ANALYSIS OF STYLISTIC ATTRIBUTES ON ONEOTA POTTERY FROM THE PAMMEL CREEK SITE LA CROSSE, WISCONSIN

By

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This study examines the shell tempered Oneota pottery from the Pammel Creek site in La Crosse, Wisconsin. The Oneota lived in the area from A.D. 1300-1650. This investigation analyzed trail markings on Oneota ceramics to try to identify if different vessels at different locations within the same site can be matched based on their tool shape and size. This data shows that the Oneota at this site did not have individuals specializing in ceramic manufacture, however there were a few individuals making multiple vessels.

ACKNOWLEDGMENTS

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INTRODUCTION

Pottery is an important part of people's lives. Pottery is used for storage, preparing and cooking foods, but may also hold special ritual meaning and value. Pots carry with them cultural background from the maker and their group. Although complete vessels are hard to find, broken pieces can provide vast amounts of information to archaeologists.

At the Pammel Creek site (47Lc61) in La Crosse, Wisconsin, researchers investigated a series of questions concerning the Oneota culture. These research questions included chronological relationships, vessel form and decorative attributes, the method of manufacture, vessel function, and depositional patterning (Arzigian et al. 1989). Past ceramic studies have been used to determine specific periods of time belonging to specific designs on the pottery. Boszhardt (Boszhardt 1994) was able to define three separate phases for the La Crosse Oneota locality based on ceramic designs, along with radiocarbon dates, which point to an occupation in the La Crosse area of 1300-1650 A.D. (Boszhardt 1994). The three phases are Brice Prairie A.D. 1300-1400, Pammel Creek A.D. 1380-1520, and Valley View phase A.D. 1530-1650 (Boszhardt 1994).

Pottery investigations have also allowed archaeologists to discover the way certain cultures are structured. Benn (1989) conducted several studies on pottery form from the Oneota and Woodland cultures. He focused on motifs, which he concluded to be evidence of Oneota cultural complexity. From the symbolic motifs he developed a standard of cultural hegemony for the Oneota (Benn 1989). Motifs are one of the many characteristics of pottery that have been used to study a society's social structure.

Peregrine (2007) conducted research dealing with individuals in a society. In particular, ceramic design styles were used to determine whether regular patterns of human behavior were

associated with particular aspects of social organization. Peregrine's investigation expands upon the results of Fischer's (1961) investigation which used ceramics to determine social characteristics of extinct societies. Both studies focus on art styles and their correlation with social hierarchy and post-marital residence patterns.

The following study was motivated by the work of Fischer (1961) and Peregrine (2007). This study focused on the middle phase of the La Crosse Oneota, the Pammel Creek phase. Within this phase there are different styles of shoulder decoration including chevrons, punctates, and patterns of horizontal and vertical trailed lines. Using measurements of trail markings and tool decoration on both body and rim sherds, together with their placement, I will show that different vessels at different locations within the same site can be matched based on their tool shape and size. Upon determining what tool made which designs, I hope to determine whether certain individuals were chosen to make the majority of the pottery or if decorative ideas are passed down from generations. From this data I hope gain knowledge of whether tool specialization occurred within the Pammel Creek site society. This would mean that only a few people in the society specialized in making pottery and everyone than got it from that person for their family.

The Oneota tradition

Oneota sites in the La Crosse Locality date from A.D. 1300 to 1650 in the La Crosse locality. The La Crosse locality Oneota sites are thought to represent the Ioway and Otoe tribes by the early historic contact period (Theler and Boszhardt 2003). Geographically the Oneota tradition extended over much of the Prairie Peninsula including Iowa, portions of Missouri, Minnesota, much of Wisconsin, western and perhaps north-eastern Illinois eastern Kansas, Nebraska and

southeast South Dakota (Figure 1). The shared material culture of the Oneota tradition, primarily reflected in the ceramics is an essential element that that ties together all these sites over such a large geographic area and relates them to specific tribes found in this area during historic times. The Oneota lived in large villages often located on broad sandy terraces along major rivers and lakes (Theler and Boszhardt 2003). They were farmers as well as hunters, gatherers and fishermen. Trade was also present among Oneota villages and with other cultures.

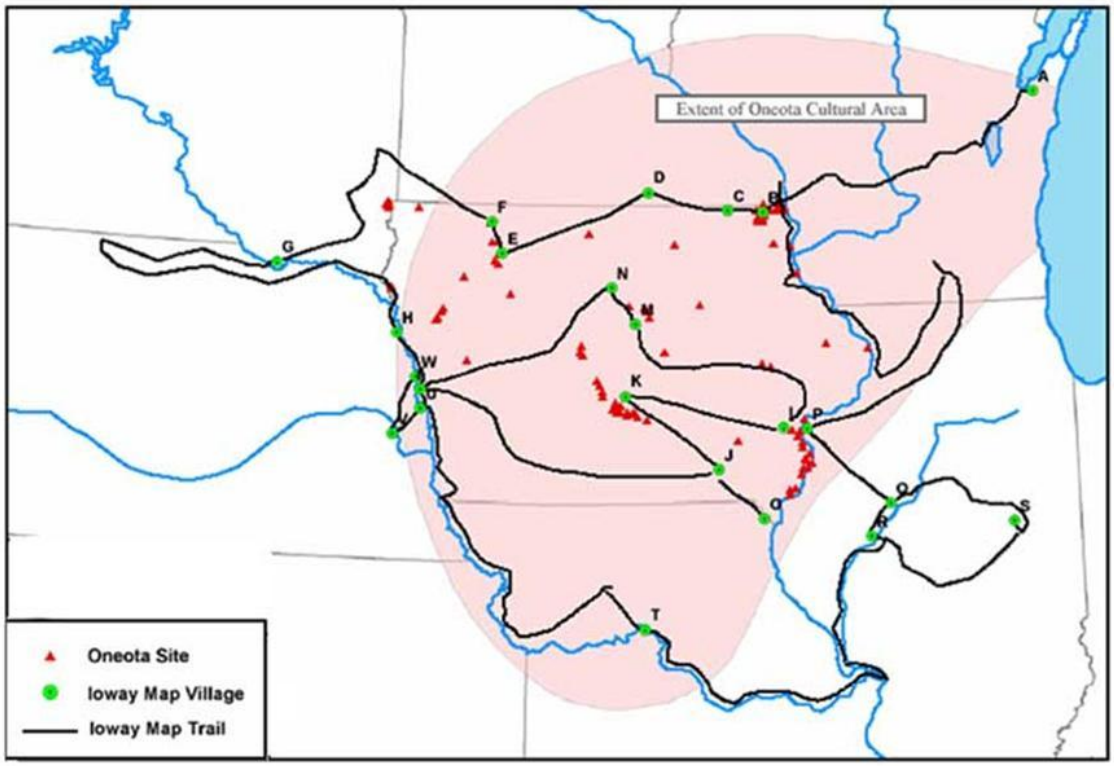

Figure 1.Map of extended Oneota Tradition (From University of Iowa 2011)

Settlement structure

The fact that Oneota villages were larger and permanent made them different from earlier settlements. Oneota people built houses in different sizes and shapes. However, the only remains of these houses are represented by postholes, hearths and numerous storage pits. Postholes are rarely found because they were set shallowly and have usually been destroyed by modern farming activities. However, varying site specific deposition patterns have preserved some Oneota house structures. The Oneota peoples buried their dead in cemeteries or within the village, rather than constructing burial mounds although some Oneota groups continued to use burial mounds in to the proto-historic period (Betts 2003).

One common feature on archaeological sites is storage pits. These were originally used to store food for the winter, but when emptied of the original contents they were filled with trash. These trash pits are often the main component found at many Oneota sites. Pits are found more frequently than structures because they are dug deeper into the ground, where the remains of houses were not dug deeply into the ground**,** and therefore did not survive as well. Pits also give a good indication of what is used and discarded at the site.

