

Analysis of Human Remains from Guana Island, BVI

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Section I Introduction

On July 7, 2004, archaeologists from the Bermuda Maritime Museum and the College of William and Mary arrived on Guana Island in the BVI as part of the ongoing investigation of the island's archaeological and architectural heritage sponsored by the island's owners, Dr. Henry and Gloria Jarecki. Upon their arrival, the archaeologists were informed of the discovery of human remains on the island and subsequent recovery efforts by the Road Town Police.

In the days that followed, archaeologists Mark Kostro and Dr. Marley Brown contacted the Institute for Historical Biology (IHB) at the College of William and Mary in order to notify the staff of the human remains' discovery. Police Commissioner Barry Webb granted their request for custody of the remains for assessment and analysis pending a preliminary inventory to be carried out at the Road Town Police Station. Mark Kostro and Melissa Eaton, Anthropology graduate students from the College of William and Mary, carried out the requested preliminary inventory on July 30, 2004 with materials provided by the Institute for Historical Biology. Dr. Marley R. Brown III, research professor at William and Mary, provided additional assistance with the inventory. The inventory was carried out in the presence of a representative of the Royal British Virgin Islands Police Service, Constable Forbes Washington.

Dr. Michael Blakey, Dr. Marley Brown and Dr. Henry Jarecki (Guana Island Hotel Corporation) arranged for a complete inventory, assessment and analysis of the remains to be conducted by the IHB on the College of William and Mary campus. The remains were shipped via FedEx and arrived at the IHB on 24 November, 2004. The laboratory portion of the project began on 17 May 2005 and was completed on 1 August 2005. The results of the laboratory work as well as subsequent interpretations are included in this report. Dr. Michael Blakey supervised the project in its entirety; Autumn Barrett, Mark Kostro, Fred Lumb and Shannon Mahoney conducted the inventory, assessment and analysis of the remains. The project report was completed by Michael Blakey, Autumn Barrett, Mark Kostro and Shannon Mahoney.

The Institute for Historical Biology would like to thank Dr. Henry Jarecki for the opportunity to examine these remains. We would also like to acknowledge Dr. Marley Brown, Dr. Edward Harris and Mark Kostro for their role in the proper care of these burials.

Section II Historical Background

The British Virgin Islands

The human occupation of the Virgin Islands began some 2000 years before present, long before the arrival of Europeans into the Western Hemisphere. The first people to inhabit the small cluster of islands today known collectively as the 'Virgin Islands group' arrived via a series of migrations from the Orinico River Basin in Venezuela. Archaeological evidence from both the U.S. and British Virgin Islands suggest a succession of occupations of the islands by Amerindians, the latest terminating within a century of the arrival of Christopher Columbus in 1493 (Bates 2001, Righter 2003).

Columbus' ships passed by the islands on his second voyage to the West Indies, naming the group of them "Las Virgines," in reference to the legend of St. Ursula and her 11,000 martyred virgins. In the ensuing years, the Spanish made little effort to settle the islands, establishing only a copper mine on Virgin Gorda in the early seventeenth century. The islands emerged as a favorite hideaway for pirates waiting to attack Spanish galleons carrying looted treasure back to Spain in the sixteenth and seventeenth centuries according to local tradition (Lewisohn 1966:5-9).

As Spain declined as a colonial power in the seventeenth century, Dutch interests in the Caribbean expanded significantly with the founding of the Dutch West India Company in 1621. In 1648 Dutch merchants established the first permanent European settlement in the Virgin Islands on the island of Tortola. By 1672 the English had gained control of Tortola from the Dutch, and in 1680 had also gained control of the nearby islands of Anegada and Virgin Gorda. In 1672 the Danes also moved into the Virgin Islands and established a settlement on the previously uncolonized island of St. Thomas (Lewisohn 1966:9-12).

In the 1690s, the British Virgins took on their first form of organized colonial government. Over the next twenty-five years, a steady influx of planters from England, North America and other islands in the West Indies came into the British Virgins gradually transforming its economic base from smuggling to agriculture, resulting in a plantation economy largely dependent upon enslaved labor to produce cotton, sugar cane, ginger and indigo. Historian Issac Dookhan suggests that a large number of these planters may have come from within the Caribbean. In his documentary history of the British Virgin Islands Dookhan notes, "the population included those who 'had fled from Barbados and the greater islands (of the Leeward Islands) for debt, or to avoid the punishment of their crimes, and have since been increased by pirates, who have come in upon acts of Grace, and are married and settled there'(1975:24). Additional archival research aimed at more specifically pin-pointing where these planters immigrated from before settling in the British Virgins is currently underway.

As more and more planters moved in, they brought with them enslaved Africans and Afro-Caribbeans to work in the fields, factories, and as domestic servants. Additional enslaved persons were purchased from the Danes in St. Thomas where they were less expensive to purchase than in the British colonies. When sugar production became the main export of the islands in the eighteenth century, the demand for laborers led planters to import captives directly from Africa. The first census of the islands was taken in 1717, and indicates there were 159 whites and 175 blacks on Tortola, and 317 whites and 308 blacks on Virgin Gorda. Three years later, the census indicates 1122 whites and 1509 blacks for the whole of the British Virgins (Dookhan 1975:71; Lewisohn 1966:12-13).

According to a report to the Board of Trade & Plantations, the agricultural output of the islands in 1740 included "sugar, molasses, rum, cotton, lime juice, ginger, indigo, coffee, aloe, pimentos, turtle shell, mahogany, timber and plank was to the value of 30,000 pounds sterling (Lewisohn 1966:16)." By 1743 over one million pounds of cotton were being exported from the colony, along with a thousand hogsheads of brown *muscovado* sugar that was being sent to England. Molasses and rum, co-products of the sugar manufacturing process, were produced for local consumption and for shipment to the North American colonies (Lewisohn 1966:15).

In the last quarter of the eighteenth century, the plantation economy of the Virgin Islands declined as it did throughout much of the Caribbean. Waning profits, hurricane damage, and increasing organized resistance to slavery by the enslaved people themselves, all contributed to collapse of the region's economy. By the turn of the century, planters in the Virgin Islands were abandoning their plantations and retreating to England or North America. The slave trade in the British West Indies was ultimately halted in 1807, and emancipation took place in 1834. At the time of emancipation, there were over 9,000 persons of African descent living in the British Virgin Islands (Lewisohn 1966).

Guana Island

The first planters are believed to have settled on Guana Island in the 1720s or 30s.¹ European derived artifacts collected from various locations across the island consistently indicate the island's plantation-period occupation began in the second quarter of the 18th century. These settlers quickly went about altering the island's landscape for sugar cultivation and processing. On Guana, as throughout the Caribbean, enslaved Africans and Afro-Caribbeans cleared the fields and built the factories in which these same individuals would later toil, often suffering significant personal injuries as a result. Numerous contemporary accounts detail the difficult and dangerous work carried out on sugar estates. In addition to the cumulative degenerative effects of heavy labor in the tropics, it was not uncommon for field hands to suffer deep cuts from errant machete swipes; for mill workers to have their

¹ Recent archaeological finds indicate that prior to European colonization, Guana had been occupied by Amerindians sometime between 600-1200 AD.

hands crushed in milling machinery; or for boiling house workers to receive burns from stoking the boiling house furnaces and from working around the scalding-hot sugarcane juice, among other injuries.

The evaluation of the physical evidence relating to Guana's plantation operations has been the focus of recent archaeological investigations. The above-ground remains of Guana's eighteenth-century factory complex, including the animal-powered crushing mill, sugar boiling house, curing house, and rum distillery have all survived to the present day. Also surviving are the foundations of a plantation great house overlooking the island's small agricultural plain. The ruins of a second great house had also survived into the early twentieth century, but are currently inaccessible under the modern-day resort facilities (Barka et al. 1999). Recently, the ruins of building and houseyard for the quartering of enslaved Africans and Afro-Caribbeans during the eighteenth-century plantation period has also been identified (Kostro et al. 2005).

As is the case for eighteenth century sites throughout the Caribbean, the documentary evidence of Guana's plantation-period occupation is minimal. Local tradition suggests that Guana was divided between two Quaker families in the eighteenth century, the Parkes and the Lakes. Quaker missionaries founded a settlement at Fat Hog Bay on Tortola in 1727, roughly coinciding with the archaeological evidence for the establishment of Guana's plantation operations. Indeed, both the Parke and Lake family names are attributed to Guana in the surviving records of the Tortola Society of Friends, as well as, in the correspondence of Quakers from both North America and England (Jenkins 1923). From the Quaker records we know that the Parke household consisted partly of James Parke and his wife, Bytha (possibly Tabitha). They had two children while living on Guana. John, born in 1741, died less than a year later. Their second child was a daughter, Dorcas. By 1754 James Parke was known as the "widower of Guanah Island", and was remarried to Mary Vanterpool (Jenkins 1923:75). The *Minutes of the Men's Monthly Meeting* also indicate that James Parke was appointed Treasurer of the Tortola Meeting in 1743, but resigned in 1749 (Jenkins 1923:31,78). Several different Lakes are mentioned in the records, but it has not yet been determined if they are all related, and if so, if they all lived on Guana. Among them are: Jonas and Elizabeth Lake and their two daughters, Ann and Miriam; Sarah Lake who married Thomas Humphreys; John Lake; James Lake; and William Lake (Jenkins 1923:31,75,77-78). The local Quaker community, however, was fairly short-lived, lasting for no more than 45 years. The Monthly Meeting of the Society of Friends on Tortola was officially ended in 1762. Very little else is known about either the Lake or Parke families, including how long they remained on Guana.

While the documentary record of Guana's planter families is sparse at best, records relating to the enslaved people living and working on the island are virtually non-existent. Among the few possible mentions of enslaved persons on Guana includes a reference in the *Minutes of the Men's Monthly Meeting* where James Lake, one of the planters on Guana, complained that his mother-in-law had kept from him "two negroes" (Jenkins 1923:31). For the late eighteenth century, nothing is known

about Guana's enslaved people. The next reference to any persons on Guana is not until 1811 when seventeen enslaved persons were emancipated and allotted 300-acres on the island. It is not clear, however, if these people were residents of Guana Island at the time of their emancipation (McGlynn 1980:55).

The preliminary archaeological evidence suggests that the island was not inhabited past the first quarter of the nineteenth century (Kostro *et al.* 2005). The only other reference to Guana before the twentieth century is a mention to the use of the island for cattle grazing in the 1860s by members of the Long Look community on Tortola (McGlynn 1980:91, 180).

In 1935 Guana Island was purchased by the Bigelow family of Massachusetts from the Frett and Shirley families of Road Town with the idea of running the island as a commune. It subsequently took on the nature of a hotel. In 1975 the island was sold to the Jarecki family of New York, who has run a small hotel and resort on the island. Since the Jarecki's purchase, the island has also served as a nature reserve and wildlife sanctuary, boasting more flora and fauna than any island of its size in the Caribbean.

Section III

Environmental and Archaeological Background

Surrounding Environment

Located across a narrow channel from the east end of the island of Tortola, Guana Island measures no more than 850-acres in total area. The geography of the island consists of two small peaks separated by a narrow level plain known locally as the "flats." The flats are bounded by the steep slopes of the island's two peaks to the northwest and southeast, by a salt pond to the northeast, and shallow bay to the southwest facing toward the island of Tortola. During the island's plantation period in the eighteenth century, the flats and the slopes of the surrounding hillsides were reportedly planted with sugar cane.



Figure 3.1: Map of the Virgin Islands.



Figure 3.2: Aerial photo of Guana Island.

The burying ground on Guana Island is located to the southeast of the present-day Beach House at White Bay Beach. The burying ground is located on the landward side (southeast) a line of low sand dunes that parallel the coastline of the bay. The dunes are covered with scrub vegetation that prevents their erosion. At the time of these investigations in July 2004, a beach-side massage stand was under construction among the sand dunes immediately adjacent to the burying ground's location. A dirt road oriented parallel to the coastline crosses over the burying ground at its northeastern extent. During the archaeological investigations of the site, at least one burial was noted to extend under the roadbed. The areas to the northwest and southeast are covered in grass.



Figure 3.3: Site before excavation.

The average high-water line along the beach is more or less 40-meters to the southwest of the burying ground, and it is located at an elevation within two-meters of sea level. The soil in this area consists primarily of white beach sand covered with a thin organic layer. According to the hotel staff, this area of the flats is particularly vulnerable to flooding during hurricanes and other heavy storms.

Other notable landscape features include the recently identified ruins of a quarter for housing enslaved Africans and Afro-Caribbeans. The quarter and the burying ground are hypothesized to be contemporary with one another. The building is located approximately 70-meters to the southeast of the burying ground, and is similarly positioned between the sand dunes and the dirt road that parallel the beach at White Bay.

Archaeological Site Context

In late June 2004, routine excavations for new electricity and water lines to the southeast of the present-day Beach House at White Beach inadvertently encountered the human skeletal remains. Upon their discovery, the Royal British Virgin Islands Police Service was called in to investigate the scene. Officers from the police carried out forensic excavations aimed at recovering additional remains and other evidence that would be useful in determining whether or not the remains were related to criminal activity. As a result of their efforts, the fragmentary skeletal remains of two individuals were recovered and taken for analysis to the Road Town Police Station on Tortola. A preliminary examination of the skeletal remains at the Police Station determined that the remains were most likely not related to any recent criminal activity, and were hypothesized to be the archaeological remains of past inhabitants of Guana Island.

In July 2004, a brief archaeological investigation of the burial site was carried out in the hopes of finding additional evidence that would be useful towards determining the relative antiquity and cultural affiliation of the two exhumed burials (Kostro 2004). Initially the investigation consisted of re-examining the burial site already examined by the police. These efforts involved passing of the sand excavated by the police through standard $\frac{1}{4}$ -inch hardware mesh archaeological screens in an attempt to recover any small bones or other objects, such as grave goods or coffin hardware that may have been missed during the police department's recovery efforts. Screening of the excavated soils resulted in the recovery of numerous small fragments of bone and a small number of artifacts. Most of the bone fragments recovered were very fragile facial bones that make up the anterior portion of the skull. In addition, individual teeth were recovered; several small finger and toe bones were found, as well as a single patella (kneecap). Non-skeletal material recovered included numerous heavily corroded iron nails and nail fragments, many of which had small fragments of wood still attached to them. The recovery of the nails in association with the burials indicates that the individuals were probably buried in wooden coffins. The fact that these individuals were likely interred in coffins is a further indicator that the burials are of historic rather than prehistoric age. The type of nails is another important clue to the age of the burials. All the nails recovered were hand wrought nails made by a blacksmith, and were most commonly in use during the seventeenth and eighteenth centuries. In addition, three bone buttons, a lead musket ball, and a cowrie shell (*Cypraea cinerea*), an indigenous species of cowrie sometimes used for adornment or for ritual purposes by the enslaved Africans in the Caribbean, were recovered. The nails, buttons, and musket ball are all artifacts typically recovered on archaeological sites dating to the eighteenth century.



Figure 3.4: Burial Ground excavation.

The recovery of the musket ball in association within the burial ground suggests the possibility that the cause of death for one of the individuals buried on Guana was from a gun shot wound. The musket ball is asymmetrical, measuring 50 to 54mm in diameter, a caliber that is consistent with ammunition used in eighteenth-century pistols (William Pittman, personal communication). However, because it was recovered from a disturbed context, and not in direct association with a specific burial, prohibits the attribution of a gun shot to a specific individual as a cause of death.

Subsequent to the initial site investigation, additional controlled excavations of the burial site were carried out to delineate the limits of the burying ground and to estimate the number of individuals interred. A front-end loader was used to remove the upper 50cm of sand from an area measuring 5x6 meters adjacent to the location of the disturbed burials. Additional excavation was done by hand using trowels and shovels. No burial shafts were evident in the bleached white sand. Instead, additional burial locations were determined from concentrations of coffin nails and organic stains left in the sand by the decomposition of the wooden coffins in which the deceased had been interred. Within this area, nine additional burials were located, indicating a minimum number of eleven interments within the burying ground. Their locations and orientations were recorded, but the burials were left undisturbed *in situ*. The small size of some of the interments indicates the burying ground includes children as well as adults. Unfortunately, the limits of the site could not reliably be determined from the excavations, and additional burials are likely to exist in all directions around the excavated block. At this time, no additional remains have been removed from this site.

Section IV

Preliminary Inventory and Condition of Remains

Following the determination that the burial site on Guana Island was an archaeological site rather than the site of a recent burial, the custody of the skeletal remains and associated materials recovered by the Royal British Virgin Islands Police Service was transferred to representatives of the Guana Island Archaeological Project. This was done in order to conduct more extensive bioarchaeological laboratory analysis of the remains that would allow for a more conclusive determination of the age of the individuals at death, their sex, population affiliations, and to investigate biological indicators relating to their quality of life.



Figure 4.1: Melissa Eaton and Marley Brown unpacking the human remains at the Police Station.

The skeletal remains were received in two Hollinger-style boxes along with a single large brown paper bag that contained some of the larger elements. The remains of the two individuals were commingled and loosely packed. The remains were unpacked at the police station in Roadtown, then separated by individual and laid out in correct anatomical position. A general inventory of elements was recorded and the condition of the remains noted.

One individual (Burial 1) was represented by a nearly complete skeleton; the second individual (Burial 2) however, consisted only of a cranium and mandible, but no post-cranial elements. Evidently, at the time of excavation, the post-cranial elements of Burial 2 were left *in situ* at the site. Most likely, the post-cranial portion of Burial 2 lies buried in the unexplored area to the southwest of the excavations.

In general, all the bones received were well preserved, and in stable condition with no evidence of post-mortem exposure to weather, rodents or other natural

disturbances. Damage to the bones inflicted at the time of their discovery and excavation, however, included severe damage to the anterior (face) portion of Burial 2's skull which was nearly completely crushed. Other damage inflicted during discovery and recovery included: a broken scapula, broken Os Coxae (pelvis), two broken humeri, two broken radii, two broken ulnae, 22 vertebrae in various degrees of fragmentation, and 41 rib fragments. All the remaining elements were complete with varying degrees of surface abrasion and nicks received from shovels and mechanical excavator during excavation.



Figure 4.2: Burial 2 – Anterior view of skull showing excavation damage.

After accepting custody of the remains in Road Town, they were cleaned using a dry tooth brush to remove any loosely adhering sand matrix. After cleaning, the remains were repacked for transportation to the Institute for Historical Biology at the College of William and Mary in Williamsburg, Virginia USA. Transportation of the remains to Williamsburg was generously provided for by Dr. Henry Jarecki.

Section V

Laboratory Methodology

Two teams, of two people each, assembled at the IHB for the Guana Project. Before the laboratory inventory, assessment and analysis began, the remains were cleaned a second time with a dry, soft-bristled brush and deionized water was used to clean dentition in order to facilitate observation. Any grains of sand or small fragments of bone that were dislodged during the examination were collected and stored in a plastic bag in order to retain association with the burials.

The inventory verified the in-field assessment of two individuals; a nearly complete skeleton of an adult male (Burial 1) and a fairly gracile cranium and mandible of an adult female (Burial 2). Overall, there is a remarkably high degree of preservation and completeness for Burial 1 although most of the distal phalanges for the hands and feet, the third metacarpal on the left hand and a few of the teeth are noticeably absent (Appendices 1a and 2a).

Bone fragments that were recovered from excavated soil were identified, sorted and placed with the proper individual. In order to assess the completeness and state of preservation for each burial, the inventory was conducted using the "Inventory Recording Form for Complete Skeletons" from the Standards for Data Collection from Human Skeletal Remains (Buikstra and Ubelaker 1994). The dental inventory, dental morphology, dental measurements and recordation of enamel defects were also conducted using forms from the Standards or a modified version of the Standards format (Appendices 1b - 1c and 2b - 2d).

