THE CONSERVATION, EXCAVATION, AND ANALYSIS OF ANCIENT HUMAN REMAINS: A BIOARCHAEOLOGICAL CASE STUDY OF PREHISTORIC REBURIALS FROM NEVIS, WEST INDIES

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by

Marissa N. Massaro

APPROVED FOR THE DEPARTMENT OF ANTHROPOLOGY

SAN JOSÉ STATE UNIVERSITY

August 2018

Marco Meniketti, Ph.D.	Department of Anthropology
Elizabeth Weiss, Ph.D.	Department of Anthropology
Lorna Pierce, Ph.D.	Department of Anthropology

ABSTRACT

In the summer of 2015, the cranium of what seemed to be an indigenous Caribbean individual was discovered partially exposed on White's Bay Beach, Nevis. The following year, upon excavation of two known burial sites, a test pit brought forth an additional burial of two individuals dating about 1025-1275 AD. Currently, there is very little known about this period causing confusion about the migration and settlement patterns of the Caribbean people during this time. Additionally, the Nevis Historical and Conservation Society is experiencing rising concerns of the demolition and utilization of their historical land and beaches for infrastructural development. As the tourist economy and access to the internet have increased, economic development has become far more important to developers and landowners than land preservation. As a result, this has caused an increase in beach erosion and historically documented and undocumented lands are being developed, erasing the cultures and histories present on this land. This thesis argues that a case study of prehistoric human remains found on White's Bay Beach can be used to describe and better understand the culture, customs, and heritage, of both the current and indigenous population on Nevis. It can also help educate and inform the current Nevisian residents on the importance of decreasing construction and preserving these lands. Traditional excavation methods and a combination of visual and metric observations were used to collect skeletal data. The results of this case study found that these burials belonged to the Taíno people, providing valuable information that will allow a better understanding of the Caribbean people during the end of the Ostionoid period (600-1500 CE).

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This project would never have emerged if the Taíno peoples had not been discovered on Nevis, so my eternal thanks goes out to the Taíno people and their ancestors. Likewise, I thank Chris Keith for his previous research and excavation of Taoüa the Carib, as well as, for the support and guidance throughout the initial thesis writing and preparation processes. Erika Harvey, thank you for being there for me for moral support throughout the 2016 Nevis Field School. Kanak Somani and Elaine Foster deserve special thanks for their tedious and careful excavation techniques, as the delicate remains discovered in the test pit could have easily been lost. Sarah Hawks, Denise Frazier, and Tim Rodriguez, thank you for your assistance in the excavation and measuring processes. To the 2016 Nevis field crew, thank you for your help surveying White's Bay Beach and the Hamilton Estate. I wish you all the best in your studies and through your journey in your careers in anthropology.

To my parents Michelle and Peter Massaro, without your devoted moral support and encouragement every single step of the way and financial support throughout my undergraduate studies, I would never have made it this far. I truly feel you two are the backbone to my successes. Thank you for always inspiring me to be great.

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CHAPTER 1

Introduction

In the summer of 2015, during a preliminary survey and analysis of various known historical sites on White's Bay Beach, Nevis, Dr. Marco Meniketti, three California graduate students, and myself discovered a partially exposed cranium of what seemed to be an indigenous Caribbean individual. After obtaining a permit from the Nevis Historical and Conservation Society, a return trip was planned for the following summer to excavate the discovered cranium and an additional known burial site just north of the skull. Upon excavation of a test pit, a burial containing the remains of two additional individuals was discovered.

Previously, in 2011, the remains of a prehistoric female dating to approximately 1050 CE were found on Nevis by Chris Keith and Dr. Marco Meniketti. Radiocarbon dating of four individuals excavated in 2016 confirms that they are placed within the same period of time as the remains excavated by Keith in 2011. It is important to point out that the recent excavations of these four individuals are being placed in a time period within Caribbean history that is strongly debated by archaeologists and anthropologists. The ethnographic, historical, anthropological, archaeological, and osteological data from this time period are all rare and inconsistent (Rouse 1964, 1977; A. Bullen and R. Bullen 1975; Allaire 1980, 1997a, 1997b; Wilson 1989; Davis and Goodwin 1990; Haviser 1997; Keegan 2000; Keith 2014). These inconsistencies make both the excavation and conservation of this site more relevant because these finding contribute a new knowledge base pertaining to the prehistoric Nevis that fits in line with the previous studies conducted by Rouse (1964, 1977), Allaire (1980, 1997a, 1997b), and Wilson (1989). In order to build on current knowledge and understanding of Nevisian culture, their heritage, and where this indigenous population originated, this thesis will focus on the population of the Taíno, describing their culture and customs. While the current residents of Nevis are not descendants of these prehistoric skeletons, these findings are still relevant because this is their home, and these remains are a part of their Nevisian heritage.

There has been much debate among scholars on topics of population, migration, and settlement patterns among the various indigenous populations within the Caribbean (Allaire 1980, 1997a, 1997b, 2008; Wilson 1989, 2006; Davis and Goodwin 1990; Golding-Frankson 2009; Fitzpatrick and Ross 2010; Pestle 2013; Giovas and Fitzpatrick 2014; Hofman et al. 2014; Torres 2014). According to Rouse, the Caribbean was without human occupants until about 5000 years ago when the indigenous American peoples first migrated from Central and South America to this land (Rouse 1964, 1977; Anderson-Cordova 2017). Moreover, there were numerous significant migrations into the Caribbean by navigating short distances from island to island. It is believed that these migrations began as early as 4000-3000 BCE (Before Common Era) and continued to the time of the European contact in 1492 CE, when the Carib and Taíno (also known as Arawak peoples) inhabited the islands (Taylor 1949; Allaire 1980, 1997; Keegan and MacLachlan 1989; Wilson 1989, 1997; Snyder et al. 2011; Fraser 2014; Keith 2014; Rodriguez Lopez 2016; Anderson-Cordova 2017). Prior to European contact, the Casimiroid people, named after the stone tool technology, mainly consisting of large blades and cores, occupied Nevis during the Ostionoid period (circa 600-1500 CE)

(Wilson 1989; Allaire 1997a; Keith 2014). The Ostionoid period was viewed as a time of new migration of people emerging out of the northern South American coastal areas and dispersing throughout the Antilles (National Parks Service 1996). Although this group occupied the Caribbean until approximately 3000-2500 BCE, it is still unclear as whether they first originated in the northeastern parts of South America or from the east coast of Central America. Evidence suggests that this population originally migrated from off the coast of Belize (Rouse 1964; Wilson 1989; Allaire 1997a; Keith 2014).

The debate of the migratory patterns into the Caribbean has again been raised by Anderson-Cordova with her recent novel *Surviving Spanish Conquest* (2017). As previously hypothesized, the islands of the Caribbean were inhabited by two distinct cultures, those who occupied the Greater Antilles and the Bahamas and those who were called the Taíno, who inhabited the Lesser Antilles (Anderson-Cordova 2017). Links between the Taíno and the Spanish have existed since their first contact. Because the Spanish did not colonize the Lesser Antilles to the extent they did Greater Antilles, the historical records from the sixteenth-century lack detail, but illustrate an existence of native peoples distinct from the Taíno throughout the Lesser Antilles (National Parks Service 1996; Anderson-Cordova 2017). In contrast, there are some scholars who argue that the Caribs never existed; instead, they were merely a mythological construction of the Spanish (Sued Badillo 1978). Therefore, differences among the Indians in the Greater and Lesser Antilles should be dismissed, and they should all be categorized as the Taíno (Sued Badillo 1978). It is for this reason that the controversy about the cultural relationships and interactions between the "Caribs," Taíno, and the Indians of the Greater

Antilles still exists to this day, thus, leaving the origins and historical relationships of the inhabitants of the Lesser Antilles open for various interpretations.

The Casimiroid peoples were the only inhabitants in the Caribbean for about 1000 years (Wilson 1989, 1997; Allaire 1997a). Between 3000 and 2500 BCE, a second wave of stone tool technology begins to emerge in the Caribbean, different enough from the Casimiroid people that archaeologists believe it to be a completely separate culture (Allaire 1997a; Wilson 1997; Keith 2014). The Ortoroid tool kit consisted of ground stone tools, axes, and pestles, as well as tools made of animal bone and shells; prior to this, these technologies were absent from the Caribbean archaeological record (Allaire 1997a; Wilson 1997; Keith 2014). Archaeologists concluded that the origins of the Ortoroid culture could be traced to South America; archaeological evidence suggests that these people migrated and settled in Cuba, Hispaniola, and some parts of the Lesser Antilles until about 500 BCE (Wilson 1989, Rouse 1992; Keegan 1994; Allaire 2008; Keith 2014).

Around this same time, the Saladoid culture appears in the archaeological record and completely encompassing the Caribbean archaeological record by around 200 BCE; according to these records, within a century or two of contact, the Saladoid peoples completely replace the Ortoroid peoples (Wilson 1989, 1997; Allaire 1997a; Haviser 1997; Righter 1997; Keegan 2000). Archaeologists differentiate the Saladoid culture from that of the Casimiroid and Ortoroid cultures because the Saladoid people were sedentary agriculturalists who utilized ceramic technology (Wilson 1989; Davis and Goodwin 1990; Keegan 2000; Golding-Frankson 2009; Giovas and Fitzpatrick 2014).

Other research indicates that the people who migrated to the Lesser Antilles called themselves the Kalinago; this was eventually translated to "Carib" by the Spanish after Columbus' explorations to the Lesser Antilles (David and Goodwin 1990; Lenik 2012; Anderson-Cordova 2017). The term "Carib" later became synonymous with "cannibal," which was first used by the Spanish to categorize all hostile Indians and to justify their enslavement (Anderson-Cordova 2017). Moreover, an indigenous population known as the Taíno also inhabited the Caribbean during this time, but very little research exists on this prehistoric population most likely due to poor preservation in the Caribbean (Rouse 1964, 1977; Ross 2004).

As previously explained, as a way to refer to the hostile Indians, the term and use of the word "Carib" has been misused by the Spanish. It can be argued that the separation of the terms Taíno or Carib is no longer present (Anderson-Cordova 2017). The haphazard and inappropriate use of the term "Carib" invalidates its use as an ethnic category, resulting in the vague and ambiguous use of the term and the word.

Recent Findings

As previously mentioned, stable isotope analysis of the remains excavated in 2011 by Keith belong to one of the last pre-Columbian migrations in the western hemisphere (Keith 2014). More recently, stable isotope analysis on the remains excavated in the summer of 2016 concluded that four additional skeletons also belong to the end of the Ostionoid period. Although Keith's research describes this Caribbean population as the "Caribs," for the purpose of clarification in my research, this thesis will be referring to these people as "Taíno;" essentially, they are one in the same. However, current research remains controversial on this point, as researchers have not settled if this difference is purely biological or cultural because it is unclear as to how far north the Taíno actually reached. Nevertheless, this thesis will still refer to this population as the Taíno.

While conducting further research on the indigenous peoples living in the Caribbean during the end of the Ostionoid era, it has become evident that the many cultures, including the Taíno peoples, occupied most of the islands in the Lesser Antilles, including Nevis. As Keith (2014) points out, with the abundance of information in the archaeological record from the pre-Columbian Caribbean, it is essential to start with understanding the first inhabitants of the Caribbean. It is my hope that since there is little knowledge and much confusion relating to the prehistoric Caribbean populations, this research will provide insight to the indigenous populations of Nevis and St. Kitts, helping to educate the current Nevisian residents of its prehistoric inhabitants, and encourage future historical and land preservation.

An Ongoing Debate among Scholars

Historians, scholars, archaeologists, and anthropologists, like Irving Rouse (1977), Louis Allaire (1980, 1997a, 1997b, 2008), Samuel Wilson (1989, 2006), and Dave Davis and Christopher Goodwin (1990), for example, have long argued over topics of settlement and migratory patterns and have presented evidence to support their theories. Since then, although much information has been gained, questions have yet to be answered regarding the settlement and migratory patterns of various human populations in the Caribbean over the past centuries (Allaire 1980, 1997a; Wilson 1989, 1997, 2006; Davis and Goodwin 1990; Rodriguez 1997). Who were these people and how did they come to this island? How long did they reside here? What were their cultural customs, and what did their diet consist of?

Although these questions are pertinent to understanding a past culture, none of this would be possible without access to the material cultures and human remains that lie buried, and exposed, on historical lands, such as White's Bay Beach, Nevis. Currently, the Nevis Historical and Conservation Society (NHCS) is experiencing rising concerns of the demolition and utilization of their historical land and beaches for infrastructural development. As the tourist economy and access to the internet has increased, economic development has become more valuable to the developers and Nevisian landowners than land preservation. What was already endangered from years of colonial plantation agriculture, is now being threatened by urban condominium developments which are causing increased beach erosion and historically documented and undocumented lands are being developed, erasing the cultures and histories that lay to rest on this land. Once again, it is important to stress that although the current residents of Nevis are not descendants of these prehistoric skeletons, these skeletons, nonetheless, are relevant to Nevisian culture. This thesis will focus on the population of the Taíno, and describe their culture and customs with the hopes to better understand their culture and heritage, who this indigenous population was, and where they originated. This thesis will hopefully provide motivation for future excavations and support for future conservation of this site, as these findings contribute knowledge pertaining to the prehistoric Nevis that fits in line with the previous studies conducted in the 1970s and 1980s by Caribbean archaeologists.

Nevis, West Indies-Lesser Antilles

Nevis is located in the Caribbean southeast of the Lesser Antilles. With the assistance of field school students, Dr. Marco Meniketti of San José State University's (SJSU) Department of Anthropology has been working on archaeological sites on Nevis for over twenty years. In the summer of 2015, Dr. Marco Meniketti invited Chris Keith, two California anthropology graduate students, and myself, as a part of a preliminary documentation assessment of historical sites, such as The Hamilton Estate, Bush Hill, and White's Bay Beach, to determine the possibility and feasibility of future field schools on Nevis. At this time, I was already preparing my application to the Applied Anthropology Master's program at SJSU, concentrating on human skeletal remains.

On one of the last days of conducting our preliminary documentation assessment, Dr. Marco Meniketti decided to survey and photograph White's Bay Beach, the same location where the discovery and excavation of female skeletal remains took place in the summer of 2011. During the assessment of White's Bay Beach, located on the southeastern coast of the island, Dr. Marco Meniketti instructed the group to search for chert, ceramics, and other materials known to have been associated with various indigenous Caribbean settlement sites in the area (personal communication with Marco Meniketti 2015; personal communication with Chris Keith 2015). After a long day of surveying and coming up empty handed, it was decided to head back to the car. While trekking back to the car, the remnants of a human skull were discovered; Dr. Marco Meniketti quickly called for the attention of Keith and myself to confirm if this was in fact a human cranium. Exposed just above the surface was a human maxilla, a complete occipital bone (the base of the skull), and extremely damaged parietal and temporal bone (the side of the skull located near the ear canal, two elements that makes up the cranial vault). This cranium was in close proximity to the remains found in 2011 by Chris Keith, as well as the conch shell trash middens documented by Samuel Wilson in the 1980s (Wilson 1989; Morris et al. 2001; Keith 2014). It was difficult to determine the age of the burial because the cranium was exposed to the elements for an unknown period of time; however, it was expected that the remains were related to the same time period as the remains excavated by Keith years prior.

Originally, it was our hope to remove the remains from the exposed surface, but given that this was the last day conducting research on Nevis, there was not enough time to efficiently and cautiously remove the remains. Additionally, it was unclear if the burial also contained post-crania. Once again, due to the lack of resources, time, and permission from both SJSU and the NHCS, only a few teeth and cranial fragments that were exposed on the surface were removed. The coordinates 62°32'45.3"W longitude and 17°07'23.6"N latitude were logged for the exact location of the cranium, and the remains were reburied with materials washed up ashore, in hopes of preserving the remains from the elements, curious passersby, and the donkeys that roam freely on White’s Bay Beach. To prevent the remains from further loss due to land erosion, the NHCS and SJSU granted permission to return the following summer with a field school team to excavate and analyze the skeletal remains.

Over the past century, with the exception of a few excavations, White’s Bay Beach and Hichman’s Beach have been free of most technological and urban developments

(Wilson 1989; 2006; Morris et al. 2001; Keith 2014). This is largely in part of the conservation efforts of the NHCS, a nonprofit organization established in the 1980s to conserve the natural, cultural, and historic fabric of Nevis, and provide the means to knowledge and education on its histories by collaborating with archaeologists and institutions like Dr. Marco Meniketti and San José State University (Keith 2014; Nevis Historical and Conservation Society 2015; personal communication with Marco Meniketti 2015). This collaboration assists in the historical preservation of burial sites, storage of skeletal and cultural materials, and provides knowledge through the use of museum exhibits catered to tourists and its residents. However, with the recent increase in tourism and access to the internet, the push for economic development has surpassed the advocacy of land preservation. Further collaboration with organizations like the NHCS can be very beneficial to the current residents of Nevis since their island's heritage is so important to them.

Possibly due to poor preservation, human skeletal remains from the date range of 1050-1160 CE are extremely rare on Nevis (Allaire 1980, 1997a; Davis and Goodwin 1990; Wilson 1989, 1997; Keith 2014). In order to confirm the remains were in fact associated with the end of the Ostionoid era, teeth samples were sent out to Beta Analytic Inc. (Florida) and International Chemical Analysis Inc. (Florida) (see appendix for the dating of the samples). Having now discovered the skeletal remains of four additional individuals, in addition to Keith's excavation of Taoüa in 2011, a comparative case study of these prehistoric indigenous individuals can build on the previously conducted research, provide insight to the heritage and cultural relationships among the current and past populations of Nevis, provide a historical and cultural background of this past indigenous population, and educate the Nevisians on their island's past inhabitants.

The present sample has a considerable amount to tell us; two of the three burials demonstrated signs of possible reburials, while the third burial, of which will be discussed in detail in the appendix of this thesis, can be argued to be a more traditional Christian burial due to its supine (person lying face upward) burial position and its remote placement. Determining a detailed lifestyle of these individuals would not be feasible because the post-crania among the sample was not preserved well enough for an in-depth examination. Furthermore, due to the belief that these remains are of Taíno descent, rather than Carib, it is not likely for an extensive comparison to that of Taoüa's skeletal remains to be made (Keith 2014). However, this thesis argues that studying these burials as a whole will help better understand the Taíno culture and what life was like on Nevis over 1,000 years ago.

The main research questions of this project are: What was each individual's sex, age, stature, and overall health? What can be learned from each burial in terms of how the remains are laid to rest? For example, how do these individuals relate to one another, and what can we tell from the positioning of skeletal remains? Why was the skull of another individual being held closely by another? Perhaps the most important questions, what can these remains tell us in terms of gaining a better understanding of the prehistoric Caribbean life, and how can these prehistoric individuals provide relevance to the Nevisian society and culture? How can a scientific perspective of these ancient skeletons create a sense of belonging and cultural affiliation among the current Nevisian residents?

The goal of this thesis is to better understand the past by examining the present sample of skeletal and cultural materials, and inform the current Nevisian residence of these findings, so they make decisions to decrease the amount of construction and preserve the lands, culture, heritage, and past histories of this island. This thesis has required extensive research into the burials of other prehistoric Caribbean cultures, and how human skeletal remains can provide information relating to an individual's life and death.

Given the literature and ethnographic accounts supporting the theory that the Taíno practiced intentional cranial deformation, I hypothesized that the present sample would display similar signs of sub-adult intentional cranial deformation, and the observed deformations were achieved through a combination of methods that were inherited by Tainan ancestors and acquired through interactions with various cultures. This hypothesis will be tested by attempting to reject the null hypothesis that the crania present did not demonstrate clear signs of cranial deformation. Other factors that will be addressed include: teeth, osteoarthritis, stature, asymmetry, and cranial pathologies, such as porotic hyperostosis, with the purpose of reconstructing the lives of these individuals. Additionally, given the ethnographic and archaeological accounts, I hypothesized that these burials were of ritual significance. This thesis will attempt to test this hypothesis by rejecting the null hypothesis that the burials excavated did not show signs of ritualistic behaviors, indicating they were primary burials.

In the following chapter, the historical background section will briefly cover what is known of the early indigenous Caribbean peoples, relating to the common lifestyles and routine daily activities. Being conscious of these daily habits can provide insight into what the lives of these prehistoric individual may have been like, as well as what signs, if any, may have been left on the skeletal remains (Larsen 1981; Ubelaker 1999; Weiss 2009). Because there is currently no comparable Taíno sample on Nevis, for comparative purposes and insight into the burial practices associated with similar indigenous cultures, research on the various types of Caribbean and Guatemalan ancestral ritualistic reburials are provided. An introduction to Levi-Strauss's structuralism, and how this theory relates to the skeletons excavated on Nevis are presented in chapter two. Three case studies of ancient skeletons are reviewed as guidelines for understanding the past from a scientific perspective, how a single individual can be studied, what they can tell us, and how they have raised debate of cultural and biological affiliation and sense of belonging. A discussion of the relevant literature is provided in chapter three, and the materials and a detailed account of each methodological path chosen for the excavation and analysis of the skeletal materials are provided in chapter four. Photographs cataloging the excavation and analysis of the remains will be offered. Chapter five will discuss the osteological results and metric data collected. A discussion of the findings will be provided in chapter six and conclusions of the present study will be offered in chapter seven. This thesis will return to the principal question: what can these prehistoric Caribbean remains tell us about their cultural customs and burial practices, and how is this information pertinent to the current residents of Nevis? Conclusively, this thesis will conclude with recommendations for site preservation on White's Bay Beach.

The radiocarbon testing results processed by Beta Analytic Inc. and International Chemical Analysis Inc. will be presented in the appendix. The metric data, results, discussion, and conclusion of NVS-WB2 Unit 1 will also be provided in the appendix, as this excavation was not intended to be a part of this thesis, but rather was completed with the intention of conservation and safeguarding these remains from further damage caused by exposure to the elements and passersby.

CHAPTER 2: Background: Prehistoric, Historic and Cultural

The introduction provided a brief prehistory of the Caribbean. This section will focus primarily on the history and knowledge of the Taíno. More specifically, the word, concepts and definitions assigned to the word, and the phenomenon or depiction of "Taíno" will be presented in this section. Curet (2014) points out that since the word *taíno* can and has been used without care or judgement, and has been assigned different meanings over time in both early literature and by scholars, it is important to outline the history of how the word "taíno" developed.

The Taíno

At the time of the Spanish Conquest in the fifteenth century, most of the Indians who spoke Lokano inhabited the larger Caribbean islands, Cuba, Hispaniola, Jamaica, and Puerto Rico, while the smaller Caribbean islands were inhabited by Indians who spoke Karina (Stevens Arroyo 1981; National Parks Service 1996). The tribes of the larger islands referred to the tribes of the smaller islands as "caribo" or "warlike" (Stevens Arroyo 1981). For more than a hundred years, Caribbean historiography has used ethnonyms, such as "Taíno," "Carib(e)," "Caribs," and "Igneri," to name both pre-Columbian and post-Columbian groups of the Greater and Lesser Antilles; these etymologies are clearly of indigenous origin (Stevens Arroyo 1981; Curet 2014). According to Curet (2014), the term "taíno" originated from a list of island words gathered during Columbus' first voyage in 1492; these words were found in the early European writings in the Caribbean. The European chronicles included characteristics of the native language and religious beliefs, cultural practices and social organization, subsistence systems, native tools, and tool usage. According to early reports, when the Spaniards asked the Indian chiefs what their names were, they responded with "Taíno" (Stevens Arroyo 1981, 33). This word did not describe their people as a whole, but rather the leadership clan, "intaíno," which referred to the chiefs. Other accounts state that the word Taíno was translated from one or more local Arawakan languages meaning "good" or "noble" (Deagan and Cruxent 2002; Curet 2014). It is clear that the Spanish writers and explorers never used the proper noun Taíno, when referring to the Indians of the Greater Antilles (Stevens Arroyo 1981; Curet 2014). Instead, the Spaniards used the term as more of a qualifying adjective to refer to the concept of goodness or the classification of the "Taíno Indians."

The Taíno phenomena can be used two different ways, the first, defined as using "facts" from the European and Spanish stories and the second, found by archaeologists in material cultures across the regions of the Greater and Lesser Antilles, as a way to verify the early accounts reported by the chronicles to understand the life among the Taíno (Stevens Arroyo 1981; Curet 2014; Rodriguez Lopez 2016). The term Taíno was developed by the Spanish to refer to the diverse collection of indigenous cultures that inhabited the Greater and Lesser Antilles (Stevens Arroyo 1981; De La Luz-Rodriguez 2011; Curet 2014). Over time, the imagined phenomenon was accepted and preserved by the traditional historiography and archaeology that was later referred to as the Taíno culture (both the concept and term) (Curet 2014). Archaeological attributes include the types of material cultures and its various styles, such as ceramics, religious artifacts, and tools. In short, the word "taíno" can be seen as referring to the original Arawak meaning of "goodness," the diverse range of the cultural constructions that are based on "facts" developed from the European and the Spanish stories, and archaeological finds throughout the Greater and Lesser Antilles.

Summarizing, despite the multiple definitions and various uses of the term "Taíno," the view overall is that they all share the same concept; this concept has become well accepted by Caribbean archaeology, anthropology, and history (Curet 2014). Throughout the twentieth century, scholars began to adopt the term "taíno" to refer to the cultural, biological, or linguistics of a particular population (Stevens Arroyo 1981; Curet 2014). It is clear that the term Taíno is used to refer to many phenomena, but for the purposes of this thesis, the term Taíno will be used to refer to the culture as a whole, including the human remains, material culture, cultural practices, and the descendants of the ancient "Taínos" who lived in the Caribbean during the pre-Columbian period.

Material Culture of the Taíno

Symbolism, ideology, and language are often reflected in the material culture of a society. When examining the pottery and ceramics found in the Caribbean, indications of the cultivation of manioc, a basic staple of the Taíno, were traced to the origins of South America (Stevens Arroyo 1981). Largely in part to the limited skeletal materials found within this region, most of the principles used to define what Taíno is, are archaeologically restricted to ceramic designs and motifs, ball courts, plazas and other ritual paraphernalia, three-pointer idols or *zemi/cemís*, and personal adornments (see Figure 1 on the next page) (Curet 2014).

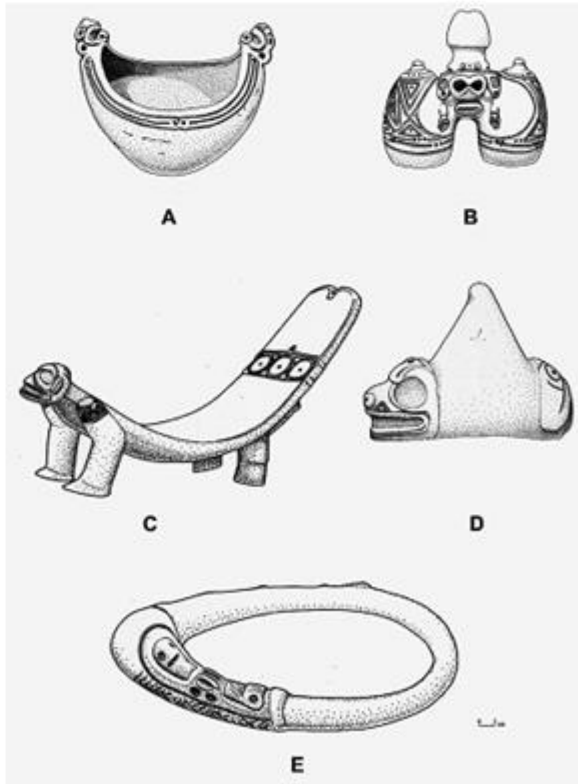

Figure 1. Taíno (Chican Ostionoid) Pottery and Other Ceremonial Objects. A-B is pottery from Hispaniola; C is a ceremonial seat or *duho* from Hispaniola; D is a three-pointed idol or *zemi/cemís* from Puerto Rico; E is a stone collar or belt from Puerto Rico.
Photo Credit: Jill Seagard, Curet (2014)

As Curet (2014) explains, throughout the Greater and Lesser Antilles, there are qualitative and quantitative differences in the designs and themes of the material cultures. By using Rouse's concepts and models, differences in the pottery can be argued to be linked to the types of foods and beverages consumed through ceremonies, daily meals, or larger rituals (Rouse 1964, 1986, 1992; Curet and Stringer 2010; Curet 2014). On the other hand, differences in the material culture can also be an indication of symbols and meanings associated with that culture through ritualistic activities (Stevens Arroyo 1981;

Curet and Stinger 2010; Curet 2014). While strong evidence of variability exists among the material culture and cultural practices found on each island in the Antilles, strong similarities are also portrayed that cannot be dismissed (Rouse 1992; Curet 2014). As Figure 1 demonstrates, much variation exists among the five illustrations of material culture discovered throughout the Caribbean, making it difficult to understand the diverse cultural practices present within and between each cultural group. Consequently, some scholars question whether the pottery from the Meillacan Ostionoid subseries should be included in the same spectrum as the Taíno (Chican Ostionoid) pottery. According to an archaeological study conducted by Oliver and Ulloa Hung, there are instances of single vessels presenting both Meillacan and Chican modes (Curet 2014).

It is clear that archaeology can justify the theory that migration of groups have the potential to bring together similar but different tribes into a coexistence in the Caribbean islands (Stevens Arroyo 1981), but despite these similarities, archaeologists have concluded that they should be kept separate because chronicles state that Meillacan pottery was originally found in the Macorix region (northeastern Hispaniola), which were occupied by a different group from that of other regions of the island (Curet 2014).

Similarities in the material culture exists among different groups throughout the Antilles, and many scholars and historical records use these similarities and differences to differentiate the Taíno from other indigenous groups. Curet (2014) expressed that these similarities and differences are likely not by common ancestry, but through interactions among these groups. It is possible that interactions among different cultural groups throughout the Caribbean may have shaped certain common cultural characteristics, symbols, and practices, but this does not suggest that every culture in the Caribbean possesses the same ideologies.

The Kalinago: A Current Living "Taíno" and Carib Descendants on Dominica

Early accounts on the events that took place both during and after European contact varies greatly from source to source. Taylor (1949) argues that much of the literature on the Carib people needs to be rewritten or corrected in order to better understand the documentary evidence of the Carib culture in the early colonial times. This is also true with the literature and historical accounts of the Taíno, due in part to much of the earlier ethnographic work completed by the chroniclers containing hasty evaluations of the indigenous people in the Lesser Antilles. Figure 2 shows a chronicler's depiction of a Carib woman.

Figure 2. Drake's Manuscript of a "Carib" Woman. Painted by an unknown artist and the manuscript's date is uncertain, but from about the 1590s based on Drake's Voyages.
Illustration Source Credit:
Histoire Naturelle Des Indes. 1996 *The Drake Manuscript in the Pierpont Morgan Library.* New York: W.W. Norton & Company.

According to their traditions, they [the Carib] arrived into the West Indies merely a century before the arrival of Columbus (Rouse 1964). Much of the literature suggests that the people who immigrated to the Caribbean islands referred to themselves as the Kalinago and was eventually translated into "Carib" by the Spanish chroniclers who followed shortly after Columbus' voyage to the Caribbean (Taylor 1949; Rouse 1964; Allaire 1980; Davis and Goodwin 1990). Their first Kalinago (Carib) father was thought to have left the mainland with his family and settled in Dominica (Taylor 1949). According to Allaire (1980), the island Kalinago culture related very closely to that of the mainland Kalina, supporting the theory of a massive migration into the Lesser Antilles at the end of the Sauzoid ceramic around 1200 CE.

One of the first accounts of contact with the Caribs is from a French source, Bouton's *Relation de l'Etsablissement des Francais en l'ile de la Martinique,* which was written after a three months' stay in the West Indies and settlement on Guadeloupe (Taylor 1949). Other literature suggests that many Caribs became acquainted with Father Brenton, a Catholic priest of 25 years in Dominica, who became an authority figure on both the language and culture of the Caribs (Taylor 1949). Father Brenton showed much interest in the Carib's language, culture, and welfare while living on Dominica and traveling to Guadeloupe, St. Kitts, and other islands. Many accounts also state that after the first contact with the Caribs, the French Missionaries made many attempts after 1650 to convert the Caribs to Christianity (Taylor 1949). After failing to convert the Caribs to Christianity, hostilities among the Caribs and the French Missionaries began to emerge around 1655. By about 1658, nearly all the Caribs were driven off of the island of Dominica or killed (Taylor 1949).

According to Taylor (1935), the British opened churches, schools, and stores in attempts to acculturate the Caribs and Taíno peoples on the reservation with British customs and cultural practices, such as the belief in the religion of Christianity and speaking English. Taylor (1935) clearly provided insight into the inevitable impacts that acculturation and interbreeding can have on a culture, as it was demonstrated that the attempt to acculturate the native peoples with the cultural beliefs and customs of the more dominant society resulted in the loss of their native traditions, characteristics, customs, and language. Within the first fifty years of being relocated onto the reservations, the Caribs lost their language and ceased the making of bow and arrows, rattles, and hammocks (Taylor 1935).

The present Carib Reserve in Dominica was created in June 1903 by enlarging the boundaries of what was known as the Carib settlement land (Taylor 1935, 1949). There are several patches of “Carib lands” outside of the reserve where Carib families and descendants are believed to still be living today (Taylor 1946, 1949). Although several other groups throughout Puerto Rico, Cuba, and Florida claim to be descendants of the Taíno and Carib peoples, the population in Dominica is the last known extant Kalinago population today (Lenik 2012; Encyclopedia Britannica Inc. 2018). The Kalinago currently reside on the reservation territory known as Salybia, on the windward coast of the island of Dominica (Taylor 1935). A photograph of a Kalinago male who currently resides in Dominica is referenced in the appendix section of this thesis.

More recently, in 1998, an umbrella organization was created by the United Confederation of Taíno People for the affirmation and restoration of Taíno culture, language, and religion (Encyclopedia Britannica Inc. 2018). As Oliver (1997, 152) states, the "Taíno are no longer among us, but their genes have been diluted among the new Old World populations" (Oliver 1997, 152). As previously mentioned, groups throughout Puerto Rico, Cuba, and Florida continue to claim to be descendants of the Taíno, but because they were believed to have been completely wiped out during the Spanish conquest and are not officially recognized as a group by any government, those who consider themselves Taíno have the right to through self-determination (Oliver 1997).

Culture

One of the principle objectives of this thesis is to provide guidelines to the relevancy of these ancient skeletons to the Nevisian society and culture. It must be made clear, again, that the current people of Nevis are not descendants to the remains excavated in White's Bay Beach, but this thesis argues that because this is their home, and once was the home of the Taíno, this study is relevant because it creates new knowledge and information pertaining to the past populations that inhabited the island. Additionally, this study works to create a sense of belonging and cultural affiliation because as demonstrated later in this chapter, past studies of a single individual are important in understanding the past from a scientific perspective. This section will demonstrate how a single individual can be studied, what they can tell us, and how a single individual can stir the debate of cultural and biological affiliation and sense of belonging.

There has been a longstanding dissatisfaction with the concept of culture (Weiss

1972; Olwig 1999). Weiss (1972) defines the starting point of culture as an “analogue of an organism or a living entity” and the destination as a cultural system. The physical human remains of an individual or cultural group have a significant relationship to a presently existing tribe, people, or culture; this relationship between the bones and its existing people goes beyond the features that are common to all humanity, as it is a representation of the fundamental changes in basic social attitudes of the museums, scientific communities, and the overall public (Stern and Susman 1983; Jaroff and Rademaekers 1992; Ackerman 1997; Hawthorne 2001; Ward 2002; Coleman and Dysart 2005; Ray 2006; Gaivin 2009; Kimbel and Delezene 2009; Pyne 2017). The blending of science, history, and culture draws in the public with the intention to better understand a culture, a tribe, and people. The study of identity is central to anthropology because it provides a foundational understanding to how similarities and differences are recognized among ourselves and others (Hartog 1961; Torres 2014). The identity of Kennewick Man, Lucy, and Otzi are examples of how single individuals are important in understanding the past from a scientific perspective. Additionally, these individuals demonstrate a cultural relationship where the social attitudes towards Native peoples and the idea of evolution, respectively, are challenged (Ackerman 1997; Ray 2006; Pyne 2017).

The next section will briefly discuss Levi-Strauss’s structuralism, and describe how cultural patterns and symbols are used to construct a narrative and influence our behaviors. Next, an explanation on the background of Kennewick Man and how his discovery challenged the rights to ownership, cultural affiliation, and belonging.

Following, a discussion of how Lucy, the iconic fossil find, changed and challenged our historical and chronological understanding of human evolution. Lastly, a discussion of Otzi's remains will provide insight into how his discovery stirred the debate of cultural and biological affiliation, and created a cultural shift among the "Natives" who celebrated their cultural connection to Otzi by wanting him in their museums, rather than arguing for his reburial. This section will conclude with why this information is relevant to Nevis and Nevisian history.

Levi-Strauss and Structuralism

"A basic principle of structuralism is that a single universal cultural patterning underlies all individual cultures" (McGee and Warms 1955, 347). Therefore, the structuralist approach should be a suitable means for explaining all symbols of culture (McGee and Warms 1955, 347). According to Levi-Strauss, structuralism promises the opportunity to reconstruct bits and pieces of a system of interconnected beliefs, constituting a culture into a coherent system of events (Stevens Arroyo 1981). Levi-Strauss's work has two purposes, first, it provides an overview of relevant contemporary stories or histories; second, it allows for scientific reconstruction of these stories which are incomplete or distorted in historical literature (Stevens Arroyo 1981). Just as a forensic scientist can reconstruct an entire human skull from a few fragments because of their knowledge of the human bone structure, the structuralist can use patterns of the human past and symbolic thought (symbols, art, internal images) to reconstruct a myth of a complete form (Stevens Arroyo 1981). Like Levi-Strauss, a structural analyst is not interested in the individual story elements, but rather the combination of these elements that make up the entire picture (McGee and Warms 1955). By examining the relationship between each story element, it provides the analyst with the unconscious meaning of the story or history in question; therefore, allowing the structural analyst to place emphasis on certain story elements regardless of their narratives (McGee and Warms 1955). As a method of analysis, structuralism can lead to valuable interpretive insights where other theoretical perspectives may have fallen short (McGee and Warms 1955). This approach can be applied to any myth, story, or history.

In the cases of the examination of a single skeleton like Kennewick Man, Lucy, and Otzi, their skeletal remains act as symbols that hold power and knowledge associated with our human past. Kennewick Man, Lucy, and Otzi all have a story or a past in which the majority of it was missing; the scientific analysis of these skeletal and cultural materials are able to create an incomplete narrative and provide an understanding pertaining to these individuals' lives and possibly their cultural traditions. Because cultural traditions are cultural constructions that can be seen in historical sites, they too pass down modes of life that represented the past landscapes, architecture, and objects (Olwig 1999). Culture is ingrained in our daily lives, and culture has a strong influence on our behaviors (Olwig 1999). While bits and pieces of their stories exist, a structuralist approach reconstructs their stories and systems of interconnected beliefs associated with each individual's past. In a way, the structural analyst searches for an unconscious meaning that allows for the interpretation of the motives behind the characters and stories of the iconic Kennewick Man, Lucy, and Otzi. Regardless of their narrative, the structural analyst is able to emphasize certain elements of each of these stories; these story elements allows for the construction of their narrative, enabling us to establish an understanding of their culture and past.

Since the structuralist approach can be applied to any myth, story, or history, this approach can be applied to the present sample excavated in 2016. While bits and pieces of each individual's story exist, the historical literature is incomplete; thus, as a structural analysts, we must attempt to examine the relationship between each element of the story in the hopes of creating a cohesive cultural narrative for the Taíno. Past definitions and research directly impacts our interpretations of the archaeological record (Meniketti 2009); therefore, these frameworks assist in shaping or reshaping their story, history, and culture.

Levi-Strauss's structuralism has justified terms such as "primitive," and has at times labeled cultures as "peoples without writing," which seems to also fit the narrative of the Taíno (Rodriguez Lopez 2016, 454). The term "primitive" is simply a piece of the contemporary story that is used to describe the Taíno and assists with overall picture and understanding of their complete story. As previously discussed, certain elements can be emphasized more than others, and although each element must be taken into consideration, the combination of these elements are what makes up the entire picture of a culture. The past has provided us with an overview of the relevant pieces of the story or past histories, but it is up to the structural analyst to use a scientific reconstruction of these pieces to complete or straighten the distorted historical literature of the past. In short, the Taíno have a history, and although the whole truth of this history is unknown, a better understanding of that history or past is made possible by analyzing the skeletal materials, material culture, and other incomplete pieces of the puzzle. Eventually, with each piece discovered, analyzed, and reconstructed, additional pieces of the puzzle are able to come together, allowing a better grasp and understanding of a system of coherent events that make up the whole story of the Taíno culture. The scientific analysis of these remains acts as a single piece of the story, but this piece speaks to all of us, just as science speaks to all of us (personal communication with Weiss 2018). Therefore, it should not matter that the Taíno peoples are not related to the current residences of Nevis, but how they relate to the overall picture of the human experience and human past.

Kennewick Man and Culture

Historically, the Native American culture has been both culturally and physically subjugated by white culture (Ackerman 1997; Ray 2006; Young 2006). This subjugation has taken on many forms; to name a few, unfair trade among European settlers and Native Americans, the use of military power to gain control of territorial lands, and the displacement of indigenous peoples. In 1990, the enactment of the Native American Graves Protection and Repatriation Act, better known as NAGPRA, marked a historical landmark legislation for Native Americans (Ackerman 1997; Tsosie 2003; Ray 2006). The scientific community endorsed NAGPRA with the intent of expressing remorse for the centuries of gawking and collecting of human remains without scientific value; therefore, allowing Native Americans to control their own culture (Ackerman 1997; Tsosie 2003; Young 2006). The statute of NAGPRA requires that the federal government must return the remains of any Native American discovered on public land to the federally recognized tribes who are able to establish their cultural affiliation with the deceased member. The enactment of NAGPRA represented a fundamental shift in the basic social attitudes and mindsets towards the Native American peoples and their affiliated remains, which can be seen by museums, scientific communities, and the general public at large.

Kennewick Man was discovered by two men on July 28, 1996. Scientists named Kennewick Man after the location of where the remains were found, just off the banks of the Columbia River near Kennewick Washington. A forensic anthropologists by the name of Dr. Jim Chatters, along with three other anthropologists, corroborated the remains to be that of European descent and not representing the traits of known Native Americans living in the area, based on the facial features and other cranial characteristics (Ackerman 1997; Coleman and Dysart 2005). After notifying local tribes of the find, the Colville, Yakama, Umatilla, Nez Perce, and Wanapum claimed to be affiliated with the remains, causing conflict (Ackerman 1997). With the hopes of claiming the remains, the Umatilla and the Nez Perce announced that they would rebury the remains to avoid scientific research carried out on the remains. Scientists were outraged and argued that returning the remains to the native tribes for reburial would be dangerous, as it would destroy scientists' ability to understand the earliest humans in the Americas (Ackerman 1997). Scientist R. Ervin Taylor Jr. ordered a DNA test that would be administered by the University of California, but the tests were ordered to a halt by the Army of Corps Engineers (Ackerman 1997). In a final attempt to claim the remains, on October 16, 1996, eight scientists, Robson Bonnichsen, C. Loring Brace, George W. Gill, C. Vance Haynes, Jr., Richard L. Jantz, Douglas W. Owsley, Dennis J. Stanford, and D. Gentry

Steele, filed suit in federal district court in Portland, Oregon, seeking a temporary restraining order to deny repatriation of the remains. After a year in court, Bonnichsen vs. United States resulted in three decisions. First, the Ninth Circuit deemed that NAGPRA could not be applied to the remains and artifacts, as they could not be proven to be that of "Native American" descent (Ackerman 1997; Ray 2006). Second, the courts granted immediate access to the remains for the purposes of studying and denied the Native Americans repatriation of the remains (Tsosie 2003; Young 2006). Lastly, five years passed, the courts ordered the remains to be transferred to a climate-controlled, secure facility in Seattle's Burke Museum after it was proven that the remains were poorly curated and lacked protection from theft or misplacement, while allowing a small amount of the remains to be reburied by the tribes for the performance of religious ceremonies (Ray 2006). Radiocarbon dating later proved the remains were much older than originally thought, dating to the Early Holocene, and more likely associated with the Native American peoples than any other living population (Rasmussen et al. 2015; Burke Museum 2017).