Material Culture

Oneota sites were known for their distinct material culture which consists of the following types of objects: geometric designs on large shell-tempered vessels, thumbnail end scrapers, sandstone abraders, small**,** unnotched triangular projectile points, celts, manos and metates (Stevenson and Boszhardt 1993). The most distinctive Oneota trait is the shell-tempered pottery, known for its globular or pumpkin like shape (Figure 2). In addition shoulder areas may have geometric

elements, including variously sized lines and trails, punctuates, and finger impressions (Tiffany 1995). Rims are usually decorated with finger or tool impressions (Boszhardt 1994). It is thought that ceramic vessels are made by the women in a community, and the decorative motifs are assumed to be learned and passed down from generation to generation through the maternal line (Theler and Boszhardt 2003:98).

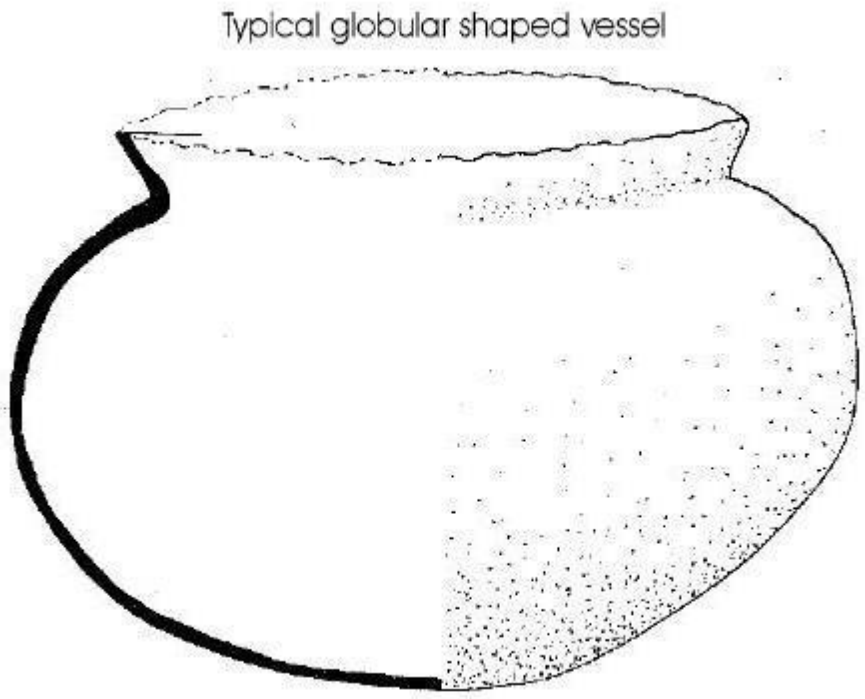

Figure 2. Typical Oneota vessel form. (From Holtz-Leith 2006: Figure 6-1).

Because pottery is frequently found on Oneota sites, Oneota pottery has been the focus of much research. Boszhardt's (1994) Oneota study used ceramic motifs to define three phases in the La Crosse locality. These phases are Brice Prairie, Pammel Creek, and Valley View. The Brice Prairie phase from A.D. 1300-1400 ceramics have inner lip or rim decoration, shoulder designs that have punctate-borders and handles that attach at the lip (Boszhardt 1994). The Brice Prairie phase (Figure 2) has been found to have vertical tool trails, nested festoons and nested zigzags over vertical tool trails as well.

The middle or transitional phase is the Pammel Creek phase. The Pammel Creek phase has been dated to A.D. 1380 to 1520 (Boszhardt 1994) (Figure 3). Pammel Creek ceramics mostly contain boldly impressed lips made by using a finger or tool notching, with the notch being larger than 1.25 centimeters (Boszhardt 1994). Shoulder designs include punctate borders, filled zones, oblique tool trails, and vertical finger trails. Pammel Creek ceramics also strap had handles, which were often decorated and are attached at or below the rim. The handle placement is one of the transitional aspects of the Oneota pottery of this phase.

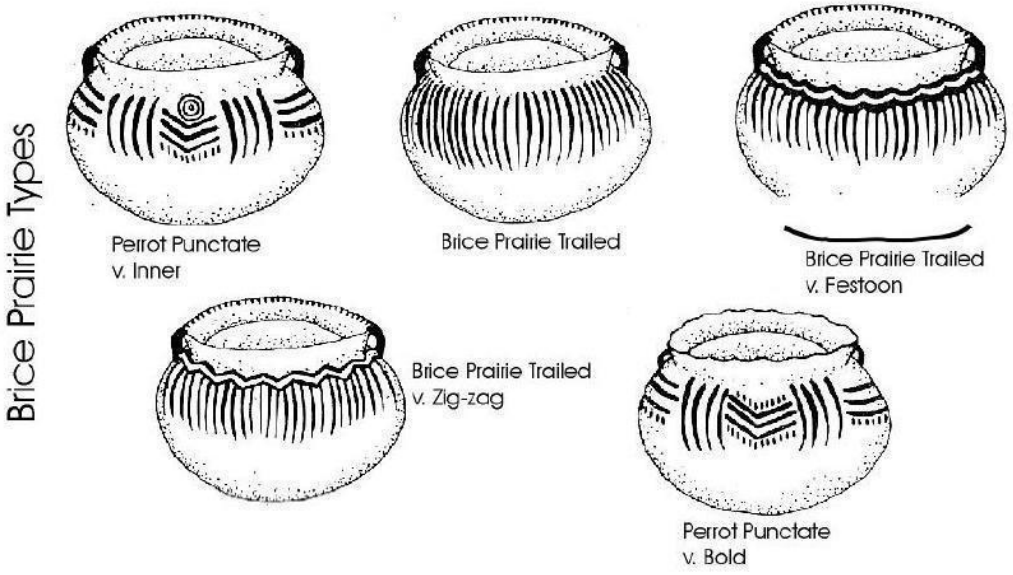

Figure 2. Brice Prairie phase ceramic designs (From Holtz-Leith 2006: Figure 6-3).

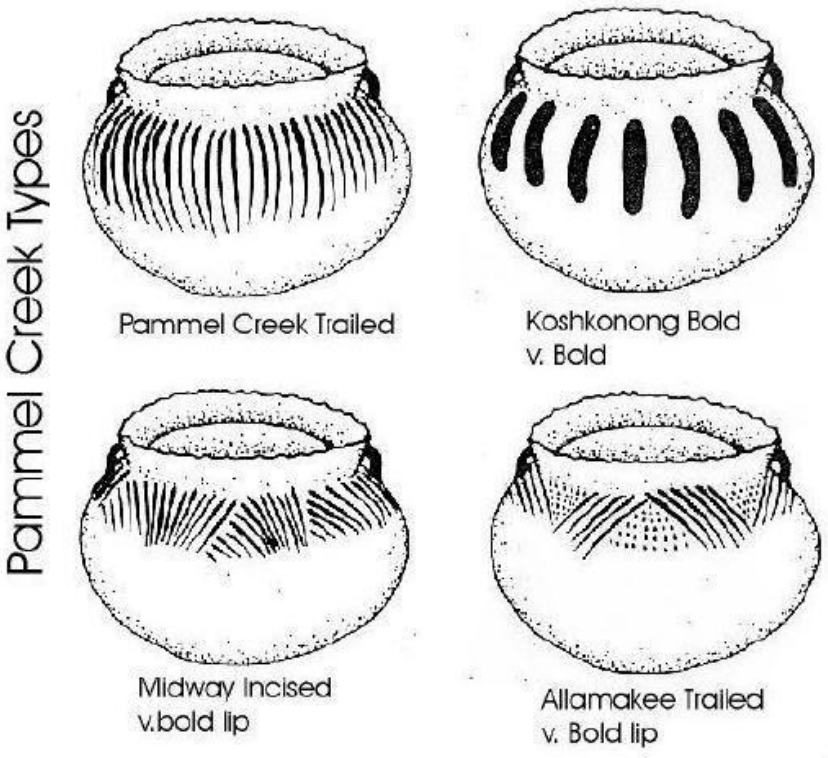

Figure 3. Pammel Creek phase ceramic designs (From Holtz-Leith 2006: Figure 6-3).

