12-2015

A Comparative Faunal Analysis of British Military Contexts at Brimstone Hill Fortress, St. Kitts, West Indies

Callie Roller Bennett
University of Tennessee - Knoxville, croller2@vols.utk.edu

To the Graduate Council:

I am submitting herewith a thesis written by Callie Roller Bennett entitled "A Comparative Faunal Analysis of British Military Contexts at Brimstone Hill Fortress, St. Kitts, West Indies." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Anthropology.

Walter E. Klippel, Major Professor

We have read this thesis and recommend its acceptance:

Barbara J. Heath, Gerald F. Schroedl

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

A Comparative Faunal Analysis of British Military Contexts at Brimstone Hill Fortress, St. Kitts, West Indies

A Thesis Presented for the

Master of Arts

Degree

The University of Tennessee, Knoxville

Callie Roller Bennett

December 2015

Acknowledgements

This thesis and my profession as a zooarchaeologist would not have been possible without the help and encouragement of several individuals. I would first like to express my appreciation to my thesis committee Drs., Klippel, Schroedl, and Heath. Their time, experience, and expertise was instrumental in the research presented here and in my education as an anthropologist and archaeologist. To my husband and family who have wholeheartedly supported me, I could not have done this without you. I would like to extend my gratitude to the Patricia Black Fund, Department of Anthropology without which integral research for this thesis would not have been possible. Many thanks to the Brimstone Hill Fortress National Park Society and to the government of St. Kitts for the archaeological materials analyzed in this study. Identifications would not have been possible without the zooarchaeological comparative collections housed in the University of Tennessee's Department of Anthropology. Many thanks to those who have contributed to it and continue to help maintain it. To my fellow zooarchaeologists who have provided invaluable encouragement and help, I extend many thanks. Lastly, I would like to especially thank Dr. Walter E. Klippel for his wisdom, intellect, and humor over the course of my undergraduate and graduate career.

Abstract

The Caribbean island of St. Kitts was one of the wealthiest colonies in the British Empire during the late 17th through early 19th centuries because of its production and export of sugar. The British sought to defend the island from foreign invaders by building a large military fortification on the island called Brimstone Hill Fortress. Built beginning in 1690, the fortress was home to a community of enslaved Africans, British army officers, British Royal Engineers, and enlisted soldiers up until its abandonment in the mid 1800s. To feed such a diverse workforce, the British military utilized imported provisions such as preserved fish and barreled beef and pork in combination with locally available livestock and produce. The diets of those residing at Brimstone Hill Fortress varied according to military rank and ethnic origin. Zooarchaeological analysis of faunal assemblages from BSH5 (enlisted men's occupation) and BSH6 (British military guards and sergeants) are examined and compared to faunal data already analyzed from enslaved African and British army officers living quarters. The analysis shows differences in the relative proportions of mammals, birds, and fish at each occupation. The enlisted men at BSH5 consumed relatively more fish and beef compared to those residing at BSH6 whose diet consisted mostly of locally raised sheep and goats. Data from skeletal part frequencies and stable carbon isotope analysis reveal that some of the beef consumed at BSH5 was barreled. This comparative analysis aids in the understanding of how the British military chose to provision its diverse population and in doing so further delineated the social ranks within the fortress walls.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction and Objectives

Zooarchaeology is the study of faunal remains from archaeological sites. Faunal remains have become an increasingly important part of archaeological research, and the field of zooarchaeology has become an integral part of prehistoric and historical archaeological studies (Landon 2005; Reitz and Wing 1999; Brewer 1992; Crabtree 1985). This field has vital importance to many archaeological investigations because it can provide an array of information regarding past human behavior. Zooarchaeologists focus on a variety of topics such as subsistence, foodways, animal domestication, resource procurement, hunting strategies, seasonality, and reconstruction of past environments. Subsistence and foodways are the focus of analysis in this thesis. Subsistence studies evaluate how past populations acquire animal resources for dietary needs. Subsistence analyses attempt to ascertain what animal taxa are procured, which are most predominant, and what changes in resource acquisition can be seen through time (Twiss 2012; Brewer 1992:200). Foodways take subsistence studies a step further to include the social practices associated with the preparation and consumption of foods (Welch and Scarry 1995; McKee 1987).

It would be challenging to examine human populations in the past without considering how they met their daily needs that were necessary for survival. Food sustains life and is an essential part of human existence. Not only does food provide nourishment, it can become a marker for individuality and group identity (Twiss 2012; Mintz and DuBois 2002; Wilk 1999; McKee 1987). As Katheryn Twiss (2012:360) explains, a person's need for "constant nutritional input renders food both cognitively prominent and physically ubiquitous," which makes food a well suited subject for archaeologists studying aspects of culture, gender, social structure, and ethnic identity.

This thesis explores food refuse coming from one of the largest military fortifications in the Caribbean, Brimstone Hill Fortress. The fortress is located on the island of St. Kitts and was constructed during the late 17th through the 19th centuries. Archaeologists working at Brimstone Hill have unveiled large numbers of artifacts that they have used to investigate the lives of enslaved Africans and British military personnel residing within the fortress walls (Ramsey 2011; Ahlman et al. 2009; Camp 2007; Klippel and Price 2007; Hill and Schroedl 2003; Schroedl and Ahlman 2002; Klippel 2001; Klippel and Schroedl 1999). The faunal remains being analyzed here represent food refuse attributed to enlisted soldiers and other military personnel residing within the military complex. Foodways (i.e. the practices associated with the production and consumption of food) can function to highlight and reinforce social boundaries (Welch and Scarry 1995; McKee 1987). What a person eats, who they eat with, and how their food is prepared and served offer clues to identity and social status. This thesis examines those social boundaries using zooarchaeological techniques.

The goals of this thesis are as follows: to provide a zooarchaeological analysis of two faunal assemblages from Brimstone Hill, to examine the presence and use of imported provisions in the diet of those residing at the fortress, and to examine social differences among people of different status and ethnicity at the fortress using zooarchaeological techniques. Previous zooarchaeological research by Ramsey (2011) and Klippel (2002, 2001) has indicated dietary differences among enslaved Africans and British military officers residing at the fortress. Klippel (2002, 2001) analyzed faunal refuse from enslaved African context at the fortress from an area known as BSH2. The majority of the enslaved African diet was imported salt beef along with preserved salt cod. Fresh provisions were not as prevalent but included sheep, goats, and fresh fish. This contrasts with another enslaved African occupation known as BSH3 where British

Royal Engineers also resided. Ramsey (2011) has analyzed faunal remains from this location within the fortress, and her results indicate that both of these social groups were consuming locally available sheep and goats along with smaller amounts of pork and beef. The British Royal Engineers and the enslaved Africans at BSH3 ate a variety of local fishes. However, the African faunal assemblage at this location had a combination of fresh fish and imported salt fish (Ramsey 2011).

Zooarchaeological research thus far at Brimstone Hill Fortress shows social differences between high ranking British army officers and enslaved Africans, and it also shows that there are differences between Africans at BSH2 and BSH3 (Ramsey 2011; Klippel 2002, 2001). An important goal of the archaeological investigations at Brimstone Hill was to compare and contrast the daily lives of British army officers, enlisted soldiers, and enslaved Africans. The addition of faunal data from two other locales occupied by British enlisted men and other British military personnel helps accomplish this goal. It generates a better understanding of how the British military provisioned its workforce at the fortress and in doing so accentuated socioeconomic boundaries already in existence.

Chapter 2: St. Kitts

St. Christopher (commonly referred to as St. Kitts) is part of the group of islands known as the Lesser Antilles located in the north eastern Caribbean Sea. St. Kitts was initially discovered by Christopher Columbus on his second voyage to the New World in 1493 but remained unsettled by Europeans until the beginning of the 17th century (Higman 2011; Metzgen and Graham 2007; Merrill 1958; Alexander 1901). The island itself was settled by both England and France in the early 1620s but eventually fell under British rule by the year 1713 (Higman 2011; Metzgen and Graham 2007:32; Davies and Shafer 1974; Parry and Sherlock 1966; Merrill 1958; Crist 1949; Russell 1778: 524). Despite being only 18 miles long and averaging five miles across, the island of St. Kitts became one of Britain's most important and prized new world colonies because of its production and export of sugar. The natural topography of St. Kitts was well suited for a variety of purposes, especially sugar growing. As William Russell (1778) remarked, the island is

> full of high and barren mountains, intersected by rocky precipices. The center of the island is full of clivities of the mountains, which are cultivated as high and possible… The soil is in general light and sandy, but very fruitful; and the plantations are well watered by several rivulets, which run down both sides of the mountains (Russell 1778:72).

Smaller islands like St. Kitts had a geographical advantage for sugar-growing and sugar-making. Not only were they more accessible, they could be colonized and defended relatively easily when compared to islands of larger size. Sugarcane became the staple crop of St. Kitts and other West Indian islands by the late 1660s, and within a few years became the exchange currency for most European powers (Higman 2011; Smith and Watson 2009; Schroedl and Ahlman 2002; Parry and Sherlock 1966; Merrill 1958). A sugar monoculture ensued that transformed the economic and social structure of Caribbean life.

Sugar colonies like St. Kitts witnessed dramatic shifts in their populace once sugar plantations were established. By the turn of the 18^{th} century populations of French and British islands that had been predominantly European became predominantly African (Smith and Watson 2009; Higman 2000; Davies and Shafer 1974; Curtin 1972; Parry and Sherlock 1966). Enslaved laborers were in high demand, and the Atlantic slave trade was in full force transporting Africans across the Atlantic by the thousands. In the British West Indies an estimated 1,500,000 enslaved Africans were imported during the 1620s to the 1770s, most destined for plantation labor (Curtin 1972; Sheridan 1972:29, 30). By the second half of the 18^{th} century, sugar dominated the Caribbean economy. Sugar plantations became extremely profitable, and usable land for growing sugarcane was at an all-time premium. In an attempt to save land and allocate more time for sugar production, European planters imported foodstuffs in combination with locally available resources to feed large workforces of enslaved Africans.

The enslaved cultivated crops and raised livestock on some islands through a system of provisioning grounds, but planters supplied much of their meat that included rations of imported salted fish, beef, and pork (Higman 2011, 1984; Sheridan 1972; Edwards 1966). Large Caribbean islands like Barbados and Jamaica that had more land available for slave subsistence did not rely heavily on imports to feed the enslaved. Bean's (1977) research on food imports into the British West Indies shows that more food was produced than imported in Jamaica and Barbados from 1680 to 1816. In fact, for a period of time in the late 17^{th} century the enslaved populations on these two islands were self-sufficient in their food production. However, the ever increasing demand for sugar soon gave way to rising populations of enslaved Africans and more land being devoted to sugar production which, in turn, led to a greater reliance on imported foods (Bean 1977; Pitman 1918:98, 99).

Smaller islands like St. Kitts did not have sufficient amounts of land to set aside for provision grounds. Most crops like corn and yams that enslaved people would have grown had to be imported, and fresh livestock was replaced with preserved meats (Bean 1977; Sheridan 1976; Parry and Sherlock 1966; Pares 1956; Pitman 1918). By the late 18^{th} century planters on St. Kitts provisioned the enslaved with one and a quarter pounds of preserved salt fish, barreled beef, or barreled pork per week. Double the quantity of fresh fish or other fresh provisions was to be given when salted rations were unavailable (Edwards 1966:178). Fresh provisions obtainable on St. Kitts included mutton, pork, beef, and rabbits as well as turkeys, geese, and ducks (Smith 1745). Research by Ramsey (2011) and Klippel (2001) confirms that enslaved Africans on St. Kitts were able to acquire some of these locally available foods in addition to imported rations of salt fish and barreled beef and pork.

Barreled Provisions

Import-based subsistence was vital to St. Kitts and other West Indian islands. As Parry and Sherlock (1966:159) remark, sugar islands in the British West Indies "depended heavily on the outside world" because much of their food and goods were imported. Barreled beef and pork were perhaps the most common imported protein sources going to the West Indies. Take for instance that in the year 1680 approximately 4,766,126 pounds of barreled beef and pork were imported to Barbados which was more than double the quantity of preserved fish imports for the same year (Bean 1977:582). Fish imports included salted herring, mackerel, and cod. The latter of which became a cheap alternative for provisioning enslaved Africans in the West Indies (Kurlansky 1997). Salt-curing cod is a demanding process. The fish must be split, salted, and dried without retaining any moisture. Poor weather conditions during the drying process and the addition of too much or too little salt resulted in an inferior product that spoiled easily. This inferior quality cod was termed “West Indian Cod” and marketed specifically for island planters in the West Indies to feed enslaved laborers (Klippel 2002; O’Leary 1996).

Historic records contain very useful information describing the packing and preservation process for salt beef and pork. As European colonization swept through the Caribbean and parts of mainland North America, the demand for salted meat provisions increased greatly and meatpacking industries began to flourish throughout parts of North America and northern Europe (Walsh 1982; Jensen 1954).

Regulatory acts were put in place to standardize the salting and packing processes. Hierarchical grades of meat were established based on cut and quality. The excerpts below are taken from Inspector William Moore (1820:162-164) out of Canada concerning an act to regulate the curing, packing, and inspection of beef and pork. Accordingly, beef

> shall be sorted and divided into three different sorts for packing and re-packing in Barrels and half-barrels, to be denominated MESS, PRIME and CARGO. Mess Beef shall consist of the choicest pieces of Oxen, Cows, or steers well fattened, the shin, shoulder, clod and neck shall be taken from the fore-quarters, and the legs and rounds from the hind-quarters.

Mess beef was the highest quality and consisted of choice pieces from the ribs and rumps. Prime beef was composed of “coarse pieces of one side of the carcass, the houghs and neck being cut off above the first joint” (Moore 1820:162-164). The lowest grade was Cargo beef and included neck and shank elements.

> Prime Beef shall consist of choice pieces of Oxen, Steers, Cows, and Heifers, amongst which there shall not be more than half a neck and one shank with the hock cut off, … Cargo Beef shall consist of fat Cattle of all descriptions of three years old and upwards, with not more than half a neck and three shanks without the hocks in each barrel or half-barrel (Moore 1820:162-163).

Historic accounts suggest that planters in the West Indies routinely provisioned their enslaved workforce with poor quality Cargo beef whereas superior quality Mess beef was destined for military consumption (Macdonald 2006; Kurlansky 1997:81; Walsh 1982:36).

Like beef, barreled pork was marketed throughout most of the New World and was graded according to content.

> Mess Pork to consist of the rib pieces of good fat Hogs only. … Prime Pork to consist of the next best pieces, with not more than three shoulders in one barrel, which shall contain no legs, nor more than twenty pounds of head that shall have the ears cut off and the snout above the tusks, the brains, and bloody grizzle taken from out of the head, … And the third quality of Pork shall be denominated CARGO PORK, in which there shall not be more in one barrel than four shoulders without the legs as aforesaid, and not more than two heads with the ears cut off and snout, and brains and bloody grizzle taken out as aforesaid (Moore 1820:7,8)

Large quantities of Prime pork were sold in the West Indies as well as the slaveholding South. This grade of meat was considered an inferior product and was advertised as an inexpensive protein source to feed the masses (Skaggs 1986:40). Higher grades of pork like Clear and Mess received the greatest amount of care during preparation. In general, the pig carcasses were cut into three main sections – hams, shoulders, and middles or sides (Skaggs 1986:39; Walsh 1982:32). These cuts would then be put in salt and brine solutions, cured, and packed into barrels according to the grades mentioned above. Customers of higher-quality pork included much of the world’s navies and active military (Macdonald 2006).

Chapter 3: Brimstone Hill Fortress

The sugar revolution that swept through the West Indies not only transformed the physical and social landscape, it also initiated competition among European powers for control over island territory. Many Caribbean islands became so profitable that European powers sought to defend them by building fortifications and housing active militias on site (Buckley 1998; Parry and Sherlock 1966; Pitman 1918). By the end of the 18th century, the British military had permanent garrisons of soldiers and military fortifications on every island in the British West Indies including St. Kitts (Buckley 1998:84).

Stemming from the success of sugar production on St. Kitts, the British needed active military establishments along the island to secure their occupation and ward off foreign adversaries. Brimstone Hill Fortress (abbreviated BSH) was one such establishment. It was constructed beginning in 1690 and became a monumental marker for British colonial power throughout the Caribbean (Ahlman et al. 2009; Schroedl and Ahlman 2002). The fortress is located along the western coast of the island and rises approximately 750 feet above sea level (Buckley 1998:75). It was built using the natural landscape of an existing hill along with the addition of limestone mortar and stone to create a large 40-acre military complex. Except for a brief period of French occupation in 1782, the British maintained full control of BSH until its abandonment in 1853 (Ahlman et al. 2009; Schroedl and Ahlman 2002; Buckley 1998: 78; Smith 1994; Parry and Sherlock 1966).

The population of BSH consisted of British army officers, British Royal Engineers, enlisted soldiers, and enslaved Africans. Each group had its own set of responsibilities designed to keep the military complex functioning at its best. Enslaved Africans owned by the British military and conscripted from surrounding sugar plantations labored on the construction and maintenance of the fortress (Ahlman 1997; Schroedl 1997). Enlisted soldiers living within the fortress walls were housed in barracks large enough to accommodate hundreds of individuals. British Royal Engineers and army officers were fewer in number and housed in their own living quarters (Ramsey 2011; Schroedl 2000; Smith 1994).

Feeding such a diverse population of people required planning on the part of the British military. An import-based subsistence strategy was put in place to feed the fortress' workforce of enlisted soldiers and enslaved Africans. The imported rations coming into St. Kitts included a variety of goods, but the British military utilized salt beef, salt pork, and several species of preserved fish to feed its inhabitants (Klippel 2002; Buckley 1998:349, 1979; Bean 1977; Parry and Sherlock 1966; Pares 1956). Africans were generally given rations of imported fish and supplemented their meals with homegrown fruits and vegetables (Richardson 1983:102). The weekly British soldiers' diet in the West Indies consisted of "about seven pounds of bread or flour, a little more than four pounds of beef and pork, six ounces of peas, and eight ounces of rice" (Buckley 1998:350). This basic diet was supplemented with whatever foods they could acquire by bartering or purchasing items at market (Schroedl and Ahlman 2002; Buckley 1998). High ranking British officers were not subject to the weekly rations given to soldiers and enslave workers. Instead they made their own eating arrangements and either had a "mess financed by subscription" or "engaged a sutler" that supplied daily dinner (Buckley 1998:351).

Chapter 4: Brimstone Hill Fortress Sites

Archaeological excavations at BSH began in 1996 and continued each summer through 1999. Excavations resumed in 2004 and ended again following the 2008 field season. Overall, the archaeological work at BSH identified six different locations labeled by number (Figure 1, Appendix 2). This thesis examines faunal materials from Brimstone Hill 5 and Brimstone Hill 6 and compares the results with vertebrate faunal data already analyzed from two other locals, Brimstone Hill 2 and Brimstone Hill 3 (Ramsey 2011; Klippel 2001).

On the west side of the fortress is Brimstone Hill 2 (BSH2). It is located 60 meters below Brimstone Hill's summit and lies beneath a stone wall that connects the Orillon and Magazine bastions (Schroedl 1997). A British Engineer's map dating to 1791 shows the location of various buildings including a kitchen and craftsmen's buildings that were utilized by enslaved Africans. Archaeological excavations at BSH2 have uncovered artifacts relating to the workspaces of African artificers' as well as Afro-Caribbean wares and European ceramics (Ahlman et al. 2009; Schroedl and Ahlman 2002; Schroedl 1997). To the north of BSH2 lies Brimstone Hill 3 (BSH3). This location includes two major terraces that were occupied by British Royal Engineers and enslaved Africans (Ramsey 2011; Schroedl 1998). The BSH3 complex encompasses office space and residential areas attributed to Royal Engineers as well as living and working areas occupied by Africans.

