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# Sugar Monoculture, Bovid Skeletal Part Frequencies, and Stable Carbon Isotopes: Interpreting Enslaved African Diet at Brimstone Hill, St Kitts, West Indies

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Sugar production was so pervasive in the British West Indies during the 17th, 18th, and 19th centuries that provisions were regularly shipped to the islands from as far away as Europe and North America. Skeletal part frequencies of bovids from late 18th century enslaved African contexts at Brimstone Hill Fortress, St Kitts, indicate that sheep and goats were probably raised locally, but that many of the cattle bones were transported to the site as barrelled beef. Stable carbon isotopes in sheep, goat, and cattle bones confirm these interpretations. This, in spite of the fact that cattle remains from Brimstone Hill included numerous marrow bones that ostensibly were excluded from barrelled beef. It is concluded that marrow bones, while reportedly excluded from barrelled beef, may have been included in provisions destined for enslaved Africans in the West Indies. 

*Keywords:* BRITISH WEST INDIES, ENSLAVED AFRICAN DIET, SUGAR MONOCULTURE, BOVIDS, SKELETAL PART FREQUENCIES, STABLE CARBON ISOTOPES.

## Introduction

Assessment of human food transport has been extensively used to interpret past human behaviour. In the case of animal resources, the presence of various skeletal portions from archaeological contexts has been used to infer that our very early ancestors were hunters who transported meat to their home bases (Bunn & Kroll, 1986; see Binford [1981] for an alternate view). For more recent times, skeletal part frequencies have been variously and widely employed to interpret the transport of animal resources from areas of primary butchery to sites of consumption and disposal (e.g. Bartram, 1993; Binford, 1978; Bowan, 1996; Landon, 1997; Lyman, 1992; O'Connell *et al*., 1988; O'Connell & Marshall, 1989; Perkins & Daly, 1968; Speth, 1983; Thomas & Mayer, 1986; White, 1953; Zeder, 1991). However, numerous factors, in addition to differential transport, can influence skeletal part frequencies from archaeological sites (e.g. Lyman, 1994; Payne, 1972; Reitz, 1986). As a result, a combination of: evidence from historic accounts, bovid skeletal part frequencies, and stable carbon isotopes from bovid bones is employed here to interpret the faunal remains from late 18th century enslaved African context in the Caribbean.

## Sugar Monoculture in the British West Indies

Historic accounts indicate that during the late 17th and 18th centuries the growing of sugarcane for export of sugar, molasses and rum was extremely important in the British West Indies with some islands becoming engaged in sugar monoculture. As early as 1647 Richard Vines wrote that "Men are so intent upon planting sugar that they had rather buy foode at very deare rates than produce it by labour, so infinite is the profitt of sugar works after once accomplished" (Hutchinson, 1769: 222). Between 1771 and 1775, 97% of the value of all exports from St Kitts was from sugar and rum (Sheridan, 1974: 160). Land set aside for subsistence agriculture was generally restricted to poor mountain land and "gutsides" on which slaves were also expected to raise small livestock to contribute to their own upkeep (Goveia, 1965: 136, 137). However, so little attention was afforded this activity that in 1793 St Kitts enacted a law requiring planters to set aside sufficient land to feed their workforce.

Notwithstanding, much of the meat for slaves was imported from England and North America during the late 18th century. In 1793 slave owners on St Kitts were required to provide each slave a weekly allotment of ". . . one pound and one quarter of herring, shad, mackarel, or other salt provisions, or double the



