Preliminary Comparative pXRF Analyses of Indigenous Saladoid Wares and Colonoware from Nevis, West Indies

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This paper discusses the preliminary results of comparative trace element testing of historic, prehistoric, and modern wares from the Caribbean island of Nevis, conducted as a means of determining clay sources and traditional production methods through modern times. What we hope to contribute by this study is an increased understanding of historic manufacturing processes and to examine continuity of material culture traditions as they may relate to cultural identity and social interaction.

Identification of locally made, hand built, low-fired Earthenwares at colonial Williamsburg, by Ivor Noel-Hume in 1962 gradually became a source of considerable unexpected debate, which persists to this day not only in America, but in the West Indies as well. The unfortunate naming of this humble ceramic as "Colono-Indian Ware," sent archaeologists down misleading paths in the interpretation of early colonial life and social relations. Later recognized as manufactured by African-American slaves and reconceived as "Colonoware"—a word in common use by many authors--or just as often as "Afro-Caribbean" wares, these ceramics were no longer associated with free Native Americans accustomed to interacting with colonists. This crude earthenware continues to offer intriguing opportunities for analysis and interpretation of colonial development vis-à-vis European/African, colonialist/slave, and wealth/status relationships through myriad paradigmatic frameworks. Not the least of these contributions are the insights traditional African-made wares may offer concerning continuity of traditions, the rise of local markets, resistance to colonial authority, or rejection of consumer capitalism in neo-colonial context. Even the term "Colonoware" is in transition—an issue that will be addressed later in this paper.

The study of ceramics offers archaeologists chronological tools, but also material culture correlates into such topics as culture change, status, identity or ethnicity, and consumer practices among others issues (Adams and Boling 1989; Barker and Majewski 2006; Hauser and DeCorse 2003; Hauser and Handler 2009). Equally engaging are studies of commodity and raw materials trade and distribution of Colonoware vessels throughout Caribbean venues (Ahlman et al. 2008; Ahlman et al. 2009; Crock et al. 2008; O'Connor 1997). Nonetheless, an important criticism has been made that inconsistencies in ethnographic studies of ceramic traditions, especially pertaining to decorative motifs, renders many ceramic studies of indigenous or traditional pottery unreliable (Arnold 1985; Hauser and Handler 2009; Soper 1985). Certainly this shortcoming has been addressed in recent years, but the problem remains, even among high-tech analyses made possible by various new technologies used to assess clay sources and manufacturing processes.

The now classic work of Ferguson (1992) wherein is described his enlightened and belated epiphany—that Colonoware might represent African traditions transplanted to the plantations along with the Africans, in the same manner that traditions in basketry with roots in West Africa were found to have persisted—has been required reading in many introductory courses in Historical Archaeology for many years now. Ferguson retraced the path by which Colonoware became legitimized as evidence of African foodways, and literally as vessels of spiritual value, used in maintenance of African religious practice clandestinely under the oblivious eyes of the plantocracy, in addition to the more mundane role of serving food at the table (Ferguson 1992, 1999, 2007). These assumptions have been critically examined by other researchers (Wilkie 1996). And while this concept has some legitimate detractors, it has not been displaced (Joseph 2005). The study of these low-fired earthenwares in other Caribbean contexts has revealed surprising continuity in manufacturing processes and variety of form, perhaps representing regional variations. Research in Jamaica has been especially fruitful, with materials recovered from sites as diverse as Port Royal and the Great House at St. Ann's Bay providing evidence of the important role these wares played in urbanized and plantation life (Hauser and DeCorse 2003). These wares not only provide data concerning foodways, it suggests that more than one tradition was present in the African population. In preparing for fieldwork on Nevis, West Indies, I became intrigued by a pot from the island of Nevis shown as one of Fergusons's illustrations. It had been hand made by local potters on Nevis carrying on the traditions passed down through generations. I had hopes of finding examples of the ware in historical plantation contexts.

Historical Background

Nevis is volcanic in origin and continues to sustain hot springs and thermal vents. Lacking any reliable year-round water in the form of rivers or creeks, inhabitants depend instead on rainfall to fill their cisterns. Rain is near constant at the top of Mt Nevis at an elevation of 3500 feet and the water percolates through the volcanic matrix to reemerge in three principal springs that feed marshy lagoons at sea level, and one higher up known as "The Source."

The island of Nevis, was one of the "mother" colonies of the formerly British Caribbean in the Lesser Antilles, along with St. Christophers (St. Kitts) and Barbados. Settled by some eighty English adventurers and their servants in 1627, the colony grew to importance and economic significance in less than fifty years. Its importance in the emerging Atlantic economy of the 17th century was out of proportion to its size (Meniketti 2000, 2004).

In 1655, Jamaica was captured from the Spanish by forces of Cromwell setting off the first of several historical demographic changes impacting development on Nevis, as numerous planters along with their slaves relocated to the sparsely populated and better watered Jamaica.

Although the smallest of the English holdings at a mere 35 square miles, the colony produced an astounding amount of wealth, based first on tobacco and ginger, and later from sugar, rum and the slave trade. Nevis acted as way point in the trade of human cargo from Africa and was often the first stop in the New World for tens of thousands of Africans bound for Caribbean and North American ports. As sugar plantations came to dominate the economic and visual landscape of Nevis, slaves increasingly were imported for all the industrial labor and plantation work, be it as field-hand, house servant, factory worker or mariner. But just as archaeologists had long ignored or misinterpreted the origins of Colonoware, historians have also been negligent in comprehending that Africans brought as slaves to these agro-industrial outposts were more than blank slates—as if the middle passage had erased their prior lives, skills, and indigenous knowledge (Mintz and Price 1976; Posnansky 1996). It is true that Africans were thrown together from many tribes and kingdoms, speaking different languages, and harboring differing religious beliefs as they were transported to the colonies. It is also true that those who survived the voyage to colonial lands did not represent one African culture—they would not have represented such a culture in Africa either (Ferguson 1992, 2007; Hauser and DeCorse 2003; Jones 1998; Lovejoy 1989; Mintz and Price1976; Wilkie 1997). Coming ashore on the Caribbean islands instead were fragments of many societies, which in some cases, shared social elements and cultural attributes. These individuals brought with them cultural components that collectively, even if inadvertently, they would strive to maintain—openly or secretly—in the face of oppression, as a structural link to their homeland. The cultural elements, changed or modified, are manifest in material culture and historical archaeology is of unique utility for interpreting this cultural evolution (Armstrong 1985). Plantation contexts have proven a fruitful venue for such studies (Mouer et al. 1999; Singleton 1985, 1995).