Measurements of each element were taken for comparative purposes, to determine stature and can be used to assess for sex. In order to facilitate anthropometric measurements and achieve accurate results, a few of the elements were mended with B-72, an acrylic adhesive. Measurements were taken using a combination of spreading calipers, dental calipers, an osteometric board and mandibulometer. The two teams measured each element from the two sets of remains. After each team took independent measurements, the results were compared and averaged (Appendices 1d and 2e). Non-metric traits were also recorded and can be a valuable tool for examining genetic familial traits (Appendices 1e and 2f).

Age, sex, pathologies and occupational markers were assessed for each individual. During the assessment phase, each element is observed for distinguishing morphological characteristics and irregularities in bone formation indicative of aging, disease, injury and physiological stress. Age was primarily determined through observations of cranial sutures, stages of epiphyseal fusion, and dental wear. Sex was determined through observations of morphological features on the crania of both individuals as well as the innominates of Burial 1.

Observations of pathology and occupational indicators were recorded by element using a modified version of the Standards pathology codes. The modified coding

system was developed for the New York African Burial Ground project and provides a thorough and efficient way of recording multiple pathologies.

Each element was photographed for inventory and reporting purposes (Appendices 1f, 1g, 2g and 2h). The remains are currently being kept at the Institute for Historical Biology in a locked and humidity-controlled cabinet.

Section VI
Demographic Information (Age, Sex and Population Affiliation)

Burial 1

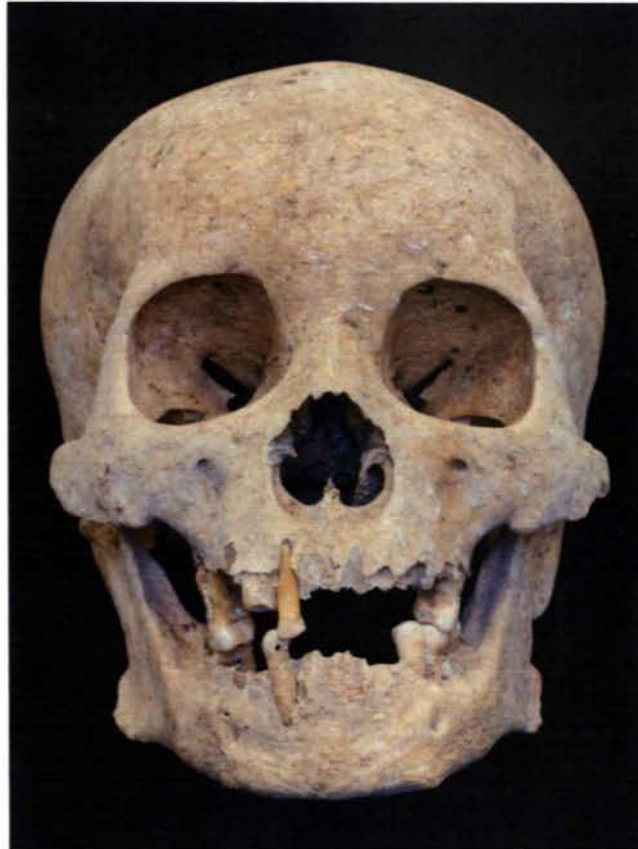


Figure 6.1: Burial 1 - Anterior view of skull.

Age

Age ranges are determined using observations of dental attrition, epiphyseal fusion as well as morphological changes in the cranium, ribs and innominates. Each feature is given a score based upon characteristics of fusion, wear or changes on the surface of the bone (Buikstra and Ubelaker 1994). Although observations of particular features prove to be more reliable than others (e.g. pubic symphysis), the evaluation of several features both independently and collectively provided the strongest assessment of age.

Cranium



Figure 6.2: Burial 1 - Superior view of cranium, showing obliteration of cranial sutures (anterior at the top of the image).

General observation of cranial suture closure indicated that this individual was likely an older adult (Figure 6.2). Using the scoring system in the Standards (Buikstra and Ubelaker 1994), all of the cranial sutures for Burial 1 reaffirmed that the sutures were either completely obliterated or show signs of significant closure (Tables 6.1 and 6.2).

Table 6.1

Cranial Vault Suture Site	Score*
Midlambdoid	2
Lambda	3
Obelion	3
Anterior Sagittal	3
Bregma	2
Vault Sutures Composite Score	13
"S" Score	S4
Age Range	30 - 60+ years.
Age Mean	45 years

*Scores range from 0 (open suture) to 3 (complete obliteration).

Table 6.2

Lateral- Anterior Suture Sites	Score*
Pterion	2
Midcoronal	2 or 3
Sphenofrontal	2
Inferior Sphenotemporal	3
Superior Sphenotemporal	2
Composite Score	11 - 12
S Score	S7
Age Range	48 - 60 + years
Age Mean	55 years

*Score is based on 0 (open suture) to 3 (complete obliteration).

While both sets of age ranges seem reasonable, the lateral-anterior suture scores (Table 6.2) seem to reflect the age of Burial 1 more accurately for several reasons. Scoring of the lateral-anterior sutures sites result in more refined age ranges and given the high percentage of complete obliteration on the cranial sutures, it is probable that this individual is older than 48 years of age.

Dentition



Figure 6.3: Burial 1 - Superior view of mandible.

The significant amount of tooth loss is problematic in determining an age based on attrition for Burial 1 (Figure 6.3). Usually, mandibular molars are examined for wear patterns on the occlusal surface; however, none of the second molars were present. The mandibular left first and third molars and the right third molar are present for observation, however, the molars on the left side exhibit very little sign of attrition

except for some superficial wear facets. The maxillary first molars on both sides also have very little indication of wear which may be attributable to the extent of tooth loss and a lack of occlusion. Nevertheless, based on the wear of the right mandibular third molar as well as the extent of tooth loss and alveolar resorption this person is likely 45 + years old (Brothwell 1963).

Innominate

Articular surfaces on the innominate (pubic symphysis and auricular surface) change in texture and density as an individual ages and can also be used in the determination of potential age ranges.



Figure 6.4: (Left) Burial 1 - Auricular surface on the left innominate.

Figure 6.5: (Right) Burial 1 - Auricular surface on the right innominate.

The left and right auricular surfaces were slightly dissimilar. The right auricular surface exhibited more of the bone density associated with an older age range than the left. The left side still had a granular surface and some faint billowing (Figure 6.4). Both sides have significant microporosity with some macroporosity, loss of transverse organization and some loss of billowing. The superior demifacet and apex both have significant lipping with the right apex appearing to be slightly more arthritic than the left. The left and the right are similar in description to Phase 7 (Lovejoy et al 1985) even though some slight asymmetry was noted in their appearance. Phase 7 characteristics have been attributed to individuals between 50 and 59 years of age (Table 6.3).



Figure 6.6: Burial 1 - Pubic symphysis of the left innominate (medial view).

The pubic symphysis has a fine grained surface with a very small amount of lipping on the dorsal and ventral surface (Figure 6.6) similar to Phase 5 of the Suchey Brooks Scoring System attributed to individuals over 25 years of age (Brooks and Suchey 1990). According to the Todd Scoring System, the pubic symphysis started to exhibit signs of erosion on the ventral margin as described in Phase 10 for individuals over 50 years of age (McKern and Stewart 1957) (Table 6.3).

Table 6.3

Innominate and Rib Aging Feature	Phase	Age Range
Auricular Surface	Phase 7	50 - 59 years
Pubic Symphysis - Suchey-Brooks Male	Phase 5	25 - 60 + (mean 45) years
Pubic Symphysis - Todd	Phase 10	50 + years
Rib - Sternal End Ossification (estimate)	Phase 7	56.3 - 66.1 years
Summary Age		50 - 66.1 years old

Ribs



Figure 6.7 – Burial 1 - Sternal end of ribs from the left side showing degree of ossification.

Examination of sternal end ossification in ribs as another method of age determination is especially helpful for older individuals. Cartilage connecting the sternal ends of the ribs with the sternum begins to ossify in older individuals and age ranges are established by the extent of ossification (Figure 6.7). Although the 4th rib is usually the standard rib examined for aging, this sternal end was not present on the right or the left. A sample of sternal ends for the left side were examined and determined to have the qualities similar to those described for individuals between 56.3 and 66.1 years of age (Iskan et al 1984)(Table 6.3).

Age Summary

Examining all of the age determinations cumulatively, the lower end of the age range would be determined conservatively by the lateral-anterior suture sites scoring, at 48 years of age (Table 6.2). The higher end of the age range is best determined by the sternal end of the ribs (Table 6.3) where ossification of cartilage places this individual as old as 66.1 years of age. Therefore, the age for this individual is most likely between 48 and 66.1 years of age.

Sex

Morphological characteristics of the mandible, cranium and innominates can vary by sex in adult individuals. Five features on the skull are scored based on their relative robusticity (male characteristics) or gracility (female characteristics). Five additional features on the innominate are assessed based on the general size and shape of features.

Cranium



Figure 6.8: Burial 1 - Lateral view of skull.

Although two of the features received “ambiguous” scores independently, general characteristics of the Burial 1 skull are strongly indicative of a male (Table 6.4) (Figure 6.8).

Table 6.4

Cranial Morphology Feature	Score*
Nuchal Crest	3
Mastoid Process	5
Supraorbital Margin	4
Supraorbital Ridge / Glabella	3
Mental Eminence	4
Sex Determination, Skull	5 (Male)

*Score for sex ranges from 1 (female) to 5 (male).

Innominate

All of the morphological features used to determine sex on the innominate were strongly male (Table 6.5).

Table 6.5

Innominate Feature	Scale	Score*
Ventral Arc	1 - 3	3
Subpubic Concavity	1 - 3	3
Ischiopubic Ramus Ridge	1 - 3	3
Greater Sciatic Notch	1 - 5	4
Preauricular Sulcus	1 - 4	4
Estimated Sex, Pelvis	1 - 5	5 (Male)

*Note that scoring varies between 1 (female) to either 3, 4 or 5 (male) depending on which method is used.

Stature

Using length measurements taken from long bones of the arm and leg, stature was assessed using the Trotter and Gleser (1952) estimates published in Bass (1995). The individual from Burial 1 was estimated to be between 5 feet 8 inches and 5 feet 11 inches tall (Table 6.6).

Table 6.6

Element	Length (mm)	Stature Estimate (cm)
Humerus	351	176
Radius	284	179
Ulna	309	181
Femur	479	172
Tibia	411	175
Fibula	410	176

Population Affiliation

Population affiliation for this individual is an approximation based on morphological characteristics provided in Bass (1995: 86-93), primarily derived from facial features of the skull. Craniometric measurements, though recorded for this individual, are not reliable in assessing population affiliation without a statistically significant sample size.

Occlusion was not observable due to tooth loss. This person has a slightly prognathic profile and a rounded forehead. The shape of the maxillary bones from the alveolar portion to the nasal aperture exhibits "nasal guttering." A slight depression is present at the bregma craniometric point. There is no depression at the nasal root and the base of the skull are broad or "flared." These features, are more frequently exhibited in West and Central African populations than in other populations with historic ties to Guana. This individual has slightly projecting zygomatics, a trait most frequent within Native American populations, but observed in varying degrees across all populations.

The general cranial morphology is consistent with the archaeological and historical context, indicating West or Central African ancestry with Native American ancestry of secondary possibility and European ancestry least likely.

Burial 1 Summary

Burial 1 is a 48 – 66.1 year old man standing between 5' 8" and 5' 11", likely of African descent.

Burial 2



Figure 6.9: Burial 2 – Anterior view of skull.

Age

Cranium

Observations for Burial 2 were complicated by a marked asymmetry in the cranial sutures (discussed further in Section VII), damage to the left side of the cranium, and taphonomic responses to wet / dry conditions. The Standards scoring for lateral-anterior sites are exclusive to the left side of the cranium, however, the sutures appear to be more open on the left and appear more closed and “complicated” on the right side. In addition, the left portion of the frontal was not available for observation and, as a result, scoring for portions of the lateral anterior sites was listed as “unobservable.” In order to accommodate these differences, both the left and right lateral-anterior sutures were scored (Tables 6.8 and 6.9).



Figure 6.10: Burial 2 - Superior view of cranium (anterior to the left of the image).

Table 6.7

Cranial Vault Suture Sites	Score*
Midlambdoid	1
Lambda	1
Obelion	1
Anterior Sagittal	1
Bregma	0
Vault Sutures Composite Score	4
"S" Score	S2
Age Range	22 - 45 years
Mean	34 years

*Scores range from 0 (open suture) to 3 (complete obliteration).

Table 6.8

Left Lateral- Anterior Sutures Sites	Score*
Pterion	0
Midcoronal	unobservable
Sphenofrontal	unobservable
Inferior Sphenotemporal	1
Superior Sphenotemporal	unobservable
Composite Score (estimate)	1
"S" Score	S1
Age Range	19 - 42 years
Age Mean	31 years

*Scores range from 0 (open suture) to 3 (complete obliteration).

Table 6.9

Right Lateral- Anterior Sutures Sites	Score*
Pterion	1
Midcoronal	1
Sphenofrontal	1
Inferior Sphenotemporal	1
Superior Sphenotemporal	1
Composite Score	5
"S" Score	S3
Age Range	27 - 51 years
Age Mean	40 years

*Scores range from 0 (open suture) to 3 (complete obliteration).

Taking the conditions of the remains into consideration, the age ranges for the left and right lateral-anterior suture sites most likely do not reflect the proper age ranges. Nevertheless, the age ranges derived from the lateral-anterior sites overlap with the age range determined by the cranial vault suture sites (Table 6.7). Relying on the examination of cranial vault sutures, this individual is in the 22 - 45 year-old age range.

Dentition



Figure 6.11: Burial 2 - Superior view of mandible.

All of this individual's permanent teeth, including the third molars, have erupted and the molars have started to show signs of wear. Solely based on the degree of attrition on the first and third mandibular molars, this person falls into the 17 - 25 year age range (Brothwell 1963). Some dentin exposure is present in the cusp areas of the first molars suggesting that the individual was in the middle to latter portion of this range.

Age Summary

Establishing the lower limit of the age range by examining the cranial sutures and the higher limit of the age range by dental attrition, this individual is between 22 and 25 years of age.

Sex



Figure 6.12: Burial 2 - Lateral view of skull.

Overall, the cranium associated with Burial 2 is gracile and cranial morphology indicates that this individual is definitely a female (Figure 6.12) (Table 6.10).

Table 6.10

Cranial Morphology – Feature	Score*
Nuchal Crest	1
Mastoid Process	1
Supraorbital Margin	2
Supraorbital Ridge / Glabella	1
Mental Eminence	2
Estimated Sex, Skull	1

*Score for sex ranges from 1 (female) to 5 (male).

Burial 2 Summary

Burial 2 is a 22 – 25 year old woman.

Section VII Pathology

Observations of pathologies are discussed in four separate categories: Developmental / General Stress Indicators, Diet / Nutrition, Infection and Musculo-Skeletal. Although it is helpful to categorize the pathologies separately to facilitate discussion of their causes and manifestation, it is important to remember that several of these pathologies are interrelated. The purpose of the pathology section is to describe the manifestation and immediate cause of each pathology. The activities and illnesses contributing to these skeletal pathologies and their relation to the individual's health are discussed in Section VIII of this report.

Burial 1

Developmental and General Stress Indicators

Dental Crowding / Malocclusion / Development

There is noticeable dental crowding on the anterior portion of the maxilla resulting in the right maxillary premolar being located medially to the right maxillary second premolar. The cause for the dental crowding in this individual cannot be determined and is simply understandable as a familial trait.

The impacted third molars grew in at a 45 degree angle above the jawline, likely pressing against the second molars. Both the maxillary and mandibular second molars are absent and the alveolar bone has completely resorbed. As a result of the combined effect of dental crowding and the third molars erupting, the second molars might have been voluntarily removed to relieve some of the pressure.

It also appears that roots of the mandibular right central and lateral incisor fused just behind the alveolar bone (Figure 7.5). No immediate cause for this condition can be determined.

Sacrum

The length of the sacrum (86.845 mm) is noticeably short for an adult male of this stature. The sacral index (125.68), a relative ratio of length to width, falls outside of the ranges provided for both males and females (Bass 1995) primarily due to the length being disproportionately small when compared to the width. Although no immediate cause can be determined, it is likely that this is related to issues of early development for this individual.

Exostoses on the External Auditory Meatus

Exostoses (spicules of bone) of the external auditory meatus (EAM) and the inferior aspect of the temporals were observed bilaterally and “may be associated with inflammation and infections of the ear, which are often associated with swimming and exposure to cold water (see Hutchinson et al. 1997)” (Blakey and Barrett 2004). The exostoses manifested in the form of spiculation rather than a bony nodule inside the EAM. Exostoses for Burial 1 are considerably less severe than those of Burial 2.

Diet / Nutrition and Disease

Periodontal Disease / Abscess



Figure 7.1: Burial 1 – Left lateral view of mandible (anterior to the left in the image), showing abscess, carious lesion on LM₁ and alveolar reduction.

The adult male had reached advanced stages of periodontal disease and tooth loss. The alveolar bone receded, exposing a considerable amount of each tooth's root. The roots of the mandibular 1st molar on the left have been exposed by a combination of an alveolar abscess and recession (Figure 7.1). The mandibular 1st molar on the right has completely rotted away as the result of an advanced carious lesion.

The alveolar portion of the maxilla is also considerably resorbed and, just prior to death, the first molars on both the left and right sides were very loose and were probably primarily held in place by the gums. Just before he died, perhaps within six months, this individual lost his left mandibular canine as the socket is showing the onset of resorption (Figure 7.2).



Figure 7.2: Burial 1 – Anterior / Left Lateral portion of the mandible, showing remodeling for the canine tooth socket and fusion of roots in incisor sockets.

There is a considerable amount of plaque (calculus) deposited on both the enamel surface and the roots indicating that the roots have been exposed over an extended period. White explains that the accumulation of plaque is often a precursor to carious lesions (1991:352) and in the case of Burial 1, as the roots gradually became exposed due to alveolar recession they accumulated plaque and subsequent carious lesions.

Tooth loss, for this individual, was a result of a number of factors including carious lesions, alveolar recession from periodontal disease, abscesses and may also include voluntary removal of the second molars.

Pitting/ Porous Bone

Several stages of bone loss with varying conditions and causes were observed for Burial 1. The older male displayed pitting on the maxilla, palate, zygomatic, temporals, occipital and sphenoid as well as each of the eye orbits. These areas of pitting and porous bone on the cranium are being distinguished from incidences of porotic hyperostosis due to the lack of diplotic expansion and the facial distribution pattern of pits. Their immediate cause is associated with inflammation and infection in surrounding tissues (see discussion on scurvy at the end of this section).



Figure 7.3: Burial 1 – Inferior view of maxilla and palate. Pitting or lesions on the posterior maxillae and palate (see scurvy discussion below).

Focal Bone Loss



Figure 7.4: Burial 1 – Anterior view of right scapula showing areas of focal bone loss.

There were several sites of focal bone loss, especially in areas where the cortical bone is thinnest: scapulae, clavicles, manubrium, innominates, and the posterior surfaces of the thoracic vertebra (Figure 7.4). Areas of focal bone loss were also apparent on the centra of several vertebrae, most notably L5 (Figure 7.5) and T3.

