Queen Anne's Revenge Shipwreck Project

RESEARCH REPORT AND BULLETIN SERIES

QAR-B-07-04

Tobacco Pipe and Tool Analysis from Shipwreck 31CR314 *Queen Anne's Revenge* Site

Linda Carnes-McNaughton, Ph.D.
Fort Bragg Cultural Resources Program

April 2007

Underwater Archaeology Branch
Office of State Archaeology
Department of Cultural Resources
State of North Carolina
www.qaronline.org

Cover photo: Queen Anne coin weight for 1 guinea gold coin. Recovered from site Fall 2006

Introduction

Smoking pipes made of clay, often considered items of personal possession and used for trade, are commonly found on colonial period sites in North America dating from the early 1600s to the early 1800s. Tobacco, having been introduced to Europe by the New World Indians in the late 1570s, was quickly embraced by explorers and commoners. Taking their cue from the Indians, early English and Dutch sailors, explorers and generally anyone who wished to do so, smoked their tobacco in small ladle-like devices made of clay, and known as pipes. Stone (1974:145) has stated that kaolin (or white ball clay) pipes have received "more critical attention in the literature of historical archaeology than any other artifact category with the exception of ceramics." The reason for this has been the interpretative value of the pipes when used as reliable temporal indicators. As demonstrated by the studies of pipe researchers, namely Oswald (1951), Harrington (1954), Binford (1962), Higgins (1999) and Bradley (2000), the dating of kaolin pipes as been derived from a number of formal attributes that vary through time. These attributes may be the pipe-bowl form; the pipe-stem bore size, manufacturer's marks, decorative designs, and surface textures such as burnishing or polishing. Stone points out that the most reliable of dating techniques for this artifact type, should be one that combines all attributes present in an assemblage from one site or source, since any single attribute could be susceptible to misinterpretation (1974:145). Other factors such as an inadequate sample size (typically less than 30 specimens), manufacturer's marks which spanned multiple generations of pipe makers, or idiosyncratic practices such as reaming the stems with flexible shank wires, can ultimately confuse the chronological results.

Morphologically, kaolin pipes of the type recovered from the *Queen Anne's Revenge (QAR)* site (31CR314) and the focus of this analysis were manufactured in a two-piece mold in which the stem, bowl, and heel/spur projection are contiguous, and the mold seam extends longitudinally (as a center line) down the stem and bowl. While still in the mold, the pipe bowl was reamed with a plunging tool and the stem was bored with a wire (known as a shanking wire) to join the bowl. The wire sometimes left a small indentation or scar on the interior wall of the bowl opposite the bore hole (seen in Specimen 418.116). The resultant mold seam was sometimes trimmed and then polished or burnished. Noel Hume (1969:296) summarizes that the earliest types of pipes from the late sixteenth century were very short-stemmed, with stem length between 1¾ to 3½ inches. By the mid to late seventeenth century, stem length had grown to 12 inches and later by the early eighteenth century, stem length was over 13 inches. Extravagant pipe makers in their zest to impress also created elaborate pipes bowls (from molds) which featured cartouches, faces, scrolls, coats of arms, or other diagnostic embellishments. Also plain pipes were created with extra long stems (over two feet in length). Clearly, much has been written on the history of these white clay, mostly fragile, pipes which are ubiquitous on many diverse terrestrial sites (military, domestic, religious, etc.) and shipwreck sites

(such as Fox 1998 work on the Port Royal materials). Moreover, the personal, medicinal and social aspects of smoking tobacco have also been expounded in recent studies. Bradley's (2000:105-130) thorough and exhaustive study of smoking pipes was used as a guide to begin this analysis of the pipe fragments found on the *QAR* site.