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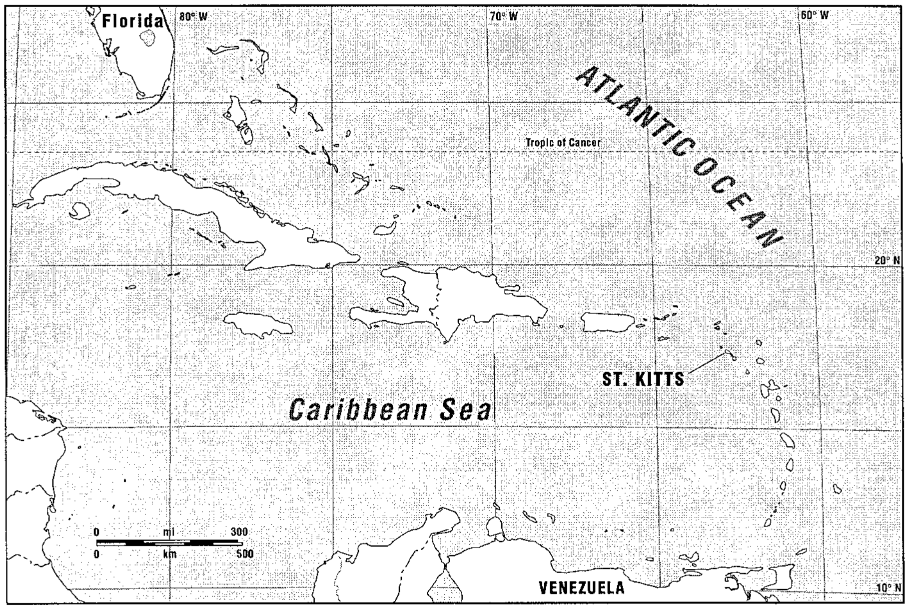


Figure 1. Location of St Kitts in the eastern Caribbean Sea.

quantity of fresh fish or other fresh provisions . . ." (Edwards, 1819: 178).

Cattle were extremely important to the sugar plantations. They were not only a source of food, but more importantly they provided power to turn cane mills and manure with which to fertilize cane fields. Planters on St Kitts, in particular, were known for manuring their fields. In his "Historical Geography of St Kitts and Nevis", Merrill (1958: 76) notes that "By comparison with other sugar islands in the West Indies, it would appear that both St. Kitts and, to a lesser degree, Nevis, were efficient and heavy producers of sugar under slavery. The main reason why this was the case were attention to manuring, and intensive cultivation of the cane land." Often cattle were kept penned in small enclosures within the cane fields to make manuring more efficient. "In crop time the penned cattle were fed cane tops, but at other seasons they were supplied with grass" (Sheridan, 1974: 160). According to Thomas Ramsay who lived on St Kitts between 1760 and 1780 collecting grass, especially in periods of severe drought, was "the greatest hardship that a slave endured, and the most frequent cause of his running away" (Ramsay 1784: 73, 74).

Historical evidence relating to how the British military organized and maintained enslaved Africans at Brimstone Hill is incomplete. The St Kitts colonial government had responsibility to provide labour for construction and maintenance activities of military installations and plantation owners were obliged to provide the necessary slaves (Cox, 1984; Goveia, 1965). Some sources indicate that the military was then responsible for providing provisions for that workforce (Aspinall, 1915: 253; Buckley, 1979: 187). In some instances slaves may have actually been attached to the British Military.

## Archaeology in Enslaved African Contexts

Archaeological investigations on the eastern Caribbean Island of St Kitts (Figure 1) have been initiated to assess the activities of enslaved Africans at Brimstone Hill Fortress. The British began building the fortress in 1690 and, except for a brief period during 1782 and 1783 when the French controlled Brimstone Hill, occupied it until the mid-19th century. Much of the archaeological fieldwork has focused on an area just outside of a defensive wall (designated BSH 2) on the west side of the Fortress (Schroedl, 1998). According to a 1791 British military engineers map, BSH 2 was the location of a kitchen, two hospitals, and a craftsmen's building utilized by slaves or "artificers" (i.e. enslaved African craftsmen).

Excavations at BSH 2 have produced domestic and military objects of obvious British origin, Afro-Caribbean pottery, and British manufactured ceramics with geometric patterns scratched on the bases of vessels; similar designs (e.g. cosmograms) are documented in Africa and North American enslaved African contexts (Ferguson, 1992). Temporally diagnostic artifacts predominantly date to the late 18th century.

Just over 20 $m^3$ of deposits were hand excavated during the 1996 and 1997 field seasons, mostly with trowels and dustpans, and were dry-screened through one-quarter inch (6·4 mm) hardware cloth. Recovered faunal remains were well preserved and even included small, delicate, fish scales. Animal bones were separated from other classes of artifacts in the field laboratory and transported to the University of Tennessee's zooarchaeology laboratory for identification.