Figure 1. Map showing location of Nevis in Caribbean.

Such traditions that survived the Middle Passage would manifest themselves in the lives of slaves to be carried on and passed down through generations, orally and in material goods. Such traditions take on new meanings when practiced in such a context—they become imbued with subtle messages reifying identity and ideology (Hauser and DeCorse 2003; Jones 1998; Wilkie 1997; Wilkie and Farnsworth 2005). Robust arguments have been advanced that material culture, used as markers of identity, can represent overt efforts at resistance or as reinforcement of perceived identity when other avenues of expression are suppressed (Orser 1998; Samford 1996). Yet counter arguments have been made that Colonoware was used from economic necessity rather than as an expression of identity and carried generally negative connotations (Galke 2009).

Colonoware is not a homogeneous ware identifiable to a specific group and may well have different meaning and value in differing contexts. As such, the term "Colonoware" has only the most general utility. Africans that came to produce this

ware in the Caribbean did not learn the practice from Native Americans in South Carolina or Virginia. But, that the enslaved in North America and the Caribbean manufactured similar wares is significant in the context of diasporic populations and traditions. Moreover, similar forms and vessel types can be found in assemblages throughout the Caribbean, for instance, Jamaica and Antigua, suggesting a common lineage if not a common historical trajectory (Hauser and DeCorse 2003; Hauser and Handler 2009). Researchers have been urged to proceed cautiously with analysis of traditional ceramics as markers of identity, that a more nuanced interpretation is called for (Galke 2009). This same cautionary approach is voiced by Hauser and DeCorse (2003). However, significant studies pioneering this analytical approach have been compelling. Although foodways and consumption during the early plantation era was considerably restricted, it was also an arena for negotiation of identity as bondsmen cultivated household crops during narrow slivers of free time and prepared traditional meals, which served to strengthen family and group cohesion. Surplus production of crops helped to stimulate localized markets where potters also sold pots and jugs of traditional style (Hauser and DeCorse 2003). The nature of these markets as lively commercial and critical social venues for both the development and reification of identity is beyond the scope of this paper and has been cogently investigated by others (Hauser 2008; Hauser and DeCorse 2003). But it is important to note that ceramics were an element of the discourse between free and unfree populations and is apparent in the distinctive forms produced when contrasted with European imports, how and from whom they were obtained, and the foodways they complemented.

Furthermore, the evidence from Jamaica strongly suggests that local manufacture may have incorporated elements from different ethnic groups during its evolution and may have found new meanings with emancipation. Interpreting the complexities of an "Afro-Jamaican" ceramic tradition, or any assemblage of wares in the Caribbean, depends on the historical and social context

In September, 2008, Hurricane Omar struck the western shore of Nevis, stripping away the beachfront and revealed early 18th century masonry fortifications and scattered artifacts. Among these, a complete bowl of a type described by Nicholson (1985) as olla style; rounded with an out-turned rim. Decoration was evident consisting of incised hatchmarks encircling the bowl just below the rim, not rouletting, but light carving. While not proof of serving an "identity" function, this decorative motif is reminiscent of styles having African origin as well as similarities to bowls from Antigua, suggesting at least a common thread in design aesthetics.

Figure 2. Bowl found embedded in mid 18th-century fortification walls following beach scouring by Hurricane Omar in 2008. Note smudge black inside and out. Marine organism growth evident but minimal. Recovered by local café owner. Incised cross-hatching around complete circumference of the shoulder just below the out-turned lip. Photo by author.

Historic records for Nevis are nearly mute regarding the presence of indigenous populations during the early decades of English settlement, but not completely. We have, for instance, knowledge that an Island Carib village existed in the unsettled south coast of the island until at least 1650. There is record also in the Nevis Archives of indigenous "old Indians" on slave roles until 1700. This is relevant for understanding how local English and African colonials learned about clay sources, if not vessel forms. The Indian Castle Estate on the southwest coast was so named for purportedly having been built atop remnants of a so-called "Carib fort." Excavations at this site in 1997 unearthed Island Carib artifacts such as ceramics and a polished celt. The ethnicity of Island Carib at contact remains a controversial issue. Rouse (1953) first drew distinctions among Arawak, Taino and Carib culture groups that defined geographic regions. The pre-contact population of Nevis can be recognized as Island Carib, in part by material culture and from documentary sources. Several coastal settlements were identified by Wilson (1989) on the Atlantic side of Nevis. One of these sites was subsequently investigated archaeologically by Southampton University (Morris 2000, 2001).

Bush Hill Estate Field Work

In the years following initial work on Nevis, hundreds of Colonoware sherds have been collected from several contexts. One pattern that has emerged is that Colonoware was frequently found in the assemblage of planters' homes, possibly as pantry wares for provision storage; another, that it could be anticipated in industrial zones. Clearly the ware functioned in a variety of ways and was not limited to the typical role or venue of household utilitarian ware or to slave quarters. At the site of Bush Hill Estate, in St John Parish, three years of detailed survey and excavation have yielded numerous Colonoware sherds disassociated with distinctly Afro-Caribbean households per se. The pottery is a friable, coarse, dark reddish to brown earthenware with inclusions of fine mineral grit which may have served as a natural temper. These wares are comparable to samples from Jamaica as well as low-fired earthenwares described on Antigua. Rims, bases and definable shapes in the assemblages point to shallow platters, bowls and jugs of relatively robust proportions.

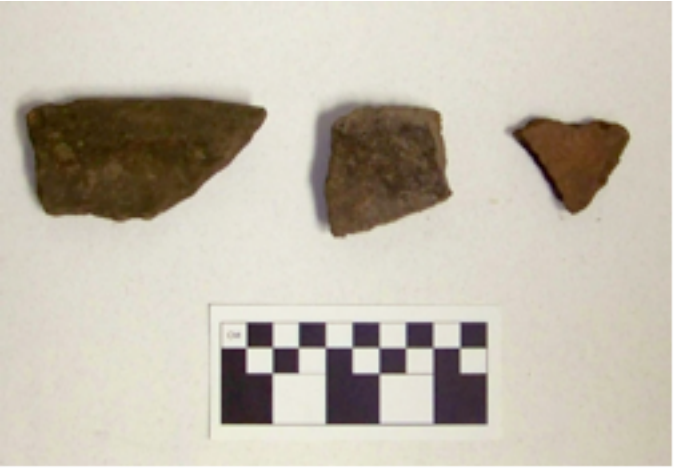

Figure 3. Three colonoware specimen. Photo by author.