These areas of focal bone loss are distinctly different from cases of porotic hyperostosis and osteoporosis although they may have been exacerbated by the latter condition. Their primary cause is probably related to conditions of general illness which are discussed further at the end of this section and in Section VIII.



Figure 7.5 – Burial 1 - Inferior surface of the fifth lumbar vertebrae showing focal bone loss (posterior at the top of the image).

Osteoporosis

The long bone epiphyses and vertebrae have all started to show signs of diffuse bone loss (osteoporosis). Gradual bone loss in an older adult exacerbated by poor nutrition (Drezner 1995) resulted in a delicate spine and increased porosity on and around the articular surfaces (Figure 7.6).



Figure 7.6: Burial 1 – Medial view of humeral heads, showing the extent of osteoporosis on the distal ends of long bones.

Infection

Periostitis

Skin lesions and inflammation associated with infection can affect the surface of the bone. Periostitis, the reaction on the bone surface, is either active (reactive woven bone) or healed (sclerotic) and can often be a combination of both. Areas of periostitis were noted on the long bones, however, observations for periostitis were compromised by the effects of a sandy matrix and weathering on the surface of the bone.



Figure 7.7: Burial 1 – Superior view of the right foot showing infection in distal phalanx.

One of the most severe infections occurred on the big toe of the right foot, resulting in diffuse bone loss and structural collapse of the distal phalanx (Figure 7.7).

Musculo-skeletal

Os Acromiale



Figure 7.8: Burial 1 – Right scapula posterior view, close-up of acromion process, showing os acromiale (non-fusion).

This individual had unilateral os acromiale on the right scapula, a condition whereby the acromion process of the scapula does not fuse as a result of "tearing of the rotator cuff due to continued and heavy loading" on that arm (Capasso et al 1999:48). Fusion of the acromion can take place anywhere between the ages of 16 and 25 years old (Bass 1995:126) and because the fusion never occurred, it is likely this man was engaged in heavy labor at a young age. Further evidence for extensive use of the right arm becomes more evident in the section on muscular hypertrophies.

Non-Fusion



Figure 7.9: Burial 1 - Left 1st Rib medial view, showing non-fusion of the rib head.

Similar muscle strain on the left hand side chest muscles also contributed to a non-fusion of the rib head on the 1st rib. The fusion of the rib head with the body occurs sometime in the late teens to early adulthood (White 1991).

Fractures



Figure 7.10: Burial 1 - Left 2nd Rib superior view, showing area of a healed fracture.

One healed fracture was observed with Burial 1 on his left 2nd rib (Figure 7.10). The rib broke midway through the sternal body but was completely healed at the time of death. The fracture is completely healed and is no longer visible except for a noticeable area of bone apposition.

General Trauma / Morphological Variation



Figure 7.11: Burial 1 – Articulated right foot and ankle. Posterior / lateral view, showing groove and abnormal bone growth on the distal end of the right fibula.

Morphological changes to the distal end of the right fibula have resulted in the rounding of the lateral malleolus and the shortening of the right fibula, in comparison to the left, by 5 mm. There is an area of porous bone apposition on the lateral surfaces which define the peroneal groove (Figure 7.11). The peroneus longus and peroneus brevis muscles, which are responsible for plantar flexion and eversion of the foot, are attached at different locations along the fibula. At the lower end of the calf, the muscles end in tendons which pass over the lateral malleolus, through the peroneal groove, and end in the foot. Although there are no muscle attachments in this area, several ligaments connect the lateral malleolus to surrounding elements. The fibular attachment for the ligament that connects the medial surface of the distal fibula to the tibia, the interosseus ligament of tibiofibular syndesmosis, exhibits a pronounced rugosity on the right and may be related to the trauma discussed in this section.

Although it is not clear what conditions led to the change in ankle morphology, some form of trauma has taken place at the distal end of the fibula. The most distal end of the lateral malleolus could have fractured resulting in a noticeable change in length and an area of bone apposition. Trauma or work related conditions requiring

plantar flexion and eversion movement of the foot could have caused excessive strain on surrounding ligaments and muscles resulting in a muscular hypertrophy on the lateral malleolus. Or, a hematoma in surrounding tissues or inflammation of connective tissues in the area could also cause reactive bone growth and remodeling of the distal end. These possibilities will be discussed in more detail at the end of this section and in Section VIII.

Muscular Hypertrophies

Upper Body

Further asymmetry is seen in the significant size difference between the left and right mastoid processes. Evidence of mechanical stress using the sternocleidomastoid muscle is seen in the enlarged right mastoid and corresponding attachment on the clavicle. These hypertrophies and enthesopathies are considerably more severe on the right than the left. The unilateral use of this muscle can be attributed to tilting the head slightly up and rotating it in order to look over the left shoulder (Williams 1995:805) but could also be attributed to excessive strain on the right side of the neck. Apart from the osteoarthritis visible in the sternoclavicular joints, excessive stress on the right shoulder also caused the cartilage connecting the sternum and the right 1st rib to ossify.

The group of muscle attachments in the upper arm showing the most strenuous use is the pectoralis major, teres major and latissimus dorsi which work in conjunction to rotate the humerus medially and toward the center of the body (Williams 1995: 838). These hypertrophies and enthesopathies are slightly more severe on the right side and would be the result of this individual continually reaching across the body with either arm and meeting some resistance.

Both the knee and elbow joints have undergone the transition of a key ligament from tissue to bone. The ossification of these tissues is a result of strenuous overuse of the muscle, ligament or tendon in that area. The elbow joint pathology is significantly more severe as the ulnae have developed an extension of bone on the posterior surface of the proximal end (Figure 7.12). This area of the ulna, which is where the insertion for the biceps brachii is located, is attributed to "carrying heavy loads while the elbows are tightly flexed" (Larsen 2000:189). This action is also verified by the noted strenuous use of the supinator on the ulna which works with the biceps brachii (see below) for turning the palm anterior and lifting something with one's elbows partially flexed (Williams 1995: 851). Activities associated with stress on the biceps brachii include woodcutting and blacksmithing (Capasso et al 1999:78).



Figure 7.12: Burial 1 – Medial view, proximal end of the left ulna, showing arthritic lipping on articular facets and ossification of connective tissues.

Lower Body

The patellar ligament (quadriceps tendon) which is an extension of the quadriceps femoris has ossified in a fashion similar to the enthesopathy seen in the elbow (Williams 1995: 700) (Figure 7.13). Quadriceps femoris is a grouping of four muscles (rectus femoris, vastus lateralis, vastus medialis and vastus intermedius). This muscle group works to extend the knee or extend the knee and hip simultaneously. The patella is laterally displaced when the knee is bent and the vastus medialis and vastus lateralis work to keep it centered. (Williams 1995: 873)

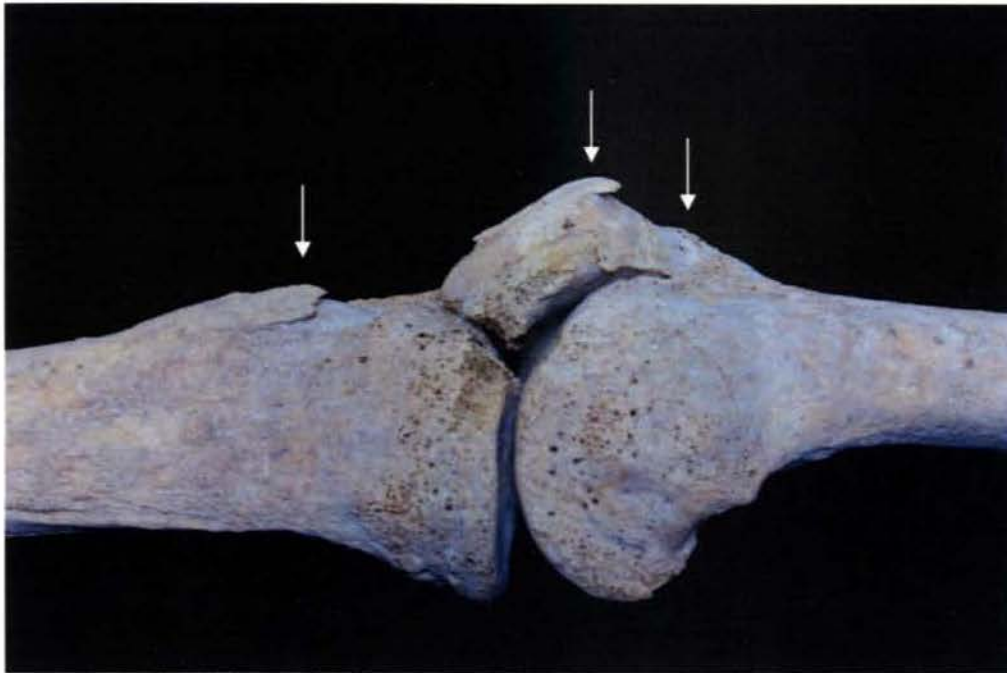


Figure 7.13: Burial 1 – Medial view of right knee joint showing ossification of connective tissues.

To some extent, these spicules of bone are also seen on the back of both feet where the Achilles tendon attaches to the calcaneus which is related to “excessive walking and running” (Larsen 2000:189) (Capasso et al 1999:139). The tendo calcaneus is also linked to the use of the soleus muscle whose attachments on both fibulae and tibiae have severe enthesopathies. (Williams 1995:886). These muscles and tendons work in conjunction to keep an individual steady on their feet in uneven terrain and have been attributed to carrying heavy loads on steep paths (Capasso et al 1999:122). In this case, the foot is usually in “partial plantar flexion” meaning that the heels are slightly off the ground while climbing, most likely contributing to the enthesopathies of the tendo calcaneus.

The femoral muscle attachments also substantiate this sort of continuous movement. The corresponding attachments for the soleus on the femur (lateral and medial gastrocnemius) just behind the knee have noticeable hypertrophies. The attachment for the adductor magnus, also known as the linea aspera and runs the entire length of the femur on the posterior surface, is extremely pronounced bilaterally but is more prominent on the right (Figure 7.14).

In conjunction with adjoining adductors (adductor longus and adductor brevis), the adductor magnus muscles are active during flexion and extension of the knee and hip. The combined use of gluteus medius and gluteus minimus serve to abduct the thigh and stabilize the hip when the alternate foot is lifted off the ground. Thus, these muscles are alternately active during walking but are not in a constant state of use (Williams 1995:877). Given the unilateral severity of these attachments, it is more likely that the hypertrophies are attributed to a work related movement rather than walking (Figure 7.14).



Figure 7.14: Burial 1 – Medial view of both femora showing extent of muscular hypertrophies on the right femur (to the left of the image).

Osteoarthritis

Osteoarthritis, a product of biomechanical stress and physical activity (Larsen 2000) has manifested in every major articular joint for Burial 1 with varying severity.

The clavicles, scapulae and humeri on both the left and right exhibit some arthritic lipping and porosity at the shoulder joint and the humeri, ulnae and radii at the elbow joint. The most severe case of osteoarthritis is visible in his right wrist which started to develop spicules of bone around the distal end of the radius and ulna bordering on osteoarthritic fusion of the wrist (Figure 7.15). Similar unilaterally severe arthritic changes are also visible in the bones (carpals) of the right hand.



Figure 7.15: Burial 1 – Palmar / anterior view of right wrist showing severity of osteoarthritis including lipping and spiculation.

The hip, knee and ankle joints also have incidences of arthritic lipping but the use of the joints is more clearly reflected in the muscular hypertrophies. More pronounced arthritic lipping on the left temporo-mandibular joint could be a byproduct of both occupational wear and an increasing reliance on the left teeth, which remained in better condition than his right teeth as he was aging.

The spinal column has significant and clear evidence of osteoarthritis. The cervical vertebrae in the neck all exhibit lipping on the centrum. Both superior and inferior articular facets on the thoracic and lumbar vertebrae exhibit arthritic lipping with spiculation. Beginning with T3, the superior articular facets on the thoracic vertebrae developed spicules that extended superiorly to nearly enclose the inferior articular facet of the adjoining vertebra. Osteophytosis, a condition precipitated by load bearing on the head and neck (Capasso 1999: 40), is visible on L3 and L4. In addition, articular facets of the vertebrae in the neck show an unusual pattern of facet extension. C1 and C2 have larger articular facets on the right side and C3 through C6 have larger facets on the left consistent with continual turning of the head to the left.

Burial 1 Summary

There is a considerable amount of asymmetry throughout this older man's body. The vertebrae, as midline elements, are equally as asymmetrical suggesting that the work he was doing required different ranges of motion on each side. Reviewing all of the pathologies, there are some areas of note, particularly the right shoulder, the right wrist, right thigh, both elbows and both knees indicating persistently

repetitive motions as well as lifting and carrying heavy loads. In addition, many of the muscles that he used extensively work to stabilize the body.

In addition, there are several indicators of a systemic infection having occurred during this man's lifetime.

Preliminary discussion of infectious disease and nutritional deficiency

Infection, disease and nutritional deficiency can result in similar skeletal manifestations. The pathologies discussed above may be indicative of tuberculosis and/ or scurvy. The following discussion begins to explore these potential interpretations for Burial 1.

Tuberculosis

Tuberculosis is an infectious disease caused by various species within the "*Mycobacterium tuberculosis* complex" differentially infecting humans and animals (Roberts and Buikstra 2003:4). Airborne "droplets" are conveyed by an infected human or animal (for example, through coughing or sneezing) to another person's respiratory system or can be contracted in the gastrointestinal system by coming in contact with infected animal products (Roberts and Buikstra 2003:5). Roberts and Buikstra (2003) cite the Seaton et al. 1989 study which suggests that prolonged exposure to an infected person(s) or animal(s) is necessary for someone to become infected. Consistent with this assertion, overcrowding and/ or contact with animals are usually associated with tuberculosis.

While the primary site of infection takes place in the lungs or gastrointestinally, lungs are the most common origin. Tuberculosis can lay dormant, not entering the bloodstream or spreading, for years after the primary infection (Ortner and Putschar 1985). Spread of the infection can be hampered or expedited depending on levels of nutritional adequacy and immunological strength of the individual (Ortner and Putschar 1985; Roberts and Buikstra 2003).

Osteological manifestations indicating tuberculosis are usually associated with focal bone loss and collapse of vertebral bodies, usually in the thoracic vertebrae. This individual has several indicators that suggest tuberculosis infection. Focal bone loss was present circumferentially on the sides of the vertebral bodies in the spine and on the inferior and superior surfaces of the vertebral bodies of T1-T3 and T6 (see Figure 7.5). Evidence of inflammatory response in the ribs and diffuse bone loss in the sternum are consistent with observations of bone tuberculosis infection. Though age is a confounding factor in this interpretation, the extant osteoporosis and degenerative joint activity throughout the skeleton, may also be related to tuberculosis. When tuberculosis travels through the bloodstream, infection can enter bone marrow, particularly affecting the epiphyses and metaphyses of long bones. The trauma and bone formation in the distal end of the right fibula and the shorter length of this element may relate to tuberculosis infection during

development (see scurvy discussion). If a long bone epiphysis is severely damaged due to tuberculosis, the infection "will leave a growth deficit and/or deformity" in a developing person (Ortner and Putschar 1985:144).

Scurvy

Pitting on the cranial vault and eye orbits, if coupled with expansion of the diploe, indicates an anemic reaction due to dietary iron deficiency, reaction to a parasite or disease. Pitting on the cranial, facial and mandible bones (particularly on the greater wing of the sphenoid) without evidence of diplotic expansion, is likely related to scurvy caused by vitamin C deficiency (Melikan and Waldron 2003; Ortner et al 2001; Ortner et al 1999; Ortner and Eriksen 1997). Ortner and Erikson (1997) prefer the operational term "porous bone" to indicate "chronic inflammation" versus porotic hyperostosis or pitting related to anemia and evidenced with expansion of the diploe. The distribution pattern of pitting in the facial elements, specifically in the greater wing of the sphenoid, palate, and posterior portion of the inferior maxillae, are indicative of scurvy. However, cross-sectioning or radiographic analysis would be necessary to confirm absence of diplotic expansion. Much of the cranial pitting and periostitis displayed in this individual has healed, indicating that these reactions may have been chronic. Alveolar resorption, periodontal disease, tooth loss, periostitis and lesions/focal bone loss on the scapulae suggest scurvy that continued or worsened in the latter part of his life due to factors such as aging, diet, infection and mechanical stress. (See Figures 7.3, 7.4 and 7.16)



Figure 7.16: Burial 1 – Lateral view of cranium (anterior to the right of the image). Pitting or lesions on the greater wing of the sphenoid and adjacent frontal bone associated with scurvy

Burial 2

Developmental / General Stress Indicators

Suture Asymmetry



Figure 7.17 and Figure 7.18: Burial 2 – superior (to the left) and posterior (to the right) images of the cranium showing cranial suture asymmetry.

As mentioned in the section on aging, the coronal and lambdoid sutures show signs of asymmetry (Figures 7.17 and 7.18). Both the coronal and lambdoid sutures on the right side tend to be more complicated and closed and less complicated and open on the left. The variation in suture closure may be an indicator of either nutritional or occupational stress at a young age affecting the physiological development of the cranium. Axial loading with a right side bias should be considered as a possible contributor to this pathology.

Hypoplasia and Hypocalcification



Figure 7.19: Burial 2 – Right lateral view of mandible showing hypoplasia on RM₃.

During dental growth at a young age, episodes of stress caused by illness or diet, disrupt normal enamel development. The interruptions in normal development result in either a visible transverse line across the developing tooth (hypoplastic lines) or one or a series of transverse pits across the tooth (hypoplastic pits).

Hypoplastic lines and hypocalcification are visible on the mandibular molars and canines (Figure 7.19). Enamel defects were not observable on the medial and lateral incisors due to post-mortem damage to the teeth.

Pitting/ Porous Bone



Figure 7.20: Burial 2 – Inferior view of right eye orbit showing pitting

Evidence of both healed and unhealed pitting is visible on the sphenoid (specifically the greater wing) parietals, occipital, temporals and maxilla with the most severe case visible on the inferior surface of the eye orbits (although fragmentation did not allow complete observation) (Figure 7.20). As with Burial 1, the distribution of the pitting in the absence of diplotic expansion suggests disease related reaction and possible scurvy.

Diet / Nutrition

Carious Lesion



Figure 7.21: Burial 2 – Medial view of mandible showing fractured RM₃ exacerbated by a carious lesion. Note onset of remodeling in socket for RM₂.

The right mandibular third molar has an open fracture along the occlusal surface (Figure 7.21). This break could have been perimortem or occurred during excavation, but it is clear that the tooth had been weakened by a carious lesion prior to the fracture. Given the young age of the woman and the fact that the third molar is the last tooth to erupt, the rapid development of such a carious lesion may have been exacerbated by a diet high in starch or sugar.

Periodontal Disease



Figure 7.22: Burial 2 – Anterior view of mandible showing onset of periodontal disease.

The onset of periodontal disease is evident primarily in the anterior mandibular teeth. The alveolar bone has slightly receded and there is evidence of root exposure (Figure 7.22).

Bilateral Tooth Loss

Both of the mandibular second molars were absent for the young woman. The alveolar region on the left lingual surface shows the onset of an abscess and some signs of healing. The socket for the molar on the right exhibits early signs of remodeling that eventually leads to resorption. Both of these indicators suggest that the teeth were lost antemortem and were likely voluntarily removed not long before she died. Bilateral loss of the same tooth was also common among an archaeological population of enslaved Africans and Afro-Caribbeans in Barbados (Handler and Corruccini 1983). The authors believe this is a clear indication of voluntary intervention and removal of "painful or diseased teeth" (1983:83).