Several standardized terms such as bowl, stem, heel, rim, mouth, lip, bite, and junction are all described in Bradley's analysis and will be used in this study where they apply to a particular fragment (or attribute of a fragment). Heel, feet, and spur refer to the small projection (and part of the mold) of clay, which is sometimes found on the base of the bowl/shank junction in kaolin pipes. Heels and feet, being more flattened, were most often associated with the earlier pipes of the 1600s (Oswald 1951), whereas spike or peg-shaped spurs were found on pipes from the 1680s to early 1800s. Changes in bowl shape have also been described in Oswald (1951, 1975), Noel Hume (1969), Bradley (2000), and more recently by Mallios (2005). Factory manufacturing of clay pipes was initiated in Holland around 1600, primarily by immigrant English pipe makers, thus, basic similarities of pipe shape (bowls) between English and Dutch pipes are known throughout the seventeenth century (Bradley 2000:116; Mallios 2005:103). By the end of the seventeenth century the bowl mouth was as wide as or wider than the bowl middle. This shape is sometimes referred to as the conoidal or conical shape. It has also been observed that generally, Dutch pipes tended to be more polished with a finer finish and the bowls were somewhat smaller than those of English-made pipes. All pipe fragments recovered from the shipwreck thought to be *Queen Anne's Revenge* appear to be of English origin based on observable manufacturing traits.

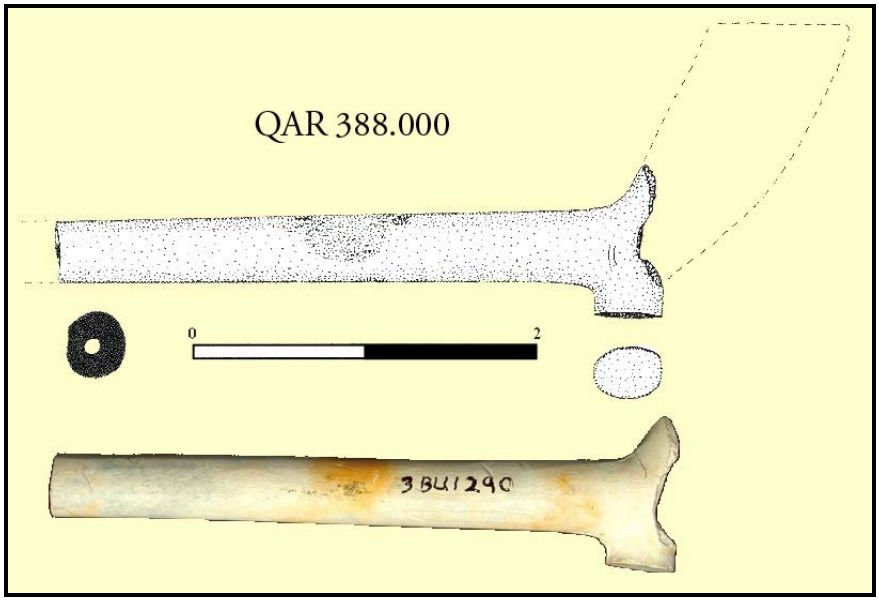

Figure 1 Combined photo and illustration of 388.000

Artifact Discussion

A total of seventeen white clay tobacco pipe fragments have thus far been recovered from excavations of the shipwreck believed to be *QAR*. Of those, three are identified as bowl fragments (347.019, 418.039, and 418.116), eight are stem segments (277.001, 418.011, 418.033, 418.057, 418.058, 495.014, 924.000 and 536.001), four are bowl/stem elements (388.000, 418.037, 418.038, and 418.144) and two fragments (940.000 and 1297.000) are still embedded in concretions (thus not analyzed at this time). Nine fragments were removed in the laboratory, along with cannon C19 and C21, from 418.000 a large concretion found in the forward area. These may represent a small cache of pipes. Stem fragment 495.014 was recovered from a ballast concretion 495.000 which also came from this portion of the shipwreck (forward). Specimen 277.001 and 536.001 were found in the bow area of the site. Bowl fragment 347.019 came from concretion 347.000, and stem 924.000, both located in the stern area, while pipe fragment 388.000 was found under the crown of Anchor A-2, in the mid-ship area. This analyst did not get a firsthand examination of artifact 388.000, the most complete pipe recovered thus far, because it was on exhibit and inaccessible. Measurements and a digital image, however, were provided for inspection and analysis. In addition, specimens 418.011, 495.014, 924.000, and 536.001, stem fragments, were still in soak baths and remained in conservation. Nonetheless, bore diameter measurements and weights had been previously recorded for these four fragments and are therefore included in this analysis. Two fragments remain unanalyzed at this time (940.000 and 1297.000).