Brimstone Hill 5 (BSH5) was occupied by British enlisted men. It encompasses an area known as the North East Work. BSH5 began as a refuge fortress that was completed in the early 1720s, but it was not until after 1783 that internal buildings appeared in the BSH5 area (Schroedl 2007; Smith 1994). The initial layout consisted of two bastions and a connecting curtain that were later renovated and raised in the 1790s. A mobile hospital was built between the two bastions in the 1780s and 1790s along with housing units for the soldiers. It was around this same time that BSH5 transitioned to a more formalized military base that could accommodate large numbers of soldiers by building a barracks area (see Figure 2, Appendix 2 for complete map of excavation areas). Two barracks, labeled as Barracks No. 4 and Barracks No. 5 on historic maps, were constructed at different times to house infantry men along with two kitchens that served as cookhouses (Schroedl 2007, 2006; Smith 1994).

Barracks No. 4 was built in the late 18th century, no later than 1791 (Schroedl 2006:9; Smith 1994:11). Maps and drawings from 1793 and 1810 provide more detailed descriptions of the layout of Barracks No. 4. The building was constructed along with a cookhouse that was erected a few meters to its north (labeled as 1790s Kitchen in Figure 2). Barracks 5, located to the north-northeast of Barracks 4, was a wooden structure built sometime around 1810 and was later replaced with a more substantial stone building in 1824 (Schroedl 2007: 9; Smith 1994: 11, 22). As Barracks 5 was being rebuilt, the 1791 cookhouse was demolished and a new one was constructed roughly 10 meters to the north-northwest (labeled 1830s Kitchen, Figure 2). Two meters north of Barracks 5 location is a cistern that was installed in 1845 along with the Soldier's Washroom (Figure 2) located on the exterior of the left bastion wall (Schroedl 2007:9; Smith 1994:24).

Brimstone Hill 6 (BSH6) is located to the west of BSH5 and includes several structures all located within the Orillon Bastion. Beginning sometime before 1750, an ordnance building was constructed followed by an ordnance yard that was built in 1802 and later rebuilt after fire damage in 1823. In addition, a barracks complex was constructed that included a married men's hut, guard houses, servants' room, sergeants' quarters, medical stores, and a dead house (BNA WO55/937, Office of Ordnance, Estimate of Probable Expense for Repair of Ordnance

Buildings, 31 March 1802; BNA WO55/945, Tolfrey to Beaver, 16 May 1823). The barracks themselves were in place prior to 1791 but were eventually converted into a hospital that was demolished and rebuilt sometime around 1820. As Figure 3 illustrates, excavations from BSH6 have uncovered the remnants of several structures that likely represent buildings from part of the barracks and hospital complex. Given the nature of the occupations at BSH6, not many persons resided here at one time. Those that did were likely part of the British military that included guards, sergeants, and medical staff.

Chapter 5: Methods of Recovery

Faunal remains were hand excavated on the island during the 2006 and 2007 field seasons by university students and local residents of St. Kitts. Excavations were carried out using 1 by 1 meter squares dug in arbitrary 10 centimeter intervals. All of the archaeological material recovered was dry-screened by hand. The faunal materials were catalogued, bagged, and separated from other artifacts and debris. Once separated, the faunal remains were transported to the United States to the University of Tennessee's Zooarchaeology Laboratory facilities where identification took place.

Faunal remains from BSH5 include 71 units with a combined total of 259 levels ($25.9m^3$) from four general occupation areas: A mobile hospital, a wash house, and excavations of the two kitchens built around 1791 and the 1820s (Schroedl 2007; Smith 1994). All 71 units were dry screened through one-quarter inch (6.4mm) mesh, and four units were further dry screened through one-eighth inch (3mm) and one-sixteenth inch (1.5mm) mesh. The faunal assemblage from the BSH6 location covers 66 units with a collective total of 108 levels. All faunal materials from BSH6 were screened only through one-quarter inch (6.4mm) mesh.

Information gleaned from the faunal analysis was put into a database using Microsoft Access and Excel. Each bone fragment was identified to a taxonomic category based on the Linnaean Taxonomic System (i.e. Class, Order, Family, Genus, Species). Bones that could not be identified to a taxonomic category were labeled as "Unidentifiable." In addition to taxon, bones were categorized by their skeletal element (e.g. femur, humerus) plus the side and portion of the bone. Archaeological specimens that could not be identified to specific skeletal element were assigned general terms such as "long bone" in the database. Faunal remains that were too fragmentary for skeletal element identification were marked as unidentifiable.

Additional information relating to taphonomic processes was also documented. Butchering evidence such as cut, chop, and saw marks was recorded when present. Burning or calcination observed due to heat damage was noted as well. Supplementary information concerning the age and sex of certain bone fragments was added to the database as "Notes." If present, root etching and weathering were also described here. Bone fragments were not weighed for this analysis. Bone artifacts and debris from the manufacturing of bone buttons (see Klippel and Price 2007; Klippel and Schroedl 1999 for further discussion) were counted, recorded, and labeled as "Artifact" and "BBD" (bone button debris).

Identification

Identifications of faunal remains from BSH were carried out by comparing the archaeological bones to specimens in the comparative collection. In addition, manuals compiled by Sisson (1921), Olsen (1968), Gilbert (1990), and White and Folkens (2005) aided in the identification and naming of certain bone elements. The first objective in the process of zooarchaeological identification is to assign a specimen to a taxonomic category using the Linnaean Taxonomic System. Faunal analysts begin by identifying the most general taxonomic category a specimen is from and move toward more definitive categories, the most specific being species. Since this thesis is concerned with vertebrate faunal remains, the most general taxonomic category utilized is Class. The following five classes of animals are represented in the faunal material from BSH: Amphibia (amphibian), Aves (bird), Mammalia (mammal), Reptilia (reptile), and Osteichthyes (bony fish). The skeletal systems of each class of animals have unique features that set them apart from other animal classes (Beisaw 2013:18; Reitz and Wing 1999). This is mainly due to similarities in modality. For example, most birds fly, fish swim, and mammals move about in various forms requiring their limbs to absorb impact. As a result, vertebrates belonging to a particular class can be differentiated from other animal classes based on generalized morphological traits in the skeleton.

Achieving levels of taxonomic identifications beyond class is where the real work begins. Skeletal elements that are relatively complete can, for the most part, be categorized to at least class. Fragmented bones, however, pose challenges for higher level taxonomic identification, and the bone material from BSH is no exception. When identifying such bones from an archaeological site, it is beneficial to have a working knowledge of the geographical range of past animals in that area. Fortunately, the historic context and island setting of BSH helped narrow the possible species present in the faunal refuse recovered from BSH5 and BSH6.

The identification of mammal remains was relatively easy because of the considerable presence of domestic animal species (i.e. cattle, pig, and horse) that were imported to the island along with smaller commensal species like rats that were introduced. Mammal bones that could be identified by skeletal element (e.g. phalanx) but lacked any identification past the class level were graded into size categories of Small, Medium, and Large. For the BSH faunal remains, “Small Mammal” refers to any rodent-sized organism such as a rat. Animals such as dogs, cats, and pigs fall within the “Medium Mammal” category. “Large Mammal” would indicate bones that are in the size parameter of horse or cattle. Admittedly, these three size categories are arbitrary and not explicitly defined, but they are used here to provide general information for mammalian remains that remain largely unidentifiable past the class level.

The main difficulty with mammal identifications came when trying to distinguish sheep (*Ovis aries*) from goat (*Capra hirca*) because these two species share very similar osteological morphology (Zeder and Lapham 2010; Boessneck 1970). When possible, criteria provided by Zeder and Lapham (2010), Payne (1985), and Boessneck (1970), was used to discriminate the bones of these two species. As noted by Boessneck (1970), the difficulty of species identification is multiplied when dealing with specimens from an archaeological site that are highly fragmented. In the case of the BSH material, making a positive distinction between sheep and goat was complicated and in most cases unfeasible. Moreover, the landmarks used to make a distinction were few in number and in most instances had either been worn away by natural processes or were not present on the archaeological bone specimens. To better illustrate the presence of these two species at BSH, the term Caprine is used to classify sheep and goat into one taxon for further zooarchaeological analysis and discussion.

Fish identifications below the class level posed the most difficulty. Fish remains are one of the most variable types of fauna recovered from archaeological sites (Colley 1990; Wheeler and Jones 1989). Their delicate nature and susceptibility to poor preservation over time can limit the variety of bone elements found in faunal refuse. Fish vertebrae are generally the most durable and common bones recovered from archaeological sites and in some instances can lead to species identification (Klippel and Sichler 2004; Colley 1990; Wheeler and Jones 1989). Other bones located in the mid-cranial region have diagnostic features that can be used to make positive identifications to at least the family level and in some circumstances to genus and species with an adequate comparative collection (Beisaw 2013; Wheeler and Jones 1989).

Fortunately, the zooarchaeological comparative collection at the University of Tennessee has a synoptic collection of Caribbean fish that was instrumental for making higher level classifications. Bones that were used in this thesis to identify fish to the family level and below include the: articular, ceratohyl, cleithrum, dentary, hyomandibular, maxilla, opercular, post temporal, premaxilla, preopercular, quadrate, and vertebrae. Without such an adequate comparative collection, identifications of certain fish species would not be possible and key inferences into diet would remain unknown. In addition to the synoptic collection, the Field Guide to Tropical Marine Fishes of the Gulf of Mexico, Florida, the Bahamas, and Bermuda by Smith (1997) and Atlantic Coast Fishes by Robins and Ray (1986) helped to narrow the possible genera that could be identified by taking into account the geographic distributions of particular fish species.

The identification of bird remains from BSH5 and BSH6 was carried out using the comparative collection as well as field guides from Bond (1993) and Peterson et al. (1993). The only challenge in higher level identifications came when trying to distinguish domestic chicken (*Gallus gallus*) from guinea fowl (*Numida meleagris*). Both species belong to the same order, Galliformes, and share similar osteological morphology. MacDonald (1992) provides detailed descriptions for differentiating the two genera using landmarks on eight skeletal elements. If possible, the distinction between domestic chicken and guinea fowl was made on the bones in question. However, the relative incompleteness and differential survival rate of avian bone made making a positive distinction between the two genera quite challenging. Thus, when bone specimens were known to belong to either a chicken or guinea fowl but the distinction could not be made between the two species, the bones were labeled as domestic chicken (*Gallus gallus*) by default.

Peterson's Field Guide to Reptiles and Amphibians of Eastern and Central North America (Conant and Collins 1991) and Fish, Amphibian, and Reptile Remains From Archaeological Sites Part I: Southeastern and Southwestern United States (Olsen 1968) were used to aid in the identifications of reptile and amphibian remains from the BSH faunal assemblages. Various reptiles and amphibians would have been present on the island of St. Kitts.

However, faunal remains from these two classes of vertebrates were limited in both BSH assemblages and most bone specimens could only be identified to order or family.

Quantification

Vertebrate faunal analysts have several options for quantifying bones from archaeological sites. Since the 1970's there has been much debate in the zooarchaeological literature about the advantages and shortcomings of two quantification methods, Number of Identified Specimens Present (NISP) and Minimum Number of Individuals (MNI) (Otárola-Castillo 2009; Lyman 2008, 1994ab, 1987; Grayson and Frey 2004; Betts 2000; Reitz and Wing 1999; Marshall and Pilgram 1993; Crabtree 1990, 1985; Gilbert and Singer 1982; Grayson 1978, 1973). Each of these methods are used to measure relative frequencies of taxa in faunal assemblages, but this thesis will use NISP along with another quantification method known as the Minimum Number of Elements (MNE) (Lyman 2008, 1994ab, 1987; Binford 1984; Watson 1979).

Before beginning any type of quantification analysis, certain factors should be considered for the archaeological site in question as there are a number of cultural and natural processes that affect faunal assemblages. The animal bones from BSH are primarily a result of human activity. As a result, the abundance and distribution of certain taxa varies across sites. The quantification methods used must provide a way to measure these variations. As Reitz and Wing (1999:327) suggest, the methods used in the faunal analysis should match the research objectives. The ultimate goal for this study is to see how the British military provisioned its workforce. BSH was home to a multiethnic, stratified community. Social and cultural boundaries were drawn in many ways, food being one.

NISP is an observational unit of measurement that counts each individual bone fragment. It is primary data that can be used to estimate the frequency of taxa at an archaeological site

(Lyman 2008:27, 1994b:100; Reitz and Wing 1999:191,192). However, applying NISP to frequency measurements can become problematic. The analysts must assume fragmentation of bone is uniform and recovery rates are constant for each animal taxa (Reitz and Wing 1999: 192). Likewise, cultural and non-cultural processes are considered to be unvarying across all bone specimens. While some zooarchaeologists criticize the use of NISP, it has been advocated by others as a reliable tool of analysis for faunal remains, especially when there is a high degree of fragmentation (Reitz et al. 2006; Grayson and Frey 2004; Marshall and Pilgram 1993; Ringrose 1993; Grayson 1984).

Subsistence practices such as the procurement, processing, butchering, and cooking of foodstuffs undoubtedly effect NISP measurements as well as non-subsistence practices like the manufacturing of bone buttons on St. Kitts (Klippel and Schroedl 1999). The faunal assemblages being analyzed in this thesis are primarily the result of discarded waste, and the leading cause of modifications on the bone specimens concerns activities related to food preparation and consumption. These factors influence NISP counts, but other quantification methods like the MNI (for further discussion see Reitz and Wing 1999; Grayson 1978; White 1953) are also impacted (Reitz and Wing1999; Kent 1993) especially if the assemblage in question has a high rate of fragmentation. NISP is used in this thesis to measure the relative abundance of different animal taxa and to cross-compare faunal data that have already been analyzed from other BSH occupation areas (see Ramsey 2011, Klippel 2001). Lastly, NISP calculations can be easily replicated and do not require a high rate of subjectivity from the analyst.

Minimum Number of Elements is considered a derived unit of measurement. It is a modified version of NISP that attempts to estimate the minimum number of skeletal elements (e.g. humeri, femora, etc.) represented in an assemblage of bone fragments (Reitz and Wing

1999; Lyman 1994ab). For example, if there are two proximal humeri and four distal humeri the MNE would be four. The NISP, however, would be six. Measurements of MNE can be used to assess body part representation and are a useful tool of analysis when discerning consumption practices with the faunal material from BSH. Converting fragmented faunal assemblages into derived units of measurements like MNE is not a simple task, and techniques for doing so vary widely across zooarchaeological literature (Marean et al. 2001; Reitz and Wing 1999; Lyman 1994b; Crabtree 1985; Klein and Cruz-Uribe 1984; Watson 1979).

The procedure for calculating MNE for this study examines the skeletal elements in question, making sure that bone fragments identified as the same skeletal element do not overlap or cover the same portion of bone. The faunal assemblages from BSH5 and BSH6 are highly fragmented. As a result, only certain portions (e.g. *proximal* rib) of bone from identified specimens were used to calculate MNE. As bone fragments become smaller they are less likely to be distinguishable from one another. This problem particularly affected the analysis of mammalian ribs and vertebrae identified from both BSH5 and BSH6 faunal assemblages. For this reason, the bone specimens that were too fragmentary and could not be identified to a specific *portion* or side of a skeletal element (e.g. right *proximal shaft* of a rib) were removed prior to the MNE calculation. In addition, the enlisted men's faunal assemblage from BSH5 covers multiple areas of excavation. For this reason, MNE was calculated for each excavation area including the 1790s Kitchen, 1830s Kitchen, Mobile Hospital, and Soldiers' Washroom. The totals for each element were then combined with the totals from the other areas in order to achieve a more precise estimation. Age was also taken into consideration when estimating the number of skeletal elements as epiphyseal fusion of long bones and other elements occurs at different rates for the proximal and distal portions of bone (Reitz and Wing 1999; Silver 1963).

Chapter 6: Results

A list of scientific and common names mentioned in both BSH faunal assemblages is provided in Table 1 located in Appendix 1. The BSH5 faunal results are discussed first followed by the faunal data from BSH6. All tables and figures mentioned in this text can be found in Appendix 1 and Appendix 2, respectively.

BSH5 Assemblage

A total of 60,746 bone specimens were recovered and analyzed from BSH5. Nearly 47% (n= 28,459) of the remains were too fragmentary for identification and were considered unidentifiable. Artifacts including bone button debris and bone handles make up 2.1% (n= 1,297) of the total assemblage. Mammals account for 46.8% of the overall faunal assemblage with 28,410 individual specimens. Osteichthyes, or bony fish, make up 4.1% (n= 2,472), and the remaining percentage includes specimens identified to Reptilia (n= 6), Amphibia (n= 1), and Aves (n= 101) that each make up less than 1% of the total BSH5 faunal assemblage. Table 2 shows the BSH5 faunal assemblage with percentages provided for each class including the unidentifiable remains and the bone button debris.

Of the 28,410 mammal bones recovered from BSH5, only 7% (n=2,099) could be attributed to a specific genera (Figure 4). The label “Other genera” includes dog (*Canis familiaris*) (n=4), horse (*Equus caballus*) (n=1), cat (*Felis domesticus*) (n=11), mongoose (*Herpestes javanicus*) (n=1), and human (*Homo sapiens*) (n=2) remains that when combined account for only 1% of the total mammal identified to genus. Two percent of the mammals belong to the genus *Rattus* that includes a mixture of brown (*Rattus norvegicus*) and black (*R. rattus*) rat. *Bos taurus*, or cattle, make up the majority of mammal bones with 66% (n=1,398).

Caprines (*Capra hirca* and *Ovis aries*) are the second most common with 17% (n=350), while pig (*Sus scrofa*) remains constitute 14% (n=288) of the total mammal bones identified to genus.

Fish remains contribute to 4.1% (n=2,472) of the total faunal assemblage from BSH5. However, only 133 specimens (5%) could be identified to the family level. The overwhelming majority of fish remains (n=2,339) could only be identified to class. Figure 5 provides percentages of the 133 fish identified to family (for individual family and genus specimen counts refer to Table 2).

The majority of fish remains that were only identified to the family level belong to Clupeidae with 60% (n=80). This family of fishes includes herrings, shads, and sardines. Their presence in the BSH5 assemblage is indicative of salted provisions and are discussed in greater detail in Chapter 7. Commonly referred to as needlefish, Belonidae make up the second highest proportion of fish identified to the family level with 9% (n=12). Nine of the 12 Belonidae bones belong to the houndfish, *Tylosurus crocodilus*. Carangidae (common names include jacks and pompano) and Serranidae (sea bass and grouper) constitute 7% each of the total fish identified to family. Six percent (n=8) of the remains are those of parrot fish from the family Scaridae that includes two species, *Scarus vetula* and *Sparisoma* spp. Snappers from the Lutjanidae family and mackerel (*Scomber scombrus*) from the Scombridae family each make up 4% of the BSH5 fish assemblage. The remaining families of fish include Sciaenidae (drum), Sparidae (porgies), and Sphyraenidae (barracuda) that each constitute 1% of the total.

Reptile remains (n=6), while few in number, include one specimen from the Cheloniidae (sea turtle) family, two specimens belonging to scaled reptiles from the order Squamata, and one bone from an iguanian lizard, *Anolis*. Two specimens belonging to Reptilia could not be identified past the class level. Amphibians identified from BSH5 are represented by only one bone fragment that was identified to the order of frogs known as Anura.

The Avian assemblage from BSH5 has a combined total of 101 bones of which 58% (n=59) were identified to the family, genus, and species levels. Out of the 59 specimens identified to at least the family level (Figure 6), the majority are domestic chicken, *Gallus gallus* (n=48). Ten percent (n=6) of the bone specimens are from the Phasianidae family and Columbidae remains account for 5% (n=3). Bird species from this family likely represent local pigeons and doves. *Numida meleagris*, or guinea fowl, contributes just 4% (n=2) of the total.