Faunal remains from BSH 2 include 6222 animal bones of which 20% are identifiable to a taxonomic

*Table 1. Vertebrate remains (NISP) from the 1996/1997 excavations at BSH 2**

| Taxa | Number | Percent |
|---|---|---|
| Mammalia | | |
| *Sus scrofa* (pig) | 457 | 37 |
| *Bos taurus* (cattle) | 365 | 30 |
| Caprine (sheep/goat) | 142 | 12 |
| *Ovis aries* (sheep) | 11 | 1 |
| *Capra hircus* (goat) | 8 | 1 |
| Other mammals | 57 | 5 |
| Total Mammals | 1040 | 86 |
| Osteichthyes Bony fish | 90 | 7 |
| Reptilia Turtles/snakes/lizards | 88 | 7 |
| Aves Birds | 12 | 1 |
| Total identified specimens | 1230 | 101 |

*Bone artifact manufacturing debris not included.

*Table 2. Bovid skeletal part frequencies*

| Taxon/Portion | Typical skeleton No. | Typical skeleton % | BSH 2 No. | BSH 2 % |
|---|---|---|---|---|
| Cattle | | | | |
| Head | 36 | 19 | 28 | 8 |
| Foot | 62 | 32 | 9 | 2 |
| Axial | 83 | 43 | 283 | 78 |
| Upper limb | 14 | 7 | 45 | 12 |
| Total | 195 | 101 | 365 | 100 |
| Caprines | | | | |
| Head | 36 | 19 | 69 | 42 |
| Foot | 62 | 32 | 25 | 16 |
| Axial | 83 | 43 | 14 | 9 |
| Upper limb | 14 | 7 | 53 | 33 |
| Total | 195 | 101 | 161 | 100 |

level below class. Over 80% of the identifiable bones are domestic pigs, cattle, sheep and goats (Table 1). The "Other Mammals" in Table 1 include both brown and black rat, dog, cat, rabbit, and horse or donkey. Fish and reptile each constitute an additional 7%; fish include both local, tropical, taxa and extralimital cod fish from the North Atlantic, while reptile remains are mostly from sea turtles that were used extensively in the manufacture of bone artifacts (Klippel & Schroedl, 1999). Birds, mostly chickens, only make up 1% of the assemblage. Nearly half of the identifiable animal bones are those of bovids and will be the focus of the following consideration of enslaved African diet at BSH 2.

### *Bovid remains from slave contexts*

Food utility studies conducted on bovids (e.g. Binford, 1978; Emerson, 1990) show that lower limbs and, to a lesser extent, heads have relatively low nutritional value (low meat utility) while axial and upper limb portions are much higher in potential human nutrition (high meat utility). Roughly 50% of the bones in the bovid skeleton (i.e. cattle, sheep, goat) reflect low utility portions when the head (i.e. skulls, mandibles, hyoids, and teeth) and feet (carpals, tarsals, sesamoids, metapodials, and phalanges) are collapsed into a low utility category. Axial (vertebrae, ribs, scapulae, and pelves) and upper limb bones (humeri, radii, ulnea, femora, tibiae, lateral malleoli, and patellae) then combine to form a high utility category (Table 2).

Ninety percent of the cattle bones from BSH 2 are high utility (Table 2). This contrasts sharply with bone of caprines that are predominantly low utility (58%). The relatively even proportions of high and low utility caprine bones suggest that sheep and goats were slaughtered at or near Brimstone Hill and not transported appreciable distances as carcass parts or preserved meat.

There are at least two potential explanations for the high utility beef food refuse in slave contexts at Brimstone Hill: (1) The British Military was provisioning slaves with high utility portions of locally raised cattle that were butchered elsewhere on the Island where many of the low utility portions were discarded as offal; or (2) slaves were provisioned with at least some barrelled beef shipped from England or North America to St Kitts in response to sugar monoculture on the Island. According to this latter scenario, barrelled beef would not likely contain low utility portions due to the high "cost" of shipping. While this second alternative is intuitively the more likely, a number of sources (e.g. Clemen, 1923: 115; Balkwill & Cumbaa, 1987: 19; Deslauriers & Rioux, 1982: 74; Grant, 1853: 278, 279) indicate that cattle marrow bones (i.e. long bones) were not included in barrels of salt beef because they caused the meat to spoil. If this is true, barrelled salt beef can not account for many of the high utility cattle bones in slave contexts at Brimstone Hill. However, it should be noted that some archaeological evidence from Australia and at Smeerenburg in the North Atlantic suggests the presence of long bones in barrelled beef (e.g. English, 1990; Van Wyngaarden-Bakker, 1984).

