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A Pilot Study on the Origins of Oysters at James Fort

Daniel Schmidt & Dexter Haven

Introduction

The fill from a vertically extended square pit associated with the original colonial fort at Jamestown Island provided an opportunity for a preliminary zooarchaeological study. *Crassostrea virginica* oyster shells were prominent in certain strata, spawning this investigation of where the shells came from and how they were likely gathered, used, and deposited. The primary research goal was to determine the harvest location of the oyster shells by looking at ecological attributes associated with the shells, including predatory marks and shell dimensions. These ecological factors frequently impact various shell characteristics, as do hydrographic features. Both of these types of phenomena vary by location in the James River and are relatively well known in the present-day river. The authors of this article assume that the ecology of the historical shells is the same as that of today. The work presented here is a pilot study designed to encourage subsequent comparisons with data from other features at Jamestown, the surrounding hinterland, and the wider region. It endeavors to contribute to a greater understanding of food procurement strategies of the English settlers and Powhatan natives, as well as an appreciation of the foodways of everyday life during the inaugural years of English colonization.

Background

The sample of oyster shells under study came from layer JR731L, one of many strata in a pit that was approximately 7.0' by 7.0' by 4.0'. Although the original purpose of this feature is unknown, it ultimately became a refuse pit with multiple layers of early 17th-century debris. Since there is a uniformity of artifact types from top to bottom, the feature appears to have been filled quickly. Wild fauna—including fish bones, sturgeon plates, and turtle shells—are abundant in this pit, paralleling wild/domestic faunal ratios in other early Fort Period features at the site (Bowen and Trevarthen 2000).

Early historical narratives addressed the significance of oysters in the lives and diets of the early English colonists. In fact, the settlers wrote of one dire period in May of 1609 when many of them subsisted almost entirely on oysters. They recalled that,

> *We were forced . . . to disperse the whole colony, some amongst the savages, but most to the oyster bank, where they lived upon oysters for the space of nine weeks, with the allowance only of a pint of Indian corn to each man of a week (*The Ancient Planters of Virginia, *in Haile 1998:894-95).*

Jamestown Council President John Smith further noted the dependence of the English colonists on the nearby oyster banks, emphasizing the need for frequent visits to "the Shells which wee must goe or starve" (Smith 1624, in Wright 1946: 20-21). Fortunately for the colonists these banks were abundant. One colonist described the James River as being "very beautiful and wide, but full of shallows and piles of oyster shells" (Perkins 1608: 133). In general, Western Europeans consumed oysters with great regularity in the early 17th century. The first English colonists at Jamestown were already well acquainted with oysters before they ever stepped foot in the Americas. Historical texts documented that, "everybody was eating these shellfish," which were "loved by almost every man" (Peterson 1994: 82).

Methodology

An oyster is made up of two shells. For this project, cup shells, or the bottom shells, were separated from the upper or flat shell, and both were counted. In addition, complete shells were detached from broken shell. Broken shells with a hinge were counted. The hinge on a shell is a resilient ligament that holds the narrow end of the two shells together. Height and length measurements were taken on each of the complete shells. Height is the distance between the umbro to the ventral valve margin. Length is the maximum distance between the anterior and posterior margin measured parallel with the hinge axis and at a right angle to the height axis (Figure 1).

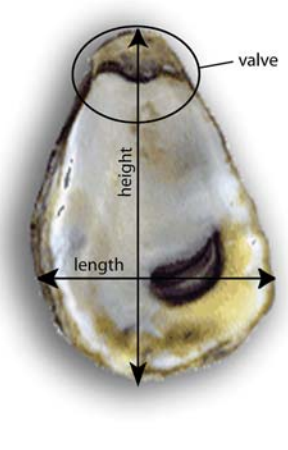

Figure 1. Oyster attributes.

Average height/length ratios (HLR) were determined for the shells. HLR may be strongly influenced by the environment and can range from 1.0 to 4.0 as summarized by Kent (1992) from a study by Gunter (1938). Kent listed the conditions and their ratio range. He noted that sand oysters from firmly packed bottoms that were generally intertidal or in very shallow water were less than 1.3. Single or loosely clustered bed oysters from mixed mud and sand ranged from 1.3 to 2.0. Channel oysters were large and elongated and had a HLR greater than 2.0, as did small and densely cluster reef oysters (Kent 1992: 25).

