The St. George's Caye Archaeology Project:

Results of the 2013 Field Season

Edited by
James F. Garber

Texas State University
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Chapter 1. Introduction

James F. Garber

St. George's Caye played a vital role in the history and development of Belize as an independent nation. This small caye is one of hundreds of islands off the coast of Belize that are part of large reef system, the second largest in the world. Its predominant role in the early history of the English settlement was due to its position and shape. The reef system forms an offshore barrier that protects the coast. Because of the difficulties of navigation, these waters provided safe haven for merchants, buccaneers, and pirates that sailed the Caribbean. To access the mainland and harbors at the mouths of the rivers, one must navigate narrow passages through the reef and then follow a complex system of channels. In order to reach the Belize River, the country's main river system, one must pass by St. George's Caye, thus its strategic location guarding the port (Figure 1.1). Additionally, the caye is crescent shaped making it ideal for careening ships on its leeward side (Figure 1.2).

The Battle of St. George's Caye on September 10, 1798 represents the end of Spain's attempts to conquer the territory that is now known as Belize. Although this battle happened over 200 years ago, it is still plays a large role in Belizean culture, as seen during the annual September Celebrations when people all over the country honor the Battle of St. George's Caye. The fact that the caye is featured on the Belize five-dollar bill is an indicator of its importance (Figure 1.3). The front side depicts a medallion from the tomb of Thomas Potts one of the Bay Settlements early leaders and the back side features a 1764 map of the caye, the Thomas Potts tomb, the Biddle house, and a "bathing crawl".

While much has been written about the history of St. Georges Caye, the first capital of Belize, there has been little archaeology done on the island. With this in mind, we initiated the St. George's Caye Archaeology Project in 2009. The results of the 2013 field season are presented in the pages that follow.

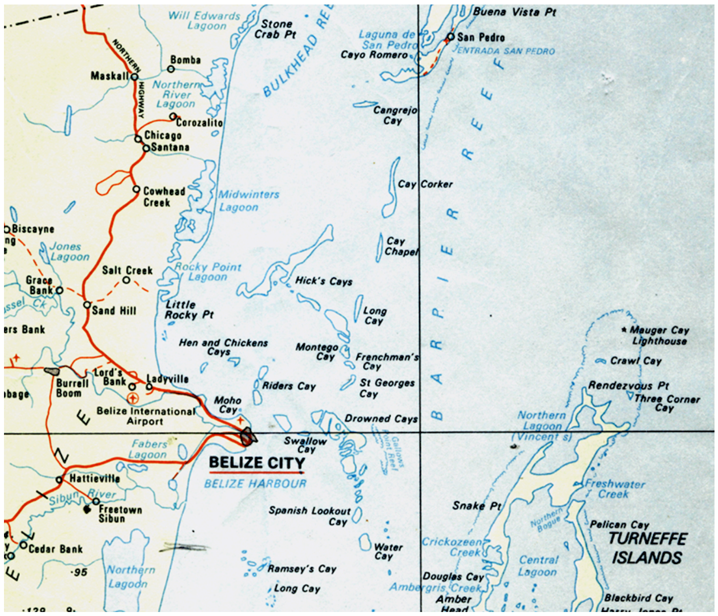

Figure 1.1. Map of Belize coast showing location of St. George's Caye.

Figure 1.2. Satellite image of St. George's Caye.

Figure 1.3. Belize 5 dollar bill. Front side depicts a medallion from Thomas Potts' tomb, backside shows a 1764 map of the caye, the Thomas Potts tomb, the Biddle house, and a bathing "crawl". This style bill was introduced in 1990.

Chapter 2: Field Investigations on St. George's Caye: Results of the 2013 Field Season

Matthew T. Elverson, James F. Garber, Lauren A. Sullivan, Lauren Springs

Two goals were established for the 2013 field season prior to the commencement of field efforts. The first was to continue investigating recorded anomalies from the ground penetrating radar (GPR) survey in the cemetery. The other goal was to conduct a systematic, intensive shovel testing survey around the Searle's white house. If any shovel test probes revealed colonial cultural material, an excavation unit (XU) would be established. Both of these goals were met with great success, revealing several unknown burials in the cemetery, and finding in-situ colonial artifacts on the Habet property (adjacent to the white house).

Two local datum points were established in the 2013 field season. The southeastern corner of XU39 was utilized for its unparalleled height over the remainder of the units. This allowed for an easier measuring of other locations throughout these areas. The northeastern corner of XU46 was utilized as the datum for the Habet excavations. Nails, with attached pin flags from the corners of XU45 and 46, were buried after the field season to help identify the boundaries of the units for additional excavations.

XU39:

XU39 was the first unit established for the 2013 field season (Figure 2.1). It is located just northwest of the current cemetery entrance. A buffer of 50 centimeters (cm) was given on the eastern boundary of the unit, so as to not endanger the integrity of the cemetery wall or intrude on the wall's construction fill. The unit measured 4x4 meters. The purpose of this unit was to investigate the large, rectangular anomaly identified in the GPR survey map. This unit was located in the eastern half of the aforementioned anomaly.

Level 1 included the thin humic layer and natural or cultural fill layer of light sand and shells. The strata visibly sloped downward from the eastern to the western half of the unit (about a 10 cm difference). The level terminated at a thin lens of clay, about 45 centimeters below datum (cmbd). This may represent the original ground surface of the cemetery prior to the natural fill deposit from storm activity. One modern glass bottle was found intact. A large palm tree stump was excavated and matched the location of the living tree to the south of the cemetery entrance, relative to the gate.

Level 2 consisted of a very thin, sterile clay lens with a high density of root inclusions. The stump appears to rest on this level, further supporting the original surface level theory for this stratum. Only a few artifacts were discovered in this level with no special finds. The level terminated at 53 cmbd.

Level 3 continued from this depth and terminated at around 130 cmbd in the eastern portion of the unit, with a slight angle down to the western half for water drainage. The unit ended at sterile, light sand. Towards the closure of the unit, a wooden plank was identified in the southern wall, while cleaning the profile. This was eventually labeled Burial 31 and will be discussed in detail below. Level 3 included historic ceramic and glass, mangrove roots, metal pieces, and dense small root inclusions.

XU40:

XU40 shared its eastern border with XU39 and was established for the purpose of investigating the western half of the previously discussed GPR anomaly. Level 1 was composed of light sandy fill with moderate marine shell inclusions. This level covered the original surface of the cemetery, possibly from the 19th century. The stratum terminates at a thin clay layer. This interface represents an abrupt stratigraphic change. Few historic artifacts were recorded in Level 1. A termination depth of 45 cmbd was measured throughout the unit.

Level 2 was characterized by a thin, dense clay stratum. This stratigraphic level was even with the one discovered in XU39, where the old palm stump was resting. Only a few artifacts were recovered from this stratum, including concrete rubble and modern bottle caps. The concrete may have been from above-ground tombs that were destroyed from storm activity. The level was terminated at 55 cmbd.

