

A Dating Formula for Colono Tobacco Pipes in the Chesapeake

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Introduction

Locally manufactured tobacco pipes have held a prominent position in Chesapeake historical archaeology since their initial discovery. For the most part, research on this topic has focused on identifying the ethnicity of the pipe manufacturers. Stylistic and spatial archaeological data have led scholars to suggest that English settlers, indigenous Algonquians, and African slaves each participated in this industry (Deetz 1993, 1996; Emerson 1986, 1988, 1994, 1999; Harrington 1951; Henry 1979; Magoon 1999; Monroe 1999, 2002; Mouer 1993; Mouer et. al.; 1999; Neiman and King 1998; Pawson 1969; Winfree 1969; Wittkofski 1983). Ball-clay tobacco pipe bore diameters have long been a central method of dating sites for historical archaeologists (Harrington 1954; Binford 1962). It has been argued without substantiating data, however, that Colono pipes were not dateable in the same manner. The study presented here questions this assumption. Using John Cotter's data from archaeological excavations at Jamestown (Cotter 1958) as well as Post-Fort Period contexts (1624 to 1700) excavated by the *Jamestown Rediscovery* team (Mallios and Straube 2000), the relationship between bore diameters of European ball-clay and Colono pipes—both mold- and hand-made—was examined. A significant correlation between the mean bore diameters of commonly provenienced ball-clay and Colono pipes indicated that both pipe types exhibit similar trends and changes. This observation allowed for the creation of a mean dating formula for Colono pipes, one that preliminary examinations suggest is as accurate as Binford's (1962) ball-clay formula for historical sites in the Chesapeake.

The Data

Cotter, perhaps anticipating findings of the study presented here, included bore diameter measurements for both ball-clay ("white") and Colono ("brown") pipes in his report (1958). Based on discrete contexts with at least 50 measurable ball-clay pipestems and 20 Colono pipestems, the current project used 13 site areas and features from Cotter's report and three features from *Jamestown Rediscovery*. For each of these contexts, mean ball-clay and Colono pipe bore diameters were

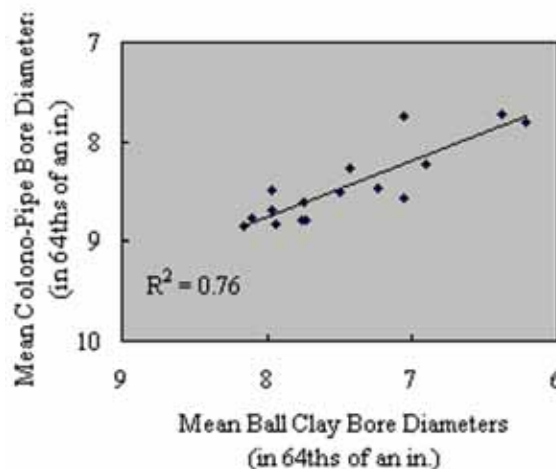


Figure 1. Scatter plot of Jamestown mean pipe bore diameters.

calculated (Tables 1 and 2). When plotted against one another, the correlation between the two was 0.87. The r^2 value was 0.76, indicating that over three-quarters of the variation in Colono pipe bore diameters is due to the variation in ball-clay bore diameters (Figure 1). The high correlation indicated that the two were significantly interrelated, and that the variation in bore diameter for both types of pipe was dependent on time. In other words, Colono pipestem bore diameters decreased over time in a very similar manner to ball clay pipestems, though not at the same rate.

The discovery that Colono pipe bore diameters regressed in size in a similar standardized manner to ball-clay pipes suggested that the development of a useful Colono pipe mean dating formula was possible. Binford mean dates on the assemblages of ball clay pipe stems used in this analysis were corroborated by complementary analytical lines of evidence—those based on stratigraphy, *terminus post quem* and *terminus ante quem*, dated items, historical analogs, parallel findings from other sites, and the intersection of artifact production and use date ranges. These dates provided midpoints for each of the Jamestown features upon which to establish a linear regression between the Colono pipes and time. This calculation resulted in the creation of a formula that estimated an assemblage's mean date (Y) on the basis of its average Colono pipe bore diameter (X). It is:

$$Y = 2073.98 - 50.57X$$

The Colono-pipe mean dating formula was tested at three archaeologically and historically well-dated sites not used in the regression analysis described above: 1) the Reverend Richard Buck site (44JC568), 2) the Pettus site (44JC33), and

