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The Cambria Connection: Identifying Ceramic Production and Community Interaction in Late Prehistoric Minnesota, AD 1050-1300

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THE CAMBRIA CONNECTION: IDENTIFYING CERAMIC PRODUCTION AND COMMUNITY INTERACTION IN LATE PREHISTORIC MINNESOTA, AD 1050-1300

by

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ABSTRACT

THE CAMBRIA CONNECTION: IDENTIFYING CERAMIC PRODUCTION AND COMMUNITY INTERACTION IN LATE PREHISTORIC MINNESOTA, AD 1050-1300

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Under the Supervision of Professor John Richards

The Cambria phase (AD 1050-1300) is an archaeological complex primarily centered on the elevated terraces of the Minnesota River in south-central Minnesota. Cambria phase pottery demonstrates technical and stylistic influences from several different late prehistoric cultures, and although the Cambria phase is currently classified as part of the Initial Middle Missouri Variant, certain affinities are evident between the grit-tempered, rolled rim ceramics at Cambria and the Powell-Ramey series at Cahokia. Although this pottery is a minority ware at Cambria, it is ubiquitous in the site literature, where it is interpreted as evidence for interaction with the Mississippian world. However, the nature and degree of the relationship between the two cultural areas has never been defined clearly.

This project utilizes attribute and compositional analysis to identify the range of variation in the ceramic assemblages of three sites referred to collectively as the Cambria Locality: the Cambria, Price, and Owen D. Jones sites. A theoretical framework is structured from integrating articulated facets of world systems theory, community studies and the internal frontier concept. The results are interpreted at multiple levels of analysis, but are primarily focused on understanding interaction locally amongst the three sites, and in a micro-regional context within southern Minnesota. The evidence for and mechanisms of cultural interaction with Mississippian communities are evaluated. Finally, a model is developed to explain the

emergence of the Cambria Locality village sites as intra-regional migration by cultural groups trending towards sedentism and maize agriculture from other areas in southern Minnesota.

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Chapter 1: Introduction

The Cambria phase is currently classified as part of the eastern variant of the Initial Middle Missouri Tradition (IMMVe), which is part of the Plains Village cultural pattern, but there is ongoing debate about whether the Cambria phase is part of the Middle Missouri tradition, the Northeastern Plains Village culture, or if it is more Mississippian in character (Gibbon 1991; Henning and Toom 2003; Johnson 1991; Scullin 2007; Tiffany 1983). The Cambria phase ceramic complex is neither singular nor uniform, and instead evinces a medley of characteristics pulled from several different late prehistoric cultural traditions, including a grit-tempered minority ware that bears many similarities to the Powell/Ramey series at Cahokia (Knudson 1967). Despite their minority status, these vessels are omnipresent in the literature where they are interpreted as evidence for interaction with the Mississippian world (Gibbon 1991; Johnson 1991; Knudson 1967; Scullin 2007; Tiffany 2003; Wilford 1945). This project focuses on identifying the range of variation in the ceramic assemblages of three sites located in the heart of the Cambria Locality: the Cambria (21BE2), Price (21BE36) and Owen D. Jones (21BE5) sites (Figure 1.1). Additional research questions focus on understanding interaction locally amongst the three sites, and in a micro-regional context within southern Minnesota. The evidence for direct interaction with Mississippian communities is examined. Finally, a model is developed to explain the emergence of the Cambria Locality village sites.

The Problem

The Cambria phase (AD 1000-1300) as it is currently known is a poorly understood archaeological phenomenon primarily centered on the elevated terraces of the Minnesota River in south-central Minnesota. It is primarily defined by its pottery, which demonstrates technical and stylistic traits in varying degrees from at least three different cultural traditions: Middle Missouri, Mississippian, and Late Woodland. The primary influence identified in Cambria phase pottery is from the west (Knudson 1967), which is reflected in its current classification as part of the Middle Missouri Tradition (Tiffany 1983). Yet, the most remarked upon aspect of Cambria ceramics are the grit-tempered, rolled rim jars emulating the Powell/Ramey series that originated at the Mississippian site of Cahokia. Powell Plain and Ramey Incised pottery are distinctive shell-tempered vessels that spread into the Upper Midwest as part of a northern Mississippian cultural expansion that took many different forms. The nature and degree of the relationship between Cambria and the Mississippian heartland has never been clearly defined.

There are two main issues hindering a more focused and dynamic understanding of the Cambria phase. The first is that the description of its material culture is heavily dependent on data from one site only, the type site. In fact, the only published ceramic or lithic analyses for any Cambria phase site are from Cambria itself (Knudson 1967; Watrall 1968). As a result, the artifact assemblages from only one site represent the entirety of the Cambria phase. In turn, nearly any thin, grit-tempered and smoothed pottery found at sites in the Minnesota River valley and further afield in southern Minnesota have been attributed to Cambria. Without a more accurate understanding of the true nature of Cambria ceramics, and if they are truly represented at a site, the settlement model for the Cambria phase remains murky.

The second issue hinges on the presence of locally made copies of Ramey Incised pottery at Cambria sites, and the large role they have played in site interpretation. Rolled rim vessels make up less than 20 percent of the ceramic assemblage at Cambria, but they are considered the prime evidence for economic interaction with Mississippian groups. In these models, Cambria provides an abundance of resources like maize, wood or buffalo hides either directly or indirectly to the American Bottom in exchange for Mississippian prestige goods. These models view the Cambria Locality largely from afar, as part of a top-down economic model that gives agency only to Cahokia, the monolithic core actively working to generate a steady flow of goods and resources from the hinterlands into the center.

The theoretical framework structuring this analysis eschews an economic inter-regional approach for a bottom-up strategy that seeks to identify variation at the site level and explain culture change through more localized forces. The study of communities has demonstrated the importance of utilizing an appropriate unit of scale for archaeological analysis (Kolb and Snead 1997), which is primarily at the site-level for this project. It also has been recognized that communities have highly varied interaction frequencies and geographical boundaries, and identifying nested levels of integrated communities across a landscape creates a dynamic model for broader social interaction from the bottom-up (Ruby, et al. 2005). Integrating community studies with the concept of the internal frontier shifts the impetus of culture change from outside the region to production of new societies through a variety of internal cultural forces often related to social or political movements.

Project Description

Ceramic attribute and compositional analyses were employed to investigate the ceramic assemblages of the Cambria, Price and Jones sites. Ceramics serve as the defining component for the Cambria phase, rendering it a ceramic culture. Identifying and describing the ceramic assemblages of each site will facilitate comparison between sites and contribute to a better understanding of intersite variation in the Cambria Locality; a concept which has yet to be addressed fully in the literature.

Terminology

The next chapter presents an overview of the Cambria phase because that is how this culture complex primarily has been discussed in the published literature. A *phase*, as defined by Willey and Phillips (1958:22), is perhaps the most fundamental unit of archaeological study; it is a grouping of related cultural traits bounded by limited parameters of time and space. Phases are designed to have tight temporal and geographical control, so they exist both within a localized area and span a relatively brief period of time. However, as it is currently defined, both the temporal and geographical boundaries of the Cambria phase are sprawling.

Outside of Chapter Two, the term *locality* is preferred in this analysis. It is defined as "a geographical space small enough to permit the working assumption of complete cultural homogeneity at any given time" (Willey and Phillips 1958:18), and does not necessarily have a strictly bounded temporal component. This more geographically focused narrative promotes a bottom-up approach by narrowing the scope of Cambria culture to the Cambria Locality, which encompasses a seven-mile stretch of the Minnesota River trench beginning approximately ten miles northwest of Mankato, and including the sizeable habitation sites of Cambria, Price and Jones.

Dissertation Organization

There are six chapters in this dissertation. The introductory chapter establishes the research questions and theoretical orientation of the project. Chapter Two provides an introduction to the Cambria, Price and Jones sites, including a brief history of excavation for each site. A description of the Cambria phase as it is currently known in the published literature is presented in the second chapter. Unpublished supplemental data from the Price and Jones sites are integrated into this discussion to provide a more comprehensive description of the cultural elements making up the Cambria Locality.

Chapter Three discusses extant models of site interpretation, the majority of which are focused on the Cambria site. Top-down models sharing concepts with world-systems and core-periphery theories are eschewed in favor of a more localized approach that integrates the internal frontier (Kopytoff 1987) with a three-tiered set of nesting communities (Ruby, et al. 2005).

Chapter Four describes the methodology for the attribute and compositional analyses, as well as descriptions of the ceramic assemblages of each site. Categories related to vessel morphology, rim and body decoration, and finishing techniques are discussed in detail, setting up the results of the comparative analysis in Chapter Five. Ceramic attribute categories were compared using a combination of chi-square and Fisher tests with Monte Carlo simulated p-values, Non-Symmetric Correspondence Analysis, and ANOVA with Tukey HSD post-hoc tests. The compositional analysis was completed through Principal Component Analysis (PCA), Robust PCA, and ANOVA with Tukey HSD post-hoc tests. The results are discussed in terms of similarities or differences between sites.

The sixth chapter summarizes the results of the attribute and compositional analyses, and situates them in a discussion focused on understanding the Cambria Locality from the bottom-up. Topics related to this discussion include identifying how the sites of the Cambria Locality interact with one another, their occupation chronology, and how they are related to other contemporary cultural groups in the region. This chapter also identifies several topics for future research.

Overall, the results from this analysis will provide valuable data regarding regional cultural dynamics, and on a broader level, will provide a strong foundation for modeling cultural interaction at the overlapping fringes of the Plains and Mississippian traditions.