Level 4 was an arbitrary pass taken to determine what the anomaly was in the GPR survey. The level extended into a sterile lens with large mangrove roots, turtle bone, and a wooden plank near the northwestern corner of the unit. This was further exposed as XU40B, the unit opened for the bilge pump, artificially expanded and caved in on itself over the course of the field season. No human remains were located, however, this was likely a structural element of a coffin at one time. On average, the level was terminated around 100 cmbd, with a slight angle to the northwest for water table adjustments.

XU41:

No excavation units from previous field seasons have been placed just outside of the cemetery's modern eastern wall. The GPR survey did not map outside of the cemetery, however, it was possible that colonial burials extended past the modern wall. For this reason, a 4x4 meter unit was excavated to understand the stratigraphy and determine if historic burials spread past the modern boundaries of the cemetery.

Level 1 encompassed the very thin humic layer and a deep second stratum that consisted of sand with large concrete chunks (20 cm in diameter). It was posited that this deep stratum was likely the result of storm activity. The termination of the level was recorded, on average, at 80 cm below a datum established outside of the cemetery (next to the wall). Few artifacts were recovered from this unit. A trench was excavated on the northern quarter of the unit that extended under the wall and into XU39. This was dug to mitigate the every-rising water table in XU41. The unit was abandoned at variable depths, including 125 cmbd in the northwestern corner and 100 cmbd in the southwestern corner.

XU42:

XU42 was opened to the west of XU39 and south of XU40. The unit was excavated to investigate a large anomaly mapped in the GPR survey. Level 1 consisted of the humic layer and marine sand fill that was also present in units 39 and 41. No special finds were recorded in this level. A termination depth was recorded at, on average, 45 cmbd throughout the unit.

Level 2 encompassed an arbitrary pass and included the discovery of the distal ends of two wooden coffins and human remains (Figures 2.2 and 2.3). The bottom half of the coffins were consistently underneath the water table, at around 110 cmbd, and were very well preserved. Each coffin lay on an east to west alignment, with one protruding into the northwestern corner of the unit and the other in the southwestern corner of the unit. Both of these coffins appeared to be made of a hard, dark wood, unlike the burial found in XU44.

The northern burial, Burial 29, was made with thin pieces of wood and had few articulated remains. Only the base of the coffin remained intact due to anaerobic preservation. The coffin was hexagonal in shape and the skull, appearing to be in-situ, was on the western half of the burial. This followed the Christian burial tradition of the east to west alignment. No grave goods were documented in association of this burial. It was possible the coin, found in XU43, level 2, was placed with this individual. The coin dates to 1812 and may provide a temporal context for Burial 29 or 30 (Figure 2.4).

The southern burial, Burial 30, was also hexagonal in shape, made of a very thin, dark wood, and appeared to be in the same alignment. The human remains were slightly more articulated in this burial, with no observed associated grave goods. Two cylindrical pieces of wood were found underneath this coffin, both as the ends of the burial and perpendicular to the coffin. These were likely utilized to lower the individual into the ground and were left in place once the burial was situated. Like Burial 29, only the base of the coffin was preserved and was at an almost identical depth of 108 cmbd. Both burials extended into XU43.

XU43:

After coffins were found extending into the western wall of XU42, XU43 was opened to complete the burial exhumations. XU43 measured 2 meters north to south by 1.5 meters east to west. A small portion of the northern wall of the unit was also removed in order to fully excavate Burial 29. Level 1 consisted of the humic layer and light sandy fill. Few artifacts were recorded in this stratum. A termination depth was recorded, on average, at 40 cmbd. Level 2, Lot 2 encompassed a dark, sandy matrix above, between, and below Burials 29, 30, and 32. Root inclusions were dense in the upper portion of this stratum, suggesting bioturbation disturbance. A 2 reale coin, with a date of 1812 visible on one side, was documented from this stratum and was found while screening the soil. The top of the level was measured at 40 cmbd and was terminated, on average, at 130 cmbd, or at the bottom of the coffins.

XU44:

XU44 measured 1 meter east to west by 50 centimeters north to south. The unit was placed just south of XU 39 and just east of the northeastern corner of XU42. The purpose of this unit was to reveal the remainder of the coffin burial that was first noticed in the southeastern corner of XU39. Level 1 included both the humic layer and marine sand fill described in XU39.

This level terminated at a depth of, on average, 85 cmbd. This level was excavated with shovels and not screened in order to expedite the exhumation of the known burial. Level 1 terminated approximately 20 cm above the exposed wooden coffin in XU39. The level ended at a stratigraphic change from the light sandy fill to a gray and dark sandy stratum.

Level 2 may represent the original cemetery ground surface. This level was a gray to dark grey sandy matrix with few artifacts. The level terminated at a darker staining on the sand and discovery of artifacts. The level depth ranged from 85 cmbd to 95 cmbd.

Level 3 consisted of a cluster of artifacts and stained soil, but was determined a non-feature. The level included a carbon-dense stain, turtle shell, conch shell, worked chert lithic, a small square stone, bottle and shards of glass, a metal box, and a piece of unidentifiable metal. All of these artifacts were level with one another and were placed directly above the coffin. The level was terminated when evidence of the coffin structure was encountered. This was at approximately 105 cmbd.

Level 4 included the coffin burial and surrounding soils (Figure 2.5). Unlike Burials 29 and 30, Burial 31 was made from pinewood, contained screws, siding, and was constructed out of robust planks. Structural planks, placed at perpendicular angles to the longer boards were also present. The human remains were hardly articulated and were scattered through the coffin interior. A termination depth of 125 was recorded within the interior of the coffin. This depth may appear to be too great, however, one much also take into account the large amount of marine sand fill near the wall that comprised a large portion of the depth.

Burial 32 was also documented towards the close of this unit. The distal ends of two human long bones were found in the northwestern corner profile wall of the unit. Human remains, including smaller foot bones, were documented and bagged with this burial. No evidence of a coffin enclosure was noted in the profile wall, however the burial is significantly higher than Burials 29 and 30. This may have resulted in the complete deterioration of the coffin wood. The human remains were about 10 centimeters higher than those found in Burial 29. The long bones were kept in the profile wall and backfilled.

XU45:

XU 45 was placed just outside the Searle white house, in the Habet property. The unit measured 2x2 meters and was placed about 15 meters east of the Searle house. The western half of the 2x2 unit was excavated, with the southeastern corner excavated for the bilge pump. This allowed for an artificial lowering of the water table for excavation in XU45 and 46. The unit was excavated to investigate positive shovel tests identified during a survey of the area. The survey will be discussed in detail below.

Level 1 consisted of the humic layer (dark loamy sand), with dense modern trash elements and few historic artifacts. The level began with a 20 cm arbitrary pass, but continued when the dense modern trash pile was discovered. Two historic pipe stems and historic glass were also identified in this stratum. The level terminated, on average, 25 cmbd. Level 2 consisted of a dense modern trash pile. Modern artifacts included plastic, glass, metal, and carbon. A 1x1 unit was continued in the larger 2x2 meter unit due to instability in the unit from the bilge pump. The 1x1 unit was excavated in the northwestern corner. Level 2 terminated at around 60 cmbd. Level 3 continued in the 1x1 meter excavation and terminated approximately 100 cmbd. Few artifacts were recovered in this stratum and the level terminated at sterile, light sand.