Stylistically, all specimens examined in this assemblage were of the white ball clay type known commonly as kaolin pipes. Using a standard drill bit set; the bore diameters for the nine measurable stem fragments were calculated at 0.09 inches or more commonly $6/64^{th}$ of an inch. The weights for the 15 fragments varied from 0.06 (tiny rim sherd) to 13.5 grams (most complete pipe – on exhibit). Bowl shapes revealed two distinct styles, each attributable to a general period of production, according to Oswald (1951) and reiterated by Bradley (2000). Bowl fragment 388.000, based on stem, heel, and bowl-to-stem angle appeared to date to the 1680 to 1710 period of production (see Noel Hume 1969:302). Bowl fragments 418.037, 418.038 and 418.144 all appear to be more conical in shape with a spur type of projection, and date from 1690 to 1750 period of production based on these attributes. The heel on artifact 388.000 is flattened and oval in general shape which enabled the pipe to stand upright on a flat surface. The spurs on specimens 418.037 and 418.038 are narrow and slightly flattened, whereas the spur on specimen 418.144 is more peg-shape in point. Only a single lateral fragment of a mouthpiece or bite end was found in specimen 277.001, but no apparent teeth marks were noted. This piece is fractured laterally along the bore line and exhibits some staining from iron rather than paint or wax (iron staining having come from contact with a nearby ferrous artifact). There were no crossmends between any of the pipe fragments from concretion 418.000.

No fragments exhibit a maker's mark of any type. Therefore dating of these pipe fragments was based on two observations (bowl shape and bore diameter) and calculated in three ways to assess a chronological dimension to the assemblage. Based on bowl shape and using Oswald's observations (as seen in Noel Hume's 1969 text), three pipes date to the general period of 1690 to 1750 in manufacture, while one appears to date earlier to the 1680 to 1710 period. Using Harrington's observation of bore diameter changes from seventeenth to eighteenth century (generally bore diameters became proportionately smaller, narrower, as the stem grew longer), which is subdivided into five distinct categories of diameter (ranging from 9/64th as the earliest to 4/64th of an inch as the latest). All nine measurable stem fragments fall into the 1680 to 1710 period of manufacture. Using a straight-line regression formula devised by Lewis Binford (1962), which measures the rate of decrease of bore diameter (based on Harrington's 1954 work), and which enables a derivation of a mean date, a date of 1702.29 was determined for the nine stem pieces (Y = 1931.85 - 38.26 [6 - where 6 reflect 6/64th inches for all nine stems] or 1931.85 - 229.56 = 1702.29). Several words of caution should be expressed in interpreting this date as an absolute date for this assemblage. First, the sample size is extremely small, if not invalid for statistical purposes (anything less than n=30, etc.). Second, recent studies have demonstrated that the Binford-Harrington formula accuracy is best suited to pipes manufactured from the 1680 to the 1760 period and anything earlier or later is susceptible to the probability of error (Higgins 1999). Bradley (2000:120) points out "given the non-regulated nature of the pipe industry, coupled with the extremely gradual evolution of the bore-reduction phenomenon, considerable variation may be expected in stem-bore diameters throughout any given period". Higgins (1997:131) discovered that two distinct stem-bore diameters in a single ship's cargo revealed that different-size bore tools were being used simultaneously by a single manufacturer. Since shipwrecks are likely to not have "reoccupation" episodes, such as one might find with terrestrial sites, Higgins' work suggests that the calculation for bore diameter's reliability could be suspect.

Conservation Notes

An analysis of smoking pipes from archaeological contexts typically includes any observations of use-wear marks and/or evidence of reworking or modification of pipe bowls, stems, etc. Observations of this type can provide useful information about the nature of the material, consumption patterns, and personal habits. A lack of teeth marks may be indicative of pipes representing damaged cargo, while extensively reworked or repaired pipes may suggest a lack of availability and resourcefulness on the part of the consumer. When smoking stains are found on bowl and stem segments they provide clear evidence the pipe has been used (and not simply stored). This dark discoloration created during tobacco smoking is caused by the oils and tars created during

combustion and absorbed into the porous clay of unglazed pipes. Typically, residue of this type cannot be cleaned off by normal washing.