BSH6 Assemblage

Approximately 1,600 bone fragments were analyzed from the BSH6 location. Less than 1% (n=7) of the remains are from bone button debris, and a little more than 12% (n=198) of the faunal remains were unidentifiable. Mammals account for 83.5% (n=1336) of the overall faunal assemblage, and the remaining percentage is made up of bony fishes (Osteichthyes) and birds with 1.1% and 2.6%, respectively. Table 3 shows the faunal materials from BSH6 with percentage totals for each class including the unidentifiable remains and the bone button debris.

The majority of remains (83.5%) were mammal. However, only a small percentage were identified beyond class. Of the 1,336 mammal bones, only 14% (n=109) could be identified past family. Figure 7 shows the percentage totals of the 109 mammal bones identified to genus.

Caprines, including both goat (*Capra hirca*) and sheep (*Ovis aries*), make up 64% (n=70) of the mammal remains identified to genus, and 20% (n=22) are represented by *Bos taurus* (cattle). Nine bones have been identified as *Rattus* spp. that make up 8% of the mammalian assemblage. *Sus scrofa* (pig) accounts for 5% (n=5), and *Equus asinus* (donkey) make up 2% (n=2). One lower limb bone from a human (*Homo sapiens*) was identified from the BSH6 assemblage, and it contributes to just 1% of the mammalian bones identified to genus.

The fish specimens are comprised of a total of 18 bone fragments, the majority of which were vertebrae (n=14). None of the fish from BSH6 could be identified past class. Reptile and amphibian classes were not identified in the BSH6 assemblage.

Bird remains constitute a total of 41 bone fragments of which 73% (n=30) were identifiable to family and genus levels while the remaining 27% (n=11) could only be identified to class. Figure 8 displays the percentages of identifiable bird with the 11 unidentifiable remains removed from the total.

Fifty percent of the identifiable bird assemblage is domestic chicken (*Gallus gallus*) (n=15) while turkey (*Meleagris gallopavo*) only represents 3% (n=1) of the assemblage. Phasianidae includes a total of 14 bone specimens, only one less than domestic chicken.

Chapter 7: Discussion

In order to evaluate the dietary habits of the residents of BSH5 and BSH6, certain animal taxa are excluded from the following analyses. Both brown (*Rattus norvegicus*) and black (*R. rattus*) rat were identified at BSH5 (n= 44) and BSH6 (n=9). Rats are a commensal species that prefer to reside near human occupation areas, especially those involving food storage (Reitz and Wing 1999). It is unlikely these small animals were eaten by people residing at BSH5 and BSH6. Although some sources have indicated rats being consumed by Africans and Europeans (Smith 1745:209), the relatively low specimen count and lack of cut marks or evidence of burning further supports that these animals were not a food source. Cat (*Felis domesticus*) (n=11) and dog (*Canis familiaris*) (n=4) remains have been identified in the BSH5 assemblage but not in the BSH6 assemblage. The bones do not exhibit evidence (i.e. cut marks or heat damage) suggesting they were a food source and are removed from the analysis of the mammal assemblages.

Interestingly, a mongoose, *Herpestes javanicus*, was identified in the BSH5 assemblage. This animal was introduced in the 19th century to the West Indies by sugar planters in the hopes of controlling rat and snake populations. Unfortunately, the mongoose population wiped out many species of native birds, reptiles, and small mammals on some Caribbean islands including St. Kitts (Merrill 1958: 36). Its presence in the faunal remains from BSH5 is likely due to its predatory nature. Various prey animals would have been drawn to the refuse piles in search of food as would the mongoose. It could also have been captured wandering inside the fortress and thrown out. Thus, it is most likely an animal species not regularly, if at all, consumed by the inhabitants at the fortress.

As mentioned previously, no amphibian or reptile bones were identified in the faunal assemblage from BSH6. The amphibian and reptile specimens identified from BSH5 are few in number (n=7) and like the rat specimens lack evidence of modification relating to consumption. The remaining fauna included for overall dietary analysis show bone modification relating to consumption practices and/or have been noted as food sources in historic documents and records.

The mammal remains included in dietary analysis are *Bos taurus*, Caprine, and *Sus scrofa*. In addition, bones that were identified as mammal and also achieved a size grade of medium and/or large along with bones that show evidence of butchery practices (i.e. cut, chop, and saw marks) and cooking (burned or calcined bone) are included in the overall dietary analysis for BSH5 and BSH6. Bird remains include all those identified to at least the family level, and all identified fish are included.

The BSH5 dietary assemblage (Table 4, Figure 9) includes a total of 5,781 specimens. The majority of the bones are mammal, which comprise 56% (n=3,250) of the dietary assemblage. Osteichthyes are next with 43% (n=2,472), and bird specimens only contribute 1% (n=59). The BSH6 dietary assemblage includes a total of 207 bone specimens. Over 70% (n=159) of the identifiable remains from BSH6 contributing to diet are mammal. Fourteen percent (n=30) are bird, and 9% (n=18) belong to fish (Table 5, Figure 10).

Osteichthyes

Multiple species of fish were identified in the faunal assemblage from BSH5. This is not surprising because of the fortress' close proximity to the ocean and the relative abundance of marine resources found there. Table 6 provides a list of the fish remains identified to family along with common names, general habitat, and specimen count (for further information regarding identified species see Table 2).

The different fishes identified in the BSH5 assemblage have been grouped into families for brevity (Table 6). These families were labeled by habitat preference and biogeographical distribution to better understand how these resources were acquired. Fish found in pelagic waters stay close to the sea surface and do not typically venture near the shore. They are caught with nets in open sea waters and generally require the use of more than one boat and a skilled crew of fishermen (Klippel 2002; Wing and Scudder 1980). Reef-dwelling fish are either found in shallow or deep waters near coral reefs. They are caught by setting traps or pots along the bottom of the reef.

Reef fish identified in the assemblage from BSH5 include fishes such as snappers (Lutjanidae), groupers (Serranidae), jacks (Carangidae), and parrot fishes (Scaridae) as well as porgies (Sparidae) and drum (Sciaenidae). They inhabit waters near the shore and would have been captured by setting pots or traps. The pelagic fish from BSH5 include Clupeidae, Belonidae, Sphyraenidae, and Scombridae. Commonly referred to as houndfish or needlefish, Belonidae are a surface dwelling fish that travel in large schools. They are caught using long nets, several boats, and, most importantly, a skilled crew of fishermen (Klippel 2002; Wing and Scudder 1980). Another pelagic fish species is the barracuda, and it is represented by the Sphyraenidae family. This species of fish can grow to great lengths and, like the schooling needlefish, would require an experienced crew of fishermen to capture them.

The enlisted soldiers at BSH5 consumed a variety of fishes coming from areas close to the shore and out in open sea waters. It could be that fresh fish were a typical part of a soldier’s daily rations at BSH. If not, these men either had the skill sets, time, and equipment that were needed for catching fish, or they had the monetary resources necessary to purchase fresh fish at market.

Clupeidae and Scombridae are designated as pelagic fish. However, the open sea waters they were inhabiting differed drastically from the tropical ocean surrounding St. Kitts. Eighty vertebrae captured in 1/8 inch and 1/16 inch mesh from the species *Clupea harengus* (Atlantic herring) have been identified in the BSH5 assemblage. Atlantic herring inhabit both sides of the North Atlantic Ocean and are not typically found in tropical waters (Reitz 2004). Why are a North Atlantic species of fish showing up in a faunal assemblage from the Caribbean? Atlantic herring were a preserved provision utilized by inhabitants on St. Kitts, and archival documents suggest this food was provisioned to enslaved Africans. In an address of William Mathews to Council, 5 February 1733/34 it is mentioned that inhabitants of St. Kitts should provision "one barrel of beef for each white person and his family and one barrel of beef or herrings for every two Negroes" that were at Brimstone Hill Fortress and nearby Charles Fort (SNA, SCCLM 1734-40). Moreover, enslaved Africans on St. Kitts were permitted weekly quantities of salt fish including herring (Edwards 1966:178). The herring bones from BSH5 indicate these fish were also provisioned to soldiers.

Atlantic herring were not the only species from the North Atlantic that were being preserved and transported to the Caribbean islands. Atlantic mackerel (*Scomber scombrus*) is known to have been preserved and transported throughout the colonial Americas (Klippel et al. 2011; Klippel and Sichler 2004; Kurlansky 1997; O'Leary 1996; Pares 1956). These fish were measured, preserved, and graded according to fat content and size. The grades correspond to live fork length measurements running from the tip of the head to the fork in the tail (Klippel et al. 2011; Klippel and Sichler 2004; O'Leary 1996). The best quality, No. 1 mackerel, had to be at least 330 millimeters in fork length. Mackerel less than 330 millimeters but greater than 279 millimeters were considered No. 2's, and the poorest quality were No. 3 (Klippel and Sichler 2004; O'Leary 1996).

Six vertebrae were identified as Atlantic mackerel from BSH5 and, unlike the Atlantic herring, all of the vertebrae were captured in 1/4 inch mesh screen. It is possible that the mackerel identified in the enlisted men's assemblage correspond to a higher grade and would be indicative of a better quality protein source (Klippel et al. 2011; Klippel and Sichler 2004; O'Leary 1996). More research is needed to confirm this statement, but the presence of this fish species in the enlisted men's assemblage from BSH5 attests that this group of individuals were provisioned with salt fish.

The enlisted men at BSH5 were consuming a combination of fresh, local fish and preserved salt fish. Buckley (1998:350) states that soldiers in the British West Indies "ate little if any of the excellent seafood that teemed the nearby Caribbean" because they were unaccustomed to such tropical fish and it would spoil quickly in the heat. The fish bones from BSH5 tell a different story. These soldiers were able to acquire several different species of tropical fish in addition to preserved mackerel and herring. In fact, mackerel has only been identified at BSH5. Herring, on the other hand, was found in African context at BSH3 (Ramsey 2011). Like the enlisted men at BSH5, Africans at this locale consumed a variety of local fishes in addition to preserved fish. Interestingly, Atlantic cod has only been identified in the BSH faunal assemblages attributed to enslaved Africans residing at BSH2 and BSH3 (Ramsey 2011; Klippel 2002). Historic documents reveal that most of the cod shipped to the West Indies was destined for enslaved Africans working on plantations, and this is likely the case for the cod at BSH as it has only been identified in African contexts at the fortress (Ramsey 2011; Klippel 2002; O'Leary 1996).

Historic documents and archives indicate that the British military made attempts to feed soldiers stationed on St. Kitts with more fresh provisions sometime after the 1820s (Buckley 1979). This could explain the abundance of fresh fish at BSH5. Fish bones from BSH5 come from three out of the four excavation areas: the Wash House in place by 1845, the 1830s Kitchen, and the mobile Hospital built during the 1790s. The remaining fourth location is the 1790s Kitchen, and no fish bones were identified at this area. If the enlisted men were provisioned with more fresh foods after the 1820s, it stands to reason that more fish remains would be recovered from areas dating after the 1820s. Fish bones from the Wash House that was in place by 1845 (n=202) and the 1830s Kitchen (n=104) support this conclusion. The Hospital contains the majority of fish bones with 2,166 specimens. According to Smith (1994:5) this area functioned as temporary housing for soldiers beginning in the 1790s while permanent barracks were undergoing construction. This area later became a disposal site for soldiers occupying the barracks nearby. The top four levels (which is indicative of the most recent occupation) of faunal remains from the hospital excavation area contain a total of 1,475 fish bones which is well over half of the total 2,166 bones.

It should be noted, however, that without the addition of fine screen the presence of Atlantic herring and a reef fish, *Caranx crysos*, would not have been known. Out of the total 2,472 fish bones from BSH5, 1,812 of those bones were captured in fine screen mesh. This means that over 70% of the recovered fish would have been unaccounted for had the units not been fine screened.

Not much can be said for the fish remains from BSH6 as they have only been identified to class and cannot be further separated by family or habitat. The fish remains from BSH6 include only 14 vertebrae, 3 spines, and 1 unidentifiable bone fragment. The inhabitants at this location did not rely as much on marine resources. However, the low specimen count could be attributed to the lack of fine screening from the BSH6 excavation areas, and it is possible that this food resource contributed more to the diet of those residing at BSH6.

Aves

The enlisted men at BSH5 were not consuming large quantities of domestic fowl or other locally acquired species of bird (Table 4, Figure 9). The majority of the birds they were consuming, however, were domestic chickens. Guinea fowl has also been identified in the bird assemblage. It should be noted that while only two bones have been identified as *Numida meleagris* (guinea fowl), the presence of this species could be underrepresented. Domestic chicken and guinea fowl share similar osteological morphology and can only be correctly distinguished from one another by morphological differentiation on eight elements- the cranium, scapula, coracoid, sternum, pelvis, radius, carpometacarpus, and tarsometatarsus (MacDonald 1992). Correct identification could only be achieved if these elements were recovered. That said, the presence of chicken and guinea fowl from BSH5 means the enlisted men did have access to fowl, although not in large quantities.

Bird remains constitute 14% (Figure 10) of the dietary fauna from BSH6. Figure 8 shows the bird bones identified by family and genus. The inhabitants occupying this location were consuming a majority of fowl from the Phasianidae family. This family of birds includes the domestic chicken, *Gallus gallus*. One bone belonging to a turkey, *Meleagris gallopavo*, was identified. Turkeys have not been identified at any other excavation area at BSH. These birds were bred and raised for food on the island (Smith 1745: 209, 221), and the BSH6 residents were able to acquire this species of bird.

The overall lack of abundance of bird remains at BSH5 is not particularly surprising (Figure 9). The British military needed to provision large numbers of soldiers, and poultry would not have been the best option. Birds were not a regularly consumed food for the soldiers, but domestic fowl dominates the bird assemblage. The inhabitants at BSH6 consumed relatively more fowl in their overall diet (Figure 10) than the enlisted men. It is likely that these individuals held a higher rank than an enlisted soldier and were able to acquire foodstuffs sourced from near the fortress like domestic chickens and turkey. Social differences in diet are expected between the enlisted soldiers at BSH5 and the guards and other military personnel at BSH6, and this is also the case for Africans and British Royal Engineers at BSH3.

British Royal Engineers consumed relatively more birds in their overall diet compared to Africans at BSH3 (Ramsey 2011). Thirty-nine percent of the Engineers' diet was poultry whereas 15% of the Africans' diet was attributed to bird (Ramsey 2011). Most of the bird eaten by the Engineers' was domestic chicken, but they were able to acquire more species of local fowl including several genera of ducks and geese along with smaller fowl such as pigeons and doves (Ramsey 2011). Social differences between Africans and high-ranking British Royal Engineers is expected, and it is not surprising that the Engineers had relatively more birds in their dietary assemblage. What is interesting, however, is the relative proportion of birds from the African context at BSH3 (15%) compared to the enlisted men at BSH5 where only 1% of their overall diet came from birds. Whether or not Africans at BSH3 were provisioned with poultry or obtained birds on their own, they ate relatively more birds in their diet compared to British enlisted men.

Mammalia

The mammal remains contributing to diet from BSH6 are separated by genus and their relative proportions are shown in Figure 11. Seventy-two percent (n=70) of the mammals contributing to diet are Caprine. Twenty-three percent (n=22) are cattle, and only 5% (n=5) can be attributed to pig.

Caprines, including both sheep (*Ovis aries*) and goat (*Capra hirca*), represent a fresh food source. These animals initially arrived on the island via ship like much of the beef and pork, but were not preserved and packed into barrels. The inhabitants at BSH6 were not extensively depending upon beef and pork, whether consuming it as a fresh or preserved resource. Instead, these persons, who were likely British military guards and sergeants, had access to locally raised sheep and goats that would have been slaughtered on the island and brought to market. It is likely that the individuals working at BSH6 had more mobility within their rank in the British military, thus giving them more access to better quality foods.

The mammal remains identified to genus from BSH5 that are contributing to diet are displayed in Figure 12. Cattle (*Bos taurus*) make up 69% (n= 1,398) of the dietary mammals while pig (*Sus scrofa*) and Caprine are 14% (n= 288) and 17% (n= 350), respectively. Unlike the inhabitants at BSH6 whose main source of meat came from locally raised sheep and goat, the enlisted men at BSH5 were consuming large quantities of beef and smaller amounts of pork and mutton. Beef, whether preserved or fresh, would be a choice staple to feed larger groups of individuals, and BSH5 was designed to accommodate upwards of 200 soldiers at one time (Smith 1994:11-22).

Like the occupation at BSH6, the British Royal Engineers and enslaved Africans that occupied BSH3 were few in number, and the relative proportions of mammals eaten at this location are similar to that of BSH6. The majority of mammals consumed at the African and Engineer contexts at BSH3 are Caprines (Ramsey 2011:30, 31). In fact, nearly 60% of the mammal remains from the British Royal Engineers' context and the enslaved African context at BSH3 are from sheep and goats. Pig remains are also similar with each context making up approximately 20% of the mammalian assemblage. More cattle bones were recovered from the enslaved African context at BSH3 with 18% versus 11% from the Engineers' quarters (Ramsey 2011:30). The mammals consumed at BSH3 and BSH6 show similarities in the prevalence of Caprine remains. This contrasts greatly with the diet of the soldiers at BSH5 who were consuming mostly beef.

Historic accounts are full of descriptions pertaining to the diet of British troops occupying the West Indies, and most mention the great reliance on salted provisions to sustain these populations. Archival documents from the St. Christopher Assembly Minutes, November 1779 discuss concerns about provisioning the militia and mention that the Committee needed to "Obtain 150 barrels of pork and beef, about one half of each, 150 barrels flour, 10 tierces of rice and 12 boxes of candles. Greatest part of this should be placed at Brimstone Hill" (SNA CO318/7).

Clearly, the cattle bones from BSH5 could represent barreled beef, and it is likely the same case with the pig bones. As Buckley (1979: 104) comments, "the diet of British troops remained heavily salted" because of the high cost of fresh beef. Nevertheless, archival data does suggests that soldiers on St. Kitts were supplied with fresh provisions including "cattle, sheep, goats, and hogs when threatened with invasion." (SNA, CO241/5, St. Christopher Assembly Minutes, 27 March 1745). The cattle, Caprine, and pig bones warrant a more detailed analysis and are further evaluated in the following chapter.

Chapter 8: Fresh and Preserved Provisions

Fresh provisions were available on St. Kitts, but the extent to which the British military utilized them to feed residents of BSH remains questionable especially in regards to the cattle and pig bones. In order to better understand the diet of those residing at BSH5 and BSH6, MNE estimates are utilized to examine the distribution of skeletal elements amongst cattle, Caprine, and pig (Tables 7 and 8). The skeletal elements are grouped into general categories similar to barreled meat grades (e.g. Mess, Prime, and Cargo) to help aid in discussion. The NISP and MNE is provided along with MNE totals for each portion. The combined total is provided at the bottom row of the table.

Minimum Number of Elements

BSH5

Most of the cattle bones from BSH5 come from the main body of the carcass with ribs being the most prevalent skeletal element. MNE counts for foot (n=55) and upper limb bones (n=51) are nearly identical in number while cattle heads only have an MNE of 35, the majority of which are mandibles. The high count of rib bones could be the product of barreled Prime or Mess beef, and the same can be said of the upper arm and leg elements. The head and foot elements are not, however, indicative of barreled beef. Their presence indicates that these particular bones came from cattle living on St. Kitts.

Pig bones from BSH5 come mainly from the upper limbs (n=36) and body (n=37) of the carcass. Only six elements came from the head, and foot elements have an MNE of ten. Thinking in terms of barreled pork, bones coming from the upper limbs and body of the carcass are indicative of Mess and Prime pork. The skull and mandible bones are found in barrels of Prime or Cargo pork. If the pig remains are from barreled salt pork, foot elements should be underrepresented as they were removed during the butchery process. It would be straightforward to conclude that at least some of the pig bones came from local livestock because of the occurrence of foot bones. However, Betts (2000:29, 30) notes that it was not uncommon for meat packers to pad barrels “with an occasional pig’s foot.” Additionally, Brophy and Crisman (2013:79-82) discovered several inconsistencies of body parts among intact pork barrels implying that “standardization criteria were not followed when barrels were being filled.” Such findings demonstrate that caution must be exercised when verifying the presence of barreled provisions, and it is plausible that some of the pork from BSH5 is from barreled salt pork.