XU46:

XU46 was located directly north of XU45. This unit measured 2x2 meters and was opened to investigate the archaeological record on the Habet property after several shovel test probes yielded positive results in the immediate vicinity. Level 1 consisted of the humic layer (dark loamy sand) and a dense modern trash fill, as previously documented in XU45. The level terminated at a stratigraphic change to a gray sandy clay matrix at around 23 cmbd. Level 2 continued and terminated at, on average, 65 cmbd. The stratum was dark grey in color, contained dense root inclusions, was just below the water table in this portion of the island, was quite muddy, and included a strong diesel smell. This level included a brick fragment, historic rum bottle fragments, several pipe stems, one pipe bowl, and one entire rum bottle that had fragmented. This level likely once represented a ground surface level due to the consistent depth of the artifacts through the excavation unit. The level was terminated at a stratigraphic change to lighter sand and the discovery of a large wooden post that was positioned at a vertical angle.

Level 3 began at the interface between the discovery of the historic artifacts and stratigraphic change. The level continued from the previous measurement and terminated around 85 cmbd with a slight angle to the south for water drainage. This level included pipe stems, faunal remains (possibly manatee), historic glass, and historic sherds. Small roots and one large mangrove root were dense in this level, occasionally transforming the water to an opaque brown color. The level terminated at the discovery of sterile, light sand and was leveled off.

Level 4 included very sterile, light colored sand with small shell inclusions and few roots. This may represent a storm episode that predates the historic artifacts discovered in the unit. Only the southern half of the unit was excavated due to a lack of time. The level terminated at 100 cmbd due to a lack of artifacts and soil change. Few artifacts were discovered in this level.

Survey:

Prior to the commencement of excavations in XU45 and 46, a survey was conducted in the Habet and Searle properties. The purpose of this survey was to investigate whether there was any likelihood of preserved archaeological integrity in the area. If so, a first round of excavation units would be excavated. Beginning in the northwestern corner of the Habet property, shovel tests, measuring 30 cm in diameter, were excavated every 4 meters heading northward. The water table began eroding the walls of each test at around 50 centimeters below surface (cmbs). Shovel tests (ST) 1 to 7 yielded positive results and were excavated to 100 cmbs. Shovel test 8 and 9, located close to the purported hurricane cut on the Searle property, were negative.

Beginning again from the ST 1 location, another transect was begun heading in a western direction. This transect included STs 10 to 14. The transect headed west, between a palm tree and the Searle white property, just south of the structure, and terminated south of the water tanks. Results were highly variable in this transect, providing historic and modern artifacts in all of the shovel tests except ST 14. Due to positive results in the south-north transect, XU45 and 46 were established. As previously mentioned, these units provided great archaeological evidence for an historic occupation of the island. Additional work should be completed in this area to further investigate the scope of the occupation in the immediate vicinity.

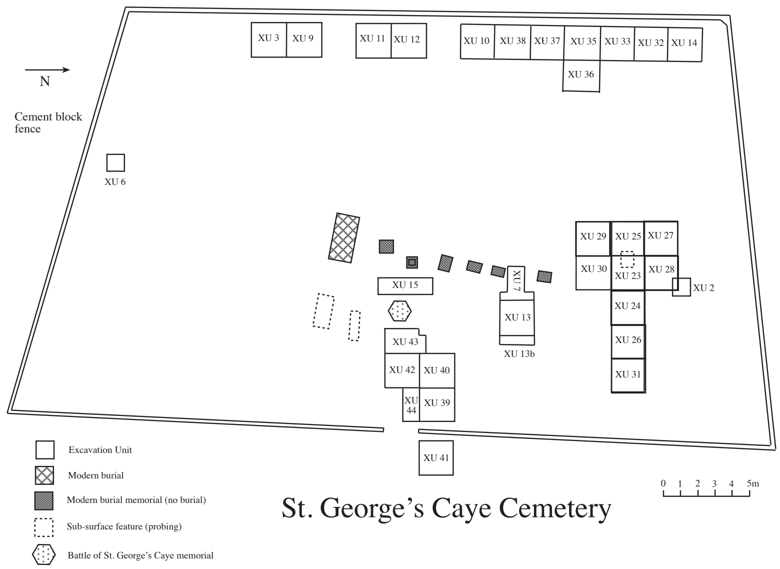

Figure 2.1. St. George's Caye Cemetery Plan Map.

Figure 2.2. St. George's Caye Cemetery Burial 29, XU43.

Figure 2.3. St. George's Caye Cemetery Burial 30, XU43.

Figure 2.4. St. George's Caye Cemetery, 2 Reale coin, 1812.

Figure 2.5. St. George's Caye Cemetery Burial 31, XU44.

Chapter 3: A Smoker's Delight: An Analysis of English Tobacco Pipe Bowls From St. Georges Caye, Belize

Matthew T. Elverson

Excavations on St. George's Caye, the country of Belize's first capital, have revealed a diverse artifact assemblage dating to the country's earliest European inhabitants. English clay pipe fragments, including pipe bowls and stems, represent some of the most prevalent cultural materials discovered in the island's archaeological record. Focusing on several decorated clay pipe bowls and stems, this study aims to identify the cultural and economic connections of the historic inhabitants with European pipe manufacturers and estimate the temporal ranges of occupation according to dating techniques identified by Mallios (2005).

Eight of the most decorated clay bowl fragments were subjectively chosen for this study from the excavated artifact assemblage. The bowls exhibit very different characteristics regarding the size, shape, and markings. The locations of exhumation were limited to the historic cemetery and adjacent Fuzy property to the north of the cemetery. The recorded stratigraphic context of each pipe bowl was highly variable and not reliable with regard to a temporal assignment. Mixing is extensive on the island and is the result of common hurricane and flooding episodes. This continuous lack of temporal context in the stratigraphic record is one of the primary reasons for this research. A dated pipe bowl or stem will be a tangible dating reference for the historic occupation of the island.

Stem hole measurement analysis was originally planned for this research. However, the lack of sufficient stem lengths and a very small sample size could not produce meaningful statistical results. Instead, the topological shape, markings, and archaeological excavations from related historical contexts were used to produce reliable dates for most of the artifacts.

Methodology

The first step in applying a temporal context for each pipe was to determine its place of origin. This was completed in either one of two ways. Native Belizeans on the island of St. George's Caye had informed the archaeologists that many of the pipes were Dutch in origin. With this in mind, and knowing that it was a former British colony, a typological comparison of the artifacts with known British and Dutch colonial styles was conducted. The other method applied to determine the place of origin was the maker's mark on the pipe or designs on the pipe. Many of these markings were common elements of a specific pipe maker, whether Dutch or English, and could aid in the determination of nationality.