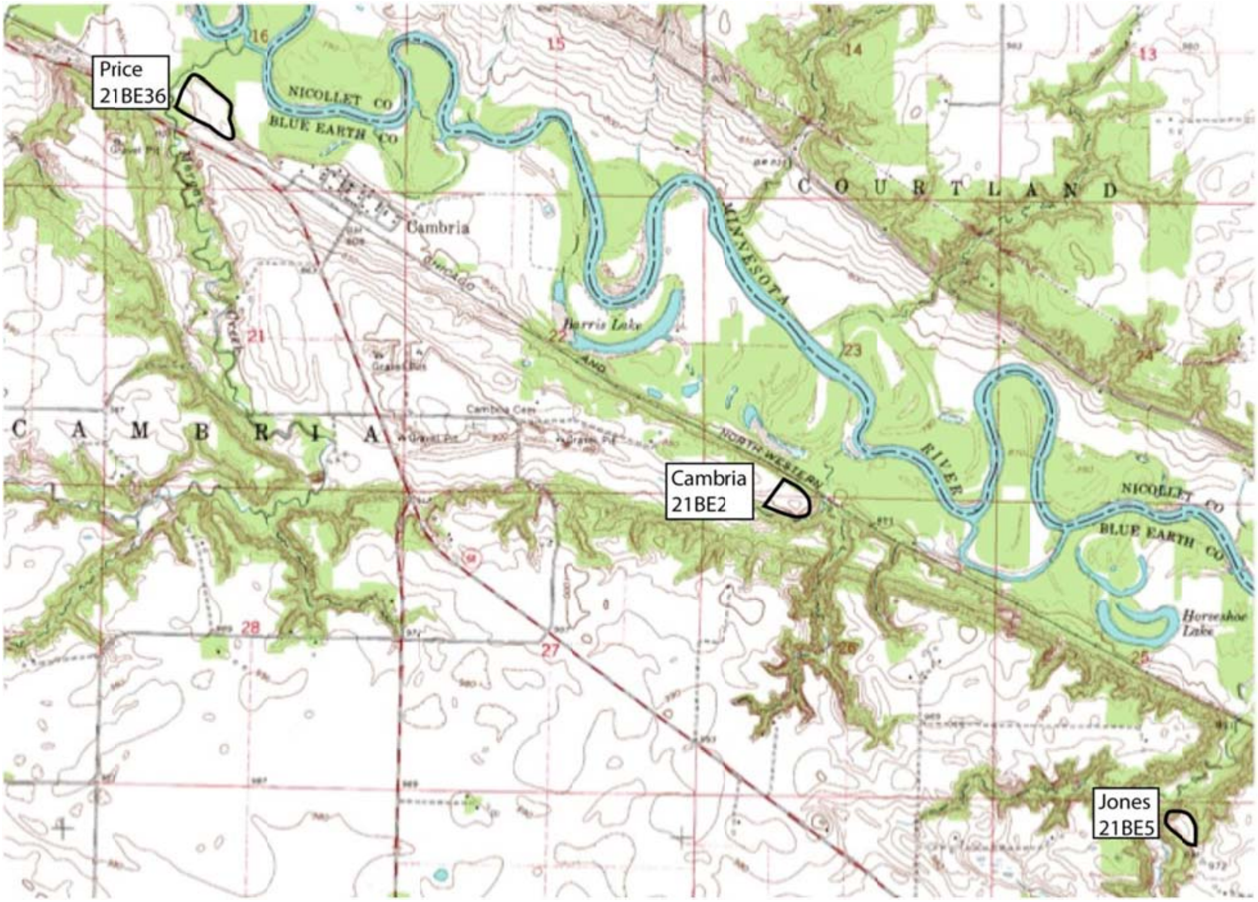

Figure 1.1: Map of Cambria Locality village sites

Chapter 2: The Cambria Locality

The heart of the Cambria Locality consists of three archaeological sites, Cambria (21BE2), Price (21BE36) and Owen D. Jones (21BE5), which are situated along a 7 km (4.3 mi) stretch of the Minnesota River, between modern-day New Ulm and Mankato, Minnesota. The topography of this area is characterized by a broad, flat floodplain approximately 1.3 km (0.8 mi) wide, flanked by upland terraces. All three sites are located on the south side of the river, and adjacent to a small creek.

The primary geographic characteristics of this region, including the Minnesota River Valley, are glacial in origin. The Wisconsin Glaciation was the last glacial period in North America, and occurred approximately 75,0000-10,000 years ago (Ojakangas and Matsch 1982:105). During that time, glacial lobes repeatedly advanced and retreated across much of Minnesota, and by 14,000 years ago the Laurentide Ice Sheet reached its maximum extent (Ojakangas and Matsch 1982:106). Not long after, around 13, 0000 years ago, the climate ameliorated and the glaciers began to melt, altering Minnesota's landscape as they slowly disappeared.

As glacial meltwater pooled behind the ice sheet at the Northern Divide, located near present-day Browns Valley, MN, on the Minnesota-South Dakota border, the largest of the glacial lakes, Lake Agassiz, began to form. Caught between the glacial ice margins still located in the far north, and the higher topography of Big Stone Moraine, a moraine dam located near Browns Valley created by retreating ice in the south, Lake Agassiz ballooned in size. The lake margins were continually in flux and never exceeded 128,000 km^2 (79,535.7 $mi.^2$) at any one time, but the total area of Lake Agassiz eventually covered nearly 320,000 km^2 (198,838.8 $mi.^2$) in parts of northwestern Minnesota, eastern North Dakota, extreme northeastern South Dakota, and a large portion of central Canada. It measured nearly 120 m (393.7 ft.) deep in places (Ojakangas and Matsch 1982:109-110).

Eventually, Lake Agassiz breached the top of Big Stone Moraine, and a torrent of water known as the Glacial River Warren escaped to the southeast, carving the Minnesota River Valley out of the existing bedrock. The fast-moving waters of the outlet river entered the Mississippi River Valley near modern-day Fort Snelling, just south of Minneapolis-St. Paul, and the joining of the two rivers forged the steep bluffs that line the Mississippi River in that region today. By 9,000 years ago, the ice at the northern margin of Lake Agassiz had melted, and the glacial lake began to drain through its northern outlet. As the water level in Lake Agassiz abated below the elevation of the Big Stone Moraine, the River Warren ceased to flow. The current Minnesota River was established in its place, and is underfit, occupying only a small portion of the Minnesota River Valley, which spans up to 8 km (5 mi) wide and 80 m (250 ft.) deep (Waters 1977:310). The Minnesota River today is far from the tumultuous force that was the Glacial River Warren, and is characterized by a gentle flow with very few rapids.

Due to the glacial activity in Minnesota, the soils underlying the Cambria Locality are mostly glacial till. Each site is underlain by one primary soil type, but as a whole, they are surrounded by a patchwork of soils associated with alluvial terraces and steep lands adjacent to rivers. There is a great deal of variability in these soils, which are described as “nearly level to very steep, poorly drained to somewhat excessively drained [and] formed in medium textured and moderately coarse textured alluvial outwash and glacial till” (Paulson 1978:2). More specifically, the Cambria Locality is associated with soils belonging to the Storden-Comfrey-Lomax map unit, although approximately 40 percent of that unit is made up of minor soil types

(Paulson 1978). Loams and clay loams tend to dominate, and also underlie numerous topographical features including floodplains, terraces, and the steep slopes of valley walls.

All of the three sites are located on relatively level terraces, but the Cambria and Jones sites are flanked by steep and irregular slopes of well drained and intricately mixed loamy and sandy soils that are often affected by severe erosion. The adjacent floodplain soils are comprised of nearly level, moderately well to poorly drained loams or silt loams that are subject to frequent flooding. A similar settlement pattern has been recognized for the nearby Blue Earth Oneota village sites, which are also located on well-drained soils developed over unsorted glacial deposits, and near large patches of arable land on the floodplains (Dobbs 1984:199).

The Cambria site is associated with a gently sloping Dickinson fine sandy loam. The soil formed over glacial outwash and is generally situated on higher landforms such as hilltops, knolls, and river terraces. It is well drained and relatively fertile, supporting the growth of native tall grass prairie, and also suitable for crop production. The Jones site is situated atop a Lester loam, which is a well-drained, gently rolling soil that formed over fine to medium textured glacial tills, and primarily occupies hilltops, knolls, and rises. Prehistorically, Lester loam supported mixed deciduous trees and tall grass prairie, but today is used for cropland. The Price site is associated with a Lomax loam, which is described as a nearly level soil associated with high river terraces. The Lomax series formed in moderately coarse, older alluvium, and is a well-drained soil. It is well suited for crops due to its natural high fertility, low risk of flooding, and ease in tilling. Prehistorically, Lomax soils supported a combination of tall grass prairie and mixed deciduous forest (Paulson, et al. 1978).

The Cambria Locality is situated approximately 20 km (12.4 mi) west of the modern prairie-forest boundary in south-central Minnesota. Prairie grasses first invaded Minnesota nearly 9000 years ago, where they covered most of the western and south-central portion of the state (Grimm 1985). The prairie marched northeastward across the state for the next 2000 years before being reinvaded by forest species. As the prairie retreated towards the southwest, the current prairie-forest boundary was established in south-central Minnesota circa 3000-2500 BP (Baker, et al. 2002; Grimm 1983). Paleoenvironmental reconstructions of the region indicate that the prairie-forest boundary area was made up of a scattered patchwork of prairie, oak savanna, and smaller percentages of hardwood forest, which are dominated by northern deciduous forest species (Camill, et al. 2003; Grimm 1983).