The final stage is the Valley View phase (1500-1650 AD) (Figure 4). Valley View ceramics consist of fine lip-top notching that is less than 1.25 centimeters, and attachment of decorated wide strap handles below the lip (Boszhardt 1994). This phase also marks the end of the punctate border that is found in both Brice Prairie and Pammel Creek phases. punctate filled zones and oblique tool trailed alternating panels continue from the Brice Prairie phase, and vertical finger trails which emerge in the Pammel Creek phase and are still found in the Valley View phase. During this time the majority of sites are located away from the Mississippi River, although there are Valley View components at earlier occupied sites which are closer to the river showing reoccupation of some of these sites (Boszhardt 1994).

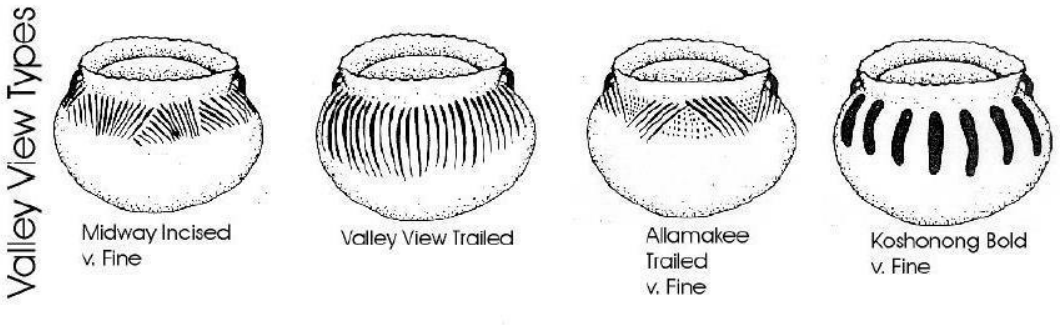

Figure 4. Valley View phase ceramic designs (From Holtz-Leith 2006: Figure 6-3).

Regional Interaction

Oneota trade centers evolved about A.D. 1300. Exchange centers included sites in the La Crosse region, the Utz site in north central Missouri, and the Leary complex in southeastern Nebraska (Henning 1995). Oneota groups may have used a specific region for an extended amount of time or returned to an area or specific locale seasonally, but they also traveled and interacted in areas far outside of this home area, this interaction and migration may account for subtle changes within the culture as it evolved (Henning 1995). There is even evidence of Oneota material found as far north as Ontario and Manitoba (Overstreet 1995). This large material culture distribution was present in this area up to the historic period.

Throughout this geographic range, Oneota material culture is relatively stable and unchanging, although there are changes and variations that occur within the Oneota over time primarily in sequence shifts in shoulder designs on the pottery. These patterns represent horizon styles that can be used to establish contemporaniety of Oneota sites throughout the Prairie Plains There are regional variations within the ceramic designs, but overall these designs are still very similar throughout the large geographic distribution.

The Pammel Creek Site (47LC61)

The Pammel Creek site is located on a low terrace at the south end of the city of La Crosse, Wisconsin (Arzigian et al. 1989: 1). The Pammel Creek site contains both Late Woodland and Oneota components but is predominantly Oneota. Sites dating to this time are located away from the river floodplain and closer to the bluff base in the La Crosse locality. Although Oneota are situated away from the river, they were still using the river as a source of food (Boszhardt 1994). The Oneota used the fertile soils located at the bluff base areas to form ridge field systems. This site was excavated over a 10 year span (Arzigian et al.1989: 17). I will be focusing on the pottery from the 1983, 1985, and the 1988 through 1989 Phase III excavations. During these excavations 202 prehistoric features were discovered and 163 were partially or completely excavated (Arzigian et al.1989:17-22). A total of 23, 272 rim and body sherds have been recovered from the Pammel Creek site since 1981. This total includes 1,430 decorated body sherds and 21,335 undecorated sherds. Since a few Woodland sherds were recovered from the site this suggests that a Woodland group had made minor use of the site. There was also evidence from radiocarbon dates, ceramics, and the minimal superimposed features to suggest that this site had a fairly short-term Oneota Occupation.

Initially the site was estimated to encompass 50 m^2 around a feature and midden deposit. The site now is known to encompass approximately 25,000 m^2. The true extent of the Pammel Creek site remains unknown though due to private lands overlooking the site where occupation may have occurred.

METHODOLOGY

In order to determine who made the vessels I attempted to see if the same tool can be identified on multiple vessels, linking body or rims, or whole vessels, together based on shoulder and rim trail markings and rim notchings. Similar trail markings and rim notchings placement will link two separate vessels within a site together to suggest that the same person made both vessels. The sample of sherds analyzed was taken mainly from these six features form the 1989 excavation 139, 144, 198, 143, 168, 167, and feature 118 from the 1985 excavation. Additional sherds were taken from feature 4 and 76 from the 1983 excavation. These were used to get a sense of how the entire site may have looked. All of the features are depicted on the map of the Pammel Creek site in Figure 5. The features chosen are located in different areas of the site and were selected because the assumption is each will contain the trash of people living near that feature. Thus, each feature should contain evidence of individualistic variation in shared decorative styles if this kind of variation is present. A total of 94 sherds from these five selected features were analyzed, representing the sherds with sufficient decoration to measure.

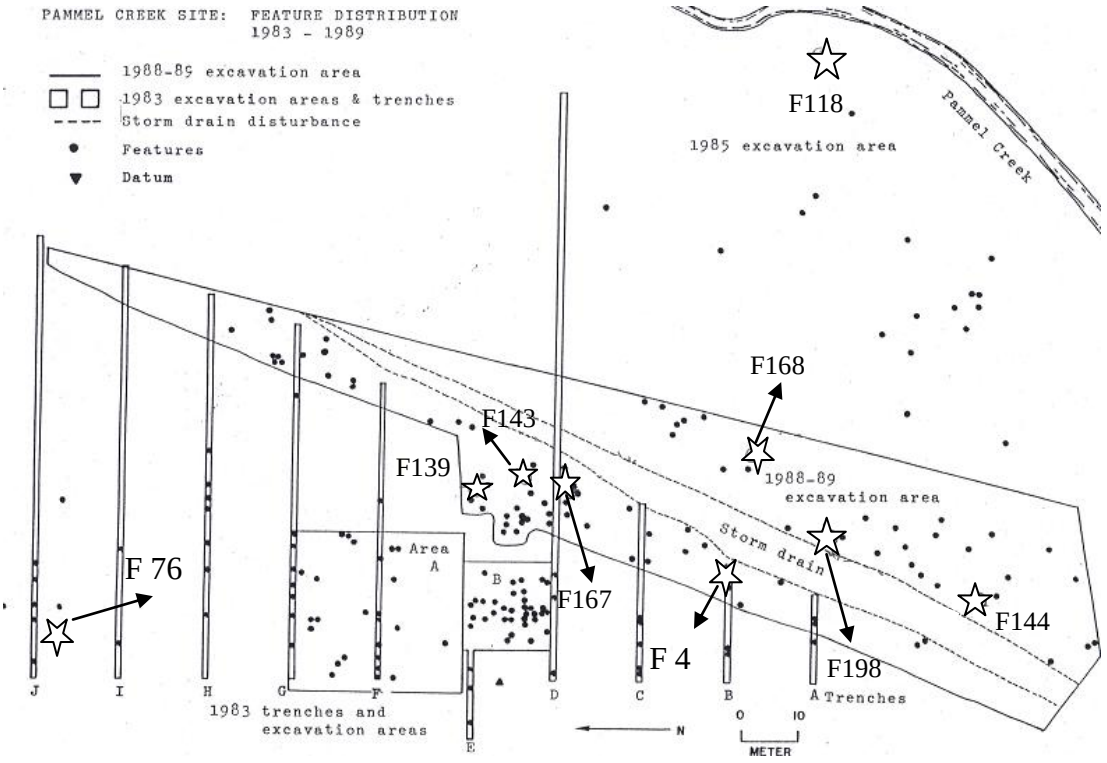

Figure 5. Map of Pammel Creek site with chosen features (Modified from Boszhardt 1989: Figure 1.12).