Unlike the cattle and pig bones, Caprine bones display an almost even occurrence of upper limb (MNE=31), foot (MNE=35), and body elements (MNE=38). The sheep and goats consumed by the BSH5 inhabitants came from locally available livestock, and this is the reason for the more even spread of skeletal elements. If the enlisted men were given whole animals, one would expect to find all body parts represented. On the other hand, they could have been supplied with particular cuts of mutton which would skew the distribution of skeletal elements.

BSH6

The majority of cattle bones from BSH6 come from the body of the carcass (MNE=8). One bone each comes from the head and feet, and the upper limbs are accounted for by a radius (MNE=1). If the beef consumed by those residing at BSH6 was barreled, it would have been a high grade. However, the lone head and foot elements point to bones coming from cattle raised and slaughtered on the island. The inhabitants at BSH6 did not extensively rely on beef (Figure 11), but the beef they did eat likely came from a fresh source.

Pig bones from BSH6 are few in number (NISP=5, MNE=3). Those residing at BSH6 did not regularly consume pork whether barreled or fresh. The pork they did eat came mainly from the head of the animal. If barreled, these bones would have been present in Prime and Cargo pork instead of the high grade Mess pork. The possibility still exists that the pig bones are from animals raised on St. Kitts.

The majority of meat consumed at BSH6 came from sheep and goats (Figure 11). The MNE calculations show most of the bones come from the upper limbs (MNE=13) followed by elements from the body of the carcass (MNE=9). Head elements are few in number (MNE=2) and foot bones have an MNE of six. Caprines were a staple source of meat for the BSH6 inhabitants, and they were able to acquire portions from most parts of the carcass.

Skeletal Part Frequency

The analysis of skeletal elements can be taken one step further to examine the nutritional value of the animals eaten at BSH5 and BSH6 using skeletal part frequency. Skeletal frequency can be an indicator for several aspects of faunal assemblages such as butchery practices, disposal habits, and food transport (Reitz and Wing 1999:202-213). It is utilized here to examine the nutritional value of the cattle, Caprine, and pig remains. As demonstrated by Binford (1978), a hierarchy of nutritional value can be applied to different parts of an animal carcass creating portions of a skeleton that possess either high or low utility. Typically, high utility skeletal elements in the bovine (i.e. cattle, sheep, and goat) skeleton include upper limbs, ribs, and vertebrae. These elements provide a higher source of nutrition and are usually associated with high status. Feet and cranial elements in the bovine skeleton do not have much nutritional value and are considered low utility. Pig utility is somewhat different in that cranial elements are counted as high utility, leaving only lower limbs and feet in the low utility category.

The skeletal part frequencies from BSH5 and BSH6 are displayed in Tables 9 and 10 and Figures 13 and 14. The enlisted men at BSH5 were, for the most part, consuming beef, pork, and mutton from high utility elements. The cattle and Caprine remains are similar with each having almost 30% of low utility elements. This means that those residing at BSH5 were consuming more cuts of meat from the body of the animal and little from the lower limbs and head where meat quality becomes degraded. Low utility elements from pig remains make up less than 10% with the majority being high utility or higher quality pork. The possibility still remains that some of the high utility beef and pork is from barreled provisions and, if compared to fresh beef and pork, would be a less desirable food.

Over 90% (n=20) of the cattle remains from BSH6 are high utility elements. Pig remains, while few in number, were all high utility. The Caprine bones show more diversity with a little over 70% (n=52) of the remains coming from higher quality cuts of meat. The inhabitants at BSH6 regularly partook in high quality cuts of meat from locally raised sheep and goat (refer to Figure 11), and they were also consuming superior cuts beef and pork, albeit in small amounts.

Skeletal part frequencies of cattle bones from enslaved African context and British Royal Engineers' quarters at BSH3 offer a unique comparison to the skeletal part frequencies from BSH5 and BSH6. The African assemblage from BSH3 contained a little over 97% of high utility cattle bone (Ramsey 2011: 32). This contrasts greatly with the British Royal Engineer's assemblage at BSH3 where only 56% of the cattle remains could be considered as high utility items (Ramsey 2011: 32). The Engineers have the most low utility cattle bones compared to the Africans at BSH3, the enlisted men at BSH5, and the military sergeants and guards at BSH6. Although this seems odd, especially when considering the high status of a British Royal

Engineer, the low utility cattle bones represent fresh beef which would be a better quality food source compared to salted beef.

Chapter 9: Stable Carbon Isotopes

The work thus far on the faunal remains from BSH reveals a great deal about what the inhabitants were eating, but there are aspects about diet that remain uncertain. The MNE calculations and the skeletal part frequencies confirm that there are differences in meat quality among the BSH5 and BSH6 inhabitants. The meat consumed by the enlisted men at BSH5 was mostly beef, and the skeletal part frequencies suggest that most of the beef came from high utility elements. What this analysis does not provide in regards to the beef is evidence of origin. Did the beef come from locally available livestock on St. Kitts, or did the meat arrive as preserved rations? Klippel (2001) answers this question of local versus fresh beef using stable carbon isotope analysis on cattle bones from enslaved African context at BSH2. His research found that some of the beef consumed by Africans was transported to St. Kitts in the form of barreled beef. This is likely the case for some of the high utility cattle bones from the enlisted men's context at BSH5. Expanding on Klippel's (2001) research at BSH2, stable carbon isotope analysis is utilized to ascertain the origin of cattle bones from BSH5.

Isotopes are different configurations of the same element, and the different configurations are a result of the number of neutrons present in the element (Schoeninger and Moore 1992). Carbon, hydrogen, oxygen, strontium, and nitrogen are examples of common elements that possess isotopes. There are two basic types of isotopes: stable and unstable. Unstable, or radioactive isotopes, decay at a predictable rate over time. Stable isotopes, on the other hand, do not change (Schoeninger and Moore 1992; DeNiro 1987). Throughout an organism's life isotopes are incorporated into their bodily tissues. Once the organism dies, the isotopes cease to integrate into the tissues and the unstable isotopes begin to decay. As a result, researchers can analyze the isotopic ratio of a given element to determine specific qualities about an organism's life.

Isotopic analysis is helpful for archaeologists studying the origin of food remains and consumption habits of past populations (e.g. Diaz et al. 2012; Keenleyside et al. 2006; Price et al. 2006; Ubelaker and Owsley 2003; van der Merwe and Vogel 1978). Isotope studies in archaeology have the potential to uncover information that would otherwise remain unknown, such as the presence or absence of salted provisions. A recent article by Guiry et al. (2012) used nitrogen and carbon isotopes to ascertain the origin of pig remains from historic colonial sites in Newfoundland. Like most of the pig specimens identified at BSH, the remains could have been shipped in as salted pork or come from pigs raised in the area. The interpretation of carbon isotope values from pig remains can be problematic, however, because of the dietary habits of swine. Pigs consume a wide variety of foodstuffs and are more omnivorous than cattle that are predominantly herbivorous grazers. Herbivores consume only plants. Plants, like all living things, contain carbon, but the amount of carbon isotopes in a plant is dependent on the process by which carbon dioxide is metabolized.

The fractionation (i.e. process by which isotopes are divided) of carbon isotopes is a useful tool for investigating how plants metabolize carbon dioxide (O'Leary 1988; DeNiro 1987; van der Merwe 1982). Carbon dioxide present in the atmosphere contains a little over 1% of the stable isotope carbon-13 (^{13}C) and 98.9% of the stable isotope carbon-12 (^{12}C) (O'Leary 1988: 328). As plants undergo the process of photosynthesis, they discriminate against ^{13}C and produce carbon compounds that can be separated into different photosynthetic groups (Tieszen 1991; O'Leary 1988; van der Merwe 1982; Sullivan and Krueger 1981; Smith and Epstein 1971).

Plants from temperate areas and plants from tropical and subtropical regions utilize two distinct photosynthetic pathways to convert carbon dioxide into either a three-carbon (C_3) or four-carbon (C_4) compound. The photosynthetic pathways of C_3 and C_4 plants vary according to the enzyme used during photosynthesis. Three-carbon plants from cool, temperate climates use the enzyme ribulose bisphosphate [RuBP] carboxylase, whereas C_4 plants from tropical areas use the enzyme phosphoenol pyruvate [PEP] carboxylase (Tieszen 1991; O'Leary 1988; van der Merwe 1982; Sullivan and Krueger 1981; Smith and Epstein 1971). Each of these enzymes discriminate against the ^{13}C from the plant's uptake of CO_2 but do so in different ways. The content of ^{13}C present in the CO_2 is determined by measuring the ratio of *R*, defined as,

$$R = {}^{13}CO_2/{}^{12}CO_2$$

The ratio of the *R* can then be converted into a percentage expressed in parts per mil as $\delta^{13}C$‰ using the formula,

$$\delta 13C = \left(\frac{R(sample)}{R(standard)} - 1\right) \times 1000$$

The resulting $\delta^{13}C$‰ value is different for C_3 and C_4 plants (O'Leary 1988:328). The majority of plants are C_3 and can function in cool conditions with normal sunlight. C_4 plants, on the other hand, are more efficient in processing carbon and are better able to thrive in environments with high temperatures and abundant sunlight. These adaptations result in different carbon isotope values. Typically, temperate C_3 plants have $\delta^{13}C$ values ranging from -38‰ to -22‰, and tropical C_4 plants have values within the range of -21‰ to -9‰ (Tieszen 1991).

The $\delta^{13}C$ values of the C_3 and C_4 plants transfer to the tissues of the animals that consume them. During this transfer the $\delta^{13}C$ is enriched in bone collagen (Schoeninger and Moore 1992; Sullivan and Krueger 1981). In the case of herbivores like cattle, the $\delta^{13}C$ is enriched in bone collagen by 5-6‰ (Schoeninger and Moore 1992:259; Tieszen 1991:240). The transfer of isotopic information to animal tissues has received much attention (Froehle et al. 2010; Warinner and Tuross 2009; Jørkov et al. 2007; De Smet et al. 2004; Jim et al. 2004; Schoeninger and Moore 1992; Tieszen 1991; Schoeninger and DeNiro 1984; Chisholm et al. 1983; Sullivan and Krueger 1981; DeNiro and Epstein 1978), and especially for the research addressed here, investigations into bone collagen have demonstrated that the $\delta^{13}C$ values are related to the $^{13}C/^{12}C$ ratios and are a reliable means for reconstructing diet.

Herbivores are an excellent candidate for stable carbon isotope analysis because of their plant based diet. Most herbivorous animals are characterized as either a grazer or a browser. This distinction is an important consideration when deciding what animal species to use for analysis. Grazing herbivores like cattle consume large quantities of grasses and keep their heads low to the ground in search for food making them excellent candidates for carbon isotope analysis.

The cattle remains selected for stable carbon isotope analysis were among those skeletal elements that could have arrived on St. Kitts in a barrel as preserved beef. Depending on the grade of beef, barreled provisions would contain different abundances of skeletal elements. Regardless of grade, it was not common practice to include any cranial or foot elements as they were typically discarded before the pickling process began. The presence of cranial and feet elements from cattle in the faunal assemblages from BSH is indicative of fresh beef. Thus, vertebrae, ribs, scapulae, and upper limb bones were the only elements chosen for the isotope analysis.

Seventeen samples were sent to the University of Georgia Center for Applied Isotope Studies for isotope analysis. Table 11 displays the $\delta^{13}C$ values of 17 cattle bones from the British enlisted men's occupation at BSH5. The results show a range of values from -8.42 to -22.01.

The $\delta^{13}C$ values of cattle bone collagen show considerable variation in plant consumption. The cattle remains from BSH5 represented by *B.t.* 13, *B.t.* 14, *B.t.* 15, *B.t.* 16, and *B.t.* 17 consumed mostly C_4 grasses. It would be exceedingly difficult for cattle consuming primarily C_3 vegetation to achieve such a high (close to zero) $\delta^{13}C$ value. These samples, therefore, represent cattle raised in a tropical environment that had abundant access to C_4 grasses such as sugar cane.

In contrast, the cattle bone samples from BSH5 represented by *B.t.* 1, *B.t.* 2, *B.t.* 3, *B.t.* 4, *B.t.* 5, *B.t.* 6, and *B.t.* 7 have $\delta^{13}C$ values that are more indicative of a diet based on temperate, C_3 vegetation. Cattle with such negative numbers like *B.t.* 1 with a $\delta^{13}C$ value of -22.01 represent beef coming from northern Europe or eastern North America. These animals were likely put out to pasture throughout most of their lives consuming C_3 grasses before being slaughtered, quartered, and packed into barrels.

Bone collagen samples that fall between a $\delta^{13}C$‰ of -14.00 and -12.00 (*B.t.* 8, *B.t.* 9, *B.t.* 10, *B.t.* 11, and *B.t.* 12) are somewhat difficult to interpret. Their $\delta^{13}C$ ratios suggest a diet with a combination of both C_3 and C_4 vegetation. It is possible that these samples represent cattle from the temperate climates of eastern North America and northern Europe that were raised on C_3 grasses but fed C_4 grains, such as maize, prior to slaughter (Klippel 2001; Skaggs 1986; Walsh 1982; Henlein 1959). Commercial butchering and meatpacking of beef grew dramatically in the late 18th century and continued to develop throughout much of the 19th century (Skaggs 1986; Walsh 1982; Henlein 1959). As a result, farmers and ranch hands became more familiar with raising cattle and adopted a feeding process that would fatten the animals to a desired weight and still be cost-effective.

According to Paul Henlein (1959), American farmers wintered their cattle outdoors on "shocked corn, put them on bluegrass in the spring and summer, and then stuffed them with corn until February when the drive to market began" (Henlein 1959: 6). Bluegrass, more commonly known as meadow grass, is from the Pooideae family. It is a characteristic C_3 plant that thrives best in cool temperatures and has a low tolerance for heat (Bora 2010). Corn, on the other hand, is a C_4 plant (Smith and Epstein 1971) and was a commonly utilized fodder during the winter months for many cattle ranchers in North America (Henlein 1959). Cattle originating from meat packing industries in parts North America could have been consuming a mixed diet of C_3 and C_4 vegetation and would undoubtedly produce a $\delta^{13}C$ value that falls between the ranges of C_3 and C_4 plants.

Cattle were an important resource for many of the Caribbean islands that had sugarcane plantations. Their manure was used to fertilize cane fields, and in some instances cattle were the primary beast of burden for powering sugar cane mills (Klippel 2001; Morgan 1995; Sheridan 1976; Merrill 1958). While these animals played a vital role on sugar plantations, their presence in the faunal materials from Brimstone Hill also means they were a fresh food source that the British military could have utilized. Laws passed in the mid 1700s offer evidence of live cattle being raised on St. Kitts specifically for market. These animals would be brought to market at certain times during the week to be butchered and sold at certain prices:

> For every Pound of Beef, seven Pence halfpenny, and so in proportion for a greater or lesser Quantity, excepting Legs, Shins, and Necks, which are not to exceed four Pence halfpenny *per* pound (Laws of the Island of St. *Christopher*; No.78, II: 72, 1711-91)

It is evident that fresh beef was available on St. Kitts, and the stable carbon isotope ratios discussed above suggest that the enlisted men were able to acquire it. The British enlisted men at BSH5 were consuming large quantities of beef, and the stable carbon isotope data in combination with MNE calculations and skeletal part frequencies demonstrate that these men subsisted on portions of both fresh and salted beef.

It is important to note, however, that Tieszen (1991) cautions researchers that are interpreting $\delta^{13}C$ ratios. A good understanding of plant species and environmental conditions is needed in order to better understand and interpret the data from stable carbon isotope analysis (Tieszen 1991). St. Kitts exhibits a tropical climate with temperatures averaging out to about 80˚F for the year. The vegetation on the island is composed mostly of tropical plants, grasses, and rainforests along with some agricultural crops not native to the island (Merrill 1958). Cattle raised on the island of St. Kitts would have consumed tropical C_4 vegetation and would have $\delta^{13}C$ ratios that are less negative. This is supported by the modern *Bos* bone specimen coming from the base of BSH2 analyzed by Klippel (2001:1195) with a $\delta^{13}C$ value was -11.70.

Chapter 10: Conclusions

The Caribbean island of St. Kitts was one of the wealthiest colonies in the British Empire during the late 17th through early 19th centuries because of its production and export of sugar. The British sought to defend the island from foreign invaders by building a large military fortification on the island called Brimstone Hill Fortress. The fortress was home to a multiethnic community of British military personnel, enlisted soldiers, and enslaved Africans. The British military was responsible for feeding the fort's inhabitants, and they did so using imported rations of beef, pork, and fish in combination with locally available foods.

This thesis explored the relationship between social rank and diet by analyzing food remains from two different occupation areas at Brimstone Hill Fortress. The inhabitants at BSH5 and BSH6 consumed the same foods (i.e. fish, mutton, pork, beef, fowl) but in relatively different amounts. The British enlisted men at BSH5 were consuming large quantities of beef and fish (Figures 9 and 12). The identified Atlantic mackerel and Atlantic herring specimens from this assemblage tell us that these men were provisioned with salt fish in addition to various species of tropical fish caught in the Caribbean waters. Unlike the inhabitants at BSH6, the soldiers at BSH5 were not eating locally available livestock (i.e. sheep and goat) or domestic fowl in great quantities. Instead, these men were mainly given rations of beef that was either salted or fresh. Pork was also part of the enlisted men's diet and, like the beef, was either salted or fresh.

The diet of those residing at BSH6 consisted mostly of locally acquired sheep and goats (Figure 11). Birds were consumed in relatively greater amounts here than at BSH5 and included domestic and local fowl. Fish were the least prevalent faunal family consumed (Figure 10).

However, lack of fine screening could account for the low number of fish bones that were recovered. Research has shown that smaller screen sizes (i.e. one-eighth inch (3mm) and one-sixteenth inch (1.5mm) mesh) increase the recovery rate of small animal bones (Reitz and Wing 1999: 193), and it is possible that fish contributed more to the diet of those residing at BSH6.

The faunal analysis was taken a step further by examining the distributions of skeletal elements with MNE calculations (Tables 7 and 8) along with skeletal part frequencies (Tables 9 and 10; Figures 13 and 14) amongst cattle, Caprine, and pig bones. This step helped to refine the dietary analysis of mammals by focusing on what parts of the animal were being consumed. The addition of stable carbon isotope analysis confirmed the presence of salt beef and fresh beef in the diet of the British enlisted men at BSH5. However, the extent to which they were given fresh rations remains unknown. The occurrence of pig feet in the BSH5 assemblage suggests fresh pork, but the possibility still exists that at least some of the pork was barreled. Although no isotopic data is available for the cattle bones at BSH6, the high number of Caprine bones compared to cattle and pig bones suggests that these individuals did not rely as much on barreled provisions.

As noted by Reed (1963), faunal remains have a cultural filter. People choose which resources they wish to utilize, and the acquisition and distribution of those resources is dependent upon many aspects of a culture (Reitz 2004; Reed 1963). The British military chose to provision its workforce at BSH in a way that separated the population according to social status and rank. Dietary choices are a result of the availability of certain foods, but they are also reflective of social constructs within a society. How much choice did an enlisted soldier at BSH5 have in what foods he was eating each day? Did those residing at BSH6 have more choice in their diet? The results from this thesis suggest that the persons residing at BSH6 held a higher status within their rank than those living at BSH5.