Context	Ball Clay Bore Diameters (in 64ths of an in.)									
	Total	12	11	10	9	8	7	6	5	Mean
Jamestown Rediscovery (JR) Ditch 1	457	0	0	0	71	318	60	7	1	7.97
JR Pit 2	93	0	0	0	6	57	26	4	0	7.65
JR Ditch 3	97	0	0	0	9	48	40	0	0	7.73
JR Ditch 6	136	0	0	0	20	80	29	6	1	7.84
JR Midden 1	584	0	0	0	51	386	145	1	1	7.76
JR Str. 163	184	0	0	0	10	60	102	11	1	7.63
National Park Service (NPS) Lot 047: General	67	0	0	0	0	18	31	18	0	7.00
NPS Refuse Pit 1	371	0	0	4	85	250	29	3	0	8.16
NPS Str. 017	206	0	0	0	2	13	56	125	10	6.38
NPS Str. 019A	67	0	0	0	5	13	23	23	3	6.91
NPS Str. 019B	94	0	0	0	5	30	45	10	4	7.23
NPS Str. 023, Str. 049, Str. 055	92	0	0	0	0	26	45	21	0	7.05
NPS Str. 026	114	0	0	0	17	38	36	23	0	7.43
NPS Str. 027	40	0	0	0	2	21	14	3	0	7.55
NPS Str. 028	59	0	0	1	10	19	24	5	0	7.63
NPS Str. 045	58	0	0	0	0	17	33	8	0	7.16
NPS Str. 106	20	0	0	0	0	11	8	1	0	7.50
NPS Str. 112: Cellar	502	1	1	5	116	228	142	9	0	7.95
NPS Str. 112: Foundation outside of cellar	95	0	1	0	16	56	22	0	0	7.97
NPS Str. 115: Cellar 1	201	0	0	0	1	15	57	83	45	6.22
NPS Str. 115: Cellar 2	180	0	0	0	4	31	74	59	12	6.76
NPS Str. 115: Foundation area west of cellars	119	0	0	1	4	34	43	36	1	7.06
NPS Str. 117	64	0	0	0	8	35	18	3	0	7.75
NPS Str. 125	56	0	0	0	4	10	16	18	8	6.71
NPS Str. 127	40	0	0	0	9	24	7	0	0	8.05
NPS Str. 128	973	0	0	0	179	722	69	3	0	8.11
NPS Well 011	83	0	0	0	8	25	50	0	0	7.49

Table 1. Ball clay pipe bore data from Jamestown Island.

3) the Barker-Lucy site at Flowerdew Hundred plantation (44PG77). The first two sites are in the general vicinity of Jamestown Island, whereas the Barker-Lucy site is upriver from Jamestown in Prince George County. Colonists occupied the Buck site from 1630 to 1650 (Mallios and Fesler 1999; Mallios 2001a:32-34). Its sealed contexts contained 144 measurable Colono pipestems and 51 ball-clay pipestems. The ball-clay Binford mean date was 1637.02. The newly created Colono pipe mean dating formula projected the site's mean date to be 1646.94, which was 6.94 years off of the site's actual temporal midpoint (1640). Historical records suggested that settlers lived at the Pettus site from 1641 to 1700. Archaeological investigations extended the end date to 1710 (Kelso 1984:75). When the average bore diameters of 119 ball clay pipes were entered into Binford's equation, the estimated mean date was 1652.13. The 105 measurable Colono pipes from sealed contexts offered a site mean date of 1669.90, 5.6 years off of the actual chronological center of occupation of 1675.5. Archaeological investigations of the Barker-Lucy site (44PG77) suggested a date of occupation from 1655 to 1700 (Emerson 1988:21). Excavations produced 601 ball clay and 720 Colono pipestems. These figures yielded a Binford and Colono mean date of 1671.73 and 1675.18, respectively, the latter 2.32 years earlier than the midpoint of occupation (1677.5). These

results illustrate the potential utility of this formula for dating 17th-century colonial sites in the Chesapeake, especially for those many assemblages from tenant sites and quarters that contain few ball-clay pipes and many Colono pipes. In its initial applications, the equation presented here produced results that were more accurate than those based on Binford's ball-clay formula.

Following Harrington's initial discovery of the relationship between English ball-clay pipe bore diameters and time, archaeologists noted limitations to pipe-based dating techniques (Binford 1962; Deetz 1987; Green 1977; Hanson 1969, Harrington 1954; Heighton and Deagan 1971; Mallios 2001b, n.d.; Noël Hume 1963; South 1962; Walker 1965, 1972). Many of these concerns impact the use of the dating formula presented here. First, both Harrington (1954) and Binford (1962) discussed the quantity and quality of their pipe samples. Harrington warned of inadequate sample sizes and of the incorporation of anomalous Dutch pipes. Binford added that these sorts of pipe analyses should use samples that had been accumulated before 1780 and were random, representative, and deposited over time at an even rate. All of the features used in this analysis had at least 70 total white ball-clay and Colono pipes, surpassing the approximate minimum sample size established by Harrington (1954).

Second, scholars did not agree that the relationship between time and ball-clay bore diameter was linear. Lee Hanson (1969) disputed Binford's straight-line regression and created multiple linear regressions to handle the data curve. However, Hanson's multiple linear divisions within the overall ball-clay pipestem range were on average longer than the entire approximate 90-year existence of Colono pipes in the Chesapeake. As a result, his corrections for a curvilinear relationship between bore size and time do not concern this formula. Robert Heighton and Kathleen Deagan (1971) used a logarithmic equation to fit the purported curvilinear relationship between time and bore diameter. However, recent analyses (Mallios n.d.) on well-dated *Jamestown Rediscovery* archaeological contexts revealed Heighton/Deagan estimates to be the least accurate mean dating technique out of Binford and Hanson stem dates and Mallios's Atkinson-based bowl dates.