The landscape of south-central Minnesota today is quite different than it was a thousand years ago. Approximately 18 million acres of tallgrass prairie once covered the prehistoric landscape of Minnesota, although less than 1 percent of it remains today (Musser, et al. 2009; Tester 1995:132). Also, it is estimated that nearly 7 million acres of wetlands were contained within that native prairie (Tester 1995:162), and that nearly 90 percent of them have been lost (Musser, et al. 2009). Frances J. Marschner (1974) reconstructed Minnesota's original vegetation prior to Euro-American settlement using the original land survey plats and field notes recorded for the state between 1848 and 1907. Historically, six eco-zones existed near the Cambria Locality: dry and wet prairie, big woods, river bottom forest, aspen-oak land, and oak openings and barons. The General Land Office (GLO) survey maps recorded in 1855 demonstrate that during the initial phase of Euro-American settlement the study area was located within a mosaic of prairie and woodland vegetation (Minnesota Geospatial Information Office 2011). Based on both historic and paleoenvironmental data, it is suggested that the Cambria sites were located in an environment characterized by mixed prairie, oak woodlands, and river bottom forests.

The Cambria sites were positioned to take advantage of the numerous and varied resources that could be derived from the nearby prairie, forest, and riverine environments. The northeastern prairie contains more than 1,500 flowering plants, 300 of which can be eaten (Shay 1984:1-2). A complete list of the prairie vegetation found within the Middle Minnesota River basin has not been compiled, but edible prairie plants include weedy species like *Chenopodium* and *Polygonum*, rushes (*Scirpus spp*.), cattails (*Typha latifolia*), prairie turnip (*Psoralea esculenta*), and berries and fruits such as chokecherry (*Prunus Virginia*), strawberry (*Fragaria spp*.) and juneberry (*Amelanchier spp*.) (Kindscher 1987; Shay 1984). Regional forest species like oak (*Quercus spp*.), hazelnut (*Corylus Americana*), and blue beech (*Carpinus Caroliniana*) provide edible nut resources, as well as the proper woodland environment required for growing mushrooms. Forest vegetation is also important for providing wood.

Faunal resources in a mixed prairie-forest environment would have included large mammals like bison, white-tailed deer, elk and black bear. Smaller mammals and birds, both terrestrial and aquatic, such as fox, beaver, muskrat, duck and geese would also have been available. In addition, the nearby Minnesota River would have provided access to riverine resources including fish, mussels, turtles, and reptiles. Two analyses have focused on the floral and faunal remains recovered from the Cambria and Price sites (Scullin 2007; Watrall 1974), and will be discussed in a later section of this chapter.

The remainder of Chapter 2 provides site descriptions and excavation histories for each of the three sites, as well as a detailed description of the Cambria phase ceramic complex as it is currently known in the published literature. Typically, the Cambria, Price and Jones sites have been discussed as part of the Cambria phase, which has been thoroughly detailed in other sources (Anfinson 1997; Gibbon 2000; Johnson 1991). A brief summary of the non-ceramic material culture, subsistence data, settlement patterns, and mortuary program of the Cambria phase is provided, also. In addition, Cambria phase radiocarbon dates are discussed, including seven new assays from the Price and Jones sites. A history and critique of how the Cambria phase has been classified and interpreted is set forth in Chapter 3.

Cambria (21Be2)

The Cambria site was first introduced in the literature in the early 1900s by N. H. Winchell (1911), as part of his compendium on the early Native American inhabitants of Minnesota. "The Village site near Cambria" is described as being littered with artifacts and having a midden up to five feet deep in some areas, leading the author to conclude: "This place is worthy of thorough exploration" (Winchell 1911:742). The Cambria site was the first professionally excavated site in the Minnesota River Valley. Originally known as the Jones Village site after its landowner, William C. Jones, the Cambria site was first excavated by William B. Nickerson in 1913, and again in 1916, under the auspices of the Minnesota Historical Society. Lloyd A. Wilford and the University of Minnesota returned to the site in 1938 and 1941 to conduct a second set of major excavations. The site was last excavated in 1974, when Guy Gibbon and a field school from the University of Minnesota opened up a small area and excavated three pit features. The artifact assemblages from all three of the excavations are currently housed at the Minnesota Historical Society.

The Cambria site is located on an elevated, roughly triangular terrace spur, approximately 25m above the adjacent floodplain of the Minnesota River. The site inhabits an easily defensible position, as it is surrounded on three sides by the steep slopes of a ravine associated with a small, neighboring creek located to the south and east. Nickerson estimated the habitation debris at Cambria covered an area of approximately 12 acres, although more recent information from the

Minnesota Archaeological Site files indicates the current surface scatter is closer to 3.5 acres in size. The actual size of the Cambria site remains unknown, as the western boundary of the site has never been defined accurately. An important, but relatively modern feature of the site, is a north-south fence line that has divided the site in half since at least 1913 (Nickerson 1988:32). The area east of the fence was plowed for a short period of time beginning in the 1860s, but has been in pasture since at least 1885; the area west of the fence was continuously cultivated (Nickerson 1988:7; Wilford 1945a:1). Figure 2.1 is a map of the Cambria site, which includes the fence line running north-south.

Evidently the site was well-known to locals even before Nickerson began his excavations in 1913, most likely due to activities related to the construction of the Chicago and North Western Railroad in the early 1870s, which runs just north of the site (Nickerson 1988:7). Both Nickerson and Wilford reported Cambria was visibly disturbed by pot hunting activities, but Wilford indicated the majority of the affected area was located on the east side of the fence, which he also characterized as the most intensively occupied area of the village (Wilford 1945a:1).

Nickerson focused his initial excavations on the east side of the fence. He began along the steep southeastern border of the site, in an area named Location No. 1, which was described as looking like a “wall” (Nickerson 1988:7). Winchell (1911:742) referred to the same area as an “Earth Circle” on his map of the Cambria site, but provided no further description of the feature. Location No. 1 stretched from the southeastern edge of the landform back toward the high and level center of the site, and was also the largest area opened (Figure 2.2). The excavation block measured approximately 980 ft^2 (91 m^2), and was organized into five adjacent sections, each 30 ft. (9.1m) long and 5 ft. wide (1.5 m), all excavated to a depth between 4 and

6 ft. (1.2 and 1.8 m). No evidence of posts or postholes was uncovered at the “wall”, or anywhere else in Location No. 1, but the entire area was densely filled with village refuse. Additional excavations were completed at this location in 1916.

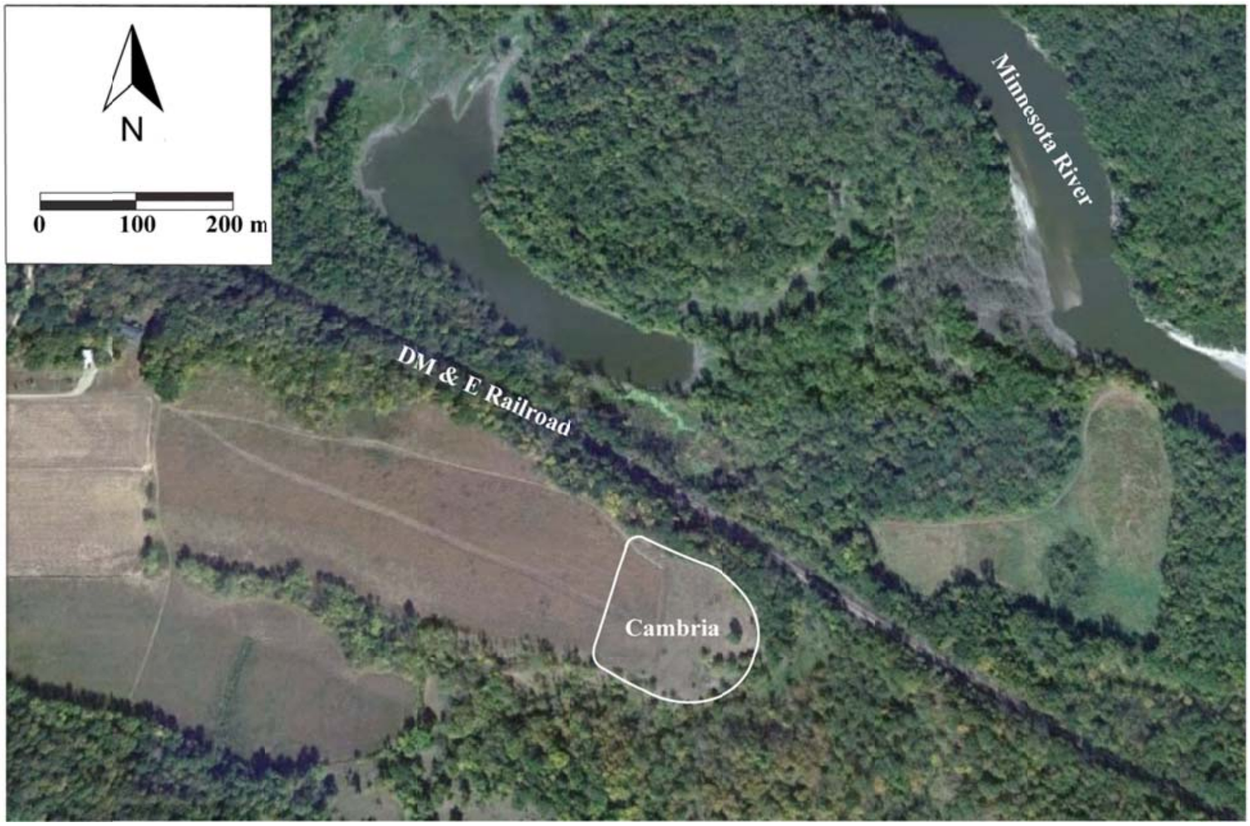

Figure 2.1: Map of the Cambria site

Nickerson also tested the center of the site in 1913, where he put in a series of long, horizontal trenches at Location No. 2. Each trench measured 10-x-5-ft, (3-x-1.5-m) and was 10 ft. (3 m) apart. Different parts of the landform to the north and east were also tested (Loc. 3-5). The 1916 excavations incorporated areas on both sides of the fence, and included additional testing in the center of the site (Loc. 6), and at the productive Location 1. Two areas were investigated in the less disturbed western part of the site (Loc. 7 and 9), but the western boundary of the village remained undefined. The majority of test trenches at Cambria were described as having pit features and cultural material characterized as “the usual village rubbish” (Nickerson 1988:13). Nickerson’s excavations at Cambria were relatively brief, but very productive. In an approximate total of six weeks over three years, he opened up more than 2,500 square feet (232.3 m^2) of the site, and recovered thousands of ceramic, lithic, bone, and shell artifacts.