In conclusion, the analysis of faunal remains from BSH demonstrates the great potential zooarchaeological data has in providing insights into subsistence practices that are reflective of a person's social standing within a society. Zooarchaeological studies pertaining to subsistence in the Caribbean are somewhat limited (Handler and Wallman 2014; Crock and Carder 2011; Gibson 2009) and usually pertain to plantation sites. It is likely that the archaeological site of BSH encompasses one of the largest sets of faunal remains in the Caribbean. More research is needed to compare and contrast what life was like for the British military personnel, enlisted men, and enslaved Africans residing at BSH. Archaeological research in the context of a colonial military organization is an exciting area of study and should be further investigated.

References Cited

Ahlman, Todd
1997 *Archaeological Evidence of African Slave Occupation at Brimstone Hill Fortress National Park, St. Kitts, West Indies*. Brimstone Hill Archaeological Project Report No. 2.

Ahlman, Todd, Gerald F. Schroedl, and Ashley H. McKeown
2009 The Afro-Caribbean Ware from the Brimstone Hill Fortress, St. Kitts, West Indies: A Study in Ceramic Production. *Historical Archaeology*. 43(4):22-41.

Alexander, W. H.
1901 St. Christopher, West Indies. *Bulletin of the American Geographical Society* 33(1):42-46.

Bean, Richard
1977 Food Imports into the British West Indies: 1680-1845. In *Comparative Perspectives on Slavery in New World Plantation Societies*, Vera Rubin and Arthur Tuden, editors. Vol. 292:581-590.

Beisaw, April M.
2013 *Identifying and Interpreting Animal Bones: A Manual*. Texas A&M University Press, College Station.

Betts, Matthew W.
2000 Augmenting Faunal Quantification Procedures through the Incorporation of Historical Documentary Evidence: An Investigation of Faunal Remains from Fort George. *Ontario Archaeology* 69:19-38.

Binford, Lewis R.
1978 *Nunamuit Ethnoarchaeology*. Academic Press, New York, NY.

1984 *The Faunal Remains from Klasies River Mouth*. Academic Press, New York.

Boessneck, J.
1970 Osteological Differences Between Sheep (*Ovis aries Linné*) and Goat (*Capra hircus Linné*). In *Science in Archaeology: A Survey of Progress and Research*, Don Brothwell and Eric Higgs, editors, pp. 331-358. Praeger Publishers, New York.

Bond, James
1993 *Peterson Field Guides: Birds of the West Indies*, 5th edition. Houghton Mifflin Company, Boston, MA.

Bora, Lily
2010 *Principles of Paleobotany*. New Delhi: International Scientific Publishing Academy.

Brewer, Douglas J.

1992 Zooarchaeology: Method, Theory, and Goals. *Archaeological Method and Theory*. 4: 195-244.

British National Archives (BNA)
1802 WO55/937, Office of Ordnance, Estimate of Probable Expense for Repair of Ordnance Buildings, 31 March 1802; British National Archives

1823 WO55/945, Tolfrey to Beaver, 16 May 1823; British National Archives

Brophy, Juliet and Kevin Crisman
2013 A Taphonomic Evaluation of Three Intact Pork Barrels. *Historical Archaeology*. 47(4):71-85.

Buckley, Roger Norman
1979 *Slaves in Red Coats: The British West India Regiments, 1795-1815*. Yale University Press, London.

1998 *The British Army in the West Indies: Society and the Military in the Revolutionary Age.* University Press of Florida, Gainesville, FL.

Camp, Jenny
2007 *Community Dynamics and Social Status at the Brimstone Hill Fortress National Park, St. Kitts, West Indies*. Brimstone Hill Fortress Archaeological Project Report No. 28

Chisholm, B.S., D.E. Nelson, K.A. Hobson, H.P. Schwarcz, and M. Knyf
1983 Carbon Isotope Measurement Techniques for Bone Collagen: Notes for the Archaeologist. *Journal of Archaeological Science* 10:355-360

Colley, Sarah M.
1990 The Analysis and Interpretation of Archaeological Fish Remains. *Archaeological Method and Theory* 2:207-253.

Conant, Roger and Joseph T. Collins
1991 *Peterson Field Guides: Reptiles and Amphibians of Eastern/Central North America*, 3rd edition. Houghton Mifflin Company, New York, NY.

Crabtree, Pam J.
1990 Zooarchaeology and Complex Societies: Some Uses of Faunal Analysis for the Study of Trade, Social Status, and Ethnicity. *Archaeological Method and Theory*. 2:155-205.

1985 Historic Zooarchaeology: Some Methodological Considerations. *Historical Archaeology*. 19(1):76-78.

Crader, Diana C.
1984 The Zooarchaeology of the Storehouse and the Dry Well at Monticello. American Antiquity 49(3):542-558.

Crist, Raymond E.
1949 Static and Emerging Cultural Landscapes on the Islands of St. Kitts and Nevis, B.W.I. Economic Geography. 25(2):134-145

Crock, John G. and Nanny Carder
2011 Diet and Rank in Caribbean Maritime Society. *Latin American Antiquity* 22(4):573-594.

Curtin, Philip D.
1972 *The Atlantic Slave Trade: A Census*. University of Wisconsin Press, Madison, WI.

Davies, K. G. and Boyd C. Shafer
1974 *North Atlantic World in the Seventeenth Century*. University of Minnesota Press.

DeNiro, Michael J.
1987 Stable Isotopy and Archaeology. *American Scientist*. 75(2):182-191.

DeNiro, Michael J. and Samuel Epstein
1978 Influence of Diet on the Distribution of Carbon Isotopes in Animals. *Geochimica et Cosmochimica Acta* 42:495-506.

De Smet, Stefaan, An Balcaen, Erik Claeys, Pascal Boeckx, and Oswald Van Cleemput
2004 Stable Carbone Isotope Analysis of Different Tissues of Beef Animals in Relation to their Diet. *Rapid Communications in Mass Spectrometry* 18:1227-1232

Diaz, Alejandra L., Tamsin C. O'Connell, Lisa A. Maher, and Jay T. Stock
2012 Subsistence and Mobility Strategies in the Epipalaeolithic: A Stable Isotope Analysis of Human and Faunal Remains at 'Uyun al-Hammam, northern Jordan. *Journal of Archaeological Science* 39:1984-1992.

Edwards, Bryan
1966 *The History, Civil and Commercial, of the British West Indies*. Vol. 5, 5th edition. AMS Press, New York, NY.

Froehle, A. W., C. M. Kellner, and M. J. Schoeninger
2010 FOCUS: Effect of Diet and Protein Source on Carbon Stable Isotope Ratios in Collagen: Follow Up to Warinner and Tuross (2009). *Journal of Archaeological Science* 37:2662-2670.

Gibson, Heather R.
2009 Domestic Economy and Daily Practice in Guadeloupe: Historical Archaeology at La Mahaudière Plantation. *International Journal of Historical Archaeology* 13(1):27-44

Gilbert, B. Miles
1990 *Mammalian Osteology*. Missouri Archaeological Society, Columbia.

Gilbert, Allan S. and Burton H. Singer
1982 Reassessing Zooarchaeological Quantification. *World Archaeology* 14(1):21-40.

Grayson, Donald K.
1973 On the Methodology of Faunal Analysis. *American Antiquity*. 38(4):432-439.

1978 Minimum Numbers and Sample Size in Vertebrate Faunal Analysis. *American Antiquity*. 43(1):53-65.

1984 *Quantitative Zooarchaeology: Topics in the Analysis of Archaeological Faunas*. Academic Press, Orlando, FL.

Grayson, Donald K. and Carol J. Frey
2004 Measuring Skeletal Part Representation in Archaeological Faunas. *Journal of Taphonomy*. 2(1):27-42.

Guiry, Eric J, Stéphane Noël, Eric Tourigny, and Vaughan Grimes
2012 A stable isotope method for identifying transatlantic origin of pig (*Sus scrofa*) remains at French and English fishing stations in Newfoundland. *Journal of Archaeological Science* 39(2012):2012-2022.

Handler, Jerome and Diane Wallman
2014 Production Activities in the Household Economies of Plantation Slaves: Barbados and Martinique, Mid-1600s to Mid-1800s. *International Journal of Historical Archaeology* 18(3):441-466.

Henlein, P.C.
1958 *Cattle Kingdom in the Ohio Valley 1783-1860*. Lexington: University of Kentucky Press.

Higman, B.W.
1984 *Slave Populations of the British Caribbean 1807-1834*. John Hopkins University Press, Baltimore, MD.

2000 The Sugar Revolution. *Economic History Review* 53(2):213-236.

2011 *A Concise History of the Caribbean*. Cambridge University Press, New York.

Hill, Amy D. and Gerald F. Schroedl
2003 *Clay Tobacco Pipes from the Brimstone Hill Fortress, St. Kitts, West Indies*. Brimstone Hill Archeological Project Report No. 23

Jensen, Arthur L.
1954 The Inspection of Exports in Colonial Pennsylvania. *The Pennsylvania Magazine of History and Biography* 78(3):275-297.

Jim, Susan, Stanley H. Ambrose, and Richard P. Evershed
2004 Stable Carbon Isotopic Evidence for Differences in the Dietary Origin of Bone

Cholesterol, Collagen and Apatite: Implications for their use in Paleodietary Reconstruction. *Geochimica et Cosmochimica Acta* 68(1):61-72.

Jørkov, Marie Louise S., Jan Heinemeier, and Niels Lynnerup
2007 Evaluating Bone Collagen Extraction Methods for Stable Isotope Analysis in Dietary Studies. *Journal of Archaeological Science*. 34:1824-1829

Keenleyside, Anne, Henry Schwarcz, and Kristina Panayotova
2006 Stable Isotopic Evidence of Diet in a Greek Colonial Population from the Black Sea. *Journal of Archaeological Science* 33(9):1205-1215.

Kent, Susan
1993 Variability in Faunal Assemblages: The Influence of Hunting Skill, Sharing Dogs, and Mode of Cooking on Faunal Remains at Sedentary Kalahari Community. *Journal of Anthropological Archaeology* 12(4):323-385.

Klein, Richard G. and Kathryn Cruz-Uribe
1984 *The Analysis of Animal Bones from Archaeological Sites*. University of Chicago Press, Chicago, IL.

Klippel, Walter E.
2001 Sugar Monoculture, Bovid Skeletal Part Frequencies, and Stable Carbon Isotopes: Interpreting Enslaved African Diet at Brimstone Hill, St. Kitts, West Indies. *Journal of Archaeological Science* 28(11):1191-1198.

2002 *Provisioning Enslaved Africans in the British West Indies: The Animal Bones from Brimstone Hill Fortress, St. Kitts*. Brimstone Hill Archaeological Project Report No. 21.

Klippel, Walter E. and Bonnie Price
2007 Bone Disc Manufacturing Debris from Newfoundland to Antigua During the Historic Period. In *Bones as Tools: Current Methods and Interpretations in Worked Bone Studies*, Christian Gates St-Pierre and Renee B. Walker, editors, pp.133-142. Archaeopress, Oxford, United Kingdom.

Klippel, Walter E. and Gerald F. Schroedl
1999 African Slave Craftsmen and Single-Hole Bone Discs from Brimstone Hill, St. Kitts, West Indies. *Post-Medieval Archaeology* 33:222-232.

Klippel, Walter E., Jennifer A. Synstelien, and Barbara Heath
2011 Taphonomy and fish bones from an enslaved African American context at Poplar Forest, Virginia, USA. *Archaeofauna* 20:27-45.

Klippel, Walter E. and Judith A. Sichler
2004 North Atlantic Fishes in Inland Context: Pickled Mackerel (*Scomber scombrus*) in the Historic Period. *Historical Archaeology* 38(4):12-24.

Kurlansky, M.

1997 *Cod: A Biography of the Fish that Changed the World*. Walker and Company, New York.

Landon, David B.
2005 Zooarchaeology and Historical Archaeology: Progress and Prospects. *Journal of Archaeological Method and Theory* 12(1):1-36

Lyman, R. Lee
1987 On Zooarchaological Measures of Socioeconomic Position and Cost-Efficient Meat Purchases. *Historical Archaeology*. 21(1):58-66.

1994a Quantitative Units and Terminology in Zooarchaeology. *American Antiquity* 59(1):36-71.
1994b *Vertebrate Taphonomy*. Cambridge University Press, United Kingdom.

2008 *Quantitative Paleozoology*. Cambridge University Press, New York.

Macdonald, Janet
2006 *Feeding Nelson's Navy: The True Story of Food at Sea in the Georgian Era*. Chatham Publishing, London.

MacDonald, Kevin C.
1992 The Domestic Chicken (*Gallus gallus*) in Sub-Saharan Africa: A Background to its Introduction and its Osteological Differentiation from Indigenous Fowls (Numididae and *Francolinus* sp.). *Journal of Archaeological Science* 19(3):303-318.

Marean, Curtis W., Yoshiko Abe, peter Nilssen, and Elizabeth C. Stone
2001 Estimating the Minimum Number of Skeletal Elements (MNE) in Zooarchaeology: A Review and a New Image-Analysis GIS Approach. *American Antiquity* 66(2):333-348.

Marshall, Fiona and Tom Pilgram
1993 NISP vs. MNI in Quantification of Body-Part Representation. *American Antiquity* 58(2):261-269.

McKee, Larry W.
1987 Delineating Ethnicity from the Garbage of Early Virginians: Faunal Remains from the Kingsmill Plantation Slave Quarter. *American Archaeology* 6(1):31-39.

Merrill, Gordon C.
1958 *The Historical Geography of St. Kitts and Nevis, The West Indies*. Instituto Panamericano De Geografia E Historia, Mexico.

Metzgen, Humphrey and John Graham
2007 *Caribbean Wars Untold*. University of West Indies Press, Kingston, Jamaica.

Moore, William
1820 Remarks on the Subject of Packing & Re-Packing Beef and Pork. Containing, also, The Material Parts of the Act, Regulating the Inspection of those Articles for Exportation from the Province of Lower Canada. Printed by Nahum Mower, Montreal.

Mintz, Sidney W. and Christine M. DuBois
2002 The Anthropology of Food and Eating. *Annual Review of Anthropology* 31:99-119.

Morgan, Philip D.
1995 Slaves and Livestock in Eighteenth-Century Jamaica: Vineyard Pen, 1750-1751. *The William and Mary Quarterly* 52(1): 47-76.

Otárola-Castillo, Erik
2009 Differences Between NISP and MNE in Cutmark Analysis of Highly Fragmented Faunal Assemblages. *Journal of Archaeological Science* 30:1-12.

O'Leary, Marion H.
1988 Carbon Isotopes in Photosynthesis. *BioScience* 38(5):328-336.

O'Leary, Wayne M.
1996 *Maine Sea Fisheries: The Rise and Fall of a Native Industry, 1830-1890*. Northeastern University Press, Boston, MA.

Olsen, Stanley J.
1968 *Fish, Amphibian and Reptile Remains from Archaeological Sites. Part 1 – Southeastern and Southwestern United States.* Papers of the Peabody Museum of Archaeology and Ethnology. Volume 56, Number 2. Harvard University, Cambridge Massachusetts.

Pares, Richard
1956 Yankees and Creoles: The Trade Between North America and the West Indies Before the American Revolution. Hamden, Connecticut

Parry, J. H. and P. M. Sherlock
1966 *A Short History of the West Indies*, 2nd Edition. St. Martin's Press, New York, NY.

Payne, Sebastian
1985 Morphological Distinctions Between the Mandibular Teeth of Young Sheep, *Ovis*, and Goats, *Capra*. *Journal of Archaeological Science* 12(2):139-147.

Peterson, Roger Tory, Guy Mountfort, and P.A.D. Hollom
1993 *Peterson Field Guides: A Field Guide to Birds of Britain and Europe*, 5th edition. Houghton Mifflin Company New York, NY.

Pitman, Frank Wesley
1918 *The Development of the British West Indies 1700-1763*. Yale University Press.

Price, Douglas T., Vera Tiesler, and James H. Burton
2006 Early African Diaspora in Colonial Campeche, Mexico: Strontium Isotopic Evidence. *American Journal of Physical Anthropology* 130:485-490.

Ramsey, Ann M.
2011 Comparative Analysis of the Faunal Remains from British Royal Engineer and Enslaved African Occupations at Brimstone Hill Fortress, St. Kitts, West Indies. Master's Thesis, Department of Anthropology, University of Tennessee, Knoxville.

Reed, Charles A.
1963 Osteoarchaeology. In *Science in Archaeology*, edited by D. Brothwell and S. Higgs. 1st edition. Basic Books, New York.

Reitz, Elizabeth J.
2004 "Fishing down the Food Web": A Case Study from St. Augustine, Florida, USA. *American Antiquity* 69(1):63-83.

Reitz, Elizabeth J., Barbara L. Ruff, and Martha A. Zierden
2006 Pigs in Charleston, South Carolina: Using Specimen Counts to Consider Status. *Historical Archaeology* 40(4):104-124.

Reitz, Elizabeth J. and Elizabeth S. Wing
1999 *Zooarchaeology*. Cambridge University Press, London, United Kingdom.

Richardson, Bonham C.
1983 *Caribbean Migrants*. University of Tennessee Press, Knoxville, TN.

Ringrose, T. J.
1993 Bone Counts and Statistics: A Critique. *Journal of Archaeological Science* 20:121-127.

Robins, C. Richard and G. Carleton Ray.
1986 *Peterson Field Guides: Atlantic Coast Fishes*. Houghton Mifflin Company, New York, NY.

Russell, William
1778 *The history of America, from its discovery by Columbus to the conclusion of the late war. With an appendix, containing an account of the rise and progress of the present unhappy contest between Great Britain and her colonies. By William Russell, Esq. of Gray's-Inn.* Volume 2. London, MDCCLXXVIII. [1778].

Schroedl, Gerald F.
1997 *A Report on the July 1996 Archaeological Investigations at the Brimstone Hill*

National Park, St. Kitts, West Indies. Brimstone Hill Archaeological Project Report No. 1.

1998 *Report on the July 1997 Archaeological Investigations at the Brimstone Hill National Park, St. Kitts, West Indies*. Brimstone Hill Archaeological Project Report No. 7.

2000 *Slavery in the Context of British Fortifications: The Archaeological Context*. Brimstone Hill Archaeological Project Report No. 19.

2006 The 2006 Archaeological Excavations at Brimstone Hill. *Cannonball, Newsletter of the Brimstone Hill Fortress National Park Society* 10 (2 & 3):8-9.

2007 Archaeological Excavations in the North East Work. *Cannonball, Newsletter of the Brimstone Hill Fortress National Park Society* 11 (2 & 3):9-11.

Schroedl, Gerald F. and Todd A. Ahlman
2002 The Maintenance of Cultural and Personal Identities of Enslaved Africans and British Soldiers at the Brimstone Hill Fortress, St. Kitts, West Indies. *Historical Archaeology* 36(4):38-49.

Schoeninger, Margaret J. and Katherine Moore
1992 Bone Stable Isotope Studies in Archaeology. *Journal of World Prehistory* 6(2):247-296.

Schoeninger, Margaret J. and Michael J. DeNiro
1984 Nitrogen and Carbon Isotopic Composition of Bone Collagen from Marine and Terrestrial Animals. *Geochemica et Cosmachinica Acta* 48:625-639.

Sheridan, Richard B.
1976 The Crisis of Slave Subsistence in the British West Indies during and after the American Revolution. *The William and Mary Quarterly*, Third Series 33(4):615-641.

1972 Africa and the Caribbean in the Atlantic Slave Trade. *The American Historical Review* 77(1):15-35.

Shipman, Pat, Giraud Foster and Margaret Schoeninger
1984 Burnt Bones and Teeth: An Experimental Study of Color, Morphology Crystal Structure and Shrinkage. *Journal of Archaeological Science* 11:307-325.

Skaggs, J.M.
1986 *Prime Cut*. Texas A&M University Press.

Silver, I. A.
1963 The Aging of Domestic Animals. In *Science in Archaeology: A Survey of*

Progress and Research, Donald Brothwell and Eric Higgs, eds., 283-302. New York, Praeger.

Sisson, Septimus
1921 *The Anatomy of the Domestic Animal, Second Edition*. W.B. Saunders Company, Philadelphia.