From documentary sources we find Bush Hill Estate operating as a successful sugar plantation from about 1780, until well after emancipation into the late 19th century. However, these documents were records of the purchase of the estate as a going concern, indicating it had been in operation much earlier. Archaeological evidence pushes this date back in time to at least 1725, with tantalizing artifactual hints that it may have first operated before 1700. Much of this is based on mean ceramic manufacturing dates of common European import wares and pipe stem analysis for mean dates. The site can be partitioned into three activity zones: Old factory, New Factory and Residential.

The Old Factory zone at the site included boiling and curing houses, an animal mill, storage facilities, and a planter's house. Prior to 1780, a windmill had been constructed and the estate house greatly enlarged to a scale deserving the title Great House. An adjacent structure appears to have served as kitchen and servant quarters. A new industrial zone was constructed around the period of emancipation and this was modified to accommodate steam power and a steam engine after 1850. A greatly enlarged boiling facility, engine house, and curing building were all constructed in an integrated factory unit with an eye toward efficiency. A smithy was established through modification of an earlier structure and additional buildings added. Several high quality, cut stone, masonry entry gates indicate a prosperous factory with an impressive façade. In this period, sugar as a commodity was less important at the plantation than rum production as indicated by installation of a sizable distillery. By 1900, the estate appears to have again been retooled for cotton processing. Caretakers lived on the property in an overseer's house until about 1960.

This highly diversified and successful estate was served by as many as 100 enslaved Africans prior to emancipation in 1834, and these individuals likely comprised most of the work force afterwards as well, owing to the restrictive laws that were enacted on the island to maintain former slaves as agricultural laborers. Bush Hill became the site of the San Jose State University archaeological field school in 2006, with generous support from the current owners of the property at the adjacent Montpelier Estate.

Colonoware sherds were recovered in surface collections, excavation units, and test pits across the site, but primarily in the industrial zones—the smithy yielding the largest quantity—and units fronting the boiling house. With the exception of fragments recovered from within the Great House outer porch, none of the Colonoware at Bush Hill is from an identified domestic context. Sherds found outside the Great House should not be construed as having a direct association. However, 100 meters away across the historic frontage road, several Colonoware sherds were located during a survey of what we believe to be remnants of a laborers' village. The frequency of imported stonewares and earthenwares and common 19th-century whitewares at the location greatly exceeded that of Colonoware, but admittedly, we have yet to conduct adequate subsurface testing. The specimen used in this study are listed in Table 1. The form and rim designations used here follow Wilson (1989) and Morris (2000). In essence, our samples of

Figure 4. Recovery of colonoware sherds from excavation unit at Bush Hill Estate. Photo by author.

Colonoware likely date from between 1700 and 1900, when the works at Bush Hill were abandoned. We cannot rule out the possibility, however, that some discards arrived at the site after this date owing to the presence of a village nearby lasting until about 1940.

Modern Production on Nevis

Complicating matters on Nevis, at least in terms of identifying historic artifacts, is the presence of a community of potters who manufacture traditional ceramic forms for household use. These forms have been in constant use from before emancipation through recent colonial times, and while finer (yet inexpensive) imports have been widely available, the traditional wares have not been fully replaced. These include braziers or coal pots, candle holders, stew pots, water jugs, plates, ashtrays, and models of vernacular architecture. Such forms are also present on Antigua (Hauser and Handler 2009), suggesting either mutual traditions or commercial interactions over the past. Among Nevisians today, the *African-ness* of the pottery is closely linked with traditional *Nevisian-ness* in a conscious affirmation of Afro-centrism. This may, however, be a recent phenomenon (Meniketti 2000). This is not to say there has been a resurgence in the use of traditional wares, only that the tradition survives in part from association with other identity-affirming practices on Nevis, such as the annual culture festival wherein all things Nevisian are celebrated. Lovers of toponymy, will be interested to learn that the community is located in the village of Potworks, just down the road from the village of Brick Kiln, near Newcastle. The firing methods are traditional and produce the same pleasing red and black buff coloration found on historic sherds. In many cases the exterior surfaces are similar to prehistoric Carib wares which also tend toward red and black, albeit more coarse. The method is similar in most ways to that described on Antigua (Hauser and Handler 2009). After molding the vessels from clays kept in the yard, the pots are allowed to dry in the sun on sheets of corrugated tin commonly used for roofing. When a batch is ready they are piled in a carefully prepared heap in the ash of previous fires and covered with coconut husks, sticks, wood from pallets and other combustibles. The pile is set ablaze and the pottery fired from above. This uneven heating and exposure to flame creates the final pleasing coloration, and differentially affects the fabric.

Production of several types; bowls, pitchers, and braziers was documented in order to understand the complete open-air firing method. The production of pottery following traditional procedures from traditional clay sources provides tourist dollar income for members of the community at Potworks. Along with utilitarian wares purchased by local residents, numerous styles are manufactured in miniature as decorations or exclusively for the tourist trade, such as the house models. Little has changed since Barbara Heath visited these potters in 1988 and reported on traditional production methods (Heath 1988).

The potters make conscious, carefully considered decisions about vessel forms and clay types, preferring a reddish clay, yet these choices are cognizant of traditions. Such processes were cogently documented in Caribbean contexts by Handler (1963) and this aspect of decision making in the potter's craft must be borne in mind when interpreting the meaning of traditions as they relate to communities.

Figure 5. Traditional pottery forms prepared for firing at Potworks in Newcastle, Nevis.
Note that some forms begin reddish while others have tan color. The palm fronds, coconut husks and pallet wood in the foreground will cover the pots once they have been placed on the ash pile. Photo by author.

Figure 6. Close up of the pottery about to be fired. Photo by author.

Figure 7. Clay storage at Potworks. Photo by author.

Figure 8. Pots, pitchers, candle holders, bowls after firing. Most are reddish with distinctive black smudge exteriors. Photo by author.

Methodology

Instrumental neutron activation analysis has been the traditional approach to evaluating constituent elements in ceramics and has successfully been used to study clay sources and possible exchange patterns (Harbottle 1982), and to distinguish locally made wares from European imports of similar character (Rodrìguez-Alegrìa et al. 2003). Ahlman and his colleagues derived significant results concerning pottery manufacture on St. Kitts and found evidence of possible exchange with neighboring Nevis (Ahlman et al. 2008, 2009). More recently, analysis of indigenous ceramics from sites on Antigua has been carried out (Decantes et al. 2009). INNA and chemical analysis of prehistoric ceramics in the Caribbean has significantly added to our understanding of early manufacturing and transport of raw materials while simultaneously exposing uncertainties needing further exploration (Curret 1997; Fitzpatrick et al. 2008). Trace element analysis using XRF (x ray fluorescence) units and other portable techniques have proven a valuable tool in non-invasive analysis of ceramics for such purposes as sourcing clay, glaze analysis, mapping potential trade patterns, and understanding manufacturing practices based on clay types and source (Calfas 2010; Inanez et al. 2010; Smith 2010).