### *Assessing the origins of bovid remains from Brimstone Hill*

Several methods were considered in an attempt to determine if some of the cattle bones from slave contexts at Brimstone Hill had been imported from England or North America as preserved meat (e.g. butchering patterns reflecting institutionalized processing, macroscopic alteration of bone due to preservatives [e.g. Angus & Falk, 1986: 39], chemical analyses to detect sodium or saltpeter, and stable isotope analyses). For varying reasons all except stable isotopes were quickly abandoned.

Analyses of stable isotopes in bone collagen has been widely used to assess past human diets (Hare, 1980) as well as those of other animals (e.g. articles and references in Emery, Wright & Schwarcz, 2000; Katzenberg, 1989; Keegan & DeNiro, 1988; Koch, Fogel & Tuross, 1994; Schoeninger & Moore, 1992; Tieszen, 1991). Stable carbon isotopes, in particular, have the potential of providing a credible means of assessing the origins of cattle remains from Brimstone Hill because of the tropical setting of St Kitts and the food habits of cattle.

*Stable carbon isotopes*

Cool temperate climates generally enhance photosynthesis in grasses with $C_3$ pathways while $C_4$ grasses have a decided competitive advantage in areas of high temperature and high light intensity. As a result, grasses found in tropical and subtropical areas are dominantly $C_4$ while those in cool temperate areas are $C_3$ (Chazdon, 1978; Collins & Jones, 1985; Teeri & Stowe, 1976). This dichotomy does not extend to trees and shrubs that generally have $C_3$ pathways even in tropical and subtropical areas (Boutton, 1991: 177; Mooney, Bulloch & Ehleringer, 1989: 137).

The enzyme (i.e. ribulose bisphosphate [RuBP] carboxylase) that converts $CO_2$ into plant carbon in $C_3$ plants discriminates against $^{13}CO_2$, while the enzyme (i.e. phosphoenol pyruvate [PEP] carboxylase) that reduces $CO_2$ to plant carbon in $C_4$ plants does not. This results in plants with the two different photosynthetic pathways (i.e. $C_3$ versus $C_4$) having distinct, nonoverlaping, $^{13}C/^{12}C$ ratios that are generally expressed as $\delta^{13}C$ ‰. Mean $\delta^{13}C$ values for $C_3$ plants are usually cited as being between −28‰ and −26‰ and those for $C_4$ plants between −14‰ and −12‰. Ranges for the former are between −38‰ and −22‰ while those for $C_4$ plants are between −21‰ and −9‰ (Tieszen, 1991: 229).

Delta $^{13}C$ values in plants are transferred to animals that consume them. During this transfer, $\delta^{13}C$ is enriched. Collagen in bones of ungulates such as cattle, sheep and goats is enriched in $\delta^{13}C$ by *c*. 5‰ (Chisholm *et al*., 1985: 197; Schoeninger & Moore, 1992: 259; Sullivan & Krueger, 1981; Tieszen, 1991: 240) and is generally thought to reflect the diet of mature animals over a substantial portion of their lives (Koch, Fogel & Tuross, 1994: 65). DeNiro & Schoeninger (1983) have shown that there are not significant difference in $\delta^{13}C$ values of different bones of given animals. Further, and of importance for the problem being addressed here, DeNiro, Schoeninger & Hastorf (1985) have shown that heating bone, such as roasting or boiling, does not significantly alter $\delta^{13}C$ values.