Smith, Bruce M. and Samuel Epstein
1971 Two Categories of $^{13}C/^{12}C$ Ratios for Higher Plants. *Plant Physiology* 47:380-384.

Smith, Frederick H. and Karl Watson
2009 Urbanity, Sociability, and Commercial Exchange in the Barbados Sugar Trade. A Comparative Colonial Archaeological Perspective on Bridgetown, Barbados in the Seventeenth Century. *International Journal of Historical Archaeology* 13(1):63-79.

Smith, Lavett C.
1997 *Field Guide to Tropical Marine Fishes of the Caribbean, the Gulf of Mexico, Florida, the Bahamas, and Bermuda*. Alfred A. Knopf, New York

Smith, Victor T. C.
1994 Barrack No. 4 and the area enclosed by the bastions of the north-east work, Brimstone Hill Fortress. Report of an Historical Investigation, Brimstone Hill Fortress National Park.

Smith, William, Revd. Mr.
1745 *A natural history of Nevis, And the rest of the English Leeward Charibee Islands in America. With many other Observations on nature and art; Particularly, An Introduction to The Art of Decyphering. In Eleven Letters from the Revd Mr. Smith, sometime Rector of St. John's at Nevis, and now Rector of St. Mary's in Bedford; to the Revd Mr. Mason, B.D. Woodwardian Professor, and Fellow of Trinity-College, in Cambridge.* Cambridge, MDCCXLV [1745].

St. Kitts National Archives (SNA)
1733 Address of William Mathews to Council, 5 February 1733/34. St. Kitts Sessional Papers, SCCLM 1734-40, Item 8. St. Kitts National Archives.

1745 CO241/5, St. Christopher Assembly Minutes, 27 March 1745. St. Kitts National Archives.

1791 Laws of the Island of St. Christopher; from the year 1711 to the yeah 1791. Published by Order of the Council and Assembly, Printed by Edward Luther Low. St. Kitts National Archives

1779 CO318/7 St. Christopher Assembly Minutes, November 1779. St. Kitts National Archives.

Sullivan, Charles H. and Harold W. Krueger
1981 Carbon Isotope Analysis of Separate Chemical Phases in Modern and Fossil Bone. *Nature* 292:333-335.

Tieszen, Larry L.
1991 Natural Variations in the Carbon Isotope Values of Plants: Implications for Archaeology, Ecology, and Paleoecology. *Journal of Archaeological Science* 18:227-248.

Twiss, Katheryn
2012 The Archaeology of Food and Social Diversity. *Journal of Archaeological Research* 20:357-395.

Ubelaker, Douglas H. and Douglas W. Owsley
2003 Isotopic Evidence for Diet in the Seventeenth-Century Colonial Chesapeake. *American Antiquity* 68(1):129-139

van der Merwe, Nikolaas J.
1982 Carbon Isotopes, Photosynthesis, and Archaeology: Different pathways of photosynthesis cause characteristic changes in carbon isotope ratios that make possible the study of prehistoric human diets. *American Scientist* 70(6):596-606.

van der Merwe N. J. and Vogel J. C.
1978 13C Content of Human Collagen as a Measure of Prehistoric Diet in Woodland North America. *Nature* 276:815–816.

Walsh, Margaret
1982 *The Rise of the Midwestern Meat Packing Industry*. Lexington: University Press of Kentucky.

Warinner, Christina and Noreen Tuross
2009 Alkaline Cooking and Stable Isotope Tissue-diet Spacing in Swine: Archaeological Implications. *Journal of Archaeological Science* 36:1690-1697.

Watson, J. P. N.
1979 The Estimation of the Relative Frequencies of Mammalian Species: Khirokitia 1972. *Journal of Archaeological Science* 6:127-137.

Welch, Paul D. and C. Margaret Scarry
1995 Status-Related Variation in Foodways in the Moundville Chiefdom. *American Antiquity* 60(3):397-419.

Wheeler, A. and A.K.G. Jones
1989 *Fishes*. Cambridge University Press, Cambridge.

White, Theodore Elmer
1953 A Method of Calculating the Dietary Percentage of Various Food Animals

Utilized by Aboriginal Peoples. *American Antiquity* 18(4):396-398.

White, Timothy. D. and Pieter A. Folkens
2005 *The Human Bone Manual*. Elsevier Academic Press, Burlington, MA.

Wilk, Richard R.
1999 "Real Belizean Food": Building Local Identity in the Transnational Caribbean. *American Anthropologist* 101(2):244-255.

Wing, Elizabeth and Sylvia Scudder
1980 Use of Animals by the Prehistoric Inhabitants on St. Kitts, West Indies. In (S.M. Lewenstein Ed.) *Proceedings of the Eight International Congress for the Study of the Pre-Columbian Cultures of the Lesser Antilles*. Arizona State University Anthropological Research Papers 22: 237-245.

Zeder, Melinda A. and Heather A Lapham
2010 Assessing the Reliability of Criteria used to Identify Post Cranial Bones in Sheep, *Ovis*, and Goats, *Capra*. *Journal of Archaeological Science* 37(10):2887-2905.

Appendices

Appendix 1. Tables

Table 1: List of Common and Scientific Names of Vertebrate Remains at BSH5 and BSH6

CLASS	ORDER	FAMILY	GENUS	SPECIES	COMMON NAME
Osteichthyes					Bony fishes
		Belonidae			Needlefishes
			Tylosurus	*crocodilus*	Houndfish
		Carangidae			Jacks
			Caranx	*crysos*	Blue runner
		Clupeidae			Herring, shad, sardines
			Clupea	*harengus*	Atlantic herring
		Lutjanidae			Snappers
		Scaridae			Parrotfishes
			Scarus	*vetula*	Queen parrotfish
			Sparisoma	spp.	Parrotfishes
		Sciaenidae			Drum, croaker
		Scombridae			Mackerel, tuna, bonito
			Scomber	*scombrus*	Atlantic mackerel
		Serranidae			Sea basses & groupers
			Epinephelus	spp.	Groupers
		Sparidae			Porgies
			Calamus	*penna*	Sheepshead porgy
		Sphyraenidae			Barracudas
			Sphyraena	*barracuda*	Great barracuda
Reptilia					Reptiles
		Cheloniidae			Sea turtles
		Polychotidae			Iguanian lizards
			Anolis	sp.	Tropical lizard
	Squamata				Snakes and lizards
Amphibia					Amphibians
	Anura				Frogs and toads
Aves					Birds
		Columbidae			Pigeons and doves
		Numididae			Guinea fowl
			Numida	*meleagris*	Guinea fowl
		Phasianidae			Pheasant, chicken
			Gallus	*gallus*	Domestic chicken
			Meleagris	*gallopavo*	Turkey

Table 1 cont. List of Common and Scientific Names of Vertebrate Remains at BSH5 and BSH6

CLASS	**ORDER**	**FAMILY**	**GENUS**	**SPECIES**	**COMMON NAME**
Mammalia					Mammals
			Canis	*familiaris*	Domestic dog
			Equus	*asinus*	Donkey
			Equus	*caballus*	Domestic horse
			Felis	*domesticus*	Domestic cat
			Herpestes	*javanicus*	Mongoose
			Homo	*sapiens*	Human
			Sus	*scrofa*	Pig
	Rodentia				Rodents
			Rattus	*norvegicus*	Brown rat
			Rattus	*rattus*	Black rat
			Rattus	spp.	Brown and black rat
		Bovidae			Cattle, sheep, goat
			Bos	*taurus*	Cattle
		Caprine			Sheep and goat
			Capra	*hirca*	Domestic goat
			Ovis	*aries*	Domestic sheep

Table 2: BSH5 Faunal Assemblage

Taxa	**NISP**	**Percent**
Unidentifiable	28,459	46.8
Mammalia		
Bos taurus	1,398	
Canis familiaris	4	
Caprine	350	
Equus caballus	1	
Felis domesticus	11	
Herpestes javanicus	1	
Homo sapiens	2	
Rattus spp.	44	
Sus scrofa	288	
Unidentifiable mammal	25,504	
Small	6	
Medium	554	
Large	247	
Total mammal	28,410	46.8
Osteichthyes		
Belonidae	3	
Tylosurus crocodilus	9	
Carangidae	4	
Caranx crysos	5	
Clupeidae	80	
Lutjanidae	5	
Scaridae	4	
Scarus vetula	1	
Sparisoma spp.	3	
Sciaenidae	2	
Scomber scombrus	6	
Serranidae	8	
Epinephelus spp.	1	
Calamus penna	1	
Sphyraena barracuda	1	
Unidentifiable fish	2,339	
Total fish	2,472	4.1
Reptilia		
Cheloniidae	1	

Table 2 cont. BSH5 Faunal Assemblage

Taxa	**NISP**	**Percent**
Anolis spp.	1	
Squamata	2	
Unidentifiable reptiles	2	
Total reptile	6	>0.0
Amphibia		
Anura	1	
Total amphibian	1	>0.0
Aves		
Columbidae	3	
Gallus gallus	48	
Numida meleagris	2	
Phasianidae	6	
Unidentifiable birds	42	
Total bird	101	0.2
Artifact/Bone Button Debris	1,297	2.1
NISP Total	60,746	100

Table 3: BSH6 Faunal Assemblage

Taxa	**NISP**	**Percent**
Unidentified	198	12.4
Mammalia		
Sus scrofa	5	
Caprine	70	
Bos taurus	22	
Equus asinus	2	
Rattus spp.	9	
Homo sapiens	1	
Unidentifiable mammal	1,162	
Small	3	
Medium	37	
Medium/Large	9	
Large	16	
Total Mammals	1,336	83.5
Osteichthyes	18	1.1

Table 3 cont. BSH6 Faunal Assemblage

Taxa	**NISP**	**Percent**
Aves		
Gallus gallus	15	
Meleagris gallopavo	1	
Phasianidae	14	
Unidentifiable birds	11	
Total birds	41	2.6
Bone Button Debris	7	0.4
NISP Total	1,600	100

Table 4: BSH5 Fauna Contributing to Diet

Taxa	**NISP**	**Percent**
Mammalia		
Medium/Large	801	13.9
Burned/Calcined	217	3.8
Cut/Chop/Saw	196	3.4
Bos taurus	1,398	24.2
Caprine	350	6.1
Sus scrofa	288	5
Total mammal	3,250	56.2
Aves		
Columbidae	3	0.1
Gallus gallus	48	0.8
Numida meleagris	2	>0.0
Phasianidae	6	0.1
Total Bird	59	1.0
Osteichthyes		
Belonidae	3	0.1
Tylosurus crocodilus	9	0.2
Carangidae	4	0.1
Caranx crysos	5	0.1
Clupeidae	80	1.4
Lutjanidae	5	0.1
Scaridae	4	0.1
Scarus vetula	1	>0.0
Sparisoma spp.	3	0.1

Table 4 cont. BSH5 Fauna Contributing to Diet

Taxa	**NISP**	**Percent**
Sciaenidae	2	>0.0
Scomber scombrus	6	0.1
Serranidae	8	0.1
Epinephelus spp.	1	>0.0
Calamus penna	1	>0.0
Sphyraena barracuda	1	>0.0
Unidentifiable fish	2,339	40.5
Total fish	2,472	42.9
Total	**5,781**	**100.1**

Table 5: BSH6 Fauna Contributing to Diet

Taxa	NISP	Percent
Mammalia		
Medium/Large	62	30
Bos taurus	22	10.6
Caprine	70	33.8
Sus scrofa	5	2.4
Total Mammal	159	76.8
Aves		
Gallus gallus	15	7.2
Meleagris gallopavo	1	0.5
Phasianidae	14	6.8
Total Bird	30	14.5
Osteichthyes		
Unidentifiable fish	18	8.8
Total	**207**	**100.1**

Table 6: BSH5 Fish Identified by Family

Osteichthyes	**Common Name**	**Habitat**	**NISP**
Belonidae	Needlefish	Pelagic	12
Carangidae	Jacks, runners, scads	Reef	9
Clupeidae	Herring	Pelagic	80
Lutjanidae	Snappers	Reef	5
Scaridae	Parrot fish	Reef	8
Sciaenidae	Drum	Reef	2
Scombridae	Mackerel	Pelagic	6
Serranidae	Sea bass, grouper	Reef	9
Sparidae	Porgies	Reef	1
Sphyraenidae	Barracuda	Pelagic	1
Other fish		N/A	2,339
Total fish			2,472

Table 7: BSH5 MNE of *Bos*, Caprine, and *Sus*

BSH5 MNE	***Bos taurus***		**Caprine**		***Sus scrofa***	
	NISP	MNE	NISP	MNE	NISP	MNE
Heads						
Skull	33	6	2	1	6	3
Hyoid	13	9	6	3	0	0
Mandible	78	20	15	7	7	3
	124	**35**	23	**11**	13	**6**
Body						
Cervical	10	5	3	2	18	9
Thoracic	22	12	3	4	8	3
Lumbar	16	4	6	2	14	4
Ribs/sternum	335	114	105	18	49	14
Scapula	28	10	12	4	7	4
Pelvis	7	5	11	8	6	3
	418	**150**	140	**38**	102	**37**
Upper Limbs						
Humerus	14	5	16	7	26	9
Radius	34	11	11	8	15	8
Ulna	25	11	9	7	9	5
Femur	24	9	6	3	23	6
Tibia	24	11	11	6	7	5
Patella	5	4	0	0	3	3
	126	**51**	53	**31**	83	**36**
Foot Elements						
Metapodials	9	4	9	4	1	1
Carpals	38	31	9	9	2	2
Tarsals	28	18	11	10	3	3
Phalanges	4	2	24	12	6	4
	79	**55**	53	**35**	12	**10**
Total	**747**	**291**	**269**	**115**	**210**	**89**

Table 8: BSH6 MNE of *Bos*, Caprine, and *Sus*

BSH6 MNE	***Bos taurus***		**Caprine**		***Sus scrofa***	
	NISP	MNE	NISP	MNE	NISP	MNE
Heads						
Skull	0	0	11	1	3	1
Hyoid	0	0	0	0	0	0
Mandible	1	1	2	1	1	1
	1	**1**	13	**2**	4	**2**
Body						
Cervical	0	0	0	0	0	0
Thoracic	1	1	2	2	0	0
Lumbar	0	0	2	1	0	0
Ribs/sternum	14	5	19	4	1	1
Scapula	1	1	1	1	0	0
Pelvis	1	1	2	1	0	0
	17	**8**	26	**9**	1	**1**
Upper Limbs						
Humerus	0	0	10	5	0	0
Radius	3	1	5	2	0	0
Ulna	0	0	1	1	0	0
Femur	0	0	6	3	0	0
Tibia	0	0	4	2	0	0
Patella	0	0	0	0	0	0
	3	**1**	26	**13**	0	**0**
Foot Elements						
Metapodials	0	0	1	1	0	0
Carpals	0	0	0	0	0	0
Tarsals	0	0	4	4	0	0
Phalanges	1	1	1	1	0	0
	1	**1**	6	**6**	0	**0**
Total	**22**	**11**	**71**	**30**	**5**	**3**

Table 9: BSH5 Skeletal Part Frequency of Three Mammals

	n	%
Bos taurus		
High Utility	544	72.8
Low Utility	203	27.2
Sus scrofa		
High Utility	198	94.3
Low Utility	12	5.7
Caprine		
High Utility	193	71.7
Low Utility	76	28.3

Table 10: BSH6 Skeletal Part Frequency of Three Mammals

	n	%
Bos taurus		
High Utility	20	90.9
Low Utility	2	9.1
Sus scrofa		
High Utility	5	100
Low Utility	0	0
Caprine		
High Utility	52	73.2
Low Utility	19	26.8

Table 11: Stable Carbon Isotope Ratios of Cattle Bones from BSH5

BSH5 Enlisted Men's Context				
UGA No.	**Sample No.**	**BSH ID**	**Material**	**$\delta^{13}C$‰**
5295	*B.t.* 1	007-268A	Collagen	-22.01
11811	*B.t.* 2	006-258	Collagen	-21.29
4109	*B.t.* 3	007-082A	Collagen	-20.89
4107	*B.t.* 4	007-074B	Collagen	-20.29
4115	*B.t.* 5	007-105A	Collagen	-18.22
4111	*B.t.* 6	007-098B	Collagen	-17.49
5296	*B.t.* 7	007-268B	Collagen	-17.13
11814	*B.t.* 8	007-187	Collagen	-14.93
11815	*B.t.* 9	007-248	Collagen	-14.22
5294	*B.t.* 10	007-256B	Collagen	-13.10
5292	*B.t.* 11	006-255	Collagen	-13.08
4108	*B.t.* 12	007-074C	Collagen	-12.53
5293	*B.t.* 13	007-256A	Collagen	-10.52
11812	*B.t.* 14	006-261	Collagen	-8.97
11813	*B.t.* 15	007-185	Collagen	-8.71
4110	*B.t.* 16	007-098A	Collagen	-8.43
4106	*B.t.* 17	007-074A	Collagen	-8.42

Appendix 2. Figures

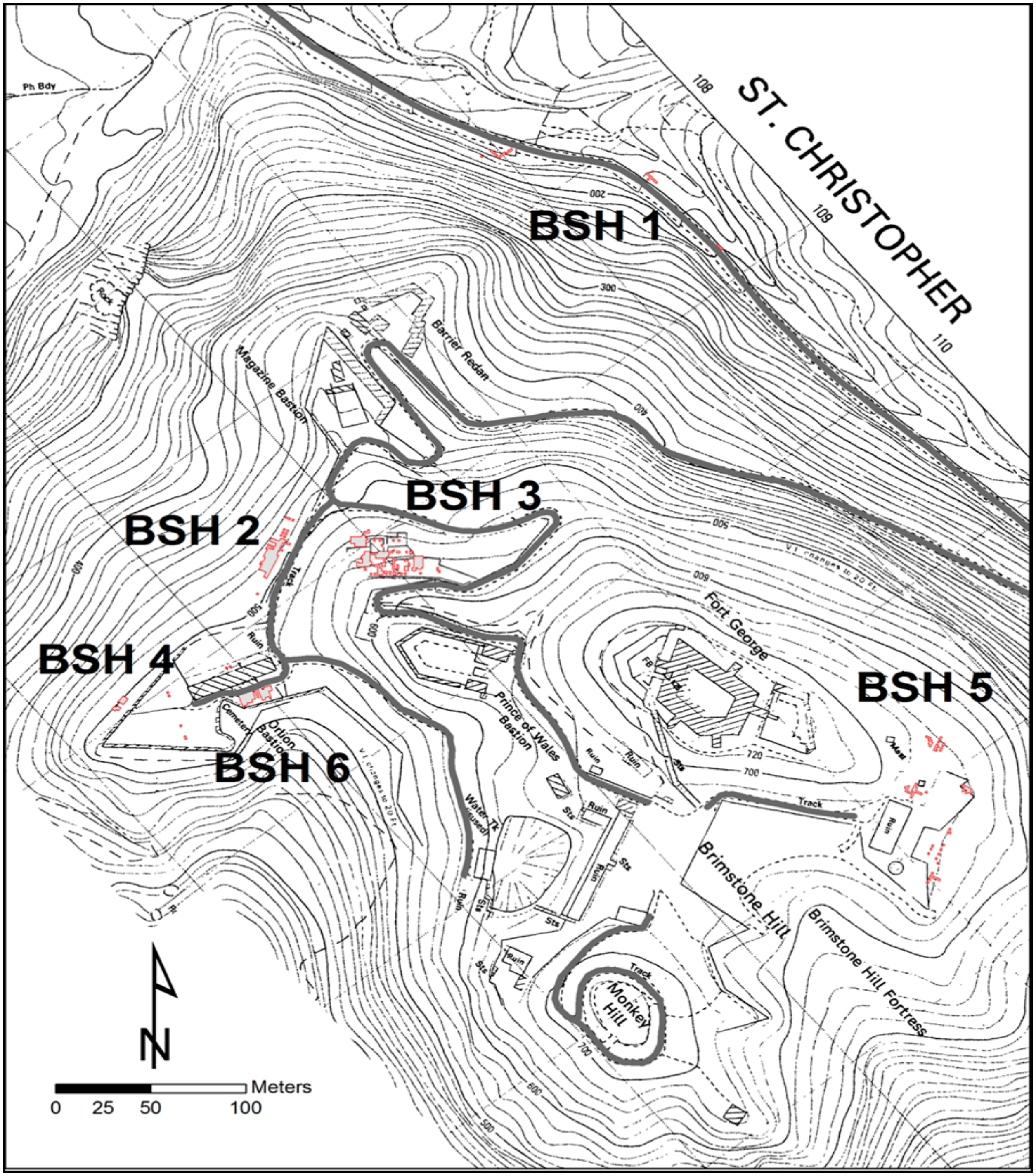

Figure 1 Brimstone Hill Fortress Excavation Areas

United Kingdom, Ordnance Survey, St. Christopher 1017 and 0917 map; site locations plotted by Todd Ahlman and Bobby Braly, 2010