The pXRF operates by emitting an x-ray toward the ceramic sample, which excites electrons of the K shell (lowest energy) of the atoms. As an electron is ejected, electrons from other shells around the atom nucleus move to fill the vacancy and emit additional energy in a cascading fashion. The energy spectrum is measured by a high resolution detector within the unit. The incoming energy signal allows elements to

be identified and the instrument's computer calculates the percentage concentration. The protocol followed in this study was to place the samples on the table mounted stationary detector and to test each sample twice. The thickest samples were used. Only when the curvature of a given sample would not allow for close contact with XRF "eye" would we opt for a hand held operation. The ThermoScientific pXRF used for this study was calibrated using a powdered matrix sample provided by the manufacturer. In fact, the regional representative conducted the calibration to the specification of this particular model before we began analysis.

The basic concept is to generate a "signature" of detectable elements which can be compared. Portable units have come a long way since early applications of Neutron Activation began to be recognized as a viable tool (Johnson and Stross 1965). Scans can be used to generate a signature or "fingerprint" of the artifact being tested within a specified range of elements. Individual spectra can be analyzed. When used judiciously and with consideration to relevant shortcomings one can obtain excellent analytical results. Such results inspire continued use of the technique. In recent years portable XRF analyzers have become easier to use, more reliable, and lower in cost, increasing its accessibility and efficacy to archaeologists.

For our analysis we employed a Niton XL3p from ThermoScientific. These x-ray analyzers, either handheld or table mounted, scan for a series of constituent elements in parts per million, or calibrated to percentages, along with calculating margins of error. The data is easily downloaded to standard spreadsheet formats and presented in tabled form. The data is then reconfigured by a compatible software program into histograms revealing relative values for the elements present. These can be compared directly side by side or superimposed as desired. Recently the validity of results for pXRF has been called into question (Shackley 2010) because of inconsistent protocols within the field of archaeology and a lack of comparability between various models from different manufacturers, among other factors. In our study we sought to focus on the concentrations of elements present and to include in our analysis only those elements detected at levels significantly exceeding the error margins.

Samples

The purpose of testing sherds in this case was to establish comparative trace-element signatures from three contexts on Nevis: prehistoric, historic, and modern pottery specimens. In the context of this study, archaeologically collected samples of low-fired Earthenwares from historic sites were designated as Colonoware, although we might be better served to call these Afro-Nevisian wares. In contrast, prehistoric wares of similar fabric and firing identified as pre-contact indigenous wares, were for the sake of simplicity termed "Carib" in the field without any assumed ethnic affiliation other than these wares were produced pre-contact. For purpose of comparison and consistency with other published studies, the term Saladoid will be used henceforth for these prehistoric indigenous wares. Each sample collected from the Bush Hill site was subjected to pXRF scanning in the laboratory. Additionally, a recently manufactured pot, acquired during fieldwork in the summer of 2009, was tested.

Wares of indigenous manufacture from two sites, Whites Bay and Hickman Estate, both on the eastern, Atlantic side, were also examined. These sites were initially identified during island surveys by Wilson (1989). The ceramic was of Saladoid era (200 BC – AD 300) or later Ostinoid (to AD 600) production as described by Keegan (2000) and can literally be found covering the ground surface near the shore so densely that one must walk gingerly so as not to crush pieces underfoot. These are found closely associated with dense middens of conch shell. These two sites are within one mile of one another and it would only be surprising if the ceramics were not similar.

The Hickman site was archaeologically investigated by Southampton University in 1999-2001 (Morris 2001). Morris (2000) also reported inclusions and temper of feldspar, quartz and grog. Using a binocular microscope at low 10X and 40x power we found the same inclusions with the exception that only one of the pieces used in this study contained grog. None contained shell. Strong winds and wave action have deeply eroded the cliff faces along this shore, actively exposing (and destroying) these native sites. A 1984 Ordinance Survey marker placed by surveyors well back from the shoreline has just about been eroded away—testimony to the rapid loss of coastal land.

As our samples were all from Nevis, we hypothesized that it was likely that similar clay sources were being accessed both in prehistoric and historic times. On the other hand, if different sources were indicated by pXRF signatures we would expect different sources. We could also speculate on differences in clay preparation, or possible inter-island exchange of the nature described by Ahlman and his

Figure 9. Three Carib ware specimen from Hickman site. Photo by author.

colleagues (Ahlman et al. 2008). The potters in Newcastle, and at Potworks, informed us where they collect the bulk of their clay, which contains a natural temper to which they claim to add no further tempering. An art history student and potter among our field crew in 2009 sampled the clay and described it as "gritty." We hoped to discover if this was the historic source for colonial plantation era potters as well and whether indigenous pre-contact populations used this source or others. Researchers on Antigua indicate that clay sources are often found close to indigenous sites. Wilson's (1989) archaeological survey of Nevis did not note Saladoid sites along the northern end of the island near this clay source and we can only speculate at this point on its indigenous use, although it is logical this resource was exploited.

It should be noted that typical Afro-Nevisian sherds are found on many archaeological sites on Nevis, both as surface scatters and subsurface. Their use as a chronological indicator is highly suspect and would be further compromised if they registered similar or identical element signatures to modern ceramics. Saladoid wares, however, are highly restricted to specific site locations.

Results of XRF and Analysis

Samples were frequently tested from both interior and exterior surfaces. These usually were identical in signature and so only one record is presented in Table 1. Our test used a limited number of samples from out of more than 50 Afro-Nevisian specimens. Afro-Nevisian ceramics (n=19) included three surface collected samples from a village site on the Montpelier Estate property known to have been occupied until 1950. The remainder came from multiple excavation units at Bush Hill. Saladoid wares (n=26), and a modern Potworks bowl (n=1) completed the test samples. Color was noted for interior and exterior surfaces. Fragments deemed too thin were not tested.

The immediate results of the XRF readings were intriguing. As will be evident in the tables of elements and concentrations (Tables 1-4), all three ceramics contained nearly identical elements at nearly identical concentrations in parts per million, highly suggestive of a common source. However, concentrations of particular elements, iron especially, varied in a statistically significant manner. This would not likely have resulted from different firing methods. Furthermore, there is not an exact match of signatures, suggestive of at least some variation in ceramic fabrics.