Exostoses

Exostoses (spicules of bone) of the external auditory meatus and the inferior aspect of the temporals were observed bilaterally and "may be associated with inflammation and infections of the ear, which are often associated with swimming and exposure to cold water (see Hutchinson et al. 1997)" (Blakey and Barrett 2004).

Tooth Wear



Figure 7.23: Burial 2 – Left lateral view of mandible showing wear facet on left canine.

This woman also has visible wear facets on the mesial occlusal surface of both the right and left mandibular canine (Figure 7.23). An accompanying facet cannot be seen on the adjacent first premolars although they are set a bit lower than the canine and the maxillary canines are not present for observation. The wear is similar to, what is commonly called, a "pipe notch" or "pipe-smoker's wear" or an area of the teeth that develops a wear pattern from the consistent gripping of a pipe stem in the same spot over time. Handler and Corruccini's study of a seventeenth and eighteenth century archaeological population of enslaved men, women and children on Barbados indicate that the most common locations for pipe facets are either between the canine and lateral incisors or between the canine and first premolars (1983). Given the absence of wear facets on the first premolar in this case, the facet may have been created by occlusion.

In addition, uneven wear on the molars indicated that this individual had a slight underbite.

Musculo-skeletal

Muscular Hypertrophies

Further asymmetry is seen in the significant size difference between the left and right mastoid processes. The larger right mastoid process is likely due to a muscular hypertrophy of the sternocleidomastoid and is a result of a strain on the right shoulder or looking consistently over the left shoulder. The activity causing the hypertrophy is likely similar to the older male from Burial 1.

Burial 2 Summary

This young woman has several indicators of considerable developmental stress at a young age, including hypoplasia, cranial suture asymmetry and pitting in the eye orbit. In addition, the asymmetrical development of the sutures and the enlarged right mastoid may be the result of strenuous labor affecting the body unilaterally. The onset of periodontal disease and a carious lesion on the right third molar at a young age are the result of a diet high in starch and sugars.

Despite the difference in age and sex profiles, the pathologies observed for Burial 2 (a young woman) are strikingly similar to those observed for Burial 1 (an older man) in different stages. Both exhibit a unilateral use of the sternocleidomastoid on the right side and the early onset of carious lesions and periodontal disease.

Section VIII

Biographical Interpretation

The purpose of the following section is to interpret the skeletal analysis of Burial 1 and Burial 2 within their historical, archaeological and socio-economic context. Contextualizing the skeletal analysis within eighteenth century Guana provides insight into how the lives of this man and woman fit into the history of this island as a sugar plantation reliant on enslaved labor. Both burials were located within a larger cemetery near the archaeological foundation of a house used by the enslaved Africans and their descendents in Guana. Artifacts date the burials within the eighteenth century (see sections II and III).

Socio-economic Context

Within the British Leeward islands during the eighteenth century, sugar cultivation was dependent upon and directly related to the expansion of enslaved labor, importation of captive Africans, and a plantation labor system (Goveia 1965:104). Planting was done during the rainy season sugar was processed during the dry season between January and June. (Goodwin 1987:42-43).

The work involved in sugar cultivation in the Leeward Islands was made particularly strenuous by slaveholders' use of human labor rather than cattle. During the agricultural season the cane field was prepared and fertilized, requiring one hole to be dug for each plant, a practice known as holing. Holing, according to Goveia, "was universally agreed to be one of the most laborious tasks of cultivation that the West Indian slaves had to perform" and was practiced in place of using a cattle-drawn plough. Rather than staking cattle in fields to fertilize, enslaved workers carried manure "in baskets on their heads" (Goveia 1965:119).

Each person had to dig approximately 60 and 100 holes per day per in order to complete preparing the field by late October and begin planting. The final agricultural task was to harvest the cane. At harvest time, workers cut the ripe cane by hand with knives called bills. The upper 12 inches of the stalk was cut first and set aside. The rest of the cane was cut close to the ground and sent to the mill for crushing. As they proceeded, the workers stripped the dry leaves from the canes. The stripped leaves were brought to the factory and used as fuel for the boiling house (Dunn 1973[1972]:192; Goodwin 1987:64-66).

Once the sugar cane had been cut, the stalks were immediately brought to the mill where they were crushed and the juice extracted. The work in and around the crushing mill was extremely dangerous. Hands and clothing were very susceptible to getting caught in between the mill's turning rollers, as Edward Littleton (1689) describes, "If a Mill-feeder be catch't by the finger, his whole body is drawn in, and he is squeez'd to pieces (in Dunn 1972[1973]:192)."

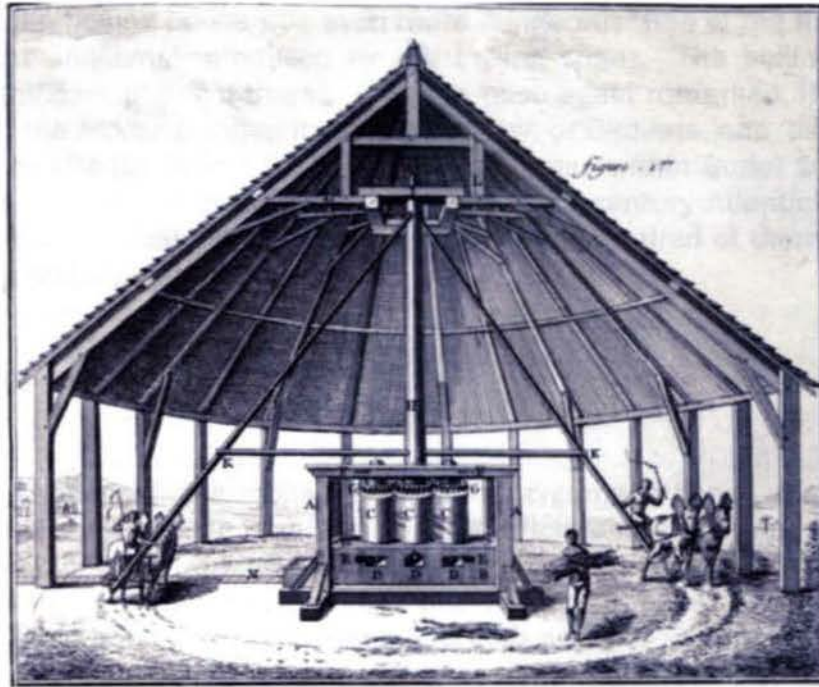
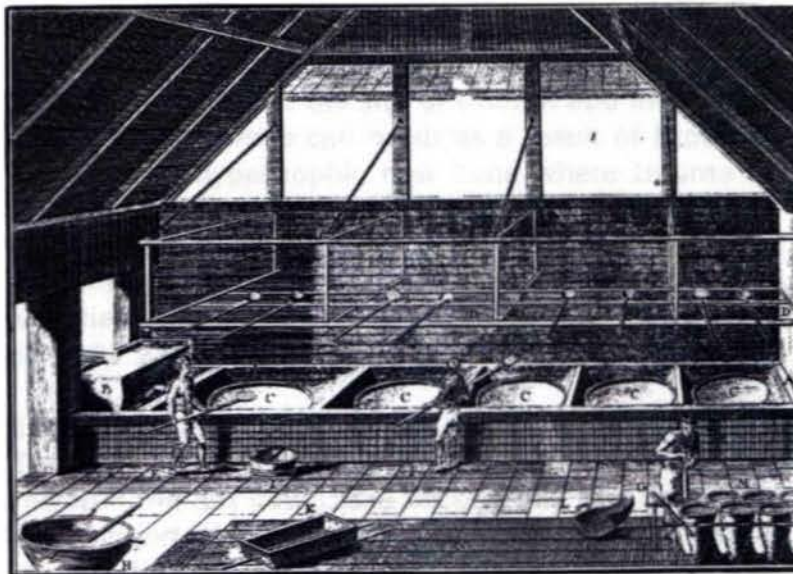


Figure 8:1: Sugar Mill (Diderot 1762, vol. 1)

From the crushing mill, the extracted juice was transported, via a gutter or pipe, into an adjacent boiling house for processing. After heating the juice in the first copper, any impurities that rose to the surface were skimmed off (see image below) and the juice is transferred to a second slightly smaller copper using a long-handled ladle. The boiling juice is transferred from copper to copper by this method until finally it is placed in the smallest copper, called the strike pan. From the strike pan, the juice is transferred into cooling tanks where the crystallization process takes place (Clement 1995:107-111).



Fol. I, Oeconomie rustique, Sucrierie, Pl. IV.

Figure 8.2: Boiling House (Diderot 1762, vol.1)

The work in the boiling house was even more dangerous than in the mill due to the extreme heat and smell produced by the boiling sugar. The boiling sugar also posed a significant physical threat. Littleton once again remarked, If a Boyler get any part into the scalding sugar, its ticks like Glew, or Birdlime, and 'tis hard to save either Limb or Life (in Dunn 1972:194). The remains within Burial 1 and Burial 2 reflect the complexity of living within the eighteenth century Atlantic world. Their bodies bear the physical evidence of strenuous labor required of them as enslaved laborers on a sugar plantation.

Interpretation

Burial 1

Pitting in the sphenoid, eye orbits, nasal bones, zygomatic bones, maxillae, palate and alveolar processes, extensive alveolar resorption, dental loss and lesions in the scapulae combined with a high frequency of remodeled inflammatory response in the post cranial skeleton indicate that this man may have experienced scurvy. Focal and diffuse bone loss in the spine, sternum and ribs and severe osteoporosis indicate chronic tuberculosis infection. Trauma in the distal end of the right fibula may be related to either of these pathologies or neither (see Section VII).

A diet lacking ascorbic acid (vitamin C), found in fresh fruit and vegetables, causes scurvy, a disease with a variety of symptoms including periodontal disease, bleeding of the gums and hemorrhaging at sites of vascular trauma from mechanical stress. Vitamin C is crucial to the development of connective tissue, and when absent in the diet, connective tissue and vascular strength are greatly compromised, resulting in bleeding when engaging in strenuous activity and even in ordinary actions, such as chewing and moving the eye muscles. (Ortner and Eriksen 1997; see also Melikan and Waldron 2003; Ortner et al 2001; Ortner et al 1999). An inflammatory response can stimulate bone reaction resulting in "reactive" woven bone or, when healed, "sclerotic" lamellar bone (Buikstra and Ubelaker 1994). During the developmental years, stimulation of bone growth is also likely to occur in the metaphyses of the lower limbs at the site of trauma and inflammation (Ortner and Eriksen 1997:213). Porous bone can occur as a result of hyper-vascularization as well as the formation of hypertrophic new bone where trauma or hemorrhaging occurred (ibid). Historically, sailors have suffered from scurvy during their extended time at sea due to the poor quality of diet lacking fresh vegetables and fruit. Scurvy has also been documented within enslaved populations generally, and specifically among enslaved field workers in the British Leeward Islands of the eighteenth century (Goveia 1965:234).

This individual had unusual and pronounced bone formation on the distal end of the right fibula. The location of this formation, the slightly shorter length of the right fibula compared with the left fibula (see section VII), and the porous quality of the bone formation support the possibility that trauma resulting from scurvy or tuberculosis during fusion (between the ages of 14 and 20 years). This developmental period is concurrent with the ages at which the acromion process

and first rib should have fused. Archival records containing the ages of enslaved Africans in the Leeward Islands in the seventeenth and eighteenth centuries show a prevalence of men in adolescence to early adulthood (Dunn 1973 [1972]:318). Within the historical and socio-political context of this man's life, the fibula trauma at the metaphysis, and the failure of the left rib and the right acromion process to fuse, may represent the period of forced migration and strenuous labor upon entering the Americas during adolescence to early adulthood.

There is no evidence of enamel hypoplasia in this individual's remaining teeth. The canine and the third molar are present, but offer no evidence of general stress during early childhood (6 months to 6.5 years old) or in later childhood and adolescence. The years of development represented by the dentition also support onset of adverse nutritional, disease, and possibly contributing mechanical stressors in late adolescence and early adulthood.

Conditions of enslavement such as poor diet and strenuous labor are evident within this individual. Historical records of diet indicate a large reliance on starchy foods such as flour, corn, peas, yams, potatoes and sometimes sugar and rum, salted cod fish and supplemental food raised on provision grounds (Dunn 1973 [1972]: 278; Goveia 1965: 135-137). Beyond the possibility of scurvy in his earlier years, the high degree of alveolar resorption, dental loss, caries and abscessing is consistent with a diet high in sugars and starches. Furthermore, this person died later in life and may have had a poorer diet in his later years. Documentary records provide reference to slaveholders' value of younger laborers, while often subjecting men and women who survived beyond the ages of 40 to poorer living conditions and diet (Dunn 1973 [1972]:320). Decreased bone density, arthritis and vertebral pathology are common in older individuals. However, the severity and distribution of osteoporosis and focal bone loss within this older man may also be related to tuberculosis, intensified by heavy labor during his lifetime (see section VII).

Differing severities observed in arthritic lipping and ligament and muscle attachments between left and right sides of this man's body are consistent with activity specifically related to cane cultivation and harvesting. A larger mastoid process on his right side and the enthesopathy on his right clavicle are evidence of severe strain or use of his right sternocleidomastoid muscle (see Figure 8.3 and labor descriptions below).



Figure 8.3: Man planting cane in sugar cane field in twentieth century Puerto Rico (Mintz 1960).



Figure 8.4: Workers in a sugar cane field in twentieth century Puerto Rico (Mintz 1960).

We are continuing to examine the following distribution of stress indicators for evidence of work involving a twisting motion of the neck and upper body: alternating lateralization of enlarged articular facets in cervical vertebra C1 – C7, alternating right and left orientation of cervical and thoracic vertebrae spinous processes (see Figure 8.5) os acromiale in the right scapula, non-fusion of the left first rib head and a fracture in the right first rib.



Figure 8.5: Alternating right and left orientation of cervical and thoracic vertebrae spinous processes in Burial 1 (lines indicate orientation of spinous processes).

This man had been engaged in heavy labor at least as early as adolescence or early adulthood (see Rankin Hill 1997 for a discussion on os acromiale, labor and development). Spicules on the wrist, elbow and knee joints result from repeated or sustained flexion of these joints. The calcaneus bone shows evidence of sustained flexion of the ankle with weight bearing on the foot. Lower limb attachments may also have been affected by the terrain, requiring a person to walk on steep inclines (see Section III).



Figure 8.6: Worker using a hoe for cane cultivation in twentieth century Puerto Rico (Mintz 1960).

An observer of migrant cane cutters on sugar plantations in late twentieth century Florida described their movements as:

stepping forward with the foot on the side of one's cutting hand (keeping the other foot back and clear of the blade on its follow-through); bending over and wrapping an arm around a bunch of stalks and raising the blade up over the shoulder and bringing it down hard across one's body to the field, striking the cane at the base of the stalk; shaving the tops from the stalks with short, flicking strokes...(Wilkinson 1989:52)

One cane cutter described his work as "Grilling, backbreaking, strenuous, and rough. The bending is [a] tremendous strain on your back, your shoulders twisting left, twisting right, bending up and down, lifting." (Wilkinson 1989:118)

Muscle and ligament attachments of the arms and legs show that this person engaged in heavy lifting and pulling. Evidence of infection, healed and active, was present throughout this individual's upper and lower body, but was most severe in his leg bones and at the sites of muscle attachments. The big toe on his right foot had evidence of very severe infection (see section VII).

The variety of activities or labor this person may have engaged in during his lifetime is not limited to the description above. However, the historical-archaeological context and the skeletal indicators for this individual suggest that his daily activity required bending, heavy lifting and extensive use of his shoulder, arm and leg muscles in a pattern consistent with cane cultivation and harvesting. Furthermore, the severity of his arthritis, vertebral pathology, hypertrophies and enthesopathies suggest that he had been working strenuously for many years prior to and up until his death.

Burial 2

This young woman's dentition provides a record of her general health during childhood through disruption in her enamel formation. Enamel (being acellular) does not remodel like bone and, therefore, provides a permanent record of health during the period of enamel development. Hypoplastic lines on this woman's incisors, canines and molars indicate an early onset and continuation of generalized stress, such as malnutrition or illness, throughout her adolescence. The earliest developing permanent teeth are the central incisors, which begin forming near six months of age, continuing enamel formation until the age of 3.5 years. Canine enamel develops between six months and approximately 6.5 years. The latest developing teeth, the third molars begin forming at age 9, continuing until approximately 16 years of age.

Using the method developed by Blakey (1994) and Goodman et al. (1980), the crown height measurement, the tooth-specific age range when enamel develops,

and the hypoplastic band measurements were used to assess the ages at which physiological stress and enamel disruption occurred. Hypoplastic bands in the canine indicate stress episodes during the approximate ages of 5.5, 6, and 7.5 years old. The right third molar displayed the most severe hypoplasia and indicates a stress episode between the approximate ages of 13 and 14 years, lasting for approximately one year.

Burials 1 and 2 are both missing second molars. All four second molars are missing in Burial 1 with complete alveolar resorption. Burial 2 is missing the mandibular second molars and shows evidence of the beginning stages of remodeling. Although Burial 1 experienced a great deal of dental attrition, the bilateral absence of the second molar in both burials may indicate practices of dentistry (as suggested by similar observation in Barbados) to remove pressure from encroaching third molars (Handler and Corruccini 1983).

Similar to the pitting patterns of Burial 1, this young woman displayed pitting or porosity in the greater wing of the sphenoid, maxilla, cranial vault and eye orbits in the absence of diplotic expansion. She may have experienced scurvy earlier in life, though how much earlier and the severity of the disease is not identifiable due to the absence of post-cranial elements. Fragmentation of the skull and absence of post-cranial elements does not allow for further observation as to the extent of pitting or presence of inflammatory responses.



Figure 8.7: Enslaved African woman carrying food using axial loading.

As observed in Burial 1, the mastoid on the right side of Burial 2 is larger than her left. The absence of post cranial elements prohibits comparison of the right clavicles. The suture patterns and fusion are asymmetrical and may be related to

mechanical stress or pressure to the head, such as axial loading. As in the image above, carrying loads or items on the head was a practice engaged in by African women in the Americas.

Women were often part of the gang labor system used in West Indian sugar plantations, performing the most arduous field labor along with men (Bush 1990:34-40). According to Bernard Moitt (2004:6), women - though often employed in the mills - "outnumbered men in the field gangs and did proportionately more labor than men." Within this context, it is more likely that this young woman worked in the cane field or in the sugar mills than in domestic service. Given the incompleteness of her remains, further interpretation is not possible.

Section IX Conclusion

The skeletal remains of a middle-aged man (Burial 1) and young woman (Burial 2) from Guana were found to have been exposed to infectious disease and nutritional deficiencies. Pathology indicators in the most observable individual (Burial 1) were consistent with tuberculosis and scurvy, the specificity of which we offer as tentative conclusions until more is known about the population and its history. The evidence of biomechanical stresses of physical labor is quite profound and includes extensive muscle attachment hypertrophy, os acromiale, and degenerative joint disease. In these respects these individuals' skeletons are similar to those from other remains of enslaved Africans in the Americas. They were highly stressed, but we currently have no way of knowing how representative of the Guana population these two individuals may have been since no statistical generalizations can be made from such a small sample.

We believe, however, that the observable pattern of stress indicators in Burial 1 may be hypothesized as a skeletal model for the purpose of identifying a sugar cane worker. The evidence of biomechanical stress, especially, is remarkably consistent with what one should expect under the demands of sugar cane agriculture, and even Burial 2's cranium bears consistencies with the observed pattern in the cranial and post-cranial skeleton of Burial 1. Overall, the pattern consists of the following criteria which Burial 1 embodies:

1) General, severe rugosity of the skeleton indicative of the historically documented extreme arduousness of sugar cane labor.

