55, Individual 1
56	Buried with Burial 55, name changed to Burial 55, Individual 2
62	In wall of excavation unit, per Hardy (1992), not included in burial count
63	Per Hardy (1992), redundant number, not included in burial count
65	Per Hardy (1992) the record of this burial is lost
78	Per Hardy (1992) this burial was never excavated and is not included in the burial count
89	Per Hardy (1992), this burial never existed

Appendix E: Tetrachoric Correlations Matrices

Table E.1: Tetrachoric Correlation Matrix. Age Category (Adult/Subadult) with Context (Part 1).

	ASA	PRIM	SUP	EXT	LEGPOS
PRIM	0.416	--			
SUP	0.010	0.047	--		
EXT	0.254	0.019	0.395	--	
LEGPOS	0.416	0.114	0.416	0.931	--
ARMPOSC	-0.094	-0.321	0.089	-0.034	-0.007
HFACC_N	0.225	-0.456	-0.012	0.095	0.247
HFACC_E	0.222	0.182	-0.197	-0.127	-0.285
HFACC_S	-0.080	-0.145	-0.025	-0.202	-0.238
HFACC_W	-0.350	0.348	0.107	0.070	0.074
BDS	0.120	-0.080	0.078	0.496	0.446
ARTS	0.002	0.108	-0.108	0.166	0.138
ARTC	-0.135	0.008	0.324	0.057	0.082
ARTH	0.463	0.083	0.126	0.176	0.225
ARTF	0.424	-0.026	-0.194	-0.033	0.110
ARTL	0.263	-0.105	-0.039	0.241	0.251

Table E.2: Tetrachoric Correlation Matrix. Age Category (Adult/Subadult) with Context (Part 2).

	ARMPOSC	HFACC_N	HFACC_E	HFACC_S	HFACC_W
PRIM					
SUP					
EXT					
LEGPOS					
ARMPOSC	--				
HFACC_N	-0.017	--			
HFACC_E	-0.339	-0.354	--		
HFACC_S	0.038	-0.252	-0.022	--	
HFACC_W	0.241	-0.523	-0.412	-0.324	--
BDS	0.246	-0.034	-0.029	0.002	0.047
ARTS	-0.082	-0.299	0.308	0.006	0.073
ARTC	0.280	0.225	-0.327	-0.175	0.072
ARTH	-0.119	0.375	-0.116	0.121	-0.367
ARTF	0.034	-0.022	0.004	0.123	-0.005
ARTL	0.038	0.196	-0.353	0.464	-0.191

Table E.3: Tetrachoric Correlation Matrix. Age Category (Adult/Subadult) with Context (Part 3).

	BDS	ARTS	ARTC	ARTH	ARTF
PRIM					
SUP					
EXT					
LEGPOS					
ARMPOSC					
HFACC_N					
HFACC_E					
HFACC_S					
HFACC_W					
BDS	--				
ARTS	0.727	--			
ARTC	-0.099	-0.308	--		
ARTH	0.397	0.024	0.359	--	
ARTF	0.220	0.212	-0.500	0.156	--
ARTL	0.114	-0.058	0.117	0.416	0.053

Table E.4: Tetrachoric Correlation Matrix. Sex (Male-Probable Male/Female-Probable Female) with Context (Part 1).

	MF	PRIM	SUP	EXT	LEGPOS
PRIM	-0.315	--			
SUP	-0.139	0.281	--		
EXT	-0.221	0.373	0.170	--	
LEGPOS	-0.067	0.448	0.201	0.886	--
ARMPOSC	0.089	-0.146	0.096	0.008	0.194
HFACC_N	0.239	-0.271	-0.177	0.148	0.250
HFACC_E	-0.301	0.038	-0.034	0.085	-0.055
HFACC_S	-0.130	-0.322	-0.157	-0.265	-0.323
HFACC_W	0.065	0.173	0.183	-0.305	-0.318
BDS	0.035	0.035	0.145	0.429	0.212
ARTS	0.010	0.261	0.086	0.156	-0.003
ARTC	-0.028	0.357	0.315	0.189	0.326
ARTH	0.447	-0.131	0.115	0.010	0.010
ARTF	0.252	-0.234	-0.307	0.257	0.310
ARTL	-0.014	-0.348	-0.047	0.089	-0.036

Table E.5: Tetrachoric Correlation Matrix. Sex (Male-Probable Male/Female-Probable Female) with Context (Part 2).