Frederick (1975) was utilized for a Dutch typological analysis of the pipes. Frederick adopted his typing of the pipes by finding common bowl styles that were restricted to limited dates. A similar method of dating the English bowls was used by applying the Oswald (1975) typological chart of pipe bowls. Oswald also found common bowl styles according to time periods, however, his analysis applied ranges of dates instead of Frederick's more rigidly assigned dates. regardless, both typological charts quickly became invaluable in this study. Amazingly, the majority of the eight artifacts tightly matched one or more bowl styles within the respective charts.

Additionally, further research into specific maker's marks or designs led to additional information for identified pipe bowls. The extensive analysis of Gouda clay pipes by J. van der Meulen (2003) is now available online and was also an invaluable resource for identifying possible pipe makers based on known pipe designs and marker's marks. After a date range was gathered, based on the typological comparison, this resource provided the pipe maker from that exact time period. Once a date and maker were documented for a pipe bowl, other archaeological excavations were researched for the same pipes. Many of the pipes in this study were located in other excavation publications and will be discussed in detail below.

Discussion

Each pipe was given an arbitrary number for this research. Pipe #1 exhibited a shield on the side of the pipe foot and a "D" with a crown on the bottom of the foot (Figure 1 and 2). The shield includes 6 small dots that are faintly still visible to the naked eye. This feature, also known as the "shield of Gouda," represented the town of Gouda which was, at one time, a "pottery town that became Holland's leading pipe producer" (Atkinson and Oswald 1975). The shield was placed on the stem of these pipes by the middle of the 1730's to market the fine work of the Gouda pipe. By 1740, however, an "S" began to appear over the small shield, indicating the pipe was "slegte" or "ordinary" (Atkinson and Oswald 1975). The mastery and reputation of pipe making in Gouda was so strict that many of the guilds, or formal groups of pipe makers, passed these rules to reduce the sale of lesser quality pipes (with the "S" over the shield) to be displayed as the highest quality product.

Figure 1. Crowned "D". Figure 2. Shield of Gouda.

The marking of the shield on this pipe without an "S" suggests the pipe is of the highest quality. This element also is indicative of a Dutch pipe. When applied to the Frederick (1975) typological pipe bowl chart, the artifact matches the 1730 date. With this date in hand, the "D" with the crown marking, found in the Meulen (2003) database, points to Jan van Leeuwen as the pipe maker and was active in the industry from 1729-1777. The crown does not suggest a high quality alone, rather, it is a common iconographic symbol in Dutch motifs and sometimes representing a guild when coupled with a number.

Pipe #2 also displayed the shield on the side of the foot or spur, indicating it too is of Dutch origin (Figure 3). No "S" was evident, suggesting a very high quality pipe. On the bottom of the foot is the stamp of a key (Figure 4). The typological analysis places this pipe ca. 1770. This date, along with the key image, indicate that Jan van Borselen was the pipe maker. This information was also gleamed from Meulen's 2003 work. Jan van Borselon was active in the industry from 1762 to 1781.

Figure 3. Shield of Gouda.

Figure 4. Stamp of a key.

The first identified English pipe from the artifact assemblage in this study was Pipe #3. Once again, the stamp on the bowl, this time on the back of the pipe, aided in the determination of its place of origin. The stamp, that of a shield with a cross, had faded considerably through the grading of sand on St. George's Caye (Figure 5). Upon further inspection, a small sword was also incised in the upper left-hand corner of the shield. Additional research indicated that this is the shield of London. Like the shield of Gouda, London has a representative shield, characterized by the St. George's Cross and the sword of the patron saint of the city, St. Paul, in the upper left-hand corner of the shield. No other pipes with the same shield and maker's initials could be located, however, the shield motif was found on a pipe in London, dating to ca. 1780 (Oswald 1975).

Figure 5. Shield of London.

The markings on Pipe #4 are documented in excavations throughout the eastern United States (Oswald 1975). A "TD" is stamped on the back of the bowl and the style matches and English type that dates to between 1730 and 1780 (Figure 6). Archival research suggests the pipe maker was likely Thomas Dormer of London, England. His pipes were commonly found throughout the American colonies, which may explain how the pipe traveled to St. George's Caye.

Figure 6. Stamp of "TD" on back of bowl.

The stamp on the back of the Pipe #5 bowl is very faint. A crown-like image is visible over a "W" with the remainder of the stamp too faint to read (Figure 7). At first, this crown element would suggest a Dutch origin. However, two pipes with very similar stamps, one with the same initials, were located over the course of this study. One of these was excavated in Port Royal, Jamaica, a common trading connection to Belize, and the other, Williamsburg, Virginia. The English typological analysis suggests a date range of 1730 to 1780. This places the pipe with William Manby of London, England. Manby was active in the pipe manufacturing industry from 1719 to 1763.

Figure 7. Crown over undetermined stamp.

Unfortunately, Pipe #6 could not be located for this study. The most decorated pipes were quickly photographed and measured over the course of the final day of the 2013 field season. This pipe could not be located at that time. Luckily, archival photographs were available and some new information was gathered from this limited resource (Figure 8). The shield of Gouda is visible on the side of the foot with an obvious "S" above the shield. This suggests an ordinary or lower quality pipe. A crowned "75" was stamped on the base of the foot, indicating this was manufactured by the 75th pipe making guild in Gouda, Holland. Additional measurements and a typographical analysis in the future may provide a date range for the pipe.

Figure 8. Shield of Gouda with "S" and Crowned "75".

Pipe #7 was too fragmented to provide a viable location of origin or date range of manufacture. A stamp with a "W" and "1" is present on the back of the bowl (Figure 9). No similar stamps could be located during the course of this research. A date range could be estimated simply based on the typological analysis, however, this would simply be too subjective. Hopefully, artifacts recovered from the isle in future excavations will aid in dating this pipe.

Figure 9. Fragmented pipe with "W" and "1" present on stamp.

The final pipe artifact, Pipe #8, is quite interesting. It is the only pipe out of this assemblage that does not have a foot and the only one to include writing on the fragmented stem (Figure 10). An imprint is visible on both sides of the stem, indicating the author as "E. Roach" and the origin, as "London." This, perhaps, was the easiest to research since such significant information was already available. E. Roach, or Edmund Roach, was the only Roach to work in London as a pipe maker and was active in the industry from 1859 to 1899 (Oswald 1975). These dates match the typological analysis of the pipe shape.

Figure 10. Maker's name stamped on stem.

Additional research was conducted to determine if pipes made by this individual have been documented in other archaeological excavations. Edmund Roach pipes have been recorded in two archaeological excavations. Not surprisingly, his pipes were located during the construction of buildings for the 2012 London Olympics games. The other location was much more of a surprise. Edmund Roach pipes were also found in Western Australia, a British penal colony at the time of the creation of the pipe.

