Archaeology on the Half Shell: Preliminary Analysis of Shellfish Consumption at Coan Hall (44NB11), Virginia

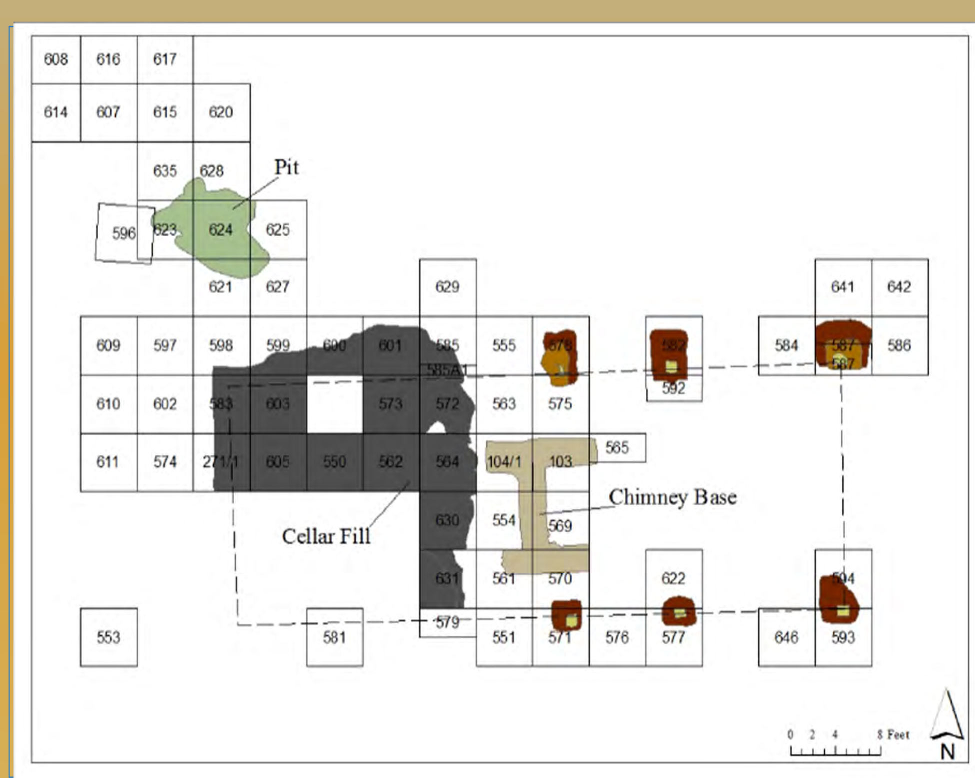
Samantha Upton, BA; Jennifer Green, MA; and Barbara J. Heath, PhD

INTRODUCTION

Coan Hall is the site of the first English settlement on the Northern Neck of Virginia, established circa 1640. It is located north of the modern town of Heathsville, on the banks of the Coan River, a brackish tributary of the Potomac River that empties into the Chesapeake Bay.

The site served as the legal, ecclesiastical, and political center of the seventeenth-century Chicacoan district, and the home plantation of John Mottrom, an English merchant-planter, who lived there with his family, servants, and slaves until his death in 1655. His son occupied the house until the 1680s. A new manor house was built closer to the river sometime around the turn of the eighteenth century, and stood until it was destroyed in the American Revolutionary War.

Representative samples of eastern oyster (*Crassostrea virginica*) were analyzed from deposits of fill at Coan Hall that represent four master contexts: Upper Cellar (ER 605 H, J, K), Lower Cellar (ER 605 L, P, Q, R, T), Pit (ER 624 D-H), and Undefined Cellar fill (ER 572 and 585). ER 624 is associated with the circa 1640 to 1660 fill of a pit outside of the dwelling house; the remaining contexts are associated with the fill of a large brick and stone-lined cellar. The lower cellar and undefined cellar fill contexts date to circa 1675 to 1690, and the upper cellar dates from circa 1700 to 1720. These periods correlate with phases of household occupation and with the demolition of the house and filling of the cellar beneath the west room of the dwelling with domestic refuse in the early 18th century.