Essentially, NAGPRA works as a mediator among the parties of Anglo-Americans, scientists, researchers, and Native Americans, and determines whether the remains in question should be returned to the Native Americans or provided to a Federally Funded Institution or a private collection (Ackerman 1997); with it comes two very different cultural perspectives that are on opposite ends of the spectrum. While scientists question the cultural affiliation to those tribes who wish to rebury the remains and believe that it is absurd to rebury the remains of a 9,000 year old skeleton that may hold scientific value, Native Americans believe that exposing the remains of Kennewick Man, and others, to scientific analysis is as similarly offensive, as it disturbs those who were placed to rest. According to Ackerman (1997), the major cultural differences among the Anglo-Americans and the Native Americans is the conceptions of time; while the Anglo-Americans view time as a linear progression, Native Americans perceive time as cyclical or spatial. Ackerman (1997) argues that as a result of the Anglo-American's view of time as being a linear progression, scientists and researchers alike, feel less emotions for older human remains, making it easier to perform destructive analyses. However, the scientific analysis of human remains have come a long way; what once was a very destructive process, has now shifted toward smaller sample sizes needed or alteration of parts of an item, preserving as much of the remains as possible (National Parks Services 2016). Common procedures now include Carbon 14 dating and other chemical analyses, thin sectioning, DNA testing, neutron activation, and metallography (studying the microstructure of all types of metallic alloys) (National Parks Services 2016). It can also be argued that the reburial of remains is as equally destructive as scientific analyses because the remains can be damaged or lost in transport, extremely fragmented remains can be misplaced, and some ceremonies include cremation of the remains before reburying them. Native Americans, on the other hand, feel a spiritual and religious connection towards human remains that they claim affiliation with does not fade as time passes. The Native American cyclical concept of time demands that death is not the end, but the beginning of a new life cycle, a transcendence that a person will experience another life after theirs has ended (Ackerman 1997; Ray 2006). Native

Americans view Kennewick Man as an example of one of the life cycles that should not have been disturbed.

Another fundamental cultural difference among Native Americans and the scientific perceptions of humans is the relation to other forms of life, another idea that is demonstrated by the Native American burial practices (Ackerman 1997; Ray 2006). Culturally, Native Americans are against digging up their ancestral remains for scientific analysis; it is clear that this is in part of their past experiences with the treatment and mistreatment of their ancestors, their people, and their culture. Native Americans claim to feel a spiritual and religious connection towards human remains that they claim affiliation with, which does not fade as time passes. The Native American cyclical concept of time emphasizes that death is not the end, but the beginning of a new life cycle; once a loved one has passed, their spirit remains, and they will experience a transcendence of another life after theirs has ended (Ackerman 1997; Ray 2006). The Native Americans view Kennewick Man as one of these life cycles, so the remains should not have been disturbed; however, many Native American remains are not dug up, but rather found through salvage.

The Native American identity can be defined according to their cultural knowledge that enables an individual to speak and understand a given language, or cultural practice of a particular indigenous group (Ray 2006). This dynamic relationship between individual competencies and cultural practices in the formation of Indian identity, or therefore any identity, is not limited (Ray 2006). Each community acts as the bearer and enforcer of certain cultural norms, while dismissing others; thus, in turn, allowing the influence of culture and its norms (Ray 2006). Language, storytelling and historical tales, cultural and religious connections with burial sites, and the act of sacred burials reinforces the power of one's cultural practices and competencies; therefore, enforcing their cultural identity. As in the case of the Kennewick Man's cultural or biological determination, cultural similarities can be seen among the modern Native American peoples, but the scientific community sees such determination as a loss to science.

The tribal community obtains justifications of their cultural integrity of the Kennewick Man's remains through referencing past traditions, beliefs, and religious and cultural significance of the burial site, and the location of where the remains were found. "Sacred human remains are not artifacts. They are what they are—sacred—and they are our ancestral remains, and they need to be treated as such" (Ray 2006, 142). The challenge of Kennewick Man runs far deeper than simply a legal form, it represents a fundamental shift in the basic social attitudes and mindsets towards the Native American peoples, and demonstrates cultural differences between the two groups. The Bonnichsen court's decision of awarding the remains to the scientists for study was unfortunate for the Native Americans, but it is clear that the Native American community was able to voice their opinions, take legal standing, and fight for their rights to be culturally recognized. The expression of cultural identity is imperative among the Native American peoples, as the fight for the rights to the remains of Kennewick Man clearly shows.

On the other hand, from the scientific perspective, it is clear there is a completely different cultural view concerning the importance of this individual because it holds scientific knowledge. Science is the embodiment of rationality, whereas cultural rationality is considered to be subjective or moral (Coleman 1995; Coleman and Dysart 2005). Without the scientific examination of Kennewick Man, scientists would not have been able to enrich the public with a scientific perspective of this individual's origins, provide insight into the anthropological theories and prehistoric migratory patterns, or contribute new information to the current knowledge base to potentially amend and modify old information and theories of prehistoric humans and their origins, their behaviors, and previous cultural values. Additionally, scientists would not have had the opportunity to complete tests, such as radiocarbon dating, which determined Kennewick Man's prehistoric origins and that he was one of the oldest skeletons ever found in the Americas.

Kennewick Man sparked immediate interest among scientist because of his prehistoric age, geographical location, and features; moreover, scientists believed these bones were inconsistent with the widely accepted models of ancient human migration (Coleman and Dysart 2005). Examination of these remains would provide some evidence to support these migration models. According to the traditional models, during the last Ice Age (about 12,000 years ago), the first North Americans arrived on foot in the area of what is known today as Alaska through the land currently covered by the Bering Strait; scientists have examined the skeletal and facial features among today's Native Americans which display Mongoloid features, but find it arguable if these features reflect this North Asian heritage (Custred 2000; Coleman and Dysart 2005). However, Kennewick Man's remains are more reflective of Polynesian or South Asian origins; thus, supporting the anthropological theories suggesting that North America was simultaneously populated by several groups, with at least one arriving by sea (Custred 2000; Coleman and Dysart 2005; Rasmussen et al. 2015). Furthermore, such migration theories and human origin debates raise significant political issues relating to race and the rights and cultural affiliation to such remains.

As within every skeletal analysis, there is always more than can be learned. Years went by without the skeletal remains being studied, and then a short period of time went by where the remains were studied (Burke Museum 2017). Over the years, some tribes visited the remains to conduct ceremonies, the morphology of Kennewick Man was studied by many, and most recently, in 2015, DNA analysis determined that Kennewick Man was more closely related to modern Native Americans than any other living population (Rasmussen et al. 2015; Burke Museum 2017). Because scientists were in doubt of Kennewick Man's exact ancestry, it prevented a proper Native American reburial (Rasmussen et al. 2015; Ghose 2017). In the end, the scientists lost the case, as the remains were given to the Native Americans and were reburied near the Columbia River in 2017, but Kennewick Man answered questions pertaining to who he was and where he came from, through understanding his cultural identity (Rasmussen et al. 2015; Burke Museum 2017; Ghose 2017). Kennewick Man was a crisis of identification and classification, ancient affiliation, ancestry, and cultural identity, as numerous tribes believed to have had cultural affiliation to these remains, but future arguments of affiliation and identity were terminated when he was reburied. Scientists may never fully understand Kennewick Man's story, but studying his remains has allowed a better understanding of who this individual was, what life was like during the Early Holocene, and provided support for certain migration models.

In summary, science is the embodiment of rationality (Coleman 1995; Custred 2000; Coleman and Dysart 2005). Coleman (1995) suggested that you cannot have one without the other, as science and culture both encompass their own rationality. In short, when researching and examining skeletal remains, it cannot be assumed that science is without values and that culture is without rationality (McGee and Warms 1955; Coleman 2005). The universals that Levi-Strauss spoke of can assist with a better narration and more complete story. Both a scientific and cultural perspective must be applied in combination, as each of these elements make up the entire picture for a holistic view of the past, and allows for a complete reconstruction of the story and an understanding of this individual's importance to the overall human history. Kennewick Man is just a fragment of this story; scientific research of Kennewick Man is an additional piece that allows for a more accurate articulation of his story.

Lucy's Cultural Significance

Discovered in November 1974, Lucy was one of the twentieth century's most iconic fossil finds, as she was a newly discovered species of extinct hominin, *Australopithecus afarensis;* moreover, she was the most complete, early hominin skeleton in paleoanthropology. As Pyne (2017) explained, some fossils acquire special significance or "celebrity status" because they are the "first" of something, or the oldest. Lucy functioned as an icon—a respected scientific object and a missing piece in the human evolutionary puzzle because she introduced a new kind of fossil in paleoanthropology

(Stern and Susman 1983; Lovejoy et al. 2002; Ward 2002; Kimbel and Delezene 2009; Pyne 2017). Everyone knew who Lucy was just by her name, and it was not long before Lucy's identity became the basis for understanding ourselves as humans.

The discovery of Lucy linked her fossils from Ethiopia to Tanzania creating controversy in the paleoanthropology community, and the naming of Lucy as belonging to the hominin species *Australopithecus afarensis* coincided with an important development in paleoanthropological theory and methodology. Although hominin locomotion has been a topic of debate since the publication of similar fossil finds, such as the Taung child from 1924, the debate over hominin locomotion became intense during the 1980s and continues to this day (Ward 2002). Lucy was believed to have been associated with the dispersal of a new species throughout East Africa during the Plio-Pleistocene; moreover, Lucy supported the previous discoveries of human social behavior and the studies of human origins (Pyne 2017). Lucy was an example of how a single skeleton can be examined in order to reconstruct the image, locomotion, and stature of an extinct human ancestor. Because Lucy was 40% complete, scientists and the public could actually get an image of what this individual looked like, and who this human ancestor was in relation to modern humans (Lovejoy 2002; Ward 2002; Kimbel and Delezene 2009; Pyne 2017). For the first time in many years, researchers were able to answer questions about hominin's environmental niches, such as locomotion, sexual dimorphism, and diet.

Lucy was excavated in fragments and reconstructed piece by piece (Johanson 2010). As Johanson (2010) explained, each segment of this individual was not explained and examined as individual cranial fragments, or a single femur, rather, she was examined as a human being and treated with respect. Lucy was a fossil that was about three million years old, measuring just under three feet tall, and probably weighed about 50-60 pounds. She was the most apelike human ancestor and an important fossil find that changed the expectations about the hominin species relating to evolution and divergence from the extant African apes (Ward 2002; Kimbel and Delezene 2009). Additionally, this fossil was believed to provide evidence that showed a transition from our brachiating ancestor to our terrestrial bipedal ancestors, based on the bipedal stature, in-line big toe, placement and limited extension of the knee and hip joints, centrally located foramen magnum, a short, broad ilium, and features of the proximal femur, including relative femoral head size, cortical bone distribution in the femoral neck, and the cross-sectional shape of the proximal shaft (Stern and Susman 1983; Ward 2002; Ruff et al. 2016). Although scientists believed Lucy was committed to terrestrial bipedalism, she still possessed curvature of the fingers, which suggested that she also engaged in arboreal activities, such as movement through trees; these skeletal traits made scientists believe that Lucy was the closest thing to the “missing link” (Stern and Susman 1983; Ward 2002). Examination of Lucy’s structural properties of the femur and humerus showed signs that are known to be developmentally plastic; these properties were then compared with other early hominins, modern humans, and modern chimpanzees (Ruff et al. 2016). Cross-sectional images were used to analyze the diaphysis (shafts of the long bones), as well as the superior and inferior cortical thicknesses of the femoral neck (Ruff et al. 2016). These tests showed femoral/humeral diaphyseal strength proportions that were transitional between those of modern humans and chimpanzees, indicating more mechanical loading of the forelimb than in modern humans (Ruff et al. 2016). It became apparent very quickly, that she did not seem to fit in any other previously created category of hominins. Her discovery was a significant breakthrough for science and the theory of evolution because it meant redrawing the evolutionary tree, in order to account for this newly discovered hominin species (Stern and Susman 1983; Lovejoy et al. 2002; Ward 2002; Kimbel and Delezene 2009; Pyne 2017).

It is not enough to simply give a fossil a specimen number, nickname, or genus name; a fossil needs a scientific name in order to have taxonomic and evolutionary status in the world of paleoanthropology (Pyne 2017). Each time a fossil is named, another layer of meaning is placed onto it. A fossil's nickname can be shaped and influenced by a society's values, beliefs, and attitudes, providing a cultural and methodological context (Pyne 2017). With a name like Lucy, chosen by the iconic Beatles song "Lucy in the Sky with Diamonds," a cultural context is suggested; this name was chosen because the song was playing repeatedly when the remains were first discovered, and Johanson's crew was excited and celebrated the discovery of what looked to be a fairly complete hominid skeleton (Johanson 2010). Once Lucy was named, there was no turning back, she became more than just a fossil; Lucy was identifiable as a female, a person, and a personality (Johanson 2010; Pyne 2017). The name Lucy was widely celebrated, and her popularity influenced the society's behaviors and acceptance towards this new scientific find, which supported the very controversial theory of evolution.

In most cases, past discovered fossil remains were either given a specimen number or an unpronounceable genus name, making their discovery and their past less personal. Over the years, other fossils have been given easily pronounceable names like Ardi, Selam, The Black Skull, Twiggy, and many others; therefore, Lucy is not the only specimen to be given a name, but she still became an icon, and that made her powerful. Her name was easy, one that people could actually pronounce and remember, allowing the public to think of her as an actual identity, rather than a pile of bones, or an old piece of history sitting in a box or a museum. According to Pyne (2017, 167), throughout Ethiopia, Lucy became a mascot-like symbol with a cultural presence in “numerous coffee shops, a rock band, a typing school, a fruit juice bar, and a political magazine;” “there is even an annual Lucy Cup soccer competition in Addis Ababa.” Showing their pride in their prehistoric past, the people of Ethiopia even fought to keep her in their country when the United States wanted to hold her in their museums (Pyne 2017). Lucy was more than just a great discovery, Lucy gave Ethiopia a voice and an identity for their prehistory.

Lucy was given an image, an iconic and memorable photograph that depicted white bony remains illuminating against a black background. Although other fossil remains like *Ardipithecus ramidus, Homo floresiensis, Homo naledi,* and *Australopithecus sediba* have been discovered after Lucy and photographed or portrayed on that same black backdrop, Lucy remains the most memorable and first depiction that comes to mind (Pyne 2017). Lucy became a standard for how other fossils are measured (Pyne 2016). In short, Lucy’s identity became a foundation for the understanding of the similarities and difference among ourselves as humans.

Paleoartist John Gurche provided life to the fossil by giving Lucy a face and body. This provided the public with the impression that at one point in time, Lucy was more than just bones, she had the capability of moving, acting, and thinking. According to Pyne (2017), a sculpture, reconstruction, or a portrait allows the viewer to step into the life of that fossil and imagine that fossil's daily activities. Creating a face creates emotion; similar to that of viewing a picture of a deceased family member, it allows the viewer to feel a more personal attachment to the remains. This interaction is very powerful because rather than looking at a tool or a bone, it allows the public to be more sympathetic and empathetic with the fossils they are viewing. After her reconstruction was completed, a six year museum tour of Lucy was implemented in 2007 with the intention to raise awareness of Ethiopian culture and give the country an opportunity to show off their heritage (Pyne 2017). It was not long before public schools became inspired by Lucy and wanted to teach anthropology.

For a fossil, names are everything; Lucy was given an identity that fulfilled both a scientific and a cultural perspective (Johanson 2010; Pyne 2017). Because of her completeness, Lucy was one of the first of her kind. Ron Harvey, a conservator who spent six years traveling with Lucy to various museums, stated Lucy connected with humanity on a level that no other artifact was able to; the public viewed and thought of Lucy as the "'mother' of all humans" (Pyne 2017, 184). Studying this single individual enhanced the understanding of our past ancestors, and allowed scientists to create a baseline for determining and accurately interpreting the locomotion in all early hominins and how humans evolved (Ward 2002). Having fossils like Lucy, made it easy for scientists to convey these interpretations to the public. Now, some forty years later since her discovery, numerous fossils have been attributed or affiliated with *A. afarensis,* further building on the knowledge of the prehistoric hominins, and providing a better, well-rounded understanding of human evolution. In the structuralist view, Lucy is just a fragment of the evolutionary story, but when this fragment is combined with past knowledge, which are the universals that Levi-Strauss spoke of, it can help tell a clearer, more complete story of the nature and timing of the transition to terrestrial bipedal locomotion. Lucy was in fact, one of the most iconic finds that lessened the gap in our evolutionary history and influenced human culture and heritage.

Otzi's Cultural Significance

Otzi is another prime example of what can be learned from studying an individual and how different cultures view the importance of this knowledge. Through the scientific analysis of skeletal materials, scientists are able to create an incomplete narrative, providing an understanding of this individual's life and possibly their cultural traditions. The analysis of skeletal materials can also enlighten the public on past histories, cultures, and heritage. Otzi, the iceman, was found in 1991, in a frozen glacier on the Otzal Alps, just inside the Australian-Italian border (Jaroff and Rademaekers 1992; Hawthorne 2001; Ermini et al. 2008; Maderspacher 2008; Gaivin 2009). Radiocarbon dating found he was about 5,300 years old, and probably one of the oldest intact bodies ever discovered. The discovery of Otzi was important to many cultures because he was one of the most important finds in modern archaeology. To scientists, Otzi was a huge part of human history and human culture, and he had an abundance of information and insight into the human past. Other cultures that surrounded the Tyrolean Oetztaler Alps found him of great cultural significance and believed they were culturally affiliated with Otzi. The discovery of Otzi was an additional piece of the prehistoric human puzzle that allowed scientists and bordering cultural regions like Italy, Australia, and the German speaking Alto Adige or South Tyrol to grasp a better understanding of the daily lives, struggles, and cultural customs of our human ancestors during the transition of the Stone Age and the Bronze Age (Jaroff and Rademaekers 1992; Hawthorne 2001; Ermini et al. 2008; Maderspacher 2008). Scientists world-wide pleaded for the opportunity to examine him, while nations and provinces bickered over custody of the remains; all the while anthropologists struggled to determine how Otzi lived and what other secrets his remains could reveal about this time period (Jaroff and Rademaekers 1992). Without Otzi's discovery, there is a possibility that a gap in knowledge might still exist to this day.

Otzi was found wearing buckskins stuffed with grass for insulation, and a grass cape over a striped leather jacket, bearskin cap, and goatskin leggings; he was accompanied with sophisticated bow and arrows, a copper axe, and other tools found nearby (Jaroff and Rademaekers 1992; Popular Science 1993; Ermini et al. 2008; Maderspacher 2008). Otzi's stomach contents showed that he ate primitive types of wheat and game meat (Maderspacher 2008). He also carried a type of mushroom and other plants that were believed to have had antibacterial properties, suggesting that the Neolithic peoples understood the antibiotic properties of plants (Jaroff and Rademaekers 1992; Maderspacher 2008). Otzi was covered in tattoos, providing evidence of the earliest tattooing practices that pre-dates the known practices among the 2000 BC Egyptian mummies (Hawthorne 2001; Maderspacher 2008; Gaivin 2009). Scientific investigations carried out since his discovery revealed that he was about 46 years old and in poor health due to signs of heart disease, joint pain, tooth decay, gum disease, and dental trauma; however, his exact cause of death is still being controversially debated, as it is unclear if he died from his brain injuries or as a result of a lethal laceration to his left subclavian artery from an arrowhead (Ruhli et al. 2017). A CAT scan also revealed that his left arm was broken above the elbow; initially, it was thought that the break occurred when removing the body, but it became clear that the break occurred antemortem (during life) or perimortem (at death), and not during excavation of the remains (Popular Science 1993).

Self-modification and body modification have a long history that are strongly related to religion (Anton 1989; Cheverud et al. 1992; Hawthorne 2001; Ross et al. 2002; Duncan and Hofling 2011). Tattooing and other cutaneous adornments have been popular in all human cultures, as an outward sign of status and belonging, regardless of the time period in which they were living (Hawthorne 2001; Gaivin 2009). According to Hawthorne (2001), anthropologists believe that tattoos are a part of the evolution that views the voluntary endurance of pain, as a way to tap into the primal urge of belonging or meaning. Tattoos have many religious and spiritual significances; for example, to name a few, tattoos for protection, devotional tattoos, and tattoos for the afterlife (Hawthorne 2001; Gaivin 2009). Tattoos entangle us into the larger web of spiritual and permanent symbols that reflect particular personal belief systems carried with us.

Cross-culturally, modern tattoos have always been seen as a taboo; Otzi provided scientists and the common people with a better understanding and toleration of tattoos. Unlike the tattooing that we see today, which are more often for decorative purposes, it is possible that Otzi's tattoos were more typical of acupuncture points for treating back and leg pains or illnesses (Jaroff and Rademaekers 1992; Hawthorne 2001; Gaivin 2009). X-rays provided evidence of arthritis in the hip joints, knee, ankles, and lumbar spine, confirming that these tattoos were for therapeutic purposes (Gaivin 2009). After Otzi's discovery, many scientists and people world-wide began to respect this prehistoric find and the knowledge he was able to provide about the Neolithic Age peoples.

The custody battle of Otzi's remains occurred between all countries surrounding the initial discovery of the remains. Unlike the previous discussion of Kennewick Man, and some with the discovery of Lucy, the "Natives" were not arguing for reburial of Otzi. The battle over Otzi's remains occurred because the surrounding countries wanted to celebrate his discovery as a part of human history and their connection to the remains by housing them in their museums. From 1991 to 1994, Otzi's remains were housed at the University of Innsbruck where scientists were able to conduct research, but struggled with the costs of Otzi's $10,000 monthly upkeep (Jaroff and Rademaekers 1992). When the remains were first discovered, it was presumed that the remains were the property of Austria (Popular Science 1993; Maderspacher 2008). After closer inspection of the remains, it was determined that he was discovered about 100 yards from the inside border of Italy's South Tyrol; therefore, he was the property of Italy (Popular Science 1993). Some authorities in Rome threatened legal action and were against scientific testing of the remains; according to the Roman authorities, this mummy was the archaeological equivalent to a work of Leonardo da Vinci and should not be damaged in anyway (Jaroff and Rademaekers 1992).

Otzi soon became an item of popular culture, possibly as a result of his significance and the excessive details pertaining to his life. Otzi is a prime example of celebrating one's connection to the remains, as several "Natives" wanted to curate his remains rather than rebury them. In short, Otzi tapped into the primal urge of finding a sense of belonging or meaning. Otzi was a breakthrough in scientific history; he allowed modern science the opportunity to forensically investigate and positively determine how he was killed over 5,000 years ago. Otzi gave scientists and the public a scientific and cultural understanding of what it means to be human, how studying an individual like Otzi can provide important details about how our prehistoric ancestors looked, lived, migrated, and struggled in their daily lives, and how he related to the human experience. Moreover, Otzi demonstrated how various cultures view the importance of science and how this knowledge works to shape our understanding of both human and cultural evolution.

Kennewick Man, Lucy, and Otzi are three case studies of prehistoric individuals who demonstrated how a single individual can be studied from a scientific perspective, what they can tell us about their past, and how a single individual can create a sense of belonging and disagreement of cultural and biological affiliation. Each of these prehistoric individuals represent the fundamental changes in the basic social attitudes of the museums, scientific communities, and the overall public. Moreover, each of these cases demonstrated how society adapted and learned to accept science and its value. Additionally, these individuals demonstrate a cultural relationship where the social attitudes towards Native peoples, the idea of evolution, and the acceptance and toleration to cultural customs of our human ancestors are challenged. The ongoing debate of scientific study versus reburial often concerns the conflicting religious beliefs and national pride (people's positive affection towards their country, which is often derived from how much a person considers themselves a member of that society), as in the cases of Lucy and Otzi (Smith 1991; Smith and Kim 2006; Joon Han 2013; personal communication with Weiss 2018). Yet, science speaks to all because it holds value and acts as observations and knowledge of the world. Science is the collaborative effort to understand, or to better comprehend, the history of the natural world and how the natural world works. As demonstrated by Kennewick Man, Lucy, and Otzi, analyzing the physical evidence is simply the beginning of that understanding, but a combination of science and culture are needed to obtain an understanding of the complete picture. Blending of science, history, and culture draws in the public, as its intention is to better understand a culture, a tribe, and the overall human experience.

CHAPTER 3: Literature Review

The following section will be comprised of information regarding the Nevis Historical and Conservation Society (NHCS), its responsibilities, and the ways in which the NHCS remains relevant and enriches the current Nevisian residents through education and knowledge on their island's histories. After an overview on the NHCS, a literature review focusing on the relevant cultural literature will help draw on the correlations among the Taíno to help better understand their culture and heritage, and where this indigenous population first originated. A review of the relevant osteological literature will follow, discussing information on the proper techniques for determining age, sex, stature, and pathology among skeletal remains. The literature provided will help create a basic understanding of the past Tainan population and these newly discovered Taíno individuals.

Overview of the Nevis Historical and Conservation Society

The NHCS is a nonprofit organization established in the 1980s to conserve the natural, cultural, and historic fabric of Nevis, which has been the Society's aim since its founding. The NHCS has two locations on Nevis, the first being the location in Charlestown at the supposed birthplace of Alexander Hamilton, and the second being the First Secretary of the United States Treasury Museum of Nevis History, formally known as the Nelson Museum (Nevis Historical and Conservation Society 2016). The NHCS resources come from volunteer services, endowments and pledges, museum admission and membership fees, donations and grants, fundraising sales and museum shop sales, and a small subvention from the Nevis Island Administration. The NHCS provides the means of knowledge and education on its island's past through collaborative efforts with archaeologists and institutions like Dr. Marco Meniketti and San José State University (SJSU) (Nevis Historical and Conservation Society 2016; Keith 2014; personal communication with Marco Meniketti 2015). This collaboration between the NHCS and SJSU assists in the historical preservation of burial sites, and proper storage of skeletal and cultural materials, and provides new information through museum exhibits catered to tourists and the current people of Nevis.

The Responsibilities and Challenges of the NHCS

Over the years, the NHCS has made very meaningful contributions to both the development and the proliferation of the historical and environmental data on Nevis by housing special exhibits to educate the public and its residents. Dr. Samuel Wilson from the University of Texas has made Nevis his focus of pre-Columbian material culture (Nevis Historical and Conservation Society 2016). Numerous archaeological surveys and excavations have been conducted on different sites throughout Nevis, and over time, the NHCS has collected various examples of material culture and skeletal materials from the prehistoric periods to the present.

Recent increases in the tourist economy and access to the internet have raised concerns by the NHCS over the demolition and utilization of Nevis' historical land and beaches for infrastructural development. As a result of the increases in tourism and technology, economic development has become much more important to the developers and landowners on Nevis than land preservation. Hotels, golf courses, urban condominiums, and mansions are being built on parts of Nevis that are eroding or too close to the water. Consequently, these urban developments are causing increased beach erosion and previously historically documented and undocumented lands are being developed, erasing the cultures and histories, or permanently encapsulating them from discovery in the land they are buried. The NHCS once had involvement and control and could interpose the permits for such developments, but it has been recognized that knowing the right people and having access to wealth can prevail over such control (personal communication with Chris Keith 2015; personal communication with Marco Meniketti 2015).

While collaboration with archaeologists and organizations helps keep the NHCS relevant, further future collaboration will be imperative for the conservation of its natural, cultural, and historic fabric. Current residents of Nevis express the importance of their island's heritage and histories through annual festivals, song, dance, food, and dress, but without the future help and protection of historical lands by the NHCS, culture and histories will be lost, and future generations will not be aware of their island's histories and past cultures in their entirety.

Relevant Cultural Literature

Due to the minimal and limited range of prehistoric and historic research concerning the various cultural groups that once existed on Nevis, it is important to determine the cultural affiliation of the remains of these four individuals. With the date range of about 1025-1275 AD, these individuals fall into the category of the late Ostionoid period (National Park Service 1996). The Ostionoid period contains multiple subseries because this time period is viewed as a new migration of people from the northern South

American coastal areas, who dispersed throughout the Antilles and are uniquely associated with the Caribbean Islands (National Park Service 1996; Saunders 2005). The Elenan Ostionoid Subseries (600-1200 AD) came from the second half of the Ostionoid era, showing the creations of artifacts with zoomorphic and anthropomorphic decorations (Curet 2005). The Chican Subseries (1200-1500 AD) is also associated with the historic Native American culture, the Taíno, where multiple generations and their occupation can be traced to Puerto Rico and the Virgin Islands (National Park Service 1996; Hoogland and Hofman 1999; Saunders 2005). Although the Chican Subseries continued the majority of the practices found in the earlier Ostionoid period, the Chican Subseries had the presence of far more elaborate rituals, ceremonies, and social and religious systems than earlier groups.

Much of the record of the human past is reconstructed and interpreted from historical and archaeological records (Larsen 2002). Because of the limited prehistoric research conducted on Nevis for the Ostionoid era, it is hard to say whether these remains are unquestionably associated with the Elenan Ostionoid Subseries or the Chican Subseries. However, although no Ostionoid ceramics associated with the Taíno have been found thus far (A. Bullen and R. Bullen 1975; Allaire 1980; 1997a), the radiocarbon date among the present sample supports the theory that these skeletons are associated with the Taíno culture.

The aforementioned lack of transition in the ceramic technology that appears in the Lesser Antilles suggests four things. First, the continuation of such technologies suggests a strong cultural connection with the earlier technologies up until early contact with the

Europeans in the late fifteenth century. Second, the lack of such transitions provides strong support of the very little occupation of various cultural groups throughout the Lesser Antilles up to the time of European contact (A. Bullen and R. Bullen 1975; Allaire 1980, 1997a, 2008; Wilson 1989, 2006; Davis and Goodwin 1990). Third, the continuation of the same technologies on Nevis makes it challenging to prove or disprove that the present sample is affiliated with the Taíno and not another extinct culture (Wilson 1989; Davis and Goodwin 1990). Lastly, it is likely that the continuation of such technologies and lack of new discoveries are the result of erosion with artifacts being lost at sea or the lack of archaeological excavations of these known sites.

Samuel Wilson (1989, 1997) completed the majority of the prehistoric research on both Saladoid and Ostionoid sites on Nevis; some of the sites excavated on the eastern side of the island were located approximately 100 m from Chris Keith's 2011 excavation site and approximately 125 m from the sites recently excavated in 2016. Because of the closeness in proximity to one another, it is promising that the collection of archaeological sites excavated in 2016 also belong to either the Saladoid or Ostionoid people. Furthermore, because the number of archaeological sites on Nevis has increased over the past few decades, it is more promising that the present sample is associated with late Ostionoid people (Wilson 1989; Rouse 1992; Morris et al. 2001).

The Taíno culture, linked to the Ostionoid culture, were a socially-ranked chiefdom society, first encountered by the Spanish (Davis and Goodwin 1990; Rouse 1992; Allaire 1997a; National Park Service 1996; Wilson 1997; Loven 2010; Crock and Carder 2011). Dozens of chiefdoms, or *cacicazgos*, controlled large areas of Cuba, Jamaica, Hispaniola, Puerto Rico, and even some locations in the Lesser Antilles and the Bahamas (Wilson 1997). According to Allaire (1997a), chiefdom ranked societies usually have material cultures associated with them that require some sort of skill, instruction, or education in order to master certain elaborate techniques and decorations. Because of the absence of elaborately decorated burials and material culture on Nevis, it must be assumed that the early Ostionoid peoples on Nevis were relatively egalitarian, rather than a chiefdom level society (Allaire 1997a).

Why Nevis?: Taíno Settlement and Trading Strategies

In order to discuss why the Lesser Antilles, particularly Nevis, is a viable location for the settlement of the Taíno, we must first understand how the Taíno related to the settlement strategies of the later era of the Antilles, and how the Taíno related to the final stages of the Ostionoid culture. Additionally, we must understand the Taíno's past and their interactions with the Spanish and the European invasion, colonization, or trade interests that may have brought them to Nevis in the first place. It is important to keep in mind that the records pertaining to the occupation of the Lesser Antilles during the pre-colonial times are scarce; furthermore, the number of known and excavated sites for this time period are limited.

Most of the research on the cultural ancestry of the Taíno people can be traced to the Arawakan-speaking Ronquinian Saladoid people who lived alongside the Orinoco River in South America (Taylor 1949; Allaire 1980; 1997; Keegan and MacLachlan 1989; Wilson 1989, 1997; Deagan and Cruxent 2002; Fraser 2014; Keith 2014; Anderson-Cordova 2017). By about 1000 BC, the Ronquinian Saladoid people were living in large settlements, cultivating corn, and crafting elaborately painted pottery (Deagan and Cruxent 2002). Throughout this time, the West Indies experienced successive waves from groups like the Taíno, Macoriges, Ciguayos, and the Caribs during the second century BCE (Keegan 1995; Rodriguez Lopez 2016). It was thought that by about 250 BC, the Taíno continued their traditions and migrated into the Caribbean, reaching as far as eastern Hispaniola (Rouse 1992; Keegan 1994; Hoogland and Hofman 1999; Deagan and Cruxent 2002). In the Caribbean, the Saladoid people encountered the island's original inhabitants, known as the "Archaic" peoples (Hoogland and Hofman 1999; Deagan and Cruxent 2002; Rodriguez Lopez 2016). Inter-island trading and other interactions with the "Archaic" people occurred, eventually adopting some practices of the Ronquinian Saladoid people (Hoogland and Hofman 1999; Deagan and Cruxent 2002).

In response to their new environment, the Saladoid people seem to have developed a new cultural expression by about 600 AD (Rouse 1992; Keegan 1994; Deagan and Cruxent 2002; Atkinson 2006). At this time, most of their material culture was expressed with the use of pottery, bone, shell, and stone (Olazagasti 1997; Deagan and Cruxent 2002; Golding-Frankson 2009). Interactions with various groups would have also shaped their cultural practices and would have been visible in their material culture.

Other sources indicate that the Taíno had been on the constant defense against the aggressive Carib people who conquered the Lesser Antilles (Encyclopedia Britannica Inc. 2018). Is it possible that during the time of their expansion, the Taíno also attempted to inhabit the islands in the Lesser Antilles, but were forced to move because they faced annihilation from their Carib rivals? This question still remains uncertain because while most sources state that the Taíno people only inhabited the Greater Antilles, other sources indicate that the Taíno once inhabited islands in the Lesser Antilles, West Indies (Siegel 1991; Hoogland and Hofman 1999; Deagan and Cruxent 2002; Ostapkowicz and Newson 2012; Rodriguez Lopez 2016). For those who believe that the Taíno inhabited the Lesser Antilles, they are referred to as the Eastern Taíno, and although very similar culturally, those who inhabited Hispaniola, Puerto Rico, and the Virgin Islands were referred to as the Classic Taíno (Keegan and MacLachlan 1989; Rouse 1992; Keegan 1994; Hoogland and Hofman 1999). While this distinction existed in the past, today, the Taíno culture is thought to be and studied as one ethnic group.

The Lesser Antilles acted as a connection of the two larger landmasses of South America and the Greater Antilles. It is not surprising that the ceramic or Saladoid groups had spread through the islands of the Lesser Antilles to the Greater Antilles, ending up in Hispaniola and Puerto Rico (Rouse 1992; Keegan 1994; Hoogland and Hofman 1999). There are conflicting views of where the Taíno resided. The majority of the material culture and archaeological sites show that the Taíno settled and remained in the Greater Antilles and South America during the post-Saladoid period or the Late Ceramic (ca. A.D. 600-1492) (Allaire 1990; Hofman 1993; Peterson 1997; Hoogland and Hofman 1999). However, archaeological evidence suggests that smaller islands in the Lesser Antilles, particularly the island of Saba, acted as the interaction center of trade among these prehistoric groups; moreover, Saba provides evidence to suggest that a small group of the Taíno may have inhabited the island (Allaire 1990; Hofman 1993; Hoogland and Hofman 1993, 1999). Reports state that the Taíno were exceptional seafarers because they used large dugout canoes that could hold up to 80-150 people at a time (Olazagasti 1997; Deagan and Cruxent 2002; Atkinson 2006). These canoes may have allowed communication and trade with other islands throughout the Caribbean possible (Wilson 1990; Rouse 1992; Deagan and Cruxent 2002). Such claims would support the expansion, migration, and trade route patterns from the Greater Antilles to Saba and the rest of the islands in the Lesser Antilles.

As Hofman and Hoogland (1991) previously hypothesized, the settlement of Saba could have acted as a location to flee from social or political uncertainty occurring in the Greater Antilles and the Virgin Islands. This hypothesis was strengthened by Curet (1992) who suggested that the migration of these groups to the Lesser Antilles could have been related to the decrease of the population on Puerto Rico. Saba is tactically located between the Greater and Lesser Antilles, thus allowing access to direct trade routes and communication with islands in both directions. Consequently, it seems more likely that the Taíno migrated towards Saba and the Lesser Antilles with the hopes of the exchange of goods and communication with the rest of the Caribbean islands (Keegan and MacLachlan 1989; Keegan 1995; Hoogland 1996, Hoogland and Hofman 1999). The expansion of the Taíno territory towards the Lesser Antilles is demonstrated by the occurrence of scattered settlements that displayed specific function or ritual connotations, and the presence of Taíno material culture on Saba (Hoogland and Hofman 1999). If Saba was not used as a place of permanent habitation, then why have settlements been found on the island that suggest ritual practices?

After 1200 AD, there was a gradual decrease in the Taíno population for the Lesser

Antilles (Hoogland and Hofman 1999). This population decline can be explained in two ways. First, because of the insufficient amount of sites reported and excavated from this period, it is perceived that the population of the Taíno decreased, when in fact the unexcavated and undiscovered sites exaggerate this claim. Second, the decline in the Taíno population can be explained by a possible recoiling to the Greater Antilles to avoid conflicts arising from their Carib rivals or colonization that settled on the Lesser Antilles.

In Hispaniola, during Columbus' second arrival, he found a significant decrease in the number of Taínos, as a result of the European contact (Wilson 1997; Deagan and Cruxent 2002). Resisting against Spanish rule and colonization, the Spanish conquered the Taíno by about 1493 in the Greater Antilles, resulting in rapid destruction of the Taíno (Keegan 1996; Wilson 1997; Hoogland and Hofman 1999; Ostapkowicz and Newson 2012; Encyclopedia Britannica Inc. 2018). Known as one of the largest tragedies of the conquest of the Americas, by the mid-sixteenth century, the Taíno were almost drawn to extinction because of the spread of epidemic diseases, imposed slavery, war, and violence resulting from European invasion and colonization of the Greater Antilles (Keegan 1996; Wilson 1997; Hoogland and Hofman 1999; Deagan and Cruxent 2002; Ostapkowicz and Newson 2012; National Museums Liverpool 2016; Rodriguez Lopez 2016). Those who survived mixed with the Spaniards, Africans, and others who were enslaved by the Europeans (Hoogland and Hofman 1999; Ostapkowicz and Newson 2012).

Lifestyle Practices of the Taíno

The Europeans gravely underestimated the Taíno peoples when they first encountered this indigenous population in the Greater Antilles (Deagan and Cruxent 2002). Living in smaller villages or sometimes larger towns, the Taíno practiced a high yielding form of shifting agriculture, a system of cultivation that preserves the soil's fertility through crop and field rotation (Encyclopedia Britannica Inc. 2018). The Taíno would also burn the forest or shrub nearby and add the ashes to their soils for additional nutrients for their crops. The Taíno's social and political structure relied heavily on a system of intensive agriculture, supplemented with wild resources and trade (Wilson 1990; Rouse 1992; Deagan and Cruxent 2002).

The overall research on the Taíno's hierarchical structure varies. While some research suggests that the Taíno were egalitarian and lacked a political structure, other research indicates that the Taíno's political structure was organized into a hierarchical chiefdom, with a paramount leader (Wilson 1989; Hoogland and Hofman 1999; Deagan and Cruxent 2002; Rodriguez Lopez 2016). Accounts from Columbus and Cuneo state that the Taíno were egalitarian, but the women completed all the farming and subsistence labor; "the women do all the work. Men concern themselves with only fishing and eating" (Deagan and Cruxent 2002, 32).

The Taíno settlements ranged in size from small hamlets to larger towns (Deagan and Cruxent 2002). The layout of their homes were not in the traditional uniform town structure we are familiar with today, rather they were laid out in an uneven fashion. To protect themselves from the tropical climates, their houses were made of wood and straw, called *caney* and *bahio;* these dwellings were constructed into a bell-shaped form and could house about ten people per structure (Rouse 1992, 1996; Olazagasti 1997; Deagan and Cruxent 2002; Atkinson 2006). Villages served hundreds, and in some cases formed political alliances under the leadership of one person or family; such power and access to communal land were also determined by matrilineal descent (Wilson 1997). Other accounts from the Spanish state that occasionally, the eldest son would inherit the rank of lineage chief from his father, suggesting that the inheritance was actually through patrilineal descent (Rouse 1948b; Wilson 1997).

Cultural Practices of the Taíno

Both intentional and unintentional cranial deformation are present among many cultures around the world (Anton 1989; Cheverud et al. 1992; Ross et al. 2002; Duncan and Hofling 2011). Several studies indicate that pre-Columbian populations in Peru practiced artificial cranial deformation (Ross et al. 2002; Duncan and Hofling 2011; Pestle 2013; Okumura 2014). Cranial variation has been investigated among various cultures in Latin America and the Caribbean, but information is still lacking (Ross et al. 2002; Ross 2004). Cranial deformation has been thought of as a sign of beauty, power, and social status; other cultures like the Maya practiced cranial deformation, but for the purposes of reducing the risk of soul loss and injury from evil winds (Ross et al. 2002; Duncan and Hofling 2011; Pestle 2013). Because cranial bones are quite malleable in the earlier periods of development, this usually begins just after birth and continues for a couple of years into early childhood (Buikstra and Ubelaker 1994).

A few examples of the methods used in achieving cranial deformation are simple and double cranial wrapping, cradle-boarding, and headdresses (Buikstra and Ubelaker 1994; Ross et al. 2002; Duncan and Hofling 2011; Pestle 2013). According to Anton (1989), head binding and cradle-boarding are exclusive of each other, and differentiating between the two can be very difficult. Many sources indicate that intentional or artificial flattening of the skull through the use of cradle-boarding will result in the flattening of the occipital bone (back of the skull), leaving the brow ridge untouched; this process involves the placement of a pad across the front of the skull to compress the infant's head to the back of the board (Cheverud et al. 1992; Ross et al. 2002; Bass 2005; Duncan and Hofling 2011; Okumura 2014).

Descriptions supported by archaeological evidence from Cuba and Haiti states that the Taíno practiced cranial deformation (Rouse 1986, 1992; Deagan and Cruxent 2002; Ross 2004; Loven 2010; Ostapkowicz and Newson 2012). Bernáldez, a Spaniard's description of the Taíno, states that "they have very large foreheads and faces, round heads, as narrow from the temple to temple, as from the forehead to the neck; they have straight black hair, bodies of medium size…" (Deagan and Cruxent 2002, 28). According to Rouse (1992) and Loven (2010), it was common for the Taíno to have a deformation affecting the forehead, as they found it fashionable to flatten their foreheads by binding hard objects to it in childhood. Ample cranial materials excavated from Cuba and Jamaica, and other skeletal materials excavated in Puerto Rico and a site on West Farm Estate, St. Kitts, have confirmed such deformation (Loven 2010). The Arawak Indians, who are closely related to the Taíno, share the same deformation; this deformation was very different from the flattening that occurs from compression from boards, which was present in the Choctaw Indians in Florida (Loven 2010). It is believed that the forehead extension seen among the Arawak Indians and the Taíno must have been an old custom that was brought with them to whatever island they traveled (Ross 2004; Loven 2010).

Other accounts from the Saladoid sites in Puerto Rico, to the Taíno satellite sites in Kelby's Ridge, Saba, provide sufficient archaeological evidence of cranial wrapping throughout the Caribbean region; yet, the reasons for such practices are poorly understood (Rodriguez 1997; Ostapkowicz and Newson 2012). Due to conflicting archaeological evidence and historical accounts, the exact cranial deformation methods used by the Taíno are unclear. However, since most sources state that the Taíno engaged in cranial deformation in infancy, and about 80 percent of the burials excavated in Puerto Rico showed signs of cranial deformation indicative of wrapping or binding, it appears that this common practice may have been a marker of group identification, rather than a marker of social status (Cheverud et al. 1992; Rodriguez 1997, 82; Ross 2004; Crespo-Torres 2010; Duncan and Hofling 2011; Okumura 2014; Rodriguez Lopez 2016).

Religious Practices of the Taíno

The religious practices among the Taíno are also poorly understood because of the overall insufficient research that has been conducted thus far. However, it is known that the Taíno manufactured *cemís* that existed in a wide variety of forms, practiced secondary internments or ritual reburials, and produced a variety of personal adornments like stone beads, ornaments, and other small celts (Wilson 1990; Deagan and Cruxent 2002; Ostapkowicz and Newson 2012). To this day, archaeologists are continuing to gather information on the Taíno in hopes to better understand their cultural practices and ways of life throughout the Caribbean.