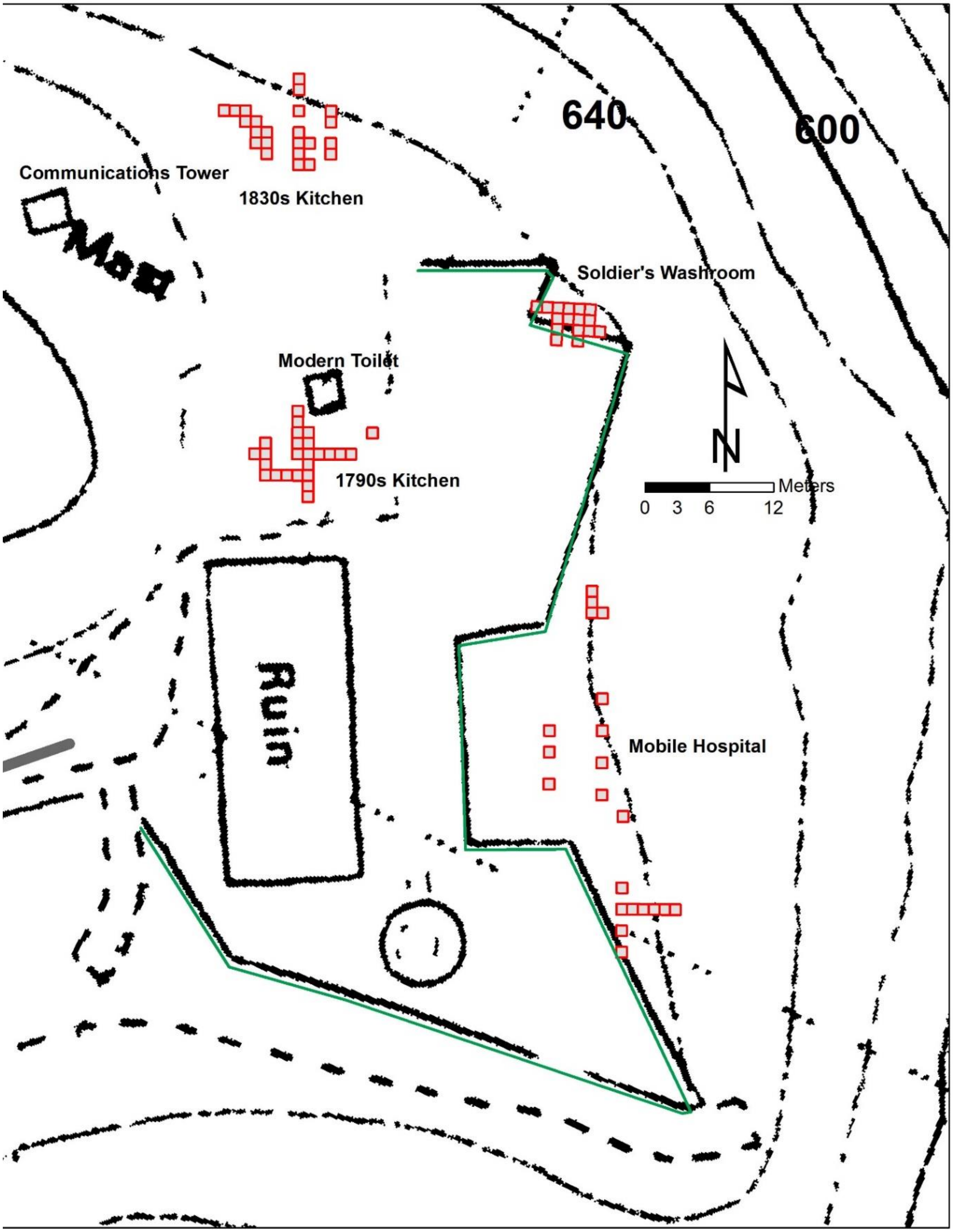

Figure 2: Brimstone Hill 5 Excavation Areas
Excavations plotted by Gerald F. Schroedl and Bobby Braly, 2010

Figure 3: Brimstone Hill 6 Excavation Areas
Excavations plotted by Gerald F. Schroedl and Bobby Braly, 2010