Porous pipe fragments recovered from sea brine, and encrusted in ferrous concretions associated with adjacent iron objects (such as cannon tubes), require more than a simple washing in the laboratory in order to discern critical morphological attributes for dating and manufacturing data. Unfortunately, harsh chemicals, used to dissolve concretions, can also cause substantial bleaching of these fragile white clay objects. Such has been the case for most of the *QAR* specimens recovered and processed during the early years of investigation. In fact, all but four of the 13 total specimens have been subjected to some process of cleaning with phosphoric acid (10%), hydrogen peroxide (8% or 10%), and even hydrochloric acid (10%) in one case (the two specimens currently undergoing conservation remain in their stained condition in deionized water). Consequently, none of the tobacco smoking pipe fragments (bowls or stems) exhibited any evidence of staining from use (or smoking). Whether the pipes found were stored, therefore, as cargo or someone's private collection or as personal belongings of several smokers, remains speculatively at this time. In addition, no teeth marks, or evidence of reworking was noted on these specimens, though some fragments are too minute for definitive observations of this type.

Artifact Details

A summary with key attributes and dates where possible is provided below. Pipe fragments are grouped according to their location on the shipwreck site: bow, forward, mid-ship, aft (not represented), and stern.

Bow Area

Specimen Number:	277.001
Provenience:	E80-90 N120
Position on Ship:	Bow
Item:	Pipe stem fragment
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold
Dimensions:	
Weight	0.5 g
Length	0.73 in
Width	0.22 in
Thickness	0.17 in
Date:	No datable attribute as stem was split along bore hole
Notes:	

Specimen Number:	536.001
Provenience:	Unit 1, E95, N130
Position on Ship:	Bow
Item:	Pipe stem fragment
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold

Dimensions:	
Weight	1.9 g
Length	1.03 in
Width	0.29 in, outside diameter
Bore Diameter	split longitudinally, 6/64th
Date:	possibly 1680-1710
Notes:	This specimen is broken at the bowl/stem joint and exhibits a small "bend" at the end of the stem portion.

Forward Area

This cache of pipes was found during cleaning of Concretion 418.000 associated with cannon C-19 and 495.014 pipe came from C-21. It is possible they were part of a personal pouch or were bundled for trade items to be bartered in the future. Their location in the forward area also suggests that the pipes may have been part of trade goods, stored for later use. As previously mentioned, there were no apparent crossmends between the nine specimens recovered from this single context. There was also no apparent evidence of use wear (burning, sooting, staining, chipping, or teeth-marks, etc.) on these pieces which supports the trade good assumption, but bleaching during conservation processes of these items could also have obliterated much of the staining related to use.

Specimen Number:	418.011
Provenience:	Concretion 418.000
Position on Ship:	Forward
Item:	Pipe stem fragment
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold
Dimensions:	
Weight	3.0 g (wet)
Length	1.34 in
Width	N.A.
Thickness	0.3 in
Bore diameter	0.09 in or 6/64th in
Date:	1680-1710, based on bore diameter

Specimen Number:	418.033
Provenience:	Concretion 418.000
Position on Ship:	Forward
Item:	Pipe stem fragment
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold
Dimensions:	
Weight	3.8 g
Length	1.48 in
Width	N.A.
Thickness	0.35-0.4 in
Bore diameter	.09 in or 6/64th in
Date:	1680-1710, based on bore diameter

Figure 2 Specimens 418.037 (L) and 418.038 (R)

Specimen Number:	418.037
Provenience:	Concretion 418.000
Position on Ship:	Forward
Item:	Stem/Bowl pipe frag with intact heel spur
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold
Dimensions:	
Weight	3.5 g
Length	1 in
Width	1 in
Thickness	0.35-0.4 in (stem)
Bore diameter	.09 in or 6/64th in
Date:	1680-1710 for bore diameter, 1690-1750 for bowl shape

Specimen Number:	418.038
Provenience:	Concretion 418.000
Position on Ship:	Forward
Item:	Stem/Bowl pipe frag with intact heel spur
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold
Dimensions:	
Weight	2.5 g
Length	0.94 in
Width	0.85 in
Thickness	0.35-0.4 in (stem)
Bore diameter	.09 in or 6/64th in
Date:	1680-1710 for bore diameter, 1690-1750 for bowl shape
Specimen Number:	418.039
Provenience:	Concretion 418.000
Position on Ship:	Forward
Item:	Pipe bowl fragment, split lengthwise

Composition: White ball clay (kaolin)
Method of Manufacture: 2-piece mold
Dimensions:
- Weight 0.8 g
- Length 1 in
- Width 0.3 in (not a stem)
- Thickness 0.20 in