Taíno rituals included fasting, dancing, purging, bathing, and chanting (Deagan and Cruxent 2002). Taíno religion was polytheistic, which is the belief in multiple or many deities that were worshiped on an independent basis (Rodriguez Lopez 2016). The Taíno also believed their ancestors lived on and interacted with the living in the afterlife (Deagan and Cruxent 2002). The production of Tainan c*emís* was an ancestral practice and they were believed to represent ancestors, spirits, devils, or deities. At times, *cemís* were manufactured with human bone placed inside them and surrounded with cotton fibers that were sewn together (Ostapkowicz and Newson 2012; Rodriguez Lopez 2016). Figure 3 shows two manufactured Taíno *cemís;* the object on the left is a wooden *cemí*, and the object on the right is a cotton *cemí.* The cotton *cemí* contains a human skull and teeth that were harvested from a burial. The human skull was wrapped with cotton and used to represent an ancestor or a spirit of an ancestor (Ostapkowicz and Newson 2012).

Figure 3. Taíno Manufactured *Cemís.* Figure to the left is a wood *cemí*, and figure to the right is a cotton *cemí.*
Photo Credit: Ostapkowicz and Newsom (2012).

The Taíno sculptures and c*emís* that represented ancestors were passed through the female line, and women were reported to have manufactured and distributed such goods (Rouse 1982; Wilson 1986; Ostapkowicz and Newson 2012). Documented accounts of c*emís* have been mentioned by Columbus himself as early as 1493 and shortly after the return from his second voyage (Loven 1979; Ostapkowicz and Newson 2012). For the Taíno, manufacturing *cemís* was ritualistic and spiritual, as these items functioned as a protection or supplication to the spirit world (Parry and Keith 1984; Deagan and Cruxent 2002). For example, when the Taíno needed rain or sun, or desired protection and support when fighting enemies, they would wear these man-made items around their necks to keep them close (Parry and Keith 1984; Deagan and Cruxent 2002).

A diversity of burial styles present throughout the Caribbean and Latin America makes it difficult for archaeologists to definitively prove they are associated with a specific cultural group (A. Bullen and R. Bullen 1975; Walker 1983, 2005; Allaire 1997b; Boomert 2000; Hofman et al. 2001; Schaffer et al. 2010; Ostapkowicz and Newson 2012; Garrard-Burnett 2015). Weather in the Caribbean is hot and humid and has detrimental impacts on the preservation of skeletal materials; thus, making other cultural preservation methods, such as mummification, less likely (Walker 1983; Wilson 1989; Bass 2005; Weiss 2009). Additionally, as a result of beach erosion and land depletion, the topography of the Lesser Antilles is constantly changing. These topographic changes affect the shorelines, resulting in an unknown loss of burials to sea and a substantial gap in the archaeological record cultural groups like the Taíno (Wilson 1989). Using ArcGIS software, the author has provided two maps included in the appendix section of this thesis; these maps compare the prehistoric shorelines to the current 2017 shorelines and show the topographic changes on Nevis over time. The burials excavated in the summer of 2016 are illustrated on these maps to stress the need for conservation of these sites.

The treatment of remains after death is an important field of study for bioarchaeologists. Because each culture practices their own unique burial style and treatment of the deceased, it is important to understand a culture's burial processes and how a culture may have viewed the life and death of an individual, both spiritually and physically (Walker 1983, 2005; Ubelaker 1999). Therefore, a discussion of the Taíno interment processes and the treatment of their dead follows.

Because of the limited skeletal evidence that has been excavated from the Lesser Antilles, and even more so with Nevis, for comparison purposes, it is important to study the other Tainan osteological remains throughout the Caribbean. Research indicates that the Taíno engaged in secondary internments or ritual reburials which were completed by harvesting the skull, and sometimes collecting the long bones, such as the femur, of a previously deceased individual, and placing them in a burial of a newly deceased individual, or in some cases, placing them in an isolated burial (Mason 1983; Boomert 2000; Schaffer et al. 2010). Most of the Taíno burials were reportedly found with the deceased buried in a strongly flexed or fetal position, with their knees bent towards their chest, holding a skull belonging to another individual in their arms (Hoogland and Hofman 1999; Walker 2005). Other than a presence of ceramic bowls and shells, these burials lacked an obvious association with grave goods (Rouse 1952a, 1952b; Walker

1983; Drew 2009; Loven 2010). A couple of sites that are important to note for comparison are at Paso del Indio, Puerto Rico, where many of the primary burials were found directly associated with secondary burials, caressing the skull of another individual (Walker 2005), and Kelbey's Ridge 2, Saba, where a total of seven burials were found with the deceased lying in a strongly flexed or fetal position and pottery placed near their feet (Hofman 1993; Hoogland and Hofman 1999). Because of the intimate nature of the burials that contained two individuals, it is assumed that these individuals were possibly ancestors who were "treasured and dear" (Walker 2005), or these individuals belonged to the same kinship group and represented members of one household (Hoogland and Hofman 1999).

In the Greater Antilles, the Taíno were very much into the use of cotton for spiritual, ritualistic, and everyday purposes (Ostapkowicz and Newson 2012). Although there have been no accounts from archaeologists or osteologists of desiccation on Nevis, possibly due to the hot and humid climate, other accounts state that the Taíno placed the deceased in a basket or large burial jars, or sometimes wrapped them in cotton hammocks and placed them near a fire to help with dehydration before placing them in a small pit within their house (Mason 1983; Walker 1983; Hoogland and Hofman 1993; Rodriguez 1997; Pretty and Calder 1998). Eventually, the remains were dug up from these pits, and the cranium and long bones would be removed from the burial and reinterred with the remains of another individual, or used for ritualistic purposes, such as manufacturing *cemís* (Mason 1983; Walker 1983; Boomert 2000; Schaffer et al. 2010; Ostapkowicz and Newson 2012). It is possible that these burial practices combined with the tropical climate contribute to the lack of skeletal remains in the Caribbean archaeological record, and even more so with Nevis (Walker 1983).

In the Ostionoid period (circa 800 CE), burial practices began to shift from the importance of community to an emphasis on the family lineage (Walker 1983). It was believed that this was the first steps towards a more centralized based power with the emergence of chiefdoms at the time of European contact, especially in the Greater Antilles (Walker 1983; Ferguson 1990, 2000). This same shift also exhibited the emergence of burials of the deceased underneath Taíno ball courts and partial-embalming that was practiced by the later Ostionoid cultures (Walker 1983; Keegan 2000). This shift possibly explains why Caribbean archaeologists are able to find evidence of both egalitarianism and more stratified societies (Rouse 1964; Walker 1983; Wilson 1989, 2001; Allaire 1997a, 1997b; Haviser 1997; Petersen 1997).

The most common burial practices in the Lesser Antilles were burials under personal homes, or secondary internments and ritual reburials (Mason 1983; Boomert 2000; Schaffer et al. 2010; Ostapkowicz and Newson 2012). Up until the discovery of the double burial in the summer of 2016, no evidence for complex mortuary practices have been discovered on Nevis (Walker 1983; Hofman et al. 2001). It cannot be certain that burials in the present study were in fact buried underneath personal homes, but given the evidence of similar Taíno burials throughout the Caribbean and the apparent shift in the burial practices in the Ostionoid period, it is likely both these burials are secondary internments or ritual reburials; moreover, it can be argued that the burial containing two individuals is an ancestral ritual reburial (Mason 1983; Walker 1983; Boomert 2000; Schaffer et al. 2010; Ostapkowicz and Newson 2012).

The Taíno used a variety of personal adornments. Accounts from Columbus' voyage claim that they used black, red, and white body paints in decorative styles, possibly for ritual or religious purposes (Parry and Keith 1984; Deagan and Cruxent 2002). Stone beads and carved pendants were worn around the neck and arms. The Taíno also practiced body modification, using facial and body piercing, such as ear plugs, nose ornaments, and lip plugs (labrets), as adornments; these items were made of stone, wood, shell, bone, and sometimes gold (Deagan and Cruxent 2002; Golding-Frankson 2009).

The Taíno valued certain stone beads that were like marble and small, short, and cylindrical in shape (Loven 2010). These cylindrical beads are commonly found on the island of Monserrat (Loven 2010). Accounts of barrel-shaped beads were also noted by the Spanish and have been found on islands in the Lesser Antilles (Loven 2010; personal communication with Samuel Wilson 2018). Among the Taíno, these beads were commonly associated with feast pits or burials, owned by the elite and upper-class families, and most likely had a ritual significance or represented valued possessions (Deagan and Cruxent 2002; Deagan 2004; Loven 2010). According to Loven (2010), occasionally, these manufactured beads were given as mortuary gifts to the dead, as a way to distinguish themselves in another world.

According to Golding-Frankson (2009), throughout the Caribbean, shells were collected primarily as a source of food, and secondarily, they were industrialized as decorative arts. Although the pre-Columbian Caribbean populations utilized the Queen conch in many ways, worked conch shell tools were a common find among the Taíno. Golding-Frankson (2009) argued that the Taíno manufactured conch shell art pieces as a way to display one's affiliation with certain protective spirits. Golding-Frankson (2009) examined the Taíno 'shellsmithing' technology and determined that specific materials and techniques were used to emphasize the natural, internal structures of the shells, as a way to communicate ideas and imagery in the manufacturing of shell ornaments, ceremonial objects, and tools. The Taíno must have used a similar selection process when choosing the materials to fabricate beads and other adornments.

Diet of the Taíno

Diet and nutrition are fundamental elements that provide insight into a person's health and overall well-being. According to Larsen (2002), the types of foods produced and consumed play an important role in the structure of a society (simple vs. complex) and their settlement patterns (sedentary vs. mobile). Like the Carib peoples, the Taíno settled close to bodies of fresh water, and they were quite dependent on the natural environments and natural resources that surrounded them. As previously stated, the Taíno's social and political structure relied on a system of intensive agriculture, supplemented by trade and wild resources, such as fish and game (Wilson 1990; Rouse 1992; Deagan and Cruxent 2002; Atkinson 2006). Whether it was done deliberately or inadvertently, the Taíno, and their predecessors the Ostionoids, were the first to have assisted in the transformation of the vegetation (Rashford 1998; Deagan and Cruxent 2002; Atkinson 2006). The Taíno grew stable foods, such as tubers and yams, corn, beans, squash, tobacco, peanuts, and peppers, and wild plants were gathered (Deagan and Cruxent 2002; Encyclopedia

Britannica Inc. 2018). The Taíno also introduced a number of new fruits, such as the pineapple, guava, and papaya (Deagan and Cruxent 2002). Other crops like cotton were also cultivated, but extremely little information is to be had about this crop (Wilson 1997; Loven 2010; Crock and Carder 2011).

According to Froelich Rainey (1940), the earlier Saladoid peoples consumed more "crab-shell" pointing towards a more terrestrial dependence, while the later Saladoid peoples, including the Taíno, focused more on a "shell-culture," suggesting a maritime dependence. Fish and shellfish were an extremely important food source for the Taíno because of their close proximity to the sea. The Taíno exploited the sea using bows and arrows, spear-throwers, hooks and lines, and nets and baskets (Olazagasti 1997; Peterson 1997; Wilson 1997; Deagan and Cruxent 2002). The Taíno anchored the nets using stone weights called *potalas,* and they built large canoes and made poisons to assist with catching fish in open waters (Olazagasti 1997; Atkinson 2006).

Archaeologists are able to better understand how the Taíno were able to adapt to their food possibilities and their environment by examining the various faunal remains found within shell mounds (Loven 2010). The faunal remains in the test pits and other excavated units throughout the Caribbean point to the understanding that the *Strombus gigas* or the Queen Conch was a very common Caribbean sea snail and a main source of protein for the Taíno (Atkinson 2006; Golding-Frankson 2009; Loven 2010). The Taíno also consumed other proteins, such as fish, crabs and other mammals, as their faunal remains have been excavated from many Taíno middens throughout the Caribbean (Atkinson 2006; Golding-Frankson 2009; Loven 2010). Reitsema and Vercellotti (2012) and Eerkens et al. (2015) have analyzed variation in ancient diet; stable isotopes found that depending on one's status, different diets were consumed. It was suggested there was a separation of diet among the elite because they consumed more mammals and larger fish when compared to non-elites (Deagan 2004; Crock and Carder 2011).

Ultimately, the Taíno in South America had to supplement their marine based diet with terrestrial animals, such as lizards, iguanas, and snakes (Taylor 1949; Wilson 1989; Stokes 1995, 1998; Newsom and Wing 2004; Atkinson 2006; Keegan et al. 2008; Loven 2010). In order to supplement some of their proteins, the Taíno in the Caribbean also shifted their diets to other terrestrial life by hunting small rodents and birds (Taylor 1949; Wilson 1989; Stokes 1995, 1998; Newsom and Wing 2004; Keegan et al. 2008). Although an abundance of marine fauna are present, faunal records of other terrestrial species also exist, causing archaeologists to be unsure as to what foods were most important; some scholars argue that the data found among the faunal remains underestimates the importance of the readily available marine resources (Peterson 1997).

Osteological Review: What a Skeleton Can Tell Us

The human skeleton is remarkably informative about an individual's health, dietary customs, lifestyle, and activity. Moreover, it can provide biological attributes, such as age, sex, and stature, all of which are used to construct demographics for populations (Larsen 2002; Gaither 2004). Bioarchaeology can be defined as the study of human remains within their cultural (archaeological) context in order to gain a holistic view and reconstruct the lifestyle, environment, and past behaviors of the deceased (Larsen 2002; Weiss 2009; Martin et al. 2013; Slaus 2015; Sheridan 2017). According to Sheridan

(2017, 112), there are “6D’s of Bioarchaeology” that are used when studying a holistic view of skeletal remains, all of which will be applied to the burials excavated on White’s Bay Beach; they are as follows: demography (each individual’s age and sex and then reviewed as a group to look at the population), diet (the types foods consumed and the types of foods available in one’s environment), disease (paleopathology), daily life (activity patterns), death (burial practices), and biodistance (genetic relatedness and migration). Whether focusing on a whole community or a single individual, analyzing skeletal remains allows for the possibility to better understand diet, diseases, and types of injuries that may have occurred throughout an individual’s daily life as related to their environment (Ubelaker 1999; Weiss 2003, 2009; Martin et al. Perez 2013; Slaus 2015; Sheridan 2017).

The methods for obtaining sex, age, and stature are all dependent on the bones that are available, the population you believe to be represented, and the relative accuracy of the results (Ubelaker 1999). It is important to keep in mind that at times, due to different environments and diets, there is often a significant difference among males and females, and among individuals of the same sex, age, and stature (Ubelaker 1999). Although estimating an individual’s sex, age, and stature can never be exact, it is important to minimize errors of false determination whenever possible. Controlling for certain factors like using methods that are the most comparable to the population being studied and that is directly associated with the skeletal materials present can assist with providing more accurate and reliable results.

The relative age at the time of death among bioarchaeological samples have been examined in numerous ways, involving both cranial and post-cranial elements, but the reliability and accuracy of certain methods are questionable; thus, a combination of methods is suggested to ensure accuracy (Buikstra and Ubelaker 1994; Ubelaker 1999; White 2000; Bass 2005; White and Folkens 2005). According to Buikstra and Ubelaker (1994), numerous studies have been conducted on the various stages of public symphysis and the articular surface, and fusion of the ilium, ischium and pubis (three segments of the hip bone), as a way to effectively assess age. Given that most archaeological samples lack an intact pelvis, this aging method is not always suitable. Epiphyseal fusion, using the distal and proximal ends of the humerus, femur, and tibia can be used to estimate age (Bogin 1988, 1999; Ubelaker 1999; White 2000; Bass 2005). Cranial sutures have also been used to assess age, but studies have indicated considerable variability in the closure rates (Meindl and Lovejoy 1985; Bogin 1988, 1999; Masset 1989; Buikstra and Ubelaker 1994). Meindl and Lovejoy (1985), Masset (1989), and Buikstra and Ubelaker (1994) argue that when other aging methods are unavailable or when used in conjunction with other methods, examination of the suture closures has been reported useful. In a more recent study, Dorandeu et al. (2009) microscopically examined the fronto-sphenoidal sutures in a sample of 244 individuals. Dorandeu et al. (2009) found that the closure rate the fronto-sphenoidal sutures effectively determined age-at-death.

When complete and well-preserved skeletal remains are not available, other aging methods can be used. For example, the fusion of secondary ossification sites on the vertebrae (the transverse process, spinous transverse process, and anular ring) has been used to effectively determine age at the time of death, as carried out by Cardoso and Rois

(2011); this study found that because the pre-sacral vertebrae have various secondary centers of ossification that have a specific timing of fusion, these sites can effectively estimate age among human skeletal remains. The ossification sites observed at the 3rd cervical through the 5th lumbar vertebrae appear at puberty and completely fuse by 25-30 years old (Scheuer and Black 2000; Cardoso and Rios 2011). According to Cardoso and Rios (2011), regardless of the type of vertebra examined, these specific fusion sites on the transverse process, spinous transverse process, and anular ring provide a good indication of one's age.

Examination of the sternal ends of the ribs has also proven to provide an approximate age for skeletal remains because of the various age-related stages that occur at the sternal ends of the ribs (Iscan 1991); this is visible with the level of porosity, coupled with sternal lipping (Iscan 1991; Loth 1995; Ubelaker 1999; Bass 2005; Pankaj et al. 2007; Fanton et al. 2010; Meena et al. 2013; Cerezo-Roman and Hernandez Espinoza 2014). In Iscan's (1991) study, 300 American Whites and Blacks, of known sexes, were assessed for their age through examination of the sternal ends of the ribs. Iscan (1991) found that there was a significant difference in the rate and pattern of metamorphosis when comparing the results by sex and race; however, when the age assessments from the ribs and pubic symphyses of the same individual were compared, the sternal ends of the ribs proved successful. Loth (1995) applied Iscan's stages to a cemetery population of known sexes and ages; she found that the rib phase technique proved to be one of the most consistently reliable methods for aging skeletal remains. Similarly, Pankaj et al. (2007) conducted a random age determination study that assessed the sternal ends of ribs among a sample of 500 individuals. Pankaj et al. (2007) hypothesized that as the individual's age increased, the pit depth would also increase. Pankaj et al. (2007) hypothesis was proven correct with a high degree of accuracy when this method was applied to the fourth rib; according to Pankaj et al. (2007), as the age of an individual increases, the walls surrounding the pits found at the sternal ends of the ribs thin, resulting in a U-shaped pit, rather than V-shaped pit (Pankaj et al. 2007). Meena et al. (2013) concurred with the accuracy of the results when these methods were applied to the fourth rib. As with any method, concerns of accuracy arise, resulting in the need for further research utilizing these methods. Fanton et al. (2010) and Cerezo-Roman and Hernandez Espinoza (2014) argued that this aging method must be improved because estimating age-at-death using the sternal end of the fourth ribs slightly underestimated the age of French and Mexican samples, respectively.

Osteologists can also use adult dental eruption to assess age because certain teeth erupt at certain stages in life (Buikstra and Ubelaker 1994; Ubelaker 1999; Gaither 2004; Bass 2005; White and Folkens 2005). Teeth vary in shape and size; primary teeth (baby teeth) and permanent teeth (adult teeth) look very different; therefore, these variations can assist with the aging of a deceased individual (Ubelaker 1999, White 2000, White and Folkens 2005; Bass 2005). At birth, individuals usually have 20 primary teeth that erupt at different stages in life; these primary teeth fall out and are replaced by 32 permanent teeth that usually erupt by the age of 21. For example, although variation among cultures exists, the third molar usually erupts between the ages of 17 to 25 years old, while the premolars usually erupt around the age of 10-12 years old (Buikstra and Ubelaker 1994; White and Folkens 2005).

Numerous studies have examined the effectiveness of attrition and other dental wear patterns to determine age-at-death (Murphy 1959; Miles 1963; Brothwell 1981; Walker et al. 1983, 1991, 2005; Santini et al. 1990; Knezovic-Zlataric et al. 2002; Oliveira et al. 2006; Gilmore and Grote 2012; Vieira et al. 2015). Miles (1963) established the rate of attrition on the third molars in young Anglo-Saxon skulls whose age could be determined from the state of dental development. Miles (1963) patterns of attrition were based on the assumption that the rate of dental wear would remain constant throughout one's life. Brothwell (1981) published a chart based on Miles' work; the stages were based on an ordinal scoring scale to age British skeletons from the Neolithic and Medieval times. Both Miles (1963) and Brothwell (1981) propose that visual scoring the various stages of attrition can assess the age; however, they caution against the use of the chart in other archaeological periods or geographical locations, as the results may not be as accurate. Walker et al. (1991) examined the attrition rates in a prehistoric California Indians from the Santa Barbara Channel. In this study, Walker et al. (1991) visually and metrically measured the mandibular molar crown heights and the occlusal attrition angles to determine the levels of attrition among this prehistoric population. According to Walker et al. (1991), dental attrition is an important source of information on the age structure among prehistoric populations and can be particularly useful for aging archaeological skeletal remains. Walker et al. (1991) found that there was a strong correlation between the attrition patterns and an individual's age; thus, attrition provides valuable data for aging skeletal remains. In a similar study conducted by Oliveira et al. (2006), which examined the occlusal surfaces of 298 permanent maxillary and mandibular molars of prehistoric Brazilian shellfish gatherers, similar results were found. Oliveira et al. (2006) concluded that the application of the Brothwell (1981) chart for the Brazilian archaeological sample presented satisfactory results of consistency and effectively determined the age at the time of death. Oliveira et al. (2006) concluded that age classification through examination of the occlusal molar attrition may be a useful tool for determining age in similar archaeological findings whose ages are unknown. Gilmore and Grote (2012) and Vieira et al. (2015) argued that additional research is needed to effectively determine if the Miles method or the examination of attrition, respectively, successfully assess age at the time of death.

Examining dentition can be very useful when analyzing the skeletons excavated on White's Bay Beach because as there is currently a lack of understanding of the Taíno diet, diseases, and daily interactions with their environment. Dental analysis of this sample can allow a better understanding of these elements and can provide a better understanding of the Taíno history or past, as theirs is currently incomplete. Moreover, examination of the dentition permits the discovery of additional pieces of the puzzle and the reconstruction of the Taíno's story, hopefully providing a basis for future research among this population and possibly other prehistoric populations on Nevis.

Although extensive levels of remodeling and signs of osteoarthritis, such as high levels of porosity, coupled with sternal lipping can be indicators of an extremely physical and active lifestyle, signs of remodeling and osteoarthritis throughout the skeleton can also be indicators of age (Weiss 2009, 2015, 2017). Occasionally, the bone length can assist osteologists with an age assessment (Buikstra and Ubelaker 1994; Ubelaker 1999; Gaither 2004; Bass 2005). Most osteologists will argue that bone length alone is not a good indication of age due to variation; therefore, this method should be accompanied with additional methods to ensure the accuracy of its results (Buikstra and Ubelaker 1994; Ubelaker 1999; White 2000; Bass 2005).

Osteologists are also capable of determining sex. Identifying sex based on the morphological attributes of sub-adult and adult skeletons have a high degree of accuracy (Ubelaker 1999; Larsen 2002; Weiss 2003). When attempting to sex skeletal materials, it is a generally preferred by osteologists to use parts of the pelvis, such as the sciatic notch, posterior angle of the greater sciatic notch, and posterior segment of the greater sciatic notch, as they are usually twice as large in females than in males and nearly 100 percent accurate (Singh and Potturi 1978; Buikstra and Ubelaker 1994; Ubelaker 1999; Bass 2005; Betti 2013; Raut et al. 2013; Petaros et al. 2015; Smithsonian Natural Museum of Natural History 2016). However, if the pelvis is incomplete or missing, although they have a lower degree of accuracy, other criteria can be used (Ubelaker 1999; Bass 2005; DiGangi and Moore 2012). The acetabulum, which is the socket-like depression on the lateral side of the pelvis that holds the femoral head, can be used; because a larger femoral head requires a larger surface or depression to sit in, males tend to have larger femoral heads than females (Ubelaker 1999). According to Ubelaker's (1999) study, a femoral head that is larger than 48 mm tend to be male, while a femoral head that is smaller than 43 mm tend to be female. Singh and Potturi (1978) examined the coxal size dimorphism between the sexes, the results concluded with consistent results of males larger than females, likely related to the selective pressures for a spacious birth canal.

When the sciatic notch and the femur are not available, although not as accurate, other metric sex estimations can be applied, such as scapular height or humeral head (DiGangi and Moore 2012). Sex can be determined by measuring the vertical diameter of the humeral head, as in a study conducted by Bass (2005). Bass (2005, 152) determined that if the range of the vertical diameter is under 43 mm, then it is a female. In an additional study conducted by Bass (2005, 18) among the prehistoric California female populations, he concluded that the transverse diameter ranges from 38.6 mm to 39.6 mm in females. It is important to note that these figures provided by Bass (2005) are not based on the population being studied in the Caribbean, but are a close comparison. Frutos (2005) conducted a sex analysis from the humerus in a Guatemalan forensic sample. Among a sample of 118 complete humeri (68 males and 50 females), the maximum length, the maximum diameter of the head, the circumference of the midshaft, the maximum diameter at midshaft, the minimum diameter at midshaft, and the epicondylar breadth were measured and subjected for sex differences. Frutos (2005) found that although there was variation in the results, the classification of sex was as follows: an accuracy of 76.8% for the maximum diameter at midshaft and an accuracy of 95.5% for the maximum diameter of the humeral head. Frutos (2005) concluded that this standard for sex estimation provided accurate results and that this standard may be useful in neighboring Central American countries where archaeological human skeletal remains are recovered.

Cranial traits and dentition can also assist with sex determinations, but due to genetic variation, these methods should be used in combination with other methods (Stewart 1979; Buikstra and Ubelaker 1994; Ubelaker 1999; White 2000; Weiss 2003, 2009; Wilkinson 2004; Bass 2005; White and Folkens 2005; Klepinger 2006; Byers 2008; DiGangi and Moore 2012). Sex determination of the cranium can be applied metrically or non-metrically. A few cranial features that can be measured metrically are the length and width of the mastoid process and the thickness of the supra-orbital ridge/glabella (brow ridge). A few cranial features that can be measured non-metrically are the prominence of the mental eminence (chin), the sharpness of the supra-orbital margin, and the size of the nuchal crest (prominence of the muscle attachment sites on the occipital bones). Although variations can exist, these traits tend to be more prominent, larger, and more defined in males than in females (Stewart 1979; Buikstra and Ubelaker 1994; Wilkinson 2004; Klepinger 2006; Byers 2008; Galdames et al. 2008; DiGangi and Moore 2012; Saini et al. 2012). It is important to note that cranial measurements associated with the skulls that show signs of intentional, artificial, or postmortem cranial deformation might provide inaccurate results because such deformations might alter the normal metric traits of the skull, leading to a false determination (Crist et al. 1997).

Most recently, Petaros et al. (2015) compared different variables, methods, and techniques that have been used to define, measure, and visually score sexual dimorphism in the mastoid process of human skulls. According to Petaros et al. (2015) most visual scoring techniques involve a number of qualitative descriptors to establish the variation between males and females; the male mastoid process was described as long, prominent, projecting, robust, large, broad, and wide, while the female mastoid process was typically described as gracile, small, and thin. Petaros et al. (2015) stated that besides the inherent subjectivity associated with visual scoring, studies have demonstrated that visual examination of the mastoid process can produce accurate results in sexing unidentified remains, often achieving good (80%) and high (90%). In attempts to make the visual scoring less subjective and more standardized, Petaros et al. (2015) suggests using an ordinal scale provided by Buikstra and Ubelaker (1994), which ranges from one (the least pronounced and most feminine) to five (most pronounced and most masculine). Petatros et al. (2015) concluded that dimorphism of the mastoid process can effectively assist with determining sex, but suggests that researchers further examine the dimorphism of the region surrounding the mastoid process during analysis, as it contains many muscle attachment points. Galdames et al. (2008) examined a total of 81 skulls (with known sex and age) belonging to Brazilian individuals from the Museum of the Federal University of Sao Paulo collection. Galdames and co-workers (2008) used statistical and discriminant function analysis to examine the sexual dimorphism in the dimensions and the areas of the mastoid triangle. The results indicated that the dimensions of the mastoid triangle correctly identify males and females with an accuracy of about 64.2%, with a high sensibility of classifying men (93%) and an extremely low sensibility for women (17.7%) (Galdames et al. 2008). A comparative study conducted by Saini et al. (2012) aimed to develop a population-specific, sex-differentiating anthropometric standard for the mastoid process of 138 adult North Indian skulls. Saini et al. (2012) found that all parameters of the mastoid process showed significant sexual dimorphism and provided an 87% accuracy.

Estimating stature is one of the primary components for establishing a biological profile for individuals with unknown identities (Gaither 2004; Menendez-Garmendia et al. 2014). Much of what we know from past populations are based on archaeological and historical accounts, but when these records are incomplete or missing and there is no basis for a population, it is much more difficult to make definitive conclusions from skeletal materials. Anthropologists have developed several stature estimation methods based on different sections of the human body, such as the humerus, radius, ulna, femur, tibia, fibula, metacarpals, cranium, and vertebral column, but find the results to be the most reliable when using the limb bones (Dwight 1894; Lundy 1985; Ubelaker 1999; Auerbach 2011; DiGangi and Moore 2012; Pomeroy and Stock 2012) and most accurate when using mathematical stature estimations (Gaither 2004; Auerbach and Ruff 2010; Auerbach 2011; DiGangi and Moore 2012). Obtaining stature by the length of the long bones, coupled with demographic-specific mathematical equations, has been verified by earlier researchers, such as Dwight (1894), Trotter and Gleser (1951, 1958), Lundy (1985) and others (Bass 2005). Some anthropologists (e.g., Asfaw et al. 1999; Allison 2002; Little and Rubin 2002) have developed several methods for estimating stature with incomplete or fragmentary remains and missing data. Other stature estimations include measuring the cranium and the vertebral column (Dwight 1894; Lundy 1985). In cases where cranial deformation is influencing cranial height, anatomical stature reconstruction is complicated and often less accurate, as shown in the skeletal study among the South American populations conducted by Pomeroy and Stock (2012).

Earlier stature studies conducted by Boas (1899) found that the average stature among eight Native American tribes, including the Shoshoni, the Bannock, the Uintah, White River, Uncompahgre, Moache, Capote, and the Weeminuche Ute, totaling 294 individuals, was 169.0 cm for males and 156.8 cm for females. Similarly, Bogin and Keep (1999) found a mean of 159.3 cm for males and 148.0 cm for females in a pooled South American sample of 322 samples of adult males, representing 20,808 individual measurements, and 219 samples of adult females, representing 9,651 individual measurements. Earlier studies conducted by Ubelaker (1984) in Ecuador found that the average stature reduced after European contact: 163.4 cm for males, and 152.9 cm for females (pre-contact) and 159.5 cm for males and 148.6 cm for females (post-contact), while later studies conducted by Ubelaker (1994) found no clear trend in Ecuador through time. King’s (2002) sample found that among 48 Arikara skeletons have a mean stature of 164.8 cm and 153.5 cm for males and females, respectively. The stature studies conducted by Boas (1899), Ubelaker (1994), Bogin and Keep (1999), and King (2002) concluded that the similarities in stature could be an indication of similar environmental stresses. These similarities in stature also suggest that genetics plays a role in the expression of stature among these populations (Gaither 2004). Furthermore, other anthropologists hypothesized that body size and proportions can reflect adaptation to different climates, genetic heritage, and childhood environment and diseases (Trotter and Gleser 1951, 1958; Johnston 1962; Gaither 2004; DiGangi and Moore 2012; Pomeroy and Stock 2012). Studies on skeletal populations have demonstrated that prehistoric groups with societal stressors, including the rise of agriculture, a decline in diet variation, and an over-reliance on foods that may block the absorption of iron, often result in a decrease in stature (Allison 1984; Webster et al. 1993; Ubelaker 1994; Larsen 1997; Bogin and Keep 1999).

Studies have been conducted cross-culturally and anthropologists have determined that when using regression formulas that are generated from different referencing samples, different results can be obtained (Gaither 2004; Benguelin 2011; DiGangi and Moore 2012). Gaither (2004) used Ubelaker's (1999) methods of stature to determine the height of prehistoric Peruvian skeletons. In this study, Gaither (2004) found that adult stature after the age of 23 demonstrated a mean of 159.1 cm for males and 147.2 cm for females. Gaither (2004) found that the female stature was somewhat lower than that of the archaeological populations, but the male stature was very similar. Finally, Gaither (2004) came to the same conclusion that stature similarities potentially indicates similar environmental stresses, or genetics plays a role in the expression of stature between Peruvians and Ecuadorians.

According to a study conducted by Sciulli and Geisen (1993), a regression equation was used to estimate skeletal height and stature for a sample of 171 prehistoric Native Americans in Ohio. Sciulli and Geisen's (1993) published regression formulas to estimate skeletal height and stature using the cranium, the vertebral column, and the maximum length of the humerus, radius, and ulna. Sciulli and Geisen (1993) concluded that the regression formulas using the length of the long bones more accurately determined height than the regression formulas involving the cranium or the vertebral column. A similar regression formula and process was performed by Ilayperum et al. (2010) and Mondal et al. (2012). Both studies used the length of the ulna to determine stature. Although these regression formulas were not developed for Native American populations specifically, Ilayperum et al. (2010) and Mondal et al. (2012) determined that the ulnar length accurately determines stature. Likewise, Bass (2005) produced a regression formula using the hand bones. Depending on the sample being studied, Bass (2005, 187) provides a limited list of different standard deviations and slopes to calculate stature. The stature regression methods that use one or two long bones work under the impression that the individuals in both the targeted and referenced population have the same stature of the long bones (Trotter and Gleser 1951, 1958; Beguelin 2011). This assumption cannot always be true, as in the case of extinct populations like the Taíno. According to Beguelin (2011), in most cases, particularly when an ancient population is the researched target, it is impossible to have a population-specific standard.

A general lack of comparable skeletal samples among known living populations is a major obstacle when attempting to develop reliable stature estimation methods that are used among prehistoric populations. According to Beguelin (2011), this is an issue that can be controlled, as long as careful attention is paid to the different body proportions displayed in the sample. It is a necessity to approximate the living stature among the Taíno with the least error as possible by using population-specific standards and regression formulas, rather than universal standards (Johnston 1962; Genoves 1967; Sciulli et al. 1990; Stinson 1990; Sciulli and Geisen 1993; Gaither 2004; Beguelin 2011;

DiGangi and Moore 2012; Pomeroy and Stock 2012). The regression formula provided by Sciulli and Geisen (1993) is possibly the closest comparable standard that can be applied to the skeletons found on Nevis.

Examination of cranial traits can provide important information on the relationships among populations, illustrate differences between and within various populations, and can provide insight into population or demographic-specific pathological diseases. Cranial pathologies can include but are not limited to, signs of intentional and artificial deformation, signs of postmortem deformation, wormian bones, porotic hyperostosis, and cribra orbitalia. This section will discuss how cranial deformation is possible, the various types of cranial deformation, and the effects that various methods can have on a cranium. Following, the ethnographic and skeletal accounts of cranial deformation among the Taíno will be briefly reviewed since this information was provided in an earlier chapter. This section will conclude with hypotheses for the cranial deformations observed among the present sample.

For reasons that vary greatly cross-culturally, intentional and unintentional cranial deformations are commonly practiced among cultures globally (Cheverud et al. 1992; Buikstra and Ubelaker 1994; Rodriguez 1997; Ross et al. 2002; Torres-Rouff 2003; Crespo-Torres 2010; Duncan and Hofling 2011; Pestle 2013; Okumura 2014; Rodriguez Lopez 2016). As previously indicated, cranial deformation is possible because the bones of the skull are extremely malleable, especially at a young age (Okumura 2014). It is not until adulthood that the eight cranial bones and fourteen facial bones fuse together into a single unit (Ubelaker 1994, 1997; Bass 2005; Weiss 2009).

Cradle-boarding, for instance, is an example of unintentional cranial deformation because the intent is not to cause a deformation, but rather to free up an adult's hand by strapping their child to their backs while working or traveling (Ubelaker 1999; White 1996; Torres-Rouff 2003; Weiss 2009; Duncan and Hofling 2011). On the other hand, binding of the skull, also known as Toulouse deformity, is a form of intentional cranial deformation, which deliberately alters the natural shape of the skull; reasons for this type of cranial deformation can vary from markers of elite status to distinguishing group affiliation (Rodriguez 1997; Ubelaker 1999). According to Rouse (1992), the Taíno intentionally flattened their foreheads by binding hard objects to it in childhood; the frontal or occipital region of the skull would have been compressed because the object would have had to be fixed to either the front or the back of the infant's head.

Regardless if the act of cranial deformation is intentional or unintentional, cultural cranial deformation can be separated into five categories: 1) vertico-occipital, which only flattens the lower occipital; 2) frontal, where only flattening of the forehead occurs; 3) circular, which is caused by wrapping or binding of the skull; 4) fronto-occipital, which is caused by pressure to both the front and the back of the skull; and 5) lambdoid, where the upper occipital region has been flattened, resulting in the lower portion of the occipital to slightly protrude (Bullen 1967; Ubelaker 1999; Weiss 2009). Referencing these categories are necessary when examining an individual's cranium because the location of the deformity can assist in determining the possible methods used to achieve such results.

Tacoma (1963-1964), Cheverud et al. (1992), Ross et al. (2002), Duncan and Hofling

(2011), and Okumura (2014) have conducted research on various cultures in Mexico and Latin America, South America, and the Caribbean who showed signs of both intentional and artificial cranial deformations. Tacoma (1963-1964) examined skeletal remains from five Aruba Indians that were described to have practiced artificial cranial deformation. After documenting and measuring the observed cranial deformations, Tacoma (1963-1964) super-imposed a skull with clear cranial deformation and a skull that lacked deformation upon each other; the positions of the two skulls clearly showed that the modified cranium had frontal and occipital flattening, with lateral expansion. Although the five skulls showed clear signs of deformation when compared visually to a non-modified skull and later confirmed by cranial measurements, Tacoma (1963-1964) concluded that research to date of the Aruba Indians did not produce indisputable evidence to prove that artificial cranial deformation had been in fashion in the regions that the skulls originated. Ross et al. (2002) examined the craniometrics of 388 individuals from the late Pleistocene and early Holocene Paleo-Indians. The purpose of this preliminary study was to show the craniometric variation using a broad spatial distribution in Latin America and the Caribbean (Ross et al. 2002). Ross et al. (2002) used measurements of the maximum cranial length and breadth, the basion-bregma height, the nasal height and breadth, and the orbital height and breadth to assess the various types of the cranial deformation present. Ross et al. (2002) found that although this study was preliminary and based on a small sample size, the data indicated that there is a diversity of cranial deformation in the Americas. Moreover, similarities between pre-contact contact Mexico and coastal Ecuador were observed and dissimilarities existed among the Peruvian sample (Ross et al. 2002). Okumura (2014) examined the cranial morphology of 78 Peruvian individuals that dated to about 1200-1450 AD. Okumura (2014) analyzed and observed three types of cranial deformation and five osteological markers relating to health status, which included cribra orbitalia, cranial trauma, antemortem tooth loss, dental caries, and periodontal cavities. Okumura (2014) concluded that males with an occipital cranial deformation were more likely to have less dental caries and cavities than those who did not have an occipital deformation; moreover, males who showed signs of fronto-lambdoid cranial deformation were more likely to have more antemortem tooth loss than the males who did not possess a fronto-lambdoid deformation. Okumura (2014) concluded that different types of cranial deformation can be linked with social status, but differences in health status were only observed in a sample of males. Likewise, Cheverud et al. (1992) examined prehistoric Peruvian Ancon (47 normal and 64 modified) and Songish samples (6 normal and 4 modified) of both normal and artificially modified crania. Three-dimensional coordinates of 53 landmarks were measured in this study and nine finite elements were evaluated to compare the normal and modified cranial averages. Cheverud et al. (1992) found that the Ancon possessed cranial deformations that were very different from that of the Songish culture. Cheverud et al. (1992) suggested this must have been evidence of an important difference existing in the morphological effects of fronto-occipital reshaping from one group to another.

With normal growth of the cranium, fusion of the cranial sutures (joints) occur in adulthood, but it is believed that the practice of cranial deformation can lead to early fusion of the cranial sutures, known as craniosynostosis (White 1996; O'Loughlin 2004). White (1996) and O'Loughlin (2004) argued that craniosynostosis can lead to an increased rate of wormian bones. Wormian bones are intra-sutural bones or extra pieces of bone that occur at sutures in the skull; it is theorized that the presence of wormian bones may or may not be associated with clinical abnormalities, cranial deformities, and genetic factors (White 1996; O'Loughlin 2004; Sanchez-Lara et al. 2007; Vasanthi et al. 2015). Osteologists still debate and question the exact cause of wormian bones. The least supported hypothesis is that intra-sutural bones are entirely driven by genetics and are not affected by cranial deformation; secondly, it is hypothesized that wormian bones are a result of cultural cranial deformation and are not determined by genetics; lastly, the most supported hypothesis is that the presence of intra-sutural bones is determined by genetics, but the rate of wormian bones are greatly impacted by cranial deformation (Kohn et al. 1995; White 1996; O'Loughlin 2004; Sanchez-Lara et al. 2007; Weiss 2009; Vasanthi et al. 2015). O'Loughlin (2004) found that the presence of less anteriorly placed sutural bones are commonly associated with posteriorly placed wormian bones, pointing to the notion that anteriorly placed wormian bones are almost exclusively driven by genetics, while posteriorly placed lambdoidal wormian bones result from craniosynostosis and fronto-occipital deformations.

According to a study conducted by Sanchez-Lara et al. (2007), the cranial index was calculated among 60 Mayan and Ancon skulls to assess the correlation between the cranial index and the presence of wormian bones. This study found that an increased presence of wormian bones occurred as the skulls became more brachycephalic and among those that showed purposeful cranial deformation and craniosynostosis (Sanchez-Lara et al. 2007). According to Sanchez-Lara et al. (2007), the frequency of the wormian bones and their location varied depending on the type and degree of the deformation observed. A positive correlation between the frequency of lambdoid wormian bones and the degree of the deformation assisted in the validation that wormian bones form in relation to pressure across the lambdoid sutures (Sanchez-Lara et al. 2007). Likewise, Vasanthi et al. (2015) examined cadaver skulls of both sexes to assess for the presence of wormian bones among the various shapes of crania at the Department of Anatomy, Andhra Medical College. The cephalic index was calculated using the length and width for each skull, the skulls were identified as normal if less than 81, and the wormian bones were identified manually by their position and location related to the suture lines (Vasanthi et al. 2015). In this study, a skull without wormian bones was considered normal, and ten skulls were observed to have wormian bones along the lambdoidal suture lines (Vasanthi et al. 2015). Vasanthi et al. (2015) concluded that an increased presence of wormian bones occurred without alteration and deformity of the skulls, and about 10% of the incidences of wormian bones accounted for genetics. The researchers acknowledged that future studies would be needed in order to fully understand the formation of wormian bones (Vasanthi et al. 2015).

As previously stated, ethnographic and skeletal accounts of cranial deformation among the Taíno have been confirmed, but the Spanish descriptions of the Taíno do not specify how the results of these deformities were achieved. Descriptions of frontal cranial deformations have been supported by archaeological evidence from Cuba, Jamaica, Puerto Rico, Haiti, Saba, and St. Kitts, and archaeological evidence from Jamaica proves that the Arawak Indians, an ancestor of the Taíno, practiced cranial deformations that extended the forehead (Rouse 1986, 1992; Rodriguez 1997; Deagan and Cruxent 2002; Loven 2010; Ostapkowicz and Newson 2012). While some archaeological evidence in the Caribbean and South America suggests a shift in the practice of cranial deformation among the Taíno because various sites show the presence of occipital deformation, more recent archaeological evidence throughout the Caribbean region, particularly Puerto Rico and Saba, show that the Taíno practiced cranial deformation indicative of cranial wrapping or binding, possibly as a marker of group identification (Rouse 1986, 1992; Cheverud, et al. 1992; Rodriguez 1997, 82; Deagan and Cruxent 2002; Ross 2004; Crespo-Torres 2010; Loven 2010; Duncan and Hofling 2011; Ostapkowicz and Newson 2012; Okumura 2014; Rodriguez Lopez 2016).

Because there are varying descriptions of the types of cranial deformations seen among the Taíno, it cannot be suggested that the Taíno only practiced one method that was handed down by their Arawak ancestors. Each culture possesses different ideologies; therefore, it is possible that interactions with various cultural groups throughout the Caribbean may have shaped certain common cultural practices, characteristics, and symbols. Rouse (1992) suggests that the shift in the cranial deformation among the Taíno resulted from a blending of other cultural influences and the traditional methods passed down from the Arawak during their migration and resettlement in the Lesser Antilles. Therefore, it can be suggested that the Arawak, and possibly the Choctaw Indians, influenced the Taíno's ideologies resulting in a higher desire of occipital flattening rather than frontal, as seen among some of the Taíno crania (Rouse 1986, 1992; Deagan and Cruxent 2002; Ross 2004; Loven 2010; Ostapkowicz and Newson 2012). Although the Choctaw Indian population are from the Gulf region of the United States, and are not a descendant population or share any ancestral relation to the Taíno, they provide an additional reference for certain cultural customs, such as cranial deformation.