	ARMPOSC	HFACC_N	HFACC_E	HFACC_S	HFACC_W
PRIM					
SUP					
EXT					
LEGPOS					
ARMPOSC	--				
HFACC_N	0.003	--			
HFACC_E	-0.386	-0.447	--		
HFACC_S	-0.008	-0.242	0.044	--	
HFACC_W	0.298	-0.562	-0.370	-0.144	--
BDS	0.118	-0.303	0.023	0.204	0.216
ARTS	-0.127	-0.629	0.365	0.189	0.282
ARTC	0.302	0.237	-0.417	-0.189	0.040
ARTH	-0.263	0.335	-0.174	0.275	-0.344
ARTF	0.056	-0.097	-0.086	0.120	0.093
ARTL	0.054	0.169	-0.408	0.565	-0.049

Table E.6: Tetrachoric Correlation Matrix. Sex (Male-Probable Male/Female-Probable Female) with Context (Part 3).

	BDS	ARTS	ARTC	ARTH	ARTF
PRIM					
SUP					
EXT					
LEGPOS					
ARMPOSC					
HFACC_N					
HFACC_E					
HFACC_S					
HFACC_W					
BDS	--				
ARTS	0.718	--			
ARTC	-0.103	-0.423	--		
ARTH	0.247	-0.077	0.367	--	
ARTF	0.220	0.122	-0.383	-0.129	--
ARTL	0.218	-0.156	0.334	0.403	0.109

Table E.7: Tetrachoric Correlation Matrix. Age Category/Sex with Context (Part 1).

	MF	AGECAT5	AGECAT6	AGECAT7	PRIM
AGECAT5	-0.524	--			
AGECAT6	0.393	-0.568	--		
AGECAT7	0.109	-0.402	-0.493	--	
PRIM	-0.161	0.037	-0.131	-0.126	--
SUP	-0.332	0.104	-0.346	0.176	0.413
EXT	-0.011	0.169	-0.043	-0.315	0.510
LEGPOS	0.125	0.038	0.134	-0.389	0.637
ARMPOSC	0.200	0.070	-0.032	-0.032	-0.012
HFACC_N	0.220	-0.070	0.035	0.046	-0.154
HFACC_E	-0.267	0.253	-0.367	0.179	-0.078
HFACC_S	-0.151	-0.024	0.199	-0.084	-0.413
HFACC_W	0.039	-0.103	0.179	-0.074	0.049
BDS	0.085	-0.279	0.009	0.299	-0.083
ARTS	-0.022	-0.278	0.143	0.155	0.136
ARTC	0.218	0.071	-0.002	-0.146	0.146
ARTH	0.446	-0.501	-0.068	0.594	-0.177
ARTF	0.246	-0.239	0.295	-0.112	-0.062
ARTL	0.116	-0.251	0.304	-0.045	-0.445

Table E.8: Tetrachoric Correlation Matrix. Age Category/Sex with Context (Part 2).

	SUP	EXT	LEGPOS	ARMPOSC	HFACC_N
AGECAT5					
AGECAT6					
AGECAT7					
PRIM					
SUP	--				
EXT	0.261	--			
LEGPOS	0.350	0.832	--		
ARMPOSC	0.188	0.145	0.301	--	
HFACC_N	-0.084	-0.050	0.144	-0.088	--
HFACC_E	-0.102	-0.005	-0.168	-0.290	-0.440
HFACC_S	-0.160	-0.283	-0.376	0.007	-0.237
HFACC_W	0.097	-0.144	-0.195	0.309	-0.523
BDS	0.047	0.340	0.072	0.172	-0.305
ARTS	0.033	0.051	-0.081	0.099	-0.688
ARTC	0.425	0.355	0.434	0.300	0.510
ARTH	0.136	-0.029	-0.097	-0.192	0.411
ARTF	-0.200	0.119	0.257	0.206	-0.142
ARTL	-0.072	0.013	-0.159	0.013	0.077

Table E.9: Tetrachoric Correlation Matrix. Age Category/Sex with Context (Part 3).