In August of 1938, Wilford placed several test trenches in the pasture east of the fence in order to determine the extent of disturbance in the main part of the village. Unfortunately, he did not record or map the sizes and locations of those test trenches. Although he concluded the eastern half of the site was “too disturbed to permit of stratigraphic study”, he was suitably impressed by the volume and variety of artifacts yielded by the test excavations (Wilford 1945:1). Wilford returned to Cambria in 1941, and this time focused his data collection west of the fence line, in an area thought to be much less disturbed (Figure 2.2). A large excavation block measuring 50 ft. (15.2 m) by 20 ft. (6.1 m) was opened up and excavated in 8 in (20.3 cm) levels. Approximately 1000 ft^2 (92.9 m^2) of the Cambria site was excavated, and 11,193 potsherds, lithics and animal bones were recovered. The excavations in the western part of the site yielded a lesser density of cultural materials leading Wilford to conclude that his most recent excavations were located at the western margin of the village, and that the main occupation area was most likely situated in the southeast corner of the landform.

The most recent work at Cambria occurred in 1974, when Guy Gibbon and Orrin Shane, from the University of Minnesota and the Science Museum of Minnesota, respectively, conducted limited testing in order to obtain material for radiocarbon dating (Shane 1980). At least three test pits were excavated at the east end of the field (Gibbon, personal communication), and the charcoal recovered from them represents the only two radiocarbon dates ever run for the

Cambria site. Aside from information related to the radiocarbon assays, the rest of the data from the 1974 investigations remains unpublished.

The primary features identified at Cambria were large storage pits and scattered ash beds, both of which yielded numerous artifacts. The pits primarily were bell-shaped, although some had vertical walls and flat bottoms, with an average depth from three to six feet (0.9-1.8 m) (Wilford 1945a:3). Many of the pits were clustered together, overlying and intersecting one another, demonstrating that the same areas had been dug into and used multiple times. An additional feature of many pits was a thick layer of ash located near the pit surface, which suggested to Wilford that their final usage might have been as fire hearths. Numerous pits and associated ash deposits are superimposed at Cambria, indicating the site was occupied quite intensively, and for an extended period of time.

Both Nickerson and Wilford mentioned the ubiquity of the ash beds at Cambria, but very little was actually written about them. Wilford (1945a:5-6) simply noted their association with the ash-filled storage pits, and assumed they were part of the same fire hearth features. Nickerson (1988:20) primarily mapped and documented the locations of ash beds in his site report, but also indicated that several of the larger ash beds might have been associated with the living floors of structures. No posts or postholes have been identified at Cambria in any of the excavations, which has made the positive identification of both structures and fortifications very difficult. Similarly, the lack of evidence for central hearth features or semi-subterranean house floors has also made the identification of structures quite problematic. Nickerson tentatively identified one house floor in Location No. 1, the main occupation area of the site, apparently based on the dense arrangement of ash, storage pits and food remains in the area. He also identified two more possible house floors in the central part of the village, at Location Nos. 6 and 7.

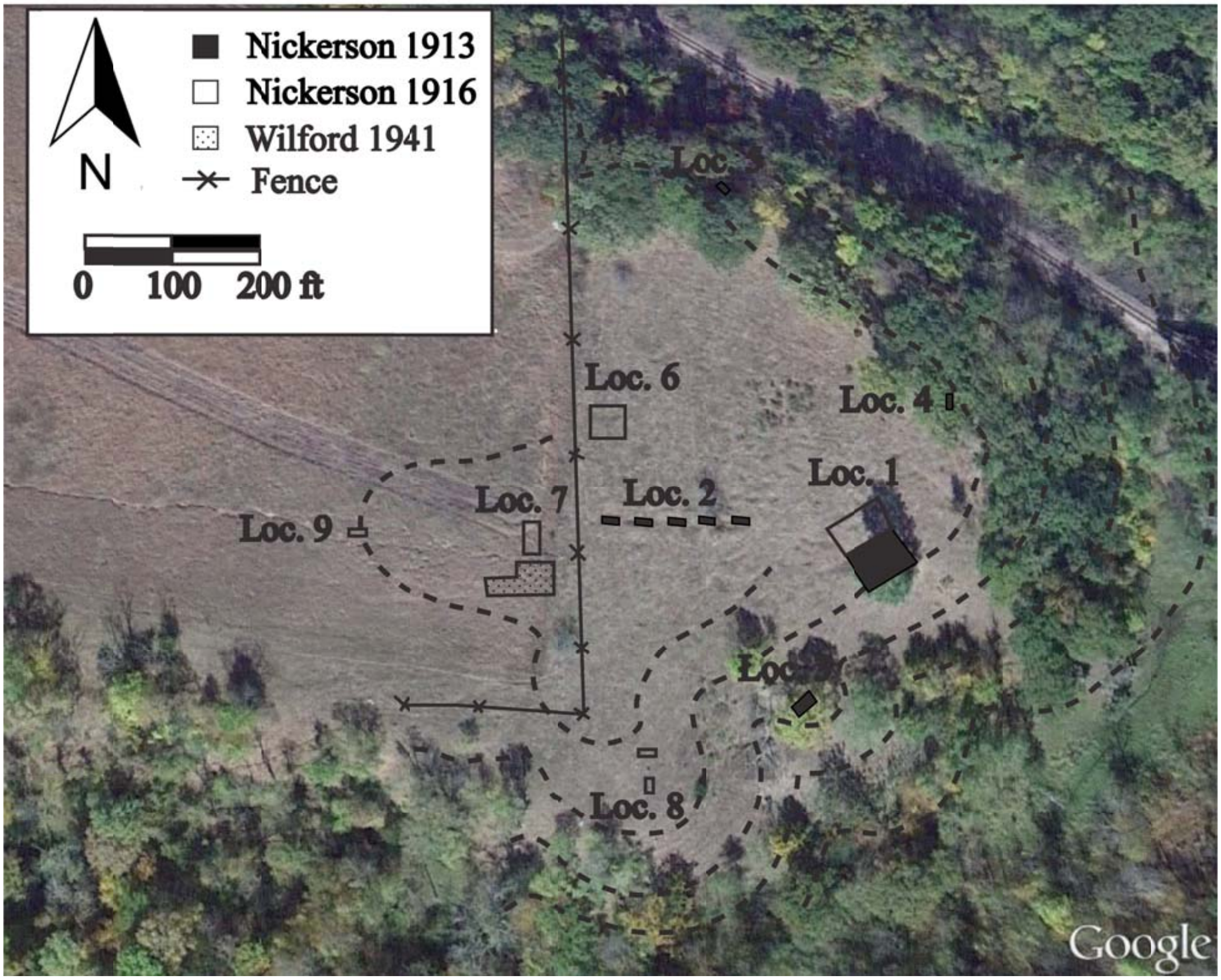

Figure 2.2: Map of major excavations at Cambria

Price (21Be36)

Evidently, the location of the Price site was already known in the early 1900s. Nickerson (1988:6) noted that a site similar to Cambria was located upstream, and approximately one-half mile west of the modern-day town of Cambria. However, the site was not named or given an official state site number until 1976. Michael Scullin and Mankato State University first excavated the Price site in the mid-1970s, and again in the early 1990s, as part of the university's summer field school program. The materials recovered from those excavations are housed at Minnesota State University, Mankato.

The Price site is located approximately 4 km (2.5 mi) northwest of Cambria, on a low terrace situated just above the Minnesota River floodplain (Figure 2.3). Morgan Creek delineates the western border of the site, and the Dakota, Minnesota & Eastern (DM & E) railroad line forms the site's southern boundary. The Price site is approximately 9 acres in size, and primarily centered in a cultivated field. The main habitation area of the site is located in the northwest corner of the field, nearest to Morgan Creek. Two probable mounds were located 100-200 m southwest of the primary habitation area, in the center of the site, based on its currently defined boundaries (Nickerson 1988:25; Scullin 2007:87). The mounds were nearly leveled by close to one hundred years of constant cultivation, and were completely destroyed in 1998 by construction and borrow activities related to the replacement of a railroad bridge over Morgan Creek. A portion of the Price site has been owned by either DM & E or the Chicago & North Western Railroad since the 1880s, and limited archaeological testing of the site within the railroad corridor has demonstrated that it is highly disturbed in that area (Terrell 2009). The northwest corner of the terrace, where the primary occupation area is located, was not affected by railroad construction activities. However, the site sustained nearly 100 years of cultivation, as well as additional damage wrought by the frequent surface collecting of locals (The Minnesota Archaeological Site File, Office of the State Archaeologist).