Porotic hyperostosis and cribra orbitalia are often indicators of health and disease (Buikstra and Ubelaker 1994; White 2000; Weiss 2009, 2015, 2017). Porosities in the exterior cranial vault (porotic hyperostosis) and orbital roof (cribra orbitalia) are one of the most frequently observed pathological lesions seen among ancient and prehistoric human skeletal remains (Buikstra and Ubelaker 1994; Bass 2005; Walker et al. 2009). Usually seen in younger individuals, these cranial pathologies resemble a “coral-like” appearance and are thought to represent an anemic response, resulting in the hypertrophic formation of blood tissues within the cranial vault (Buikstra and Ubelaker 1994; Walker et al. 2009; Weiss 2009; 2015, 2017). While rare hereditary anemias occurred in the Old World, most instances of porotic hyperostosis and cribra orbitalia in North American Indians are the result of nutritional deficiencies, iron malabsorption, parasites, or infectious diseases (Buikstra and Ubelaker 1994; Walker et al. 2009; Weiss 2009; 2015, 2017). Porotic hyperostosis was once thought to be associated with a maize-based, iron deficiency diet (Bass 2005; Walker et al. 2009); however, according to Walker (1986), porotic hyperostosis is sometimes associated with the loss of nutrients resulting from diarrheal diseases, rather than diet. According to Buikstra and Ubelaker (1994), porotic hyperostosis usually occurs on the orbital surface of the frontal bones or the adjacent lambdoidal, sagittal, and occasionally, the coronal sutures. However, in extreme cases, porotic hyperostosis can occur on the more central regions of the frontal, parietal, and occipital bones (Buikstra and Ubelaker 1994). Walker et al. (2009) reexamined the causes of porotic hyperostosis using recent hematological research; he came to the conclusion that although earlier research believed that iron-deficiency anemia was the cause of porotic hyperostosis, there are many additional causes for such cranial lesions. Walker et al. (2009) concluded that several lines of evidence suggested that porotic hyperostosis is likely caused by the accelerated loss of red blood cells, followed by the over-production of red blood cells in hemolytic and megaloblastic anemias. Additionally, Walker et al. (2009) argued that porotic hyperostosis and many cases of cribra orbitalia lesions are caused by the megaloblastic anemia developed by nursing infants of B-12 deficient mothers or gastrointestinal infections resulting from unsanitary living conditions.

Evaluation of post-cranial elements allows for a better understanding of the pathologies associated with a single skeleton. Eventually, these understandings can be applied to other skeletal materials presumed to be from the same population, or they can be applied cross-culturally to better understand cultural variation and similarities. The list of post-cranial pathologies are vast, and the assessment of the physical condition of an individual's health is all dependent on the post-cranial elements that are being examined. A few examples of pathologies that can be diagnosed in the post-crania are: degenerative joint diseases, osteitis, rickets, tuberculosis, Schmorl's nodes, rib and vertebral fusion, trauma, broken bones, fractures and amputation, and periostitis (Buikstra and Ubelaker

1994; Bass 2005, Weiss 2009). According to a theory suggested by Wood et al. (1992), when a skeleton lacks signs of diseases or trauma, it cannot be assumed that that individual was completely healthy; in fact, it is often an indication that the individual was extremely unhealthy and they died before their bones could react to the trauma or disease. This theory is called the osteological paradox (Wood et al. 1992). Being able to determine when a bone injury occurred in relation to the person's time of death is critical, as it can provide information about an individual's health and possibly how that individual died. However, if death was caused by the means of a pathology (disease), there are seldom indications present on the skeletal system, making it difficult to determine the cause of death (White 2000; Weiss 2009). Most pathologies usually affect the soft tissues first; bacteria, viruses, parasites, and fungal infections can spread relatively easily through the bloodstream and cause irreversible damage that kills bone cells (Weiss 2015). For example, smallpox can cause fusion and erosion of the elbow, which can mimic traumatic arthritis (Weiss 2015). Bone diseases such as osteitis and osteomyelitis, which are an inflammatory infection of bone tissue, can be mistaken for fractures or other forms of trauma (White 2000; White and Folkens 2005). According to White and Folkens (2005), osteomyelitis is most often always caused by pus-producing bacteria. These microorganisms can reach the bone directly, as a result of an injury at any age, or through the blood stream (White and Folkens 2005). Hard tissues surround the original bone, resulting in a deformation; a pus-draining hole called a cloacae forms, differentiating osteomyelitis from a fracture or other forms of trauma.

The human vertebral column can provide insight into approximate age, as discussed above, and environmentally induced diseases. Osteoarthritis (OA) is a degenerative joint disease that breaks down the cartilage between adjacent bones, allowing unprotected contact between two bones; believed to be associated with repetitive activities or age, OA is commonly found on the vertebral column (Ubelaker 1999; Weiss 2009). This age-related disease can assist with estimating age or gaining insight into the daily activities and stresses throughout an individual's life.

However, there is some debate over how OA actually develops; because there are many other influencing factors for OA, it is questionable as to how reliable OA effectively measures activity (Weiss and Jurmain 2007; Weiss 2009, 2014). Nevertheless, OA can be useful in reconstructing an individual's daily activities because one of the causes of OA is repetitive behavior and overuse of specific joints (Weiss and Jurmain 2007; Weiss 2009). The correct ways to score OA are highly debated among scholars; still, Buikstra and Ubelaker (1994) are the most commonly referenced method for scoring OA. Buikstra and Ubelaker (1994) visually score OA by examining the severity or levels of porosity (pinholes), eburnation (a shininess on the bone's surface caused by the friction between two bones), and lipping (extra bone deposits eventually resulting in joint fusion). Some archaeologists argue that porosity is an unreliable measurement for scoring OA and should be disregarded (Rojas-Sepulveda et al. 2008; Weiss 2009); additionally, when using OA scores to reconstruct activity, other factors should be considered, such as sexual dimorphism, age, stature, diet, trauma, and other diseases, but these factors do not affect the method of scoring OA (Weiss and Jurmain 2007; Weiss 2009, 2014).

Bioarchaeologists are able to determine a handful of things by studying an individual's dentition. For example, what types of foods an individual consumed throughout their life (e.g. sugary foods, tough or abrasive foods, and remnants of sand in their diet), possible dietary shifts, a relative age at the time of death (as discussed previously), approximately how long ago a person died and occasionally how that person died, and their migration patterns (Ubelaker 1999; Bass 2005; Knudson and Price 2007; Coppa et al. 2008; Weiss 2009; Knudson et al. 2010; Laffoon et al. 2013; Eerkens et al. 2015). Extensive literature records the utilization of attrition in the reconstruction of prehistoric diets, estimating age-at-death, and explaining the incidents and patterns for dental pathologies, such as dental caries and abscesses. Attrition and other wear patterns can provide information on the various daily uses of one's teeth, such as a third hand for the assistance in tool manufacturing. The following section will review how examining the dentition of the present skeletal sample can assist with determining each individual's approximate age, diet, and health.

Dental caries is a disease process that involves the demineralization of enamel due to the production of acid byproducts like carbohydrates; this acid byproduct is called *Streptococcus mutans* (Larsen 2002; Weiss 2009). Dental caries are not usually life-threatening, but in the cases of prehistoric times and pre-medicine, cavities resulting from caries can continue to grow in size and are prone to infection that can spread throughout the surrounding bones and soft tissues (Larsen 2002). In extreme cases, the severity of these lesions can cause the entire tooth to decay, resulting in tooth loss (White and Folkens 2005). If tooth loss is antemortem, alveolar bone resorption can occur

(Ubelaker 1999; Knezovic-Zlataric et al. 2002; Bass 2005; White and Folkens 2005). Dental disease caused by eating certain foods that contain starches, sugars, and other foreign objects, such as grit or sand, can expose the root by grinding down the occlusal surface of the teeth; severe attrition and exposure to the root can result in extreme pain, blood poisoning, and death (Walker 1983; Weiss 2009, 2015). Identifying the severity of the attrition can be useful in drawing conclusions about diet and tooth use, especially among the Taíno where such information is minimal and needs further development.

Patterns of attrition can also provide information pertaining to a culture's use of dentition for the purposes of manufacturing goods and textiles, such as shell ornaments, ceremonial objects, and tools. Oblique (interior) attrition on the central and lateral incisors can result from high levels of grit or sand in one's diet due to the processing methods for maize, but lateral attrition to the incisors and canines, as well as between the incisors is attributed to the use of teeth as tools (Walker 1986; Walker and Erlandson 1986; Weiss 2009). Walker's (1983) study of the osteological remains from Puerto Rico can provide insight into the diet and lifestyles of the Caribbean peoples because his study is roughly the same time period as the recently excavated remains on Nevis. According to Walker's (1983) analysis, females were seen to have incisor and canine attrition that was indicative of tool use. Walker (1983) states that lateral attrition is only observed among Caribbean women and can be traced back to the same dental wear patterns seen among South American women. As Winn (2012) demonstrated, antemortem tooth loss, dental caries, abscesses, attrition, and chipping frequencies can provide interpretations of the health and diets of past human populations. Winn (2012) examined the dentition of a

Native American population from the Archaic and Late Prehistoric sites in the Northwestern Great Plains in order to understand the dietary behaviors and oral health of this population. Although Winn's sample size was small, his study found that this population was likely a hunter-gatherer society that consumed low levels of cariogenic carbohydrates, with no reliance on horticulture or agriculture. According to Winn (2012), the Archaic and Late Prehistoric peoples had exceptionally pronounced crown wear, possibly as the result of the consumption of stone ground seeds and hide working, a low frequency of carious lesions and antemortem tooth loss, and a moderate amount of chipping, possibly the result of particles introduced into the food from grinding.

Relating to activity, numerous scholars have conducted research on the subject of determining handedness among skeletal remains of primates and humans, extinct hominins, human cadavers, and living human populations (Schultz 1926, 1937; Gray 1977; Stewart 1979; Kusec et al. 1990; Roy et al. 1994; Steele 2000; Bass 2005; Danforth and Thompson 2008; Cashmore 2009; Ubelaker and Zarenko 2012; Oladipo et al. 2016). Problems and difficulties of determining the precise nature and the relationship between hand use and bone morphology, the materials, methods, and past research assessing hand preference, and what is even meant by the term "handedness" are still being debated and questioned by scholars (Roy et al. 1994; Bass 2005; Danforth and Thompson 2008; Cashmore 2009; Ubelaker and Zarenko 2012; Oladipo et al. 2016). Numerous anthropologists have attempted to address these issues, particularly pertaining to the range of methodical approaches, comparison of osteological techniques, and studies of prehistoric material culture (Schultz 1926, 1937; Gray 1977; Stewart 1979; Roy et al.

1994; Bass 2005; Danforth and Thompson 2008; Cashmore 2009; Ubelaker and Zarenko 2012; Oladipo et al. 2016). The overall consensus is that like any other bone in the human body, dimensions of the metacarpal bones are subject to the influence of intrinsic (genetic) and/or extrinsic (environmental) factors; therefore, differences in the dimensions of the upper limb, including the metacarpals, can determine dominance (Kusec et al. 1990; Roy et al. 1994; Steele 2000; Bass 2005; Danforth and Thompson 2008; Cashmore 2009; Ubelaker and Zarenko 2012; Oladipo et al. 2016).

The term “handedness” is used in numerous disciplines, but derives from the field of psychology, where it refers to questionnaires and self-reported preferences for the use of a particular hand for various tasks among living individuals; in skeletal materials, handedness is ascertained using proxy measures, namely upper limb bilateral asymmetry or asymmetry in the glenoid cavity, and asymmetry in the stature (length and width) of the second, third, and fourth metacarpals (Gray 1977; Kusec et al. 1990; Roy et al. 1994; Steele 2000; Bass 2005; Danforth and Thompson 2008; Cashmore 2009; Oladipo et al. 2016). The approach of examining the upper limb bilateral asymmetry and asymmetry in the stature of the second, third, and fourth metacarpal is based on the assumption that behavioral lateralization (a complex and ongoing process where regions of the brain “take over” the functioning of specific behaviors and cognitive skills), such as the preference for using a particular hand for various tasks, results in an increased asymmetry (Steele 2000; Cashmore 2009). Studies relating to the assumption that behavioral lateralization may also affect asymmetry in the cranial vault are still being developed (Steele 2000).

Supplementary studies conducted by Schultz (1937), Roy et al. (1994), Steele (2000), Danforth and Thompson (2008), and Cashmore (2009) state that the asymmetry visible in the dominant hand would also be visible in the long bones of the dominant limb. Danforth and Thompson (2008) stated that numerous studies have assessed handedness by assuming that the bones on the side of the dominant hand will be larger and longer, but concerns of sample size and replicability of measurements usually arise. In a sample size of 137 individuals of known handedness, Danforth and Thompson (2008) attempted to improve these limitations by investigating patterns of side differences in the standard length and transverse dimensions of the clavicle, scapula, humerus, ulna, and radius. Danforth and Thompson (2008) recommend other means to assess handedness because the results of this study showed that the asymmetrical development in the arm bones did not correctly identify handedness among some individuals. Danforth and Thompson (2008) believed that these findings are likely related to the fact that modern human activities are generally not unilateral in their stresses to result in the asymmetrical development of the arm bones. In most cases, it has been confirmed that asymmetry of the dominant upper limbs or the maximum length and width of the second, third, and fourth metacarpals are larger than the non-dominant limb (Kusec et al. 1990; Roy et al. 1994; Bass 2005; Cashmore 2009). Schultz (1937) found that long bone length asymmetries exist for the humerus, radius, and both combined among North American Indians. Roy et al. (1994) conducted a study that examined the medullary cavity and the total width of the second metacarpal among 992 individuals. Roy et al. (1994) concluded that the bilateral asymmetry in the structure of the second metacarpal is indicative of hand dominance and handedness. Additional studies have compared x-rays measuring the cortical thickness (the dense outer layer that surrounds the internal cavity), of the dominant and non-dominant arms of professional tennis players; an increase in cortical bone was observed in the dominant arm (Jones et al. 1977; Cashmore 2009).

Since multiple sources indicate that metacarpals of the dominant hand are much larger than those of the non-dominant hand, applying the methods outlined by Roy et al. (1994) and Bass (2005) allows the construction of a basis for measuring and observing handedness among the Taíno (Schultz 1926, 1937; Stewart 1979; Roy et al. 1994; Steele 2000; Bass 2005; Danforth and Thompson 2008; Cashmore 2009; Ubelaker and Zarenko 2012). Although there is currently no research that has been completed on determining handedness for the Taíno peoples, the studies conducted by Roy et al. (1994) and Bass (2005) are the closest in comparison. Given the past research conducted on the topic of handedness, undoubtedly, researchers still have some way to go before interpretations of handedness related to skeletal materials can be made with 100% confidence. More importantly, in order to effectively apply these methods to the skeletal sample from White's Bay Beach and future prehistoric studies, additional research is needed to lessen the gap in knowledge concerning Native American populations.

The next chapter will provide the materials, excavation methods and experience, and a complete review of the osteological methods used when examining the sample from White's Bay Beach. Each excavation unit will be discussed in detail, outlining the exact processes for beginning the excavation unit, excavating the skeletal and cultural materials, and transporting and analyzing the skeletal remains. Relevant photos will be provided to illustrate each burial in situ, the degree to which the burials are damaged, or in jeopardy of being lost due to erosion or exposure to the elements, and the degree to which the skeletal remains have been impacted by such exposures.

CHAPTER 4: Recovery Methodology, Materials, and Osteological Methodology

Excavation Methods and Experience

The excavation methods used at the burial sites were in accordance with the standards of the Register of Professional Archaeologists (RPA) under the supervision of Dr. Marco Meniketti of San José State University. The use of the RPA methods was the best choice for this project because of their widely accepted standard for both professional and academic levels of archaeological excavation. Prior permission to excavate and remove the skeletal remains and material cultures was granted to San José State University as part of an archaeological field school project and completion of this master's thesis project. Additional permission to remove the remains and other materials for conservation efforts was requested and granted by the Nevis Historical and Conservation Society (NHCS).

Most of the knowledge and expertise pertaining to the proper handling and identification of skeletonized human remains were attained by prior experience with burial excavations from previous field work in a medieval cemetery site in Badia di Pozziveri, Italy. Additionally, proficiency in identifying human remains was gained from multiple osteology, anatomy, and forensic anthropology courses from both San José State University and West Valley Community College. Prior to the excavations in 2016, both Denise Frazier and Sarah Hawks, two field school shadow students, had gained prior experience with the identification and proper handling of fragile human remains from osteology and forensic anthropology courses at San José State University.

Excavation of NVS-WB1 Unit 1

Our excavation began by locating the coordinates of 62°32'45.3"W longitude and

17°07'23.6"N latitude to see if the cranium was left undisturbed and in the same condition as it was left a year prior. After the burial was located, it was apparent that it was untouched and the materials that were used to protect and disguise the remains were left intact. To start the excavation, prior to the removal of the beach debris and materials protecting the remains, initial photographs of the site were taken for cataloging and documentation purposes (shown in Figure 4). About six meters from the site, tire tracks and donkey hoof prints were visible, providing additional support for the conservation of these remains. After the materials protecting the burial were removed, additional photographs were taken to show the degree to which the remains were damaged, exposed, and in need of conservation (shown in Figure 5).

Figure 4. NVS-WB1 Unit 1, Initial View 2016. The unit is facing northeast prior to the removal of the debris used to protect the skeletal remains from the elements, freely roaming donkeys, trucks, and passersby. Found to the right of the burial, the remains are in close proximity to a conch shell trash midden.

Figure 5. NVS-WB1 Unit 1, Close Up of the Exposed Cranium. This close up showing the degree of exposure and damage to the cranium visible on the surface.

After the initial photographs were taken, two field students drew the burial in situ and noted the degree of exposure, the position of the remains, the types of material culture present and their proximity to the cranium, and any observations surrounding the burial NVS-WB1 Unit 1. Next, a 1 m by 1 m square unit was placed oriented north with string and a line level (shown in Figure 6). The cranium was excavated using arbitrary levels of 10 cm using hand trowels, soft bristled toothbrushes and brushes, small plastic hand dustpan, wooden clay pottery tools, and a 1/8 in screen mesh to screen all soils. A standard of 10 cm levels was used for excavation because it is the most universally used in non-specialized units; additionally, using 10 cm levels for excavation was ideal because the exact formation of the stratigraphic layers was unclear throughout the unit (Harris 1989). Hand trowels were chosen instead of traditional shovels because they were less destructive to smaller items that may have been lying beneath the exposed cranium.

Wooden clay pottery tools were used to avoid direct and abrasive contact with bone, in order to prevent damage to the fragile cranium and any other bones that may be present. Soft brushes and toothbrushes were used to remove loose soils from the unit and bone. A small plastic dustpan and bucket were used to assist with removing loose soil from the unit for sifting. All soils excavated were screened through a 1/8 in mesh, in hopes of preserving any small skeletal elements, material culture, and other highly fragmented ceramics.

Figure 6. NVS-WB1 Unit 1, Level 1. The unit is facing north and the unit is excavated to level 1 (10 cm).

The exposed cranium was found lying on its right side, with the occipital bone facing north, the left temporal bones (sides of the face) extremely fragmented and exposed on the surface, and the maxilla facing northeast. The cranium was positioned in the northwest corner of the 1 m by 1 m unit. In anticipation of discovering the post-crania of this individual, our team marked off two additional 1 m by 1 m square units that extended north and south of the cranium (shown in Figures 7 and 8). These directions were chosen because of the position of the cranium, making it unclear as to which direction the post-crania would be lying, if present. Remnants of additional cranial fragments belonging to this individual were also discovered on the surface about a meter north and south of the exposed cranium. Each unit was drawn in situ, and the artifacts and bone fragments were collected and cataloged for future photographing and examination.

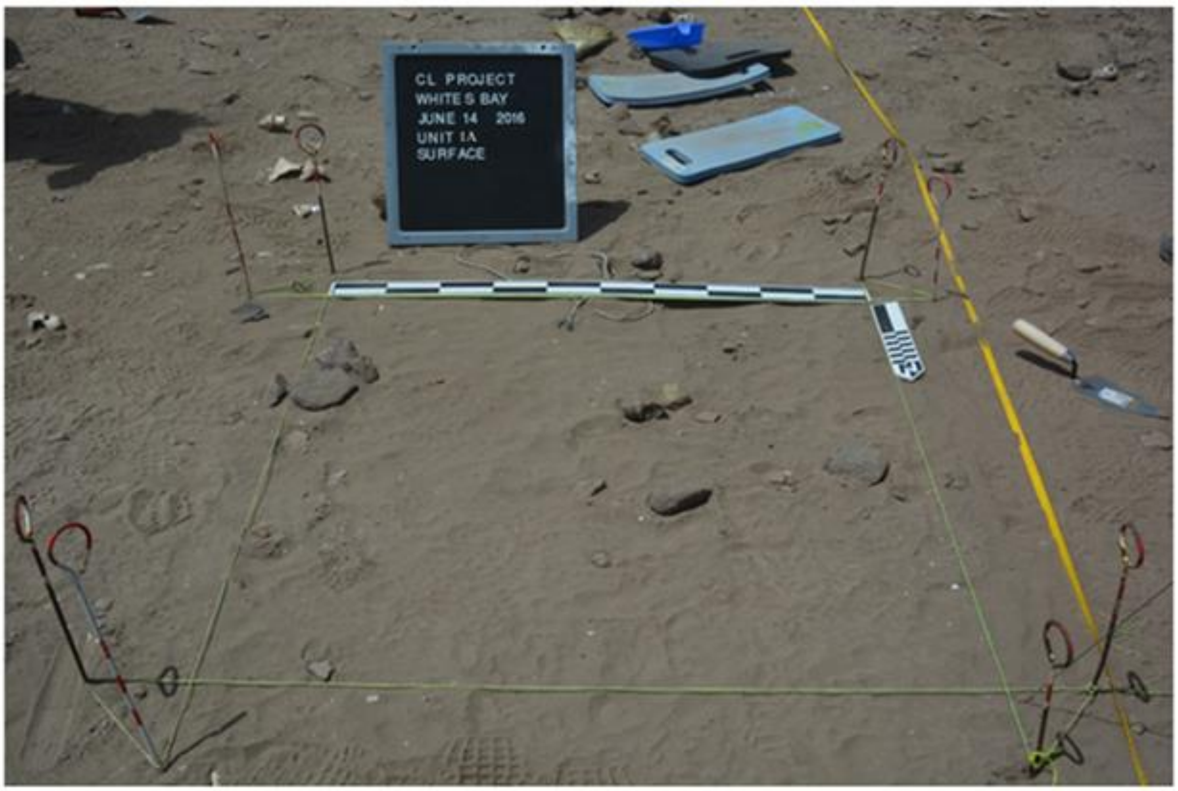

Figure 7. NVS-WB1 Unit 1A, Unit North of NVS-WB1 Unit 1. NVS-WB1 Unit 1A is a 1x1 m square unit, located directly north of the exposed cranium in NVS-WB1 Unit 1. The south wall of NVS-WB1 Unit 1A touches the north wall of NVS-WB1 Unit 1 which contains the exposed cranium.

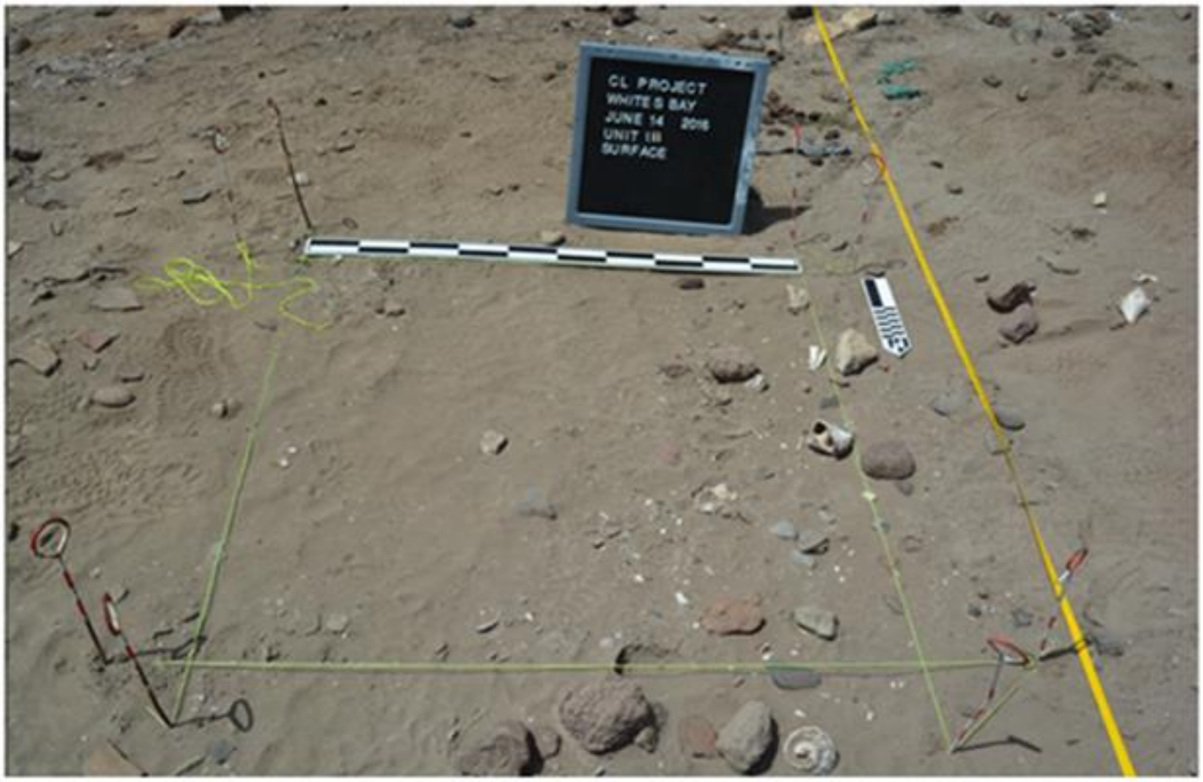

Figure 8. NVS-WB1 Unit 1B, Unit South of NVS-WB1 Unit 1. NVS-WB1 Unit 1B is a 1x1 m square unit, located south of the cranium in NVS-WB1 Unit 1. The north wall of NVS-WB1 Unit 1B touches the south wall of NVS-WB1 Unit 1 which contains the exposed cranium.

Our excavations began solely in NVS-WB1 Unit 1 in order to determine what direction the post-crania laid, if any. After two completely sterile levels, it was determined that this burial only contained an isolated cranium, and there were no signs of post-crania present, as it did not extend in any direction. It was clear that other than surface findings of pottery and bone fragments, which could have been disturbed by the surrounding natural environment, NVS-WB1 Unit 1A and NVS-WB1 Unit 1B was obsolete, and the burial did not extend beyond the originally discovered cranium.

After bringing down NVS-WB1 Unit 1 to level two (20 cm deep), it became clear that the presence of other post-cranial elements were absent. It was decided to pedestal the cranium while excavating the unit to levels three and four (shown in Figure 9). The unit was brought down to level three (20-30 cm in depth), and the cranium was removed after determining the absence of all material culture and bone present in the unit. After the cranium was removed, it was placed in a storage container with soft, sifted soils from the unit, and covered with a white sheet to shield it from the elements while it was brought back to our secured facility. The unit was brought down to levels four and five (30-50 cm in depth), where it was determined that the unit was sterile. Final sketches of the unit were made, photographs were taken, and the unit was refilled.

Figure 9. Pedestal Excavation of NVS-WB1 Unit 1. In excavation, the isolated cranium was found lying inverted and on top of the mandible. The occipital bone of the skull was facing up, while the frontal bone was facing the ground. Pedestalling the remains allows for a better understanding and visual of the burial in situ.

While closing the excavation unit, Dr. Marco Meniketti mentioned an additional site that possessed exposed remains on a cliff about 150 meters north. After being told that the remains have been exposed for some time, it was decided it would be best to collect and document what was left of the remains before they were completely lost at sea due to the erosion of the hillside. The discussion of this burial can be found in the appendix section because this excavation was merely completed for conservation purposes and was not intended to be a part of this thesis.

NVS-WB1 Unit 2, NVS-WB1 Unit 2A, and NVS-WB1 Unit 2B

Two field students were instructed to excavate a 1 m by 1 m test pit located approximately five meters west of NVS-WB1 Unit 1. After two days of excavation and extracting nothing more than material cultures, such as pottery and shells, the appearance of a rounded bony surface emerged about eight cm down on the northwest corner of the test pit. Eager to find out what this object was, the students logged their find and continued to bring the unit down to a total of 10 cm. While removing the additional two cm of soil, another rounded bony surface emerged less than 10 cm from the original bony feature. The students called for Dr. Marco Meniketti and myself to view their find. The field students were instructed to slow down their excavation to allow us to reassess the unit. Initially, the two objects in the unit resembled anything other than human due to the severe deformation and position of the crania, but as more soil was pushed away, it was clear these objects were human.

After excavating NVS-WB1 Unit 2 down to level two, about 20 cm, it became evident that at least one of the individuals in NVS-WB1 Unit 2 extended into the southwest corner of the unit. Dr. Marco Meniketti and I decided to add a 1 m by 1 m square that overlapped half a meter in the southwest corner of the unit to expose the main burial's position; this unit extension was labeled NVS-WB1 Unit 2A (see Figure 10 located on the next page). The students were instructed to continue excavating the remains in NVS-WB1 Unit 2, while I measured out the extension of the 1 m by 1 m square in the southwest corner. Once the unit extension was in place, NVS-WB1 Unit 2A was brought down to match the current level of 20 cm. NVS-WB1 Unit 2A confirmed that the remains present belonged to one individual with the presence of two crania. After taking numerous photos of the two units showing the positioning of the two crania, both units were excavated equally.

Throughout the entire excavation process, numerous photos were taken at each level of the excavation process, in addition to sketches and notes taken by both students to log any changes in the soils or materials found within the burial. Both individuals in the burial were pedestaled in order to fully understand the position of each individual in situ. While the intersection between NVS-WB1 Unit 2 and NVS-WB1 Unit 2A contained the minority of the partial skeleton's post-crania, the rest of this individual extended into the south and southwest corners of NVS-WB1 Unit 2A (see Figure 11 on the next page).

It was easier to understand which direction the skeleton was lying once the perimeter of NVS-WB1 Unit 2A was outlined. The site was photographed, and both crania were removed to avoid any further damage that might have been caused by the extreme temperatures, sun, wind, and rain while the excavation continued. The skulls were placed in separate acid-free paper bags, and each skull placed in a storage container with their original sifted soil and covered with a clean white sheet for additional cushioning and protection. Both crania were transported to our locked and temperature controlled room on Pond Hill. The rest of the burial was recovered nightly with soft sifted soils and wooden planks found nearby to protect against passersby and roaming donkeys.

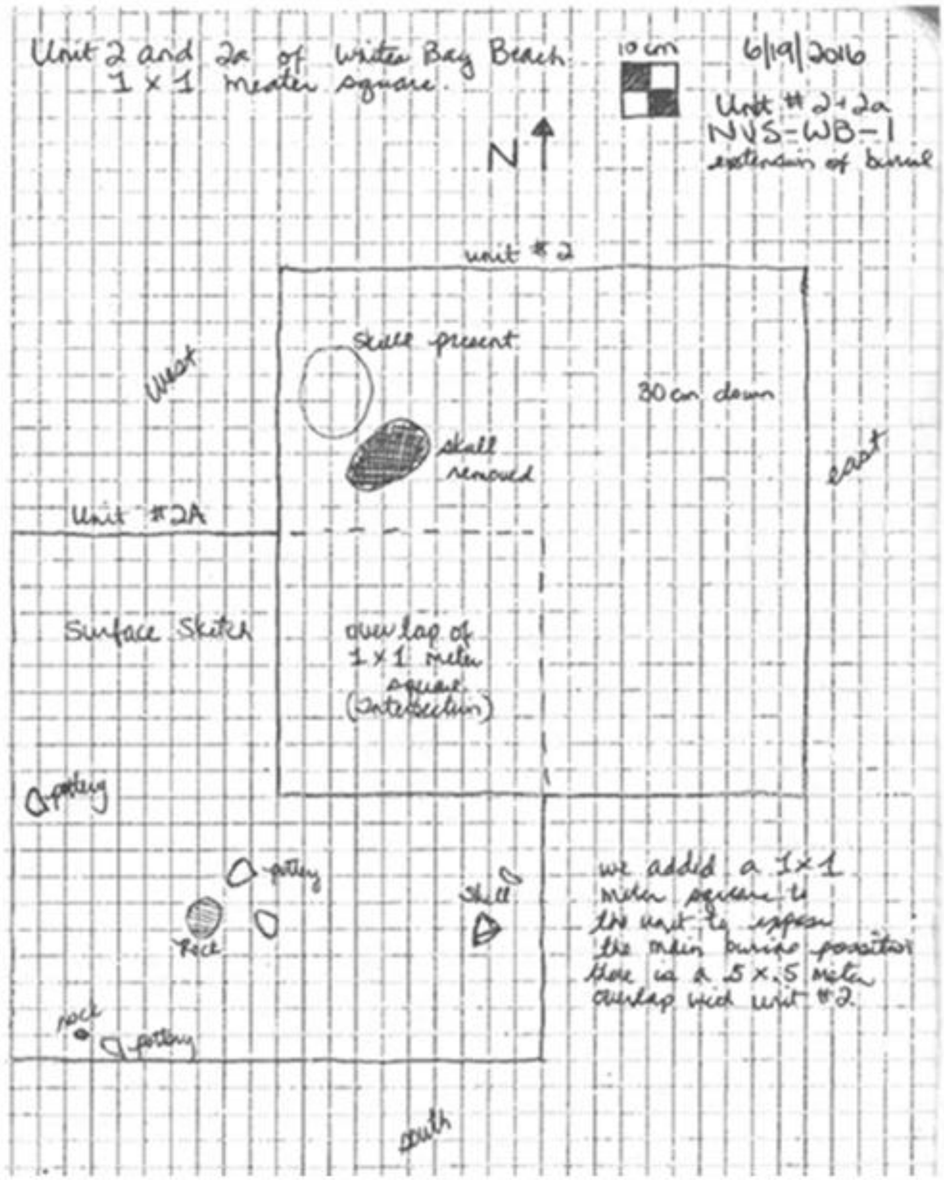

Figure 10. NVS-WB1 Unit 2 and NVS-WB1 Unit 2A, Sketch of Unit Extension. NVS-WB1 Unit 2A is shown extending from the southwest corner of NVS-WB1 Unit 2 with a ½ m by ½ m square of overlap in the center.

Figure 11. NVS-WB1 Unit 2 and NVS-WB1 Unit 2A, Extension and Burial Position. Unit 2A is the surface level shown in the left hand side of the page. Unit 2 is shown in the upper right hand side of the photo; Unit 2 contains the crania of two individuals and Unit 2A contains the post-crania of a single individual. Both skulls are covered by sifted soils to protect them from the elements, while excavating Unit 2A to the same level as Unit 2 (20 cm in depth).

On the last day of excavation, it was clear that some of the post-crania, mainly the humerus (the upper arm bone) and some of the ribs were located in the unexcavated northern wall of NVS-WB1 Unit 2A. We were in a crunch for time because this was our last day of excavation on White's Bay Beach. In order to save time and ensure that the entire skeleton would be extracted, it was decided to open an additional square unit that measured about ¼ m by ¼ m. This new unit extension was called NVS-WB1 Unit 2B (see Figure 12).

Figure 12. NVS-WB1 Unit 2B, Extension to Extract Post Skeleton. Located in this extension is the humerus and some of the ribs belonging to the female found in NVS-WB1 Unit 2. The mounds in the middle of the photo are the pelvis and the foot belonging to the same individual.

NVS-WB1 Unit 2B was brought down to level three to match the other subunits for this burial. At about 25 cm deep, the humerus and fragmented rib bones were able to be extracted. Each segment of the skeleton was removed, bagged, and logged. Once the partial skeleton was removed, to ensure the absence of all material culture and additional human remains present within the unit, the field students were instructed to continue to bring down all subunits two additional levels or until the soil was sterile. The entire unit of NVS-WB1 Unit 2, 2A, and 2B were brought down to a total of 50 cm were two sterile levels were reached. The field students sketched and documented the units at their final stage of level five, additional photographs of the unit were taken, and the unit was backfilled.

Lab Analysis and Storage of Remains

All excavated cultural and skeletal remains were transported in acid-free paper bags, contained within storage containers, to our locked and temperature controlled room on Pond Hill, Nevis, where the field school students were residing. Initial cataloging of the materials was done at the locked facility on Pond Hill. Once all material cultures were cataloged, drawn, and photographed, they were packaged into their original storage bags, placed into an acid-free cardboard box, and labeled with the excavation unit. These boxes were then placed into a larger plastic storage container to avoid any further damage from moisture and the elements. Each storage container was transported to a locked and secured facility under the direction of the NHCS at the Nelson Museum.

In the past, field students were able to use the labs at the Medical University of the Americas, Nevis for analysis and instruction. These labs were unable to be accessed for the analysis of these skeletal remains because Dr. Bob Mankoff at the Medical University of the Americas was no longer the Assistant Dean of Students. Instead, the remains were transported to a temperature controlled and secured access facility at Oualie Beach Resort, Nevis, generously provided by the hotel management. This secured access facility was restricted access by myself, Dr. Marco Meniketti, three field school students, and the hotel manager.

The preservation, cleaning, and analyzing of all skeletal materials was completed along the guidelines outlined by Buikstra and Ubelaker (1994) and supported by methods established by Bass (2005). Buikstra and Ubelaker (1994) was used in the examination of these remains as it was strongly advised by San José State University Professor Elizabeth Weiss as being one of the most commonly used reference guides by bioarchaeologists, and an excellent source for collecting skeletal data. Cleaning of the remains was accomplished with soft brushes and wooden clay pottery tools. No water was used in the cleaning of these remains because they were extremely fragile and any amount of water used on the bone caused them to crumble and break.

As suggested by Dr. Elizabeth Weiss, clear Gorilla Super Glue Gel was used to reassemble all cranial fragments for the completion of the cranial analyses (personal communication with Elizabeth Weiss 2016). Although traditional Elmer's glue is usually preferred, Gorilla Super Glue Gel was used because it also dries clear, but it is a stronger and faster drying adhesive (personal communication with Elizabeth Weiss 2016). Buikstra and Ubelaker (1994), supplemented with White (2000) and Bass (2005) were referenced to effectively glue the cranial fragments back into their original anatomical positions. In some cases, additional fragments and palate portions were unable to be glued to the rest of the cranium because of their minute size and extensive damage. Instead, these pieces were photographed, placed in a separate acid-free paper bag, and labeled with their contents and identifiable site code.

Mitutoyo digital calipers were important when measuring smaller bones, such as the metacarpals, metatarsals, and craniometrics. An osteometric board was used to measure the length of the long bones that were in the best condition. With the hopes of obtaining the chronological dating and isotopic measurements of each individual, teeth samples were collected and stored for carbon dating. These samples were later sent to Beta Analytics for accelerated mass spectrometry (AMS) dating; these remains returned a date range of 1025-1275 CE.

After the completion of our analysis and photographing of the remains, each burial was stored in separate acid-free containers, wrapped and lined with acid-free paper for further protection and cushion, and clearly labeled with its excavation unit and its contents. Moreover, the human skulls were stored separately from the applicable post-crania to avoid further damage and crushing. Each box was then stored in accordance with Bass (2005) and the advice provided by Dr. Lorna Pierce (personal communication 2015). The boxes were transported to a locked and secured temperature-controlled curation facility under the direction of the NHCS at the Nelson Museum.

Materials

The present study consisted of four individuals, one of which is mentioned only in the appendix of this paper (see appendix for the materials, results, and discussion of NVS-WB2 Unit 1). In this section, the two burials explained and described in detail are NVS-WB1 Unit 1 and NVS-WB1 Unit 2, both of which were excavated near a conch shell trash midden. It is possible that these burials were originally buried either next to or underneath a shell midden, but repeated land erosion altered the landscape, possibly resulting in the exposure of NVS-WB1 Unit 1 and the absence of cultural materials in the burials.

Tables 1-3 details the bones that were available for study from the three individuals examined in this thesis. The first burial excavated was NVS-WB1 Unit 1 which contained the remains of a partially exposed isolated cranium. In situ, the cranium was found with the occipital resting on the mandible and lacked all post-cranial elements. The burial also contained pottery fragments.

Pit NVS-WB1 Unit 2 contained two individuals; an individual with a cranium and some of the post-crania and an individual with only a cranium preserved. For each burial, a limited amount of faunal remains, such as fish vertebrae, possible rodent bones, and various sizes of shells and crab claws were discovered. Charcoal fragments, charcoal stained soils, and red and black pottery fragments were also found within both of these burials, all of which share a close resemblance to the accounts reported by Rouse (1952a, 1952b) and Drew (2009). Overall, both burials demonstrated a lack of complex grave offerings, such as stone pendants, celts, and cemís.

The remains of the partial skeleton in NVS-WB1 Unit 2 were found in a fetal position, with her knees bent to the chest, and the left side of the cranium facing east. The left hand of the partial skeleton was positioned very close to the face; interestingly, the skull of the second individual was found lying within the left hand of the first individual described. For the partial skeleton, a total of seven vertebrae were unearthed. The foot bones and a patella were present, and the ribs did not remain intact when removed from the burial. The partial skeleton's cranium appeared to be in great shape; however, as it was extracted from the grave, the cranium was observed to have postmortem compression affecting the frontal, facial, parietal, temporal, and occipital bones on the left side of the skull. During the cleaning process of the partial skeleton, it was observed that these remains were extremely fragile. Segments of the occipital region of the skull broke apart from the rest of the cranium during cleaning. The crumbling nature of the remains did not allow for an in-depth examination and handling of the skull without causing further damage, which made obtaining certain cranial and post-cranial measurements impossible.

The second cranium found in NVS-WB1 Unit 2 was observed to be the most complete among the present sample because all of the cranial features were observed to be intact, with the exception of an incomplete right orbit and the nasal cavity being slightly compressed. An upper right first molar and an upper left first molar were intact in the maxilla. An upper left central incisor, a lower right lateral incisor, a lower third right molar, and what was believed to be a lower second premolar were discovered in this burial. These teeth were thought to belong to this individual because the partial skeleton found within the same burial possessed these teeth, among many others, still intact in her maxilla and mandible.

Six diagrams showing the exact cranial and post-cranial bones collected from each burial are provided in the appendix section of this thesis. Listed below, is a complete list of the cranial and mandibular elements that were present among the three excavated crania. If the element was present, the item was indicated present, if the item was lacking or unable to be measured the item was labeled absent (see Table 1 and Table 2 for a comparison of these elements). Table 3 will only provide the post-cranial element for the partial skeleton.

Table 1. Comparison of the Cranial Elements in the Present Sample.

Cranial Elements	Isolated Skull in NVS-WB1 Unit 1	Partial Skeleton in NVS-WB1 Unit 2	Second Cranium in NVS-WB1 Unit 2
Maximum Cranial Length	Present	Absent	Present
Maximum Cranial Breadth	Absent	Absent	Present
Bizygomatic Diameter	Absent	Present	Present
Basion-Bregma Height	Absent	Present	Present
Cranial Base Length	Absent	Absent	Absent
Basion-Prosthion Length	Absent	Absent	Present
Maxillo-Alveolar Breadth	Absent	Absent	Present
Maxillo-Alveolar Length	Absent	Absent	Present
Biauricular Breadth	Absent	Absent	Absent
Upper-Facial Height	Absent	Present	Present
Total Facial Height	Absent	Present	Present
Minimum Frontal Breadth	Present	Present	Present
Upper Facial Height	Absent	Absent	Absent
Nasal Height	Absent	Present	Present
Nasal Breadth	Absent	Present	Present
Right Orbital Height	Absent	Present	Present
Right Orbital Breadth	Present	Present	Present
Left Orbital Height	Absent	Present	Present
Left Orbital Breadth	Absent	Present	Present
Bi-Orbital Breadth	Absent	Present	Present
Interorbital Breadth	Absent	Present	Present
Frontal Chord	Absent	Absent	Present
Parietal Chord	Absent	Absent	Present
Occipital Chord	Absent	Absent	Present
Foramen Magnum Length	Absent	Absent	Present
Foramen Magnum Breadth	Absent	Absent	Present
Mastoid Process Length	Absent	Absent	Absent
Mastoid Process Width	Absent	Absent	Present
Maxilla Length	Absent	Absent	Absent
Maxilla Width	Present	Absent	Absent
Mandible Gonial Angle Length	Present	Absent	Absent

Zygomatic Length	Present	Absent	Absent
Zygomatic Width	Present	Absent	Absent
Cephalic Index	Absent	Absent	Present

Table 2. Comparison of the Mandibular Elements in the Present Sample.