	HFACC_E	HFACC_S	HFACC_W	BDS	ARTS
AGECAT5					
AGECAT6					
AGECAT7					
PRIM					
SUP					
EXT					
LEGPOS					
ARMPOSC					
HFACC_N					
HFACC_E	--				
HFACC_S	0.011	--			
HFACC_W	-0.357	-0.131	--		
BDS	-0.005	0.163	0.254	--	
ARTS	0.197	0.119	0.533	0.717	--
ARTC	-0.539	-0.182	-0.099	-0.143	-0.369
ARTH	-0.194	0.176	-0.375	0.226	-0.161
ARTF	-0.033	0.058	0.096	0.231	0.136
ARTL	-0.410	0.544	0.066	0.197	-0.133

Table E.10: Tetrachoric Correlation Matrix. Age Category/Sex with Context (Part 4).

	ARTC	ARTH	ARTF
AGECAT5			
AGECAT6			
AGECAT7			
PRIM			
SUP			
EXT			
LEGPOS			
ARMPOSC			
HFACC_N			
HFACC_E			
HFACC_S			
HFACC_W			
BDS			
ARTS			
ARTC	--		
ARTH	0.371	--	
ARTF	-0.371	-0.191	--
ARTL	0.276	0.402	0.210

Table E.11: Tetrachoric Correlation Matrix. Burial Data Only (Part 1).

	EXT	SUP	HFACC_N	HFACC_E	HFACC_S
SUP	0.102	--			
HFACC_N	-0.001	-0.106	--		
HFACC_E	0.070	-0.031	-0.358	--	
HFACC_S	-0.154	0.214	-0.288	-0.127	--
HFACC_W	0.024	-0.011	-0.463	-0.387	-0.327
LEGPOS	0.915	0.291	0.048	-0.059	-0.209
ARMPOSC	-0.105	0.093	-0.035	-0.213	-0.052
BDS	0.344	0.160	0.003	0.003	0.071
ARTS	0.236	-0.204	-0.280	0.297	-0.035
ARTC	-0.031	0.444	0.283	-0.257	-0.028
ARTH	0.194	0.169	0.309	0.026	0.042
ARTF	-0.106	-0.238	-0.026	-0.071	0.012
ARTL	0.267	-0.219	0.121	-0.368	0.310

Table E.12: Tetrachoric Correlation Matrix. Burial Data Only (Part 2).

	HFACC_W	LEGPOS	ARMPOSC	BDS	ARTS
SUP					
HFACC_N					
HFACC_E					
HFACC_S					
HFACC_W	--				
LEGPOS	0.122	--			
ARMPOSC	0.213	-0.012	--		
BDS	-0.045	0.316	0.286	--	
ARTS	0.070	0.164	0.001	0.708	--
ARTC	-0.053	0.026	0.316	-0.012	-0.234
ARTH	-0.355	0.195	-0.108	0.473	0.116
ARTF	0.069	0.059	0.029	0.221	0.154
ARTL	-0.063	0.245	0.030	0.166	0.004

Table E.13: Tetrachoric Correlation Matrix. Burial Data Only (Part 3).

	ARTC	ARTH	ARTF
SUP			
HFACC_N			
HFACC_E			
HFACC_S			
HFACC_W			
LEGPOS			
ARMPOSC			
BDS			
ARTS			
ARTC	--		
ARTH	0.356	--	
ARTF	-0.523	0.215	--
ARTL	0.002	0.398	0.086

Appendix F: Operation 24 Concentration Tables

Table F.1: Operation 24—Sex within and outside of concentration.

Operation 24	Sex				Total	*Freq.%*
	MPM	*Freq.%*	FPF	*Freq.%*		
Concentration	5	*41.7*	7	*58.3*	12	*31.6*
Outside Concentration	13	*50.0*	13	*50.0*	26	*68.4*
Total	18	*47.4*	20	*52.6*	38	*100.0*

Fisher's Exact, p=0.734

Table F.2: Operation 24—Age-at-Death within and outside of concentration.