The first step I did was to analyze the trail markings to measure and note their placement. Trail marking widths were analyzed to determine, further, if any similarities existed amongst the sherds or whole vessels. Measurements were taken with digital calipers that were accurate to a tenth of a millimeter. The width of each trail marking was measured in multiple places along its length and then the average of these measurements was calculated. Categories and measurements were used to group together sherds that could have been made with the same tool to make analysis easier.

The placement categories were, diagonal, vertical, horizontal-vertical-horizontal lines, chevron patterns, finger trails, and unique placement. In addition, two specific designs from Midway Incised and Allamakee Trailed ceramics were used; Midway Incised pottery consists of alternating panels of oblique tool trails. Allamakee Trailed pottery is typically comprised of vertical trailed bands with punctate-filled zones.

Body sherds were examined and only included if they had multiple distinct sets of trail markings or had a unique and identifiable tool shape present. Tool shape is indicated by the design(s) left behind on the clay, for example rounded tips or multiple lines pressed inside the trail markings. Trail markings were measured on the widest part of the tool mark. If tool lines appeared to be jagged or misshapen the measurement was taken where the crispest tool impression could be seen.

The measurements of tool trails on body sherds were put into an Excel spreadsheet based on the categories of Midway Incised, diagonal, vertical, horizontal-vertical-horizontal lines, chevron patterns, finger trails, Allamakee Trailed, and unique placement. Unique patterns consisted of unidentifiable tool trail patterns, stab and drag tool markings, and a variety of zigzags. The mean trail marking widths for each sherd were calculated and used as the primary measurement for the sherd. The means were then graphed on a histogram to reveal clusters of sherds that have similar mean widths. Histograms were utilized to investigate whether there were patterns in tool use regardless of the decorative schemes. Standard error ranges for the mean measurements were used to further determine if tool trails were similar.

DATA AND RESULTS

Variability in the Widths of Tool Marks within a Single Vessel

The variability of tool trail markings within one vessel is important to see the range of variation by a single potter. Therefore if two pots with very similar measurements are analyzed and their variability is similar to that seen on a single pot, then the possibility exists that the same tool was used, perhaps by the same potter. The frequency of trail widths was calculated for one complete vessel consisting of 24 visibly measurable lines. This vessel came from the chevron patterned category. The results are reported in Figure 6.

This graph shows that the trail markings have a tight range. Most of the widths fall within a range of 1.5 to 2.5 millimeters. Most of the widths on this vessel fall within a range of 1.5 to 2.5 millimeters and average approximately 2.0 millimeters with a standard deviation of 0.3 millimeters. Considering one standard deviation around the mean, 66% of the trail widths would fall between 1.8 to 2.3 millimeters. This provides an indication of the variability to be expected by one potter using the same tool, but with some variation in application.

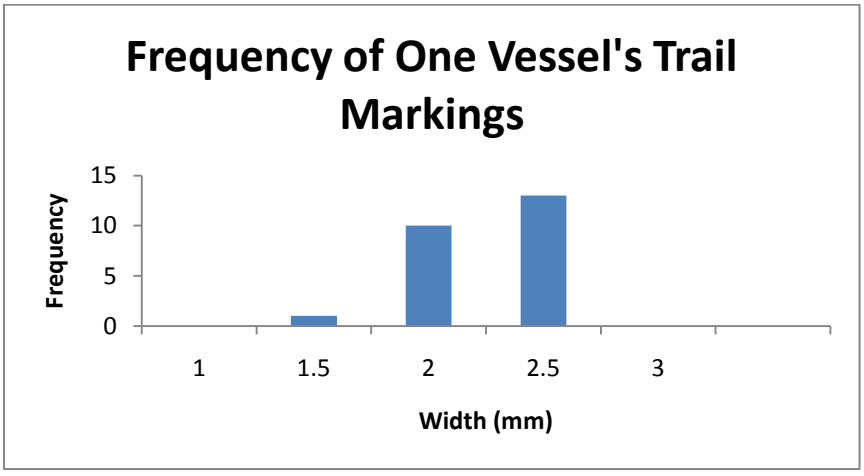

Figure 6. Graph of frequency in one vessel's tool trail widths, all measurements in millimeters.

Midway Incised Pattern Category

A total of 13 sherds were assigned to the Midway Incised decorative scheme. The mean widths of the sherds were placed into a histogram, which can be seen in Figure 7. The histogram below displays varied width measurement groups. When the sherds within the groups were visually analyzed, the patterns did not show any similarity, except for 1 group comprised of three sherds that had width averages between 3.7 and 4.5mm. The three sherds displaying this pattern Figures 8, 9, and 10 were clearly linked to each other. All three of these sherds were excavated from the same feature. The sherds had a distinctive pattern consisting of various angling lines, which suggests that the same tool and perhaps person made the impressions on all three sherds. This investigation was vital, because it provided visual evidence of similar tools being used.

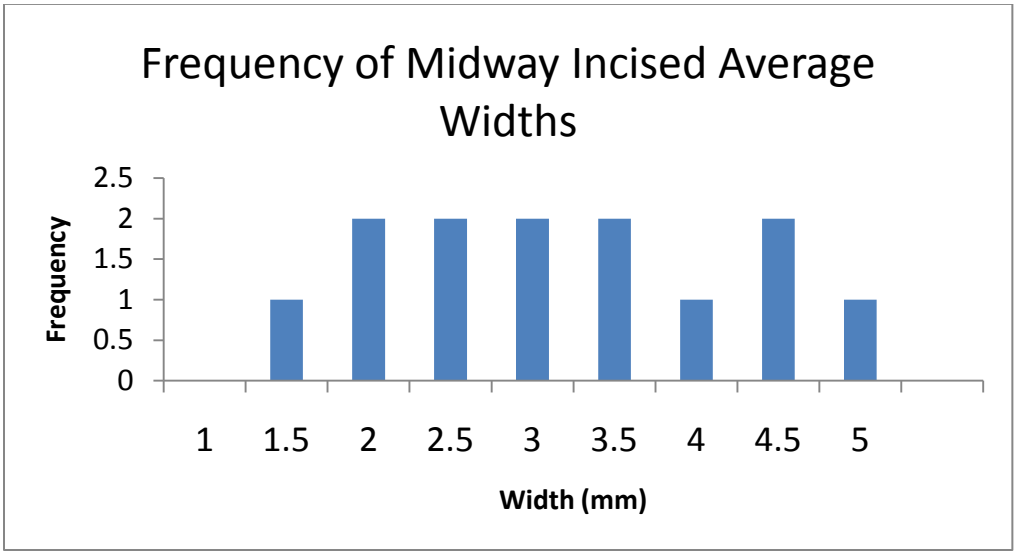

Figure 7. Graph of the frequency of Midway Incised average widths from body and rim sherd, all measurements in millimeters.

Figure 8. One of three vessel fragments which appear to have matching tool marks with those fragments shown in Figures 7 and 8 below. Vessel number 1985.288.09 Feature 118

Figure 9. Second match of Midway Incised sample pattern, Vessel number 1985 288.12.Fea 118

Figure 10. Third match of Midway Incised sample pattern, Vessel number 1985.288.??

Diagonal Pattern Category

The diagonal category consisted of six sherds. Trail marking patterns within this category often varied in direction of lines. Some lines started from the upper left and ended in the lower right (Figure 11). The sherds assigned to this decorative scheme may belong in the Midway Incised pattern; however, the sherds are too small to be able to positively identify them as that pattern. The graph (Figure 12) of average widths showed one cluster of two sherds.