Mandibular Elements	Isolated Skull in NVS-WB1 Unit 1	Partial Skeleton in NVS-WB1 Unit 2	Second Cranium in NVS-WB1 Unit 2
Height of Mandibular Body	Present	Present	Present
Breadth of Mandibular Body	Present	Present	Present
Mandibular Length	Present	Present	Present
Mandibular Angle	Absent	Absent	Absent
Bicondylar Length	Absent	Absent	Absent
Bicondylar Breadth	Absent	Present	Present
Bigonial Breadth	Absent	Present	Present
Minimum Ramus Length	Present	Absent	Present
Minimum Ramus Breadth	Present	Absent	Present
Maximum Ramus Height	Present	Absent	Present
Chin Height	Present	Present	Present

Table 3. Post-Crania Partial Skeleton Only.

Post-Cranial Elements Present	Notes on Condition
Cervical (C) 1	
C7	
Thoracic (T) 1	Incomplete, lacking vertebral body
T12	Incomplete, lacking vertebral body
Lumbar (L) 1	Fragmented but present
L2	
L3 (Possible)	Only superior portion of vertebral body present
L4	
L5	
Right Scapula	Completely fragmented
Left Scapula	Completely fragmented
Right Clavicle	Complete
Ribs 1-12 Right	Most were present but in fragments
Ribs 1-12 Left	Most were present but in fragments

Right Humerus	Complete
Left Humerus	Incomplete and fragmented
Right Ulna	Fragmented and missing the olecranon, coronoid process and trochlear notch
Right Radius	Proximal head is missing
Left Patella	Complete
Pelvis	Extremely fragmented and fragile
Right Metacarpal (MC) 1	
Right 1st Distal Hand Phalange	
Right MC 2	
Right 2nd Intermediate Hand Phalange	
Right 2nd Proximal Hand Phalange	
Right MC 3	
Right 3rd Intermediate Hand Phalange	
Right 3rd Proximal Hand Phalange	
Right MC 4	
Right 4th Distal Hand Phalange	
Right 4th Intermediate Hand Phalange	
Right 4th Proximal Hand Phalange	
Right 5th Distal Hand Phalange	
Right Lunate	
Right Scaphoid	
Right Capitate	
Right Navicular	
Right Hamate	
Right Greater Multiangular	
Right Lesser Mutliangular	
Left 2nd Distal Hand Phalange	
Left 2nd Intermediate Hand Phalange	
Left MC 3	Incomplete, base missing
Left 3rd Distal Hand Phalange	
Left 3rd Proximal Hand Phalange	
Left MC 4	
Left 4th Distal Hand Phalange	
Left 4th Intermediate Hand Phalange	
Left MC 5	
Left 5th Distal Hand Phalange	
Left 5th Intermediate Hand Phalange	

Left Lunate	
Left Scaphoid	
Left Capitate	
Right Metatarsal (MT) 1	Base is damaged and incomplete
Right 1st Distal Foot Phalange	
Right 1st Proximal Foot Phalange	
Right 2nd Intermediate Foot Phalange	
Right 2nd Proximal Foot Phalange	
Right MT 3	
Right 3rd Intermediate Foot Phalange	
Right 3rd Proximal Foot Phalange	
Right MT 4	Base is damaged and incomplete
Right 4th Intermediate Foot Phalange	
Right 4th Proximal Foot Phalange	
Right MT 5	Damaged and broken in two
Right 5th Distal Foot Phalange	
Right 5th Proximal Foot Phalange	
Right Calcaneus	Incomplete and damaged
Right Talus	Incomplete and damaged
Right Cuboid	Complete
Right First Cuneiform	Complete
Right Second Cuneiform	Complete
Right Third Cuneiform	Fragmented
Right Navicular	Complete
Left 1st Proximal Foot Phalange	
Left MT 2	Broken into two pieces-Incomplete
Left MT 3	
Left 3rd Distal Foot Phalange	
Left 3rd Intermediate Foot Phalange	
Left MT 5	Head missing
Left 5th Intermediate Foot Phalange	
Left Calcaneus	Complete
Left Cuboid	Complete
Left Second Cuneiform	Complete
Left Navicular	Incomplete

Osteological Methodology

The data set for the present study consisted of information obtained from published sources pertaining to the osteological methods of sexing and aging a skeleton, and obtaining estimated stature of Prehistoric Native Americans from Ohio, of which are comparable in size to the Taíno (Sciulli et al. 1990; Sciulli and Giesen 1993). Research of additional sources involving pathological diseases, trauma, and the overall dental and physical health, were also reviewed in order to better understand each individual's life story. Measurements of the long bones were obtained using a portable osteometric board (accurate to 0.5 mm) produced by Paleo-Tech Concepts, Inc. Measurements of all other cranial and post-cranial bones were obtained using Mitutoyo digital calipers calibrated to 0.00 mm (accurate to 0.01 mm). All post-cranial measurements among this sample were obtained by Denise Frazier, the measurements were recorded by Sarah Hawks, and the author observed. All cranial measurements among this sample were obtained by the author and the measurements were recorded by her assistant, Mark Pirotta. The osteometric measurements obtained throughout the skeletal analysis are provided in separate tables later in this thesis. The descriptions and notes concerning these measurements and visual observations of the bones are also provided later in this thesis.

The osteological methods included visual and metric observations collected from the skeletal remains. All methods for skeletal analysis were chosen and applied based on the most intact and complete bones present (Buikstra and Ubelaker 1994; Ubelaker 1999; White 2000; Bass 2005; White and Folkens 2005). The aging methods used in this study, in order to determine if these individuals were adults or sub-adults, involved examination of the post-cranial epiphyseal fusions, fusion of the secondary ossification sites on the vertebrae, and the eruption of the dentition. Further skeletal analyses of the sternal ends of the ribs was able to be conducted once a relative age was established, ruling out the possibility of them being juveniles. All aging estimations pertaining to the epiphyseal closure of the long bones and the secondary ossification sites on the vertebra were drawn from the guidelines established by Buikstra and Ubelaker (1994). The aging method involving the examination of the sternal ends of the ribs were drawn from the guidelines established by Iscan et al. (1984), and dental examinations as a method of aging were drawn from the guidelines established by White and Folkens (2005).

If the post-crania was present, each skeleton was examined for completeness of the epiphyseal closure of the long bones, using the distal and proximal ends of the humeri, radii, ulnae, and fibulae. Second, the visual fusion of the secondary ossification sites located on the spinous and transverse processes the vertebrae were observed and fusion of the anular epiphyses of the vertebrae were observed. Observations of the secondary ossification centers were applied to the C3-L5 (3rd cervical through the 5th lumbar) vertebrae since these appear at puberty and usually fuse by 25-30 years old (Scheuer and Black 2000; Cardoso and Rios 2011). Each of the long bones and vertebrae were chosen to be examined by their completeness; if these bones were more than 50% incomplete and missing more than half of their identifying features, these bones were excluded from these methods. The methods for examination and scoring of the epiphyseal fusion in the long bones and vertebral fusion were drawn from the guidelines outlined in Buikstra and Ubelaker (1994); visual scoring of these fusion sites were as follows: N/A-not applicable or the bone is missing; 0-open: epiphysis and diaphysis are completely separated with no bony union; 1-partial union: some union has occurred, but fusion is incomplete; and 2-complete union: all visible aspects of the epiphysis and diaphysis are united.

Among the burials that contained post-cranial elements, as a way to assist with an assessment of age, the sternal ends of the ribs were examined for their pit depth, paying particular attention to the 4^{th} rib. In addition, the ribs were examined for high levels of porosity, coupled with sternal lipping, as the sternal ends of the ribs can also show age-related diseases, assisting with age determination (Ubelaker 1999; Bass 2005; Pankaj et al. 2007; Weiss 2009). The pit depth were both visually observed and measured with digital calipers by keeping the caliper perpendicular to the base of the pit. After the sternal ends of the ribs were measured and visually examined, they were photographed, and placed into eight categories based on the severity of the observed and measured pitting. The scoring of these pits were categorized by the methods outlined by Iscan et al. (1984, 1986a, 1986b) found in Ubelaker (1999) and Bass (2005). The visual scoring of the sternal pits for females is as follows: Phase 0 (13 years and younger): the articular surface is flat/billowy with a regular rim and rounded edges, and the bone is very smooth and solid; Phase 1 (14-15 years old): the articular surface has a slight indentation and billowing or ridges may also be present, the rim is round and regular, and the bone is firm, smooth, and solid; Phase 2 (16-19 years old): the pit is deeper and has a V-shaped appearance between the anterior and posterior walls, the walls are thick and smooth, the rim is rounded, but might have a wavy rim, and the bone is firm and solid; Phase 3 (20-24 years old): the pit has deepened, but still resembling a V-shape, sometimes resembling a moderate U-shape, the walls become a bit thinner, the rounded edges are now pronounced, and the rib is firm and solid; Phase 4 (26-32 years old): the pit depth is increasing, now resembling a wide V-shape or a narrow U-shape with flared edges, the walls are thinner with a rounded rim, some irregular scalloping patterns may be present, and the bone's firmness and weight is decreasing; Phase 5 (33-46 years old): the pit depth is about the same as Phase 4, but the walls are flaring into a wider V-shape or U-shape, and in some cases, a smooth, hard plaque-like deposit fills the pit, the edges of the rim start to sharpen, becoming more irregular, and the bone is less dense and lighter in weight; Phase 6 (43-58 years old): an increase in pit depth is noted, the V-shape or U-shape has widened, the ends have a pronounced flaring at the ends, the plaque deposit is roughened and more porous, the walls are thin and the edges are sharp, and the bone is brittle with signs of deterioration; Phase 7 (59-71 years old): the pit depth actually shows a slight decrease, irregular bony growths are often extruding from the interior of the pit, the central arc is still present, but is now accompanied by pointed projections, the walls are very thin and have irregular sharp edges, and the bone is fragile and deteriorated; Phase 8 (70 years and older): the floor of the U-shaped pit is relatively shallow, badly deteriorated, or completely eroded, and sometimes it is filled with bony growths, the central arch is barely discernable, the walls are extremely thin and fragile and the edges are sharp and irregular with long projections often found at the edges, "window" formations sometimes occur, and the bone itself is in poor condition (Iscan et al. 1984). Once visual scoring of the pits were completed, measurements of the pits were taken and then categorized into different age groups based on their measurements. Using the categories provided by Iscan et al. (1984) the age groups for the measured pit depth were as follows: less than 1 mm (15 years old and younger), 1.1 mm-2.5 mm (16-24 years old), 2.6 mm-4.5 mm (26-35 years old), 4.6 mm-7.0 mm (36-46 years old), 7.1 mm-10.0 mm (47-59 years old), 10.1 mm and greater (70 years and older). The categories chosen were based on an assemblage of the similar categories provided by Bass (2005) when examining the remains of Native Americans, the data collected from Loth (1995) who examined a cemetery population, Pankaj et al. (2007) who examined Indian remains, and Cerezo-Roman and Hernandez Espinoza (2014) who examined Mexican males; among these studies, when both the right and left ribs were examined, the age and associated sternal pit depth contained dissimilarities of about 2-3 years in age. When dissimilarities of depth of multiple ribs from the same individual were observed, an average was calculated.

The author visually examined the dentition as a last way to confirm if these individuals were adults or sub-adults and obtain an estimation of age. Careful attention was paid to the thickness of the enamel and dentin layers, the size and shape of the crowns, and the size and shape of the roots in comparison to the crowns, as these features tend to be thinner, shorter, and more slender in sub-adults than adults (Bogin 1988, 1999; Buikstra and Ubelaker 1994; Ubelaker 1999; Gaither 2004; Bass 2005; White and Folkens 2005). Dental data included both visual and metric observations collected from the skeletal remains. Visual examinations were used whenever possible and each tooth was categorized and determined to be juvenile or adult by the methods and guidelines outlined by White and Folkens (2005). This information was supplemented with the descriptions and photographs provided by Buikstra and Ubelaker (1994). Any individual who did not have at least two teeth from which to derive an age estimate were discarded from the study, and in cases where the burial only contained a cranium and teeth, examination of the dentition was the primary aging method applied. In the cases where post-crania was available, dentition was used as a final aging method to confirm the results obtained from the previously mentioned methods.

Abnormalities of the teeth were observed and recorded in accordance with the methods presented by White (2000) and White and Folkens (2005). Photographs of the mandible, maxilla, and isolated teeth were taken whenever possible for visualization of the alveolar process, missing teeth and signs of alveolar bone resorption, dental caries, and attrition. Measurements of the teeth were taken whenever possible with digital calipers.

Examination of molar attrition was also used to assess age. In order to apply this method, visual examination of at least one molar must be completed. The Brothwell (1981) method was applied to assess occlusal wear of molar teeth to estimate age. The author conducted all visual observations of the teeth, while Mark Pirotta logged the scoring and observations. Each molar gathered in this study were classified independently according to the parameters of the Brothwell (1981) chart. The occlusal surfaces of the molars were visually examined for the level of dentin exposed due to the level of attrition present on the cusps and enamel polishing. According to Brothwell (1981), ordinal scoring for the classification of age was as follows: classification of the ages 17-25 years old indicates the dentin is not yet exposed and a slight polishing of the enamel may be present; classification of the ages 25-35 years old indicates a moderate amount of the dentin exposed and a moderate presence of enamel polishing; classification of 35-45 years old indicates a severe amount of the dentin exposed, causing the presence of enamel polishing to be absent; finally, classification of 45 years and older indicates any degree greater than the previous categories, and very unequal wear sometimes occurs in the later stages. To simplify these stages of wear, the author categorized these stages as: Stage 0- no wear present (0-17 years old); Stage 1- wear of the enamel only (17-25 years old); Stage 2- slight wear of the dentin, where the occlusal surface possesses more enamel than dentin and a slight exposure of the pulp chamber may be present (25-35 years old); Stage 3- moderate wear of the dentin, where the occlusal surface has more dentin than enamel and a moderate exposure of the pulp chamber might be present (35-45 years old); and Stage 4- advanced or extreme wear, with advanced exposure of the pulp chamber (45 years and older). With the hopes of better understanding the diet and possible alternative uses of teeth among this population, the author also applied the observed levels of attrition and other patterns of wear to the premolars, canines, and incisors. These patterns of attrition were recorded based on their anatomical location in the mandible or maxilla and visually scored as: Stage 0- no wear; Stage 1- wear of the enamel only; Stage 2- slight wear of the dentin, where more enamel is present than that of dentin and the pulp chamber is slightly exposed; Stage 3- moderate wear of the dentin, where less enamel is present than that of dentin and the pulp chamber is moderately exposed; or Stage 4- advanced or extreme wear stage, with extreme exposure of pulp chamber.

Methods for sexing these skeletons was limited due to the lack of post-cranial elements present. Among this sample, the sciatic notch was either absent or greatly fragmented, making the possibility of using the originally intended sexing method relating to the pelvis impossible. The author utilized other sexing methods which involved the measurements of the humerus, and both visual and metric observations of the crania (Ubelaker 1999; Bass 2005). Each humeral head was examined for completeness before the method of measuring the vertical diameter of the humeral head could be applied. Digital calipers were used to measure the vertical diameter of the articular capsule, but not including the anatomical neck of the humerus. Each humeral head was photographed, and the measurements were recorded in an excel spreadsheet and into three separate notebooks. As previously indicated, if the vertical diameter of the humeral head measures under 43 mm, it is female, and populations of prehistoric California females possess a vertical diameter of the humeral head that ranges from 38.6 mm to 39.6 mm (Bass 2005, 18; 2005, 152). Once again, these figures provided by Bass (2005) are not based on the Caribbean population being studied but are comparable to the American indigenous peoples.

With the exception of one individual, the present sample lacked post-cranial elements; therefore, sexing methods relating to the cranium were applied (Buikstra and Ubelaker 1994; Ubelaker 1999; Bass 2005). It is important to note that the preservation of the skulls in this study varied due to their time of exposure. Two of the three crania began to crumble during the cleaning process and required segments to be glued back together in order to complete the cranial measurements and examination of the remains.

The observed cranial morphological features used for sexing included the length and width of the mastoid process, the thickness of the supra-orbital crests, the prominence of the supra-orbital ridge/glabella, and the prominence of the rugged and larger muscle markers like the nuchal crest and the mental eminence, as these traits tend to be larger and more defined in males than in females (Stewart 1979; Ubelaker 1999; Wilkinson 2004; Klepinger 2006; Byers 2008; Galdames et al. 2008; Saini et al. 2012). Examination of these sexually dimorphic features were only applied to the burials that contained a cranium that had 50% or more of the cranial bones present. The visual scoring techniques used to obtain the sex of these individuals involved a number of qualitative descriptors, as outlined by Buikstra and Ubelaker (1994) and cited in Petaros et al. (2015). The visual observations of these features were labeled male if they were described as long, prominent, projecting, robust, large, broad, and wide; these features were labeled female they were described as short, flat, gracile, small, and thin (Petaros et al. 2015). In order to account for inherent subjectivity, visual scoring was coupled with a less subjective and more standardized ordinal scale of 1-5, as provided by Buikstra and Ubelaker (1994). The scaling of these features were as follows: 1-structures indicate high probability of female, with little doubt; 2-structures indicate probable female, with a higher likelihood of female than male; 3- ambiguous sex, as the sexual diagnosis of the structures are ambiguous and cannot be determined; 4- probable male, as the structures are more likely to be male than female; 5- structures indicate high probability of male, with little doubt (Buikstra and Ubelaker 1994, 19-21). The sex estimation of all the values was calculated by viewing the list of each individual’s scores; if the list of scores had three or more values that indicated male (4 and 5) or female (1 and 2), then each individual was sexed as such

(Buikstra and Ubelaker 1994). For any individual who had more than two undetermined sex (0) or ambiguous sex (3), the individual's sex could not be determined. As outlined by Buikstra and Ubelaker (1994) and Bass (2005), digital calipers were used when obtaining measurements of certain cranial features, such as the supra-orbital crests and the mastoid process.

Visual observations of the dentition were used to document and reference the size, shape, and attrition amongst each previously sexed individual (Buikstra and Ubelaker 1994; Ubelaker 1999; Bass 2005). Descriptive observations were used when examining the dentition because there are currently no comparable Caribbean skeletal samples that have reliably determined sex solely on dentition. The morphology of the incisors, canines, premolars, and molars were described to be robust or gracile, large or small, prominent or flat, sharp or dull, and bulbous or smooth.

Throughout this study, the author attempted to control for the stature measurements by using the most reliable stature estimation methods for prehistoric populations. There is a clear lack of comparative skeletal samples among known living Taíno descendant populations; thus, it becomes a necessity to approximate the living stature among the Taíno with the least error as possible by using standards and regression formulas that are population specific, rather than universal standards (Genoves 1967; Sciulli et al. 1990; Stinson 1990; Sciulli and Geisen 1993; Beguelin 2011; Pomeroy and Stock 2012). Further work is needed to explore whether these previously published stature regression formulas are able to be applied to other Taíno samples within and outside the study area of Nevis.

Sciulli and Geisen (1993) published a regression formula using the maximum length of the humerus, radius, and ulna to estimate the skeletal height and stature for prehistoric Native American populations in Ohio from the Late Prehistoric Period. This method was only applied to the partial skeleton since this was the most intact skeleton excavated in this study. Their formulae are as follows: for height from the humeral length, Skeletal Height= 62.360 + 2.706 (Maximum Humerus Length); for height from the radius length, Skeletal Height= 73.945 + 3.033 (Maximum Radius Length); and for height from the ulnar length without the styloid process, Skeletal Height= 76.588 + 2.717 (Length of the ulna without the styloid process). Once the skeletal height is calculated, 10 cm must be added to skeletal heights 153.5 cm or less, 10.5 cm must be added to skeletal heights 153.6-165.4 cm, and 11.5 cm must be added to skeletal heights 165.5 cm or greater (Sciulli and Geisen 1993).

The methods pertaining to the cranial pathologies amongst this skeletal sample involved examination of the crania and dentition. The crania were examined for potential signs of cranial deformation, wormian bones, porotic hyperostosis and cribra orbitalia, and dental diseases, such as attrition, caries, and alveolar resorption. These pathologies were visually observed and photographed.

The cranial deformation methods used in this study involved collecting measurements of the maximum breadth of a skull (from the euryon to the euryon) and the maximum length of the skull (from the glabella to the opisthocranion) with a digital caliper to calculate the cranial index (Buikstra and Ubelaker 1994; Williams et al. 1995; Bass 2005). The cephalic/cranial index is a number that expresses the ratio that indicates if an individual's cranium is dolichocephalic (an index of less than 75, where the skull is long and narrow when seen from the top), mesaticephalic (an index of 75-80, where the skull is nearly oval), brachycephalic (an index 80-85, where the skull is broad and short), or hyper-brachycephalic (an extreme degree of brachycephaly with a cephalic index of over 85) (Williams et al. 1995; Bass 2005). The ratio was calculated by taking the measurement of the maximum width (biparietal diameter or BPD, side to side) of the skull, multiplying this number by 100, and then dividing it by the maximum length (occipito-frontal diameter or OFD, front to back) of the skull. This study did not consider using the methods associate with the Frankfort plane. Each cranium was visually examined for noticeable cranial deformations. Each deformation was noted for its location (frontal, occipital, temporal/parietal, coronal, sagittal, and lambdoidal) and categorized (paralleo-fronto-occipital or tabular oblique, fronto-occipital/tabular erect, lambdoid, or occipital). Each cranium was photographed from the anterior, posterior, superior, and lateral, perspectives to assess for cranial deformations. The manner in which the cranium was deformed and the shape of the skulls were described.

The presence of wormian bones were first visually observed for their size, shape, and location on the cranium. Next, the observed wormian bones were measured with digital calipers; both the maximum length and width were obtained. Last, each wormian bone was photographed and logged for its size, shape, and location on the cranium. Additionally, the present sample was observed for signs of cranial pathologies, such as porotic hyperostosis and cribra orbitalia. Each observed occurrence of porotic hyperostosis and cribra orbitalia were noted and photographed to show the location and level of severity. Both of these cranial pathologies were visually scored and categorized into four degrees of severity, of which were: 1-barely discernable; 2-porosity only; 3-porosity with thickening of the spongy bone (coalescence of foramina), no thickening; 4-coalescing foramina with increased thickening (Buikstra and Ubelaker 1994). For example, based on Buikstra and Ubelaker (1994) coding for porotic hyperostosis, cases that are barely discernable are coded as 6.1.1, cases where only porosity is present are coded as 6.1.2, and cases that show signs of porosity with the presence coalescence of foramina are coded as 6.1.3.

As outlined in Buikstra and Ubelaker (1994), Bass (2005), and White and Folkens (2005), periodontal diseases were examined through visual observation. Dental caries or cavities were determined by the presence of black indentations on the teeth (Buikstra and Ubelaker 1994; White and Folkens 2005). The location and number of the dental caries were documented on all the teeth in the present sample. The severity of these lesions were recorded visually by their size and if they appeared to have made their way to the root. Levels of attrition were also recorded visually and the severity was determined by the amount of exposure to the root of the tooth (Ubelaker 1999; Bass 2005; White and Folkens 2005). With the intention to better understand possible dietary related diseases among this population, the teeth were observed for 8 stages of attrition, as explained by Buikstra and Ubelaker (1994). Methods of examining attrition for the purposes of aging was previously described and unrelated to this scoring method, since this method is related to the assessment of the possible dietary related periodontal diseases. These stages of attrition are as follows: Stage 1- unworn or a slight polished appearance or small facets (no dentin exposed); Stage 2- point/hairline of dentin exposed or moderate cusp removal (blunting); Stage 3- dentin line of distinct thickness or full cusp removal with moderate dentin patches, Stage 4- moderate dentin exposed that is no longer resembling a line, or at least one large dentin exposed on one cusp; Stage 5- large dentin area with enamel rim complete or two large dentin areas (with or without slight coalescence); Stage 6- large dentin area with enamel rim lost or one side/very thin, or dentin areas coalesced with enamel rim still complete; Stage 7- enamel rim lost on two sides and only a small amount of enamel remains or full dentin is exposed with a loss of a rim on at least one side; Stage 8- complete loss of crown and the surface has taken shape of the root (Buikstra and Ubelaker 1994). Teeth that had more exposure to the root and substantially less enamel were determined to have extreme levels of attrition (Stages 5-8), while those that had the presence of more enamel and less root exposure were determined to have low levels of attrition (Stages 1-4).

Antemortem tooth loss (AMTL) was assessed among this sample. Alveolar bone resorption was visually determined based on the presence of missing teeth within the mandible or maxilla, and clear antemortem resorption of the bone or the receding of the alveolar process (Ubelaker 1999; Knezovic-Zlataric et al. 2002; Bass 2005; White and Folkens 2005).

The post-crania of the partial skeleton and the fragmented skeleton, of which is discussed in the appendix, were examined for degenerative joint diseases, Schmorl’s nodes, rib and vertebral fusion, and clear indications of trauma, broken bones and fractures.

Buikstra and Ubelaker's (1994) definitions of porosity, eburnation, and lipping were applied to the clavicle, vertebrae, ribs, carpals, and metacarpals in hopes of better understanding the overuse of these specific bones and gaining an insight into these individual's daily activities. Fractions of >1/3, 1/3-2/3, and <2/3 were used to describe the extent to which each vertebra was overtaken by OA and the observed lipping, eburnation, and porosity present were scored from a range of 1 (barely discernable) to 3 (highly discernable or present throughout) (Buikstra and Ubelaker 1994).

Asymmetry of the left and right humeri were measured, as described by Niinimaki (2012), and asymmetry of the right and left metacarpals were measured and observed, as described by Roy et al. (1994) in attempts to assist with the determination of handedness among this skeletal sample. Measurements and observations of these post-cranial elements were only applied to individuals who possessed complete humeri and had at least 50% of the metacarpals and carpals per hand. The humeri and metacarpals were measured with a digital caliper. The measurements of the humeri were completed by the author and recorded by Mark Pirotta, while measurements of the metacarpals were completed by Denise Frazier and recorded by Sarah Hawks. As a way to assess any clear differences between the right and left humerus, the maximum humeral length and the maximum humeral breadth found at the distal ends humeri were measured, and the entire length of the humeri were measured with an osteometric board.

Methods for measuring asymmetry in the metacarpals included measuring the total length of each metacarpal (from the head to the base), measuring the total width of the medullary cavity (the thickness of the shaft of the metacarpals), and measuring the width of the proximal and distal ends of the metacarpals, all while, paying careful attention to the differences between the second and the fourth metacarpals (Roy et al. 1994; Bass 2005). These measurements were then placed into a regression formula provided by Hopkins (2006) to calculate handedness: $\%R = {}^{R}/_{R\,+\,L}$ x 100, where R and L indicate the total length of the right and left metacarpal, respectively. Percentages less than 50% indicate left handed, percentages greater than 50% indicate right handed, and percentages equaling 50% are undetermined (Hopkins 2006). As a way to provide additional evidence of potential handedness in each individual, the metacarpals and carpals of each hand were visually observed for the presence of OA or clear morphological changes associated with overuse. Methods for observing hand asymmetry included: observing the thickness, length, and the overall shape or misshape of the metacarpals, and measuring of the length and width of the metacarpals. In order to assess asymmetry, the length and width of the same metacarpals in the right and left hand were compared. The methods for assessing handedness included: looking for any clear deformations, erosive osteoarthritis, or rheumatoid arthritis in the metacarpals and carpals, observing the distal and proximal ends of the right and left metacarpals for porosity, lipping, and eburnation, and observing the right and left carpals for porosity, lipping, and eburnation. The presence of OA in the carpals and metacarpals were scored from a range of 1 (slight/barely discernable) to 3 (highly discernable/extreme) (Buikstra and Ubelaker 1994). In order to determine handedness, the observed levels of OA were compared between the same carpals and metacarpals in the right and left hand.

CHAPTER 5: Osteology Results

Osteological Results of the Isolated Cranium in NVS-WB1 Unit 1

Overall, the observed and measured cranial and facial features were large, particularly the mandibular length and the maximum cranial length. Additionally, the teeth were large, especially the lower third molar. The mental eminence was prominently square, and the supra-orbital ridges were rough and prominent. The nuchal crest was visually scored between a 3 and 4, but leaning more towards a 4 due to its prominence, the supra-orbital ridge was scored a 4, and the mental eminence was scored between a 4 and 5 (see Figures 13 and 14) (Buikstra and Ubelaker 1994). According to these results, this individual was likely a male. These cranial features were compared against both skulls in NVS-WB1 Unit 2; it was determined that these features were much more robust, larger in size, and more closely resembled the second cranium in NVS-WB1 Unit 2.

Figure 13. NVS-WB1 Unit 1 Cranium (frontal view). Notice the mid-facial region, parietal and temporal, lower occipital bones, and maxilla are damaged or missing. The mandible was also incomplete on the left side. The nuchal crest was present.

Figure 14. NVS-WB1 Unit 1 Cranium (lateral view) Cranial Deformation. The occipital (back of the skull) was observed to have a slight flattening. A slight flattening of the frontal region of the skull also observed. Possibly as a result of vertico-occipital flattening.

The eruption of the dentition confirmed this individual was not a juvenile. The eruption of the third molars present in the mandible suggested that this individual was about 25 years of age. However, due to the extreme levels of attrition on the third molar (Stage 2-3 wear), it possible that this individual was much older than 25 years old when he died.

First examinations of the cranial fragments displayed no clear signs of antemortem deformation. However, once the cranial fragments were glued back together, a slight deformation to the occipital region was observed, and although not affecting the brow region, a slight deformation to the frontal region was also observed. These observations were later confirmed by measurements of the maximum cranial length and breadth. Wormian bones were not observed. When observing the occipital region of the skull, there was what seemed to resemble porotic hyperostosis. It was observed that this individual had barely discernable porosity present (see Figure 15).

Figure 15. NVS-WB1 Unit 1 Cranium (posterior view) Porotic Hyperostosis. This is part of the occipital bone of the isolated skull. Possible porotic hyperostosis visible on, and just above, the nuchal crest.

The maximum cranial length was measured to be 181.74 mm, which was larger than the measurement obtained from the second cranium excavated in NVS-WB1 Unit 2. The measurements listed below were taken from the available portions of the occipital, and the right frontal, temporal, and parietal bones (see Tables 4 and 5 below for these measurements).

Table 4. NVS-WB1 Unit 1 Craniometrics-Isolated Skull.

Cranial Elements	Measurements (in mm.)
Maximum Cranial Length	181.74
Minimum Frontal Breadth	96.05
Right Orbital Breadth	41.92
Mastoid Process Width	18.46
Maxilla Length	29.30
Maxilla Width	34.80
Mandible Gonial Angle Length	69.10
Zygomatic Length	49.10
Zygomatic Width	33.90

Table 5. NVS-WB1 Unit 1 Mandibular Measurements-Isolated Skull.

Mandibular Elements	Measurements (in mm.)
Height of Mandibular Body	25.40
Breadth of Mandibular Body	17.52
Mandibular Length	98.26
Minimum Ramus Length	32.63
Minimum Ramus Breadth	38.67
Maximum Ramus Height	56.13
Chin Height	30.91

Examination of the dentition showed a presence of dental caries on the buccal side and occlusal surface of his lower right third molar (see Figure 16). There was moderate attrition visible on the occlusal surface of his lower right third molar. It was assessed that the molar attrition closely resembled that of Stage 5 or Stage 6 (Buikstra and Ubelaker 1994). A visible crack on the lower right third molar was also observed. There was what seemed to be a moderate level of alveolar bone resorption to the first and second right mandibular molars and a slight level of alveolar bone resorption visible on the first left mandibular molar. The alveolar resorption was more discernable on the right side.

Figure 16. NVS-WB1 Unit 1, Mandible and Dentition. A lower right lateral and lower right third molar are shown. Buccal and occlusal carries are visible on the lower right third molar, and the root exposure is likely due to the extreme wear. Alveolar bone resorption is also visible on the right side of the mandible.

Osteological Results of the Partial Skeleton in NVS-WB1 Unit 2

The cranial and facial features on the right side of the skull were measured and visually observed (according to Buikstra and Ubelaker’s 1994 scale), as they were not affected by the postmortem deformation. The prominence of the supra-orbital ridge on the right side of the skull was observed to resemble a 1, and the mental eminence was also observed to be a 1. The supra-orbital margin resembled that of a 1 or a 2. Due to the postmortem compression and crumbling nature of the left side and base of the skull, the nuchal crest was unable to be observed and scored a 0 (see Figure 17). Also, the transverse diameter and vertical diameter of the humerus were measured to be 39.0 mm and 38.7 mm, respectively. These results indicate that this individual was likely a female.

Figure 17. NVS-WB1 Unit 2-2B, Postmortem Cranial Deformation. This cranium belongs to the partial skeleton found in NVS-WB1 Unit 2, 2A, and 2B. The first image (frontal view) shows the postmortem deformation to the left side of the cranium, resulting in the lateral flattening of the skull. The second image (lateral view) shows a slight frontal deformation, also resulting postmortem. The skull is lacking signs of antemortem cranial deformation to the occipital region of the skull. The complete right side of the cranium and mandible are intact. The mastoid process on the left and right side of the skull are damaged and incomplete.

The presence of the third molars suggested that this individual was not a juvenile or sub-adult. Observations of the epiphyseal ends of the humerus were completely fused. The secondary fusion sites located on the lumbar vertebrae, transverse process, spinous transverse process, and anular ring were all observed to be completely fused. It was determined that this individual was at least 25 years of age. Examination of the sternal ends of the ribs found that there was porosity, in addition to slight lipping, which suggested an age range of 28-35 year old. The Stage 2-3 wear patterns on the molars indicated that this individual was in her thirties when she died. As discussed later, the minor to moderate levels of osteoarthritis observed throughout the skeleton support that she was in her thirties.

The total length of the right humerus was 320 mm. The total lengths of the right radius and right ulna were 220 mm and 215 mm, respectively. Using the regression formulae provided by Sciulli and Geisen (1993), the height of this individual was 1.5895 meters tall, or about 5 feet 3.5 inches tall.

Provided in Tables 6 and 7 are a list of the cranial and facial measurements that were collected.

Table 6. NVS-WB1 Unit 2 Craniometrics-Partial Skeleton.

Cranial Elements	Measurements (in mm.)
Bizygomatic Diameter	94.49
Basion-Bregma Height	130.38
Upper-Facial Height	74.46
Total Facial Height	142.10
Minimum Frontal Breadth	84.89
Nasal Height	47.70
Nasal Breadth	23.65
Right Orbital Height	39.55
Right Orbital Breadth	44.00
Left Orbital Height	37.98
Left Orbital Breadth	43.28
Bi-Orbital Breadth	73.45

Table 7. NVS-WB1 Unit 2 Mandibular Measurements-Partial Skeleton.

Mandibular Elements	Measurements (in mm.)
Height of Mandibular Body	22.23
Breadth of Mandibular Body	14.05
Mandibular Length	89.04
Bicondylar Breadth	68.27
Bigonial Breadth	63.53
Chin Height	30.27

Examination of the dentition showed signs of oblique and lateral attrition on the central incisors, lateral incisors, and canines. Attrition was also observed on both the left and right second and third molars. The level of attrition present on the molars resembled that of Stage 5 wear (Buikstra and Ubelaker 1994). A few dental caries were observed on the buccal side of premolars and molars.

The vertebrae present were assessed for OA. Slight porosity was observed on the fragmented bodies of the L4 and L5 vertebrae and the inferior articular processes of the thoracic and lumbar vertebrae. The presence of pitting on the vertebrae remained relatively consistent throughout the progression of the spine. Lipping was visible on the L2-L5 vertebrae and slight lipping was present on the inferior articular facet on T12. Eburnation seemed to be present on C1, C7, T1, T12, and L2-L5. Provided below in Table 8 is a list of the vertebral measurements and scoring.

Table 8. NVS-WB1 Unit 2 Vertebral Column-Present Vertebrae Only Partial Skeleton.

Vertebral Element	Notes, Porosity, Lipping, and Eburnation Present
Cervical (C) 1	Notes: Vertebral body and right transverse process are missing
	Porosity: present (2-3)
	Eburnation: 1 (barely discernable)
C7	Notes: Spinous process and left transverse process present
	Eburnation: too difficult to tell
Thoracic (T) 1	Notes: Vertebral body and transverse processes missing
	Porosity: pinpoints on inferior articular processes (2)
	Eburnation: too difficult to tell
T12	Notes: Vertebral body missing
	Porosity: inferior articular processes (2)
L2	Notes: Vertebral body and spinous process missing
	Porosity: inferior articular processes (1)
	Lipping: present on the left inferior articular facet (1)
L3 (possible)	Notes: Only superior portion of vertebral body present
	Lipping: visible on the superior portion of the vertebral body (1-2)
L4	Notes: Vertebral body and transverse process missing
	Porosity: observed on fragmented bodies, but uncertain due to size
	Lipping: visible on the superior portion of vertebral body (1-2)
L5	Notes: Vertebral body and right transverse process missing
	Porosity: observed on fragmented bodies
	Lipping: visible on the superior portion of vertebral body (1-2)

Pitting was visible on the acromial and sternal ends of the right clavicle, and eburnation was present on the impression for the costoclavicular ligament and the acromial end. The vertebral end of the twelfth thoracic rib showed low signs of porosity and lipping. Level three porosity (extreme/high) was found on the right lunate, right scaphoid, right hamate, and right greater multiangular. Level one porosity was also visible on the left fourth metacarpal. Eburnation was visible on the right capitate.

While a fusion of two left thoracic ribs was observed, it was immediately established that they were not fused together as a result of trauma or disease, but they appeared to the fused due to the compression in situ and the soil binding the two ribs together.

Measurements of the length and width of the metacarpals in the right and left hand showed slight asymmetry in both the third and fourth metacarpals. A comparison could not be made with the second metacarpals because the burial was lacking a left second metacarpal. When using the regression formula provided by Hopkins (2006) for calculating handedness, assessment of the third and fourth metacarpals were 51.1% and 53.7%, respectively.

Tables 9 and 10 contain the post-cranial measurements for the female skeleton. Missing bones were omitted in this chart. Levels of porosity, lipping, or eburnation were noted and scored accordingly (1-slight, 2-moderate, and 3-extreme/high).

Table 9. NVS-WB1 Unit 2 Hands and Feet-Partial Skeleton.

Element	Length-Measurements (in mm.)	Mediolateral Width of Base-Measurements (in mm.)	Notes on OA
Right Hand Measurements			
Right Metacarpal (MC) 1	40.63	14.80	
Right 1st Distal Hand Phalange	22.00	17.30	
Right MC 2	51.30	15.00	
Right 2nd Intermediate Hand Phalange	25.50	13.20	

Right 2nd Proximal Hand Phalange	42.20	15.00	
Right MC 3	58.40	16.90	
Right 3rd Intermediate Hand Phalange	24.00	13.00	
Right 3rd Proximal Hand Phalange	43.60	15.00	
Right MC 4	57.50	16.00	
Right 4th Distal Hand Phalange	16.80	10.00	
Right 4th Intermediate Hand Phalange	21.60	12.00	
Right 4th Proximal Hand Phalange	37.70	15.00	
Right 5th Distal Hand Phalange	15.40	8.30	
Right Lunate			Extreme levels of porosity present throughout (3)
Right Scaphoid			Extreme levels of porosity present throughout (3)
Right Capitate			Light porosity and Eburnation (1)
Right Navicular			
Right Hamate			Extreme levels of porosity present throughout (3)
Right Greater Multiangular			Extreme levels of porosity present throughout (3)
Right Lesser Mutliangular			Light porosity present (1)
Left Hand Measurements			
Left 2nd Distal Hand Phalange	16.60	9.90	
Left 2nd Intermediate Hand Phalange	25.50	15.10	
Left MC 3	50.30	14.50	
Left 3rd Distal Hand Phalange	19.50	13.10	
Left 3rd Proximal Hand Phalange	38.30	14.50	
Left MC 4	55.00	13.20	Porosity on head and base (1)
Left 4th Distal Hand Phalange	14.90	9.50	

Left 4th Intermediate Hand Phalange	29.40	12.70	
Left MC 5	53.70	12.30	
Left 5th Distal Hand Phalange	14.50	9.10	
Left 5th Intermediate Hand Phalange	23.00	11.30	
Left Lunate			Sight porosity present (1)
Left Scaphoid			Slight porosity present (1)
Left Capitate			Porosity present (1)
Right Foot Measurements			
Right Metatarsal (MT) 1	49.00	20.50	
Right 1st Distal Foot Phalange	22.20	12.60	
Right 1st Proximal Foot Phalange	26.90	15.80	Porosity present on head (2)
Right 2nd Intermediate Foot Phalange	10.20	16.00	
Right 2nd Proximal Foot Phalange	25.50	12.40	Porosity present on head (2)
Right 3rd Intermediate Foot Phalange	11.50	10.00	
Right 3rd Proximal Foot Phalange	24.50	13.20	
Right MT 4	63.40	14.80	
Right 4th Intermediate Foot Phalange	9.20	10.00	
Right 4th Proximal Foot Phalange	23.50	11.40	
Right MT 5	50.50	21.30	
Right 5th Distal Foot Phalange	8.00	9.20	
Right 5th Proximal Foot Phalange	21.60	11.00	
Right Calcaneus			High porosity present (3)
Right Talus			High porosity present (3)
Right Cuboid			High porosity present (3)
Right First Cuneiform			High porosity present (3)
Right Second Cuneiform			High porosity present (3)

Right Third Cuneiform			High porosity present (3)
Right Navicular			High porosity present. (3)
Left Foot Measurements			
Left 1st Proximal Foot Phalange	26.20	18.60	
Left MT 2			
Left MT 3	63.30	16.60	
Left 3rd Distal Foot Phalange	11.50	8.30	
Left 3rd Intermediate Foot Phalange	19.90	11.50	
Left MT 5			
Left 5th Intermediate Foot Phalange	19.90	12.30	
Left Calcaneus			High porosity present (3)
Left Cuboid			High porosity present (3)
Left Second Cuneiform			High porosity present (3)
Left Navicular			High porosity present (3)

Table 10. NVS-WB1 Unit 2 Osteometrics of Long Bones-Partial Skeleton.

Elements	Measurements (in mm.)
Right Humerus	320
Left Humerus	260
Right Ulna	215
Right Radius	220

Osteological Results of the Second Cranium Found in NVS-WB1 Unit 2

The observed and measured cranial and facial features were quite large, particularly the mandibular length and the maximum cranial length. The mastoid process was also very large, relatively wide, and extended (see Figure 18). The teeth were large, especially the molars. The supra-orbital ridges were observed to be rough and prominent, and the mental eminence was prominently squared, rather than rounded. The scoring of the cranial features were as follows: the nuchal crest was scored a 4 to 5, the mastoid process was scored a 5, the supra-orbital ridge was scored a 4 to 5, and the mental eminence was scored a 4 to 5 (Buikstra and Ubelaker 1994). These results indicate that this individual is likely a male. These measured and observed features were compared to the partial skeleton and the isolated cranium; the features more closely resembled the isolated cranium from NVS-WB1 Unit 1.

Figure 18. NVS-WB1 Unit 2-2B, Second Cranium's Deformation (lateral view). Note the flattening of the frontal and occipital regions, resulting in a slight elongation.

The presence of the third molar indicated that this individual was at least 25 years of age. Based on the Stage 3 attrition to the third molar and the lower second left premolar, it was likely that this individual was older than 25 years old. The premolar and the first molars in particular were extremely worn down and the root of the tooth was exposed, resembling Stage 6 and Stage 7 wear (Buikstra and Ubelaker 1994). Dental caries were also observed on the occlusal surfaces of the premolar and molars.

While the cranium was in situ, initial observations of the skull did not detect any clear signs of antemortem deformations. After the skull was pedestaled and removed from situ, a moderate deformation to the entire occipital region was noted. A slight compression to the frontal region with a slight effect on the brow region was observed (see Figure 18). It was observed that there was a slight elongation of the skull (see Figure 18). These observations were later confirmed by measurements of the maximum cranial breadth, the maximum cranial length, the basion-bregma height, and the calculation of the cranial index. The cephalic index for this individual was approximately 85% (87.173), which is on lower end of the hyper-brachycephalic cranial index. A wormian bone, about 12 mm in size, was observed on the left side of the occipital region, between the sagittal and lambdoidal sutures (see Figure 19). The majority of the cranial measurements were collected. See Tables 11 and 12 below for these measurements.

Figure 19. NVS-WB1 Unit 2-2B, Wormian Bone (posterior view). The photos illustrates the sagittal and lambdoidal sutures. Note the presence of a small wormian bone located at the apex of the sagittal and lambdoidal sutures.

Table 11. NVS-WB1 Unit 2 Craniometrics-Second Cranium.