Operation 24	Age Category				Total	*Freq.%*
	Subadult	*Freq.%*	Adult	*Freq.%*		
Concentration	6	*33.3*	12	*66.7*	18	*20.5*
Outside Concentration	41	*58.6*	29	*41.4*	70	*79.5*
Total	47	*53.4*	41	*46.6*	88	*100.0*

Fisher's Exact, p=0.067

Table F.3: Operation 24—Burial Disposition within and outside of concentration.

Operation 24	Burial Disposition				Total	*Freq.%*
	Extended	*Freq.%*	Other	*Freq.%*		
Concentration	10	*83.3*	2	*16.7*	12	*19.4*
Outside Concentration	38	*76.0*	12	*24.0*	50	*80.6*
Total	48	*77.4*	14	*22.6*	62	*100.0*

Fisher's Exact, p=0.717

Table F.4: Operation 24—Burial Position within and outside of concentration.

Operation 24	Burial Position				Total	*Freq.%*
	Supine	*Freq.%*	Prone	*Freq.%*		
Concentration	9	*90.0*	1	*10.0*	10	*19.6*
Outside Concentration	38	*92.7*	3	*7.3*	41	*80.4*
Total	47	*92.2*	4	*7.8*	51	*100.0*

Fisher's Exact, p=1.000

Table F.5: Operation 24—Arm Position within and outside of concentration.

Operation 24	Arm Position				Total	*Freq.%*
	Similar	*Freq.%*	Different	*Freq.%*		
Concentration	8	*88.9*	1	*11.1*	9	*22.5*
Outside Concentration	22	*71.0*	9	*29.0*	31	*77.5*
Total	30	*75.0*	10	*25.0*	40	*100.0*

Fisher's Exact, p=0.404

Table F.6: Operation 24—Head Orientation within and outside of concentration.

Head Orientation	**Operation 24**				**Total**	***Freq.%***
	Concentration	*Freq.%*	Outside Concentration	*Freq.%*		
N	0	*0.0*	11	*100.0*	11	*22.0*
NE	0	*0.0*	3	*100.0*	3	*6.0*
E	1	*14.3*	6	*85.7*	7	*14.0*
SE	1	*100.0*	0	*0.0*	1	*2.0*
S	0	*0.0*	3	*100.0*	3	*6.0*
SW	0	*0.0*	1	*100.0*	1	*2.0*
W	7	*58.3*	5	*41.7*	12	*24.0*
NW	1	*8.3*	11	*91.7*	12	*24.0*
Total	10	*20.0*	40	*80.0*	50	*100.0*

No statistical analysis conducted for this table.

Table F.7: Operation 24—Beads within and outside of concentration.

Operation 24	**Beads**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Concentration	9	*81.8*	2	*18.2*	11	*22.4*
Outside Concentration	15	*39.5*	23	*60.5*	38	*77.6*
Total	24	*49.0*	25	*51.0*	49	*100.0*

Fisher's Exact, p=0.018

Table F.8: Operation 24—Shell artifacts within and outside of concentration.

Operation 24	**Shell Artifacts**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Concentration	11	*100.0*	0	*0.0*	11	*22.4*
Outside Concentration	13	*34.2*	25	*65.8*	38	*77.6*
Total	24	*49.0*	25	*51.0*	49	*100.0*

Fisher's Exact p=0.000

Table F.9: Operation 24—Ceramics within and outside of concentration.

Operation 24	**Ceramics**				**Total**	**Freq.%**
	Present	Freq.%	Absent	Freq.%		
Concentration	8	*72.7*	3	*27.3*	11	*22.4*
Outside Concentration	29	*76.3*	9	*23.7*	38	*77.6*
Total	37	*100.0*	12	*100.0*	49	*100.0*

Fisher's Exact p=1.000

Table F.10: Operation 24—Human Remains within and outside of concentration.

Operation 24	Human Remains				Total	*Freq.%*
	Present	Freq.%	Absent	Freq.%		
Concentration	0	*0.0*	11	*100.0*	11	*22.4*
Outside Concentration	3	*7.9*	35	*92.1*	38	*77.6*
Total	3	*100.0*	46	*100.0*	49	*100.0*

Fisher's Exact p=1.000

Table F.11: Operation 24—Faunal artifacts within and outside of concentration.