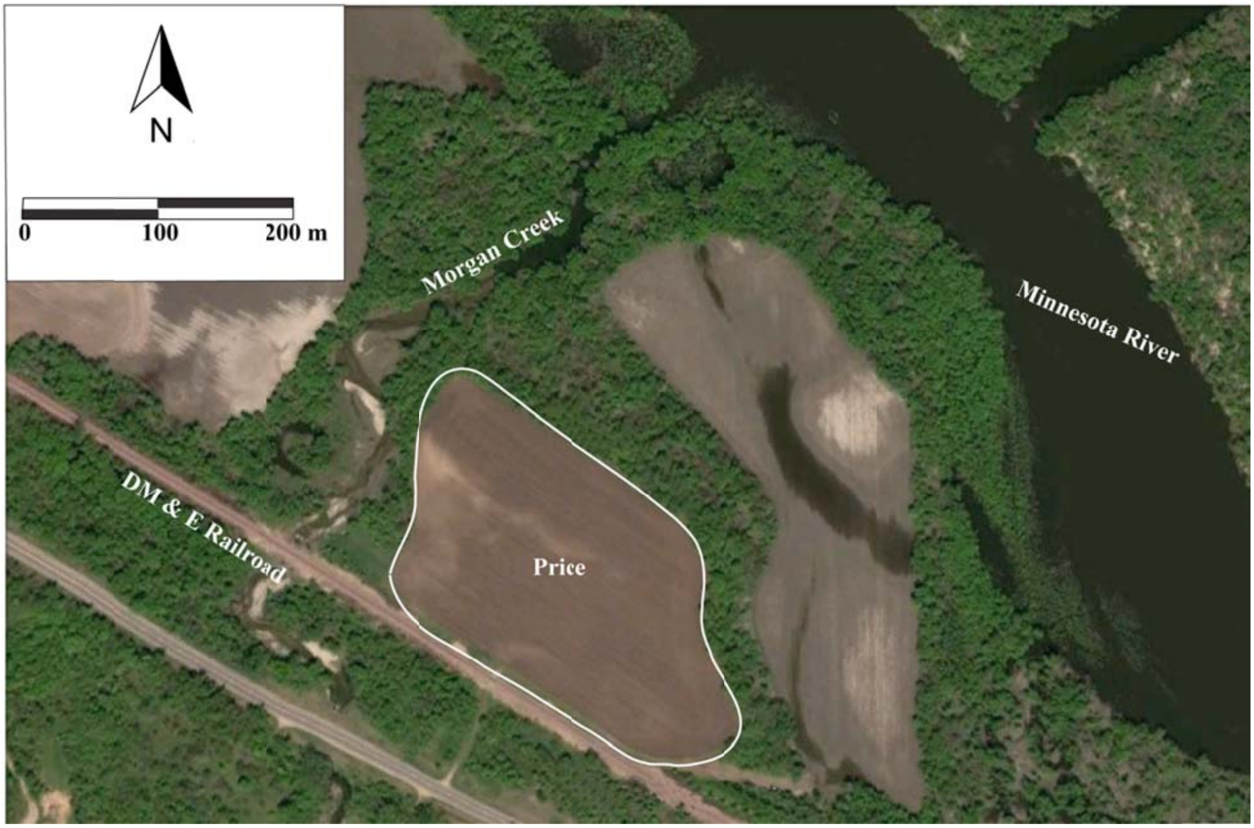

Figure 2.3: Map of the Price Site

The Price site was excavated in the summers of 1974 and 1975, and again in the summers of 1991 and 1992. The primary habitation area of the site was quite small, approximately two acres in size, and was the main focus of all four field schools, although other areas of the site were sampled. In sum, over 400 m^2 and at least 25 large, bell-shaped storage pits and one stone-lined hearth feature were excavated (Figure 2.4). The overwhelming majority of features at the Price site were deep, bell-shaped storage pits averaging over 100 cm in depth. The amount of cultural material recovered varied from pit to pit, but overall many ceramic and lithic artifacts were found, as was faunal material. However, tools and beads fashioned from bone and shell were quite rare. In contrast to the Cambria site, no ash beds and only one hearth feature were identified within the living area at Price, and none of the features overlapped. The lack of superimposed pit features suggests the site was occupied for a considerably shorter period of time than the Cambria site.

The hearth feature was located north of the mounds, and approximately 150 m east of the main occupation area, adjacent to the northern edge of the field. The hearth was lined with large, fire-cracked granitic cobbles, ranging from 10-15 cm in diameter. Evidence of use was in the form of abundant ash, but no other cultural material was recovered from the feature fill. Scullin (2000) posits the stone-lined pit may have been used to roast maize.

In 1975, both of the probable mounds were tested. The larger mound, located approximately 55 m northeast of the access road, was described as a circular, flat-topped mound measuring 15 m in diameter and 1 m high. The smaller mound was located approximately 60 m northeast of the larger mound, and situated roughly in the center of the terrace. This mound had been plowed nearly flat, and was virtually undetectable on the ground surface in 1974 (Scullin 2000). Winchell (1911) did not identify any mounds in the area of the Price site in his exhaustive survey of mounds and earthworks in the state of Minnesota, but the larger central mound is quite visible in a 1938 aerial photo of the Price site (Figure 2.5).

The larger mound was transected by a trench measuring 16-x-0.75-m, and a dark A horizon soil was identified that became increasingly thicker towards the center of the mound. Very few artifacts were recovered from the test trench, only a small cluster of fire-cracked rock and one flake (Scullin 1998). The smaller mound was tested via probing with a post-hole digger. Similar to the first mound, a thickened dark A horizon was also present, but no cultural material was recovered (Scullin 2000). Scullin never clearly identified the mounds as cultural constructions, which has led to some confusion in the literature (Arzigian and Stevenson

2003:350). However, it seems clear in both his published and unpublished manuscripts that he believes that mounds were of aboriginal construction.