When the cluster of sherds was analyzed, it was clear that only two of sherds had matching widths. Even though the two sherds had the exact same trail marking widths, upon further analysis with a microscope the tool markings did not match. The microscopic pictures were essential to this study, because it strongly suggests these sherds were not made from the same tool.

Figure 11. Example of diagonal pattern trail marked pottery, vessel number 1989.1916.12 Feature 198.

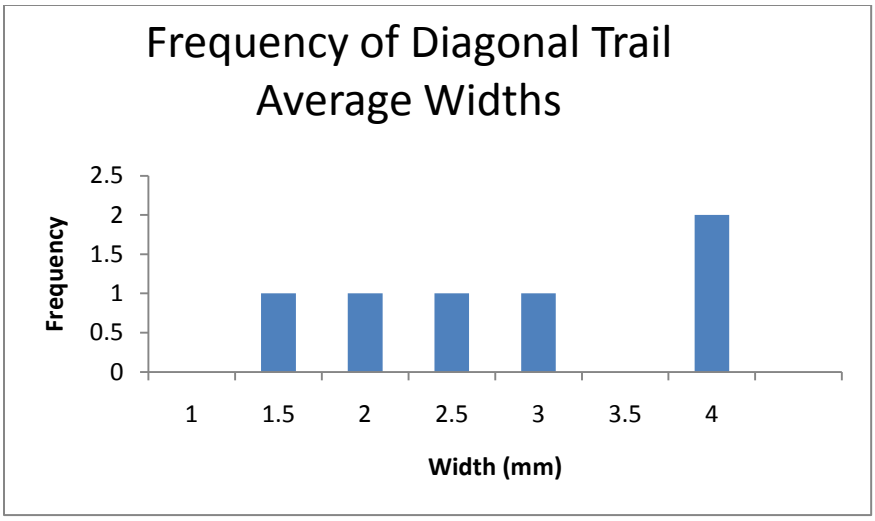

Figure 12. Graph of the frequency of Diagonal Trail average widths from body and rim sherds, all measurements in millimeters.

Vertical Pattern Category

There were 12 sherds able to be identified as belonging to the vertical patterned line decorative scheme. However, there are two possible sub schemes that were created due to different characteristics seen as stated in the sub scheme categories. Since the sample size was not very large the sample was only visually analyzed. There sample consisted of vertical lines depicted like Figure 13. The tools markings left were clearly not positive matches due to the varied width and impressions of the patterned lines.

Figure 13. Vertical Pattern of tool trails, vessel number 1989.554.03 Feature 135.

Close Knit Handle and Body Sherd Vertical Pattern

This category was created because four sherds had both closely spaced vertical patterns on the body sherds as well as on the handle (Figure 14). They were separated from other sherds, because they are distinctly different in pattern and tool marking from the rest of the vertical pattern category. A histogram was not constructed for these sherds due to the similarities presented visually. Figure 14, 15, 16, and 17 all present the distinct round tip tool markings that determine their similarities. In order to prove the sherds were made with same tool, thus the same artist, pictures were taken from a microscope, which can be seen in Figures 18, 19, and 20. Due to the camera attachment the magnification varies with each sherd picture. Under the microscope it was easier to see that each tool trail was rounded at the tip and was pretty smooth. However, in Figure 19 we can see that the far right tool trail has a distinct horizontal mark in the line concluding that this tool is different from the three sherds. The tool impressions on Figures 14, 15, and 17 showed that the same tool possibly made all three of these vessels.

Figure 14. Handle and Body sherd with vertical pattern, vessel number 1989 1419.02 Feature 167.

Figure 15. Handle and body sherd with vertical pattern, vessel number 1983.1269.02 Feature 76

Figure 16. Handle and body sherd with vertical pattern, vessel number 1989. 1370.28 Feature 167

Figure 17. Handle and body sherd with vertical pattern, vessel number 1983 40.05 Feature 4

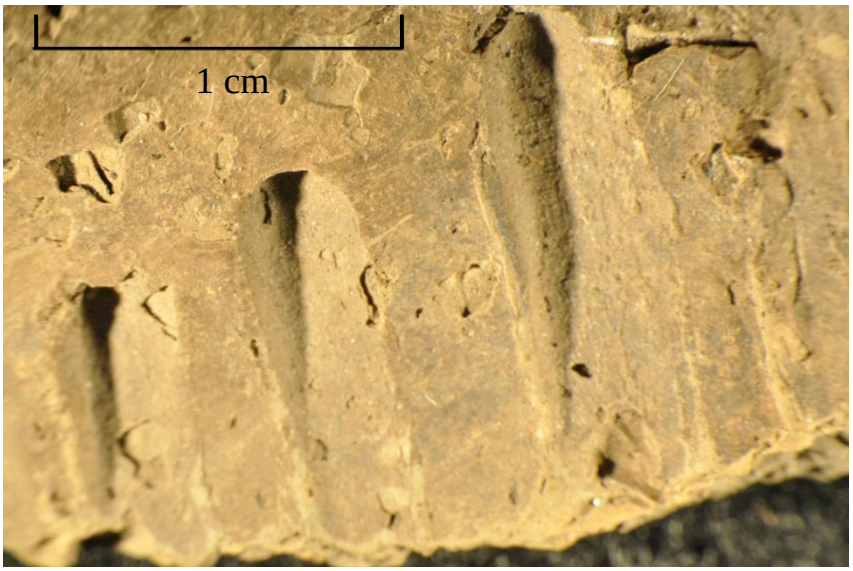

Figure 18. Microscopic picture of vertical pattern pottery at 3.9 power, vessel number 1983 1269.02.Feature 76

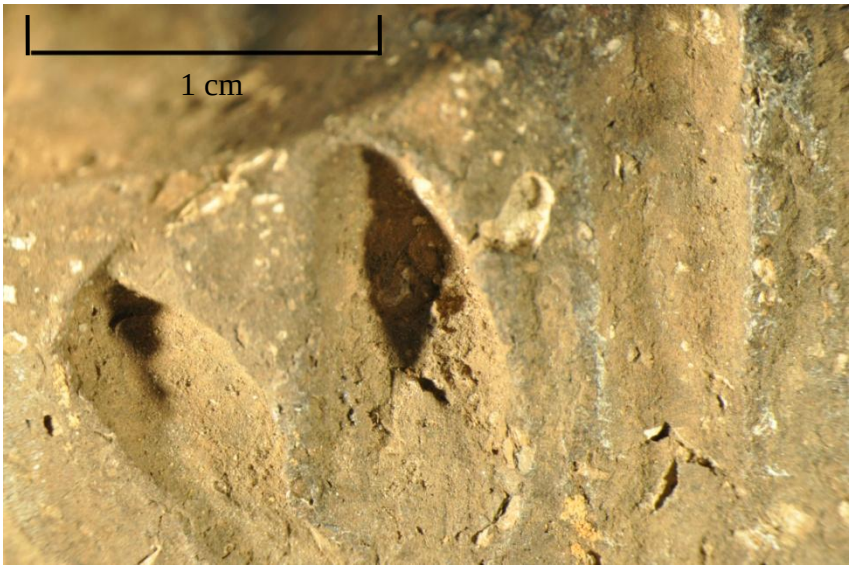

Figure 19. Microscopic picture of vertical pattern pottery at 5.2 power, vessel number 1989.1370.28 Feature 167

Figure 20. Microscopic picture of vertical pattern pottery at 5.2 power, vessel number 1989.1419.02 Feature 167

Thin Curvilinear lines

There were also six sherds that had vertical pattern lines, but formed a distinct pattern. These sherds consisted of very thin and shallow curvilinear lines. Each line came to a thin point at the end as seen in Figure 21 and Figure 22. A histogram was made for the average measurements of the trail widths (Figure 23). The two groupings of similar sherds were further analyzed using a microscope. Due to the shallow and disappearing nature of the pattern, only two sherds from the first grouping containing 3 sherds, Figure 21 and 22 could be magnified clearly under a microscope. The result suggests positive matches. This group, while not magnified (Figure 24 and 25), is still considered a positive match due to the distinct wavy nature of the pattern and the unusually thin nature of the trail markings. The distinct characteristic of starting out wide and getting smaller, along with the width suggests this pattern may be the signature of a certain maker.