Nearly all Afro-Nevisian sherds tested were from plate or bowl forms, mainly rims. The Saladoid vessels were predominately flat or shallow plate forms, some quite large with diameters of more than 30 cm. Others, which were even larger, approaching 2 cm thick, possibly representing cassava bread griddles. A variety of rim forms were represented, however, the majority were plain, plain canted, and platform types (following Morris 2000, based on Wilson). The modern specimen purchased at Potworks was a traditional bowl with handles in miniature. It was tested on its base and its sides.

Signature elements included Ca, Ti, Ni, Fe, Sr, Nb, Mo and Y. Of these, Ca, Fe, Sr, Nb, Mo spikes were common to all ware samples, modern, Saladoid or Afro-Nevisian. Minor spikes of Mn, Ga, and Pb registered in some samples, as did other metals, Zn, Cu, As, and Zr. However, these are present at very small levels, and Pb never appeared in the Saladoid wares nor in the modern samples from Potworks. In fact, the modern pieces are virtually indistinguishable from the Saladoid samples, except for Fe levels, but both are distinct from the archaeologically recovered Afro-Nevisian specimens, by both indicators of elements present and Fe concentrations. Elements present at minor levels included Eu, Br, and other elements which did not register statistically significant values.

The presence of Pb and As, often paired, deserves attention. It has been noted by other researchers that lead and arsenic are often found together in XRF studies, especially in glazes, and further, that potential

Rec #	Ware	Specimen #	Form	type	Color intr/extr	Thick mm	Elements Present
10	Saladoid	H-1-09-3-1	rim	plate	red/brn	12.1	Ca Ti Fe Ni Br Sr Nb Mo Y
11	Saladoid	H-1-09-3-2	base	bowl	rd-blk/tan	15.0	Ne Ca Ti Fe Ni Zn Fr Br Sr Nb Mo
12	Saladoid	H-1-09-3-3	rim	bowl	rd-brn/brn	11.5	Ca Ti Eu Fe Ni Rb Sr Nb Mo
13	Saladoid	H-1-09-3-4	flat rim	bowl	brn/blk	8.5	Ca Fe Ni Br Sr Nb Mo Y
26	Saladoid	H-1-09-3-5	rim	plate	orng/brn	11.3	Ca Ti Eu Fe Ni Br Sr Nb Mo Y
27	Saladoid	H-1-09-3-6	rim	plate	brn/tan	8.7	Ca Ti Fe Ni Rb Sr Nb Mo
28	Saladoid	H-1-09-3-7	rim	plate	red/brn	11.5	Ca Ti Fe Ni Br Sr Nb Mo Y
31	Saladoid	H-1-09-3-22	rim (ins)	plate	red/tan	10.0	Ca Ti Eu Fe Ni Rb Sr Nb Mo
32	Saladoid	H-1-09-3-23	body	bowl	red/orng	10.3	Ca Ti Mn Fe Rb Sr Nb Mo
33	Saladoid	H-1-09-3-24	base	?	red/tan	15.6	Ca Ti Fe Ni Rb Sr Nb Mo
34	Saladoid	H-1-09-3-25	rim	griddle	brn/blk	10.0	Ca Ti Fe Rb Sr Nb Mo
36	Saladoid	H-1-09-3-26	base	bowl	brn/blk	11.4	Ca Ti Eu Fe Ni Rb Sr Nb Mo
103	Saladoid	H-1-07-3-66-	rim	plate	brn/red	12.7	Ca Fe Ni Rb Sr Nb Mo
105	Saladoid	H-1-07-3-67	rim	shl bowl	rd-brn/red	8.9	Ca Ti Fe Ni Rb Sr Nb Mo
107	Saladoid	H-1-07-3-68	rim	sml bowl	red/orng	14.2	Ne Ca Ti Fe Ni Br Sr Nb Mo
109	Saladoid	H-1-07-3-69	rim	sml bowl	brn/red	6.6	Ca Eu Fe Ni Br Sr Nb Mo
113	Saladoid	WB-1-07-3-74	rim	shl bowl	rd-brn/brn	10.6	Ca Ti Fe Ni Br Sr Nb Mo Y
114	Saladoid	WB-1-07-3-75	rim	bowl	brn/blk	17.2	Ca Ti Mn Fe Ni Ga Br Rb Sr Nb Mo
121	Saladoid	WB-1-07-3-80	rim	deep bowl	brn/brn	10.3	Ca Ti Fe Ni Br Sr Nb Mo
122	Saladoid	WB-1-07-3-81	rim	bowl	red/brn	9.5	Ca Ti Fe Ni Br Sr Nb Mo
123	Saladoid	WB-1-07-3-82	rim	bowl	brn/red	10.3	Ti Fe Ni Br Sr Nb Mo
125	Saladoid	WB-1-07-3-84	body	lg bowl	brn/brn	5.7	Ca Ti Fe Ni Br Sr Nb Mo
126	Saladoid	WB-1-07-3-85	rim	griddle	rd-brn/brn	10.4	Ca Ti Fe Ni Br Sr Nb Mo Y
144	Saladoid	H-1-09-3-93	rim	lg bowl	rd-brn/brn	12.7	Ca Ti Fe Ni Br Sr Nb Mo Y
145	Saladoid	H-1-09-3-94	rim	plate	blk buff/red	11.8	Ca Ti Fe Ni Br Sr Nb Mo Y
146	Saladoid	H-1-09-3-95	body (ins)	sm bowl	blk buff/red	8.5	Ca Ti Fe Ni Rb Sr Nb Mo
147	Saladoid	H-1-09-3-96	flat base	plate	blk/brn	10.0	Ca Ti Fe Ni Br Sr Nb Mo Y
148	Saladoid	H-1-09-3-97	body	bowl	buff tan/tn	7.5	Ti Fe Ni Sr Nb Mo
37	AfroNev	BH-1-tc1-07-1-27	rim	griddle	rd-blk/red	11.8	Ne Ti Fe Zn Rb Sr Nb Mo
38	AfroNev	BH-1-tc1-07-1-28	rim	bowl	blk buff	10.4	Ca Mn Fe Ga Rb Sr Nb Mo
40	AfroNev	BH-1-tc2-09-1-29	body	bowl	brn/blk	9.5	Ca Mn Fe Zn Rb Sr Nb Mo
41	AfroNev	BH-1-tc2-09-1-30	rim	strg jar	red/blk	21.3	Ca Eu Fe Ni Rb Sr Nb Mo
95	AfroNev	BH-1-09-1-58	rim	?	blk buff/red	12.2	Ca Ti Fe Ni Zn Pb Ac Rb Nb Mo
96	AfroNev	BH-1-09-1-59	body	?	blk/red	8.4	Ca Ti Fe Ni Pb Ac Rb Nb Mo
97	AfroNev	BH-1-09-1-60	body	?	blk/blk	8.6	Ca Ti Fe Ni Cu Pb Ac Rb Nb Mo
98	AfroNev	BH-1-09-1-61	body	?	blk/blk	7.5	Ca Ti Fe Ni Pb Ac Rb Nb Mo
99	AfroNev	BH-1-09-1-62	body	?	blk/blk	7.3	Ca Ti Mn Fe Ni Pb Ac Rb Nb Mo
214	AfroNev	MPE-1-07-1-127	rim	bowl	blk buff/blk	11.5	Ne Ti Fe Ni Zn Pb Ac Rb Zr Nb Mo
215	AfroNev	MPE-1-07-1-128	curved base	bowl	org/tan	6.5	Ne K Ti Fe Ni Zn Br Sr Nb Mo
216	AfroNev	MPE-1-07-1-129	rim	bowl	blk/brn	14.5	Ti Fe Ni Cu Pb Ac Rb Nb Mo
238	AfroNev	BH-1-08-1-151	body	?	brn/brn	10.0	Ca Ti Fe Ni Cu Zn Pb Br AcNb Mo
239	AfroNev	BH-1-08-1-152	rim	bowl	blk/blk	10.0	Ca Ti Fe Ni Cu As Sr Rb Nb Mo
244	AfroNev	BH-1-08-2-157	body	?	red/red	8.0	Ca Ti Fe Zn As Ac Rb Nb Mo
245	AfroNev	BH-1-08-2-158	body	bowl	red/tan	8.5	Ca Fe Cu Zn Pb Ac Rb Nb Mo
246	AfroNev	BH-1-08-2-159	base	bowl	red/red	10.6	Ti Fe Cu Zn Pb Ac Rb Nb Mo
247	AfroNev	BH-1-08-2-160	body	bowl	rd-blk/tan	16.0	Ca Ti Fe Cu Zn Ac Rb Nb Mo
251	AfroNev	BH-1-08-1-164	body	bowl	rd-blk/brn	7.6	Ca Ti Fe Ni Cu Pb Ac Rb Zr Nb Mo
128	Modern	Potworks-09	bowl	bowl	rd-blk/red	7.8	Ca Ti Eu Fe Ni Sr Nb Rb Mo