Free ranging herbivores of the family Bovidae consume grasses as well as leaves from shrubs and trees but the proportions consumed are largely species dependent. Goats, for example, have been characterized as browsers that consume leaves from shrubs and trees while cattle are grazers that dominantly feed on grasses. Sheep are mixed feeders that utilize both leaves from woody plants and grasses (Hafez *et al*., 1969: 341; Levy, 1992: 70; Redding, 1992: 102; van der Merwe, 1982: 604). If these characterizations of bovid food habits are generally correct, it should be possible to differentiate bones from these taxa raised in tropical areas on the basis of their $\delta^{13}C$ values. Cattle bones will reflect consumption of tropical $C_4$ grasses and have less negative $\delta^{13}C$ values. Goats should generally reflect browse on leaves from $C_3$ shrubs and trees that have relatively more negative $\delta^{13}C$ values, while sheep should reflect a mixture of browsing and grazing and have intermediate $\delta^{13}C$ values. If, on the other hand, cattle were raised in England or eastern North America and then shipped to Brimstone Hill as salt beef, their bones should have $\delta^{13}C$ values that reflect consumption of temperate $C_3$ grasses and have relatively more negative $\delta^{13}C$ values.

*Stable carbon isotopes from Brimstone Hill bovid remains*

Bovid bones that were included among the high utility elements in the analysis of skeletal part frequencies were chosen for stable isotope analyses. Nine distal humeri and one thoracic vertebra were subjected to stable carbon analysis by Beta Analytic Inc. and M. J. Schoeninger's Palaeodiet Lab at the University of Wisconsin. All of the specimens were photographed and the seven that were sufficiently intact, were measured using standard measurements recommended by von den Driesch (1976). The distal epiphyses of both caprines were fully fused suggesting ages of over 10 months (Silver, 1963: 252). Cattle distal humeri epiphyses were also fused indicating they were in excess of 18 months of age (Silver, 1963: 252). Cortical bone from above the epicondyles was detached from distal humeri and submitted for analysis.

Distal humeri are among the more reliable of caprine bones for distinguishing sheep and goat remains (Bossneck, 1969: 340–341). One left goat and one right sheep distal humeri from 18th century slave context were analysed. Three left and one right distal humeri from 18th century cattle were also analysed. Measurements taken on these specimens indicate that all four were from different animals. One right humerus lateral diaphysis fragment and one thoracic vertebra fragment of *Bos* were also analysed; neither were sufficiently intact to measure nor was it possible to determine if they belonged to one of the other four cattle. One modern right distal humerus with fused epiphysis from a cow that had died within the past year (Behrensmeyer, 1978: 157) in a field at the base of Brimstone Hill was also analysed.

The $\delta^{13}C$ values of bovid bone collagen from Brimstone Hill show considerable variation in the plants utilized by animals whose remains were recovered from late 18th century slave contexts

*Table 3. Carbon $^{13}C/^{12}C$ ratios (‰) of bovid bone collagen from Brimstone Hill*

| Sample No. | Species | Element | Period | Lab | $\delta^{13}C$ |
|---|---|---|---|---|---|
| B.t.#1 | *Bos taurus* | Humerus | Modern | Beta | − 11·7 |
| B.t.#2 | *Bos taurus* | Humerus | 18th century | Beta | − 22·3 |
| B.t.#3 | *Bos taurus* | Vertebra | 18th century | Beta | − 10·1 |
| B.t.#4 | *Bos taurus* | Humerus | 18th century | Wisconsin | − 15·62 |
| B.t.#5 | *Bos taurus* | Humerus | 18th century | Wisconsin | − 15·26 |
| B.t.#6 | *Bos taurus* | Humerus | 18th century | Wisconsin | − 21·12 |
| B.t.#7 | *Bos taurus* | Humerus | 18th century | Wisconsin | − 10·97 |
| C.h.#1 | *Capra hircus* | Humerus | 18th century | Wisconsin | − 15·38 |
| O.a.#2 | *Ovis aries* | Humerus | 18th century | Beta | − 14·9 |

(Table 3). The modern cow (*B.t.*#1) and two of the 18th century cattle (*B.t.*#3, *B.t.*#7) must have had access to ample $C_4$ grasses while four of the 18th century cattle (*B.t.*#2, *B.t.*#4, *B.t.*#5, and *B.t.*#6) were probably raised on vegetation with a $C_3$ pathway. The 18th century sheep and goat bones reflect foraging on both $C_3$ and $C_4$ plants (Table 3).