However, in basing his classification on habitat, bottom type, shell type, markings, and exposure to air and sunlight, Kent's system does not perfectly model the 17th-century oyster habitat as it then existed in the James River. Kent's four categories would be more typical of today's environment where over-harvesting has lowered once massive intertidal oyster reefs to the extent that most are now level with the surrounding bottom. Oyster distribution is now more diverse and scattered (Haven and Whitcomb 1983: 147).

Several recent studies are more descriptive of the habitat of oysters in the early 17th century (Haven and Whitcomb 1983; Johnson, Blanton, and Hobbs 1995; Hargis and Haven 1999). A determination of the probable habitat of the oyster from JR731L begins with an understanding of the term *oyster reef* in the Chesapeake. By definition, an oyster reef is "a massive naturally occurring and self-renewing structure formed over a long period of time during the recent rise in sea level, beginning about 18,000 years ago" (Hargis and Haven 1999: 318). As sea level continued to rise, oysters and other marine life began to proliferate in the Chesapeake Bay between 7500 and 4500 years ago. Soon oyster reefs began forming along shoreline features in the James River and grew slowly higher as oysters grew. On these early reefs, oysters set on the shell material and as the oysters grew old shell gradually accumulated, adding to the reef's area. Their height above the bottom also increased as sea level gradually rose.

All shells were also examined for various ecological attributes. Cylindrical holes on the outer surface caused by boring sponge were noted. Boring sponge commonly occur on oysters in many regions of the Chesapeake Bay. The holes are sites where the sponge initially sets on the shell. These filter feeders often occur as a finger-like mass 50-75mm in size and may grow to more than 300mm. Hopkins (1962: 121) studied the occurrence of boring sponge in the Chesapeake Bay and noted four different species: *Celonia trutti, Celonia vastifica, Celonia lobata*, and *Celonia celata*. Each of these species maintains a different tolerance for salinity. As a result, if it is assumed that the oyster shells came from a single general locus, the presence or absence of certain boring sponge can pinpoint a harvest source based on areas with an appropriate salinity.

The presence or absence of the oyster drill *Urosalpinx cinerea* was recorded as well. This snail, which can reach an inch in length, feeds on oysters and other mollusks by drilling a countersunk hole through the shell and then ingesting the meat (Galtsoff 1964: 430). In addition, this study noted the presence or absence of the hard clam *Mercenaria mercenaria* in the oyster shell sample. Like the sponge, drills and clams also occur only in specific salinities and thus, can be used to pinpoint probable harvest zones.

Results and Interpretations

The average heights of flat (upper) and cupped (lower) shells from JR731L are almost the same: 69.5mm for flat shells and 74.2 for cup shells. The frequency distribution of the height of the two types of shells is also similar (Figure 2). Flat shells range from 20mm to 130mm with a bimodal distribution. A smaller group occurs from 56mm to 130mm. The large group includes 76.2% of all flat shell. Cup shells have similar heights, ranging from 20mm to 145mm, and they also have a bimodal distribution, with both groups mimicking the ranges described above for the flat shell. Over three-quarters of the cup shells are between 56mm and 145mm, the length of oysters commonly harvested for consumption.

Based on the preceding data, oysters appear to have been selected for their larger sizes: colonists gathered those containing the most meat. The smaller immature shells present in the feature probably represent oysters that were attached to the