Table 1. All rim or base samples also had body components. Thickness was determined by averaging three measurements from the body portion. H : Hickman site; WB: White's Bay site; BH: Bush Hill site; MPE: Montpelier estate village site. Rim forms primarily of three types; plain, canted plain, and platform (after Morris 2000, based on Wilson 1984). Bowl forms were determined by curvatures. Samples 31 and 146 had incised rectilinear decoration evident. The terms Saladoid has been used for indigenous wares in order to be consistent with other published studies. Afro-Nevisian is used rather than the more vague "colonoware" to underscore that the ware under consideration is from historic sites on Nevis.

No	Fe	Fe Error	Mn	Mn Error	Ti	Ti Error	Sr	Sr Error	Ca	Ca Error	K	K Error
37	48965.54	868.76	1356.06	198.69	1760.84	168.08	267.43	15.01	11356.5	522.07	11623.9	679.06
38	48803.4	852.28	1093.3	180.85	4287.44	294.93	286.67	15.25	29683.19	937.48	13726.7	869.48
40	49946.8	869.19	1526.91	207.15	1113.42	126.96	267.46	14.85	7263.44	397.44	5303.31	446.06
41	37709.35	733.75	660.72	143.28	3142.14	254.61	261.6	14.28	27454.54	875.18	13166.6	826.23
95	49524.29	859.95	1016.38	175.59	3264.26	237.59	286.16	15.25	27286.6	833.55	8355.01	641.54
96	46440.42	824.26	918.93	165.87	3771.01	287.95	305.69	15.59	47335.78	1160.08	13209.8	855.91
97	47098.85	838.04	1260.23	189.78	3595.19	279.75	343.81	16.65	50114.61	1199.53	12349.1	838.6
98	55666.82	929.98	1532.76	211.48	3375.15	230.39	272.85	15.21	19064.79	688.97	3129.32	420.02
99	53283.86	911.49	1838.81	228.09	4104.41	291.62	240.37	14.34	26227.24	881.84	4170.11	533.4
214	43610.61	793.73	1263.79	185.45	3595.26	286.45	281.78	14.89	33775.59	974.74	11111.1	775.05
215	50895.5	876.86	1706.5	217.26	3897.57	278.73	274.98	15.05	26421.78	881.84	7506.23	664.13
216	46212.14	834.7	1183.16	186.26	3923.13	278.48	279.7	15.16	34075.38	996.67	32902.6	1266.05
238	42610.61	816.09	1015.6	176.98	3483.6	257.78	367.9	17.61	46856.84	1147.16	24758	1117.38
239	49731.61	866.96	608.5	146.76	4699.27	289.71	259.66	14.66	44980.55	1142.81	27803	1191.62
244	42904.04	801.6	988.19	173.21	3385.42	318.88	365.23	17.18	43795.61	1113.74	16589.5	938.33
245	40839.82	779.74	778.38	156.66	3267	274.18	304.42	15.69	50311.71	1163.01	14427.1	866.8
246	43276.67	806.05	1203.29	185.64	3116.93	268.92	250.99	14.38	35654.95	1007.85	12281	818.06
251	45322.68	827.01	995.74	174.22	3421.82	264.05	335.7	16.55	55925.42	1248.79	15304	910.01

Table 2. Elements present in colonoware sherds and concentrations in ppm. Error range included.