Date: no datable attribute present, too small

Specimen Number: 418.057
Provenience: Concretion 418.000
Position on Ship: Forward
Item: Pipe stem fragment
Composition: White ball clay (kaolin)
Method of Manufacture: 2-piece mold
Dimensions:
- Weight 3.6 g
- Length 1.23 in
- Width N.A.
- Thickness 0.33-0.4 in
- Bore diameter .09 in or 6/64th in

Date: 1680-1710 for bore diameter

Figure 3 Pipe Stem Fragment (418.058)

Specimen Number: 418.058
Provenience: Concretion 418.000
Position on Ship: Forward
Item: Pipe stem fragment
Composition: White ball clay (kaolin)
Method of Manufacture: 2-piece mold
Dimensions:
- Weight 4.9 g
- Length 1.86 in
- Width N.A.
- Thickness 0.31-0.35 in

Bore diameter	.09 in or 6/64th in
Date:	1680-1710 for bore diameter

Specimen Number:	418.116
Provenience:	Concretion 418.000
Position on Ship:	Forward
Item:	Pipe bowl fragment with dimple/rod impression opposite bore hole
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold
Dimensions:	
Weight	1.8 g
Length	N.A.
Width	1.11 in
Thickness	0.09-0.11 in
Date:	No datable attribute present, too small

Figure 4 Pipe bowl and stem section (418.144)

Specimen Number:	418.144
Provenience:	Concretion 418.000
Position on Ship:	Forward
Item:	Pipe Bowl/Stem section, with intact heel spur (peg); bowl 90% intact (3 pieces glued)
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold
Dimensions:	
Weight	13.5 g

Length	2.75 in
Width	0.82 (bowl)
Thickness	0.35-0.4 (stem)
Bore diameter	.09 in or 6/64th in
Date:	1680-1710 for bore diameter, 1690-1750 for bowl shape

Specimen Number:	495.014
Provenience:	Concretion 495.000
Position on Ship:	Forward
Item:	Pipe stem fragment
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold
Dimensions:	
Weight	3.1 g (wet)
Length	1.17 in
Width	N.A.
Thickness	0.35 in
Bore diameter	.09 in or 6/64th in
Date:	1680-1710 for bore diameter

Mid-ship Area

A single specimen, recovered from the Mid-Ship area, is the most complete pipe thus far found on the *QAR* site. It was not available for firsthand examination by the author since it is currently on display in the North Carolina Maritime Museum. Digital images and measurements, however, were made available and the following analysis is based observations from these records.

Specimen Number:	388.000
Provenience:	Under crown of Anchor 2 and Cannon 4
Position on Ship:	Mid-Ship
Item:	Pipe stem and portion of bowl attached, with flattened heel or foot
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold
Dimensions:	
Weight	11.1 g
Length	3.55 in
Width	N.A. (bowl broken off at junction with stem)
Thickness	0.35 in
Bore diameter	.09 in or 6/64th in
Date:	1680-1710 for bore diameter, 1680-1710 for bowl-stem angle and flattened style foot or heel

Stern Area

Specimen Number:	347.019
Provenience:	N41, E76.5
Position on Ship:	Stern
Item:	Pipe bowl rim fragment
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold
Dimensions:	
Weight	0.06 g
Length	0.29 in
Width	0.19 in
Thickness	0.05 in
Date:	No datable attribute present, too small

Specimen Number:	924.000
Provenience:	Unit 27, N83, E12
Position on Ship:	Stern
Item:	Pipe stem fragment
Composition:	White ball clay (kaolin)
Method of Manufacture:	2-piece mold
Dimensions:	
Weight	9.60 g
Length	3.17 in
Width	0.40 in
Thickness	
Bore diameter	7/64th
Date:	Bore diameter unreliable, so not included in analysis formula. Exhibits slight tapering at one end as it narrows to mouth end.