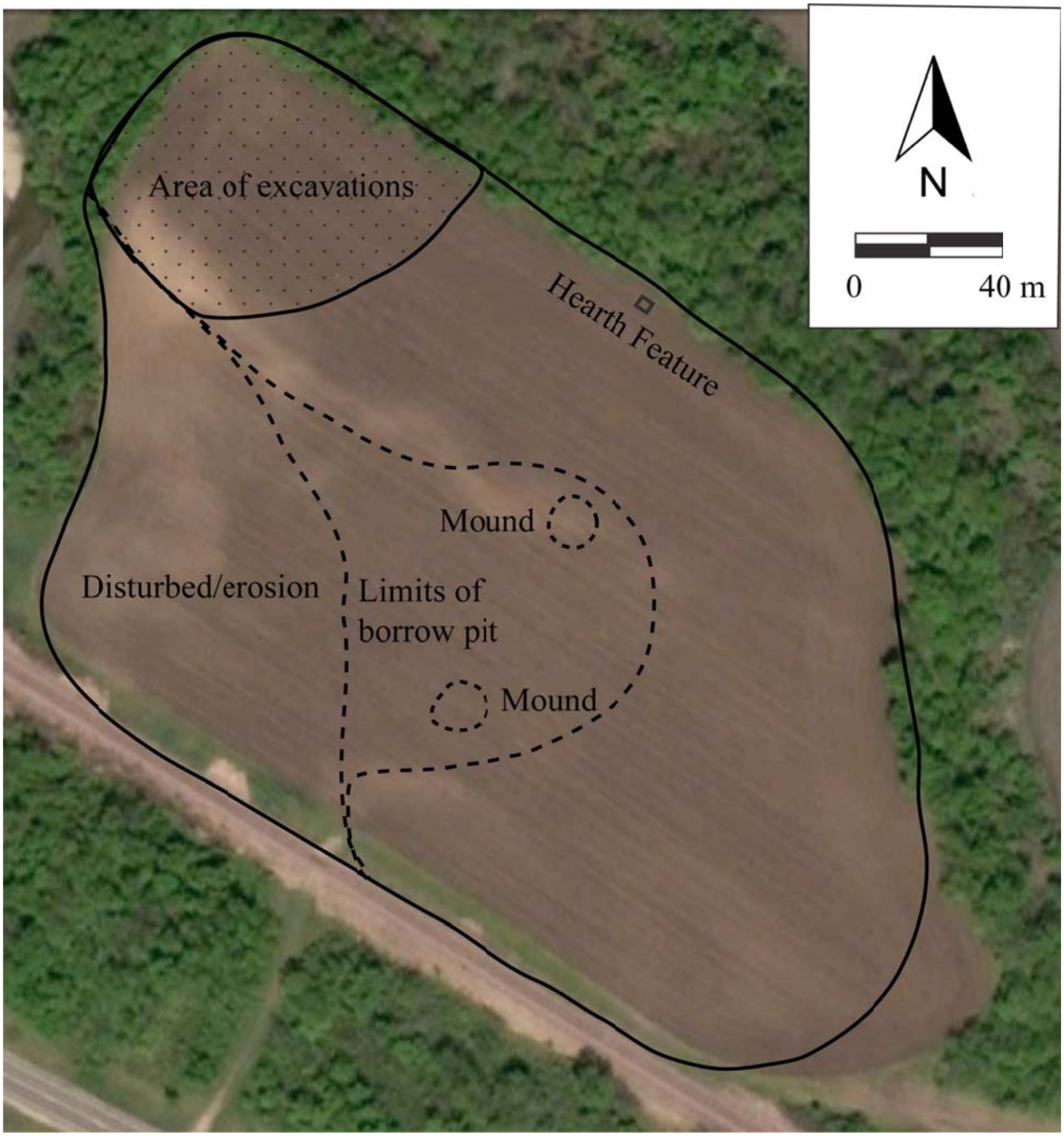

Figure 2.4: Excavation map of Price site

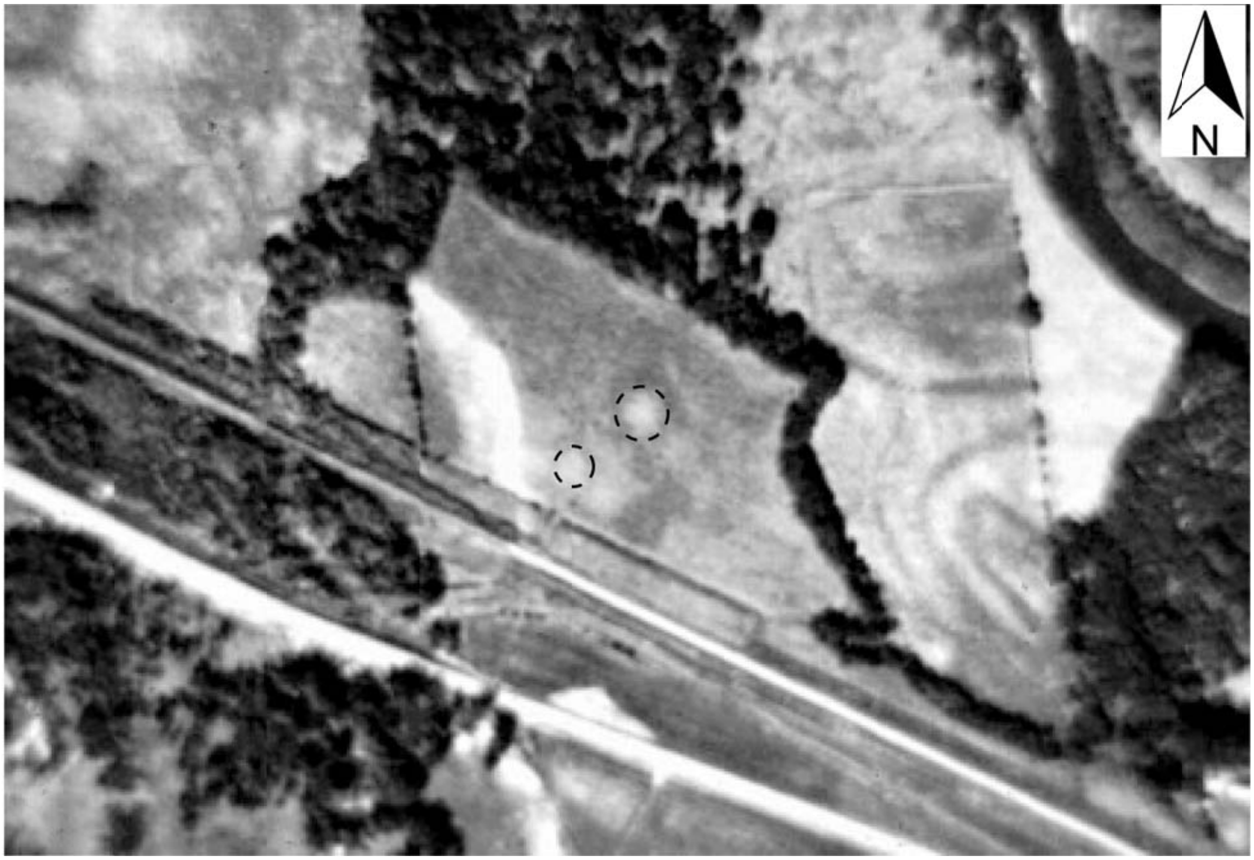

Figure 2.5: A 1938 aerial view of the Price Site with mounds visible in center of terrace. Photograph courtesy of M. Scullin

Jones (21Be5)

In addition to the Cambria site, Wilford (1946) also conducted excavations at the Owen D. Jones site in 1941. The Jones site is roughly 3.5 acres in size, and located approximately 3 km (1.9 mi) southeast of Cambria, on a triangular shaped promontory almost entirely surrounded by steep ravines (Figure 2.6). The site is situated in a very defensible position, nearly 30 m (98.4 ft.) above the base of the ravines, and is connected to a larger landform at the same elevation via a narrow strip of earth that stretches toward the southeast. The Jones site is geographically unique amongst the Cambria Locality sites for two reasons. One, it is the only site not located on the river terraces directly flanking the southern boundary of the Minnesota River Valley; instead, it is located roughly one-half kilometer south of the terrace border on an erosional draw. Two, in addition to overlooking the junction of two streams, the Jones site is associated with two springs. Wilford (1946) reported that an independent spring existed in the eastern ravine, and a permanent spring fed stream was located in the western ravine.

The site remained unknown until 1937, when it was initially plowed. Four years later, Wilford put in two test trenches where the artifacts were most numerous: one along the west side of the site, measuring 30-x-10-ft (9.1-x-3-m) and the other in the northeast corner, measuring 20-x-30-ft (6.1-x-9.1-m). The excavations uncovered three large storage pits, each approximately three feet (91 cm) in diameter, and ranging from 1.5- 3 ft. (46- 91 cm) deep. One pit feature was identified in the west trench, and its contents included ash and the broken remains of a single, large pottery vessel at the bottom. Two pit features were identified in the northeast trench. The first pit contained very little cultural material, while the bottom of the second pit contained a cluster of 17 large rocks with a mixture of charcoal and ash. In sum, Wilford excavated approximately 80 m^2 of the Jones site, and recovered 347 sherds, which he identified as being similar to the pottery from Cambria. He also recovered 14 stone tools, including chipped projectile points, scrapers and knives, and ground stone abraders made from sandstone. It is unclear if Wilford collected any chipped stone flakes or pieces of bone from the Jones site, but none are mentioned. Based on the similarities in artifact types and site location and layout, Wilford (1946) classified the Owen D. Jones site as part of the Cambria Focus. The artifacts from Wilford's excavation are currently curated at the Minnesota Historical Society.

More than fifty years later, Michael Scullin (1998) and Mankato State University returned to the Jones site to conduct two summer field schools. In 1993, a series of test trenches and excavation units were set in along the central axis and southern quarter of the site

(Figure 2.7). The soil in the southern part of the site was characterized as dark, compact, and very difficult to excavate. In 1995, test trenches and large excavation blocks were placed near the northern site boundary. The northern excavation block may have partially overlapped Wilford's trenches, as Scullin's excavation notes indicate that two possible features had square corners, and were most likely part of Wilford's excavation trenches. Overall, it is estimated that just under 700 m^2 of the Jones site was excavated. The artifacts from these excavations are currently housed at the University of Minnesota, Mankato.

The main occupation of the site appears to have been located on the highest part of the site, in the east-central and northern portions of the cultivated field (Scullin 1998). Scullin noted the soil in this part of the site was different from the dark loam located in the southern quarter; it was light brown and very easy to dig. According to field notes and site maps, 32 features were excavated, most of which were large, "U"-shaped storage pits. There were some differences in feature shape and size between Price and Jones. Storage pits at the Jones site generally were not as deep, averaging an approximate depth of 80 cm, and were "U"-shaped, with a flat bottom and straight sides. Features at the Price site, and, based on Nickerson's descriptions, also at Cambria, were more bell-shaped, and had an average depth of more than 100 cm. The Jones site also produced the only two postmolds ever identified at any site in the Cambria Locality, although they do not appear to be associated with an identifiable structure.

The artifacts recovered from Jones are similar in type and style to those from Cambria and Price. However, Scullin recovered much less faunal refuse at Jones, and his records indicate that overall the storage pits are about one-fourth the size of those at Price. A dearth of artifacts at the Jones site was also noted by Wilford (1946:5): "The paucity of material and the shallowness of the cultural layer indicate a very short occupation, or an intermittent use of the site never very intensive". Scullin also noted that the density of artifacts, both on the surface and in the ground, was much lower at the Jones site, at least compared to his findings from Price.