Operation 24	Faunal				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Concentration	6	*54.5*	5	*45.5*	11	*22.4*
Outside Concentration	18	*47.4*	20	*52.6*	38	*77.6*
Total	24	*49.0*	25	*51.0*	49	*100.0*

Fisher's Exact, p=0.742

Table F.12: Operation 24—Lithics within and outside of concentration.

Operation 24	Lithics				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Concentration	1	*9.1*	10	*90.9*	11	*22.4*
Outside Concentration	3	*7.9*	35	*92.1*	38	*77.6*
Total	4	*8.2*	45	*91.8*	49	*100.0*

Fisher's Exact p=1.000

Appendix G: Chi square and Fisher's Exact Tests: Nacascolo

Table G.1: Burial Disposition—Sex, Sapoa Period.

Sex	Burial Disposition				Total	*Freq.%*
	Extended	*Freq.%*	Other	*Freq.%*		
MPM	9	*100.0*	0	*0.0*	9	*69.2*
FPF	3	*75.0*	1	*25.0*	4	*30.8*
Total	12	*92.3*	1	*7.7*	13	*100.0*

Fisher's Exact, p=0.308

Table G.2: Burial Disposition—Sex, Pre-Sapoa Period.

Sex	Burial Disposition				Total	*Freq.%*
	Extended	*Freq.%*	Other	*Freq.%*		
MPM	0	*0.0*	17	*100.0*	17	*50.0*
FPF	0	*0.0*	17	*100.0*	17	*50.0*
Total	0	*0.0*	34	*100.0*	34	*100.0*

No statistical test could be completed for these variables.

Table G.3: Grave Goods—Sex, Sapoa Period.

Sex	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	7	*77.8*	2	*22.2*	9	*69.2*
FPF	3	*75.0*	1	*25.0*	4	*30.8*
Total	10	*76.9*	3	*23.1*	13	*100.0*

Fisher's Exact, p=1.000

Table G.4: Grave Goods—Sex, Pre-Sapoa Period.

Sex	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	16	*94.1*	*1*	*5.9*	17	*48.6*
FPF	15	*83.3*	*3*	*16.7*	18	*51.4*
Total	31	*88.6*	*4*	*11.4*	35	*100.0*

Fisher's Exact, p=0.603

Table G.5: Beads—Sex, Sapoa Period.

Sex	Beads				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	0	*0.0*	*7*	*100.0*	7	*70.0*
FPF	1	*33.3*	*2*	*66.7*	3	*30.0*
Total	1	*10.0*	*9*	*90.0*	10	*100.0*

Fisher's Exact, p=0.300

Table G.6: Beads—Sex, Pre-Sapoa Period.

Sex	Beads				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	0	*0.0*	*16*	*100.0*	16	*51.6*
FPF	2	*13.3*	*13*	*86.7*	15	*48.4*
Total	2	*6.5*	*29*	*93.5*	31	*100.0*

Fisher's Exact, p=0.226

Table G.7: Shell—Sex, Sapoa Period.

Sex	Shell				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	2	*28.6*	*5*	*71.4*	7	*70.0*
FPF	1	*33.3*	*2*	*66.7*	3	*30.0*
Total	3	*30.0*	*7*	*70.0*	10	*100.0*

Fisher's Exact, p=1.000

Table G.8: Shell—Sex, Pre-Sapoa Period.

Sex	Shell				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	7	*43.8*	*9*	*56.3*	16	*51.6*
FPF	4	*26.7*	*11*	*73.3*	15	*48.4*
Total	11	*35.5*	*20*	*64.5*	31	*100.0*

Fisher's Exact, p=0.458

Table G.9: Ceramics—Sex, Sapoa Period.

Sex	Ceramics				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	1	*14.3*	*6*	*85.7*	7	*70.0*
FPF	3	*100.0*	*0*	*0.0*	3	*30.0*
Total	4	*40.0*	*6*	*60.0*	10	*100.0*

Fisher's Exact, p=0.033

Table G.10: Ceramics—Sex, Pre-Sapoa Period.