In Burial 1 such indicators include hypertrophies of the linea aspera and knee attachments for the triceps femorii, attachments for the biceps trachii of the ulna, and attachments for pectoralis and other humeral musculature.

2) Extreme asymmetry or lateralization in which the individuals' handed side (the right side in most cases) shows markedly more evidence of biomechanical stress than does the other side of the body, extending from head to foot. This lateralization is consistent with the constant use of a machete involving muscles and joints in one arm and shoulder as well as bending and twisting, and the extensive use of the foot on the same side for planting with a shovel.

In Burial 1 such indicators include the right mastoid process of the skull, os acromiale of the right shoulder joint, arthritis of the right elbow and of the right wrist, as well as slightly greater enlargement of the right linea aspera than of the left, and the possible fracture and hypertrophy of the right foot related to the action of the peroneal muscle.

3) Evidence of strain from repetitive twisting and bending.

In Burial 1 elements of the axial skeleton, especially the vertebrae, show alternating effects of joint degeneration and muscular strain to the left and right side.

4) Non-biomechanical pathologies such as extensive caries from eating sugar cane and nutritional deficiencies associated with regimes of plantation slavery.

In Burial 1 evidence of infectious disease and nutritional deficiencies are consistent with findings of highly stressed enslaved populations in both plantation and urban settings.

When these criteria are observed together in temporal and spatial contexts in which human populations were exposed to sugar cane labor, the patterns plausibly identify sugar cane workers. Studies of such a pattern do not yet appear in the literature, although one of us (M. Blakey) has observed commingled remains from a 19th century plantation of sugar cane workers (remains from the Kenner and Kugler cemeteries studied by Yakubic et al. (1986) at the Bonnet Carre' Spillway near New Orleans, Louisiana) that are consistent with the first criterion mentioned above. We are proposing these criteria, as observed in Burial 1, as a hypothesis to be tested. We hope the model will be considered by colleagues who study related archaeological populations, the ergonomics of living sugar cane workers, and the biomechanics of comparable behaviors.

There are several recommendations that can be addressed if archaeological excavations are expanded upon and/or acquisition of a larger sample of human remains occurs on Guana.

1. The biological model of sugar cane workers hypothesized on the basis of the present study can be tested with additional human skeletal evidence from this site. Comparative studies of skeletons of individuals under differing labor regimes could be used to further test this hypothesis..
2. Infectious disease and nutritional stress has been assessed in these two individuals that might be verified or better understood on the basis of additional archival, archaeological, and faunal evidence.
3. Evidence of stress in the observed individuals is associated with different points in their life cycles. Information about their locations in parts of Africa, North America, and the Caribbean at various ages is essential to telling their personal stories. Chemical sourcing data including both lead and strontium isotopes should reveal much about their geographical migrations.
4. It is recommended that reburial of the two individuals discussed in the current report take place in a manner deemed appropriate by descendant Tortollans. Such a reburial may be preceded by an educational forum in which the scientific knowledge about the identities of the two individuals

discussed in this report is shared with the local community. Those events could preface plans for future study and/or relocation of Guana remains should the owners of the land decide to further develop land in which the cemetery is located.

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Appendix I

INVENTORY RECORDING FORM FOR COMPLETE SKELETONS

Site Name/ Number	Guana	Observers	Fred Lumb and Shannon Mahoney
Feature/ Burial Number	Burial 1	Date	17 May 2005
Burial/ Skeleton Number			
Present Location of Collection	Institute for Historical Biology		

1 = >75% present = complete

2 = 25% - 75% = partial

3 = <25% present = poor

CRANIAL BONES AND JOINT SURFACES

	<u>L (left)</u>	<u>R (right)</u>		<u>L (left)</u>	<u>R (right)</u>
Frontal	1	1	Sphenoid	1	1
Parietal	1	1	Zygomatic	1	1
Occipital	1	1	Maxilla	1	1
Temporal	1	1	Palatine	1	1
TMJ	1	1	Mandible	1	1

POSTCRANIAL BONES AND JOINT SURFACES

	<u>L</u>	<u>R</u>		<u>L</u>	<u>R</u>
Clavicle	1	1	Os Coxae		
Scapula			Ilium	1	2
Body	1	2	Ischium	1	1
Glenoid f.	1	1	Pubis	1	2
Patella	1	1	Acetabulum	1	1
Sacrum	1	1	Auric. Surface	1	1
Coccyx	1				

VERTEBRAE (Individual)

	<u>Centrum</u>	<u>Neural Arch</u>
--	----------------	--------------------

C1	1	1
C2	1	1
C7	1	1
T10	3	1
T11	-	-
T12	-	1
L1	2	1
L2	1	1
L3	1	1
L4	1	1
L5	1	1

VERTEBRAE (group)

	<u>#Present/ #Complete</u>
--	----------------------------

	<u>Centra</u>	<u>Neural Arches</u>
C3-6	4/4	4/4
T1-T9	9/9	9/9

Sternum:

<u>Manubrium</u>	<u>Body</u>
1	1

RIBS (Individual)

	<u>L</u>	<u>R</u>
--	----------	----------

1st	1	1
2nd	1	1
11th	1	-
12th	-	1

RIBS (grouped)

	<u>#Present/ #Complete</u>
--	----------------------------

	<u>L</u>	<u>R</u>	<u>Unsid</u>
3-10	8/8	8/8	/

Site Name/ Number Guana

Observer

Fred Lumb and Shannon Mahoney

Feature/ Burial Number

Burial 1

Date

17 May 2005

Burial/ Skeleton Number

Present Location of Collection

Institute for Historical Biology

LONG BONES

Diaphysis

	Proximal Epiphysis	Proximal Third	Middle Third	Distal Third	Distal Epiphysis
Left Humerus	1	1	1	1	1
Right Humerus	1	1	1	1	1
Left Radius	1	1	1	1	1
Right Radius	1	1	1	1	1
Left Ulna	1	1	1	1	-
Right Ulna	1	1	1	1	1
Left Femur	1	1	1	1	1
Right Femur	1	1	1	1	1
Left Tibia	1	1	1	1	1
Right Tibia	1	1	1	1	1
Left Fibula	1	1	1	1	1
Right Fibula	1	1	1	1	1
Left Talus	1				
Right Talus	1				
Left Calcaneus	1				
Right Calcaneus	1				

HAND (#Present/ #Complete)

	<u>L</u>	<u>R</u>	<u>Unsided</u>
# Carpals	6/6	8/8	
# Metacarpals	5/5	4/4	
# Phalanges	9/9	13/13	

FOOT (# Present/# Complete)

	<u>L</u>	<u>R</u>	<u>Unsided</u>
# Tarsals	4/4	4/4	
#Metatarsals	5/5	5/5	
#Phalanges	8/8	8/8	

Institute for Historical Biology

Dental Measurement Form

Site Name/ Number: Guana

Observer: Shannon Mahoney

Feature/Burial Number: Burial 1

Date 20 May 2005

Burial/ Skeleton Number:

TOOTH MEASUREMENTS

TOOTH MEASUREMENTS

Left Max.		MD	BL	CH
9	¹ I	<u>unobservable: absent</u>		
10	² I	<u>unobservable: absent</u>		
11	^x C	<u>unobservable: absent</u>		
12	¹ P	<u>unobservable: absent</u>		
13	² P	<u>unobservable: absent</u>		
14	¹ M	<u>12.18</u>	<u>10.44</u>	<u>7.41</u>
15	² M	<u>unobservable: absent</u>		
16	³ M	<u>unobservable: absent</u>		

Right Max.		MD	BL	CH
1	M ³	<u>unobservable: absent</u>		
2	M ²	<u>unobservable: absent</u>		
3	M ¹	<u>10.70</u>	<u>10.85</u>	<u>7.16</u>
4	P ²	<u>unobservable: absent</u>		
5	P ¹	<u>unobservable: absent</u>		
6	C ^x	<u>unobservable: absent</u>		
7	I ²	<u>7.46</u>	<u>6.71</u>	<u>6.01</u>
8	I ¹	<u>unobservable: absent</u>		

Left Mand.		MD	BL	CH
17	³ M	<u>11.17</u>	<u>10.18</u>	<u>7.23</u>
18	² M	<u>unobservable: absent</u>		
19	¹ M	<u>12.40</u>	<u>11.22</u>	<u>6.52</u>
20	² P	<u>7.93</u>	<u>6.40</u>	<u>5.80</u>
21	¹ P	<u>unobservable: absent</u>		
22	^x C	<u>5.25</u>	<u>*</u>	<u>6.72</u>
23	² I	<u>unobservable: absent</u>		
24	¹ I	<u>unobservable: absent</u>		

Right Mand.		MD	BL	CH
25	I ₁	<u>unobservable: absent</u>		
26	I ₂	<u>unobservable: absent</u>		
27	C _x	<u>unobservable: absent</u>		
28	P ₁	<u>unobservable: absent</u>		
29	P ₂	<u>unobservable due to condition</u>		
30	M ₁	<u>unobservable due to condition</u>		
31	M ₂	<u>unobservable: absent</u>		
32	M ₃	<u>7.42</u>	<u>10.68</u>	<u>5.34</u>

* unobservable due to condition

Institute for Historical Biology										
ANTHROPOMETRIC RECORD										
Burial Number: Guana: Burial 1										
Category:										
Recorder: A. Barrett & S. Mahoney										
Date: 5/23/05										
CRANIAL MEASUREMENTS (Pages 53-62)										
ALL MEASUREMENTS IN mm	1st Set	1st Set	2nd Set		Final		1st Set		2nd Set	Final
1.) MAXIMUM LENGTH (g-op):	179		178.71		178.855	13.) NASAL HEIGHT (n-ns):	56		56.06	56.03
2.) MAXIMUM BREADTH (eu-eu):	151		150.61		150.805	14.) NASAL Breadth (al-al):	30		30.14	30.07
3.) BIZYGOMATIC BREADTH (zy-zy):	142		142.4		142.2	15.) ORBITAL BREADTH (mf-ec):	40 Left		40.69	40.345
4.) BASION-BREGMA (ba-b):	125		126.52		125.76	16.) ORBITAL HEIGHT:	36 Left		35.79	35.895
5.) CRANIAL BASE LENGTH (ba-n):	108		107.51		107.755	17.) BIORBITAL BR. (ec-ec):	102		101.7	101.85
6.) BASION-PROSTHION L. (ba-pr):	108		107.48		107.74	18.) INTEROBITAL BR. (mf-mf):	22		22.2	22.1
7.) MAX. -ALVEOLAR BR. (ecm-ecm):	68		68.86		68.43	19.) FRONTAL CHORD (n-b):	105		105.14	105.07
8.) MAX. -ALVEOLAR L. (pr-alv):	53.47		57.3		55.385	20.) PARIETAL CHORD (b-l):	105		106.23	105.615
9.) BIAURICULAR BREADTH (au-aw):	127		130.66		128.83	21.) OCCIPITAL CHORD (l-o):	93		93.58	93.29
10.) UPPER FACIAL HGT. (n-pr):	73		73.98		73.49	22.) FORAMEN MAGNUM L. (ba-o):	37		36.39	36.695
11.) MIN. FRONTAL BR. (ft-ft):	92		94.57		93.285	23.) FORAMEN MAGNUM BR.:	29		28.48	28.74
12.) UPPER FACIAL BR. (fmt-fmt):	108		112.3		110.15	24.) MASTOID LENGTH:	36		36.89	36.445
MANDIBULAR MEASUREMENTS (Pages 62-65)										
25.) CHIN HEIGHT (gn-id):	30.97		30.7		30.835	30.) MIN. RAMUS BREADTH:	43.1		43.29	43.195
26.) BODY HEIGHT at MENTAL FOR:	28.17		31.93		30.05	31.) MAX. RAMUS BREADTH H:	50.04		52.02	51.03
27.) BODY THICKNESS at M. FOR:	14.68		13.93		14.305	32.) MAX. RAMUS HEIGHT:	53		56	54.5
28.) BIGONIAL DIAMETER (go-go):	110.38		109.38		109.88	33.) MAND. LENGTH:	86		86.5	86.25
29.) BICONDYLAR BR. (cdl-cdl):	124.17		124.52		124.345	34.) MAND. ANGLE:	28		28.5	28.25
POSTCRANIAL MAESUREMENTS (Pages 65-79)										
	Left	Right					Left	Right		
CLAVICLE: Epiph. P/A:						INNOMINATE: Epiph. P/A:				
35.) MAXIMUM LENGTH:	164		164		164	57.) HEIGHT:	200		202	201
36.) SAGITTAL DIAM. At MIDSH:	12.71		13.94		13.325	58.) ILIAC BREADTH:	149.9		150.87	150.385
37.) VERTICAL DIAM. At MIDSH:	10.3		10.2		10.25	59.) PUBIS LENGTH:	73.84		70.9	72.37
						60.) ISCHIUM LENGTH:	77.07		79.43	78.25
SCAPULA: Epiph. P/A:						FEMUR: Epiph. P/A:				
38.) ANATOMICAL BREADTH (HGT):	N/A		155.3	approx	107.14	61.) MAXIMUM LENGTH:	479		479	479
39.) ANATOMICAL LENGTH (BR):	106.53		107.75	approx	38.74	62.) BICONDYLAR LENGTH:	468.5		468.5	468.5
40.) GLENOID CAV. LENGTH :	37.96		39.52			63.) EPICONDYLAR BREADTH:	82.21		83	82.605
						64.) MAX. DIAM. OF HEAD:	45.76		45.7	45.73
HUMERUS: Epiph. P/A:						65.) A/P SUBTROCH. DIAMETER:	24.55		24.86	24.705
41.) MAXIMUM LENGTH:	351	fragmented	351		351	66.) TRANSV. SUBTROCH. DIAM:	32.2		33.4	32.8
42.) EPICONDYLAR BREADTH:	66.6		57.5		62.05	67.) SAGITTAL DIAM. MIDSH:	31.39		30.95	31.17
43.) MAX. VERT. DIAM. OF HEAD:	45.76	erosion	46.19		45.975	68.) TRANVS. DIAM. MIDSH:	24.85		24.69	24.77
44.) MAX. DIAM. At MIDSHAFT:	22.52		22.84		22.68	69.) CIRCUMFERENCE AT MIDSH:	89		88.5	88.75
45.) MIN. DIAM. At MIDSHAFT:	16.87		16.7		16.785					
						TIBIA: Epiph. P/A:				
RADIUS: Epiph. P/A:						70.) CONDYLO-MALLEOLAR LENGTH:	412		411	411.5
46.) MAXIMUM LENGTH:		284	284		12.065	71.) MAX. PROX. EPIPH. BR:	78.49		79.55	79.02
47.) SAGITTAL DIAM. At MIDSH:		12.03	12.1		18.255	72.) MAX. DIST. EPIPH. BR:	56.9		56	56.45
48.) TRANSV. DIAM. At MIDSH:		18.01	18.5			73.) MAX. DIAM. NUTRIENT FOR:	36.8		38.8	37.8
						74.) TRANSV. DIAM. NUTR. FOR:	23.96		25.5	24.73
ULNA: Epiph. P/A:						75.) CIRCUM. AT NUTR. FOR:	98		98	98
49.) MAXIMUM LENGTH:		309	309 R		309					
50.) DORSO-VOLAR DIAMETER:		16.82	15.23 R		16.025					
51.) TRANVERSE DIAMETER:		14.39	14.93 R		14.66	FIBULA: Epiph. P/A:				
52.) PHYSIOLOGICAL LENGTH:		273	272 R		272.5	76.) MAXIMUM LENGTH:	410		410	410
53.) MIN. CIRCUMFERENCE:		37	37 R		37	77.) MAX. DIAM. At MIDSHAFT:	15		15.3	15.15
SACRUM: No. Segments:						CALCANEUS: Epiph. P/A				
54.) ANTERIOR LENGTH:	84.43	condition	89.26		86.845	78.) MAXIMUM LENGTH:	85.01		89.4	87.205
55.) ANTERIOR-SURFACE BR:	108.8		109.5		109.15	79.) MIDDLE BREADTH:	44.6		46.09	45.345
56.) MAX. BREADTH (S-1):	50.7	condition	50.9		50.8					

Primary NonMetric Traits Recording Form
Institute for Historical Biology

Site Guana

Burial Burial 1

	L	M	R
1. Metopic Suture		0	
0 = absent			
1 = partial			
2 = complete			
9 = unobservable			
2. Supraorbital Structures	3		3
a. Supraorbital Notch			
0 = absent			
1 = present, < 1/2 occluded by spicules			
2 = present, > 1/2 occluded by spicules			
3 = present, degree of occlusion unknown			
4 = multiple notches			
9 = unobservable			
b. Supraorbital Foramen	0		0
0 = absent			
1 = present			
2 = multiple foramina			
9 = unobservable			
3. Infraorbital Suture	0		0
0 = absent			
1 = partial			
2 = complete			
9 = unobservable			
4. Multiple Infraorbital Foramina	0		0
0 = absent			
1 = internal division only			
2 = two distinct foramina			
3 = more than two distinct foramina			
9 = unobservable			
5. Zygomatico-facial Foramina	2		2
0 = absent			
1 = 1 large			
2 = 1 large plus smaller f.			
3 = 2 large			
4 = 2 large plus smaller f.			
5 = 1 small			
6 = multiple small			
9 = unobservable			
6. Parietal Foramen	0		0
0 = absent			
1 = present, on parietal			
2 = present, sutural			
9 = unobservable			

Page 1 of 2

Observer Shannon Mahoney

Date 20 May 2005

	L	M	R
7. Sutural Bones			
0 = absent			
1 = present			
9 = unobservable			
a. epipteric bone:	0		0
b. coronal ossicle	0		0
c. bregmatic bone		0	
d. sagittal ossicle:		0	
e. apical bone:		0	
f. lambdoid ossicle bone:	0		0
g. asterionic bone:	0		0
h. ossicle in occipito-mastoid suture:	0		0
i. parietal notch bone:		0	
8. Inca Bone		0	
0 = absent			
1 = complete, single bone			
2 = bipartite			
3 = tripartite			
4 = partial			
9 = unobservable			
9. Condylar Canal	1		1
0 = not patent			
1 = patent			
9 = unobservable			
10. Divided Hypoglossal Canal	0		0
0 = absent			
1 = partial, internal surface			
2 = partial, within canal			
3 = complete, internal surface			
4 = complete, within canal			
9 = unobservable			
11. Flexure of Superior Sagittal Sulcus		9	
1 = Right			
2 = Left			
3 = Bifurcate			
9 = Unobservable			
12. Foramen Ovale Incomplete	0		0
0 = absent			
1 = partial formation			
2 = no definition of foramen			
9 = unobservable			

Primary NonMetric Traits Recording Form

Institute for Historical Biology

Site GuanaBurial Burial 1

L M R

13. Foramen Spinosum Incomplete

0 0

0 = absent

1 = partial formation

2 = no definition of forament

9 = unobservable

14. Pterygo-spinous Bridge

not observed

0 = absent

1 = trace (spicule only)

2 = partial bridge

3 = complete bridge

9 = unobservable

15. Pterygo-alar Bridge

not observed

0 = absent

1 = trace (spicule only)

2 = partial bridge

3 = complete bridge

9 = unobservable

16. Tympanic Dihiscence

0 0

0 = absent

1 = foramen only

2 = full defect present

9 = unobservable

17. Auditory Exostosis:

0 0

0 = absent

1 = <1/3 canal occluded

2 = 1/3 - 2/3 canal occluded

3 = > 2/3 canal occluded

9 = unobservable

18. Mastoid Foramen

a. Location

1 1

0 = absent

1 = temporal

2 = sutural

3 = occipital

4 = both sutural and temporal

5 = both occipital and temporal

9 = unobservable

b. Number

1 2

0 = absent

1 = 1

2 = 2

3 = more than 2

9 = unobservable

Observer Shannon MahoneyDate 20 May 2005

Page 2 of 2

L M R

19. Mental Foramen

1 1

0 = absent

1 = 1

2 = 2

3 = >2

9 = unobservable

20. Mandibular Torus

0 0

0 = absent

1 = trace (can palpate but not see)

2 = moderate: elevation between 2 - 5 mm.