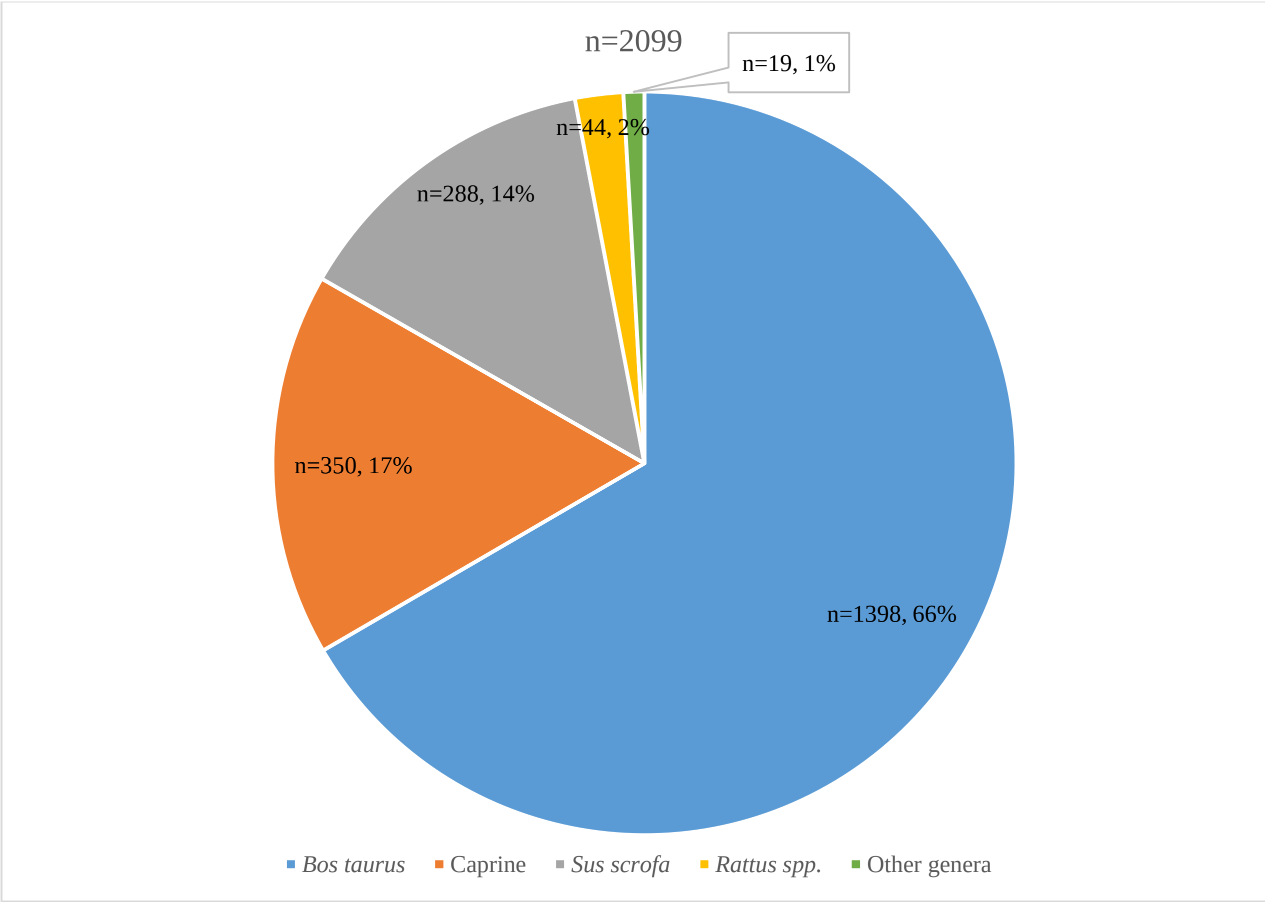

Figure 4: BSH5 Mammal Identified to Genus

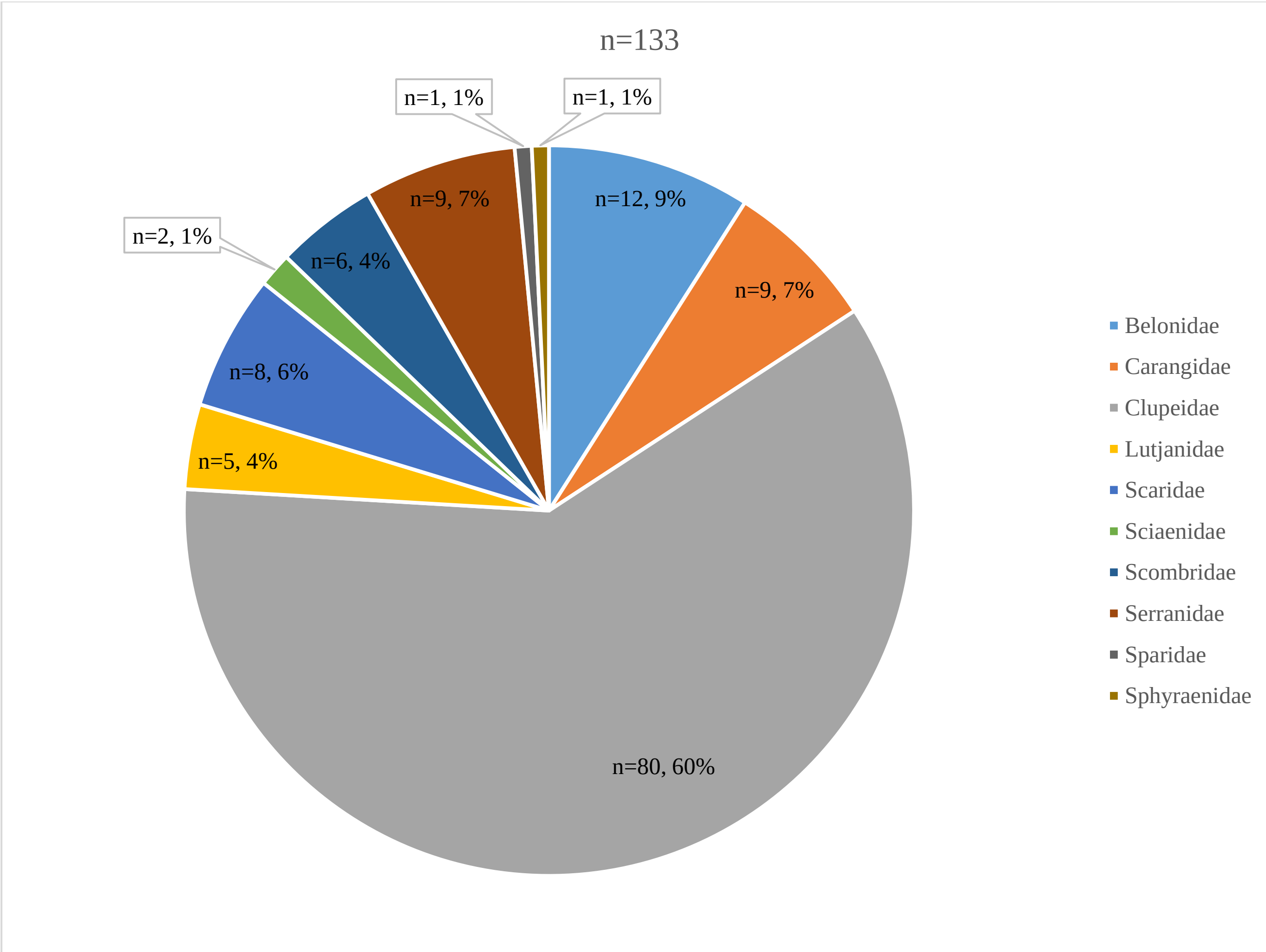

Figure 5: BSH5 Fish Identified by Family

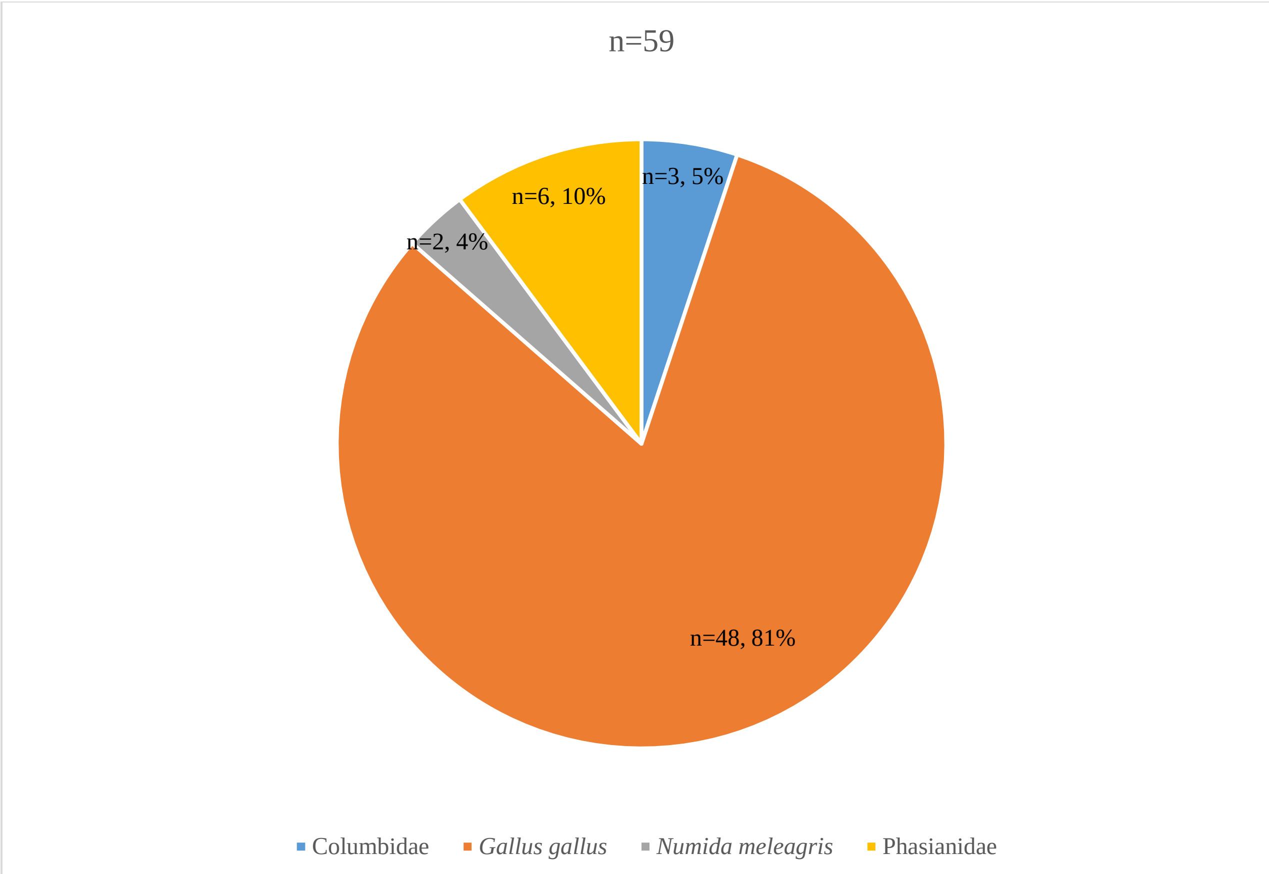

Figure 6: BSH5 Avian Assemblage Identified to Family and Genus

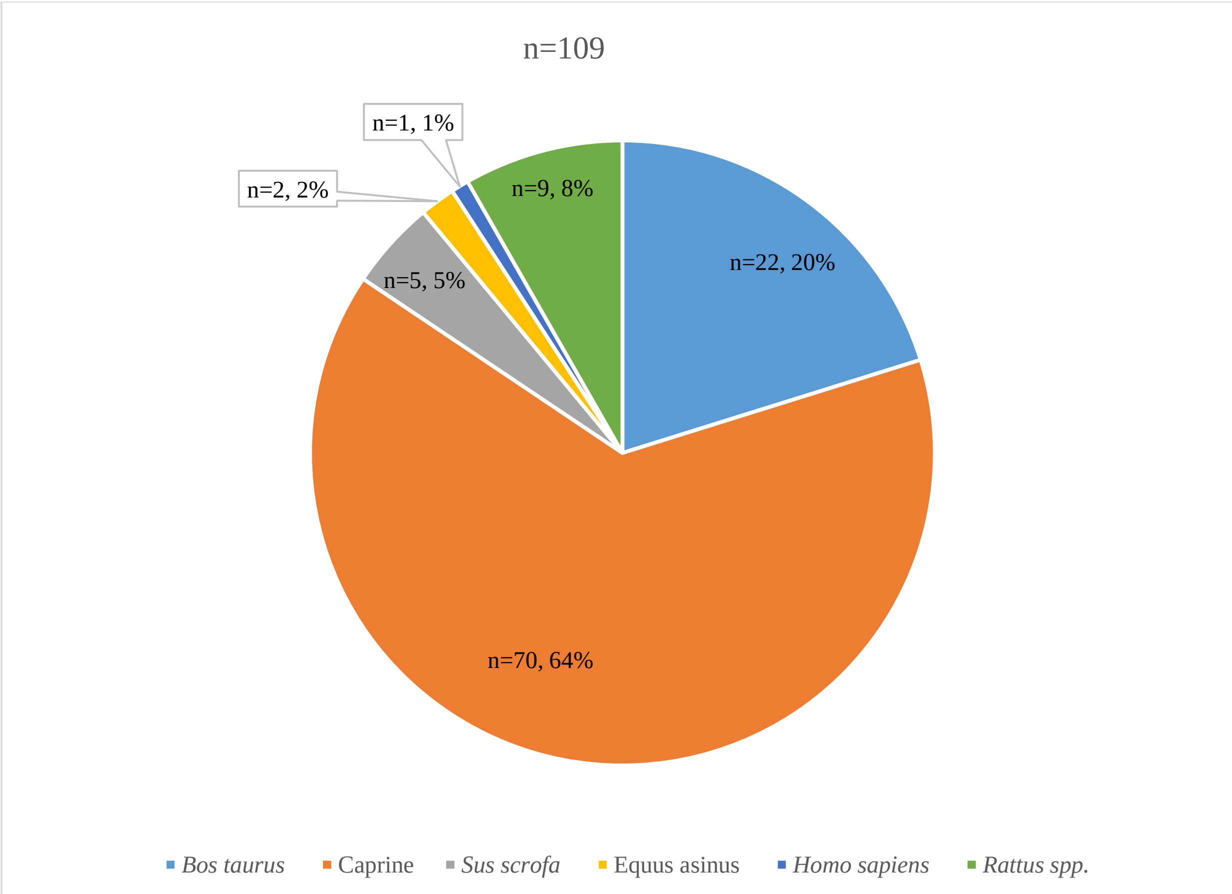

Figure 7: BSH6 Mammal Identified to Genus

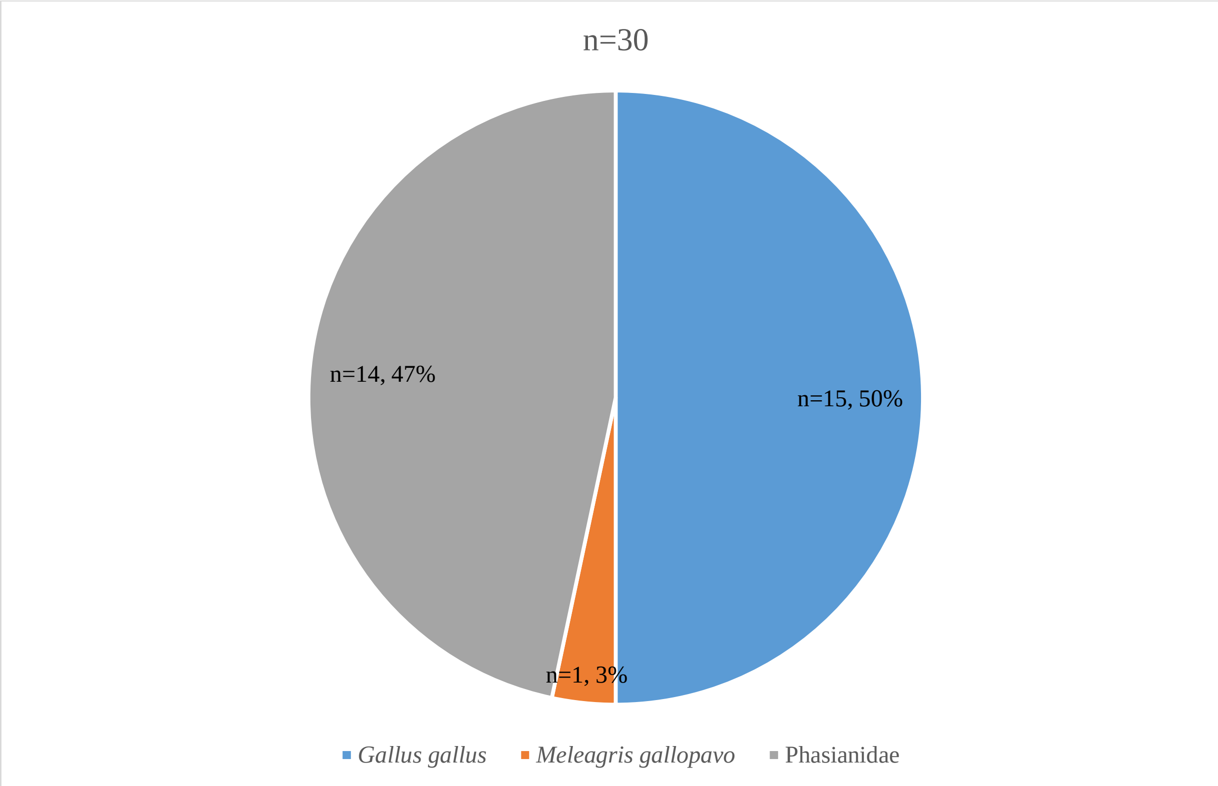

Figure 8: BSH6 Avian Assemblage Identified to Family and Genus

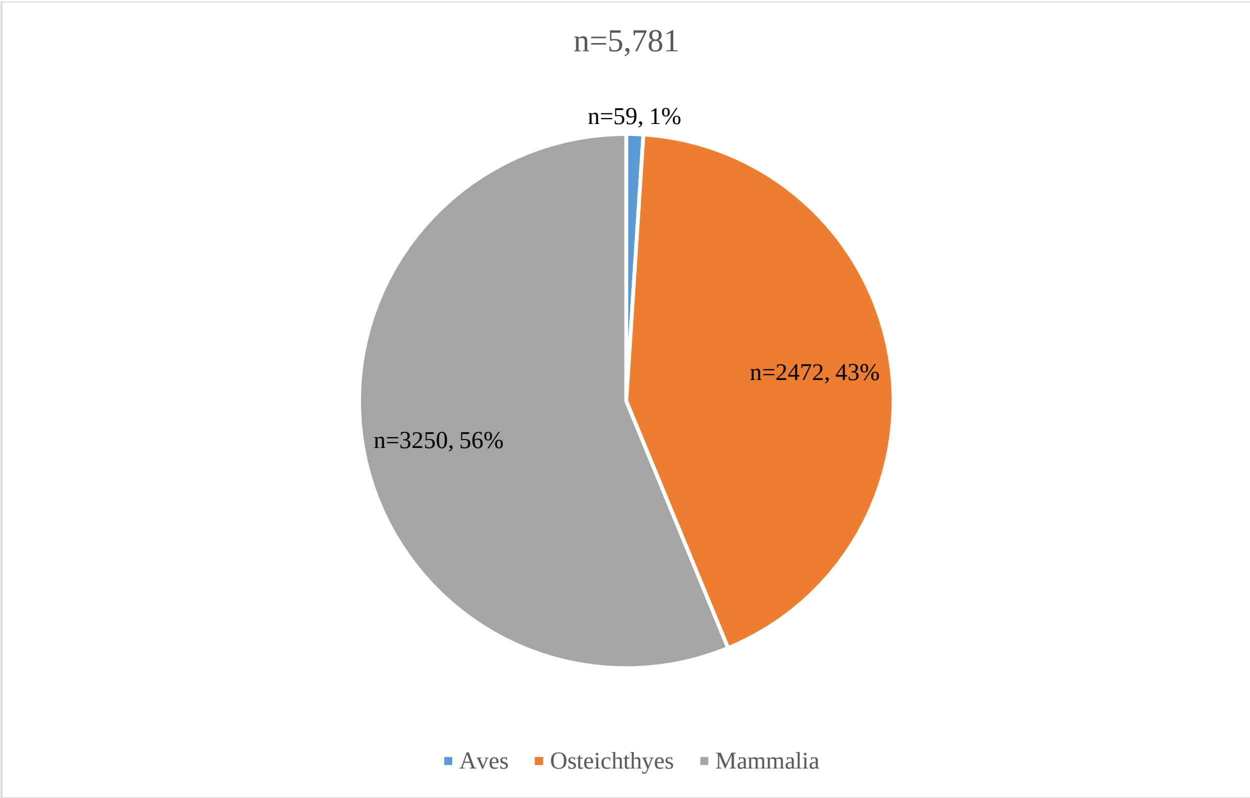

Figure 9: BSH5 Fauna Contributing to Diet

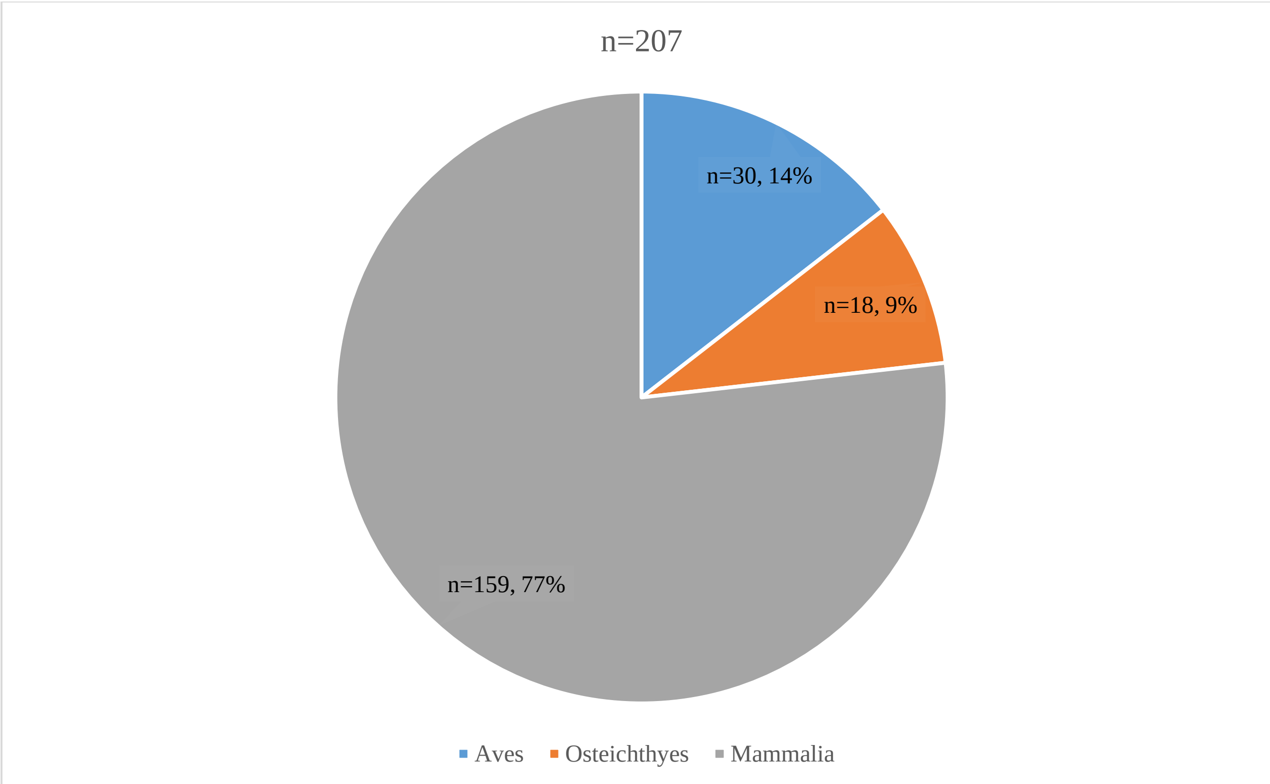

Figure 10: BSH6 Fauna Contributing to Diet

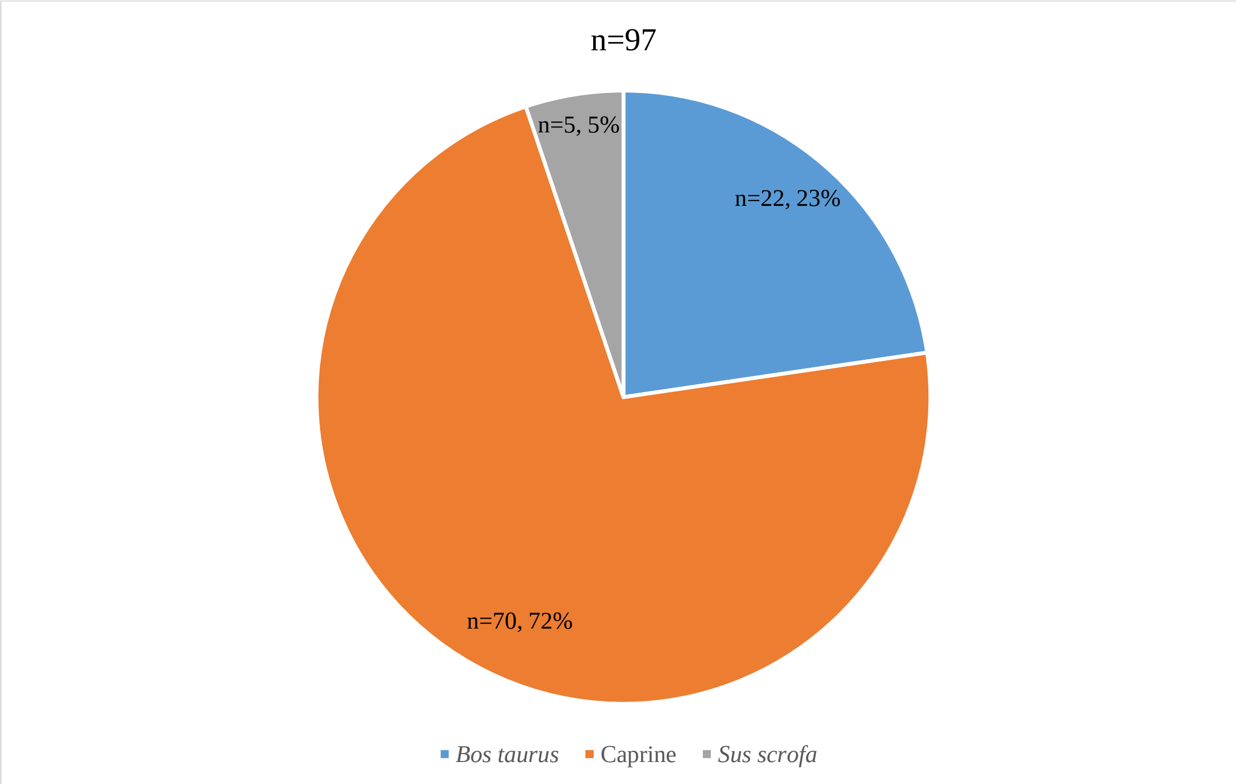

Figure 11: BSH6 Mammal by Genus Contributing to Diet

Note: Unidentifiable medium and large mammal bones (n=62) are not included.

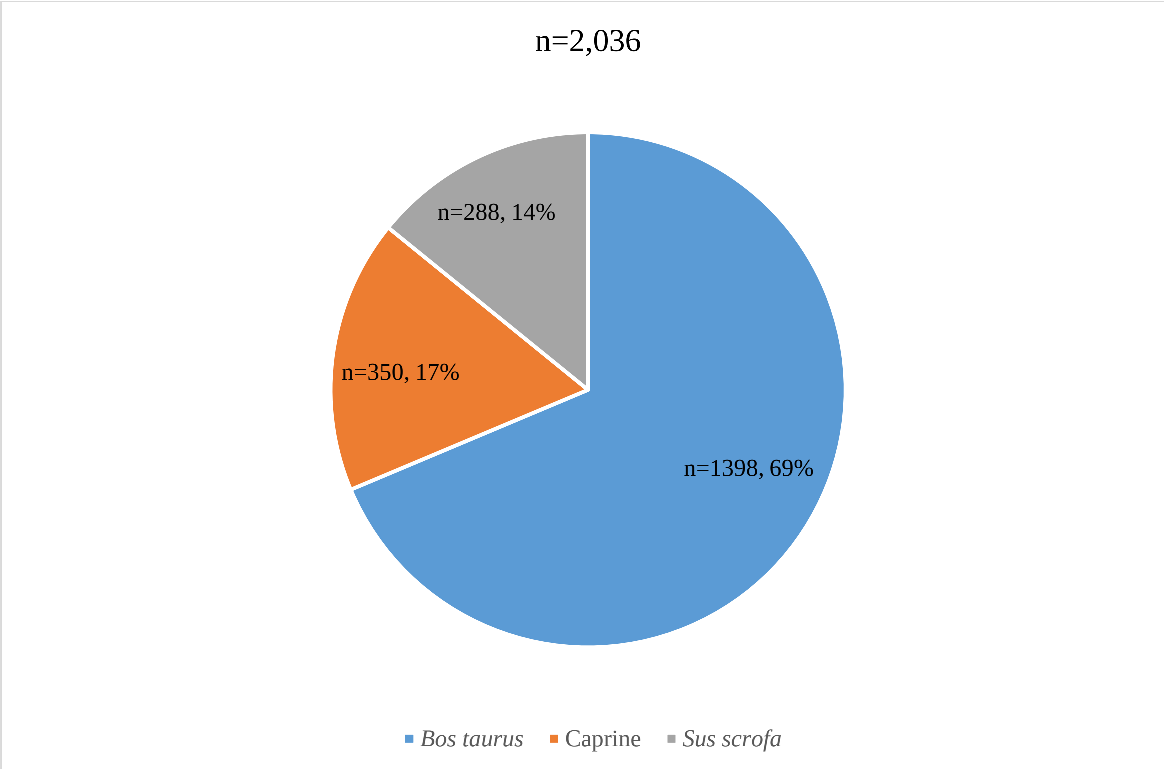

Figure 12: BSH5 Mammal by Genus Contributing to Diet

Note: Unidentifiable medium and large mammal bones (n=801), burned/calcined bones (n=217) and bones with cut/chop/saw marks (n=196) are not included.

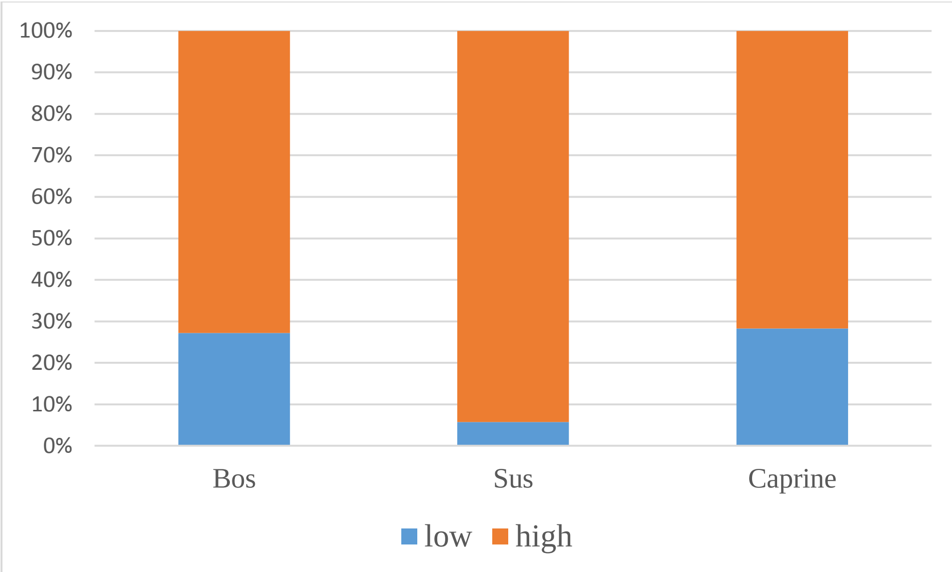

Figure 13: BSH5 Skeletal Part Frequency

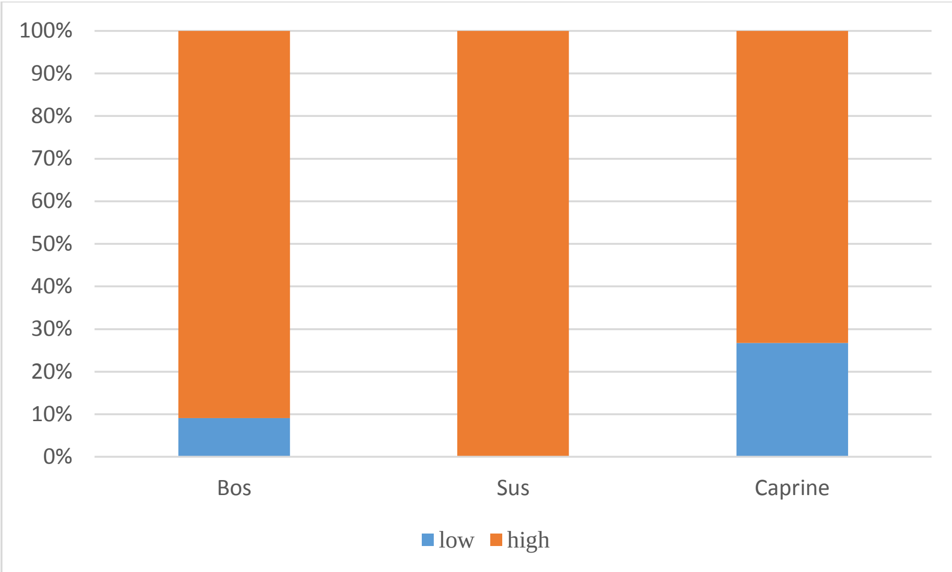

Figure 14: BSH6 Skeletal Part Frequency

Vita

Callie Bennett grew up in Unicoi County, Tennessee and graduated from Unicoi County High School in 2005. She earned a Bachelor of Arts degree in Anthropology and a Bachelor of Arts degree in Psychology from the University of Tennessee, Knoxville in 2009.