Sex	Ceramics				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	15	*93.8*	*1*	*6.3*	16	*51.6*
FPF	15	*100.0*	*0*	*0.0*	15	*48.4*
Total	30	*96.8*	*1*	*3.2*	31	*100.0*

Fisher's Exact, p=1.000

Table G.11: Human Remains—Sex, Sapoa Period.

Sex	Human Remains				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	1	*14.3*	6	*85.7*	7	*70.0*
FPF	0	*0.0*	3	*100.0*	3	*30.0*
Total	1	*10.0*	9	*90.0*	10	*100.0*

Fisher's Exact, p=1.000

Table G.12: Human Remains—Sex, Pre-Sapoa Period.

Sex	Human Remains				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	0	*0.0*	16	*100.0*	16	*51.6*
FPF	0	*0.0*	15	*100.0*	15	*48.4*
Total	0	*0.0*	31	*100.0*	31	*100.0*

No statistical test could be completed for these variables.

Table G.13: Faunal—Sex, Sapoa Period.

Sex	Faunal				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	1	*11.1*	8	*89.9*	9	*69.2*
FPF	2	*50.0*	2	*50.0*	4	*30.8*
Total	3	*23.1*	10	*76.9*	13	*100.0*

Fisher's Exact, p=0.203

Table G.14: Faunal—Sex, Pre-Sapoa Period.

Sex	Faunal				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	3	*1.6*	14	*82.4*	17	*51.5*
FPF	3	*18.8*	13	*81.3*	16	*48.5*
Total	6	*18.2*	27	*81.8*	33	*100.0*

Fisher's Exact, p=1.000

Table G.15: Lithics—Sex, Sapoa Period.

Sex	Lithics				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	3	*42.9*	4	*57.1*	7	*70.0*
FPF	0	*0.0*	3	*100.0*	3	*30.0*
Total	3	*30.0*	7	*70.0*	10	*100.0*

Fisher's Exact, p=0.475

Table G.16: Lithics—Sex, Pre-Sapoa Period.

Sex	Lithics				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
MPM	7	*43.8*	*9*	*56.3*	16	*55.2*
FPF	4	*30.8*	*9*	*69.2*	13	*44.8*
Total	11	*37.9*	*18*	*62.1*	29	*100.0*

Table G.17: Burial Disposition—Age-at-Death, Sapoa Period.

Age Category	Burial Disposition				Total	*Freq.%*
	Extended	*Freq.%*	*Other*	*Freq.%*		
Subadults	12	*92.3*	*1*	*7.7*	13	*81.3*
Adults	2	*66.7*	*1*	*33.3*	3	*18.8*
Total	14	*87.5*	*2*	*12.5*	16	*100.0*

Table G.18: Burial Disposition—Age-at-Death, Pre-Sapoa Period.

Age Category	Burial Disposition				Total	*Freq.%*
	Extended	*Freq.%*	*Other*	*Freq.%*		
Subadults	1	*2.6*	*37*	*97.4*	38	*73.1*
Adults	1	*7.1*	*13*	*92.9*	14	*26.9*
Total	2	*3.8*	*50*	*96.2*	52	*100.0*

Fisher's Exact, p=0.470

Table G.19: Grave Goods—Age-at-Death, Sapoa Period.

Age Category	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	10	*76.9*	*3*	*23.1*	13	*76.5*
Adults	1	*25.0*	*3*	*75.0*	4	*23.5*
Total	11	*64.7*	*6*	*35.3*	17	*100.0*

Table G.20: Grave Goods—Age-at-Death, Pre-Sapoa Period.

Age Category	Grave Goods				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	34	*79.1*	*9*	*20.9*	43	*62.3*
Adults	23	*88.5*	*3*	*11.5*	26	*37.7*
Total	57	*82.6*	*12*	*17.4*	69	*100.0*

Fisher's Exact, p=0.514

Table G.21: Beads—Age-at-Death, Sapoa Period.

Age Category	Beads				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	1	*10.0*	*9*	*90.0*	10	*90.9*
Adults	0	*0.0*	*1*	*100.0*	1	*9.1*
Total	1	*9.1*	*10*	*90.9*	11	*100.0*

Fisher's Exact, p=1.000

Table G.22: Beads—Age-at-Death, Pre-Sapoa Period.