3 = marked: elevation greater than 5 mm.

9 = unobservable

21. Mylohyoid Bridge

2 2

a. Location

0 = absent

1 = near mandibular forament

2 = center of groove

3 = both bridges described in 1) and 2) with hiatus

4 = both bridges described in 1) and 2) no hiatus

9 = unobservable

b. Degree:

1 1

0 = absent

1 = partial

2 = complete

9 = unobservable

22. Atlas Bridging

0 0

a. Lateral Bridging

0 = absent

1 = partial

2 = complete

9 = unobservable

b. Posterior Bridging

0 0

0 = absent

1 = partial

2 = complete

9 = unobservable

23. Accessory Transverse Foramina

0 9

- in 7th Cervical Vertebra

0 = absent

1 = partial

2 = complete

9 = unobservable

24. Septal Aperture

0 0

0 = absent

1 = small foramen (pinhole) only

2 = true perforation

9 = unobservable



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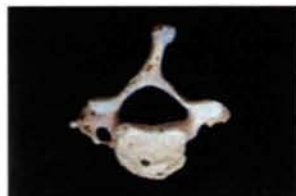
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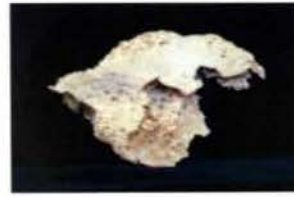
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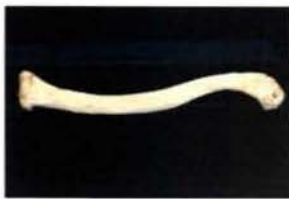
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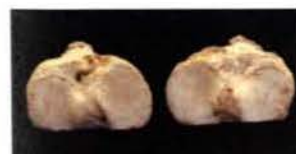
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	D	E	F	G	H
1	Burial ID	Element	Side	Aspect	Comments
2	Both	Table Shot			Pre-Cleaning Inventory
3	Both	Table Shot			Pre-Cleaning Inventory
4	Burial 1	Table Shot			Pre-Cleaning Inventory
5	Burial 1	Cranium / Mandible	Left and Right	Superior	Pre-Cleaning Inventory
6	Burial 1	Cranium / Mandible		Anterior	Pre-Cleaning Inventory
7	Burial 1	Cervical Vert			Pre-Cleaning Inventory
8	Burial 1	Thoracic Vert			Pre-Cleaning Inventory
9	Burial 1	Cervical and Lumbar vert			Pre-Cleaning Inventory
10	Burial 1	Sternum / Clavicle / Scapu	Left and Right	All	Pre-Cleaning Inventory
11	Burial 1	Scapula / Clavicle	Left and Right		Pre-Cleaning Inventory
12	Burial 1	Scapula	Left and Right		Pre-Cleaning Inventory
13	Burial 1	Ribs	Left and Right		Pre-Cleaning Inventory
14	Burial 1	Innominate	Right		Pre-Cleaning Inventory
15	Burial 1	Innominate	Left		Pre-Cleaning Inventory
16	Burial 1	Sacrum / Innominates	Left and Right	Medial / Lateral / Posterior	Pre-Cleaning Inventory
17	Burial 1	Humeri / Radii / Ulnae	Left and Right	All	Pre-Cleaning Inventory
18	Burial 1	Humeri / Radii / Ulnae	Left and Right	All	Pre-Cleaning Inventory
19	Burial 1	Hands	Left and Right		Pre-Cleaning Inventory
20	Burial 1	Tibiae	Left and Right	Anterior	Pre-Cleaning Inventory
21	Burial 1	Femora	Left and Right		Pre-Cleaning Inventory
22	Burial 1	Fibulae	Left and Right		Pre-Cleaning Inventory
23	Burial 1	Tarsals	Left and Right		Pre-Cleaning Inventory
24	Burial 1	Feet	Left and Right		Pre-Cleaning Inventory
25	Unknown	All			Pre-Cleaning Inventory
26	Unknown	All			Pre-Cleaning Inventory
27	Burial 1	Full Body		Anterior	Inventory
28	Burial 1	Full Body		Anterior	Inventory
29	Burial 1	Full Body		Anterior	Inventory
30	Burial 1	Full Body	Right	Lateral	Inventory/ Full Body, upper
31	Burial 1	Skull - with mandible		Anterior	Mandible/ Maxilla in occlusion
32	Burial 1	Skull - with mandible	Right	Lateral	Mandible/ Maxilla in occlusion
33	Burial 1	Skull - with mandible	Left	Lateral	Mandible/ Maxilla in occlusion
34	Burial 1	Cranium		Superior	All
35	Burial 1	Occipital		Posterior	Mandible/ Maxilla in occlusion
36	Burial 1	Occipital		Posterior	Rugosity/ Nuchal Crest/ Suture closure

	D	E	F	G	H
37	Burial 1	Frontal		Anterior	Supra-orbital tori (PHHL) glabella
38	Burial 1	Frontal	Right	Inferior	Cribra orbitalia - eye orbit
39	Burial 1	Frontal	Right	Inferior	Cribra orbitalia - eye orbit
40	Burial 1	Frontal	Left	Inferior	Cribra orbitalia - eye orbit
41	Burial 1	Temporal	Right	Lateral	Zygomatic arch
42	Burial 1	Temporal	Left	Lateral	EAM / Mastoid close up
43	Burial 1	Temporal	Right	Lateral	EAM / Mastoid close up
44	Burial 1	Temporal	Right	Lateral	EAM / Mastoid close up
45	Burial 1	Cranium		Inferior	Medial area of inferior/ maxilla/ palate
46	Burial 1	Cranium		Inferior	All
47	Burial 1	Hyoid		Inferior	Inventory
48	Burial 1	Hyoid		Posterior	Inventory
49	Burial 1	Hyoid		Posterior	Inventory
50	Burial 1	Hyoid		Anterior	Inventory
51	Burial 1	Mandible		Superior	
52	Burial 1	Mandible		Inferior	
53	Burial 1	Mandible		Anterior	
54	Burial 1	Mandible	Right	Lateral	
55	Burial 1	Mandible	Left	Lateral	
56	Burial 1	Mandible		Posterior	
57	Burial 1	Mandible	Left	Lateral	Dentition - close-up, buccal, abcessing & cementum
58	Burial 1	Mandible	Right	Lateral	Dentition - abcessing & M3 enamel wear
59	Burial 1	RM3 - mand	Right	Occlusal	Close-up
60	Burial 1	Mandible	Left	Anterior	Close-up, canine socket
61	Burial 1	Mandible	Left	Medial	
62	Burial 1	Atlas		Superior	Inventory
63	Burial 1	Atlas		Inferior	Inventory
64	Burial 1	Atlas		Anterior	Inventory
65	Burial 1	Atlas		Posterior	Inventory
66	Burial 1	Atlas		Lateral	Inventory - Left Side
67	Burial 1	Atlas		Lateral	Inventory - Right Side
68	Burial 1	Axis		Anterior	Inventory
69	Burial 1	Axis		Lateral	Inventory
70	Burial 1	Axis		Superior	Inventory
71	Burial 1	Axis		Inferior	Inventory
72	Burial 1	Axis		Posterior	Inventory

	D	E	F	G	H
73	Burial 1	C3		Superior	Inventory
74	Burial 1	C3		Inferior	Inventory
75	Burial 1	C4		Superior	Inventory
76	Burial 1	C4		Inferior	Inventory
77	Burial 1	C5		Superior	Inventory
78	Burial 1	C5		Inferior	Inventory
79	Burial 1	C6		Superior	Inventory
80	Burial 1	C6		Inferior	Inventory
81	Burial 1	C7		Superior	Inventory
82	Burial 1	C7		Inferior	Inventory
83	Burial 1	Cervical Verts		Posterior	Inventory
84	Burial 1	Cervical Verts		Anterior	Inventory
85	Burial 1	Cervical Verts	Right	Lateral	Inventory
86	Burial 1	Cervical Verts	Left	Lateral	Inventory
87	Burial 1	Cervical Verts	Left	Lateral	Inventory
88	Burial 1	T1 - T9		Posterior	Inventory
89	Burial 1	T1 - T9		Posterior	Inventory
90	Burial 1	T1 - T9		Anterior	Inventory
91	Burial 1	T1 - T9		Anterior	Inventory
92	Burial 1	T1 - T9	Left	Lateral	Inventory
93	Burial 1	T1 - T9	Right	Lateral	Inventory
94	Burial 1	T1 - T9	Right	Lateral	Inventory
95	Burial 1	T1		Inferior	Centrum - close-up FOBL
96	Burial 1	T1		Superior	Centrum - close-up FOBL
97	Burial 1	T3		Inferior	Close-up - FOBL on centrum
98	Burial 1	T4	Right	Lateral	Close-up - Costal facet - lipping
99	Burial 1	T7		Posterior	Close-up - articular facets, superior
100	Burial 1	T7	Right	Lateral	Close - up - spicules on inferior articular facets
101	Burial 1	T8 & T9	Left	Lateral	Close-up
102	Burial 1	T8 & T9	Right	Lateral	Close-up
103	Burial 1	T10		Posterior	Inventory
104	Burial 1	T10		Anterior	Inventory
105	Burial 1	T10	Left	Lateral	Inventory
106	Burial 1	T10	Right	Lateral	Inventory
107	Burial 1	T10	Right	Lateral	Inventory
108	Burial 1	T12		Posterior	Inventory

	D	E	F	G	H
109	Burial 1	T12		Anterior	Inventory
110	Burial 1	T12	Right	Lateral	Inventory
111	Burial 1	T12	Left	Lateral	Inventory
112	Burial 1	L1 - L5		Posterior	Inventory
113	Burial 1	L1 - L5		Anterior	Inventory
114	Burial 1	L1 - L5	Right	Lateral	Inventory
115	Burial 1	L1 - L5	Right	Lateral	Inventory
116	Burial 1	L1 - L5	Left	Lateral	Inventory
117	Burial 1	L1		Inferior	Close-up - FOBL on centrum
118	Burial 1	L4		Superior	Close-up - FOBL on centrum
119	Burial 1	L4		Superior	Close-up - FOBL on centrum
120	Burial 1	L4		Inferior	Close-up - FOBL on centrum
121	Burial 1	L5		Superior	Close-up - FOBL on centrum
122	Burial 1	L5		Inferior	Close-up - FOBL on centrum
123	Burial 1	L5		Inferior	Close-up - FOBL on centrum
124	Burial 1	Sacrum		Posterior	needs cropping
125	Burial 1	Sacrum		Anterior	needs cropping
126	Burial 1	Sacrum	Left	Lateral	
127	Burial 1	Sacrum	Right	Lateral	
128	Burial 1	Sacrum		Superior	good shot
129	Burial 1	Sacrum		Posterior	close-up - vertebral facets
130	Burial 1	Sacrum	Right	Lateral	close-up - auricular surface
131	Burial 1	Manubrium		Anterior	
132	Burial 1	Manubrium		Posterior	Reshoot
133	Burial 1	Manubrium	Right	Lateral	Shows ossified connective tissue
134	Burial 1	Manubrium	Left	Lateral	Broken edge - not helpful
135	Burial 1	Manubrium	Left	Superior	Shows ossified connective tissue
136	Burial 1	Sternum		Anterior	
137	Burial 1	Sternum		Posterior	
138	Burial 1	Sternum	Right	Lateral	
139	Burial 1	Sternum	Left	Lateral	
140	Burial 1	Manubrium/ Sternum		Anterior	
141	Burial 1	Manubrium/ Sternum		Posterior	
142	Burial 1	Manubrium		Superior	close-up - ossified tissue
143	Burial 1	Manubrium		Posterior	close-up - ossified tissue - good shot
144	Burial 1	Ribs 1-11	Right	Superior	Inventory

	D	E	F	G	H
145	Burial 1	Ribs 1-11	Right	Superior	Inventory
146	Burial 1	Ribs 1-11	Right	Inferior	Inventory
147	Burial 1	All Ribs	Left	Superior	Inventory
148	Burial 1	All Ribs	Left	Superior	Inventory
149	Burial 1	All Ribs	Left	Inferior	Inventory
150	Burial 1	All Ribs	Left	Inferior	Inventory
151	Burial 1	Rib 1	Right	Superior	Close-up - ossified cartilage and infection
152	Burial 1	Rib 1	Right	Inferior	Close-up - ossified cartilage and infection
153	Burial 1	Rib 1	Left	Medial	Close-up - FRAC
154	Burial 1	Rib 2	Left	Posterior	Close-up - FCPL - healed fracture
155	Burial 1	Rib 2	Left	Anterior	Inventory - shows fracture
156	Burial 1	Rib 2	Left	Inferior	Shows fracture - close-up
157	Burial 1	Rib 2	Left	Inferior	Shows fracture - close-up
158	Burial 1	Rib 6	Right	Inferior	Close-up - WBSC
159	Burial 1	Ribs 6 and 7	Left	Anterior	Sternal ends - use for age
160	Burial 1	Ribs 6 and 7	Left	Anterior	Sternal ends - use for age
161	Burial 1	Scapulae	Left and Right	Posterior	Inventory
162	Burial 1	Scapulae	Left and Right	Anterior	Inventory
163	Burial 1	Scapulae	Left and Right	Lateral	Inventory
164	Burial 1	Scapulae	Left and Right	Superior	Inventory
165	Burial 1	Scapulae	Left and Right	Inferior	Inventory
166	Burial 1	Scapulae	Left and Right	Medial	Inventory
167	Burial 1	Scapula	Left	Posterior	Inferior angle FOBL
168	Burial 1	Scapula	Left	Lateral	Glenoid Fossa
169	Burial 1	Scapula	Left	Lateral/ Inferior	Porosity around Glenoid
170	Burial 1	Scapula	Right	Lateral	Glenoid Fossa
171	Burial 1	Scapula	Right	Lateral	ARLP - Glenoid Fossa
172	Burial 1	Scapula	Right	Lateral	Scapula border
173	Burial 1	Scapula	Right	Lateral	Os Acromiale
174	Burial 1	Scapula	Right	Superior	Os Acromiale
175	Burial 1	Scapula	Right	Superior	Os Acromiale
176	Burial 1	Scapula	Right	Anterior	FOBL
177	Burial 1	Clavicle	Left	Anterior	Inventory
178	Burial 1	Clavicle	Left	Posterior	Inventory
179	Burial 1	Clavicle	Left	Superior	Inventory
180	Burial 1	Clavicle	Left	Inferior	Inventory

	D	E	F	G	H
181	Burial 1	Clavicle	Left	Sternal	Inventory
182	Burial 1	Clavicle	Left	Lateral	Inventory
183	Burial 1	Clavicle	Right	Anterior	Inventory
184	Burial 1	Clavicle	Right	Posterior	Inventory
185	Burial 1	Clavicle	Right	Superior	Inventory
186	Burial 1	Clavicle	Right	Inferior	Inventory
187	Burial 1	Clavicle	Right	Posterior	Focal bone loss
188	Burial 1	Clavicle	Right	Superior	Focal bone loss
189	Burial 1	Clavicle	Right	Sternal	close-up
190	Burial 1	Clavicle	Right	Sternal	close-up
191	Burial 1	Clavicle	Right	Inferior	close-up hype/enth on sternal end
192	Burial 1	Clavicle	Right	Superior	close-up hype/enth on lateral end
193	Burial 1	Clavicle	Left	Inferior	Sternal end - hype/enth
194	Burial 1	Clavicle	Left	Superior	Lateral end - hype/enth
195	Burial 1	Clavicle	Right	Lateral	Inventory
196	Burial 1	Clavicle	Right	Lateral	Inventory
197	Burial 1	Humeri	Left and Right	Anterior	Inventory
198	Burial 1	Humeri	Left and Right	Posterior	Inventory
199	Burial 1	Humeri	Left and Right	Lateral	Inventory
200	Burial 1	Humeri	Left and Right	Medial	Inventory
201	Burial 1	Humeri	Left and Right	Anterior	Total diaphysis
202	Burial 1	Humeri	Left and Right	Posterior	Total diaphysis
203	Burial 1	Humeri	Left and Right	Proximal-Medial	ARLP (close - up) of head
204	Burial 1	Humeri	Left and Right	Distal-Anterior	Distal Ends
205	Burial 1	Humeri	Left and Right	Distal-Posterior	Distal Ends
206	Burial 1	Humerus	Left	Distal-Anterior	Enthesopathy
207	Burial 1	Elbow	Right	Medial	
208	Burial 1	Elbow	Right	Medial	
209	Burial 1	Elbow	Left	Anterior	
210	Burial 1	Elbow	Left	Lateral	
211	Burial 1	Elbow	Left	Medial	
212	Burial 1	Elbow	Left	Anterior	
213	Burial 1	Elbow	Right	Medial	Inventory
214	Burial 1	Elbow	Right	Lateral	Inventory
215	Burial 1	Elbow	Right	Anterior	Inventory
216	Burial 1	Ulnae	Left and Right	Anterior	Inventory

	D	E	F	G	H
217	Burial 1	Ulnae	Left and Right	Posterior	Inventory
218	Burial 1	Ulnae	Left and Right	Lateral	Inventory
219	Burial 1	Ulnae	Left and Right	Medial	Inventory
220	Burial 1	Ulnae	Left and Right	Medial	Proximal Diaphysis
221	Burial 1	Ulnae	Left and Right	Anterior	Inventory
222	Burial 1	Ulnae	Left and Right	Medial	Inventory
223	Burial 1	Ulnae	Left and Right	Posterior	Inventory
224	Burial 1	Ulnae	Left and Right	Superior	Proximal Epiphysis - Enthesopathy
225	Burial 1	Ulna	Right	Medial	Proximal Epiphysis shot
226	Burial 1	Ulna	Right	Anterior	Proximal Epiphysis shot - enthesopathy
227	Burial 1	Ulna	Right	Lateral	Proximal Epiphysis shot - ARLP
228	Burial 1	Ulna	Right	Lateral	Proximal Epiphysis shot - ARLP
229	Burial 1	Ulna	Right	Anterior	Diaphysis - Periostitis
230	Burial 1	Ulna	Right	Anterior	Distal Epiphysis - ARLP
231	Burial 1	Ulna	Right	Inferior	Distal Epiphysis - ARLP
232	Burial 1	Ulna	Left	Lateral	Proximal Epiphysis - Enthesopathy
233	Burial 1	Radii	Left and Right	Anterior	Inventory
234	Burial 1	Radii	Left and Right	Anterior	Inventory
235	Burial 1	Radii	Left and Right	Lateral	Inventory
236	Burial 1	Radii	Left and Right	Posterior	Inventory
237	Burial 1	Radii	Left and Right	Superior	Proximal Epiphysis
238	Burial 1	Radius	Right	Anterior	PE/P1 Inventory
239	Burial 1	Radius	Right	Anterior	DE/D1 Inventory
240	Burial 1	Radius	Right	Anterior	M1 - showing mended post-mortem break
241	Burial 1	Radius	Right	Anterior	P1 - hypertrophy (radial tuberosity)
242	Burial 1	Radius	Right	Medial	P1 - hypertrophy (radial tuberosity)
243	Burial 1	Radius	Right	Medial	M1 - interosseus crest
244	Burial 1	Radius	Right	Anterior	DE - ARLP (detail)
245	Burial 1	Radius	Right	Posterior	DE - ARLP (detail)
246	Burial 1	Radius	Right	Posterior	DE - ARLP
247	Burial 1	Radius	Right	Superior	PE - lateral side is up
248	Burial 1	Radius	Right	Inferior	DE - lateral side is to the right
249	Burial 1	Radius	Left	Anterior	P1 Inventory
250	Burial 1	Radius	Left	Anterior	D1 Inventory
251	Burial 1	Radius	Left	Posterior	M1 - showing break at mid-shaft
252	Burial 1	Radius	Left	Medial	P1 - hypertrophy (radial tuberosity)