Figure 2.6: Map of the Jones site

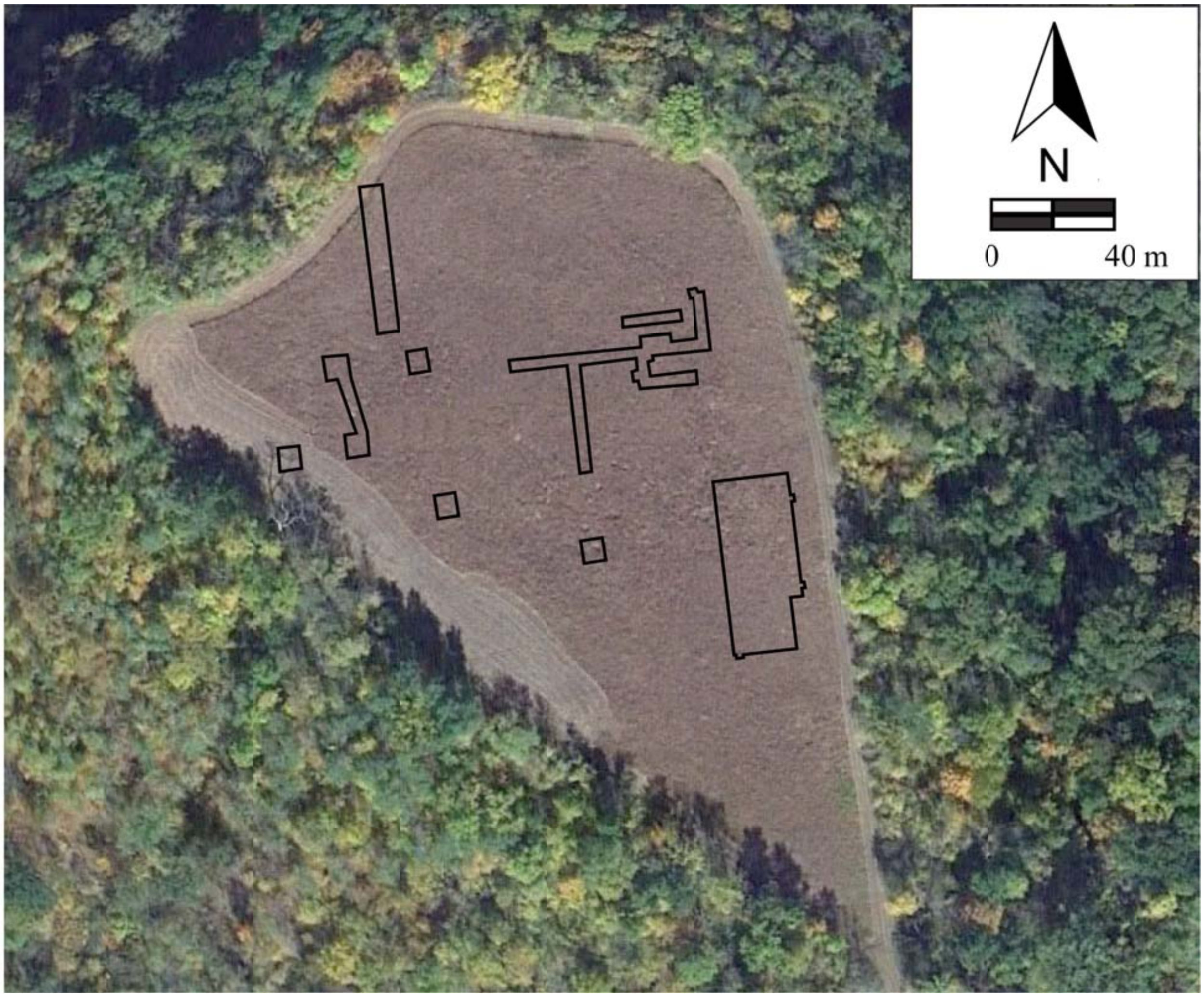

Figure 2.7: Reconstructed excavation map of the Jones site

The Cambria Phase

The majority of published literature focused on the cultural context of Cambria and associated sites typically discuss them collectively as the Cambria phase. Scott Anfinson (1997) synthesized much of the known literature related to Plains Village sites in southern Minnesota into a comprehensive description of the Cambria phase. The following pages summarize what is currently known about the Cambria phase, emphasizing technology, settlement, trade, burial practices, and chronology with an emphasis on the Cambria, Price and Jones sites.

Ceramics

As noted previously, the Cambria ceramic complex is primarily known through two published analyses from the Cambria site (Knudson 1967; Wilford 1945b). The majority of all Cambria vessels are grit-tempered, globular jars with defined shoulders, a constricted neck, and a smooth exterior surface. Initially described by Wilford (1945b:36-38), the Cambria site ceramics were divided into three broad types based on differences in rim form: Cambria Type A, B, and C. Cambria Type A dominated Wilford's assemblage at 82 percent of the total, and was characterized by a vertical or out-flared rim ranging from 10-40 mm in height, and a squared-off lip. Shoulder decoration was not uncommon, and occurred in the form of several incised geometric motifs, mostly parallel horizontal lines, chevrons, zig-zag lines, and horizontal bands with short vertical lines or punctate fringe appended below them. Curvilinear design elements were rarely associated with Type A. Rim decoration was present on the lip, as well as on both the exterior and interior rim margins, in the form of punctates, vertical or oblique incised lines, cross-hatching, tool and twisted cord impressions, and as a combination thereof. Wilford (1945b:39) characterized Cambria Type A pottery as "[occupying] a position somewhat intermediate between Great Oasis and Oneota", noting that in temper and surface finish Type A resembled Great Oasis ceramics, but the design field and motif patterns were more characteristic of Oneota pottery.

Cambria Type B was distinguished by an "S"-curved rim form, where the rim and neck shape were characterized by a concave interior, followed by a convex exterior neck line. Rim and lip decoration was common, either in the form of narrow trailed lines or twisted cord impressions. Similarly, shoulders were decorated with trailed or twisted cord impressed chevron motifs. Cambria Type B ceramics were in the extreme minority at Cambria, and make up only 4 percent of the total. Wilford posited a connection with the Plains based on the presence of western traits in Type B pottery, particularly the "S"-shaped rim form combined with twisted cord and trailed line decoration.

Wilford believed Cambria Type C ceramics were strongly influenced by Middle Mississippian culture, and he specifically linked the pottery type to similar shell-tempered vessels identified at the northern hinterland site of Aztalan in southeastern Wisconsin. Cambria Type C vessels are described as having "angular shoulders, rolled rims, surface polish, and scroll designs", all of which are Mississippian pottery attributes (Wilford 1945b:39). However, the majority of Type C vessels were grit-tempered, and the overall lack of shell-tempering at Cambria demonstrated to Wilford (1945b:39) that Cambria Type C was not a Middle Mississippian pottery, and that Cambria itself was not a Middle Mississippian site. Although Wilford did not consider Cambria to be a Mississippian site, he did believe it was strongly influenced by Mississippian culture; as such, he became the first of many archaeologists to privilege the perceived Mississippian influences at Cambria over the "less pronounced" Plains influences from the west (Wilford 1945b:40).

The only other published ceramic analysis for the Cambria phase was completed by Ruth Ann Knudson (1967), who examined all the available ceramic material from both the Nickerson and Wilford excavations of the Cambria site. Utilizing the type-variety approach, five separate types and ten different varieties were identified primarily based on rim form and rim decoration. Knudson emphasized the blended nature of the Cambria ceramic complex by identifying its primary characteristics as stemming from the Plains, specifically the Middle Missouri Tradition, but also integrating strong influences from both the Woodland and Mississippian traditions.

Knudson defined two everted rim types that were synonymous with Wilford's Cambria Type A. *Linden Everted Rim* is the dominant type, representing 64.4 percent of the total vessel count (Knudson 1967:260), while *Mankato Incised* was recovered in smaller numbers, representing only 12.3 percent of the total vessel count (Knudson 1967:266). As its name suggests, the Linden Everted type is characterized by a low to medium everted rim, and like the bulk of Cambria pottery, is grit-tempered with a smooth vessel surface (Figure 2.7). Knudson did not record a shoulder form for Linden Everted. Most Linden vessels are plain, but jar rims and lips may be incised, or decorated with tool, finger and cord impressions. Additional broad trailing, mostly in the form of linear and chevron motifs, may adorn the vessel shoulders. Knudson also includes curvilinear motifs on Linden Everted rim pots, but the current analysis does not bear this out. Loop handles attached at the lip and riveted to the shoulder, some decorated with vertical trailed lines, are not uncommon. Linden Everted Rim was subdivided into the following four varieties: Linden, Nicollet, Cottonwood, and Searles.

The Linden varieties are categorized based on the kind and location of decoration around the lip, rim and neck of the vessel. The lip and rim decoration techniques are fairly limited in number, but quite varied in combination. Lip decoration mainly includes crosshatching and parallel vertical or diagonal line incising. Less common lip decoration includes twisted cord impressions, dentate stamping, and punctation. Decoration at the lip and exterior rim margin primarily is made up of wide finger impressions, tool impressions in a variety of shapes, and fingernail impressions. Less frequent forms of exterior rim decoration include twisted cord impressions, incised lines, and crosshatching. The interior rim is also decorated at Cambria, albeit much less frequently than the lip or exterior rim margin. The majority of interior lips are decorated with tool impressions resembling narrow, rectangular notches, as well as twisted cord impressions and parallel horizontal incised lines. The neck, located below the exterior rim margin, also may be decorated. The most prevalent neck decoration is incised parallel lines, but twisted cord impressions are common, as well.

Figure 2.8: Cambria Ceramic Type Linden Everted

(A-B) C-161 and C-195, Linden Linden (Knudson) or Type A (Wilford);
(C-D) C-18 and C-90, Linden Nicollet (Knudson) or Type A (Wilford);
(E-F) C-14 exterior and interior, Linden Searles (Knudson) or Type A (Wilford)

Figure 2.9: Cambria Ceramic Types Linden Everted and Mankato Incised

(A-B) C-156 exterior/interior, Linden Cottonwood (Knudson) or Type A (Wilford);
(C-D) C-163 exterior and interior, Linden Cottonwood (Knudson) or Type A (Wilford);
(E-F) P-42 and C-04, Mankato Incised Mankato (Knudson) or Type A (Wilford)