Conclusion

This new information fulfilled the two goals originally caste for this research. A solid and repeated temporal context is established for the historic occupation of St. George's Caye. The earliest viable dates, based on a combination of makers marks and pipe typology, indicate a 1730 occupation of the isle. The discovery of similar markings and maker's pipes in other British colonial colonies supports the cultural and economic connections of Belize with other colonial British colonies, as well.

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Chapter 4. Results of the Skeletal Analysis for the 2013 Field Season on St. George's Caye

Lauren Springs

2013 Burial Analysis

Burial 29

Burial 29 (B29) was located on the northern walls of XUs 42 and 43, with the toe extending into XU 40. The remains from the B29 are catalogued as lot 4 of level 2. The base of the coffin extended from 88 cmbs at the head to 110 cmbs at the foot. The remains of the hexagonal coffin enclosure include the base and approximately 1 inch of the sidewalls. The coffin reached a maximum length of 183 cm and a maximum width of 53 cm.

The toe of the B29 was oriented to the east and the skull is facing northeast. The postcrania were largely disarticulated but the individual appears to have been in flexed position and lying on their back. A sandy matrix was cemented to many of the skeletal elements and no soft tissue or textiles were preserved in association with this burial.

Many of the irregular and flat bones from B29 were poorly preserved and highly fragmented. There are 595 whole and fragmentary skeletal elements representing one individual interred in B29. The individual from B29 is estimated to have been an adult male of unknown age. The individual had healthy dentition with slight calculus, a few caries, and no signs of hypoplasia. The occlusal surface of B29's upper central incisors was worn in the shape of an arc, with the greatest degree of wear most centrally located. The wear pattern is not indicative of intentional modification, but may be occupational.

There is evidence that B29 had broken at least two bones that healed during their lifetime. Approximately 1/3 of the way down the shaft of the right femur the bone bulges anteriorly in a manner consistent with a healed break. A 5mm bone spur is located on the lateral and anterior margin of the bulge and there is a corresponding "punch-hole" on the posterior and lateral surface. Despite the misshapen morphology, there are no indicators of continued infection at the site, suggesting the break was well healed. Additionally, the base of one unsided first metacarpal has an abnormal morphology that is consistent with a fracture or break.

Burial 30

Burial 30 (B30) was located along the southern walls of XUs 42 and 43 in lot 5 of level 2. The skeletal remains were enclosed in a hexagonal coffin with no lid, partial siding, and two horizontally oriented support beams for lowering the coffin into the ground. The beams were positioned at the head and toe of the coffin. The coffin length was 182 cm and the maximum width reached 49 cm. The maximum depth of B30 extended to 113 cmbs at the center of the coffin base.

Burial 30 was positioned similarly to B29 and the skeletal elements were also clearly disturbed. There were no soft tissue or clothing remains found in association with B30. Portions of the sandy matrix surrounding the skeletal remains had cemented onto the coffin and skeleton.

There are 550 elements from one individual found in B30. The individual is estimated to be a middle to older adult male. The skeleton is very worn and the exterior surfaces of the bones are frequently exfoliated or flaking. The individual had poor dental health with moderate wear to the teeth, significant calculus build-up, and large caries. The mandibular right incisors each have a pronounced horizontal line similar to a hypoplasia that is running across the crown of the tooth. However, the lack of corresponding lines anywhere else in the dental arcade or the left mandibular incisors suggests that the presence of the anomalies may not be pathological. The femora, tibiae, and left radius exhibit sections of striated bone with additional growth along the shafts that is consistent with infection. The medial half of the right clavicle is angular and misshapen, and could be indicative of a healed fracture.

Burial 31

Burial 31 (B31) was found in XUs 39 and 44 in lot 4 of level 2 directly below a relatively modern burn pile. The hexagonal coffin had a partial lid still intact during the excavation. The elevation at the highest point of the lid was at the toe of the coffin and measured 106 cmbs. At its base, the coffin extended approximately 126 cmbs along the entire length of the structure. The length and maximum width of the coffin were 178 cm and 56 cm, respectively. The coffin was made of pine and fastened with brass screws. One horizontal board was fixated to the coffin floor approximately half way down the length of the coffin.

B31 was oriented with the toe to the east. The remains in B31 were highly disturbed and disarticulated. No cementation of the surrounding matrix to the bone was observed in B31. Although no soft tissue remain were recovered, there were numerous buttons found within the burial enclosure. Twenty single-hole and two four-hole machined bone buttons were identified along with thirteen metal buttons and nine round metal rings that were presumably used to fix the metal buttons to cloth.

The best preserved of all of the burials, B31 consists of 175 skeletal elements and ossified cartilage. Most of the remains found for B31 are whole bones. The burial is estimated to be a middle age adult male. The dentition is heavily worn, particularly on the incisors. The individual had a moderate amount of calculus build-up and hypoplasias on the mandibular anterior teeth. B31 also has an impacted upper right permanent canine. The unerupted canine is in contact with the alveoli of both right incisors. The deciduous canine was lost antemortem and the alveolus resorbed. Both of the femora from B31 exhibit osteophytic bone growth and anterior lipping of the femoral heads. They also have striations with slight bone bulging on the distal-most portions of the posterior and lateral aspects of the shafts.

Burial 32

Burial 32 (B32) consists of the remains of the feet and distal lower limbs of a burial extending into the northwest corner of XU 43. Although no burial enclosure was directly observed, a soil stain was present where the coffin base would have been located. A total of 25 elements were collected for B32, but no skeletal analysis was performed.

Chapter 5: Stable Isotope Analysis of Human Diet at St. George's Caye, Belize

Julia Prince and Eric J. Bartelink

INTRODUCTION

Stable isotope analysis has been used as a method of dietary reconstruction since the 1970s. Stable isotopes, such as carbon ($^{13}C/^{12}C$) and nitrogen ($^{15}N/^{14}N$), are incorporated into body tissues via the foods consumed. Thus, it is possible to relate stable isotope ratios to the diet (DeNiro and Epstein 1978; DeNiro and Epstein 1981; Fry 2006). Stable isotope analysis of human bone provides a record of diet from the last 10-15 years of an individual's life (Hedges et al. 2007; Manolagas 2000). This report uses stable carbon and nitrogen isotope analysis of bone collagen and stable carbon isotope analysis of bone apatite to analyze the diet of individuals recovered at the historic cemetery on St. George's Caye. This report first discusses the theoretical grounding of stable isotope analysis, followed by a discussion of human diet on St. George's Caye.

Stable Isotope Analysis

Isotopes are variations of a chemical element that are different only in the number of neutrons in the nucleus. This causes differences in the atomic mass between isotopes of the same element. Due to these slight differences in mass, stable isotopes of the same element will react at slightly different rates in chemical reactions. This process is known as isotopic fractionation. Unlike radioisotopes, stable isotopes do not undergo radioactive decay (Fry 2006).