STUDY AREA

Map of the Chesapeake Bay
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MARYLAND MAP OF HISTORIC OYSTER BEDS OF THE CHESAPEAKE BAY
△ = COAN HALL ; / = COAN RIVER

OBJECTIVES

- Determine if there is evidence for change in oyster size and valve shape across contexts and determine if changes reflect cultural practices.
- Discern if oysters were harvested from multiple habitats (i.e. hard or soft substrates).
- Evaluate metric data from oysters within the undefined oyster fill (ER 572 and 585) to see if they compare with the other contexts.

Methods

Ten liter flotation samples were taken from archaeological contexts within the cellar and a pit feature located north of the cellar. These samples included a number of oyster shells and shell fragments. For this study, oysters were sorted by right and left valve, and all left valves with measurable dimensions (N=484/1789) of height (the maximum dorsal-ventral dimension) and length (the maximum anterior-posterior dimension) were given a sample number and were measured with digital calipers to the nearest hundredth of a millimeter (Kent 1992:25). The height-length ratio (HLR) was computed by dividing the height of each shell by its length. Average HLRs were computed for each group of temporally-associated contexts.

Oyster valve height and length measurements

Quantitative analyses were run in SAS9.4 on the dependent variables of height, length and HLR. A one-way ANOVA was used to test for evidence of significant variation among the three dependent variables. When the one-way ANOVA showed that there was significant differences among height, length, and HLR, a Tukey-Kramer test was used to compare all possible pair of means between the three groups. Tukey-Kramer shows where variation lies within the data (Zar 2010).

RESULTS

Quantitative analyses showed that oysters in the Upper Cellar fill are significantly larger in height and length than oysters from the Lower Cellar and Undefined Basement fills. Accordingly, there are no significant differences between the Undefined Cellar fill and the Lower Cellar fill.

There were no significant differences between the Pit (ER 624) feature and any other context. However, due to the small sample size of shells from the Pit feature (N=6), we cannot be confident that results associated with this context are statistically reliable.

This study found no significant differences in HLR (overall shape) values between the four contexts.

Archaeological Context	HEIGHT_mm_ LSMEAN
ER 585 and 572	70.7272581
ER 605 Upper Cellar	87.0913853
ER 605 Lower Cellar	72.8839344
ER 624 Pit	55.4133333

Archaeological Context	LENGTH_mm_ LSMEAN
ER 585 and 572	43.3303226
ER 605 Upper Cellar	52.3147186
ER 605 Lower Cellar	44.8404918
ER 624 Pit	34.82

Archaeological Context	Height to Length Ratio LSMEAN
ER 585 and 572	1.61382039
ER 605 Upper Cellar	1.63817661
ER 605 Lower Cellar	1.60901976
ER 624 Pit	1.51511348

Least Squares Means for Archaeological Context
Pr > |t| for H0: LSMean(i)=LSMean(j)
Dependent Variable: LENGTH_mm_

i/j	ER 585 and 572	ER 605 Upper Cellar	ER 605 Lower Cellar	ER 624 Pit
ER 585 and 572		<.0001	0.9218	0.5849
ER 605 Upper Cellar	<.0001		0.0078	0.0458
ER 605 Lower Cellar	0.9218	0.0078		0.4716
ER 624 Pit	0.5849	0.0458	0.4716	

Least Squares Means for Archaeological Context
Pr > |t| for H0: LSMean(i)=LSMean(j)
Dependent Variable: HEIGHT_mm_

i/j	ER 585 and 572	ER 605 Upper Cellar	ER 605 Lower Cellar	ER 624 Pit
ER 585 and 572		<.0001	0.9691	0.6632
ER 605 Upper Cellar	<.0001		0.0127	0.0841
ER 605 Lower Cellar	0.9691	0.0127		0.5864
ER 624 Pit	0.6632	0.0841	0.5864	

Least Squares Means for Height to Length Ratios
Pr > |t| for H0: LSMean(i)=LSMean(j)
Dependent Variable: HLR

i/j	ER 585 and 572	ER 605 Upper Cellar	ER 605 Lower Cellar	ER 624 Pit
ER 585 and 572		0.8116	0.9994	0.8285
ER 605 Upper Cellar	0.8116		0.8864	0.7093
ER 605 Lower Cellar	0.9994	0.8864		0.8601
ER 624 Pit	0.8285	0.7093	0.8601	