Age Category	Beads				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	2	*5.9*	*32*	*94.1*	34	*59.6*
Adults	1	*4.3*	*22*	*95.7*	23	*40.4*
Total	3	*5.3*	*54*	*94.7*	57	*100.0*

Fisher's Exact, p=1.000

Table G.23: Shell—Age-at-Death, Sapoa Period.

Age Category	Shell				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	3	*30.0*	*7*	*70.0*	10	*90.9*
Adults	0	*0.0*	*1*	*100.0*	1	*9.1*
Total	3	*27.3*	*8*	*72.7*	11	*100.0*

Fisher's Exact, p=1.000

Table G.24: Shell—Age-at-Death, Pre-Sapoa Period.

Age Category	Shell				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	11	*32.4*	*23*	*67.6*	34	*59.6*
Adults	2	*8.7*	*21*	*91.3*	23	*40.4*
Total	13	*22.8*	*44*	*77.2*	57	*100.0*

Fisher's Exact, p=0.054

Table G.25: Ceramics—Age-at-Death, Sapoa Period.

Age Category	Ceramics				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	3	*30.0*	*7*	*70.0*	10	*90.9*
Adults	1	*100.0*	*0*	*0.0*	1	*9.1*
Total	4	*36.4*	*7*	*63.6*	11	*100.0*

Fisher's Exact, p=0.364

Table G.26: Ceramics—Age-at-Death, Pre-Sapoa Period.

Age Category	Ceramics				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	33	*97.1*	*1*	*2.9*	34	*59.6*
Adults	23	*100.0*	*0*	*0.0*	23	*40.4*
Total	56	*98.2*	*1*	*1.8*	57	*100.0*

Fisher's Exact, p=1.000

Table G.27: Human Remains—Age-at-Death, Sapoa Period.

Age Category	Human Remains				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	1	*11.1*	*8*	*89.9*	9	*90.0*
Adults	0	*0.0*	*1*	*100.0*	1	*10.0*
Total	1	*10.0*	*9*	*90.0*	10	*100.0*

Fisher's Exact, p=1.000

Table G.28: Human Remains—Age-at-Death, Pre-Sapoa Period.

Age Category	Human Remains				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	0	*0.0*	*23*	*100.0*	23	*40.4*
Adults	0	*0.0*	*34*	*100.0*	34	*59.6*
Total	0	*0.0*	*57*	*100.0*	57	*100.0*

No statistical test could be completed for these variables.

Table G.29: Faunal—Age-at-Death, Sapoa Period.

Age Category	Faunal				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	3	*23.1*	*10*	*76.9*	13	*76.5*
Adults	0	*0.0*	*4*	*100.0*	4	*23.5*
Total	3	*17.6*	*14*	*82.4*	17	*100.0*

Fisher's Exact, p=0.541

Table G.30: Faunal—Age-at-Death, Pre-Sapoa Period.

Age Category	Faunal				Total	*Freq.%*
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	6	*15.0*	*34*	*85.0*	40	*63.5*
Adults	0	*0.0*	*23*	*100.0*	23	*36.5*
Total	6	*9.5*	*57*	*90.5*	63	*100.0*

Fisher's Exact, p=0.078

Table G.31: Lithics—Age-at-Death, Sapoa Period.

Age Category	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	4	*40.0*	*6*	*60.0*	10	*90.9*
Adults	0	*0.0*	*1*	*100.0*	1	*9.1*
Total	4	*36.4*	*7*	*63.6*	11	*100.0*

Fisher's Exact, p=1.000

Table G.32: Lithics—Age-at-Death, Pre-Sapoa Period.

Age Category	**Lithics**				**Total**	***Freq.%***
	Present	*Freq.%*	Absent	*Freq.%*		
Subadults	11	*34.4*	*21*	*65.6*	32	*59.3*
Adults	0	*0.0*	*22*	*100.0*	22	*40.7*
Total	11	*20.4*	*43*	*79.6*	54	*100.0*

Fisher's Exact, p=0.002

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