In order to interpret data consistently, certain standards have been adopted, especially for elements of interest to biological studies. Typically, the delta (δ) notation is used for reporting data as all values are a comparison against a known standard. Values are presented as a ratio, typically with the heavier isotope divided by the lighter isotope. This is calculated as follows:

$$\delta = (R_{sample} - R_{standard}) / R_{(standard)} \times 1000$$

Where "R" is the ratio of the heavy to the light isotope in comparison to the standard of that element. The resulting values units are in permil (‰), which are parts per thousand relative to the standard. Standard are set to 0‰, thus all materials will have smaller or larger values compared to the standard (Fry 2006; Schoeller 1999). This allows for the possibility of negative values, which are more depleted in the heavy isotope than the standard, and positive values, which are more enriched in the heavy isotope than the standard (Fry 2006).

Stable Carbon and Nitrogen Isotopes

Stable carbon isotopes ($^{13}C/^{12}C$) reflect the consumption of three different photosynthetic pathways used by plants and the animals that eat these plants. These photosynthetic pathways are C_3, C_4, and CAM. While C_3 plants preferentially fractionate ^{12}C during photosynthesis, C_4 plants will take in any form of carbon despite the slight differences in mass. This results in extreme differences in their $\delta^{13}C$ values. $\delta^{13}C$ values for C_3 plants average -26.5‰, whereas $\delta^{13}C$ values for C_4 plants average around about -12.5‰. There is no overlap in the stable carbon isotope values for these types of plants. CAM plants, in contrast, can use both C_3 and C_4 photosynthetic pathways, and therefore their $\delta^{13}C$ values can overlap with either plant type; however, these plants represent cacti and succulents that are usually found in desert environments (O'Leary 1988; Schwarcz and Schoeninger 1991; Katzenburg 2008).

C_3 plants make up the majority of plants, especially in temperate regions of the globe. C_4 plants, by comparison, are composed of subtropical grasses and some cultigens, such as maize, sorghum, cane sugar, and millet. Due to the differences between C_3 and C_4 plants, it is possible to interpret the contribution of different plant types to the diet, especially with knowledge of the types of plants available to a population. Carbon isotopes can also be used to look at the contribution of terrestrial versus marine foods to the diet. Marine food webs carbon signatures are based on concentrated amounts of dissolved carbon-based molecules in the water, photosynthesis by C_3 and marine plants (which have values similar to C_4 plants), and photosynthesis by phytoplankton (Schwarcz and Schoeninger 1991). While marine food webs are variable, they generally overlap with C_4 terrestrial plants. Thus, dietary studies are more straightforward in instances where the terrestrial source is C_3-based and is compared to marine ecosystems, since C_4 resources can potentially be confused with marine resources (Schoeninger and DeNiro 1984).

Bone collagen and bone apatite are both commonly used tissues for isotope analyses. Bone collagen tends to preferentially route carbon from protein sources. Carbon isotopes of bone collagen, then, primarily reflect the contributions of dietary protein to the diet. Bone apatite carbon molecules, on the other hand, derive from the whole diet (Ambrose and Norr 1993; Tieszen and Fagre 1993). Therefore, by using both bone collagen and bone apatite in stable isotope analysis, it is possible to more clearly discriminate between the contributions of different dietary macronutrients (Kellner and Schoeninger 2007; Froehle et al. 2010). The Froehle et al. (2010) is used in this report to delineate between non-protein and protein portions of the diet.

Stable nitrogen isotopes ($^{15}N/^{14}N$) are correlated with a species' position on the food chain. $\delta^{15}N$ values reflect the trophic levels of the foods consumed, as an animal's $\delta^{15}N$ value is approximately 3‰ over their primary food sources (DeNiro and Epstein 1981). Marine resources tend to have higher nitrogen values than those observed in terrestrial species because marine food chains tend to be much more extended than terrestrial food chains (Schoeninger and DeNiro 1984). In studies on humans, this allows the researcher to estimate the trophic level of an individual relative to the food web. When used in conjunction with stable carbon isotope data, it is possible not only to sort out the contributions of different types of plants and marine foods, but also whether or not they were consuming different types of plant or protein sources over others.

DIETARY RECONSTRUCTION

Diet in the Historic British Caribbean and Belize

This section provides the historical background for Belizean diets, slave diets, and military diets within the British Caribbean. An understanding of the types of foods typically consumed by the variety of groups from the region will provide a stronger background from which to base interpretations of the stable isotope data.

Belize's population was founded by buccaneers, outlaws, and scavengers who escaped from poverty, indentured servitude, or who were otherwise displaced (Wilk 2005). Their exposure to native flora and fauna was probably from the Maya, African slaves, and Black

Caribs. Their economic interest, however, would have limited their utilization of these resources to the exploitation of logwood, mahogany, manatee, and green sea turtles (Wilk 2005). Available regional food was of great interest beyond the simple biological requirement to eat to stay alive.

For example, archaeological and historical evidence strongly suggests the consumption and use of turtle meat. There is a strong probability it was consumed on the island as maps indicate the presence of five turtle corrals on the shores of St. George's Caye in 1764 (Craig 1966). Excavations on the island have revealed turtle bone in ceramic and glass deposits east and north of the cemetery wall (Garber 2011). In 1809, turtling was described to be "the most profitable, and consequently the most pursued in this country" of local fishing industries (Craig 1966:41). However, turtles, both marine- and freshwater-based, were mostly consumed domestically, with only some being sent to England as a special delicacy (Craig 1966; Wilk 2006).

Texts also suggest that despite the prohibitions on agriculture by the Spanish, buccaneers and later inhabitants probably took up some degree of farming. Logwood cutters maintained small hidden groves for plantains, maize, roots, and other vegetables adopted from the local Maya population (Wilk 2006). Hunting also would have also been a popular way of obtaining food. European nobility back in Europe participated in hunting because it was an aristocratic sport (Wilk 2005, 2006). Wild game was intrinsically tied to social status and power in Europe. Buccaneers, the first Europeans to truly settle in the area, hunted consistently. This is in contrast to the European social class ideal, and may have been potentially in rebellion to these social norms but mostly because they would quickly run out of rations. They would even release breeding pairs of domestic animals like cattle and sheep on islands and other places to maintain an easy location for hunting and refilling their food supplies (Wilk 2006).

Despite being willing to eat whatever meat was available, there were also strong preferences that moved the first English Belizean's taste buds. Baymen had a love for "sweet" and "fat" flavors, which seemed to be assigned to almost anything that didn't consume meat or carrion. Decisions not to eat alligators and other carnivores were not based on their availability but more because carnivores and scavengers were considered "unclean" (Wilk 2006). Predatory fish were also avoided, and probably for a good reason, as toxic microorganisms become concentrated in the meat of the fish that are high trophic level (Wilk 2006).

Slave diets also depended on the region in the colonies that the individual lived in and their respective occupation. In rural regions, records suggest that the diet consumed was either solely imported rations or grown on the plantation and distributed as rations. In British Honduras, the status of a local provision system was limited at best and cultivated food crops were under the direct control of slave masters (Higman 1984). Provision grounds, like the small hidden crops Baymen kept, may have been used on the small scale to maintain the fiction that the logwood industry was not permanent (Wilk 2006).