	D	E	F	G	H
253	Burial 1	Radius	Left	Medial	M1- interosseus crest
254	Burial 1	Radius	Left	Superior	PE
255	Burial 1	Radius	Left	Inferior	DE - lateral side is to the left
256	Burial 1	Radius	Left	Anterior	DE
257	Burial 1	Radius	Left	Posterior	DE
258	Burial 1	Radius	Left		PE
259	Burial 1	Radius	Left		PE
260	Burial 1	Radius	Left and Right	Medial	PE/P1 comparing radial tubercities
261	Burial 1	Radius	Left and Right	Medial	M1 comparing interosseus crest
262	Burial 1	Radius	Left and Right	Anterior	M1 comparing interosseus crest
263	Burial 1	Radius	Left and Right	Anterior	PE/P1 comparing radial tubercities
264	Burial 1	Radius	Left and Right	Posterior	PE/P1 comparing radial tubercities
265	Burial 1	Radius	Left and Right	Posterior	M1 comparing interosseus crest
266	Burial 1	Radius	Left and Right	Anterior	Inventory
267	Burial 1	Radius	Left and Right	Posterior	Inventory
268	Burial 1	Radius	Left and Right	Medial	Inventory
269	Burial 1	Radius	Left and Right	Lateral	Inventory
270	Burial 1	Radius	Right	Anterior	Inventory
271	Burial 1	Radius	Right	Posterior	Inventory
272	Burial 1	Radius	Right	Medial	Inventory
273	Burial 1	Radius	Right	Lateral	Inventory
274	Burial 1	Radius	Left	Anterior	Inventory
275	Burial 1	Radius	Left	Posterior	Inventory
276	Burial 1	Radius	Left	Medial	Inventory
277	Burial 1	Radius	Left	Lateral	Inventory
278	Burial 1	Radius	Left and Right	Superior	Inventory
279	Burial 1	Radius	Left and Right	Inferior	Inventory
280	Burial 1	Radius	Left and Right	Anterior	Inventory - DE
281	Burial 1	Metacarpals	Right	Dorsal	Inventory
282	Burial 1	Metacarpals	Right	Palmar	Inventory
283	Burial 1	Metacarpals	Right	Lateral	Inventory
284	Burial 1	Metacarpals	Right	Medial	Inventory
285	Burial 1	Metacarpals	Right	Proximal bases	Inventory
286	Burial 1	Metacarpals	Right	Distal ends	Inventory
287	Burial 1	Metacarpal 1	Right	Lateral	Inventory
288	Burial 1	Metacarpal 1	Right	Medial	Inventory

	D	E	F	G	H
289	Burial 1	Metacarpal 2	Right	Lateral	Inventory
290	Burial 1	Metacarpal 2	Right	Medial	Inventory
291	Burial 1	Metacarpal 3	Right	Lateral	Inventory
292	Burial 1	Metacarpal 3	Right	Medial	Inventory
293	Burial 1	Metacarpal 4	Right	Lateral	Inventory
294	Burial 1	Metacarpal 4	Right	Medial	Inventory
295	Burial 1	Metacarpal 5	Right	Lateral	Invenotry
296	Burial 1	Metacarpal 5	Right	Lateral	Inventory
297	Burial 1	Scaphoid	Right	Palmar up	Inventory - view from the capitate
298	Burial 1	Scaphoid	Right	Palmar up	Inventory - view from the radius
299	Burial 1	Lunate	Right	Dorsal up	Inventory - view from the capitate
300	Burial 1	Lunate	Right	Palmar down	Inventory - view from the scaphoid
301	Burial 1	Lunate	Right	Palmar down	Inventory - view from the triquetral
302	Burial 1	Triquetral	Right	Lateral up	Inventory - Palmar view
303	Burial 1	Triquetral	Right	Palmar up	Inventory - view from the hamate
304	Burial 1	Greater Multiangular	Right	Palmar up	Inventory - view from the MC2 base
305	Burial 1	Greater Multiangular	Right	Palmar up	Inventory - view from the lateral scaphoid end
306	Burial 1	Greater Multiangular	Right	Palmar up	Inventory - view from scaphoid-trap. boundary
307	Burial 1	Lesser Multiangular	Right	Palmar up	Inventory - view from distal trapezium
308	Burial 1	Lesser Multiangular	Right	Palmar up	Inventory - view from the capitate-scaphoid boundary
309	Burial 1	Capitate	Right	Proximal up	Inventory - view from the hamate
310	Burial 1	Capitate	Right	Proximal up	Inventory - view from the scaphoid-trap. boundary
311	Burial 1	Hamate	Right	Palmar up	Inventory - view from MC4/MC5
312	Burial 1	Hamate	Right	Palmar up	Inventory - view from capitate
313	Burial 1	Hamate	Right	Palmar up	Inventory - view from lunate
314	Burial 1	Metacarpals	Left	Dorsal	Inventory
315	Burial 1	Metacarpals	Left	Palmar	Inventory
316	Burial 1	Metacarpals	Left	Lateral	Inventory
317	Burial 1	Metacarpals	Left	Medial	Inventory
318	Burial 1	Metacarpals	Left	Proximal ends	Inventory
319	Burial 1	Metacarpals	Left	Distal ends	Inventory
320	Burial 1	Scaphoid	Left	Palmar up	Inventory - view from capitate
321	Burial 1	Scaphoid	Left	Palmar up	Inventory - view from radius
322	Burial 1	Lunate	Left	Dorsal up	Inventory - view from capitate
323	Burial 1	Lunate	Left	Palmar up	Inventory - view from scaphoid
324	Burial 1	Lunate	Left	Palmar up	Inventory - view from triquetral

	D	E	F	G	H
325	Burial 1	Triquetral	Left	Palmar up	Inventory - view from hamate
326	Burial 1	Greater Multiangular	Left	Palmar up	Inventory - view from scaphoid-trap. boundary
327	Burial 1	Greater Multiangular	Left	Palmar up	Inventory - view from MC2
328	Burial 1	Capitate	Left	Proximal up	Inventory - view from hamate
329	Burial 1	Capitate	Left	Proximal up	Inventory - view from scaphoid and trapezoid
330	Burial 1	Hamate	Left	Palmar up	Inventory - view from MC4/MC5
331	Burial 1	Hamate	Left	Palmar up	Inventory - view from triquetral
332	Burial 1	Hamate	Left	Palmar up	Inventory - view from capitate
333	Burial 1	Pisiform	Right	Distal is left	Inventory - view from triquetral
334	Burial 1	Pisiform	Right		Inventory - view from proximal
335	Burial 1	Hand	Right	Palmar	Inventory
336	Burial 1	Hand & Wrist	Right	Palmar	Inventory
337	Burial 1	Wrist	Right	Palmar	Inventory
338	Burial 1	Wrist	Right	Palmar	Inventory
339	Burial 1	Wrist	Right	Dorsal	Inventory
340	Burial 1	Wrist	Left	Dorsal	Inventory - with middle finger missing
341	Burial 1	Hand & Wrist	Left	Dorsal	Inventory - with middle finger missing
342	Burial 1	Hand & Wrist	Left	Palmar	Inventory - with middle finger missing
343	Burial 1	Hand & Wrist	Left	Palmar	Inventory - with middle finger missing
344	Burial 1	Hand & Wrist	Left	Palmar	Inventory - with middle finger missing
345	Burial 1	Hand & Wrist	Right	Dorsal	Inventory
346	Burial 1	Hand & Wrist	Right	Dorsal	Inventory
347	Burial 1	Innominate	Both	Anterior	Inventory
348	Burial 1	Innominate	Left and Right	Anterior	Inventory
349	Burial 1	Innominate	Left and Right	Posterior	Inventory
350	Burial 1	Innominate	Right	Anterior	Inventory
351	Burial 1	Innominate	Right	Medial	Inventory
352	Burial 1	Innominate	Right	Lateral	Inventory
353	Burial 1	Innominate	Right	Medial	Inventory
354	Burial 1	Innominate	Right	Lateral	Inventory
355	Burial 1	Innominate	Right	Inferior	Inventory
356	Burial 1	Innominate	Right	Inferior	Inventory
357	Burial 1	Innominate	Right	Superior	Inventory
358	Burial 1	Innominate	Right	Lateral	Greater Sciatic Notch / Focal Bone Loss
359	Burial 1	Innominate	Left	Medial	Greater Sciatic Notch / Auricular Surface
360	Burial 1	Innominate	Left	Medial	Inventory

	D	E	F	G	H
361	Burial 1	Innominate	Left	Lateral	Inventory
362	Burial 1	Innominate	Left	Lateral	Inventory
363	Burial 1	Innominate	Left	Medial	Inventory
364	Burial 1	Innominate	Left	Posterior	Inventory
365	Burial 1	Innominate	Left	Lateral	Acetabulum (bad focus)
366	Burial 1	Innominate	Left	Lateral	Acetabulum
367	Burial 1	Innominate	Right	Lateral	Acetabulum
368	Burial 1	Innominate	Right	Lateral	Acetabulum
369	Burial 1	Innominate	Right	Inferior	Ischiopubic ramus
370	Burial 1	Innominate	Left	Superior	Inventory
371	Burial 1	Innominate	Left	Medial	Surface of Pubic Symphysis (age)
372	Burial 1	Innominate	Right	Medial	Surface of Pubic Symphysis (age)
373	Burial 1	Innominate	Left and Right	Medial	close-up - pubic symphysis
374	Burial 1	Innominate	Right	Medial	Auricular Surface
375	Burial 1	Innominate	Left	Medial	Auricular surface
376	Burial 1	Innominate	Left	Medial	Auricular surface
377	Burial 1	Innominate	Right	Medial	WBSC - Close-up
378	Burial 1	Innominate	Left	Inferior	ischio-pubic ramus
379	Burial 1	Coccyx		Posterior	Inventory
380	Burial 1	Coccyx		Anterior	Inventory
381	Burial 1	Coccyx		Superior	Inventory
382	Burial 1	Innominate Frags			Innominate fragments
383	Burial 1	Femora	Left and Right	Anterior	Inventory
384	Burial 1	Femora	Left and Right	Posterior	Inventory
385	Burial 1	Femora	Left and Right	Lateral	Inventory
386	Burial 1	Femora	Left and Right	Medial	Inventory
387	Burial 1	Femora	Left and Right	Superior	Inventory
388	Burial 1	Femora	Left and Right	Inferior	Inventory
389	Burial 1	Femora	Left	Anterior	Inventory
390	Burial 1	Femora	Left	Posterior	Inventory
391	Burial 1	Femora	Left	Lateral	Inventory
392	Burial 1	Femora	Left	Medial	Inventory
393	Burial 1	Femora	Right	Anterior	Inventory
394	Burial 1	Femora	Right	Posterior	Inventory
395	Burial 1	Femora	Right	Lateral	Inventory
396	Burial 1	Femora	Right	Medial	Inventory

	D	E	F	G	H
397	Burial 1	Femora	Left	Superior	Inventory
398	Burial 1	Femora	Right	Superior	Inventory
399	Burial 1	Femora	Right	Inferior	Inventory
400	Burial 1	Femora	Left	Inferior	Inventory
401	Burial 1	Femora	Left	Anterior	Inventory - PE
402	Burial 1	Femora	Left	Anterior	Inventory - DE
403	Burial 1	Femora	Right	Anterior	PE/P1 Inventory
404	Burial 1	Femora	Right	Posterior	PE/P1 Inventory
405	Burial 1	Femora	Right	Posterior	PE/P2 Inventory
406	Burial 1	Femora	Right	Medial	PE/P1 Inventory
407	Burial 1	Femora	Right	Anterior	PE/P2 Inventory
408	Burial 1	Femora	Right	Lateral	PE/P2 Inventory
409	Burial 1	Femora	Right	Lateral	M1 Inventory
410	Burial 1	Femora	Right	Posterior	M1 Inventory
411	Burial 1	Femora	Right	Medial	M1 Inventory
412	Burial 1	Femora	Right	Anterior	M1 Inventory
413	Burial 1	Femora	Right	Anterior	DE/D2 Inventory
414	Burial 1	Femora	Right	Lateral	DE/D2 Inventory
415	Burial 1	Femora	Right	Posterior	DE/D2 Inventory
416	Burial 1	Femora	Right	Medial	DE/D2 Inventory
417	Burial 1	Femora	Left and Right	Anterior	PE/P1 Inventory
418	Burial 1	Femora	Left and Right	Lateral	M1 Inventory
419	Burial 1	Femora	Left and Right	Posterior	M1 Inventory
420	Burial 1	Femora	Left and Right	Medial	M1 Inventory
421	Burial 1	Femora	Left and Right	Anterior	DE/D1 Inventory
422	Burial 1	Femora	Left and Right	Medial	DE/D1 Inventory
423	Burial 1	Femora	Left and Right	Posterior	DE/D1 Inventory
424	Burial 1	Femora	Left and Right	Lateral	DE/D1 Inventory
425	Burial 1	Patellae	Left and Right	Anterior	Inventory (inverted)
426	Burial 1	Patellae	Left and Right	Inferior	
427	Burial 1	Patellae	Left and Right	Superior	
428	Burial 1	Patellae	Left and Right	Medial	
429	Burial 1	Patellae	Left and Right	Lateral	
430	Burial 1	Patellae	Left and Right	Lateral	
431	Burial 1	Patellae	Left and Right	Posterior	ARLP
432	Burial 1	Knee	Right	Lateral	

	D	E	F	G	H
433	Burial 1	Knee	Right	Anterior	
434	Burial 1	Knee	Right	Anterior	
435	Burial 1	Knee	Right	Anterior	
436	Burial 1	Knee	Right	Lateral	
437	Burial 1	Knee	Right	Medial	
438	Burial 1	Knee	Left	Medial	
439	Burial 1	Knee	Left	Anterior	
440	Burial 1	Knee	Left	Anterior	
441	Burial 1	Knee	Left	Lateral	
442	Burial 1	Tibiae	Left and Right	Anterior	Inventory
443	Burial 1	Tibiae	Left and Right	Posterior	Inventory
444	Burial 1	Tibiae	Left and Right	Medial	Inventory
445	Burial 1	Tibiae	Left and Right	Lateral	Inventory
446	Burial 1	Tibiae	Left and Right	Posterior	Proximal end - use for path
447	Burial 1	Tibia	Left and Right	Superior	Proximal epiphysis - articular facets
448	Burial 1	Tibia	Left and Right	Inferior	Distal epiphysis - articular facets
449	Burial 1	Tibia	Right	Anterior	Proximal end - Tibial crest
450	Burial 1	Tibia	Right	Medial	Periostitis
451	Burial 1	Tibia	Right	Medial	Proximal 1/3 - periostitis
452	Burial 1	Tibia	Left	Anterior	Proximal end - Tibial crest
453	Burial 1	Tibia	Left	Medial	Periostitis
454	Burial 1	Fibulae	Left and Right	Anterior	Inventory
455	Burial 1	Fibulae	Left and Right	Posterior	Inventory
456	Burial 1	Fibulae	Left and Right	Lateral	Inventory
457	Burial 1	Fibulae	Left and Right	Lateral	Inventory
458	Burial 1	Fibulae	Left and Right	Superior	Inventory
459	Burial 1	Fibulae	Left and Right	Inferior	Inventory
460	Burial 1	Fibulae	Left and Right	Lateral	Distal epiphysis
461	Burial 1	Fibulae	Left and Right	Medial	Proximal epiphysis
462	Burial 1	Fibula	Left	Posterior	Periostitis
463	Burial 1	Fibula	Left	Medial	close-up
464	Burial 1	Ankle	Right	Anterior-Lateral	Inventory
465	Burial 1	Ankle	Right	Posterior-Lateral	Inventory
466	Burial 1	Foot	Right	Superior	Inventory
467	Burial 1	Foot	Right	Medial	Inventory
468	Burial 1	Foot	Right	Lateral	Inventory

	D	E	F	G	H
469	Burial 1	Foot	Right	Plantar	Inventory
470	Burial 1	Foot	Left	Superior	Inventory
471	Burial 1	Foot	Left	Lateral	Inventory
472	Burial 1	Foot	Left	Medial	Inventory
473	Burial 1	Foot	Left	Plantar/ inferior	Inventory
474	Burial 1 and Burial	Crania		Anterior	
475	Burial 1 and Burial	Crania		Anterior	
476	Burial 1 and Burial	Crania		Anterior	
477	Burial 1 and Burial	Crania		Anterior	
478	Burial 1 and Burial	Crania		Anterior	
479	Burial 1 and Burial	Crania		Anterior	
480	Burial 1 and Burial	Crania		Posterior	Shows difference in mastoid
481	Burial 1 and Burial	Mandibles		Superior	
482	Burial 1 and Burial	Mandibles		Anterior	Better in full crania shots

Appendix II

INVENTORY RECORDING FORM FOR COMPLETE SKELETONS

Site Name/ Number Guana Observers Fred Lumb
 Feature/ Burial Number Burial 2 Date 17 May 2005
 Burial/ Skeleton Number
 Present Location of Collection Institute for Historical Biology

1 = >75% present = complete

2 = 25% - 75% = partial

3 = <25% present = poor

CRANIAL BONES AND JOINT SURFACES

	L (left)	R (right)		L (left)	R (right)
Frontal	2	2	Sphenoid	1	1
Parietal	1	1	Zygomatic	1	1
Occipital	1	1	Maxilla	-	1
Temporal	1	1	Palatine	-	-
TMJ	1	1	Mandible	1	1

POSTCRANIAL BONES AND JOINT SURFACES

	L	R		L	R
Clavicle	-	-	Os Coxae		
Scapula			Ilium	-	-
Body	-	-	Ischium	-	-
Glenoid f.	-	-	Pubis	-	-
Patella	-	-	Acetabulum	-	-
Sacrum	-	-	Auric. Surface	-	-
Coccyx	-	-			

VERTEBRAE (individual)

Centrum Neural Arch

C1	-	-
C2	-	-
C7	-	-
T10	-	-
T11	-	-
T12	-	-
L1	-	-
L2	-	-
L3	-	-
L4	-	-
L5	-	-

VERTEBRAE (group)

#Present/ #Complete

	Centra	Neural Arches
C3-6	-/-	-/-
T1-T9	-/-	-/-
Sternum:	Manubrium	Body
	-	-

RIBS (individual)

L R

1st	-	-
2nd	-	-
11th	-	-
12th	-	-

RIBS (grouped)