### *Discussion of stable carbon isotopes in bovid remains from BSH 2*

Modern bone collagen can not be compared directly with pre-industrial revolution collagen because of our accelerated use of fossil fuels (Keeling *et al.*, 1979: 122). Investigations by Cerling & Harris (1999: 352) suggest that $\delta^{13}C$ has changed globally by 1‰ to 2‰ during this period and in a recent study Cerling *et al.* (1997: 154) use a $\delta^{13}C$ enrichment correction of 1·5‰ for fossil mammals (also see Heaton, 1999: 645 [1·5‰]). This correction value has been applied to the 18th century bone samples from Brimstone Hill to facilitate a comparison with modern materials (i.e. *B.t.*#1 as well as $C_3$ and $C_4$ plants). In addition, as already noted above, bone collagen is enriched in ungulates by *c.* 5‰ during the transfer from plants to bone collagen. As a result, if modern cattle were grazed entirely on $C_4$ plants with a $\delta^{13}C$ of − 13·9 (e.g. sugarcane) their bone collagen should yield $\delta^{13}C$ values of − 8·9. If 18th century cattle were fed only sugarcane leaves their bone collagen should yield $\delta^{13}C$ values closer to − 7·4. Clearly, none of the bovids listed in Table 3 lived entirely on sugarcane. However, the modern cow (*B.t.*#1) and two of the 18th century specimens (*B.t.*#3 and *B.t.*#7) were from animals that had fed extensively on $C_4$ grasses and probably represent locally raised cattle (Figure 2).

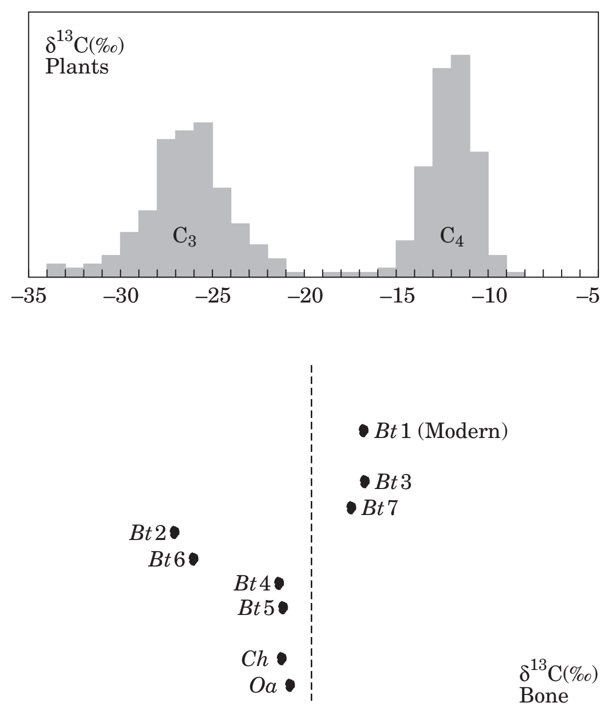


Figure 2. Delta $^{13}C$ values for modern plants (after O'Leary, 1988) and bovid bones from Brimstone Hill (*Bt, Bos taurus; Ch, Capra hircus;* and *Oa, Ovis aries*). Bovid remains are plotted to reflect the 5‰ fractionation between plants and bone collagen. Eighteenth century humeri are further corrected for a 1·5‰ recent enrichment in $\delta^{13}C$. Uncorrected $\delta^{13}C$ values are presented in Table 3.

Given the fact that cattle are dominantly grazers, the remaining four cattle bones can most parsimoniously be interpreted as having been raised on $C_3$ grasses. Two of the cattle (*B.t.*#2 and *B.t.*#6) fed almost entirely on $C_3$ grasses which indicates they were raised in a more northern, temperate, climate. According to De Voe (1867: 28) such animals produced poor quality barrelled beef. "It appears to me, as soon as the salt touches 'grass-fed beef' it draws back, shrinks into a smaller compass, and changes to a dark color, as if there was not firmness or solidity to resist the action of the salt; and when boiled, especially if salted a long time, will shrink very much, leaving it tasteless, juiceless, without heart or substance, and when cut, of a dark color. 'Stall-fed beef' on the contrary, . . . has the appearance (when properly cured) of being firmer, brighter, plumper, or has a swelled look, as if the well-mixed fat protected the lean parts of the flesh." Historic accounts (e.g. Clemen, 1923: 117; De Voe, 1867: 29; Innis, 1940: 162; Kurlansky, 1997: 81; Walsh, 1982: 36) suggest that poor quality meat was routinely shipped to the West Indies to provision slaves. Such accounts are congruent with finding "grass-fed" salt beef in enslaved African contexts at Brimstone Hill.