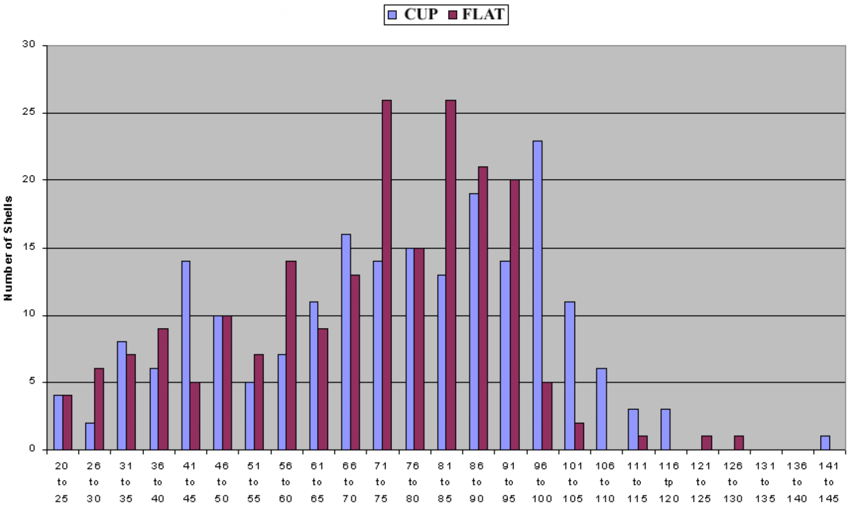

Figure 2. Height distribution (cm) of flat and cupped shells from JR731L.

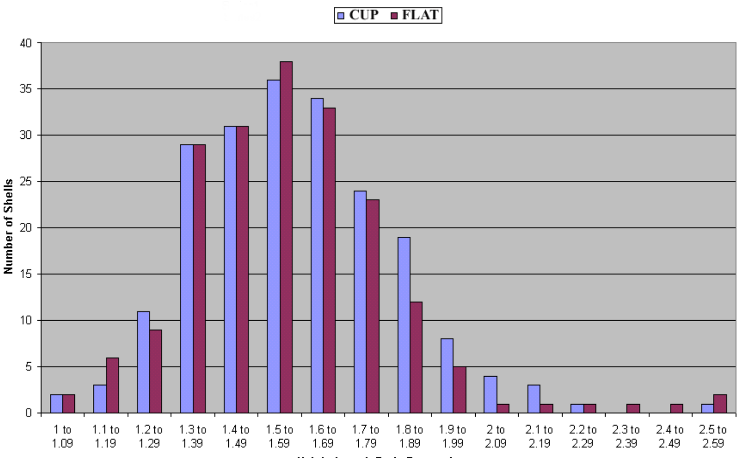

Figure 3. Height-length (cm) ratios for flat and cupped shells from JR731L.

larger ones when harvested and became detached over the years in the refuse pit. In addition, the fact that the numbers of cup shells and flat shells are virtually identical supports the notion that JR731L was a primary deposit. Individuals at James Fort likely consumed these oysters nearby and threw them the trash pit shortly thereafter.

The average HLR of the oysters from JR731L is 1.55 for the flat shells and 1.59 for the cupped shells (Figure 3). These values correspond with Kent's range for bed oysters. The HLR shown in Figure 3 fits the description of oysters that 17th-century individuals likely harvested from various depths on an old elevated reef where several of the types noted by Kent (1992) would occur. The smaller sizes have an HLR close to 1.0, which is characteristic of juvenile oysters. Oysters on top of the reef were exposed to air during low tide and would not have sponge holes since the fragile sponge structure could not tolerate desiccation in the intertidal zone (Hopkins 1962: 123). The larger sizes, being older, likely came from lower down on the slope of the reef, below the intertidal zone, where they were not exposed to air at low tide and consequently would have sponge.

The sponge data supports the interpretations drawn from the HLRs. All flat and all cup shells were checked for the presence or absence of *C. trutti* holes and *C. celata* holes on the shell exterior. A total of 195 flat shells and 206 cup shells were examined. Many shells had no *C. trutti* holes. In addition, their occurrence on flat and cup shells differed. Whereas 37% of all flat shells had sponge holes, there were holes on 64% of the cup shells. The reason for sponge being more abundant on cup shells may be associated with the basic setting pattern of oyster larvae. Mature oyster larvae always settle and attach to a hard substrate like oyster shell with the cup side next to the surface (Galstoff 1964: 365). As the oyster grows, the cup side may offer a more protected environment for the developing sponge.

Of significance in the sponge study is that many of the oyster shells have no evidence of past sponge attachment. An appreciation of this distribution builds on the previous discussion regarding oyster-reef structure. During colonial times, some of these massive reef structures were intertidal (Hargis and Haven 1999: 318). Shells without holes from JR731L are thought to have come from near the intertidal region of these oyster reefs where sponge could not live. Shells with sponge holes likely came from the same reef but were submerged below the intertidal zone during the entire tidal cycle. Since sponge is a filter feeder whose fragile structure does not tolerate drying, sponge does not grow intertidally (Hopkins 1962: 123). It is likely that a substantial number of the oysters from JR731L were collected from the top of the oyster reef, which was exposed at low tide. This type of harvest could have been carried out easily by hand. Oyster shells with sponge probably came from the same reef but at a slightly lower level where they could be collected by wading in shallow waters. The shell with *C. trutti* holes may have also been gathered by hand, simply by wading in several inches of water.