More than likely at least some rations were imported to St. George's Caye because of the laws encouraging labor dedicated to exportation of wood. Also, the closest land to the island would have been Belize City and the resident slaves on the island would mostly have been kept as domestic servants. Therefore, the food consumed by residents of St. George's Caye was probably similar to urban diets of the time period, of which almost entirely depended on monetary allowances for rations (Higman 1984:251). It is known that some British North American colonies imported fish and flour to the West Indies (Solow 1987). Also, as mentioned before, the merchant class of Belize was invested in limiting the extent of agricultural in order to ensure profit from imported foods (Wilk 2006:53).

In consideration of this, then, there are two sets of descriptions for rationed slave diet in the British Caribbean that should be reflective of the late 18th century. The first is the rationing system from Barbados, which gave daily allowances of 4.5 to 5 pounds of sorghum and maize, 1 pound of salt fish, 1 pint of molasses, ½ pint of salt, 1 pint of tea, and rum or molasses sweetened water (Higman 1984). Other islands, according to the Leeward Islands slave law, included a wider variety of foods, such as beans, rice, oatmeal, wheat flour, rye flour, yams, bananas, plantains, and even fresh fish (Higman 1984). In general, maize and "Guinea corn," also called sorghum, was considered good only for cattle and slaves to eat in the eyes of plantation owners (Higman 1984). The Bay of Honduras, however, in the itemization of yearly supply estimates on slave upkeep in the early nineteenth century suggests rations of 5 pounds of Irish salt pork per week, 1 pound of flour, a "gil" of rum per day, and the potential to purchase 12 pounds of sugar maximum for each individual for a fee to be paid by the slave them self (Bolland 1977:69; Wilk 2006:61).

Especially unique in the historic literature is the inclusion of pork instead of fish in slave rations, because terrestrial animal meat was not previously thought to play a large role in the slave diet (Higman 1984). In an urban situation, prices fluctuate due to droughts and other scarcity factors (Higman 1984). This would have changed what foods were readily available. Hence, like in the rural situation, small agricultural plots may have been in use. More recent research on slave diets using stable isotope analysis at the Royal Naval Hospital Cemetery has found that individuals of African ancestry who were likely slaves had a highly variable diet that ranged from C_3-based terrestrial, to heavily marine, to C_4-based (Varney 2011; Varney 2007). This supports the historic record that slave diets were probably highly variable throughout the British Caribbean.

British military diets, in contrast, were strict compared to the other groups discussed. The diet of European military personnel included a heavy reliance on beef, pork, poultry, wheat, and oats, with some reliance on local foodstuffs. These foods are primarily C_3-based plants and terrestrial protein resources. Stable isotopic analysis on the diet of British Navy men has strongly supported a consistent diet of these C_3 resources in both the British Caribbean and in England (Roberts et al. 2012; Varney 2011; Varney 2007). This suggests that military personnel had a fairly consistent diet type throughout British territories due to rations (Roberts et al. 2012; Varney 2011; Varney 2007).

Given the literature discussed above, there are a few main conclusions. One is that there were numerous sources of food available to individuals in the British Caribbean. Another is that there is no clear way to assess the contributions of imported and local foods to the diet, at least for St. George's Caye. There is also a large amount of cultural diversity within the colonies themselves that make attributing specific diets to specific groups in an archaeological context very difficult, except for perhaps Navy personnel. Due to the fact that there is such a large amount of possible diversity, and that we cannot account for whether or not individuals at St. George's Caye were native to the region or immigrants from Europe at this time, we must construct a food web that can take into account the multiple dietary circumstances people may have had at the site. This will allow for conservative interpretations of the data.

Food Web Reconstruction

Food webs are a valuable tool used in stable isotope analysis to evaluate dietary contributions of different resources. By knowing how stable carbon and nitrogen isotope values reflect organisms' diets, it is possible to compare the isotopic ratios of fauna and flora and compare them with humans. Specifically, by comparing animals and plants from a specific region with the people who lived there, it is possible to interpret isotopic results with more precision than by only examining human bone collagen $\delta^{13}C$ and $\delta^{15}N$ values (Szpak et al. 2009:2740).

An isotopic food web for the historic Caribbean was constructed by compiling data on faunal and floral samples reported in previous isotopic studies in the Caribbean region (Keegan and DeNiro 1988:324-327; Tieszen and Fagre 1993:33; van der Merwe et al. 2000:31; van Klinken et al. 2000:54, 56; Williams et al. 2009:45, 47; see Figure 1). Because the area this food web is being developed for is a British Colonial site, isotopic values from Europe and the British Isles were also considered (van Klinken et al. 2000; Jones et al. 1998; Barrett et al. 2000; Schulting and Richards 2009; Privat et al. 2002; Muldner and Richards 2005; see Figure 2). This is because merchants in the late eighteenth and early nineteenth century discouraged farming in Belize so that they could sell imported food and necessities to the workers and slave owners in the forest for even greater profits. Despite this fact, however, people also grew personal gardens, as imports were often unreliable (Wilk 2006). Due to there being a likely contribution of both local and non-local resources to the diet, and the fact that immigration status of the remains is unknown, it is important to consider the stable isotopic values of both regions.

Modern sample baseline data were adjusted by 1.5‰ to account for the Seuss effect (Williams et al. 2009:46). The Seuss effect is the result of industrialization on the atmosphere. Due to the way carbon is emitted from fossil fuels that are burned, the $\delta^{13}C$ of the Earth's atmosphere have been depleted by 1.5‰ (Williams et al. 2009:46).

Along with this, data on stable carbon and nitrogen values from bone collagen was adjusted to represent the isotopic values of meat. Previous research has demonstrated that for vertebrates, the fractionation difference (i.e., offset) between muscle tissue and bone tissue is approximately -3.7‰ for $\delta^{13}C$ and 1.7‰ for $\delta^{15}N$. This means that muscle tissue is reduced by

3.7‰ for $\delta^{13}C$ values, and is enriched by 1.7‰ for $\delta^{15}N$ values (William et al. 2009:46; DeNiro and Epstein 1978:503; DeNiro and Epstein 1981:345). All values were finally adjusted for fractionation for the diet-to-tissue spacing by 3‰ for nitrogen and 5‰ for carbon (Ambrose and Norr 1993).