Figure 21. Thin curvilinear pattern, vessel number 1985 288.03.Feature 118

Figure 22. Thin curvilinear pattern, vessel number 1985 288.02.Feature 118

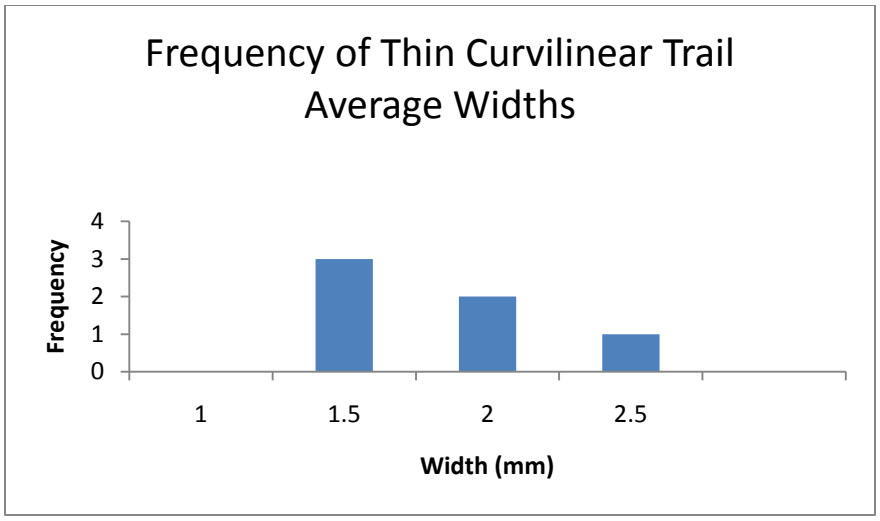

Figure 23. Graph of the frequency of Thin Curvilinear Trail average widths, all measurements in millimeters.

Figure 24. Variant of faded thin curvilinear pattern, vessel number 1989 868.07 Feature 143.

Figure 25. Variant of faded thin curvilinear pattern, vessel number 1985 288.07Feature 118

Horizontal-Vertical-Horizontal Lines Category

There are six sherds within this category. Two of these sherds have two sets of horizontal lines with a set of vertical lines in between being drawn last out of the present trail markings on the sherd (Figure 26). Figure 26 is a rim sherd with a decorated shoulder. Two of the more complete sherds display stab and drag marks under the vertical trail lines. The stab and drag technique displayed is a band of square ended stick grooves lining the horizontal trails. Similar to previous patterns the mean widths were graphed in a histogram for comparison (Figure 27).

Figure 26. Variant of Horizontal and vertical pattern trail marking, vessel number 1989.892.01&.02. Feature 144.

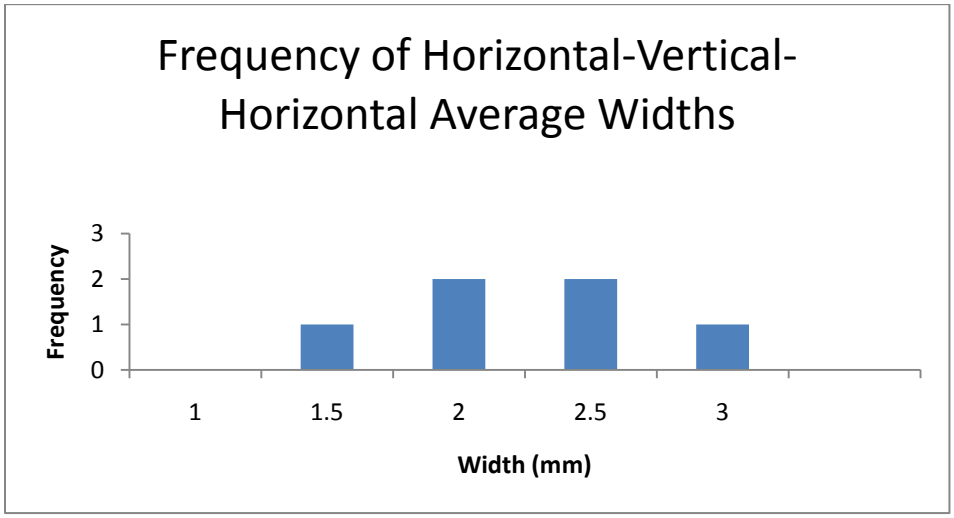

Figure 27. Graph of the frequency of horizontal-vertical-horizontal Trail average widths, all measurements in millimeters.

The graph shows that there are a variety of tools being used to make these similar patterns. The two highest frequencies of sherd widths were further analyzed to determine if the same tool was being used. Both of these groupings did not have any identifiable characteristics to be able to definitively match the trail markings to one tool.

Chevron Pattern Category

The chevron pattern category consists of two body sherds, one vessel, and two rim and body decorated sherds. The same analysis of graphing frequencies of trail widths reported on Midway Incised pottery was done with the Chevron patterned pottery in Figure 28. An examination was done on one group of measurements which had multiple similar widths. To determine further a positive match standard error ranges of the mean measurements were examined. The results show that they represent pattern production. A microscope was also used to determine if tool trails were similar just in case errors were performed during measuring, this proved to have the same conclusion as above.

Overall for the chevron category there was quite a bit of variation in placement of lines and chevrons on each sherd. This included patterns that were stretched out chevrons with punctate borders (Figure 29). One sherd had chevrons placement and shape where each was crafted differently. As three of the five examples of this decorative scheme occurred on large fragments, representing nearly complete pots, it was possible to see nearly the entire pattern of decoration. Thus it was possible to definitively rule out the possibility that they came from either the same pot or were made by someone using the same decorative pattern. The remaining sherds did not have an entire chevron pattern visible. When rim sherds did not have the full pattern, it made the type of analysis used in this study impossible because only the minimum number of design elements could be used for measurement and analysis.

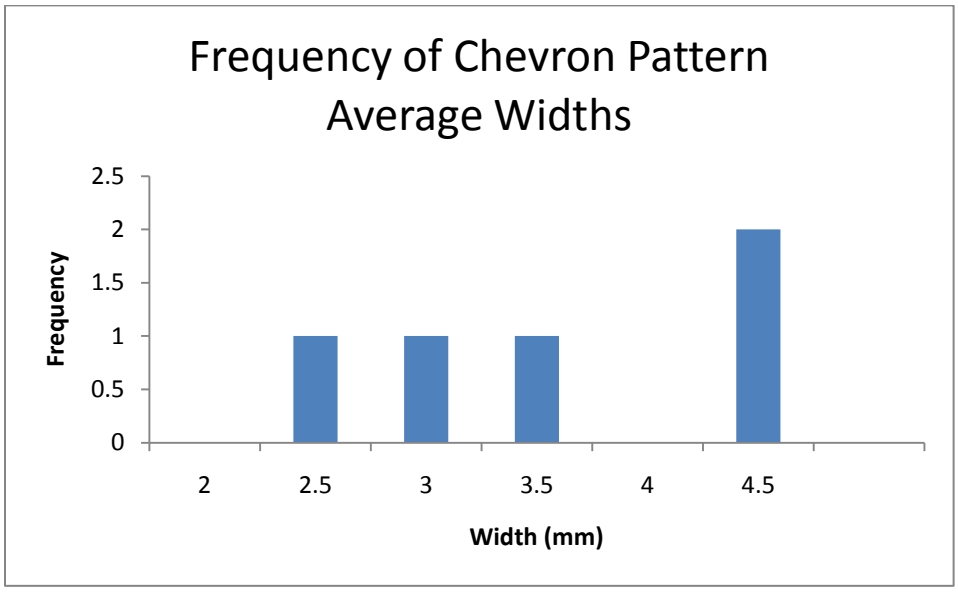

Figure 28. Graph of the frequency of Chevron trail average widths from body and rim sherds, all measurements in millimeters.