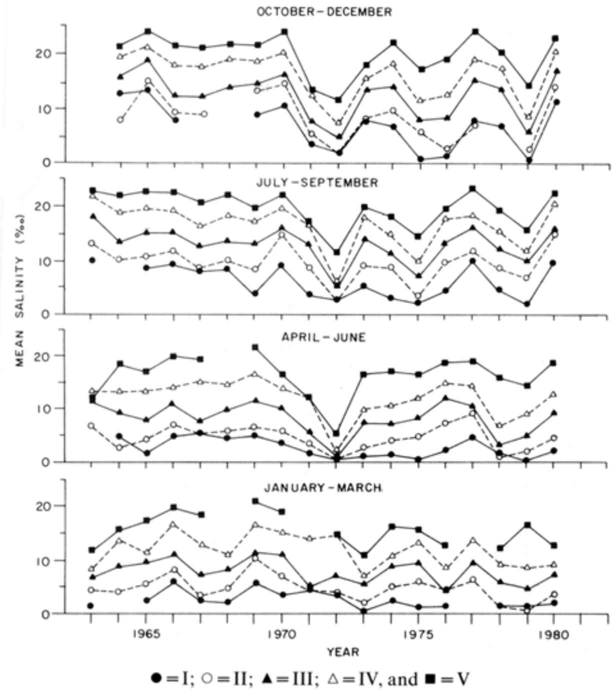

Figure 4. Mean salinity quarter year periods by section in the James River, Virginia, from 1963 to 1980.

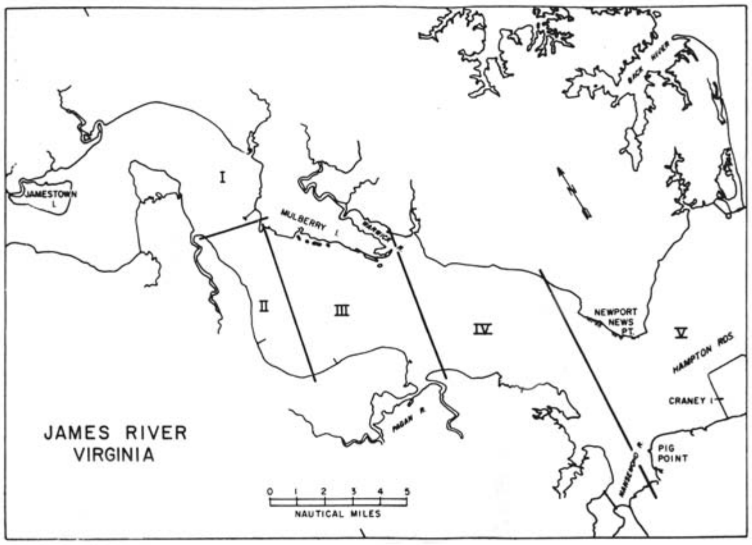

Figure 5. Divisions of the James River, Virginia, based on studies of hydrography, salinity, and estuarine circulation by M. M. Nichols (1972).

Of the sponges noted by Hopkins (1962) in the Chesapeake, three are low salinity species—*C. trutti*, *C. vastifica*, and *C. lobata*—whereas the fourth, *C. celeta*, occurs only in high salinity regions. Hopkins (1962: 123-24) notes that in the absence of large bore holes of *C. celata* the other species of *Celoni* will be restricted to sponge which can tolerate low salinity. They can endure salinity below 15ppt and even below 10ppt for short periods of time. These include *C. trutti*, *C. lobata*, and *C. vastifica*. The latter two appear not to be widely distributed. Kent (1992: 31) uses the term "*C. trutti* type" to include the three low salinity species. The current project employs this term in the same manner. Kent's 1992 summary of Hopkins' studies includes the following classificatory distinctions:

1. No boreholes: Salinity below 10ppt for about half a year and rarely above 20ppt.
2. Valves with small boreholes and no large boreholes: Salinity below 10ppt for about one-fourth of the year, below 15ppt for about half the year, and occasionally above 20ppt.
3. A mix of small and large bore holes: Salinities occasionally below 15ppt and above 20ppt for one-fourth to one half a year.
4. Valves with large boreholes as common or more common than valves with small boreholes: Salinity rarely below 15ppt and above 20ppt for most of the year (Kent 1992: 30).