No	Fe	Fe Error	Mn	Mn Error	Ti	Ti Error	Sr	Sr Error	Ca	Ca Error	K	K Error
10	32828.9	524.23	482.45	97.14	2499.49	216.56	287.76	11.44	22529.04	781.92	8517.1	672.23
11	32997.5	689.11	602.18	137.37	3426.17	275.07	340.93	16.29	39775.24	1030.57	21761.3	1024.96
12	38043.6	737.65	757.11	151.39	1453.69	154.71	280.86	14.78	13220.41	539.47	6146.5	499.16
13	38848.9	747.39	1344.07	188.97	1704.02	157.85	291.54	15.08	11264.15	506.54	6132.8	501.94
26	42328.6	802.09	1134.46	182.22	3795.73	261.74	312.17	16.04	38026.25	1013.34	9926.21	736.35
27	39538.4	736.84	1163.54	174.05	1471.95	159.32	303.17	15.02	17127.99	608.92	4736.65	448.69
28	37802.2	754.24	796.15	157.66	1353.36	147.03	306.63	15.82	15256.84	571.38	5433.72	470.52
29	12563.1	441.61	567.59	131.98	667.11	118.81	187.08	12.64	87774.98	1323.07	5285.93	510.58
31	44438.8	805.09	1320.36	190.62	4424.95	297.13	269.5	14.64	35185.85	1007.29	11750.4	812.36
32	36329.9	712.87	1510.56	194.31	3242.46	249.04	302.91	15.14	37297.21	995.26	10763.9	753.95
33	36475.1	708.46	546.92	132.48	1561.55	154.08	248.06	13.68	10494.5	489.2	6102.83	499.38
34	41558.1	763.11	1012.98	168.52	4068.05	270.76	248.95	13.82	26159.91	865.1	15561.5	894.92
36	35379.6	702.24	1189.39	175.95	3380.64	250.59	347.37	16.15	34398.26	988.03	24169.7	1096.25
103	35485.4	706.42	973.02	163.81	2936.39	222.04	239.47	13.58	28771.98	859.4	11007.6	730.85
105	49975.1	883.07	779.47	163.8	4070.61	274.36	324.93	16.58	37777.34	1043.11	18118.6	973.37
107	34942.1	707.7	560.46	134.88	5254.78	280.1	362.52	16.74	20511.03	750.07	12235.3	781.43
109	54915.5	910.32	874.66	170.06	3727.06	280.88	266	14.81	34658.87	1022.75	12791	853.96
113	34555.3	722.03	1186.28	182.73	3449.44	243.61	322.41	16.21	40891.47	1026.69	10897.4	751.42
114	49752.2	908.67	1491.44	214.68	4454.46	263.27	316.74	16.87	39430.71	1011.72	9154.79	701.13
121	31167.5	661.5	535.62	131.37	2666.09	211.78	292.16	14.93	30116.25	868.38	11553.9	737.92
122	43273.2	792.47	565.04	139.4	3101.14	252.38	239.7	13.82	26146.1	860.25	12057.8	792.72
123	64381.7	998.74	816.9	170.42	3993.51	287.36	327.75	16.6	44220.64	1181.31	9091.12	769.99
125	40132.6	762.99	925.5	163.96	3456.65	252.81	279.42	14.85	29745.24	896.57	12398.6	790.41
126	41998.4	822.32	1208.38	191.5	2902.34	228.67	300.23	16.19	27653.98	845.34	13432.2	798.28
144	47241.6	822.97	1184.86	181.74	3700.45	277.42	288.6	15	28985.78	911.94	14075.9	858.23
145	44237.9	808.87	723.13	153.95	3735.29	258.62	246.91	14.15	24938.66	845.62	11791.8	789.26
146	39847.9	759.14	905.1	162.54	3902.81	266.06	301.26	15.38	34080.88	954.72	10571.8	740.57
147	33530.1	684.99	989.52	162.98	2553.99	224.11	303.71	15.16	38384.89	1003.28	11144.2	761.28
148	55239.1	939.96	737.24	164.8	6104.78	318.7	187.51	12.94	13134.36	641.67	9248.62	710.72

Table 3. Elements present in Carib sherds and concentrations in ppm. Error range included.

No	Fe	Fe Error	Mn	Mn Error	Ti	Ti Error	Sr	Sr Error	Ca	Ca Error	K	K Error
128	43228.92	789.66	773.86	154.25	3144	242.31	276.24	14.74	21418	851.58	56185	303.01

Table 4. Elements present in modern bowl and concentrations in ppm. Error range included.

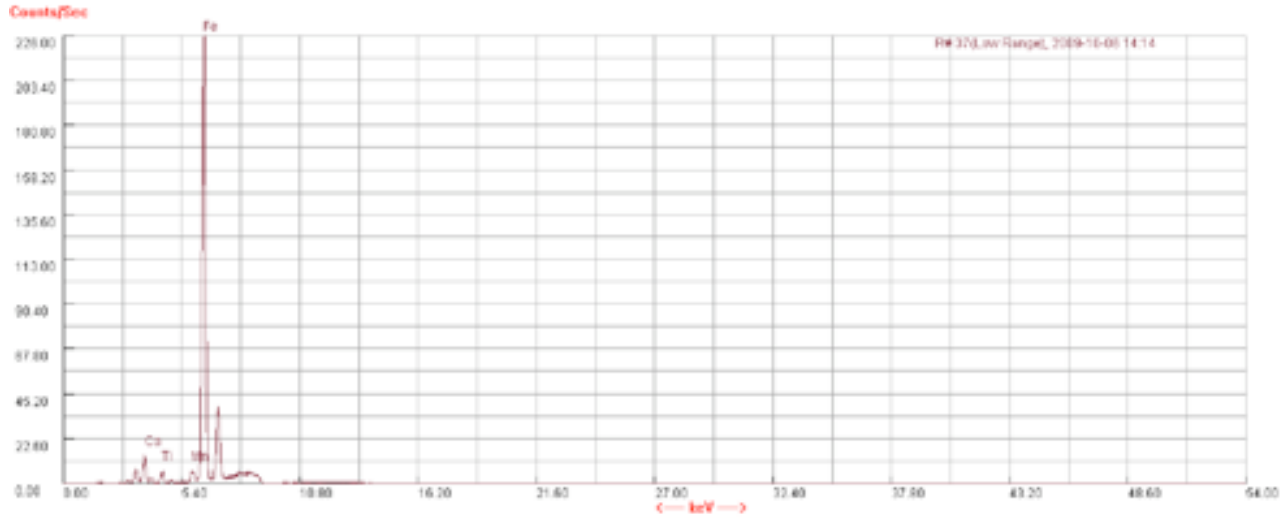

Figure 10. Spectra of colonoware specimen.