#Present/ #Complete

	L	R	Unsid
3-10	/	/	/

Site Name/ Number Guana

Observer

Fred Lumb

Feature/ Burial Number

Burial 2

Date

17 May 2005

Burial/ Skeleton Number

Present Location of Collection

Institute for Historical Biology

LONG BONES

Diaphysis

	Proximal Epiphysis	Proximal Third	Middle Third	Distal Third	Distal Epiphysis
Left Humerus	-	-	-	-	-
Right Humerus	-	-	-	-	-
Left Radius	-	-	-	-	-
Right Radius	-	-	-	-	-
Left Ulna	-	-	-	-	-
Right Ulna	-	-	-	-	-
Left Femur	-	-	-	-	-
Right Femur	-	-	-	-	-
Left Tibia	-	-	-	-	-
Right Tibia	-	-	-	-	-
Left Fibula	-	-	-	-	-
Right Fibula	-	-	-	-	-
Left Talus	-				
Right Talus	-				
Left Calcaneus	-				
Right Calcaneus	-				

HAND (#Present/ #Complete)

	<u>L</u>	<u>R</u>	<u>Unsided</u>
# Carpals	-/-	-/-	
# Metacarpals	-/-	-/-	
# Phalanges	-/-	-/-	

FOOT (# Present/# Complete)

	<u>L</u>	<u>R</u>	<u>Unsided</u>
# Tarsals	-/-	-/-	
#Metatarsals	-/-	-/-	
#Phalanges	-/-	-/-	

Institute for Historical Biology

Dental Measurement Form

Site Name/ Number: Guana

Observer: Shannon Mahoney

Feature/Burial Number: Burial 2

Date 20 May 2005

Burial/ Skeleton Number:

TOOTH MEASUREMENTS (mm) TOOTH MEASUREMENTS (mm)

Left Max.		MD	BL	CH	Right Max.		MD	BL	CH
9	¹ I	unobservable: absent			1	M ³	8.66	11.12	7.16
10	² I	unobservable: absent			2	M ²	9.14	11.66	6.74
11	^x C	unobservable: absent			3	M ¹	9.28	11.38	6.58
12	¹ P	unobservable: absent			4	P ²	7.12	9.55	6.43
13	² P	unobservable: absent			5	P ¹	6.38	9.44	7.04
14	¹ M	unobservable: absent			6	C ^x	unobservable: absent		
15	² M	unobservable: absent			7	I ²	unobservable: absent		
16	³ M	unobservable: absent			8	I ¹	unobservable: absent		
Left Mand.		MD	BL	CH	Right Mand.		MD	BL	CH
17	³ M	10.96	9.99	7.24	25	I ₁	5.23	5.30	8.02
18	² M	unobservable: absent			26	I ₂	6.17	6.21	8.29
19	¹ M	11.22	9.78	6.59	27	C _x	7.12	7.09	8.98
20	² P	7.48	6.53	5.25	28	P ₁	7.16	7.35	6.92
21	¹ P	6.93	7.50	7.06	29	P ₂	7.48	6.98	7.20
22	^x C	6.41	7.14	8.73	30	M ₁	10.19	11.11	5.76
23	² I	5.66	6.26	7.97	31	M ₂	unobservable: absent		
24	¹ I	unobservable: absent			32	M ₃	10.69	10.06	7.32

Institute for Historical Biology

Enamel Defect Measurement

Specimen # Burial 2

Observer & Date Mark Kostro and Fred Lumb 5-24-05
Autumn Barrett 6/26/05

Maxilla

Mandible

Tooth	CH	/ Def Type	/Inc	/Cerv	/Bil		Tooth	CH	/Def Type	Inc/	/Cor	/Bil
I ¹							I ₁					
I ²							I ₂					
C ¹							C ₁		HP	3.20	2.90	
									HP	5.99	5.45	
									HP	5.22	4.94	
PM ¹							PM ₁		HC	6.92	3.13	
PM ²							PM ₂	Possible	HC	7.20	2.24	
M ¹							M ₁		HC	5.54	2.17	Y
							(right)					
M ²		HC Cream/ white color	4.90		R		M ₂	tooth absent				
M ³		HC	7.16	2.35	R		M ₃	7.32	HP Linear Horiz. Grooves	2.18	.90	No
							(Right)					
									HC	Occl (Damage).	2.45	Yes, (slightly diff)

Institute for Historical Biology ANTHROPOMETERIC RECORD							
Burial Number: Guana Burial 2				First Set of Measurements			
Category:							
Recorder: S. Mahoney & A. Barrett							
Date:							
CRANIAL MEASUREMENTS (Pages 53-62)							
ALL MEASUREMENTS IN mm							
	1st Set	2nd Set	Final		1st Set	2nd Set	Final
1.) MAXIMUM LENGTH (g-op):	not observable	not observable		13.) NASAL HEIGHT (n-ns):	not observable	not observable	
2.) MAXIMUM BREADTH (eu-eu):	127.84	128.92	128.38	14.) NASAL Breadth (al-al):	not observable	not observable	
3.) BIZYGOMATIC BREADTH (zy-zy):	126.68	127.12	126.9	15.) ORBITAL BREADTH (mf-ec):	35.48	37.5	36.49
4.) BASION-BREGMA (ba-b):	130.96	130.46	130.71	16.) ORBITAL HEIGHT:	not observable	not observable	
5.) CRANIAL BASE LENGTH (ba-n):	130.55	99.5	115.025	17.) BIORBITAL BR. (ec-ec):	not observable	not observable	
6.) BASION-PROSTHION L. (ba-pr):	not observable	not observable		18.) INTEROBITAL BR. (mf-mf):	not observable	not observable	
7.) MAX. -ALVEOLAR BR. (ecm-ecm):	not observable	not observable		19.) FRONTAL CHORD (n-b):	104.95	106.35	105.65
8.) MAX. -ALVEOLAR L. (pr-alv):	not observable	not observable		20.) PARIETAL CHORD (b-l):	106.18	107.24	106.71
9.) BIAURICULAR BREADTH (au-aw):	116.79	116.73	116.76	21.) OCCIPITAL CHORD (l-o):	88.87	89.6	89.235
10.) UPPER FACIAL HGT. (n-pr):	not observable	not observable		22.) FORAMEN MAGNUM L. (ba-o):	31.68	32.3	31.99
11.) MIN. FRONTAL BR. (ft-ft):	not observable	not observable		23.) FORAMEN MAGNUM BR.:	25.64	25.16	25.4
12.) UPPER FACIAL BR. (fmt-fmt):	not observable	not observable		24.) MASTOID LENGTH:	28.08	20.88	24.48
MANDIBULAR MEASUREMENTS (Pages 62-65)							
25.) CHIN HEIGHT (gn-id):	34.05	35.65	34.85	30.) MIN. RAMUS BREADTH:	32.29	32.69	32.49
26.) BODY HEIGHT at MENTAL FOR:	31.93	30.45	31.19	31.) MAX. RAMUS BREADTH:	37.87	38.52	38.195
27.) BODY THICKNESS at M. FOR:	12.52	12.45	12.485	32.) MAX. RAMUS HEIGHT:	48	49.5	48.75
28.) BIGONIAL DIAMETER (go-go):	87.55	84.95	86.25	33.) MAND. LENGTH:	80.51	79	79.755
29.) BICONDYLAR BR. (cdl-cdl):	109.39	109.27	109.33	34.) MAND. ANGLE:	28	26.5	27.25

Primary NonMetric Traits Recording Form
Institute for Historical Biology

Site Guana

Burial Burial 2

L M R

1. Metopic Suture

0 = absent
1 = partial
2 = complete
9 = unobservable

0

2. Supraorbital Structures

a. Supraorbital Notch

0 = absent
1 = present, < 1/2 occluded by spicules
2 = present, > 1/2 occluded by spicules
3 = present, degree of occlusion unknown
4 = multiple notches
9 = unobservable

9

0

b. Supraorbital Foramen

0 = absent
1 = present
2 = multiple foramina
9 = unobservable

9

1

3. Infraorbital Suture

0 = absent
1 = partial
2 = complete
9 = unobservable

9

9

4. Multiple Infraorbital Foramina

0 = absent
1 = internal division only
2 = two distinct foramina
3 = more than two distinct foramina
9 = unobservable

9

0

5. Zygomatico-facial Foramina

0 = absent
1 = 1 large
2 = 1 large plus smaller f.
3 = 2 large
4 = 2 large plus smaller f.
5 = 1 small
6 = multiple small
9 = unobservable

6

6

6. Parietal Foramen

0 = absent
1 = present, on parietal
2 = present, sutural
9 = unobservable

2

2

Page 1 of 2

Observer Shannon Mahoney

Date 20 May 2005

L M R

7. Sutural Bones

0 = absent
1 = present
9 = unobservable

a. epipteric bone:

9

0

b. coronal ossicle

0

0

c. bregmatic bone

0

d. sagittal ossicle:

0

e. apical bone:

0

f. lambdoid ossicle bone:

0

1

g. asterionic bone:

0

0

h. ossicle in occipito-mastoid suture:

0

0

i. parietal notch bone:

0

8. Inca Bone

0 = absent
1 = complete, single bone
2 = bipartite
3 = tripartite
4 = partial
9 = unobservable

0

9. Condylar Canal

0 = not patent
1 = patent
9 = unobservable

1

1

10. Divided Hypoglossal Canal

0 = absent
1 = partial, internal surface
2 = partial, within canal
3 = complete, internal surface
4 = complete, within canal
9 = unobservable

0

0

11. Flexure of Superior Sagittal Sulcus

1 = Right
2 = Left
3 = Bifurcate
9 = Unobservable

2

12. Foramen Ovale Incomplete

0 = absent
1 = partial formation
2 = no definition of foramen
9 = unobservable

0

0

Primary NonMetric Traits Recording Form

Observer Shannon Mahoney

	L	M	R
13. Foramen Spinosum Incomplete 0 = absent 1 = partial formation 2 = no definition of forament 9 = unobservable		0	
14. Pterygo-spinous Bridge 0 = absent 1 = trace (spicule only) 2 = partial bridge 3 = complete bridge 9 = unobservable		not observed	
15. Pterygo-alar Bridge 0 = absent 1 = trace (spicule only) 2 = partial bridge 3 = complete bridge 9 = unobservable		not observed	
16. Tympanic Dihiscence 0 = absent 1 = foramen only 2 = full defect present 9 = unobservable	0		0
17. Auditory Exostosis: 0 = absent 1 = <1/3 canal occluded 2 = 1/3 - 2/3 canal occluded 3 = > 2/3 canal occluded 9 = unobservable	0		0
18. Mastoid Foramen a. Location 0 = absent 1 = temporal 2 = sutural 3 = occipital 4 = both sutural and temporal 5 = both occipital and temporal 9 = unobservable b. Number 0 = absent 1 = 1 2 = 2 3 = more than 2 9 = unobservable	0		0

	L	M	R
19. Mental Foramen 0 = absent 1 = 1 2 = 2 3 = >2 9 = unobservable	1		1
20. Mandibular Torus 0 = absent 1 = trace (can palpate but not see) 2 = moderate: elevation between 2 - 5 mm. 3 = marked: elevation greater than 5 mm. 9 = unobservable	0		0
21. Mylohyoid Bridge a. Location 0 = absent 1 = near mandibular forament 2 = center of groove 3 = both bridges described in 1) and 2) with hiatus 4 = both bridges described in 1) and 2) no hiatus 9 = unobservable b. Degree: 0 = absent 1 = partial 2 = complete 9 = unobservable	0		0
22. Atlas Bridging a. Lateral Bridging 0 = absent 1 = partial 2 = complete 9 = unobservable b. Posterior Bridging 0 = absent 1 = partial 2 = complete 9 = unobservable		not observable	
23. Accessory Transverse Foramina - in 7th Cervical Vertebra 0 = absent 1 = partial 2 = complete 9 = unobservable		not observable	
24. Septal Aperture 0 = absent 1 = small foramen (pinhole) only 2 = true perforation 9 = unobservable		not observable	



001_Guana_117.JPG



002_Guana_121.JPG



003_Guana_122.JPG



004_Guana_118.JPG



005_IMG_0471.JPG



006_IMG_0479.JPG



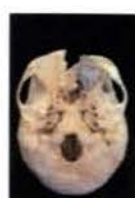
007_IMG_0497.JPG



008_IMG_0489.JPG



009_IMG_0498.JPG



010_IMG_0501.JPG



011_IMG_0515.JPG



012_IMG_0516.JPG



013_IMG_0525.JPG



014_img_0577.jpg



015_img_0588.jpg



016_IMG_0522.JPG



017_IMG_0580.JPG



018_IMG_0529.JPG



019_IMG_0532.JPG



020_IMG_0572.JPG



021_IMG_0573.JPG



022_IMG_0574.JPG



023_IMG_0579.JPG



024_img_0589.jpg



025_IMG_1490.JPG



026_IMG_1493.JPG



027_IMG_1494.JPG



028_IMG_1495.JPG



029_IMG_0536.JPG



030_IMG_0538.JPG



031_IMG_0541.JPG



032_IMG_1496.JPG



033_IMG_1497.JPG



034_IMG_1498.JPG



035_IMG_1500.JPG



036_IMG_0570.JPG



037_IMG_0551.JPG



038_IMG_0560.JPG



039_IMG_0563.JPG



040_IMG_0567.JPG



041_IMG_0584.JPG



042_IMG_0586.JPG



043_IMG_0587.JPG



044_IMG_1711.JPG



045_IMG_1713.JPG



046_IMG_1714.JPG



047_IMG_1689.JPG



048_IMG_1690.JPG



049_IMG_1511.JPG



050_IMG_1512.JPG



051_IMG_1513.JPG



052_IMG_1514.JPG



053_IMG_1515.JPG



054_IMG_1516.JPG



055_IMG_1517.JPG



056_IMG_1520.JPG



057_IMG_1522.JPG

Date	Project	Photo ID	Burial ID	Element	Side	Aspect	Comments
5/15/2005	Guana	IMG_117	Burial 2	Cranium / Mandible			Pre-Cleaning Inventory
5/15/2005	Guana	IMG_121	Burial 2	Cranium / Mandible		Anterior	Pre-Cleaning Inventory
5/15/2005	Guana	IMG_122	Burial 2	Mandible		Superior	Pre-Cleaning Inventory
5/15/2005	Guana	IMG_118	Burial 2	Atlas / Zygomatic / Frontal			Pre-Cleaning Inventory
6/7/2005	Guana	IMG_471	Burial 2	Skull		Anterior	Inventory
6/7/2005	Guana	IMG_479	Burial 2	Skull	Right		Inventory
6/7/2005	Guana	IMG_497	Burial 2	Skull	Left		Inventory
6/7/2005	Guana	IMG_489	Burial 2	Skull	Left	Posterior	Porocity (PHAH) on Parietal Bone at Asterion
6/7/2005	Guana	IMG_498	Burial 2	Skull	Left	Posterior	Detail of porocity (PHAH) on Parietal Bone at Asterion
6/7/2005	Guana	IMG_501	Burial 2	Skull		Inferior	Inventory
6/7/2005	Guana	IMG_515	Burial 2	Skull		Posterior	Inventory
6/7/2005	Guana	IMG_516	Burial 2	Skull		Superior	Inventory - Camera Angle is slightly posterior
6/7/2005	Guana	IMG_525	Burial 2	Skull		Superior	Inventory
6/8/2005	Guana	IMG_577	Burial 2	Cranium		Superior	Sagittal suture
6/8/2005	Guana	IMG_588	Burial 2	Occipital		Posterior	Suture close-up
6/7/2005	Guana	IMG_522	Burial 2	Skull		Superior	Detail of porocity (PHAH) on Parietal Bone at Bregma
6/8/2005	Guana	IMG_580	Burial 2	Cranium	Right	Posterior	PHAH
6/7/2005	Guana	IMG_529	Burial 2	Skull	Right	Inferior	Detail of orbital plate (PHAH)
6/7/2005	Guana	IMG_532	Burial 2	Skull		Anterior	Cranium only - inventory
6/8/2005	Guana	IMG_572	Burial 2	Sphenoid & Occipital		Inferior	Inventory
6/8/2005	Guana	IMG_573	Burial 2	Sphenoid & Temporal	Left	Inferior	Exostoses - close-up
6/8/2005	Guana	IMG_574	Burial 2	Occipital		Inferior	Condyles - close-up of facets
6/8/2005	Guana	IMG_579	Burial 2	Temporal	Right	Lateral	Mastoid and external auditory meatus
6/8/2005	Guana	IMG_589	Burial 2	Temporal and External Auditory Meatus	Left	Lateral	Close-up
6/17/2005	Guana	IMG_1490	Burial 2	Vomer		Anterior	
6/17/2005	Guana	IMG_1493	Burial 2	Vomer		Posterior	
6/17/2005	Guana	IMG_1494	Burial 2	Vomer	Left	Lateral	
6/17/2005	Guana	IMG_1495	Burial 2	Vomer	Right	Lateral	
6/7/2005	Guana	IMG_536	Burial 2	Maxilla	Right	Inferior	Occlusal surfaces - inventory
6/7/2005	Guana	IMG_538	Burial 2	Maxilla	Right	Lateral	Buccal view - inventory
6/7/2005	Guana	IMG_541	Burial 2	Maxilla	Right	Medial	Lingual view - Inventory
6/17/2005	Guana	IMG_1496	Burial 2	Maxilla		Superior	Palatine and Max - Palate
6/17/2005	Guana	IMG_1497	Burial 2	Maxilla		Inferior	Max and Palatine - Palate
6/17/2005	Guana	IMG_1498	Burial 2	Incus	Left		
6/17/2005	Guana	IMG_1500	Burial 2	Cranial Frags			Cranial fragments
6/7/2005	Guana	IMG_570	Burial 2	Mandible		Superior	Inventory

6/7/2005	Guana	IMG_551	Burial 2	Mandible		Anterior	Inventory
6/7/2005	Guana	IMG_560	Burial 2	Mandible		Posterior	Inventory
6/7/2005	Guana	IMG_563	Burial 2	Mandible	Right		Inventory
6/7/2005	Guana	IMG_567	Burial 2	Mandible	Left		Inventory
6/8/2005	Guana	IMG_584	Burial 2	Mandible	Right	Lateral	Buccal view - dentition
6/8/2005	Guana	IMG_586	Burial 2	Mandible	Right	Anterior	Anterior teeth
6/8/2005	Guana	IMG_587	Burial 2	Mandible	Right	Lateral	Buccal
7/25/2005	Guana	IMG_1711	Burial 2	Mandible	Left	Lateral	Inventory
7/25/2005	Guana	IMG_1713	Burial 2	Mandible	Left	Medial	showing M2 abcess
7/25/2005	Guana	IMG_1714	Burial 2	Mandible	Right	Medial	good shot; M2 socket and M3 fracture/ carious lesion
7/25/2005	Guana	IMG_1689	Burial 2	Mandible	Left	Lateral	close-up pipe wear facet
7/25/2005	Guana	IMG_1690	Burial 2	Mandible	Right	Lateral	close-up pipe wear facet
6/17/2005	Guana	IMG_1511	Burial 1 and	Crania		Anterior	
6/17/2005	Guana	IMG_1512	Burial 1 and	Crania		Anterior	
6/17/2005	Guana	IMG_1513	Burial 1 and	Crania		Anterior	
6/17/2005	Guana	IMG_1514	Burial 1 and	Crania		Anterior	
6/17/2005	Guana	IMG_1515	Burial 1 and	Crania		Anterior	
6/17/2005	Guana	IMG_1516	Burial 1 and	Crania		Anterior	
6/17/2005	Guana	IMG_1517	Burial 1 and	Crania		Posterior	Shows difference in mastoid
6/17/2005	Guana	IMG_1520	Burial 1 and	Mandibles		Superior	
6/17/2005	Guana	IMG_1522	Burial 1 and	Mandibles		Anterior	Better in full crania shots