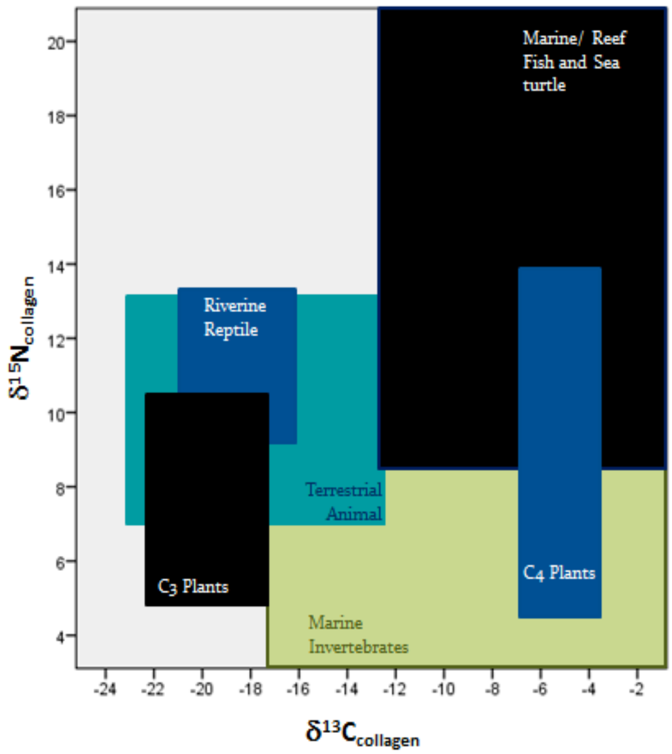

Figure 1: Indigenous Caribbean and Belize food web.

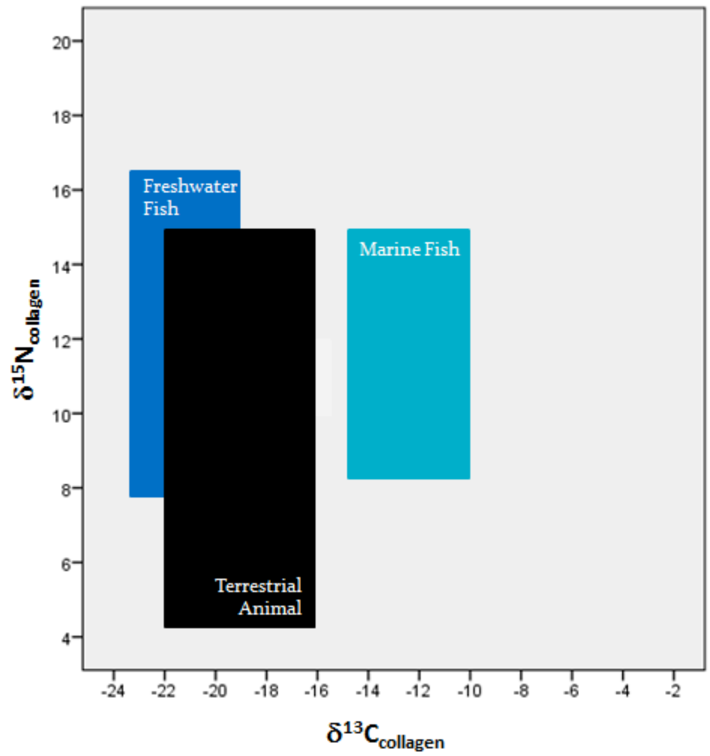

Figure 2: Food web for the British Isles and Europe.

MATERIALS AND METHODS

Sample Preparation

Preparation of the stable isotope samples was conducted by Julia Prince in the Stable Isotope Preparation Laboratory at CSU-Chico. For each burial, approximately 2-3 g of bone was sampled for stable isotope analysis. Collagen was extracted by first soaking approximately 1 g of the sample in 0.25 M hydrochloric acid solution until demineralized (Ambrose and Norr 1993; Schwarcz and Schoeninger 1991). Collagen pseudomorphs were then soaked for 24 hours in a 0.125 M sodium hydroxide solution to remove humic contaminants. Samples were then solubilized in pH≈3 water and then freeze-dried in glass scintillation vials.

Collagen $\delta^{13}C$ and $\delta^{15}N$ was initially measured by continuous-flow mass spectrometry at the Stable Isotope Facility, under the direction of Dr. Joy Matthews, Department of Plant Sciences, UC Davis. While the percent collagen yield fell within the range of well-preserved collagen, the results from the initial run for C/N ratios were slightly outside of the ideal range for well-preserved collagen (DeNiro 1985; van Klinken 1999). Samples were rerun at the Archaeological Center Research Facility at the University of Utah under the direction of Dr. Joan Brenner Coltrain. A first rerun was done as a control without ultra-filtration to provide inter-lab comparison between UC Davis and University of Utah laboratories. The second rerun was done after samples were ultra-filtered. These samples were hydrated, re-gelatinized, and then filtered through a PDVF membrane 0.45 micron syringe filter and freeze-dried a second time. The data returned for the Utah laboratory had C/N ratios within the acceptable range for all but sample #15B (DeNiro 1985; van Klinken 1999). For this report we use the data collected from the ultra-filtered samples for analysis. Data from the other two runs, however, are also reported.

To extract the apatite fraction, all bone samples were ground into a powder using a steel mortar and pestle, and sieved through fine mesh screen (<200 μm). Collagen was removed by soaking the bone in two 24 hour treatments of 1.5% sodium hypochlorite solution with a 0.04 ml solution/mg sample ratio (Koch et al. 1997). The powdered apatite samples were then treated with a 1.0 M acetate-buffered (pH≈4.5) acetic acid solution for two 12 hour soaks to remove contaminants. Once again, a 0.04 ml solution/mg sample ratio was used. $\delta^{13}C$ values were measured at the Stable Isotope Laboratory using a GVI Optima Stable Isotope Ratio Mass Spectrometer by Dr. Howard Spero, Department of Geology, UC Davis.

RESULTS AND DISCUSSION

Carbon and Nitrogen Isotopes of Bone Collagen

Table 1 provides the data for stable isotope analysis conducted on bone collagen and apatite samples. All burial data are from Springs (2012, 2013). Sample 15b is reported in Table 1 but is excluded from analysis due to the abnormally high C/N ratio. Bone collagen values suggest most individuals relied on a primarily C_3-based terrestrial protein portion of the diet, as the majority of individuals overlap with terrestrial animal values for both British and Caribbean food webs (Figures 3-4). This means the primary contribution to the protein portion of diet are terrestrial mammals with some possible contributions of freshwater species available in either the Caribbean or British Isles. Marine resources do not play a primary role in dietary protein.

Two individuals (16 and 21) have carbon values that suggest a primarily C_4/marine based protein portion of the diet (Figures 3-4). C_4-based terrestrial resources cannot be excluded as a primary contribution to protein due to the presence of terrestrial animals with C_4 signatures available in Belize. Individuals 2, 8, and 20 have a combination of C_3-terrestrial and C_4/marine-based resources contributing to their diets based on their positions in both food webs (Figures 3 and 4). Once again, C_4 terrestrial based animal resources are a possible contribution to this mixed diet due to its availability in the Caribbean. While we are unwilling to assign social or ancestral categories using stable isotope analysis, it should be noted that these five individuals fall outside the value ranges for individuals with corresponding European ancestry at the Royal Naval Cemetery in Antigua (-20.8‰ to -17‰) (Varney 2011). This is potentially something to examine in the future if ancient DNA or provenancing studies were to be conducted on the individuals at the cemetery.