Figure 29. Variation of chevron pattern, vessel number 1989 Feature 137.

Finger Trail Pattern Category

This category contained the highest quantity of sherds, 19. The pattern consisted of wide spaced finger trails as seen in Figure 30. A histogram was created showing the distribution of the mean widths of finger trail markings found on each example of this decorative scheme (Figure 31). The resulting distribution was visually examined to determine whether there were any apparent groupings or clustering in the data. Based on this analysis, there were not sufficient markings left behind by a finger to determine positive matches.

Given that fingers were the tools used on these sherds a visual analysis with a microscope was necessary in order to provide evidence for positive matches. This analysis provided little support for any of the different sherds being made by the same person. The smooth surface of a finger does not allow for a great deal of marking variation. Human error also has to be taken into account, because pressing a finger down numerous times in a row can get tiring, as well so that the pressure used each time is not as precise as with tool application.

Figure 30. Finger trailed pattern sherd, vessel number 1989 2012.01 Feature 205.

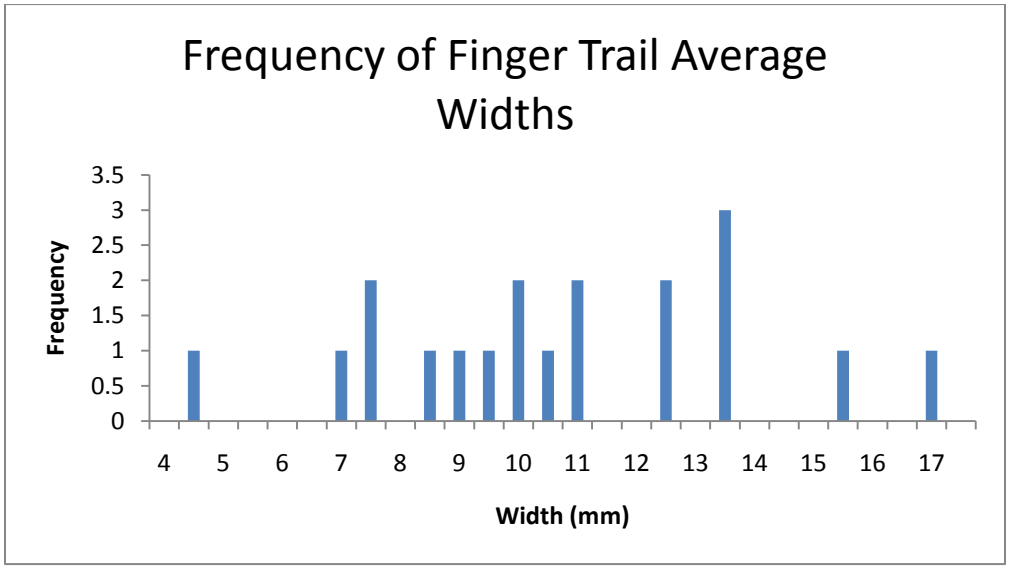

Figure 31. Graph of the frequency of Finger Trail average widths from body and rim sherds, all measurements in millimeters.

Allamakee Trail Pattern

For this pattern category there were only two sherds. The sherds consisted of the typical pattern for Oneota Allamakee style pottery with punctates either filling space or acting as borders (Figure 32). Although the trail lines were done in a similar style on a diagonal, the placement of punctates and the tool markings do not match.

*Figure 32. Typical Allamakee trail pattern, vessel number 1989 1457.33 Feature 16**8.***

Unique Pattern Category

The remaining six sherds were placed into a unique pattern category, because they either did not have matching patterns or were too deteriorated to be specific. The sherds seem to have certain characteristics of the already analyzed pattern categories. One sherd consisted of diagonal lines, as well as containing random horizontal lines (Figure 33). The sample consists of one diagonal-vertical pattern, one horizontal-vertical pattern (Figure 34), two wide spaced vertical patterns and two faded vertical tool line patterns. Due to the unique patterns in this category there was no need to perform statistical analysis to prove matches.

Figure 33. Unique pattern of pottery consisting of horizontal and diagonal lines, vessel number 1989 696.121 Feature 139.

Figure 34. Unique pattern of horizontal lines under the rim, vessel number 1989 550.01 Feature 142.

Aside from the stylistic attributes a final histogram was constructed using all the tool trail marking measurements, without the finger trails sherds because they are considered a separate tool (Figure 35). From the graph we can see that there is a great deal of variability. The variability of tool widths could tell us that Oneota were not using specific tools, they were simply picking up any tool that was around them. The results could suggest that tool widths cannot lead to the conclusion that the same person made multiple vessels.

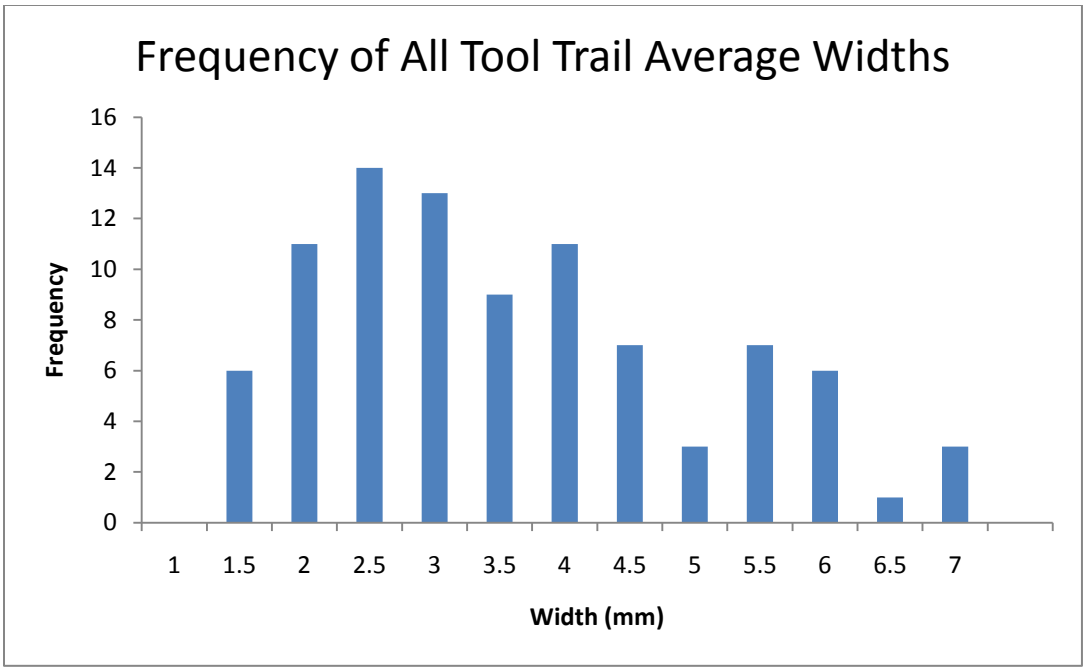

Figure 35. Graph of the frequency of all tool trail average widths, excluding finger trails, all measurements in millimeters.

CONCLUSIONS

The analysis of the Pammel Creek site pottery style was somewhat successful in identifying if different vessels at different locations within the same site can be matched based on their tool shape and size. For the most part there was too much variation in the styles and the placement of design elements to conclude that the craft specialization occurred here. The majority of pottery did not consist of the same pattern nor was it made by the same tool, suggesting that people were making the designs individually. The sample size and features chosen played into this outcome. Only 69 sherds were able to be fully analyzed, the remaining 25 sherds did not clearly indicate trail marking patterns and were too small to determine accurate information. Each category of

patterns consisted of sherds showing that while these people were individualistic about their pottery making, they did share similar design elements. Since the analysis of tool trail patterns on body sherds was unable to link multiple tool trails of similar size and tool shape, it shows that most vessels were made with different tools, possibly only used on one vessel.