In relation to these salinity ranges, the presence of *C. trutti* and the absence of *C. celata* offer additional insight into the original harvest loci for the oysters. The probable origin of the oysters becomes apparent when observed sponge distribution is put into perspective alongside a salinity study that investigated the relation of salinity to the attachment of oyster larvae to shell in the James River (Haven and Fritz 1985: 275). The analysis recorded and averaged over 13,000 seasonal salinity measurements of the James River from 1963 to 1980 (Figure 4). The salinity data drawn from the VIMS hydrographic files was calculated for five specific sections of the James River based on hydrographic charts done by Nichols in 1972 (176).

Figure 5 divides the James River into five sections and reveals that the seasonal variation in salinity in Area III is compatible with the growth of *C. trutti* sponge. The lower part of Area II may also support a limited quantity of *C. trutti* sponge. However, studies by Haven (2002 personal communication) examining oyster size each fall from 1950 to 1982 indicated that most oysters from Area II were less than 60mm long and would not be optimal for food.

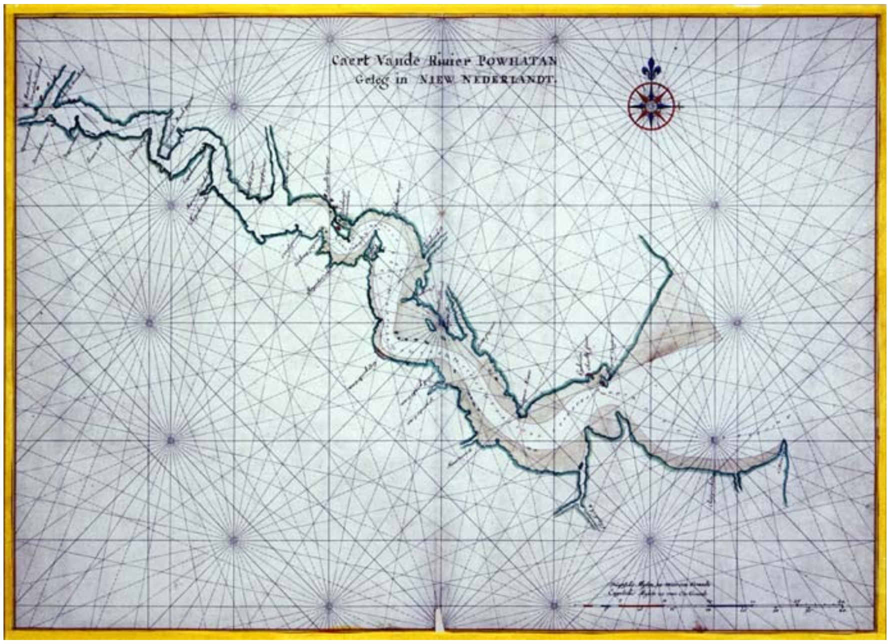

Figure 6. Atlas of the Dutch West India Company by Johannes Vingboons, drawn after ca. 1638 from ca. 1617 ships logs.

According to the salinity data, oysters in the JR731L collection came from the eastern James River in the low salinity region from Area III and possibly the lower part of Area II (Haven and Fritz 1985: 275). Area III extends from Mulberry Point to the mouth of the Warwick River on the north side of the James River and from about Deep Creek to Pagan Creek on the south side. The upper limit of Area III is approximately twelve miles from Jamestown Island. The absence of predatory oyster drills (*Urosalpinx cinerea*) and high salinity mollusks, such as hard clams (*Mercenaria merceneria*), further supports the likelihood of Area III as the oyster source. Both of these organisms seldom occur in salinities below 15ppt, like Area III. In fact, one would have to travel a distance of more than 20 miles to Area V before encountering oyster drills or hard clams.