Cranial Elements	Measurements (in mm.)
Maximum Cranial Length	141.19
Maximum Cranial Breadth	123.08
Bizygomatic Diameter	141.28
Basion-Bregma Height	148.63
Basion-Prosthion Length	128.85
Maxillo-Alveolar Breadth	68.19
Maxillo-Alveolar Length	42.31
Upper-Facial Height	69.38
Total Facial Height	138.55
Minimum Frontal Breadth	105.34
Nasal Height	52.30
Nasal Breadth	29.16
Right Orbital Height	37.50
Right Orbital Breadth	38.69
Left Orbital Height	38.63
Left Orbital Breadth	45.99
Bi-Orbital Breadth	100.77
Interorbital Breadth	33.08
Frontal Chord	122.12
Parietal Chord	89.99
Occipital Chord	106.51
Foramen Magnum Length	32.77
Foramen Magnum Breadth	30.17
Mastoid Process Width	21.65
Cranial Index	87.173

Table 12. NVS-WB1 Unit 2 Mandibular Measurements-Second Cranium.

Mandibular Elements	Measurements (in mm.)
Height of Mandibular Body	23.48
Breadth of Mandibular Body	18.05
Mandibular Length	98.26
Bicondylar Breadth	105.78
Bigonial Breadth	110.73

Minimum Ramus Breadth	36.21
Maximum Ramus Breadth	47.94
Maximum Ramus Height	72.00
Chin Height	34.34

CHAPTER 6: Discussion

The present study found that there are much confusion and conflicting theories on how the Caribbean, particularly the Lesser Antilles, became inhabited, what cultures were present in the Caribbean during the Ostionoid period, and the interactions that took place between the various cultures. There is disagreement among scholars on what these cultures were like and how the Taíno fit into the overall human experience of the Caribbean peoples. However, there is a consensus that the Taíno practiced cranial deformation, ritual reburials or secondary internments, and were great seafarers who navigated throughout the Caribbean for trade.

This was the first study to conduct a skeletal analysis among three burials, containing four individuals on Nevis. Although the sample size may be considered insufficient to accurately understand this population, the author believes that the information provided here can be used in aiding future archaeological and forensic studies of the Taíno population on Nevis. Due to the limited amount of time and sample size available, the data provided are particularly scarce. Preservation was also an issue and the fragility of the post-skeleton made most measurements and data collections a challenge. Most of the long bones and some of the cranial elements were composed of small bone flakes, further limiting the data collected. For example, the pelvic bones, in particular, are the most commonly used bones for sexing, but were also the most fragile and incomplete, so this study omitted such methods. The radiocarbon dating results place the burials excavated on White's Bay Beach at the end of the Ostionoid era, 1025-1275 AD. The results of this study indicated that these individuals are Taíno based on the radiocarbon date, the burial patterns and the presence of secondary internments, and the observed and measured cranial deformation. Based on the results related to the skeletal and cultural materials and the burials positions present, the following conclusions and basic understandings of these individuals and its cultural identification have been made.

The diversity of burial styles present throughout the Caribbean makes it difficult for archaeologists to definitively prove that a burial is associated with a specific cultural group over another. Additionally, weather in the Caribbean is hot and humid, which has detrimental impacts on the preservation of skeletal materials (Walker 1983; Wilson 1989; Bass 2005; Weiss 2009). The topography of the Lesser Antilles is constantly changing, resulting in beach erosion, land depletion, and an unknown loss of burials to sea, further creating a substantial gap in the archaeological record. The limited skeletal evidence in the Lesser Antilles requires a comparison of other Tainan osteological remains excavated throughout the Caribbean (Walker 1983, 2005; Hofman 1993; Hoogland and Hofman 1999; Loven 2010).

Secondary burials under personal homes are commonly found associated with the Taíno and similar cultures in the Lesser Antilles (Mason 1983; Boomert 2000; Schaffer et al. 2010; Ostapkowicz and Newson 2012). Although it cannot be certain that these burials were in fact underneath a home, given the evidence of similar Taíno burials throughout the Caribbean, it is more likely that these sites on White’s Bay Beach are secondary internments or ritual reburials (Mason 1983; Walker 1983; Boomert 2000; Schaffer et al. 2010; Ostapkowicz and Newson 2012). As most of the research indicates, Taíno burials are reportedly found with the deceased buried in a strongly flexed or fetal position, accompanied by shells, pottery, and ceramic bowls, and holding a skull belonging to another individual in their arms, suggesting an ancestral relationship (Rouse 1952a, 1952b; Hoogland and Hofman 1999; Walker 2005; Drew 2009). Other research indicates that the Taíno reburied the skulls, and sometimes the long bones, of a previously deceased individual (Mason 1983; Walker 1983; Boomert 2000; Schaffer et al. 2010; Ostapkowicz and Newson 2012). Walker's (1983) argument of the apparent shift in the burial practices in the Ostionoid period (circa 800 CE) supports the theory that the isolated skull is a ritual reburial and the burial containing two individuals is possibly an ancestral ritual reburial.

Discussion of the Osteological Results of the Cranium in NVS-WB1 Unit 1

The remains at NVS-WB1 Unit 1 contained a single isolated cranium, with his head facing east, and in close proximity to, or within, a shell midden (Haviser 1983, 1985; Atkinson 2006; Golding-Frankson 2009; Loven 2010). The burial lacked a clear presence of grave goods with the exception of a small number of shells and red and black pottery shards found within the burial. Given the archaeological evidence that states that the Taíno practiced secondary internments that often lacked a clear presence of grave goods, this burial resembled such accounts, indicating a high possibility that this individual is of Taíno descent (Mason 1983; Wilson 1990; Hoogland and Hofman 1999; Boomert 2000; Deagan and Cruxent 2002; Walker 2005; Atkinson 2006; Golding-Frankson 2009; Loven 2010; Schaffer et al. 2010; Ostapkowicz and Newson 2012).

The isolated cranium was examined for sex and age. Examination of the mental eminence, the nuchal crest, and the supra-orbital ridge, all scored on the higher end of the scale (4-5), indicating that this individual was a male (Buikstra and Ubelaker 1999). Because this was the only sexing method applied, it cannot be certain that this individual is definitively a male, but Buikstra and Ubelaker's methods point to male. The cranium was also compared to the other crania excavated; this individual more closely resembled the second cranium who was presumed to be male than the partial skeleton who was presumed to be female.

Age was determined by the eruption of the third molars; it was assumed that this individual was about 25 years of age. Extreme levels of attrition and root exposure observed on the third molars indicated that this individual was likely older than 25 years. Based on the Miles (1963) and Brothwell (1981) methods, these patterns of attrition resembled that of Stages 2 or 3 (slight or moderate wear to the dentin and slight or moderate exposure of the pulp chamber), indicating that this individual was likely closer to his late thirties or early forties when he died.

The dental caries on the teeth are indicative of a diet containing foods with complex carbohydrates or sugars, eventually leading to the demineralization of dental hard tissue. Stage 6 molar attrition (extreme levels of attrition, with more exposure to the root and substantially less enamel present) was observed, indicating that this individual's diet may have been harsh (Buikstra and Ubelaker 1994). It is likely that this individual suffered from these extreme levels of attrition and dental caries. Alveolar bone resorption was present, suggesting that the loss of these teeth occurred antemortem and not postmortem. The lack of alveolar bone resorption to the rest of the mandible suggests that the rest of the dentition fell out postmortem, or possibly perimortem, and were possibly not collected when the cranium was removed from its original burial.

Closer examination of the occipital and nuchal regions of the skull showed probable signs of porotic hyperostosis. It was likely that the observed cranial pathology was in its early stages or likely a very mild case because no additional signs of other bony changes were observed and the individual survived to adulthood (Buikstra and Ubelaker 1994). According to Buikstra and Ubelaker (1994), Bass (2005), and Walker et al. (2009), pathological lesions, such as porosities on the exterior cranial vault are frequently observed among ancient and prehistoric skeletal remains. This lesion is often associated with a maize-based, iron deficiency diet, but sometimes can be associated with nutrient loss resulting from diarrheal diseases, as seen in cases involving poor sanitation or vitamin B-12 deficiency in breast-fed infants (Walker 1986; Bass 2005; Walker et al. 2009). Given that this individual was likely to be about 30-40 years old, it is more likely that the observed porosity on the nuchal region was not associated with earlier stages of nursing, but rather, a diarrheal disease from unsanitary living conditions or a maize-based diet (Buikstra and Ubelaker 1994; Bass 2005; Walker et al. 2009; Weiss 2009, 2015, 2017). However, since porotic hyperostosis is often evidence of nutritional deficiencies that occurred during the early stages of childhood development, the lesions that are visible in adults are often bony changes that have not undergone complete remodeling (Stuart-Macadam 1985; Buikstra and Ubelaker 1994; Bass 2005; Walker et al. 2009; Weiss 2009, 2015, 2017). Although there are varying results indicating when this cranial lesion may have occurred, is it possible that it occurred in the earlier childhood stages, between the ages of infancy and 12 years old, or closer to the end of this individual's life, between 30-40 years old (Stuart-Macadam 1985; Wright and Chew 1999; Salvadei et al. 2001). The Taíno were agriculturalists who cultivated corn and practiced traditional preparation methods of stone-ground maize, but also had a high caloric intake of shellfish and other marine resources (Larsen 1981; Walker 1983; Deagan and Cruxent 2002; Atkinson 2006; Golding-Frankson 2009; Loven 2010; Encyclopedia Britannica Inc. 2018). Marine foods are also known to be high in parasites, another known cause of porotic hyperostosis (Buikstra and Ubelaker 1994; Walker 1986; Hilderbrand et al. 2003; Bass 2005; Walker et al. 2009). Although the Taíno were known to consume large amounts of marine proteins, poor sanitation or times of famine with a reliance on maize could have resulted in this individual's decline in health. Therefore, this cranial lesion would visible, but would be expected to be low.

When conducting a literature review, the author hypothesized that the crania in the present sample would display similar signs of sub-adult intentional cranial deformation achievable through a combination of methods passed down by ancestors and influenced by other cultural interactions with the Taíno. This hypothesis was tested by attempting to reject the null hypothesis that the cranium demonstrated no clear signs of cranial deformation. This individual was observed to show signs of cranial deformations and the maximum cranial length was 181.74 mm. The large cranial length measurement suggests that this individual likely displayed signs of cranial deformation, but the maximum cranial breadth and cephalic index were unable to be calculated due to the absence of the lower portion of the occipital region. Therefore, it is unclear as to whether this individual was dolichocephalic, mesaticephalic, brachycephalic or hyper-brachycephalic.

While multiple methods of cranial deformation exist, given the ethnographic and skeletal accounts of cranial deformation in the Tainan population, it is likely that the Taíno continued the original methods inherited by their ancestors, but shifted and incorporated alternative cultural methods that may have been introduced during their migration and resettlement in the Lesser Antilles (Rodriguez 1997; Ostapkowicz and Newson 2012). Archaeological evidence has found both frontal and occipital flattening among the Taíno, and scholars have hypothesized that this could confirm the shift in their traditional and ancestral fashion by altering the back of their skulls rather than the front (Rouse 1992). The observed abnormalities on this individual's skull were nowhere in line with the distinctive flattening of the frontal bones described by the Spanish. There were no clear signs of brow ridge compression, making fronto-occipital deformation a possibility (Cheverud et al. 1992; Bass 2005; Ross et al. 2002; Duncan and Hofling 2011; Okumura 2014). However, vertico-occipital flattening of the cranium is also a possibility because the occipital bones appeared to be slightly flattened, but neither of these theories can be confirmed and no conclusions can be made due to the incompleteness of the cranium. To conclude, the null hypothesis must be accepted because although there is strong ethnographic and archaeological evidence that the Taíno practiced intentional cranial deformation altering the frontal and occipital regions of the skull, the cephalic index was unable to be calculated. In order to better understand if the cranium does in fact show signs of intentional deformation, future research and a comparison of other skulls using the Frankfort Plane and other methods should be used to draw out such conclusions (Pancherz and Gokbuget 1996; Silva and Ferreira 2003).

Discussion of the Osteological Results of the Female in NVS-WB1 Unit 2

The partial skeleton was found in a moderately flexed, fetal position, with her knees bent to her chest, and her head facing east. Her left hand was positioned very close to her face and was holding the skull of a second individual who was believed to be male, possibly an ancestor. Small amounts of pottery, remnants of crab claws, fish vertebrae, and large shells were placed around her and near her feet, but there were no substantial grave goods found within the burial. Remnants of charcoal fragments were visible near the east wall and center of the burial. This site was also found close to, or within, a shell midden. Given the presence of an additional cranium and the intimate positon of the remains, the proximity to the conch shell midden, and the lack of grave offerings, this burial closely resembled past archaeological evidence of Taíno secondary internments; therefore, there is a high possibility that this female is also of Taíno descent (Haviser 1983, 1985; Mason 1983; Wilson 1990; Hoogland and Hofman 1999; Boomert 2000; Deagan and Cruxent 2002; Walker 2005; Atkinson 2006; Golding-Frankson 2009; Loven 2010; Schaffer et al. 2010; Ostapkowicz and Newson 2012).

The sex of this individual was judged to be female based on the measurement of the transverse diameter and vertical diameter of the humerus. The results were 39.0 mm and 38.7 mm, respectively, which fell within the range of the prehistoric California female populations provided by Bass (2005, 18; 2005, 52). The right facial features, such as the right supra-orbital ridge, the right supra-orbital margin, and the mental eminence, were observed because most of the left cranial features suffered from postmortem compression. These results indicated this individual was a female (Buikstra and Ubelaker 1994).

Examination of her post-crania made it possible to obtain a more accurate assessment of her age. The author presumed she was about 28-35 year old based on the examination of the epiphyseal closure of the long bones, the completeness of the secondary ossification centers on the C2-L5 vertebrae, the metamorphic changes at the sternal end of the right and left fourth ribs, and the dentition. Examination of the dental wear patterns on the first, second, and third molars revealed slight to moderate wear to the dentin and a slight to moderate exposure of the pulp chamber, estimating that she was likely in her mid to late thirties when she died (Miles 1963; Brothwell 1981). Porosity combined with slight lipping found on the sternal ends of the ribs confirmed this age range.

Dental caries were observed on the premolars and molars, indicating a diet containing complex carbohydrates or sugars. The assessment of the molar attrition resembled that of a Stage 5, indicating that this individual had advanced to extreme levels of attrition with advanced to severe exposure of the pulp chamber and substantially less enamel present (Buikstra and Ubelaker 1994). Oblique and lateral attrition on the central and lateral incisors and canines was observed. According to Walker (1983), lateral attrition is usually indicative of tool manufacturing and less likely to be associated with diet, while oblique attrition on the central and lateral incisors results from the processing methods associated with stone-ground maize. Since these attrition patterns are seen among other females in the Caribbean and South America (Walker 1983), it is likely that this woman used her teeth as a third hand to assist with the manufacturing of textiles.

According to Sciulli and Geisen's (1993) regression formula, which uses the maximum length of the humerus, radius, and ulna to estimate skeletal height and stature, the partial skeleton was determined to be about 1.5895 meters tall, or about 5 feet 3.5 inches tall. The average stature for women in St. Kitts and Nevis have been reported to be about 1.60 meters tall, which is very similar to the estimated stature of the partial skeleton (WorldData 2018). Although this study is very limited in terms of its sample size and lacks intra-sample comparison, this finding is of great significance and can be used as a reference for future stature estimations and research among the Taíno. However, further work is needed to explore whether the previously published stature regression formulas effectively estimates the height among other Taíno samples within and outside the study area of Nevis (Sciulli et al. 1990; Sciulli and Geisen 1993; Beguelin 2011; Pomeroy and Stock 2012).

The hypothesis involving the observed and calculated sub-adult intentional cranial deformation was unable to be applied to this female's cranium. The cranium presented clear signs of postmortem deformations to the left temporal, parietal, and frontal regions of the skull, likely caused by top soil compression. Although it appeared that the occipital region was slightly deformed or compressed, this observed deformation could likely have been the result of postmortem compression or intentional cranial deformation. The crumbling nature of the skull limited further examination of the cranium, as handling of the cranium was not practical, and there is a high possibility that the postmortem cranial deformation present on this cranium may have exaggerated or underestimated certain cranial measurements.

However, given the amount of erosion that has occurred on Nevis, it was also hypothesized that the overall cranial deformation present on the left side of her cranium was as a result of the post interment process, and not an act of intentional or unintentional cranial deformation. This hypothesis was tested by attempting to reject the null hypothesis that the cranial deformation observed on the partial skeleton is directly related to antemortem cranial deformation and not the result of postmortem trauma or deformation while in situ. According to Crist et al. (1997), postmortem trauma or deformation caused by top soil compression or weight can be a contributing factor in the deformation of skeletal remains, as bone can exhibit brittle or ductile behaviors depending various factors, including age-at-death. Crist et al. (1997) also state that typical forces and soil compression encountered by prehistoric and historic burials tend to dissipate force through a single crack, but when higher forces of energy are applied it results in multiple fractures and displacement of the bone. Given that this burial was about 10 cm from the surface, the depth of the burial could have affected the skull, causing the deformation to the left temporal and parietal bones (Micozzi 1991; Haglund and Sorg 1996; Crist et al. 1997).

Post-cranial pathologies were assessed, but the data was limited. The female skeleton was missing both femora, tibiae and fibulae, and the existing upper limbs showed no signs of breakage, disease, infection, or malnourishment. It is likely that signs of trauma or disease were present on these long bones, but because they were not found within the burial, it relays the impression that this female was relatively healthy at her time of death. However, it is also possible that she may have encountered very little disease or pathological agents when young, but suffered a severe illness in her adulthood, resulting in her death. Provided that her tarsals and metatarsals were present, it suggests that her lower limbs were present when she was placed in the burial, and although the long bone tend to preserve better than most bones due to their density, many factors could have resulted in the absence of the lower limbs. The preservation of prehistoric burials are greatly impacted by their enviornment (Crist et al. 1997). This burial was found in close proximity to the ocean, and many elements like repeated rain and heat spells or humidity, could have impacted the overall preservation of this burial. It is possible that because it was presumed that she was more likely to be in her late thirties when she died, her bones were brittle from old age, resulting in the poor preservation of this burial and the absence of these bones. Therefore, it is possible that a combination of this individual's age-at-death, tropical climate, pressure, soil perturbation, and vibration could have resulted in the crushing and the absence of these bones and the fragile nature of this skeleton (Haglund and Sorg 1996; Crist et al. 1997).

The osteological paradox was applied to this skeleton because there were no clear indications of disease or trauma present (Wood et al. 1992). Drew (2009, 181) found an absence of skeletal pathologies associated with infectious diseases and overly strenuous workloads among the Taíno and Saladoid skeletal remains excavated in Puerto Rico. While Drew (2009) and others Caribbean studies support that the Taíno had low rates of skeletal pathologies, the present skeletal sample is extremely small and lacking complete post-cranial materials of multiple individuals. Therefore, the health and lack of pathological findings from one individual, or even three individuals, is not enough to conclude that the Taíno population on Nevis were healthy and lacked disease. The author acknowledges that future research will be needed in order to obtain an understanding and basis for post-cranial pathologies among the Taíno.

Among the present sample, the partial skeleton was the only individual that had post-crania present and large enough vertebral fragments for an analysis of OA and other pathologies. These elements were examined for the purpose of understanding this individual's activity and daily life. Being mindful of certain biases, the author attempted to look for other Tainan remains from this time period for comparison, but was unable to find any studies that pertained to anything other than the cranium (Loven 1979, 2010; Cheverud et al. 1992; Hoogland and Hofman 1993, 1999; Deagan and Cruxent 2002; Atkinson 2006; Drew 2009; Crespo-Torres 2010). Keeping these limitations in mind, the initial observations made it unclear as to whether this individual was suffering from this degenerative joint disease, if it was a result of normal aging within this population, or if it was a result of the fragile nature of this skeleton.

A slight to moderate degree of porosity ranging from 1-2 was visible on the C1, the fragmented bodies of the L4 and L5, and the inferior articular processes of the thoracic and lumbar vertebrae. The degree of porosity remained relatively consistent throughout the progression of the spine. Lipping was only visible on the vertebral bodies of the lumbar vertebrae (L2-L5), but due to the incomplete nature of the vertebral bodies, an extensive examination of vertebral lipping was not feasible. It was determined that eburnation was not visible on the vertebrae because there was not enough of the bone to definitively confirm it was eburnation; besides, in most cases, the vertebral column has a natural shine to them that is often mistaken for eburnation (personal communication with Weiss 2018). Similar finds relating to porosity and lipping were verified by Drew (2009), who concluded that the Saladoid and later Tainan remains lacked extreme levels of osteoarthritis and other diseases possibly due to their marine diet. It is likely that the pitting on the thoracic and lumbar vertebrae was related to age because OA and age are tightly correlated in many studies, while the cervical vertebrae are more closely linked to activity, such as carrying heavy loads (Bridges 1992; Weiss 2017).

Porosity and eburnation on the sternal ends of the clavicle are commonly linked with coastal populations who engage in frequent activities like rowing a canoe or grinding maize, while changes in the sternal end of the ribs are most often associated with age (Iscan et al. 1984; Iscan 1991; Weiss 2009). The Taíno engaged in deep sea fishing and coastal migration (Allaire 1990; Wilson 1990; Rouse 1992; Hofman 1993; Olazagasti 1997; Peterson 1997; Wilson 1997; Hoogland and Hofman 1999; Deagan and Cruxent 2002; Atkinson 2006). Therefore, it is possible that the porosity and eburnation observed on the clavicle is associated with activity rather than age. However, activities of canoeing and grinding maize are only two possibilities of bone remodeling in the clavicle. Other factors such as age, trauma, and bone infections can also result in bone remodeling (White 2000; Weiss 2009). The pit depth and remodeling visible on the sternal ends of the ribs could also be related to osteoarthritis, but it seems more likely that this is related to age rather than activity because the remodeling occurred on both the vertebral and sternal ends of the right and left ribs.

It is believed that this female was right handed because of the level three porosity found on the right lunate, scaphoid, hamate, and greater multiangular, and eburnation on the right capitate. Although slight porosity was also visible on the left MC4, the right carpals and metacarpals showed higher signs of porosity and eburnation. The observed pitting can be the presence of OA, indicating overuse of these bones in the right hand, but can also be due to old age or overall preservation of the skeleton. Measurements of the length and width of the metacarpals in the right and left hand showed a slight asymmetry and variation between the right and left MC3 and the right and left MC4. Although a comparison of the MC2 could not be made, when using the regression formula for calculating handedness, assessment of the MC3 and MC4 indicated that she was right-handed. According to numerous studies, the metacarpals in the dominant hand will usually be larger and asymmetric when compared to the non-dominant hand (Schultz 1926, 1937; Stewart 1979; Roy et al. 1994; Steele 2000; Bass 2005 Danforth and Thompson 2008; Cashmore 2009; Ubelaker and Zarenko 2012). Consistent with the study conducted by Roy et al. (1994), the measurements of the length and width of the metacarpals indicated that she was right handed, and the observed pitting and eburnation in the carpals of the right hand confirmed this individual was right handed (Buikstra and Ubelaker 1994). The author acknowledges that because this is an extremely small sample, and studies relating to handedness among the Taíno or a comparable Native American population have not been conducted, inter and intra-sample comparisons would be useful to determine the effectiveness of these methods. The application of these methods would be useful for other skeletal sample from Nevis and future prehistoric studies, as it would lessen the gap in knowledge concerning Native American populations.

Discussion of the Osteological Results of the Second Cranium

This cranium was found in very close proximity to the female skeleton, suggesting a possible ancestor of the female skeleton (Walker 1983). There was no post-crania present. Like the other two individuals found on White’s Bay Beach, this cranium was also oriented east, small amounts of pottery and large shells were placed around this individual, and the burial lacked complex grave goods. Remnants of charcoal fragments were visible near the east wall, center of the burial, and the left side of the skull. As stated prior, because of the burial’s orientation and location near a conch shell midden, and the fact that it contained the remains of two individuals, this setting offers further support that this individual is Taíno (Haviser 1983, 1985; Mason 1983; Wilson 1990; Hoogland and Hofman 1999; Boomert 2000; Deagan and Cruxent 2002; Walker 2005; Atkinson 2006; Golding-Frankson 2009; Loven 2010; Schaffer et al. 2010; Ostapkowicz and Newson 2012).

Examination of the sexually dimorphic cranial features all fell on the higher end of the scale (4-5), indicating that this individual was a male. The observed and measured cranial and facial features and the dentition were quite large. These traits more closely resembled the isolated cranium from NVS-WB1 Unit 1 than the female skeleton.

The eruption of the third molars indicated that this individual was about 25 years old. According to the Miles (1963) and Brothwell (1981) methods, based off the Stage 3 attrition observed throughout the dentition, it was estimated that this individual was likely closer to his early to mid-forties when he died. Using Buikstra and Ubelaker's (1994) levels of attrition for understanding diet, it was determined that the molar attrition resembled that of Stage 6, indicating that a there was more dentin exposure and little enamel rim present. This stage of attrition is consistent with grit or sand in the diet. A moderate level of dental caries were also present on the teeth. There is no doubt that this individual suffered from extreme attrition and dental caries.

As previously indicated, it was hypothesized that the present sample would display signs of sub-adult intentional cranial deformation, and that a combination of methods passed down by the Arawak or other cultural interactions with the Taíno were used to achieve such results. This hypothesis was tested by attempting to reject the null hypothesis that the cranium present demonstrated no clear signs of cranial deformation.

A closer examination of the overall shape of the cranium indicated a high possibility of cranial deformation. The observed and measured maximum cranial length was 141.19 mm, the cranial breadth was 123.08 mm, and the basion-bregma height was 148.63 mm; these measurements imply that this individual displayed signs of cranial deformation. The cephalic index for this individual was approximately 85% (87.173), placing him on the lower end of the hyper-brachycephalic cranial index; thus, indicating that he had occipital flattening, resulting in a wider and elongated skull. A slight deformation to the frontal bone and brow region was observed, suggesting these results were achieved by the process associated with fronto-occipital deformation. Sometimes, hyper-brachycephaly can result in the premature fusion of the coronal or lambdoid sutures (White 1996;

O’Loughlin 2004; Sanchez et al. 2007; Vasanthi et al. 2015). A wormian bone was observed on the left side of the cranium between the sagittal and lambdoidal sutures, providing additional support that this cranium was modified. While there are other reasons for the presence of wormian bones, it has been argued that cranial deformation can affect the presence of anteriorly placed lambdoid wormian bones (White 1996; O’Loughlin 2004; Sanchez-Lara et al. 2007). The measurements of the cranium and the presence of a wormian bone, coupled with observations of an elongation of the skull, with lateral expansion, suggests that this individual has a fronto-occipital cranial deformation (Tacoma 1963-1964; Bullen 1967; Kohn et al. 1995; White 1996; Ubelaker 1999; Ross et al. 2002; O'Loughlin 2004; Weiss 2009; Vasanthi et al. 2015). This finding is not surprising given the fact that the majority of the crania associated with the Taíno were reported to have frontal and occipital deformations (Rouse 1986, 1992; Deagan and Cruxent 2002; Ross 2004; Loven 2010; Ostapkowicz and Newson 2012).

Recalling the ethnographic and archaeological evidence of cranial deformation among the Taíno and their Arawak ancestors, it is possible that the observed deformations are the result of intentional cranial deformation (Rouse 1986, 1992; Rodriguez 1997; Deagan and Cruxent 2002; Ross 2004; Loven 2010; Ostapkowicz and Newson 2012). The probable source of the observed fronto-occipital deformation is likely a combination of traditions passed down by the Arawak peoples, coupled with a cultural shift among the Taíno resulting from various cultural interactions and the meshing of various ideologies (Rouse 1986, 1992; Deagan and Cruxent 2002; Ross 2004; Loven 2010; Ostapkowicz and Newson 2012). Although most archaeologists are unsure of the exact methods the Taíno used, it is suggested that fronto-occipital deformation was achieved through the use of boards during infancy (Cheverud et al. 1992; Ross, et al. 2002; Bass 2005; Duncan and Hofling 2011; Okumura 2014). This process would have left the brow ridge untouched or slightly deformed, and the base of the skull would have been elongated or flattened. To conclude, the null hypothesis stated no clear signs of cranial deformation would be observed. The null hypothesis must be rejected because the ethnographic and archaeological evidence and the calculation of the cephalic index suggest that this cranium was modified. However, because this study did not apply the Frankfort Plane, in order to provide undeniable proof that individual does in fact show signs of intentional cranial deformation, future research using the Frankfort Plane will need in order to make such conclusions.

Comparison of the Osteological Results among this Sample

The author hypothesized that these burials excavated on White's Bay Beach were of ritual significance. This hypothesis was tested by attempting to reject the null hypothesis that the burials excavated show no signs of ritualistic behaviors, indicating they are primary burials. The burials excavated on White's Bay Beach seem to be typical of the Taíno ritual reburials excavated in the regions the Greater Antilles, the Caribbean, and South America (Haviser 1983, 1985; Mason 1983; Walker 1983, 2005; Wilson 1990; Hofman 1993; Hoogland and Hofman 1999; Boomert 2000; Deagan and Cruxent 2002; Atkinson 2006; Loven 2010; Schaffer et al. 2010; Ostapkowicz and Newson 2012).

In the present sample, both burials were discovered and excavated next to a conch shell trash midden. The overall absence of grave goods, with the exception of the charcoal, fish, shell, and pottery fragments suggests that these burials were associated with the Taíno (Rouse 1952a, 1952b; Drew 2009). One of the burials excavated contained the remains of two individuals, suggesting an ancestral relationship. The positioning of the crania in the present sample were identical with each of the skulls oriented east, representing the land of the living. This is consistent with Walker's (1983) explanation of the tightly linked and conceptualized view of the spiritual world and the cycle of the sun, which is common among the indigenous inhabitants of South America. According to Walker (1983), the east was the morning sunrise and was viewed as the land of the living, while the west was the setting sun and viewed as the land of the dead. Based on the past archaeological evidence and given the circumstances of how the remains were positioned, their proximity to the conch shell middens, and their contents of skeletal and cultural cultures, the null hypothesis must be rejected. The author would like to see additional research on White's Bay Beach for comparison, but it is very clear that both burials resemble Tainan ancestral ritual reburials.

A sex analysis among this population concluded with the ratio of 2 males/1 female. When the skulls were compared, it was clear that the cranium of the partial skeleton partial was much smaller, softer, and less robust. The shape of the crania suggested that the males in the sample demonstrated signs of fronto-occipital cranial deformation, which is consistent with the archaeological and archaeological accounts of the Taíno (Rodriguez 1997, 82; Ross et al. 2002; Ross 2004; Duncan and Hofling 2011; Ostapkowicz and Newson 2012; Pestle 2013; Okumura 2014). Signs of intentional or artificial cranial deformation could not be assessed with the female's cranium because of postmortem cranial deformation (Crist et al. 1997). Although observations indicated that both males shows signs of intentional cranial deformation, definitive conclusions cannot be made until this sample can be compared to additional crania excavated in the Caribbean and on White's Bay Beach.

Overall, it is assumed that the age of these individuals ranged between 30-45 years old (Miles 1963; Brothwell 1981; Iscan et al. 1984; Walker et al. 1991; Buikstra and Ubelaker 1994; Oliveria et al. 2006). Although the size of this study is small and the data was limited, overall, it is assumed that these individuals lived relatively long, healthy lives for prehistoric times, but likely experienced pain from their dental pathologies. While it cannot be proven, it is also likely that the exposure of the roots could have resulted in infection, blood poisoning, and even death.

The present study did, however, find evidence to suggest that this sample was able to adequately measure periodontal diseases, such as attrition, alveolar bone resorption, and dental caries. Attrtion was observed most on the molars and premolars among this sample and remained consistant with these three individuals, implying that this observed pattern is not sex specific, but rather an overall pattern of attrition in the Caribbean (Walker 1983). It clear that these individuals consumed harsh foods or remnants of sand, resulting in the advanced or severe exposure of the dental roots, observed attrition, and the presence of dental caries and chipping (Walker 1983; Golding-Frankson 2009; Loven 2010; Winn 2012). Consistent with the observations of chipping from Winn's (2012) study, the visible crack on the lower right third molar of the isolated cranium in NVS-WB1 Unit 1 can also be an indication of a tough diet and possibly the presence of grit or sand. However, it is also likely that this crack occurred postmortem; therefore, further examination of this molar and a comparison of other samples is needed in order to conclude if the crack occurred antemortem or postmortem.

Interestingly, the levels of dental caries on the molars in this study were high, given that this population survived mainly on marine resources. Bioarchaeologists tend to see less dental caries among populations who have a higher level of attrition, as a result of the tooth wearing down, causing less cusps for sugars to get trapped (Larsen 1991; Weiss 2009, 2015). Research indicates that agriculturalists tend to show an increase of dental carries, suggesting that these individuals were likely an agriculturalist and possibly just as dependent on agriculture as maritime resources (Larsen 1981; Weiss 2009). Corn for example, is a complex carbohydrate, which was a common food that was consumed by the inhabitants of the Lesser Antilles, so the presence of a few carious lesions are to be expected within the Taíno population (Walker 1983; Allaire 1997a; Larsen 1981, 2002; Rashford 1998; Deagan and Cruxent 2002; Atkinson 2006; Weiss 2009). Because the rate of dental caries remained consistent among these three individuals, it can be argued that overall, their diet had a dependence on maize or other carbohydrates. Since the Taíno were known to cultivate corn, yams, pineapple, guava, and papayas, all of which are very high in carbohydrates or sugars, there is no question that an increase of dental caries would be observed (Larsen 1981; Deagan and Cruxent 2002; Atkinson 2006; Weiss 2009; 2015; Encyclopedia Britannica Inc. 2018). Moreover, sugar cane grew extremely well in the Caribbean, and it has been reported that Carib populations and other Caribbean tribes from the same period sucked on sugar cane or used it in the manufacturing of beverages (Bullen 1967; Mintz 1997; Meniketti 2009). Both of these cases would have led to the occurrence of early dental caries.

The lateral attrition observed on the incisors and canines of the female skeleton, suggests that this individual utilized her front teeth as a third hand for the manufacturing of goods. These attrition patterns resemble other female Caribbean remains who were known to have engaged in such activities, suggesting they are female specific (Walker 1983). Lateral attrition was not visible on the male's dentition, but due to this small sample size, additional research is needed before conclusions can be made relating to sex specific patterns of attrition.

Although post-cranial pathologies among this sample were attempted to be examined in detail to provide a more complete life story for each individual, the present population was lacking sufficient post-crania to examine, resulting in a lack of data. The minor to moderate levels of remodeling and OA visible throughout the partial skeleton suggests they are age related, but the remodeling and OA on the right hand and vertebral column may have resulted from an extremely physical and active lifestyle (Weiss 2009). Regardless of severity, lipping is always an indication of age; therefore, the minimal lipping observed on the vertebral column, is age related, rather than activity related (Bridges 1992; Weiss 2017). It is impossible to definitively state whether the pitting visible throughout the spinal column was related to OA or just a normal aging process for the Taíno because OA can result from activity or age (Buikstra and Ubelaker 1992). OA on the right carpals indicated overuse of the right hand. Because females were commonly associated with manufacturing cemís and other personal adornments (Rouse 1982;

Walker 1983; Wilson 1986; Ostapkowicz and Newson 2012), it could explain the overuse of bones in the right hand, but the author would like to see additional research relating to OA and handedness among the Taíno and comparable Native American populations before population or sex specific conclusions can be made.

CHAPTER 7: Conclusions and Recommendations

Conclusions

The process of researching the indigenous Taíno peoples was very confusing at times, due to unclear, vague and misleading information, the conflicting theories on how the Lesser Antilles became inhabited, and how the Taíno related to this overall picture. The data relating to the analysis of Tainan skeletal remains are also limited. Additionally, there is considerable disagreement among scholars on what cultures were present in the Caribbean during this time, what these cultures were like and the cultural interactions that took place, and how these groups fit into the human experience and the overall Caribbean culture. More importantly, this research helps elucidate how each story of the past inhabitants can assist with establishing a better understanding of the Caribbean culture.

According to Rouse, the Caribbean was without human occupants until about 5000 years ago when the indigenous American peoples first migrated from Central and South America to this land (Rouse 1964, 1977; Anderson-Cordova 2017). During this time, there were numerous waves of migration throughout the Antilles, which included the Saladoid, Casimiroid, and the Ortoroid people, each one replacing its predecessors. It was hypothesized that the Caribbean was inhabited by two distinct cultures, one which was the Taíno who inhabited the Lesser Antilles (Anderson-Cordova 2017). Historical records from the sixteenth-century lack detail, but illustrate an existence of native peoples throughout the Lesser Antilles; this group was the Caribs who were distinct from the Taíno (Allaire 1980, 1997a, 1997b, 2008; Wilson 1989; Davis and Goodwin 1990; National Park Service 1996; Anderson-Cordova 2017). Other research indicates that the people who migrated to the Lesser Antilles called themselves the Kalinago; this was eventually translated to "Carib" by the Spanish after Columbus' explorations to the Lesser Antilles (David and Goodwin 1990; Lenik 2012; Anderson-Cordova 2017). Controversy about the cultural relationships and interactions between the "Caribs," the Taíno, and the Indians of the Greater Antilles still exists to this day, thus, leaving the origins and historical relationships of the inhabitants of the Lesser Antilles open for interpretation.

Although they exist in skeletal form, the Taíno are no longer among us. Their genes may have been scattered among various populations before and after Spanish and European contact. The Tainan culture has been integrated into the holistic system of archaeological artifacts and material culture that can be seen in pottery, wood, shell, and stone objects. Although remnants of their culture and skeletal remains prove they existed on various islands throughout the Caribbean, the historical, archaeological, and osteological examinations are still quite minimal.

Historical and archaeological records indicate that the Taíno practiced intentional frontal and occipital cranial deformation that began near or at birth and engaged in secondary internments or ritual reburials, which contained a single cranium or multiple individuals (Rouse 1986, 1992; Boomert 2000; Deagan and Cruxent 2002; Ross 2004; Loven 2010; Schaffer et al. 2010; Ostapkowicz and Newson 2012). Two crania excavated on White's Bay Beach closely resembled these accounts of cranial deformation, and both burials resembled ritual reburials, suggesting that the present sample is of Taíno ancestry.

Most commonly found on Monserrat, archaeological evidence and historic accounts indicate that Tainan beads and pendants were worn and reported to represent valued possessions of the upper-class families (Deagan and Cruxent 2002; Loven 2010). A barrel-shaped marble bead was found at the site NVS-WB2 Unit 1, and according to Loven (2010), these manufactured beads held ritual significance and were occasionally given as mortuary gifts to the dead. Based on researching Tainan stone beads and their burial practices, it is extremely likely that these burials and this barrel-shaped marble bead belong to the Taíno (personal communication with Dr. Georgia Fox 2018, personal communication with Dr. Samuel Wilson 2018) (see appendix for the analysis of NVS-WB2 Unit 1 and information on the Tainan bead).

Relating back to the original research questions involving who these individuals were, and what their gender, age, and stature can tell us about their lives, this study was able to develop a basis for understanding the prehistoric Taíno peoples on Nevis. More importantly, this study in particular breaks new ground and contributes directly to the Caribbean studies because there are so few studies that have been conducted on the topic thus far. From the previously discussed cranial deformation, to levels of OA demonstrating repetitive activities such as paddling, drawing in fishing nets, manufacturing textiles and other personal adornments, and possibly baring heavy loads on their shoulders, the skeletons in the present sample displayed traits that were indicative of various cultural practices among the Taíno (Olazagasti 1997; Peterson 1997; Wilson 1997; Deagan and Cruxent 2002; Atkinson 2006). These traits are supported by the acknowledged and documented Taíno cultural practices, including intensive subsistence strategies, maritime trade and dependence, the production of *cemís* and other personal adornments, and the engineering of large dugout canoes that were used for migration, trade, and deep sea fishing (Allaire 1990; Wilson 1990; Rouse 1992; Hofman 1993; Olazagasti 1997; Peterson 1997; Wilson 1997; Hoogland and Hofman 1999; Deagan and Cruxent 2002; Atkinson 2006). Given the literature and the previously conducted research pertaining to the Taíno, there is a high likelihood that the three burials excavated in the summer of 2016 belong to the culture of the indigenous Taíno peoples. Cranial and post-cranial skeletal traits suggests that this sample consisted of two males and one female who likely survived by consuming a diet heavily dependent on maritime proteins and supplemented with agricultural resources, contributing to the occurrence dental caries, it is likely that this population sucked on sugar cane or consumed it in beverages (Bullen 1967; Larsen 1981, 2002; Walker 1983; Walker and Erlandson 1986; Allaire 1997a; Rashford 1998; Deagan and Cruxent 2002; Atkinson 2006; Weiss 2009, 2015; Encyclopedia Britannica Inc. 2018).

The female was judged to be right handed, about 30-35 years old, standing about 5 feet and 3.5 inches tall, with a stature comparable to the Late Prehistoric Native American Populations in Ohio and the current female population on Nevis (Sciulli and Giesen 1993; WorldData 2018). The male found in NVS-WB1 Unit 1 was estimated to be in his late thirties, while the male found buried with the female was judged to be about 45 years old, all of which are quite a long time for prehistoric standards. Due to the lack of preservation of these remains, the exact cause of death of these individuals is unknown, but it is likely that these individuals suffered from their attrition or dental caries. Despite the overall high levels of attrition and lack of bony infections present, this study can conclude that the female was in relatively good health when she died; however, the same conclusions cannot made for the male individuals in this study because examination of the post-crania would have been essential for such conclusions. Moreover, the overall lack of post-crania does not rule out the possibility that these individuals suffered or died from bony infections. Low levels of trauma and an overall lack of evidence for malnutrition could indicate a higher socio-economic status, but because this study dealt with a small population, examination of a larger population would be needed for comparison and definitive conclusions (Walker 1983).

The fact that these individuals date to about 1025-1275 CE provides evidence and support for the migratory patterns for the Taíno throughout the Greater and Lesser Antilles. While Allaire (1980, 1997a, 1997b) believed the Lesser Antilles were abandoned after 800 CE, many scholars believe that these islands were continually occupied from the Saladoid era to the time of Columbian contact (Taylor 1949; Keegan and MacLachlan 1989; Wilson 1989, 1997; Davis and Goodwin 1990; Snyder et al. 2011; Fraser 2014; Rodriguez Lopez 2016; Anderson-Cordova 2017). Since the radiocarbon results provide a time frame after Allaire's estimations, it disproves the claims that these islands were abandoned after 800 CE, supporting the theories of continued occupation.

This study used the case studies of Kennewick Man, Lucy, and Otzi, as guidelines for understanding the past from a scientific perspective to illustrate how a single individual can be studied, what information can be gained, and how they have raised debate of cultural and biological affiliation and sense of belonging. According to Levi-Strauss, structuralism promises the opportunity to reconstruct bits and pieces of a system of interconnected beliefs which assists in establishing a culture's complete story (Stevens Arroyo 1981). Applying Levi-Strauss's work to the Taíno has two purposes; first, it provides an overview of relevant contemporary stories or histories, of which have been provided; and second, through the examination of the physical data present, it allows for a scientific reconstruction of the stories that are incomplete or distorted in historical literature (Stevens Arroyo 1981). The past has provided us with an overview of the relevant story elements or past histories of the Taíno, but their story is quite incomplete. Science is the collaborative effort to better comprehend the history of the natural world and how the natural world works. A blending of science, history, and culture draws in the public, as its intention is to better understand a past culture and the overall human experience. The scientific knowledge acquired from the analysis of these remains holds value and speaks to all of us. Like the historical literature and the examination of the material culture, the scientific analysis of these remains acts as an additional piece of the Taíno's story and assists in further developing an understanding of their complete story.

In short, the whole story of the Taíno is unknown; from a scientific perspective, a better understanding of this history or past can be established by analyzing each individual skeleton, the presence or absence of material cultures, and past archaeological evidence. Eventually, with each discovered, analyzed, and reconstructed story segment, additional pieces of the puzzle come together. For instance, acquiring knowledge pertaining to each individual's age, sex, stature, diet, and disease, provides a better understanding of each individual's past, and can create a sense of belonging or cultural and biological affiliation by classifying them as Taíno or that of another cultural group. By providing a cultural and biological affiliation, it allows for the possibility to better understand of how each individual relates to the overall picture of the Taíno culture. It should not be relevant that this population is not related to the current residences of Nevis, because there prehistoric skeletons relate to the overall picture of the human experience and human past; therefore, these skeletons are a part of the Nevisian island and the Caribbean culture; therefore, these remains are related to the current residences of Nevis through a shared geographical location. Hopefully by creating this sense of cultural belonging, the present sample of the indigenous Taíno peoples can change the basic social attitudes of the museums, scientific communities, and the overall public relating to science and its value, the importance of site conservation and preservation, and the acceptance and toleration of the cultural customs of the prehistoric inhabitants of Nevis. Consequently, this study and knowledge can allow for a better grasp of the distorted historical literature of the past and create a coherent narrative and sequence of events that make up the whole cultural story of the Taíno.