The stylistic analysis of the Midway Incised pattern was successful in determining a positive match. In this case of positive matches the sherds were found within the same feature, suggesting one possibility that the same person made the pottery. Further analysis of attempting to fit the sherds together was performed to determine if they were from the same vessel. This analysis, along with temper and the angle of the rim, determined they were not from the same vessel. Although the sherds were found in the same are**a,** the matching patterns and tool use suggest that the creator could have made several pots at the same time using the same tool.

The analysis of closely spaced vertical lines on the body and handle pattern category produced the same conclusion as the Midway Incised. The rounded ends and angles of lines were crucial in this study to identify the same tool. Even though the sherds in this category matched, two sherds in the sample were excavated in separate years, thus separate locations. Although the 1983 and 1989 excavations areas were excavated alongside each other Feature 167 of the 1989 excavation is located to the far east of Features 76 and to the northwest of Feature 4 as seen in Figure 36. This suggests the possibility that when finally disposed, the pottery sherds from one vessel were dispersed randomly. Further research may point to Oneota at this site collectively eating or storing their food, because similar pottery is scattered everywhere. This may also further suggest that women made the pottery and could have taken some of it with them to a different location (the location of their husband's home).

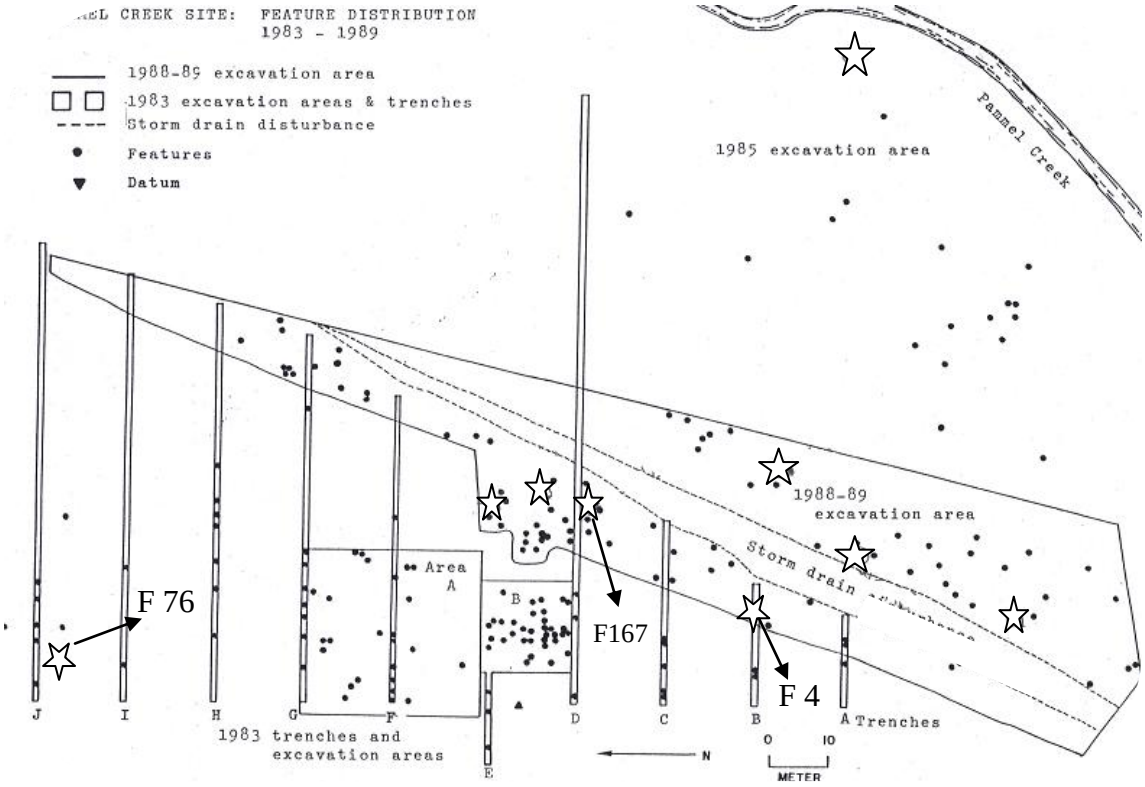

Figure 36. Map of Pammel Creek site with Vertical Handle and Body features (Modified from Boszhardt 1989: Figure 1.12).

The pattern categories of horizontal-vertical-horizontal, diagonal, chevron pattern, vertical, and Allamakee produced no matches. These categories had too much variation in styles to conclude that the same person or tool made the sherds. The placement of punctates, chevrons, and vertical lines were too varied to decisively define any patterns on numerous vessels. Specifically, the stylistic analysis of diagonal tool trails was unsuccessful because the sample did not have complete patterns, which may have placed sherds in different patterns than if they were complete.

The thin curvilinear pattern category was the only category that consisted of matching pottery within the same area. This suggests that the final deposition of all vessels was in the

same vicinity. The analysis of thin curvilinear patterned pottery was successful-- two clusters of similar tools shape were identified. Tool shape needed to be unique and identifiable in order for the trail markings to be definitively linked with another sherd from a different vessel. The first grouping of sherds suggests that within feature 143 the same artist was making several vessels with the same tool. The second grouping of sherds was all from a single feature as well.

Due to sample selection, patterns were tabulated according to feature. From this analysis ceramic patterns are not consistent at certain features. To ensure that sherds were not from the same vessel in different pits, the features chosen were checked against Boszhardt's (1989) findings of cross-fit vessels. From this analysis it was determined that none of the sherds were from the same vessel. There are a few exceptions of features having similar patterns, but the majority of features contain a wide array of patterns. The presence of undecorated pottery at each of these features was also taken into account. While undecorated body sherds are abundant, most of each vessel has decorations only on the upper vessel shoulder meaning there is a far greater likelihood for undecorated as opposed to decorated body sherds. Undecorated Oneota vessels are possible, but cannot be demonstrated with this sample.

The histogram compiled of all tool trail markings, except for finger trials, shows that the widths of the tool trails were not very consistent. This study set out to determine if variation in the construction of shared shoulder patterns on Oneota ceramics could be identified on vessels from different locations within the same site. There is still a need for positive identification of more clusters from this site in order to definitively understand the decorative variation in tool use and application present. A larger sample should be examined from this site and others based on the positive results of this study.

Tool Marks

Most tool marks did not have distinctive impressions which could set them apart. Many components play into the final shape of a tool trail. The actual tool shape and size makes up the main component of the tool mark. Another variable that plays into the final shape of the trail lines is how the tool was placed into the clay. If the tool was inserted into the clay and moved around, wiggled, then the trail line will not reflect the tool shape as much as if the tool was placed straight and moved down with no wiggling.

The consistency of the clay can also affect too trails. Identifiable tool lines may have been in the clay as it was beginning to dry which allowed unique tool traits to leave an impression. If the clay was wetter when the tool trails were made, any unique marks on the tool face would get clogged with clay, so the impression would not be as evident. The final variable deals with the individual making the mark. The pressure and steadiness of an individual's tool application plays a great deal into how trail lines are made, especially in the case of finger markings.

Data Problems

While the features I choose at the Pammel Creek site did contain sufficient data for examination of stylistic attributes, there were several features that contained a majority of undecorated pottery that have been discussed earlier. There was also the problem that most sherds do not have a complete pattern present. The fragmentary nature of the sample makes this kind of study more analysis challenging, because only the minimum number of design elements could be measured and analyzed. Although there problems arose during analysis the majority of vessels from each site contained the adequate data.

Future Research

Expanding the sample size is essential to the kind of methodological and theoretical approaches taken in this study. Studies could focus on reproducing tools that would make trail lines similar to the ones seen in the study. These tools could be made either from bone or wood that were part of the excavated materials. Bone or wood would be the possible choices because both tools could create the trail markings studied in this analysis. Further analysis into the tools used by the Oneota can gain more insight into how certain ceramics were crafted.

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