The remaining cattle bones (*B.t.*#4 and *B.t.*#5) also appear to be from animals that had fed predominantly on $C_3$ grasses. If they were raised on $C_3$ grasses and "stall-fed" maize grain (a $C_4$ plant) for several months prior to slaughter one would expect less negative $\delta^{13}C$ values. According to De Voe (1867), such animals had the potential of producing a superior quality salt beef and may represent provisions originally designated for military consumption. They could also be from northern cattle that were fed maize fodder during the winter. In the northeastern United States it was not uncommon to store shocked maize in barns where ears were removed, primarily for hog feed, and the stocks fed to cattle throughout the long winter months. In areas of less severe winter conditions "The corn [maize] was shocked in the field following the Virginia custom. . . . The cattlemen built no barns. They wintered their two-year-olds out of doors on shocked corn [maize], put them on bluegrass in the spring and summer, and then stuffed them with corn [maize] until February, when the drive to market began" (Henlein, 1958: 6). These markets were typically the larger cities along the East Coast of the United States that had resumed considerable export of beef and pork, as well as livestock, to the West Indies by the 1790s (Thompson, 1973: 71, 73). If maize stalks, alone, are responsible for the less negative $\delta^{13}C$ values in *B.t.*#4 and *B.t.*#5 then a superior quality salt beef is not indicated. Maize stocks quickly lose nutritional value for cattle as the grain ripens (Klopfenstein, 1981: 40) and harvested stocks, while potentially adequate as a maintenance ration, would certainly not have served to fatten cattle.

Some maize could have been available to cattle raised in Europe and thus potentially be responsible for the $\delta^{13}C$ values in *B.t.*#4 and *B.t.*#5. Maize was fairly widespread as a forage crop in Europe by the late 1700s (Young, 1794) and some sources indicate that northern flint maize was "prevalent in England" as early as 1640 (Bunting, 1978: 6). However, agricultural historians suggest that turnips and clover (both $C_3$ plants) were the dominant new forage crops in England during the "Agricultural Revolution". Little-to-no mention is made of maize, making Europe an unlikely source of cattle with $\delta^{13}C$ signatures like those found in *B.t.*#4 and *B.t.*#5.

The two 18th century caprine bones have $\delta^{13}C$ values consistent with having been raised on St Kitts where they had year-round access to $C_3$ leaves from woody shrubs and $C_4$ tropical grasses. Sheep are mixed feeders and the $-14{\cdot}9$ $\delta^{13}C$ value for O.a.#2 undoubtedly reflects both grazing and browsing by an animal in a tropical setting where both shrubs and grasses were available. Goats have been characterized as predominantly browsers. The goat bone from Brimstone Hill has a $\delta^{13}C$ value ($-15{\cdot}38$) less negative than might be expected if that animal had lived entirely on leaves of woody shrubs. However, in an area devoted to sugar monoculture, it is entirely possible that goats had access to harvested fields where they could have fed on short, or damaged, cane stocks that had been passed over as unfit for harvest.

## Conclusion

Skeletal part frequencies of bovid remains recovered from slave context at Brimstone Hill indicate that sheep and goats were raised locally, but that some beef may have been transported to the Island as barrelled meat. Stable carbon isotopes confirm these interpretations; sheep and goat remains have carbon isotopes consistent with having been raised on St Kitts while beef bones have isotopes indicating some of the cattle were raised in a temperate climate. Barrelled beef, then, can account for the large numbers of high utility cattle bones in slave contexts.

Although a fair number of historic sources indicate that barrelled beef was not shipped with marrow bones, there is clear evidence from Brimstone Hill that at least portions of long bones were included with provisions shipped to the British West Indies during the late 18th century. This may be a reflection of the times when, under sugar monoculture, enslaved Africans were often provisioned with inferior quality meat from more northern latitudes.

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