I hope that my work has added clarification to the cultural groups within the Lesser Antilles and the Caribbean during this time period. Furthermore, I hope that the analyses of the present sample has provided insight into the incomplete Taíno past and has revealed who these prehistoric individuals were who lived thousands of years ago. Judging by the dentition and the burial's proximity to the shell middens, the Taíno on Nevis were low or moderate-level agriculturalists who were highly dependent on access to maritime resources for subsistence and trade. The male crania showed signs of cranial deformation indicative of the Taíno cultural practices, but because observations of the female skull were inconclusive due to the high level of postmortem deformation, definitive conclusions cannot be made pertaining to the possible expression of sex specific cranial deformation (Okumura 2014). It must be acknowledged that the remains of four incomplete and poorly preserved individuals are not enough to draw conclusions concerning the Taíno; however, the clearly purposeful secondary internments, poor dentition, the likely presence of cranial deformation, and the positioning of various artifacts and material cultures found within each site indicate Taíno descent.

The evidence and research gathered and the suggestions made in the process of creating this thesis are meant to assist archaeologists and historians, the NHCS, and the extant Taíno and Kalinago population to advocate for the conservation of these remains and this site. My hope is that these groups and organizations will better understand the Taíno prehistory as a whole and hopefully encourage advocacy for the conservation of this, and other, prehistoric sites on Nevis and throughout the Caribbean. It cannot be stressed enough that future research among the Taíno's expansion and habitation on Nevis will be essential in determining, and possibly amending, the prehistory and narratives of the post-colonialization of the Caribbean.

While the preservation of skeletal remains in the Caribbean is poor due to the hot and humid climate, it can be argued that if we were able to pick an arbitrary test pit and find a burial containing two additional individuals, there must be an overwhelming amount of Taíno remains on White's Bay Beach available for additional research. Conservation and future studies in this area would allow a more in depth examination of the skeletal materials and lessen the gap in knowledge; thus, allowing archaeologists and osteologists to better describe the culture, customs, and heritage of both the indigenous population and the current population of Nevis, and provide a more holistic view of the Tainan culture, its people, and how they related to the Lesser Antilles and the Caribbean as a whole. Consequently, the more information gained concerning the Taíno will only build on past knowledge, and optimistically, work to encourage advocacy for decreasing overbuild on these sites and preserve these prehistoric lands.

Recommendations for Site Preservation

Urban condominium and hotel developments, golf courses, and other infrastructure has become a concern for the NHCS who work to protect and preserve the land. This origination is now facing more resistance from urban developers and some Nevisian residences who advocate for such developments. Due to the recent increased amount of construction and land development on Nevis, land erosion and depletion has become a concern worth assessing. As this land mass continues to shrink in size, material culture, prehistoric skeletal remains, and other prehistoric and historic materials are being lost at sea. Thus, it is necessary to stress the importance of land preservation on White's Bay Beach and other historical sites on Nevis.

One of the main objectives of this thesis was to provide relevancy of these ancient skeletons to the Nevisian society and culture; although it was made clear that the current Nevisian residents are not descendants to the remains excavated on White's Bay Beach, it can be argued that because this is their home, and once was the home of the Taíno, this study is relevant, as it creates new knowledge and information of the past populations on

Nevis. The knowledge gained from the analysis of these skeletons has created a sense of belonging and cultural affiliation, as these individuals belong to the Taíno and are a part of the Nevisian heritage.

The long term goal of this project is to permanently preserve this prehistoric site from all future developments. It is important to conserve the natural landscape because it is vital for water quality and water supply, natural wildlife, and the conservation of cultural heritage and history. Organizations like the NHCS and UNESCO should continue to partner with archaeologists and universities like Dr. Marco Meniketti and San José State University, respectively, in order to continue archaeological excavations and the conservation of these prehistoric remains. Additionally, the objective of this continued partnership would assist with educating the residents of Nevis and tourists on the importance of land and historical preservation, and the significance of building a knowledge base relating to the various prehistoric cultures on Nevis.

White's Bay Beach is located on the Atlantic side of the island, and although it is the least developed side of the island, lacking stores, houses, and streets, more recently, construction of newly paved access roads increases the likelihood that this land will soon be targeted for future developments, erasing more of this island's history. Together, organizations like UNECSO and the NHCS can partner with historical archaeologists who recommend preservation and conservation of this, and other, prehistoric sites on Nevis.

It is recommended that UNESCO and the NHCS work to prevent the development or improvements of the land for purposes other than archaeological research and conservation. Rouse (1964, 1982, 1986, and 1992) and Wilson (1986, 1989, 1997, and 2006) have documented and provided preliminary research relating to the prehistory of Nevis, which has provided a basis concerning the prehistoric peoples of Nevis, but additional archaeological research is needed to lessen the gap in knowledge relating to indigenous groups like the Taíno. This research will not be possible if this land is developed or lost to sea due to natural erosion and natural disasters.

It is not always easy to prevent people from developing on lands that are wanted for infrastructural developments; however, it is easier to protect the shorelines and these prehistoric and historic sites from natural disasters, such as hurricanes and high tides. Such successful shoreline preservation and restoration projects or methods would involve a comprehension of the coastal morphological processes (e.g. the type of coastal profile and the type of coastline) and why certain solutions will work better than others. More importantly, selecting a solution that fits the type of coastline and fulfills the goals of as many of the stakeholder and authorities as possible is essential; however, realistically, it is often quite impossible to fulfill the goals of all stakeholders, as they are often conflicting and restricted by budget restraints.

A few suggestions to preserve the Atlantic side of the island, particularly White's Bay Beach are: (1) register White's Bay Beach as a protected prehistoric place, eliminating the possibility of future developments and creating limited access; (2) build a barrier similar to the one found in Charlestown, where a wall and large rocks jut out from the shoreline to prevent further destruction caused by high tides and erosion; and (3) create a secure passage to and along the beach that prevents access and future damage to these sites caused by cars, motorcycles, and all-terrain vehicles. Ideally, implementing these three suggestions would be best for ensuring the conservation of the natural, cultural, and historic fabric of Nevis and provide the means to future knowledge and education on its histories. Budget restraints are a known limitation of the NHCS (personal communication with Marco Meniketti 2015; Nevis Historical and Conservation Society 2016). Therefore, the first and last suggestion for the conservation and preservation of White’s Bay Beach are the easiest and possibly the least expensive options, while the second suggestion is possibly the most expensive option, as it involves developing and building barriers that can withstand hurricanes, high tides, and other natural disasters.

Suggestions for land preservation for historic purposes can be expensive and tedious because it often involves the participation from advocates who possess knowledge on the subject, as well as mediation between all stakeholders. A current advocate for Nevis is Dr. Marco Meniketti, as he has conducted over 20 years of research on the island; he is knowledgeable on the rules and regulations for historical preservation, and he has become a trustworthy individual among the residents and authorities on the island. Advocating for the protection of this land ensures future research on Nevis concerning the Taíno promising, and the Nevisian residents will have the opportunity to better understand their island’s history and importance of historical preservation.

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APPENDICES

A Letter to the Current Living "Taíno" Population on Dominica

The following is a letter forwarded to the only known extant Kalinago population today, on the island of Dominique.

August, 2018.

To Whom it May Concern,

My name is Marissa Massaro and I am an archaeologist who specializes in the excavation of human remains operating out of San José State University (SJSU), San Jose, California, United States of America. I started working on an archaeological sites on the island of Nevis, West Indies in the summer of 2015. I was a part of a preliminary team determining the possibility and feasibility of future field schools on the island of Nevis. While on Nevis, our field crew discovered human remains on White's Bay Beach, in close proximity to the remains found in a previous year by Chris Keith and the 2011 field team. Once again, due to the lack of resources and time, we decided to remove only a few teeth and cranial fragments that were exposed on the surface, and rebury the remains in hopes of preserving them from the elements and the donkeys that roam freely on the beach.

With granted permission of the Nevis Historical and Conservation Society (NHCS) and SJSU, I returned to Nevis in the summer of 2016 with Professor Marco Meniketti and a field school team to excavate the remains of this individual to prevent them from further loss due to land erosion. Throughout our excavation, two of the remains of two additional individuals were found in a single burial. This site consisted of a single skull and the *remains of an additional individual, who we believe to be a female. We excavated the skeletal remains and analyzed them in a secured and locked facility by the Oualie Beach Resort, on Nevis, generously provided by the hotel management. The remains are currently being stored on Nevisunder the direction of the NHCS at the Nelson Museum in locked storage facility.*

This information is relevant to you because once again through radiocarbon dating and archaeological research, it was discovered that these individuals were prehistoric Caribs, very likely of Kalinago lineage, living sometime during the late Ostionoid Era, eleventh century CE. Through our analysis, we believe the initial cranium found in the summer of 2015 belongs to a Taíno male. As for the additional remains that were excavated in the summer of 2016, we believe the second cranium belongs to that of a male, while the skeleton belongs to a female.

As direct descendants of the Kalinago nation, I feel it is my responsibility to inform you of the existence of these remains, as well as the remains of other possible Carib descendants on White's Bay Beach. In previous years, it is my understanding that the NHCS was interested in the possibility of holding an exhibit, which focuses on the Caribs of Nevis, and it is my understanding that this is still true.

Moreover, these remains were used by myself to partially fulfill the requirements for the completion of my Master's degree in Applied Anthropology from San José State University. The analysis and the research that was gathered from the remains, the excavation, and the available literature on the pre-colonial peoples of the Caribbean, forensic theory and bioarchaeological theory were used to write a thesis.

I would like to offer my completed research, as well as the extensive amount of photos that were taken to document the excavation and analysis process of this project. Please go to google.com/drive/, create a Google account and email me for access to online album for access to the complete photo album. I will also have the full downloadable version of the entire photo album and a copy of my thesis available. For the downloadable version, or any questions and comments please email me at mmassaro13@yahoo.com and provide the subject heading of "2016 White Bay research." I encourage you to contact me for any questions or comments that may arise, and I sincerely hope that further cooperation between the living Kalinago, researchers and the NHCS will lead to future research of the remaining burials on White's Bay Beach, Nevis.

Thank you,

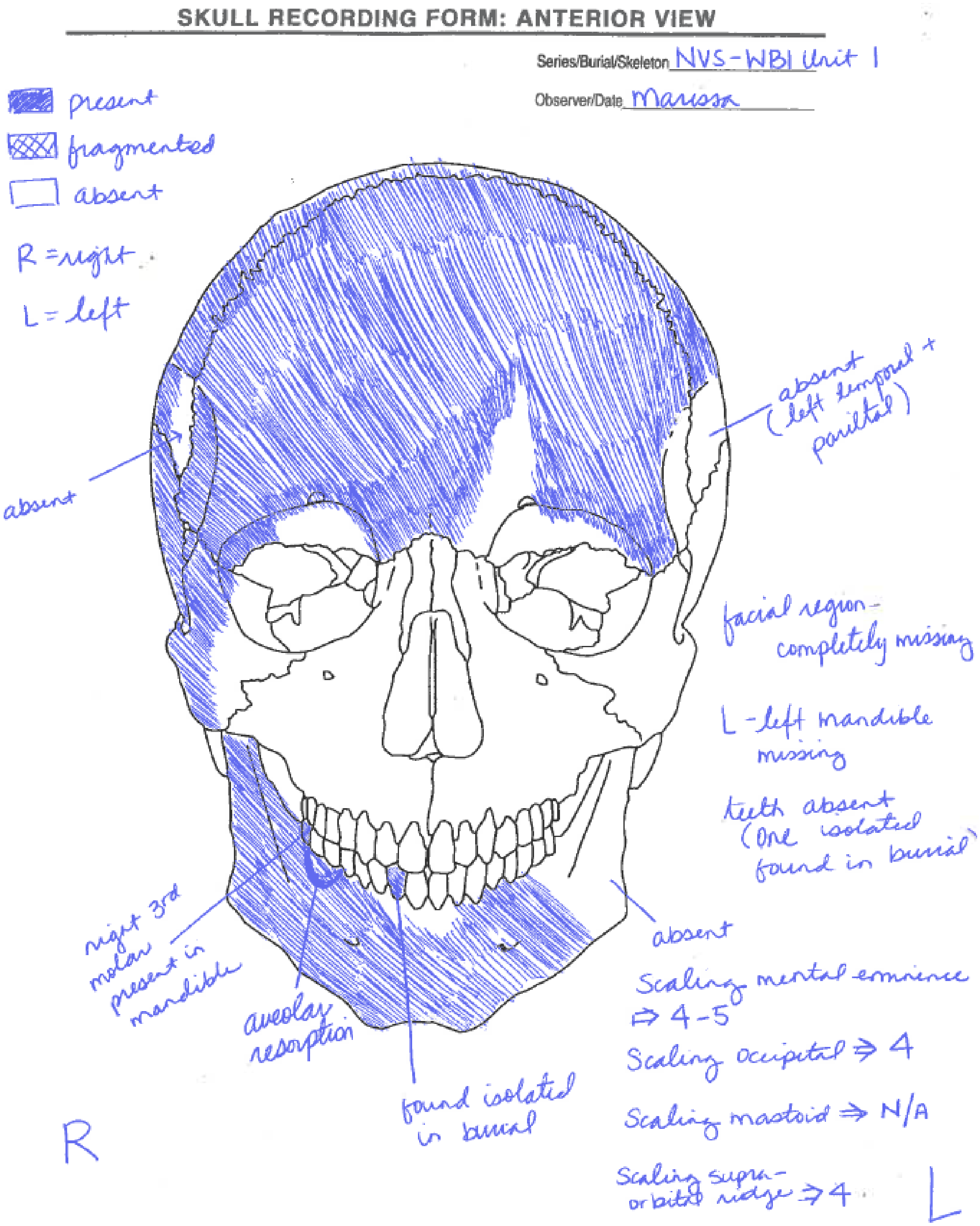
Marissa Massaro
San José State University
Department of Anthropology
mmassaro13@yahoo.com

Photo of a Modern Kalinago Descendent

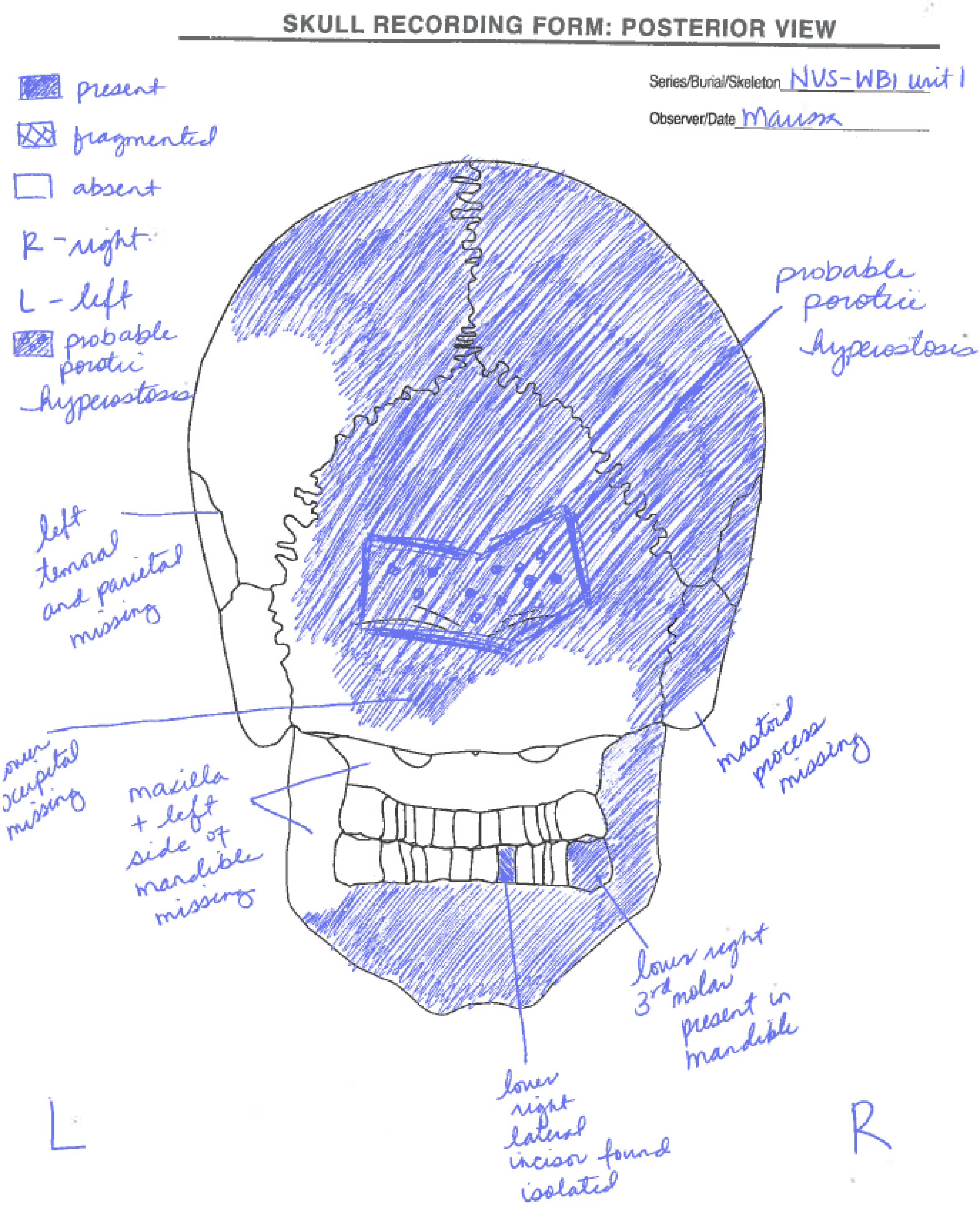
The purposes of including this photograph of a modern Kalinago is to show that this culture, and its people, are still living. The presently conducted research is related to the extinct population of the Taíno, but the Kalinago are important stakeholders, as they are keeping their culture alive. Additionally, the Kalinago are keeping aspects of their ancestral Taíno culture alive. The Kalinago are living people and they represent a descendent culture of the Taíno.

Illustrated above, is a photograph of a modern Kalinago descendent from the reserve on Dominica.
Photo Credit: Dr. Marco Meniketti

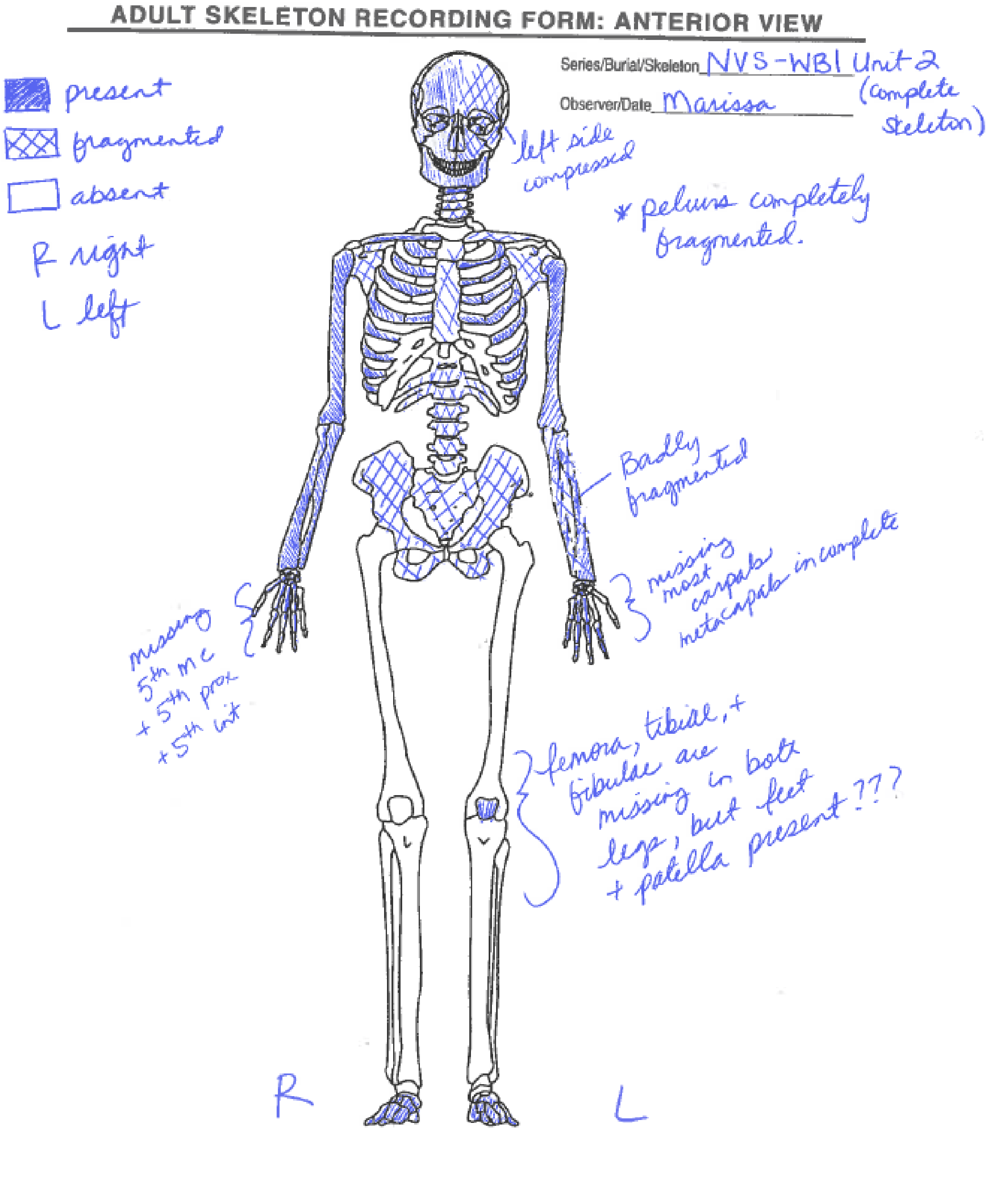
NVS-WB1 Unit 1 Skull Recording Form: Anterior View (Isolated Skull)



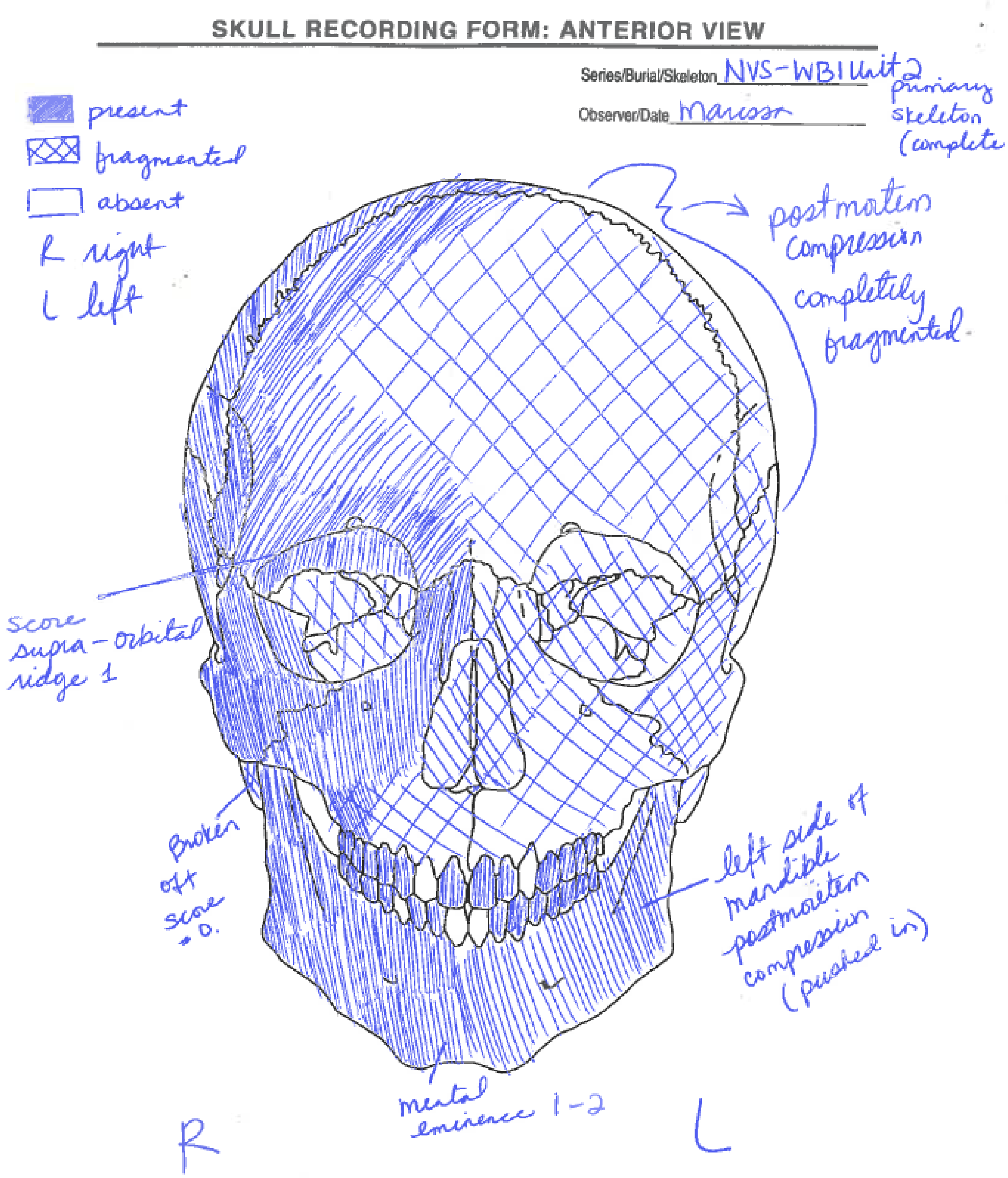
NVS-WB1 Unit 1 Skull Recording Form: Posterior View (Isolated Skull)



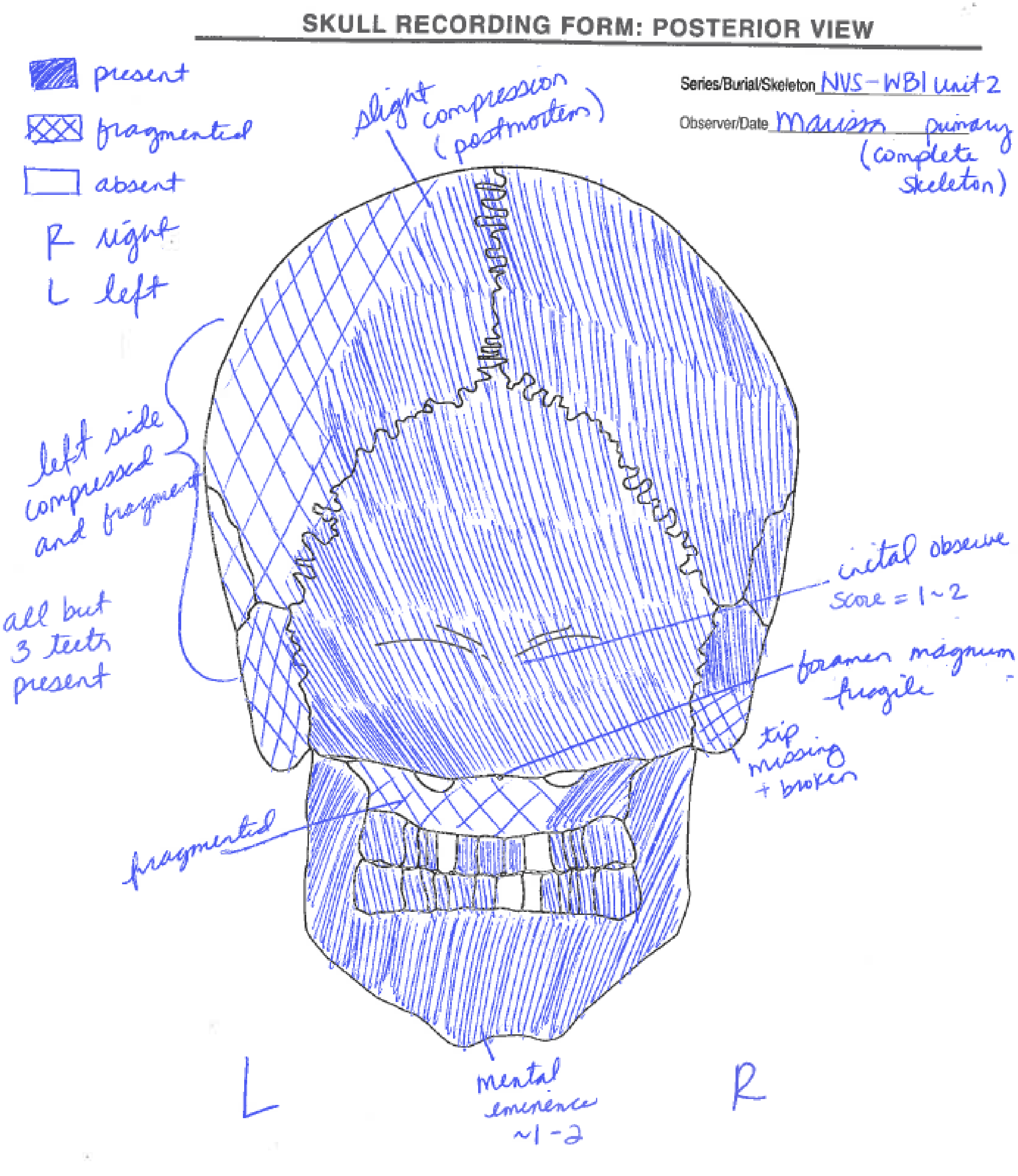
NVS-WB1 Unit 2 Adult Skeleton Recording Form (Partial Skeleton)



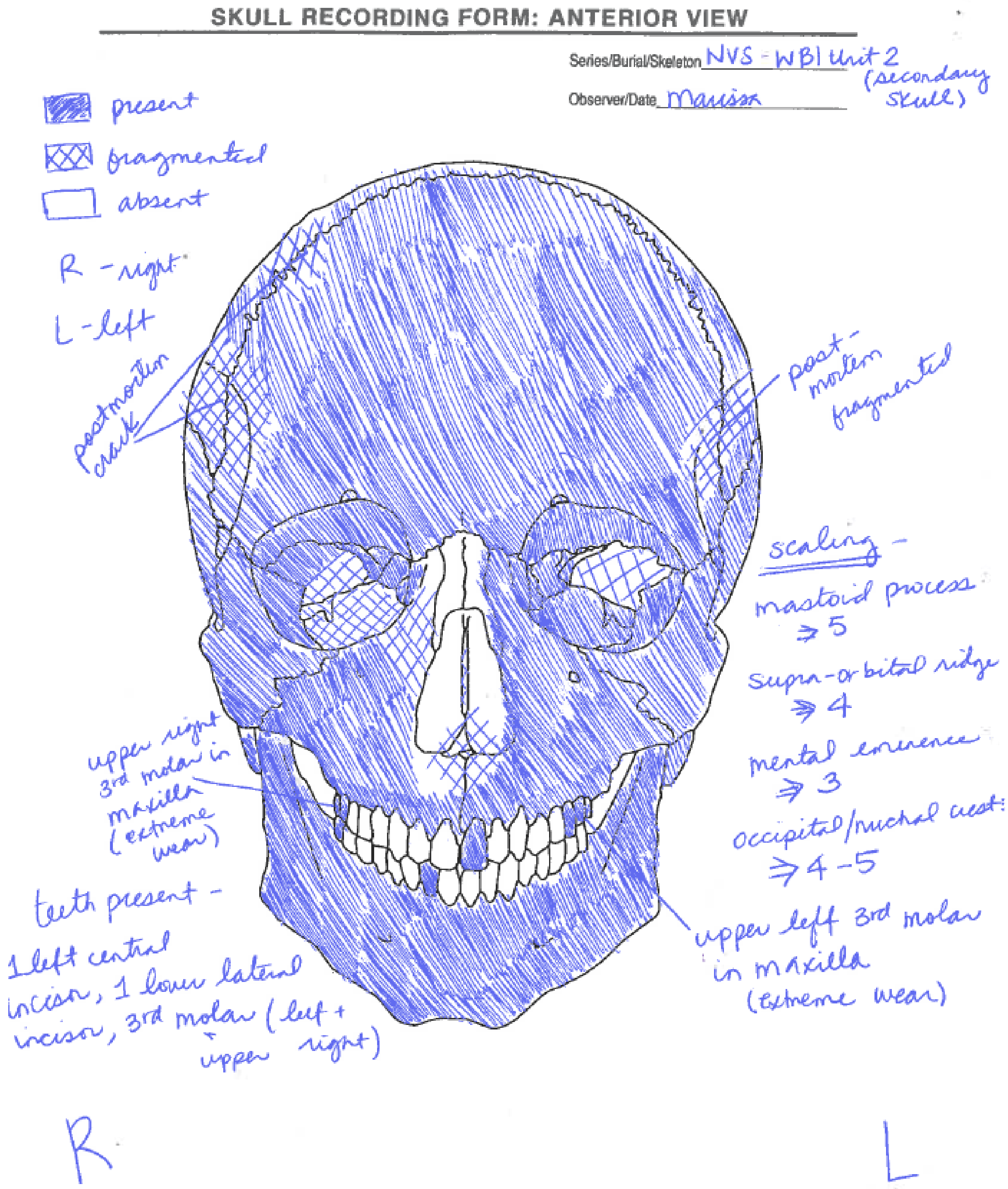
NVS-WB1 Unit 2 Skull Recording Form: Anterior View (Partial Skeleton)



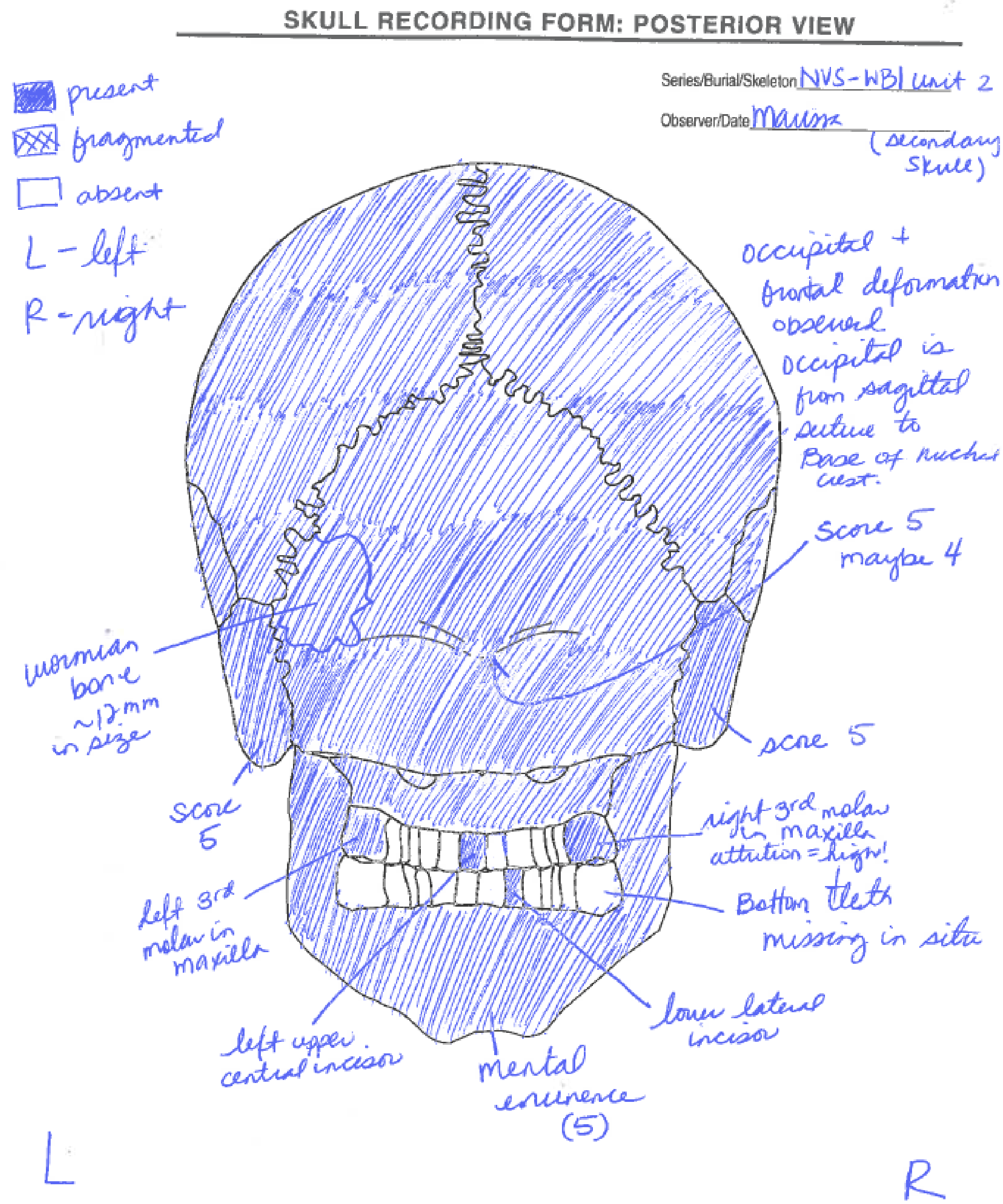
NVS-WB1 Unit 2 Skull Recording Form: Posterior View (Partial Skeleton)



NVS-WB1 Unit 2 Skull Recording Form: Anterior View (Second Cranium)

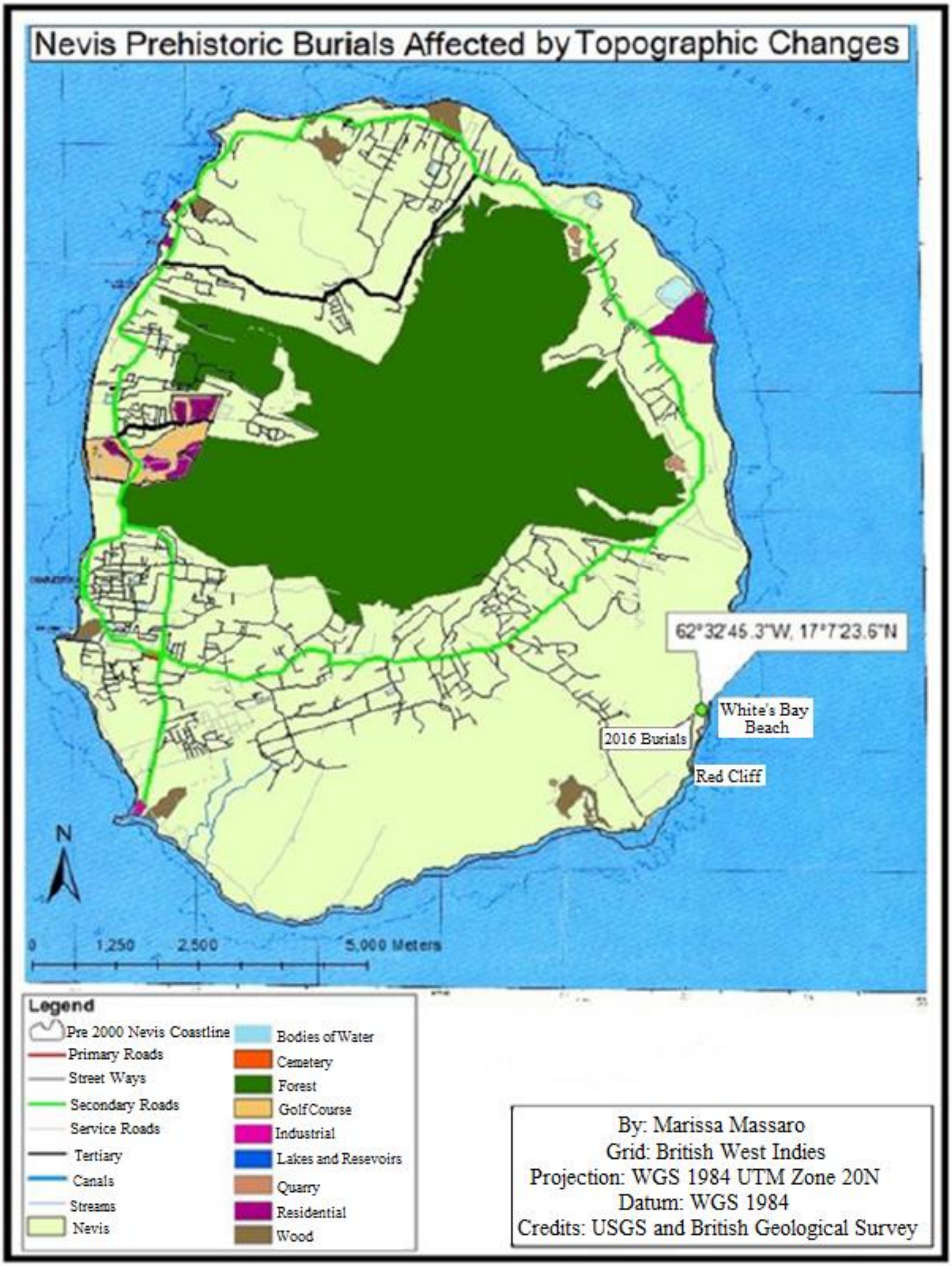


NVS-WB1 Unit 2 Skull Recording Form: Posterior View (Second Cranium)



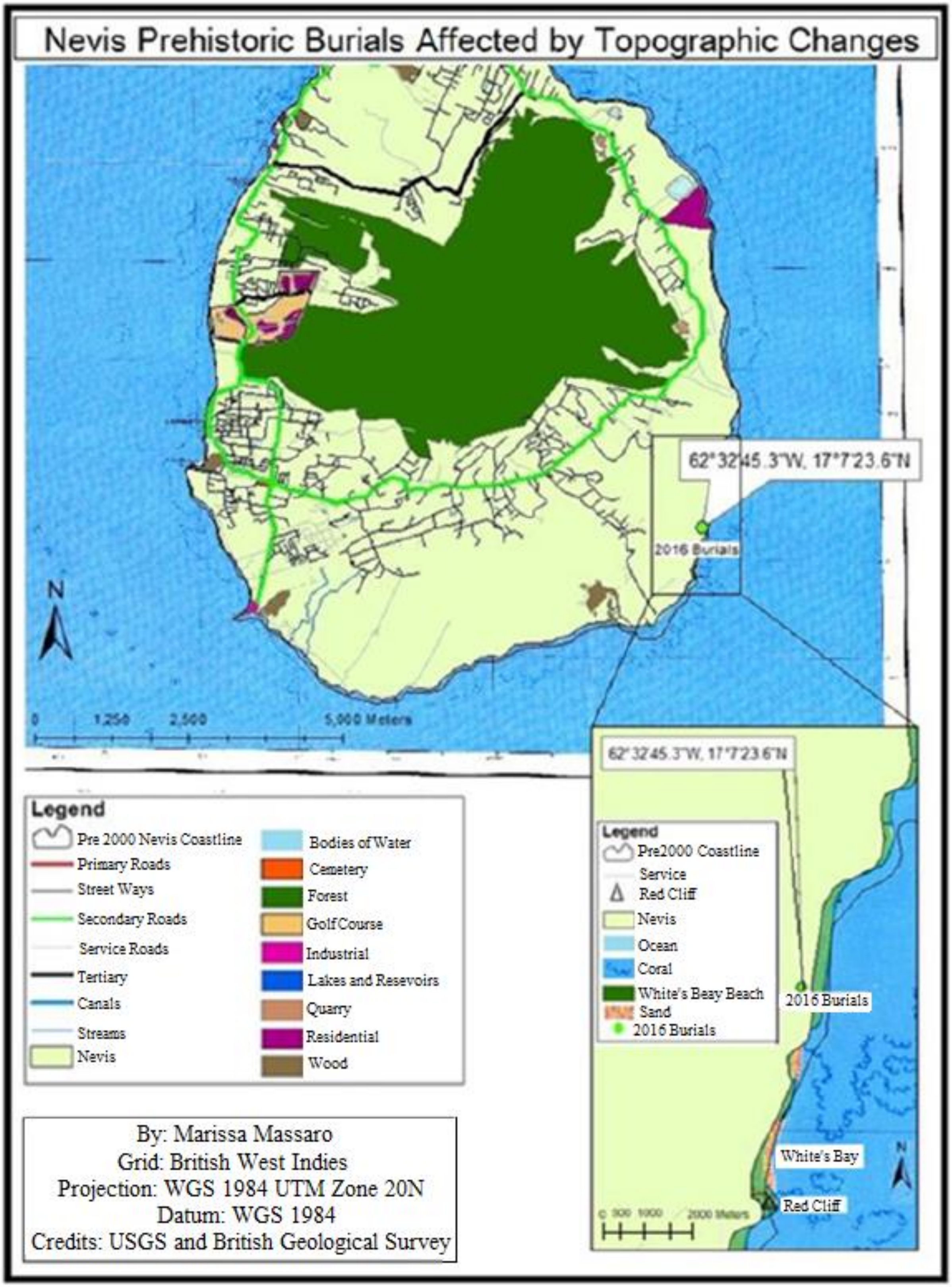
Nevis Prehistoric Burials Affected by Topographic Changes

The first map illustrated on the next page shows the entire island of Nevis and the island's topographic changes. This map compares the prehistoric shoreline to the current shoreline in 2017. The black outline shows the prehistoric shoreline of Nevis. The coordinates for the excavated burials from White's Bay Beach in 2016 are included in order to show the severity of the land erosion and depletion on Nevis.