Summary of Proveniences Analyzed from Coan Hall (44NB11) Excavations

	Context	Left Valves	Right Valves	Valve fragments	Weight (g)
ER 624 Pit	D	57	40	1331	1924.34
	F	1	1	33	51.39
	G	109	74	1240	5768.85
	K	0	1	17	12.49
ER 605 Upper Cellar	H	83	72	1271	3623.51
	J	886	447	5270	58763.6
	K	87	72	930	6020
ER 605 Lower Cellar	P	51	25	722	0
	L	101	92	1553	4921.1
	Q	11	3	265	393.46
	W, U	0	0	25	23.54
	X	1	0	63	74.05
	T, Y, Z	12	12	375	580.6
	AA	0	1	38	46.72
ER 585	C	90	92	146	4352
	F	5	5	32	46
ER 572	C	295	201	438	11750

Summary of Oyster Habitats Represented in Sample

	Pit Fill	Lower Cellar Fill	Upper Cellar Fill	Undefined Cellar Fill
Sand	16.7%	10.0%	11.2%	10.8%
Reef	0.0%	6.7%	9.9%	10.2%
Bed	83.3%	83.3%	78.9%	79.0%

DISCUSSION/CONCLUSIONS

Oyster growth is affected by both nutrient availability and by salinity levels, with increases in both variables resulting in higher growth rates. Miller hypothesizes that salinity decreased over time in the Lower Chesapeake as a byproduct of intensifying agricultural practices that allowed a greater volume of fresh water runoff into tributaries of the bay (Miller 1986:179). According to Jenkins (2017:75), oyster height specifically is one measure of resource depression or overharvesting. In such scenarios, oyster heights are expected to decrease over time. Heights of Coan Hall oysters, however, generally increase over time. This suggests that oysters local to Coan Hall were either 1. influenced by an increase in nutrients; 2. under no harvesting pressure; or 3. impacted by a combination of both nutrient increase and stable harvesting efforts.

HLRs, or overall oyster shape, are affected by environmental conditions such as salinity, nutrients, and substrate. The range of HLRs typically correspond with four different types of oyster beds. Sand oyster shells exhibit lower HLRs (< 1.3) associated with growth on firmly packed sands or muds, while shells with higher HLRs (> 2) occur in areas where oysters grow in close proximity to one another, such as high-density reefs or channels. Reef and channel oysters both typically present HLRs of >2, however these oysters vary in shape. Reef oysters are small and narrow, while channel oysters are large and narrow. High HLRs can also result from growth in soft muds. Oysters with HLRs of 1.3 to 2 typically grow along river bottoms with mixed sand and mud. These are known as "bed oysters" (Kent 1992:25).

The majority of Coan Hall oysters have an HLR from 1.2 to 2, and can therefore be characterized as bed oysters harvested from mixed sand/mud riverbeds. However, there is a small presence of both sand and reef oysters. Sand oyster quantities decrease over time, while reef oyster quantities increase over time. This suggests that early inhabitants of Coan Hall likely exhausted the sand oyster populations as these beds lie in shallow water and are more easily obtained. The increase of reef oysters harvested and a corresponding decrease of bed oysters suggest a change occurring in bed oysters that led to a slight increase in harvesting of reef oysters. It is possible that occupants were travelling farther distances to harvest in new ranges.

Our data demonstrate an increase in valve size over time and an increase in oyster harvesting, however, overall shape over time remained consistent. These factors suggest that oysters were responding to environmental change that may have resulted from increasing nutrients introduced to the water through runoff associated with increasing numbers of livestock, penning of livestock near rivers or streams, and/or the practice of dumping organics such as offal or garbage into the river.

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Left: UT Graduate Student, Lindsey Cochran, a feature from the floor of the cellar fill. Above: Profile of cellar fill, brick/stone cellar wall, bulkhead entrance of cellar.