The "Chalky White Stick"

One of the more interesting artifacts thus far recovered from the *QAR* shipwreck site is an innocuous clay-like stick-like object, initially referred to as the chalky white stick (512.000). Originally thought to be part of a modified white ball clay (kaolin) pipe stem, closer inspection revealed a combination of intriguing attributes. The specimen was recovered from the Mid-Ship area, near pipe fragment 388.000, which is the complete pipe found, and possibly the oldest based on stylistic features. One suspected function of this artifact was that of a pipe tamper. One end of the stick is slightly rounded, flattened and brown-stained (suggestive of burning tobacco and packing down dottle). Besides possessing a pipe, smokeable tobacco and a means to ignite it, a pipe tamper facilitated the critical function of packing or breaking up the tobacco once consumption was underway. This hand-formed stick of tempered clay could easily have functioned as a personal accoutrement to a smoker's pouch, or slipped tidily into a pocket or hank. Given its idiosyncratic appearance, efforts to determine a date of manufacture for this unique object would be based solely on the context and association with other recovered artifacts.

Morphologically the clay-like object appears to be tempered with fine-grained sands containing quartz, micaceous flecks, and possibly a darker mineral (such as hornblende or tourmaline). Through a microscope, the micrometer size for these grains ranges from 0.1 to 0.3 mm in size, with a few large inclusions. Though generally elongated, there is a smoother surface and a rougher or textured surface, in opposition. Some linear striations are visible on the rougher or textured surface, while the smoother side has no apparent marks. The matrix appears to be made of a whitish-to-gray clay (Munsell 2.5Y8/2, pale yellow, gray), possibly of local origin (of the southeast coastal United States). The clay appears to have been tempered with fine composite sands, then hand-formed into a stick-like shape, and fired in a kiln or furnace of some type. Two possible methods of manufacture are posited. One is that the formed clay stick was fired on one side, where the bottom was laid in a layer

of sand resulting in a textured or grainy underside. Another possibility is that the clay was poured into a tube-like mold, and then settled out to the point where the heavier particles in the clay migrated to the bottom and the smoother clays rose to the surface of the object, prior to firing. No mold seams are visible on this object, though burnishing is evident on the smoother side. A more thorough search of smoking pipe accoutrements from a diversity of sources could reveal additional information as to the source and exact function of this object. No conservation or applications of chemicals were applied to this artifact, thus it remains unbleached and exhibits telltale staining of smoking use.

Figure 5 Possible Pipe Tamper (512.000)

Specimen Number:	512.000
Provenience:	Between A1 and C4
Position on Ship:	Mid-Ship
Item:	Possible pipe tamper
Composition:	White clay with granular tempering
Method of Manufacture:	Hand-formed
Dimensions:	
Weight	11.5 g
Length	4.49 in
Width	N.A.
Thickness	0.34 in
Date:	No datable attribute present

References

Binford, Lewis

1962 A New Method of Calculating Dates from Kaolin Pipe Stem Samples. *Southeastern Archaeological Conference Newsletter*, 9(1): 19-21.

Bradley, Charles S.

2000 Smoking Pipes for the Archaeologist. *Studies in Material Culture Research,* Karlis Karklins, editor. Published by the Society for Historical Archaeology. P.105-133.

Fox, Georgia Lynne

1998 The Study and Analysis of the Kaolin Clay Tobacco Pipe Collection From the 17th Century Archaeological Site of Port Royal, Jamaica. Unpublished dissertation, Texas A&M University, Department of Anthropology.

Harrington, J. C.

1954 Dating Stem Fragments of 17th and 18th Century Clay Tobacco Pipes. *Quarterly Bulletin, Archaeological Society of Virginia*, 9(1):10-14.

Higgins, David

1999 Little Tubes of Mighty Power: A Review of British Clay Tobacco Pipe Studies. *Old And New Worlds*, edited by Geoff Egan and R.L. Michael, Oxbox Books, p310-321.

Mallios, Seth

2005 Back to the Bowl: Using English Tobacco Pipebowls to Calculate Mean Site-Occupation Dates. *Historical Archaeology*, 39(2):89-104.

Noel Hume, Ivor

1969 *A Guide to Artifacts of Colonial America.* Reprinted in 1970 by Alfred A. Knopf, New York, NY.

Oswald, Adrian

1951 English Clay Tobacco Pipes. *The Archaeological Newsletter*, 3: 153-159, London.

1975 Clay Pipes for the Archaeologist. British Archaeological Reports, 14. Truexpress, Oxford, England.

Stone, Lyle M.

1974 *Fort Michilimackinac 1715-1781: An Archaeological Perspective On the Revolutionary Frontier*. Publication of the Museum, Michigan State University, East Lansing, Michigan.