Nevis Prehistoric Burials Affected by Topographic Changes
62°32'45.3"W, 17°7'23.6"N
White's Bay Beach
2016 Burials
Red Cliff
N
0 1,250 2,500 5,000 Meters
Legend
Pre 2000 Nevis Coastline
Primary Roads
Street Ways
Secondary Roads
Service Roads
Tertiary
Canals
Streams
Nevis
Bodies of Water
Cemetery
Forest
Golf Course
Industrial
Lakes and Resevoirs
Quarry
Residential
Wood
By: Marissa Massaro
Grid: British West Indies
Projection: WGS 1984 UTM Zone 20N
Datum: WGS 1984
Credits: USGS and British Geological Survey

Nevis Prehistoric Burials Affected by Topographic Changes (Close Up)

The second map illustrated on the next page shows the same topographic changes on Nevis which are depicted in the first map, but zooms in on the eastern side of the island to show the burials excavated on White's Bay Beach in the summer of 2016. A close up of the burials and the changes in proximity to the prehistoric shoreline to that of the current shoreline in 2017 are shown.


Nevis Prehistoric Burials Affected by Topographic Changes
62°32'45.3"W, 17°7'23.6"N
2016 Burials
N
0 1,250 2,500 5,000 Meters
Legend
Pre 2000 Nevis Coastline
Primary Roads
Street Ways
Secondary Roads
Service Roads
Tertiary
Canals
Streams
Nevis
Bodies of Water
Cemetery
Forest
Golf Course
Industrial
Lakes and Resevoirs
Quarry
Residential
Wood
By: Marissa Massaro
Grid: British West Indies
Projection: WGS 1984 UTM Zone 20N
Datum: WGS 1984
Credits: USGS and British Geological Survey
62°32'45.3"W, 17°7'23.6"N
Legend
Pre2000 Coastline
Service
Red Cliff
Nevis
Ocean
Coral
White's Beay Beach
Sand
2016 Burials
2016 Burials
White's Bay
Red Cliff
N

NVS-WB1 Unit 1: Isolated Skull Carbon Dating Results

BETA
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Beta Analytic Inc.
4985 S.W. 74 Court
Miami, Florida 33155 USA
PH: 305-667-5167
FAX: 305-663-0964
beta@radiocarbon.com
www.radiocarbon.com

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

October 09, 2017

Marissa Massaro
San Jose State University
Clark Hall Suite 469
San Jose, CA 95192
United States

RE: Radiocarbon Dating Results

Ms. Massaro,

Enclosed is the radiocarbon dating result for one sample recently sent to us. The report sheet contains the Conventional Radiocarbon Age (BP), the method used, material type, and applied pretreatments, any sample specific comments and, where applicable, the two-sigma calendar calibration range. The Conventional Radiocarbon age has been corrected for total isotopic fractionation effects (natural and laboratory induced).

All results (excluding some inappropriate material types) which fall within the range of available calibration data are calibrated to calendar years (cal BC/AD) and calibrated radiocarbon years (cal BP). Calibration was calculated using one of the databases associated with the 2013 INTCAL program (cited in the references on the bottom of the calibration graph page provided for each sample.) Multiple probability ranges may appear in some cases, due to short-term variations in the atmospheric 14C contents at certain time periods. Looking closely at the calibration graph provided and where the BP sigma limits intercept the calibration curve will help you understand this phenomenon.

Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference and consistent with all past Beta Analytic radiocarbon dates. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result. The reported d13C was measured separately in an IRMS (isotope ratio mass spectrometer). It is NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

All work on this sample was performed in our laboratories in Miami under strict chain of custody and quality control under ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 accreditation protocols. Sample, modern and blanks were all analyzed in the same chemistry lines by professional technicians using identical reagents and counting parameters within our own particle accelerators. A quality assurance report is posted to your directory for each result.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely,

Beta Analytic
RADIOCARBON DATING
Consistent accuracy delivered on time

DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74th Court
Miami, Florida, USA 33155
PH: 305-667-5167 FAX: 305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Marissa Massaro — Rerport Date: October 09, 2017

San Jose State University — Material Received: September 27, 2017

Sample Information and Data	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 474900	**NVS-WB-U1-IS**	**940 +/- 30 BP**	IRMS δ13C: -15.1 o/oo IRMS δ15N: +12.3 o/oo
Submitter Material: Tooth		**(95.4%) 1025 - 1160 cal AD**	**(925 - 790 cal BP)**

Analyzed Material: Tooth collagen
Pretreatment: (tooth collagen) collagen extraction; with alkali
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 88.96 +/- 0.33 pMC
Fraction Modern Carbon: 0.8896 +/- 0.0033
D14C: -110.43 +/- 3.32 o/oo
Δ14C: -117.61 +/- 3.32 o/oo(1950:2017)
Measured Radiocarbon Age: (without d13C correction): 780 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13
Carbon/Nitrogen: CN : 3.2 %C: 43.63 %N: 15.91

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

BetaCal 3.21

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: d13C = -15.1 o/oo)

Laboratory number **Beta-474900**

Conventional radiocarbon age **940 ± 30 BP**

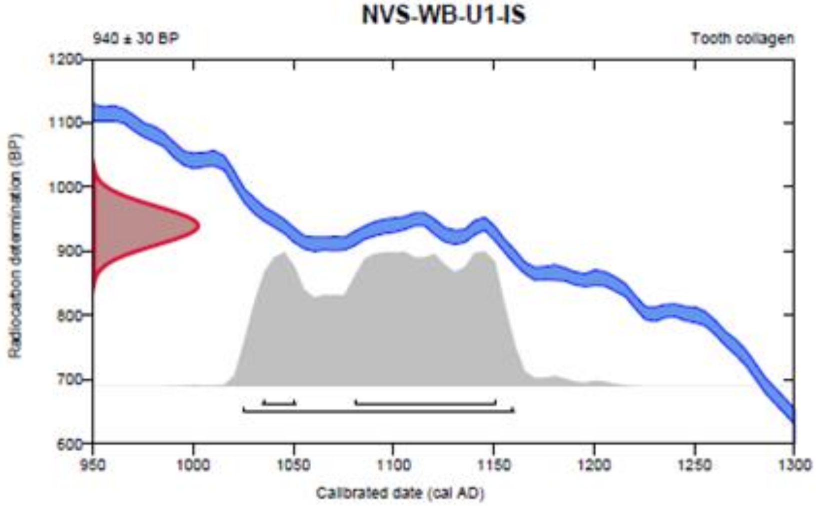
95.4% probability

(95.4%)	1025 - 1160 cal AD	(925 - 790 cal BP)

68.2% probability

(55.7%)	1081 - 1151 cal AD	(869 - 799 cal BP)
(12.5%)	1035 - 1051 cal AD	(915 - 899 cal BP)

NVS-WB-U1-IS



Database used

INCAL13

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL13

Reimer, et.al., 2013, Radiocarbon55(4).

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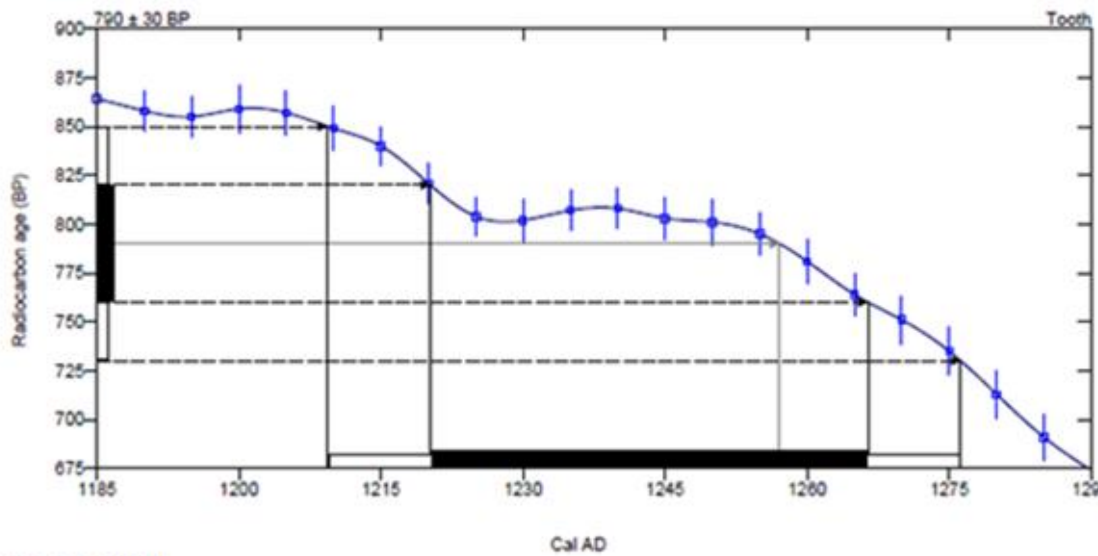
NVS-WB1 Unit 2: Female Fragmented Skeleton Carbon Dating Results

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -18.4 o/oo : lab. mult = 1)

Laboratory number	**Beta-452998 : NVS-WB-1-U2-FFS**
Conventional radiocarbon age	**790 ± 30 BP**
Calibrated Result (95% Probability)	**Cal AD 1210 to 1275 (Cal BP 740 to 675)**
Intercept of radiocarbon age with calibration curve	Cal AD 1255 (Cal BP 695)
Calibrated Result (68% Probability)	Cal AD 1220 to 1265 (Cal BP 730 to 685)



Database used
INTCAL13

References
Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322
References to INTCAL13 database
Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887., 2013.

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NVS-WB2 Unit 1

Introduction

The excavation of this burial was solely intended for conservation purposes, as these remains have been exposed to the surface elements for an unknown period of time. Additionally, weather and extreme exposure to the sun and other elements has resulted in extensive damage to these remains, and has resulted in the majority of the remains being lost to sea, as the cliff side where the remains were originally buried is quickly receding. For the purposes of professionalism and completion, the materials, excavation, analysis, discussion of the results, and the carbon dating results will be provided in this section. See chapter three for a complete literature review and chapter four for the osteological methods used in the examination of these skeletal remains.

Excavation Methods of NVS-WB2 Unit 1

Once again the excavation methods used at the site were in accordance with the standards of the Register of Professional Archaeologists (RPA) under the supervision of Dr. Marco Meniketti of San José State University (SJSU). Prior permission to excavate and remove these skeletal and cultural materials were granted to SJSU for conservation efforts, as a part of an archaeological field school project on White's Bay Beach by the Nevis Historical and Conservation Society (NHCS).

The excavation began with taking photographs and surface sketches of the burial in situ (see Figure 20). This was important because the degree to which this burial was exposed and damaged was great. The burial laid scattered on top of a cliff and partially covered by a few tree branches and rocks for an unknown period of time. The unit was not measured out with the traditional 1 m by 1 m square, but rather it was mapped out with a 1 m by 1 ½ m rectangle because there were numerous cuts in the soil caused by erosion of the hillside (see Figure 20 and 21).

Figure 20. NVS-WB2 Unit 1, in Situ. The burial is under the rocks and branches, located just off a cliff on the north end of White's Bay Beach. The ocean below is east of the burial. The skull fragments were found oriented east, but were found right above the thick tree branch in the lower left hand corner of the photo.

The material culture present on the surface was just as abundant as the amounts found at the previously excavated sites on White's Bay Beach. Pottery and ceramic shards, large conch shells, and the fragmented human remains were collected and logged. A team of field students were instructed to climb down the hillside to see if there were any remnants of this individual below, but it was clear that when the ocean tides rise, any and all materials would have been lost to the ocean. The fragmented remains dispersed on the cliff side above was all we had to work with.

Figure 21. NVS-WB2 Unit 1, Unit Markings. The top of the photo faces west and the right corner of the photo is oriented north.

Throughout the excavation of this unit, a team of three field students quickly sketched each level and noted changes in soil's coloration and consistency. It was assessed that the burial would not need an in-depth excavation because the burial was surfaced and the west side of the unit lacked additional skeletal and cultural materials. Using a line level, the left side of the unit was brought down to 10 cm, leaving the east side of the unit untouched because of the slight sloping of the hillside. With continuous use of the line level and minding the slight slope of the burial, the west side of the unit was brought down to level two (10-20 cm), and the east side of the unit was brought down five cm. The absence of material culture and human remains continued as the unit was brought down to level three (20-30 cm). This level had soft crumbly soils on the northwest, northeast, and southeast corners, and hard limestone in the center extending towards the southwest corner of the unit. The field students were unable to continue excavation of this unit because of the hard limestone; therefore, the excavation of this unit halted at 30 cm in depth. The field students sketched, documented, photographed, and backfilled the unit.

Lab Analysis and Storage of Remains from NVS-WB2 Unit 1

After the excavation of this unit, all cultural materials and skeletal remains were placed into separate acid-free paper bags, contained within storage containers and boxes, and were transported to a locked and temperature controlled room on Pond Hill. Initial cataloging of the cultural and skeletal materials was completed in the locked facility on Pond Hill. Once all materials were cataloged, drawn, and photographed, they were packaged into their original acid-free storage bags, placed into an acid-free cardboard box, and labeled with the excavation unit.

As previously stated, because Dr. Bob Mankoff at the Medical University of the Americas, Nevis was no longer the Assistant Dean of Students, the science labs previously used for the analysis of the human remains were unable to be utilized. Instead, the human skeletal remains were transported to a temperature controlled and secured access facility on Oualie Beach Resort, Nevis. This location was generously provided by the hotel management and only myself or Dr. Marco Meniketti had access to this room and the remains.

The preservation, cleaning, and examination of the remains were completed along the guidelines outlined by Buikstra and Ubelaker (1994) and supported by the methods established by Bass (2005). The methods of Buikstra and Ubelaker (1994) were strongly advised by San José State University Professor Elizabeth Weiss because they are the most used standard for collecting skeletal data. Cleaning of the skeletal materials were completed with soft brushes and wooden clay pottery tools. No water was used in the cleaning process because the remains were extremely fragile, and any amount of water used on the bone could potentially cause them to absorb the water, crumble, and break.

Mitutoyo digital calipers calibrated to 0.00 mm (accurate to 0.01 mm) were used to measure all the skeletal and cultural materials found within the burial. Selected by their intact nature, two teeth samples were collected from this burial to send to the International Chemical Analysis Inc. (ICA) for accelerated mass spectrometry (AMS) dating to provide a chronological date and isotopic measurements. This company was used for obtaining the carbon dating results for this burial because the ICA was the most affordable option for obtaining results on a burial that was not directly associated with this thesis and the other burials excavated on White's Bay Beach. The carbon dating results came back with a date range of 1260-1300 AD.

After the competition of our analysis, the skeletal fragments were photographed, placed within an acid-free paper bag, and placed in an acid-free cardboard box that was clearly labeled with its excavation unit and its contents. This acid free storage box was then placed into a larger plastic storage container to prevent any further damage to the remains that might occur while in storage. The box was transported to a locked and secured, temperature-controlled curation facility under the direction of the NHCS at the

Nelson Museum, where they were stored in accordance with Bass (2005) and the advice provided by Dr. Lorna Pierce.

Materials

NVS-WB2 Unit 1 was excavated on the ridge north of White's Bay Beach. The skeletal remains were found lying in a traditional Christian burial (with the individual positioned supine or face up), rather than the previously mentioned burials found on White's Bay Beach and other islands in the Greater and Lesser Antilles. Determined by the position of the bones, the skull was oriented on the west side of the unit, but facing east and the tarsals were oriented east. Remnants of hooves prints of freely roaming donkeys and other scavenging animals were present.

The burial contained only fragmented remains and a few teeth. All of the skeletal elements were bleached white and brittle from the prolonged exposure to the sun. All of the cranial and post-cranial fragments were too damaged and brittle to reassemble. Only cranial fragments were present, which were determined by the meningeal grooves on the interior surfaces of the fragments. Additional skull fragments were collected, but were too small to determine if they were associated with the cranial vault, facial bones, maxilla, or mandible. A total of three teeth were collected: an upper left lateral incisor, an upper right central incisor, and an upper left central incisor.

The larger post-cranial elements were characterized by their identifiable features. A fragmented C2, determined by the visible dens, was found exposed to the surface elements. Fragments of a cervical, thoracic, and lumbar vertebrae were also collected, but these fragments were too small for assessment and vertebral measurements. The overall post-crania present for this individual was very minimal and extremely fragmented; the bones that were collected were: a single left clavicle, a fragmented right clavicle, a piece of the sternum, a complete left 1st rib, multiple rib fragments, and a fragmented ulna and fibula.

Charcoal, red and black pottery fragments, and faunal remains, such as fish vertebrae, shells, and crab claws, were found near or around the burial unit. This burial demonstrated the presence of more grave offerings than the other burial excavated on White's Bay Beach in the summer of 2016. A single white and black marbled bead was found in the burial, making it plausible that it was a grave offering of some sort (Wilson 1990; Deagan and Cruxent 2002; Ostapkowicz and Newson 2012). A worked conch tool was also discovered within the burial, similar to the ones described by Golding-Frankson (2009). A diagram of the skeletal remains can be found at the end of the conclusion section, just before the radiocarbon dating results for this burial. Photographs of the fragmented remains and material cultures are provided in the methods and results sections to follow.

Table 13. NVS-WB2 Unit 1 Complete List of Cranial and Post-Cranial Elements.

Post-Cranial Elements Present	Notes
23 Cranial Fragments	All very small in size
1 Upper Left Central Incisor	
1 Upper Right Central Incisor	
1 Upper Left Lateral Incisor	
C2	Incomplete but den s was present to tell it was a C2
Cervical Vertebral Fragment	Unsure if C1 or C3-C7
Cervical Vertebral Fragment	Unsure if C1 or C3-C7

Lumbar Vertebral Fragment	Unsure if L1-L5
Left Clavicle	Fragmented
Right Clavicle	Fragmented
Sternum	Fragmented
Ulna Fragment	Unsure if it is right or left
1st Left Rib	
9 Left Rib Fragments	Unsure if they are ribs 2-12
8 Right Rib Fragments	Unsure if they are ribs 1-12
6 Rib Fragments	Unsure if they are right or left ribs 1-12
Fibula Fragment	Unsure if it is right or left
Patella Fragment	Unsure if it is right or left
Material Cultures	
1 Barrel-Shaped Marble Bead	
1 Worked Conch Shell Tool	

Osteological Methodology

The same osteological methods explained in the methods chapter of this thesis were used when examining the fragmented skeletal remains in NVS-WB2 Unit 1. See Chapter 4 for the methodologies used.

Material Cultures Present

The material cultures found within this burial site were the most abundant out of this skeletal sample. A significant amount of large red and black pottery shard were collected. A single worked conch tool and a single marble or granitic, barrel-shaped stone bead were found within the burial site. Listed below in Figures 22, 23, and 24 compare the barrel-shaped bead found at this burial site to the various barrel-shaped beads known to belong to the Taíno. Figure 22 is a photograph of the various shapes and sizes of Tainan lapidary and stone work. This photograph is provided by Deagan and Cruxent (2002). Figure 23 was found in the Metropolitan Museum of Art, called the “Taíno Necklace.” This photo illustrates a Taíno stone bead necklace with different shapes, colors, and sizes of stone pendants and beads. Figure 24 is a series of photographs illustrating multiple angles of the barrel-shaped stone bead that was found within this burial site. This image shows the positioning and size of the holes and coloration of the bead.

Figure 22. Taíno Lapidary, Stone Beads. The second bead found on the left side of the last row is very similar to the bead that was found in NVS-WB2 Unit 1; the measurement, thickness, size, and shape are all comparable.
Photo Credit: James Quine, Deagan and Cruxent (2002).

Figure 23. Taíno Stone Bead Necklace.
Photo Credit: Metropolitan Museum of Art, called "Taíno Necklace."

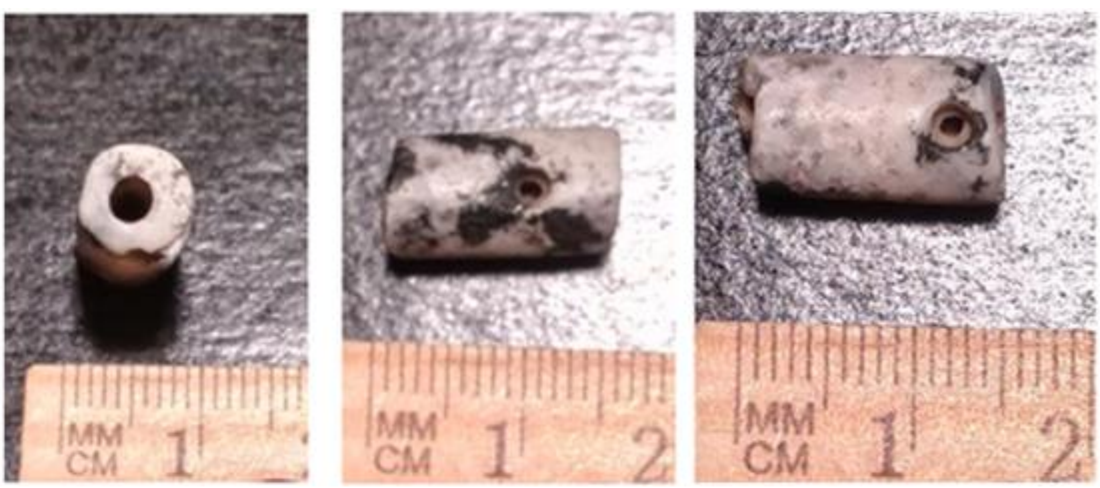


Figure 24. A Taíno Marble Stone Beads, Burial NVS-WB2 Unit 1. This item was found within the burial site. The bead measures about 15 mm in length and about 8 mm in width. The stone bead is barrel-shaped, has a 4 mm hole running straight through from top to bottom, and a 2-3 mm conical-shaped hole on either side of the bead.

The stone bead found in this burial unit was examined under a binocular Leica MZ6 microscope supplied by SJSU. Dr. Marco Meniketti assisted with the examination of this stone bead (Figure 24). The initial observations of this bead resembled a broken and modified clay pipe stem because of its size, shape, thickness, and center hole, but the inclusions of black mica made this theory questionable. Upon researching literature concerning the materials used for manufacturing colonial smoking pipes, it became apparent that clay was the material of choice, and no accounts mentioned quartz, marble, or other stones used in the manufacturing of smoking pipes. When comparing this stone to other known pipe stems from Bush Hill, Nevis, all of the pipe stems were white with porous bodies and had a visible seams from the molds used in the pipe steam manufacturing. These pipe stems also have a center hole that was often off centered.

After observing the item under the microscope, it became clear that this material was, in fact, stone and possibly some sort of quartz or marble. Small cracks were visible, and inclusions of black mica and a blackish crystal material were present, suggesting the material was a granitic stone. There was no question that this was stone and not clay, as almost all manufactured pipes were white. The holes that were drilled on either side resembled that of a stone drill due to their conical shape. It is unclear as to how exactly these holes were manufactured; it is possible that a stone drill was used, which could explain the conical shape, but it is also possible that these holes were made with a metal drill that stopped when the drill broke through the surface. The center hole resembled to have been drilled, but the center hole was not conical in shape; in fact, it seemed to have been drilled straight thru. The center hole caused confusion because it was unclear as to how it was drilled. When closer attention was paid to the entry of the hole from both ends, there was a reddish, almost rust like material on either ends surrounding hole's opening. It was possible that the residue marked the location of where to drill the hole, or as the result of rubbing against another material for an extended period of time. Because both sides of the bead were marked, it likely indicates that they marked both sides of the stone to drill the hole from both sides. This could possibly explain the straight through hole for the center and why it does not resemble conical in shape.

Dr. Marco Meniketti suggested to reach out to Dr. Georgia Fox, an Anthropology Professor at California State University, Chico who is an expert researcher of smoking pipes, as she would be an excellent reference for an additional opinion of the item in question. Dr. Georgia Fox has completed extensive research concerning the materials and manufacturing of smoking pipes from both the pre-colonial and colonial era. When communicating with Dr. Georgia Fox, she too confirmed that historically, smoking pipes have not been manufactured with stone, nor has she discovered any smoking pipes that contained black mica or blackish crystal materials (personal communication with Dr. Georgia Fox 2018). Dr. Georgia Fox instructed that the author reach out to Dr. Samuel Wilson at the University of Texas at Austin, as he might have more information or may have discovered similar finds in his own work on the Taíno contact sites in the Caribbean (personal communication with Dr. Georgia Fox 2018).

After communicating with Dr. Samuel Wilson, he confirmed this was in fact a pre-contact bead and similar ones have been recently found on Nevis and other Leeward islands (personal communication with Dr. Samuel Wilson 2018). Dr. Samuel Wilson was unable to state what kind of stone it was manufactured from, but was able to say that it was of a type of igneous porphyry; additionally, black and white stones were often used in this region for beads and small triangular objects (“three pointers”) (personal communication with Dr. Samuel Wilson 2018). Dr. Samuel Wilson continued to say that it was Sebastian Knippenberg (2006) who identified the source of the stone in his dissertation from Holland (personal communication with Dr. Samuel Wilson 2018).

In close proximity to the stone bead, a worked conch shell tool, closely resembling those described by Golding-Frankson (2009), was found on the surface of the eastern side of this burial site (see Figure 25). The presence of this worked conch tool provides additional evidence that this burial is possibly a Taíno burial prior to the shifts in the Ostionoid period because most of the burials described by archaeologists do not have the presence of such items (Mason 1983; Walker 1983; Hofman 1993; Parry and Keith 1994; Hoogland and Hofman 1999; Hofman et al. 2001; Boomert 2000; Deagan and Cruxent 2002; Loven 2010; Schaffer et al. 2010; Ostapkowicz and Newson 2012).

Figure 25. Worked Conch Tool, NVS-WB2 Unit 1. The item was found on the east side of the burial NVS-WB2 Unit 1. The first image shows the smooth surface of the tool. The second image shows the underside of that same tool, with clear definition to fit within an individual’s palm.

Osteological Examination

Examination of the epiphyseal fusion of the fibula and ulna, the sternal end of the first rib, and the dentition present indicated that this individual was not juvenile. The epiphyseal fusion of the fibula and ulna provided an age estimate of about 25 years old. The complete first rib was able to show a slight cupping at the sternal end indicating an age of about 25 years old, but a comparison of the other ribs was not possible in order to definitively state that this individual was over the age of 25. The teeth collected were observed to be permanent due to their size, thicker enamel, and the narrow roots (Buikstra and Ubelaker 1994; White and Folkens 2005). It is possible that this individual was older than 25 years old, but was unable to be confirmed due to the incomplete nature of this burial.

This individual had extreme oblique and lateral wear visible on the upper central incisors. The presence of dental caries was observed on the labial surface of the upper left central incisor.

Only cranial fragments were present, most of which ranged from 6 mm to 39.6 mm in size (see Figure 26 and Table 14).

Figure 26. NVS-WB2 Unit 1, Cranial Fragments.

Table 14. NVS-WB2 Unit 1 Fragmented Skeleton Cranial Bones and Fragments.

Cranial Fragments	Length Measurements (in mm.)	Width Measurements (in mm.)
Cranial Fragment	28.70	11.1
Cranial Fragment	24.00	16.90
Cranial Fragment	21.00	12.50
Cranial Fragment	21.50	15.60
Cranial Fragment	20.20	25.50
Cranial Fragment	29.50	15.80
Cranial Fragment	15.50	9.90
Cranial Fragment	39.60	21.70
Cranial Fragment	26.00	16.10
Cranial Fragment	32.10	17.50
Cranial Fragment	14.50	13.90
Cranial Fragment	15.50	11.70
Cranial Fragment	19.90	13.00
Cranial Fragment	35.90	35.10
Cranial Fragment	21.50	27.40
Cranial Fragment	21.40	19.00
Cranial Fragment	27.10	21.70
Cranial Fragment	25.10	18.90
Cranial Fragment	19.50	14.80
Cranial Fragment	29.00	24.60
Cranial Fragment	20.60	8.00
Cranial Fragment	19.00	8.50
Cranial Fragment	19.80	6.00

Signs of porosity were visible on the dens (C2), indicating that it was possibly related the sun damage and not OA. The other vertebral fragments were too small for assessment. Listed in Table 15 are the larger vertebral fragments that were collected, measured, and assessed for OA.

Table 15. NVS-WB2 Unit 1 Fragmented Skeleton Vertebrae.

Vertebral Elements	Length Measurements (in mm.)	Width Measurements (in mm.)
Cervical (C) 2	24.00	18.50
Cervical Vertebral Fragment	27.00	22.90
Cervical Vertebral Fragment	26.30	24.50
Lumbar Vertebral Fragment	32.60	25.40

Very few post-cranial bones were collected; therefore, the analysis of this skeleton is incomplete. The complete first rib showed slight cupping at the sternal end and possible porosity, but this was unable to be compared with the other ribs, as the sternal ends were missing. Table 16 show the post-cranial measurements collected.

Table 16. NVS-WB2 Unit 1 Fragmented Skeleton Post-Cranial Measurements.

Post-Cranial Elements	Length Measurements (in mm.)	Width Measurements (in mm.)
Left Clavicle-fragmented	29.40	12.40
Right Clavicle-fragmented	81.60	14.60
Sternum-fragmented	37.50	31.10
1st Left Rib	72.50	
Left rib fragment	50.40	
Left rib fragment	41.20	
Left rib fragment	44.80	
Left rib fragment	56.80	
Left rib fragment	83.10	
Left rib fragment	82.10	
Left rib fragment	54.90	
Left rib fragment	85.30	
Left rib fragment	116.70	
Right rib Fragment	37.30	
Right rib Fragment	48.00	
Right rib Fragment	46.20	
Right rib Fragment	101.90	
Right rib Fragment	112.30	
Right rib Fragment	81.80	
Right rib Fragment	107.70	

Right rib Fragment	104.50	
Rib fragment	74.70	
Rib fragment	45.50	
Rib fragment	53.80	
Rib fragment	34.70	
Rib fragment	52.40	
Rib fragment	37.50	
Ulna Fragment	58.50	23.80
Fibula Fragment	72.20	19.50
Patella Fragment	25.80	20.50
Material Culture		
1 Marble Bead	15.00	8.00
1 Worked Conch Shell tool		

Discussion

The Taíno commonly practiced ritual reburials or secondary internments which were usually found under personal homes or in close proximity to conch shell middens and accompanied by shells and pottery (Rouse 1952a, 1952b; Mason 1983; Walker 1983, 2005; Hoogland and Hofman 1999; Boomert 2000; Hofman et al. 2001; Drew 2009; Loven 2010; Schaffer et al. 2010; Ostapkowicz and Newson 2012). A shift in the burial practices during the Ostionoid period (circa 800 CE) emphasized family lineage, it is possible that this burial demonstrates the mortuary practices of this shift (Walker 1983). As previously mentioned, the radiocarbon dating results determined that this individual was from 1260-1300 AD, placing this individual within the Ostionoid period. Given that this burial was found on a ridge, positioned in a traditional Christian burial style with the feet and cranium facing east, and accompanied by grave goods, such as a worked conch tool, pottery, and a stone bead, it is clear that this burial does not resemble the other burials previously excavated on White's Bay Beach. It is possible that this burial is an example of this shift towards the emergence of chiefdoms at the time of European contact

(Walker 1983; Ferguson 1990, 2000). Burials that are oriented east are tightly linked with the conceptualized view of the spirit world and the cycle of the sun, a common practice of the indigenous inhabitants of South America (Walker 1983). Although this burial was found in isolation and resembled a traditional Christian burial, it is clear that the common practices of the indigenous inhabitants of South America and the connection with their deceased remained. However, it must be acknowledged that a considerable amount of future research will be needed to definitively confirm such claims of the possible shift in their mortuary practices.

The Taíno valued certain stone beads and descriptions from the Spanish state that the Tainan beads were like marble and were either cylindrical or barrel-shaped (Loven 2010). According to Dr. Samuel Wilson, barrel-shaped Taíno stone beads have been found on Nevis and other islands in the Lesser Antilles (personal communication with Dr. Samuel Wilson 2018). Among the Taíno, these beads represented valued possessions owned by the upper-class and were occasionally given as mortuary gifts to the dead in order to distinguish themselves in another world (Deagan 2004; Loven 2010). The presence of this barrel-shaped stone bead confirms the Spanish accounts that these beads existed among the Taíno and disproves the notion that these beads are only related to the Greater Antilles (Deagan and Cruxent 2002; Loven 2010; personal communication with Dr. Georgia Fox 2018; personal communication with Dr. Samuel Wilson 2018). This bead also provides proof that the Taíno migrated, traded, and possibly inhabited the islands in the Lesser Antilles and Nevis during the Ostionoid era.

Worked conch shell tools were also common among the Taíno and were believed to have been manufactured to emphasize the natural internal structures of shells as a way to communicate ideas and imagery in their shell ornaments, ceremonial objects, and tools (Golding-Frankson 2009). The worked conch tool discovered at this site suggests that this was likely a grave offering or a valued possession, providing additional support that this burial associated with the Taíno (Golding-Frankson 2009).

The sex of this individual was unable to be determined. The approximate age of this individual was assessed to be at least 25 years old, but it was likely this individual was older (Buikstra and Ubelaker 1994; White and Folkens 2005). This individual’s stature was not estimated because this burial lacked intact long bones. Although stature methods exist to determine height from fragmented remains (Asfaw et al. 1999; Allison 2002; Little and Rubin 2002), there is a clear lack of comparative skeletal samples among known living Taíno descendant populations and comparable populations.

The cephalic index was unable to be calculated; therefore, an assessment of cranial deformation and the shape of the skull were omitted. The null hypothesis relating to cranial deformation must be accepted because the remains were too fragmented to clearly show if this individual engaged in cranial deformation.

Extreme oblique and lateral attrition was observed on the incisors, possibly as a result of consuming sand or tool manufacturing (Walker 1983; Ubelaker 1999; Weiss 2009; Laffoon et al. 2013). Walker (1983) observed similar oblique wear and determined it was the result of sexual dimorphism in lifestyle habits and labor. As previously mentioned, ethnographic accounts state that the Taíno women completed all the farming and subsistence tasks, including manufacturing *cemís* (Walker 1983; Deagan and Cruxent

2002, 32; Ostapkowicz and Newson 2012; Rodriguez Lopez 2016). It is possible that the oblique attrition is a sign of known sexual dimorphism in labor among women; however, basing the conclusion that this individual is female entirely off the ethnographic accounts and Walker's (1983) analyses is not reasonable. While this data exists, additional skeletal evidence is needed to prove this theory.

Slight cupping and what seemed to be porosity was observed on the sternal end of the first rib, but the remains were in too poor condition for the author to determine if this individual showed signs of OA or if the observed pitting was caused by damage and prolonged exposure (Weiss 2009). The observed pitting on the C2 was later determined to be as a result of sun damage and not OA (Crist et al. 1997).

Conclusions

Historical and archaeological records indicate that the Taíno were agriculturalists, engaged in secondary internments and ritual reburials, and manufactured marble or stone beads and pendants that held value and ritualistic significance among the elite (Rouse 1986, 1992; Wilson 1989; Deagan and Cruxent 2002; Ross 2004; Atkinson 2006; Loven 2010; Ostapkowicz and Newson 2012). A barrel-shaped marble bead and a worked conch tool were found in this burial site, possibly indicating that this individual was of a higher socio-economic status (Deagan 2004; Golding-Frankson 2009; Loven 2010). The presence of these items provide additional evidence to support the hypothesis that this is a Taíno burial and not that of another extinct culture; however, definitive conclusions cannot be made because of this study's small sample size and lack of a comparable sample (Wilson 1990; Deagan and Cruxent 2002; Deagan 2004; Golding-Frankson 2009; Loven 2010; Ostapkowicz and Newson 2012).

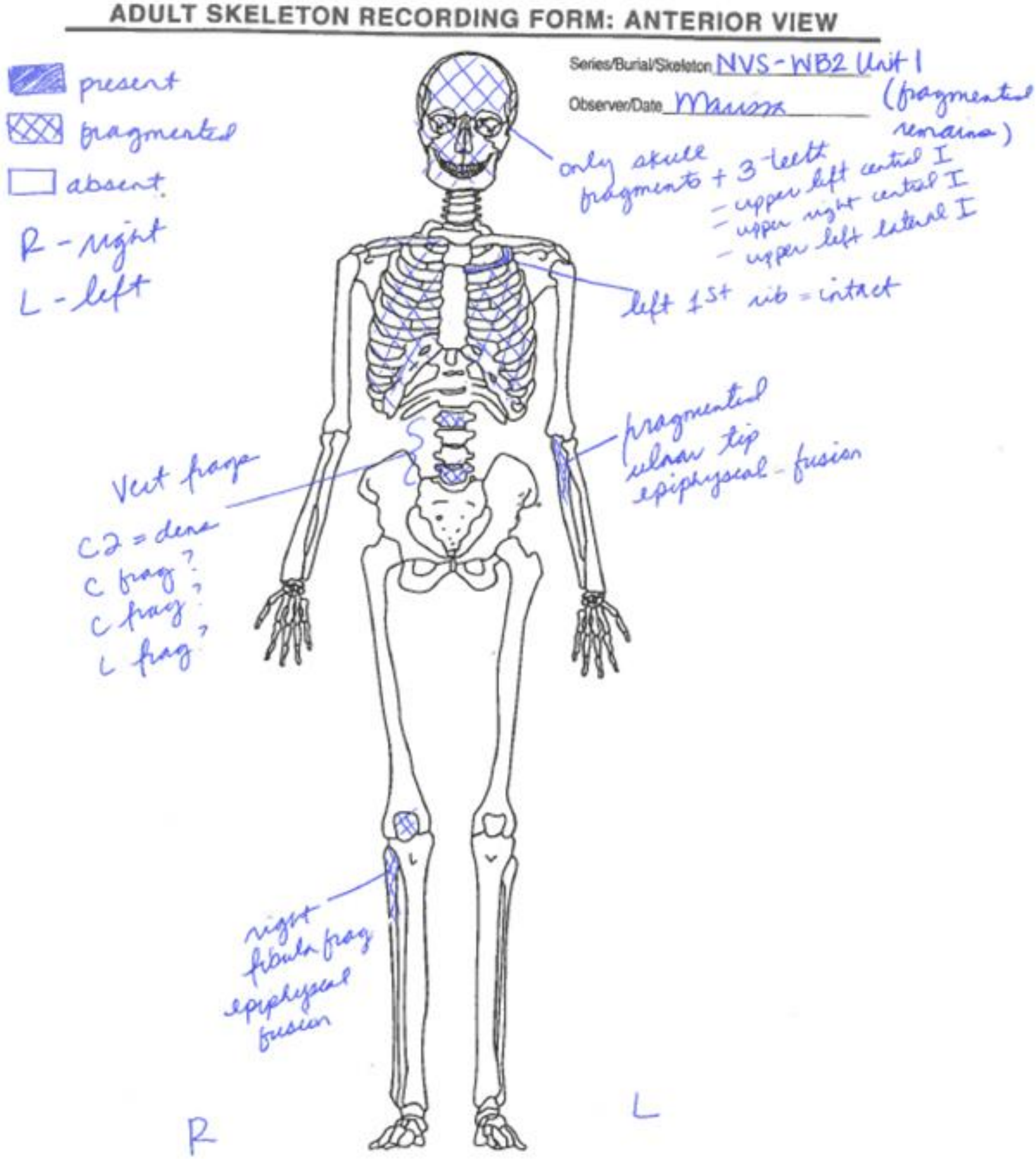
Relating back to the original research questions involving who this individual is and what information can be learned, examining this skeleton assisted with understanding this individual's life story and better interpreting the lives of the prehistoric Taíno peoples on Nevis. Although the information relating to this individual's to age, sex, stature, diseases, and cause of death was limited and incomplete, another element can be added to the Taíno's story. The fact that this individual lived for about thirty years in the Caribbean provides support that the Taíno migrated throughout the Greater and Lesser Antilles and proves that Nevis was inhabited after 800 CE (Taylor 1949; Allaire 1980, 1997a, 1997b; Keegan and MacLachlan 1989; Wilson 1989, 1997; Davis and Goodwin 1990; Snyder et al. 2011; Rodriguez Lopez 2016; Anderson-Cordova 2017).

This burial was excavated with the intention to preserve what is left of this individual. It did not seem reasonable or justified to leave these remains lying in an area where exposure to the sun and weather could potentially result in the loss of this burial to the ocean below. It is my hope that the analysis of this burial, although incomplete and minimal, helps to add clarification to the cultural groups within the Caribbean during this time period. Furthermore, I hope that my analysis of this burial has offered insight into the cloudy and incomplete Taíno past. It is important to note that this individual, in combination with the other burials excavated on White's Bay Beach are not enough to draw conclusions concerning the Taíno, but the skeletal and cultural materials suggest this individual belongs to the Taíno peoples. Thus, lessening the gaps in knowledge relating to the Taíno.

The evidence and research gathered, and the suggestions made in the process of creating this thesis are meant to assist with future archaeological and historical research on Nevis. Furthermore, this research will hopefully assist the NHCS and the extant Taíno and Kalinago population with a better insight of the Taíno prehistory and work to encourage advocacy for the conservation of this, and other, prehistoric sites on Nevis and throughout the Caribbean.

With the clear lack of existing biological and archaeological research completed among the indigenous Taíno, the conservation and future research in this area would allow a more in-depth examination of these, and future, skeletal materials. Thus, providing a more holistic view of the Taíno's expansion and habitation on Nevis, the Tainan culture, and its people, and how they related to the Lesser Antilles and the Caribbean as a whole.

NVS-WB2 Unit 1 Adult Skeleton Recording Form (Fragmented Remains)



NVS-WB2 Unit 1: Fragmented Remains Carbon Dating Results

International Chemical Analysis Inc.
10585 NW 53rd ST.
Sunrise, FL 33351

Sample Report

Submitter Name: Marissa Nicole Massaro
Company Name: San Jose State University Department of Anthropology
Address: One Washington Square Clark Hall Suite 469 San Jose CA 95192

Date Received	January 24, 2018	Material Type	Tooth
Date Reported	February 09, 2018	Pre-treatment	Col-AAA
ICA ID	18T/0158	Conventional Age	700 +/- 20 BP
Submitter ID	NVS-WB-2-U1-FSR	Calibrated Aged	Cal 1260 - 1300 AD (89.8%) Cal 1360 - 1380 AD (5.6%)

International Chemical Analysis Inc.
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Sunrise, FL 33351

QC Report

Submitter Name: Marissa Nicole Massaro
Company Name: San Jose State University Department of Anthropology
Address: One Washington Square Clark Hall Suite 469 San Jose CA 95192

Date Submitted	January 24, 2018	Date Reported	February 09, 2018
QC 1 Sample ID	IAEA C7	QC 2 Sample ID	NIST OXII
QC Expected Value	49.53 +/- 0.50 pMC	QC Expected Value	134.09 +/- 0.70 pMC
QC Measured Value	50.03 +/- 0.20 pMC	QC Measured Value	134.07 +/- 0.10 pMC
Pass?	YES	Pass?	YES

- pMC = Percent Modern Carbon.
- IAEA = International Atomic Energy Agency.

- Calibrated ages are attained using INTCAL13: **IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0–50,000 Years cal BP.** *Paula J Reimer, Edouard Bard, Alex Bayliss, J Warren Beck, Paul G Blackwell, Christopher Bronk Ramsey, Caitlin E Buck, Hai Cheng, R Lawrence Edwards, Michael Friedrich, Pieter M Grootes, Thomas P Guilderson, Haflidi Haflidason, Irka Hajdas, Christine Hatté, Timothy J Heaton, Dirk L Hoffmann, Alan G Hogg, Konrad A Hughen, K Felix Kaiser, Bernd Kromer, Sturt W Manning, Mu Niu, Ron W Reimer, David A Richards, E Marian Scott, John R Southon, Richard A Staff, Christian S M Turney, Johannes van der Plicht.* **Radiocarbon 55(4), Pages 1869-1887**.
- Unless otherwise stated, 2 sigma calibration (95% probability) is used.
- Conventional ages are given in BP (BP=Before Present, 1950 AD), and have been corrected for fractionation using the delta C13.