Third, temporal limitations of pipestem-based dating techniques also received scrutiny. Audrey Noël Hume (1963) warned of their ineffectiveness on archaeological contexts dating before 1670 and after 1760. Reliable temporal estimates generated from ball-clay pipes unearthed at sites occupied from the second and third quarter of the 17th century (Mallios and Fesler 1999; Mallios 2000) contradict the belief that 1670 marked a meaningful chronological barrier regarding the utility of stem-based measures. However, Binford's ball-clay pipe formula was ineffective for Fort Period (1607-1624) contexts at Jamestown (Mallios n.d.). The Colono pipe mean dating tech-

Context	Colono Bore Diameters (in 64ths of an in.)											
	Total	14	13	12	11	10	9	8	7	6	5	Mean
Jamestown Rediscovery (JR) Ditch 1	46	0	0	0	5	9	8	10	5	4	0	8.68
JR Pit 2	14	0	0	0	1	2	5	2	1	2	0	8.54
JR Ditch 3	39	0	0	3	3	8	5	9	11	0	0	8.79
JR Ditch 6	18	0	0	1	3	6	3	2	0	0	0	9.28
JR Midden 1	215	0	0	8	15	30	65	58	30	0	2	8.80
JR Str. 163	11	0	2	0	0	0	3	2	3	0	1	8.64
National Park Service (NPS) Lot 047, General	10	0	0	0	0	1	3	4	2	0	0	8.30
NPS Refuse Pit 1	110	3	0	0	11	14	18	61	3	0	0	8.85
NPS Str. 017	159	0	0	0	2	1	22	75	47	9	3	7.72
NPS Str. 019A	27	0	0	0	0	1	11	9	5	1	0	8.22
NPS Str. 019B	50	0	0	0	0	5	18	22	5	0	0	8.46
NPS Str. 023, Str. 049, Str. 055	24	0	0	0	0	0	0	18	6	0	0	7.75
NPS Str. 026	90	0	0	1	0	7	19	50	13	0	0	8.27
NPS Str. 027	14	0	0	0	0	0	4	9	1	0	0	8.21
NPS Str. 028	18	0	0	0	0	0	8	10	0	0	0	8.44
NPS Str. 045	13	0	0	0	0	0	7	4	1	1	0	8.31
NPS Str. 106	19	0	0	0	0	2	6	8	2	1	0	8.32
NPS Str. 112, Cellar	207	0	0	3	10	26	95	58	15	0	0	8.84
NPS Str. 112, Foundation outside of cellar	39	0	0	0	0	7	8	21	3	0	0	8.49
NPS Str. 115, Cellar 1	20	0	0	0	0	2	4	5	6	3	0	7.80
NPS Str. 115, Cellar 2	10	0	0	0	0	0	0	8	2	0	0	7.80
NPS Str. 115, Foundation area west of cellars	76	0	0	3	1	4	26	36	6	0	0	8.57
NPS Str. 117	23	0	0	0	0	1	12	10	0	0	0	8.61
NPS Str. 125	17	0	0	0	0	0	7	9	1	0	0	8.35
NPS Str. 127	71	1	0	11	0	20	25	12	2	0	0	9.59
NPS Str. 128	22	0	0	2	0	4	6	7	1	2	0	8.77
NPS Well 011	60	0	0	0	0	0	30	30	0	0	0	8.50

Table 2. Colono pipe bore data from Jamestown Island.

nique was equally ineffective for distinctive Colono pipes with diamond-cartouche fleur-de-lis decorations that were exclusive to the earliest colonial deposits at Jamestown (Kelso and Straube 2000:41). Thus, pre-1624 pipes made in both England and English colonial settlements in the Chesapeake did not exhibit the same bore standardization seen in later periods. This observation further substantiated the inference that parallel trends shaped ball-clay pipe production in England and Colono pipe production in the colonial settlements of the Chesapeake. It also intimates that Colono pipe bores were made using certain standardized English pipe making tools.

Conclusions

Examination of previously published and recently excavated tobacco pipes from Jamestown and environs has demonstrated a high correlation between the temporal regression of Colono and ball-clay pipes, enabling the creation of a mean dating formula. This formula, when tested at three archaeological sites along the James River, proved to be as accurate as Binford's original formula for providing mean occupation dates. One of the three sites (44PG77) is located upriver from Jamestown at some distance, suggesting that this formula may be equally accurate for sites located outside of Jamestown's hinterland. It remains to be demonstrated whether this formula is appli-

cable for dating sites in the Maryland Chesapeake. We encourage future researchers to explore this possibility.

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