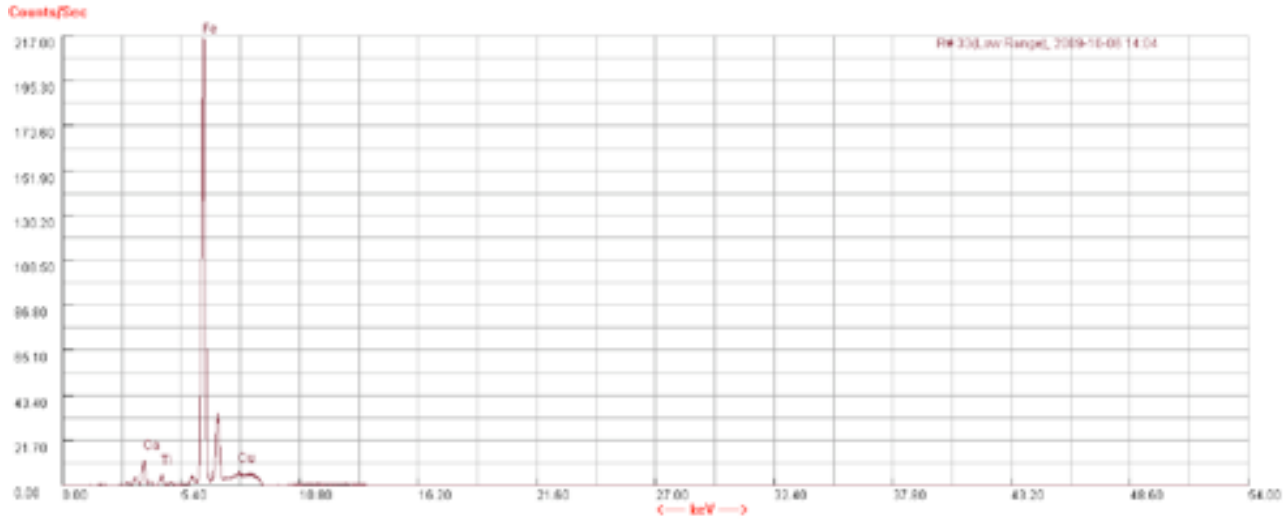

Figure 11. Spectra of Carib ware sherds.

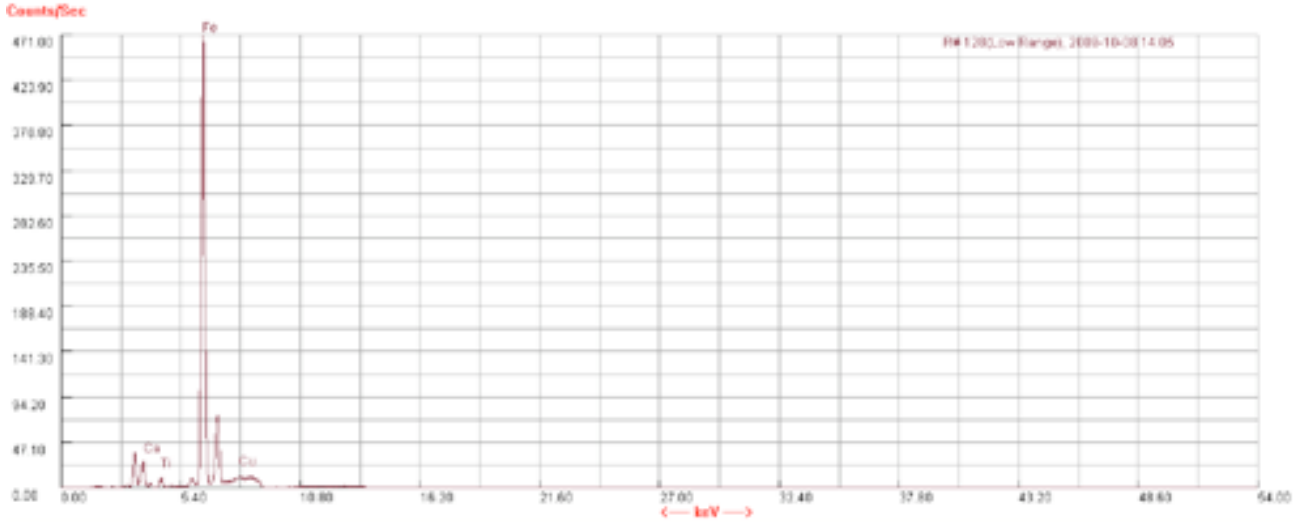

Figure 12. Spectra of modern Potworks vessel.

problems inherent in the detectors themselves may misread secondary traces of lead as arsenic, providing false indications of its presence.

Glazes were not evident on any samples so that can at least be ruled out as a source of discrepancy. The fact that some samples generated spikes with Pb and As while others indicate Pb only, and some samples registering Cu also indicated As, suggests at least minimal error, otherwise we should expect to always see specific pairings, for example; As indicated in every sample with Pb present. This was not the case.

The Afro-Nevisian wares were divisible into three major groups: samples with Zn, Pb in detectable levels, those containing Cu and As, and those that lacked any of these four elements, but further distinguished from prehistoric and modern specimen by Fe concentrations. Samples from the two coastal Island Carib sites were divisible into two groups based on presence/absence of Br. A single sample contained Fr, but as a standalone cannot be assessed further. For nine samples, Ca was not detected by the pXRF. This occurred in both Saladoid and Afro-Nevisian wares. In reviewing where these specimen were collected it became apparent that the distinctions could be associated with specific sites (Bush Hill, Montpelier) and the elements may represent localized contamination, absorption, or possibly tempering differences still to be examined.

Discussion

The essential finding satisfying the purpose of this study is that we could readily distinguish between our various specimen on the basis of element concentrations and between sites by element presence/absence using our particular model of pXRF. What this means, however, is another matter. We also were able to re-classify four samples as Afro-Nevisian wares that had been misidentified as European earthenware in the field. Why the concentration of iron varies so broadly among our sherds has not yet been deciphered. Spectra are compared in Figures 10-12.

While this study potentially sheds light on local manufacture and clay sources, it does not as yet increase our understanding of manufacturing processes. There can be little doubt that early colonists learned about clay sources from indigenous populations and while Europeans may have sustained themselves initially with imported earthenwares, subsequent production and island development depended on archaeologically identified "Afro-Nevisian" wares for domestic and industrial purposes—a practice in other Caribbean colonial contexts as well. The high percentage of Afro-Nevisian vessels at factory sites and in the pantry of the households of European planters as found on Nevis suggest that it had industrial applications in addition to food storage and was not limited to African laborer households. We may speculate that the smithy at Bush Hill also served as a home for the smith, in which case the wares present may have been serving domestic purposes (food storage, cooking, etc.) and conformed to vessel types traditionally used for these purposes. An we must not overlook the possibility the smithy was of African heritage. Nonetheless, the importance of Afro-Nevisian wares as a feature of daily routine can not be denied.

The present evidence suggests a common source for the historic, prehistoric and modern clays. Whether this represents continuity of traditions from the historic colonial period or economic realities remains to be sorted out through future research. That traditional ware forms continue to be produced, however, speaks volumes. The sale of these forms to tourists also underscores the conscious association between these vessels and Nevisian heritage locally, and the celebration of these forms in homes as decorative motifs and functional accents strongly hint that minimally, they are viewed as Afro-Nevisian by Nevisians.

Acknowledgements

The author wishes to thank the publishers and the reviewers of the original manuscript whose comments and valuable feedback have served to improve and enhance this paper.

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