Haven and Whitcomb (1983: 142-143) charted the locations of current oyster reefs in Area III of the James River. Some of the reefs they identified appear to be depicted as islands on an early 17th-century Dutch chart of the James River by Johannes Vingboons (Figure 6). Of particular interest is the area known today as "Point of Shoals," located just off of Mulberry Point on the south side of the James River. This is the general area that was the most probable source for the oyster shells under study. Today, only flat shelly areas mark the location of these old massive reef systems (Haven and Whitcomb 1983: 149) (Figure 7).

Conclusion

On the basis of height/length ratios and the presence or absence of various boring sponge, oyster drills, and hard clams, certain tentative conclusions can be made. First, the oysters of JR713L most likely came from various levels on an old intertidal oyster reef twelve miles east of Jamestown Island. These massive structures existed in colonial times but have been lowered as a result of over-harvesting. Second, the oysters in this study were likely selected for size, and the harvesting was probably done by hand. Before they were harvested, these oysters were likely located just below the surface of the water at low tide or within reach slightly below the low-tide level. Third, following harvest and consumption, inhabitants of James Fort deposited the shells in a pit. The oysters in layer JR731L appear to be a primary deposit resulting from nearby consumption.

The preliminary results of this study add to discussions of early colonial food procurement strategies in the multicultural Chesapeake. The oysters that ended up being consumed at James Fort were collected and transported from a relatively remote source, revealing one of the ways in which the settlers' diet was augmented with food from outside of their immediate environment. In addition, the distance and direction between Jamestown Island and the oyster source at Mulberry Point may spotlight the identity of certain intra- and intercultural trade routes and exchange partners. Overall, it is hoped that other scholars will build on this study and related analyses to gain additional insight into subsistence at James Fort and environs.

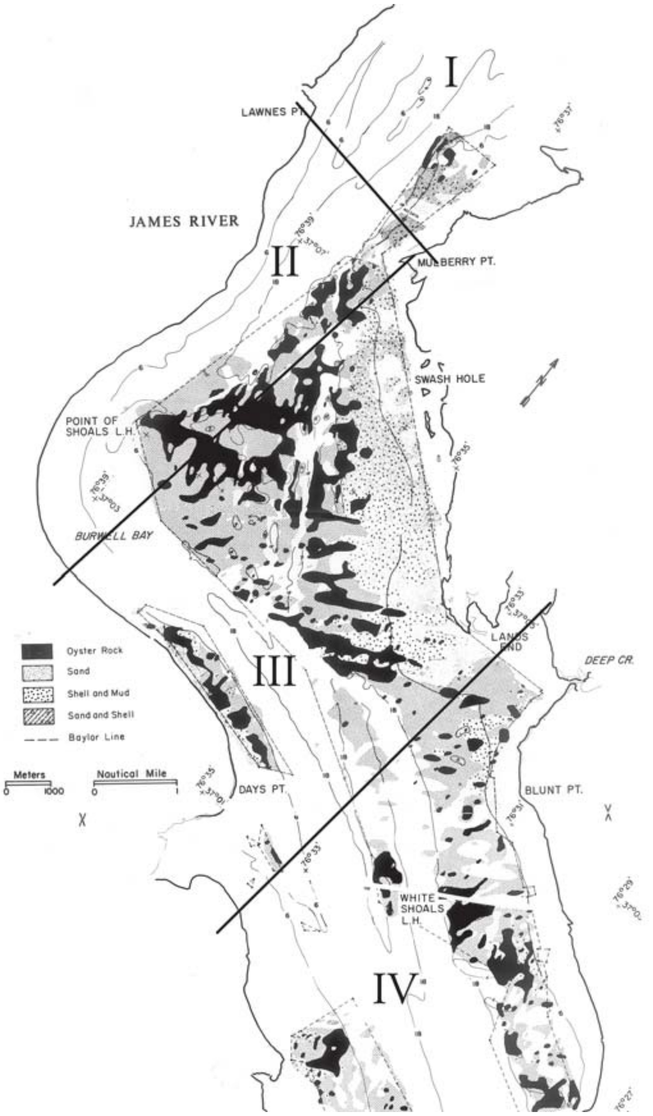

Figure 7. Chart of locations of oyster reefs in the James River, Virginia.

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