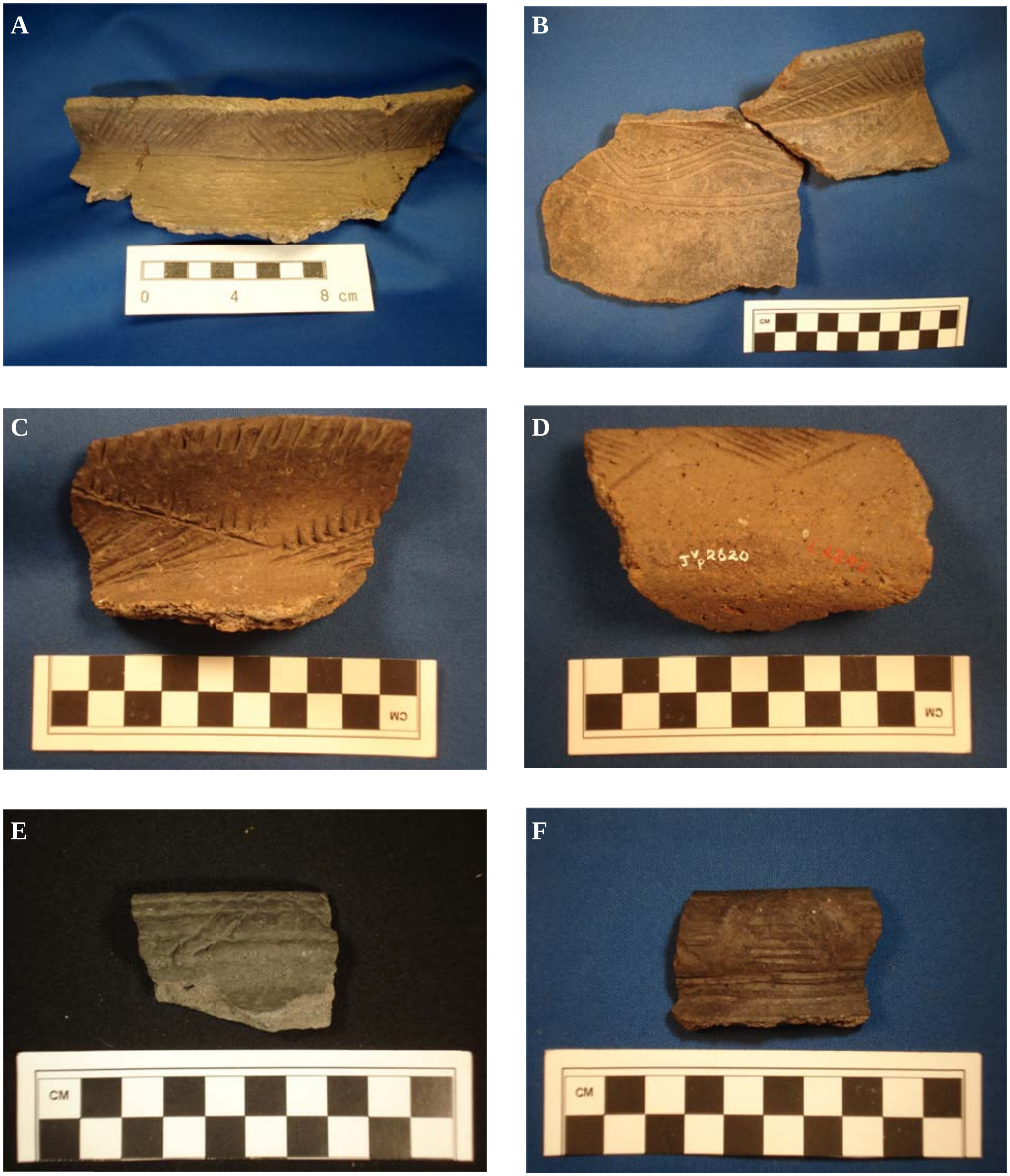

Figure 2.10: Cambria Ceramic Types Mankato Incised and Judson Composite

(A-B) C-112 and C-104, Mankato Incised Butternut (Knudson) or Wilford Type A;
(C-D) C-160 exterior and interior, Mankato Incised Butternut (Knudson) or Type A (Wilford);
(E-F) C-84 and C-89, Judson Judson (Knudson) or Type B (Wilford)

Linden Linden is the most prevalent type at the Cambria site, representing 28.3 percent of the total vessels (Knudson 1967:260). It is primarily characterized by plain, undecorated rims and lips. Shoulders also may be plain, or decorated with broad trailed designs that are often deep enough to leave a cameo impression on the interior of the vessel body. *Linden Nicollet* vessels are identified by decoration on the lip, lip margin, or immediate exterior rim. One particular lip treatment is very distinctive, and involves the insertion of a sharp instrument into the center of the lip, where it creates an “incised punctate”, which looks like a very deep, tubular slash (Knudson 1967:261). The lip slashes are always accompanied by wide tool or finger impressions at the exterior lip/rim margin. Other lip treatments for *Linden Nicollet* are less diagnostic and include crosshatching, incised vertical or diagonal lines, twisted cord impressions, and one example of dentate stamping. Decoration on the lip/rim margin is limited to finger, fingernail, or tool impressions. *Linden Searles* is primarily characterized by decoration on the interior rim, although sometimes the lip is also decorated. The exterior rim margin and neck are always plain. Tool impressed, vertical notches are the most prevalent interior rim decoration, but twisted cord impressions are also popular. When the lips are decorated, they are usually marked with short, parallel vertical or diagonal lines spanning the lip surface. The type *Linden Cottonwood* is decorated on both the lip and exterior neck, although sometimes either, or both, of the exterior and interior rim margins are decorated, also. The most prevalent form of neck decoration for this type-variety is narrow trailed lines. The most popular neck motifs are parallel horizontal lines, sometimes with the addition of diagonal parallel lines that form alternating chevron patterns. Lips, and the exterior and interior rim margins if decorated, are adorned with various combinations of the techniques described previously. The Linden Everted type-varieties are illustrated in Figures 2.7 and 2.8.

Table 2.1: Ceramic Type Frequencies by Site

Pottery Type	Cambria		Price	
	Number of Vessels	Percentage of Vessels	Number of Vessels	Percentage of Vessels
Linden Everted	**551**	**64.4**	**87**	**70.2**
Linden Linden	242	28.3	36	29.0
Linden Nicollet	236	27.6	51	41.1
Linden Searles	42	4.9	0	0
Linden Cottonwood	31	3.6	0	0
Mankato Incised	**105**	**12.3**	**13**	**10.5**
Mankato Mankato	57	6.7	2	1.6
Mankato Butternut	48	5.6	11	8.9
Rolled Rim	**125**	**14.6**	**23**	**18.5**
Powell Plain	7	0.8	1	0.8
Ramey Broad Trailed	65	7.6	22	17.7
Unassigned	53	6.2	0	0
Judson Composite	**74**	**8.7**	**1**	**0.8**
Judson Judson	25	2.9	0	0
Judson South Bend	22	2.6	0	0
Judson Lincoln	27	3.2	0	0
Unassigned			1	0.8
Total	**855**	**100**	**124**	**100**

Mankato Incised vessels are similar to the Linden Everted varieties in that both types have outflaring rims. However, Mankato Incised vessels are characterized by medium to high everted rims with predominately flat lips and gently rounded shoulders. Some vessels are appended with plain loop handles, but those are rare. Rims, lips and shoulders are almost always decorated. Shoulder decoration primarily occurs as incised or narrowly trailed lines forming a series of triangle motifs with border punctates or vertical "fringed" lines. Mankato and Butternut represent the two varieties of this type, and are distinguished primarily by the presence of neck decoration.

The type *Mankato Mankato* demonstrates decoration on both the interior and exterior lip/rim margins (Figure 2.8). Typically, the interior rim is decorated by a series of diagonal incised lines, although twisted cord impressions are identified, as well. Exterior lip/rim margin decoration is characterized by finger, tool, or cord impressions. *Mankato Butternut* vessels are complexly adorned, with decoration placed on the lip, both the interior and exterior rim margin, and on the exterior neck. The neck decoration is practically diagnostic, and forms a unique motif comprised of parallel, left-leaning incised diagonal lines, intermittently crossed with three parallel, right-leaning diagonal incised lines (Figure 2.8). In combination with the unique neck incising, interior rims are decorated with incised diagonal lines, and the exterior lip/rim margin is marked with fingernail or tool impressions.

Judson Composite is the minority ware at Cambria, representing only 8.7 percent of the total vessel count (Knudson 1967:257). The characteristic features of this type are a shallow "S"-shaped rim with a flattened lip and sharp angled shoulders, a smooth vessel surface, and small loop handles. Rim decoration is common, and mostly occurs as twisted cord impressions or incised lines covering the entire exterior rim in combinations of parallel lines and chevrons. Shoulder decoration is primarily broad trailed, and often deep enough to exhibit a cameo effect on the interior. Shoulder designs are mainly parallel lines or nested chevron motifs. This type corresponds to Wilford's Cambria Type B, but Knudson subdivided it into the following varieties: Judson, South Bend, and Lincoln.

Vessels are categorized as *Judson Judson* if they have twisted cord impressed or incised exterior rim decoration. For the most part, both decorative techniques are used to express the same motif, a series of parallel horizontal lines superimposed with chevrons (Figure 2.9). Knudson reports that a small number of Judson Judson rims also may have lip, and/or interior and exterior rim margin decoration. *Judson South Bend* vessels are differentiated by the placement of decoration on the lip and exterior lip or rim margin.

Figure 2.11: Cambria Ceramic Types Judson Composite and Powell Plain/Ramey Broad Trailed

(A) C-344, Judson South Bend (Knudson) or Wilford Type B;
(B-C) C-101, exterior and interior, Judson Lincoln (Knudson) or Type B (Wilford);
(D) C-115, Powell Plain (Knudson) or Type C (Wilford);
(E-F) C-110 and C-223, Ramey Broad Trailed (Knudson) or Type C (Wilford)

Crosshatching and vertical or diagonal incised lines mainly adorn the lip surface, while finger and fingernail impressions are described as the primary decoration for the exterior lip/rim margin (Figure 2.10). The type *Judson Lincoln* lacks any rim decoration, and may have plain or trailed shoulder decoration (Figure 2.10).

The rolled rim types at Cambria were designated as *Powell Plain* and *Ramey Broad Trailed* (Knudson 1967:255-257). Powell Plain and Ramey Incised are shell-tempered ceramic types originally defined by Griffin (1949) for the Cahokia site in central-west Illinois. They are companion wares differentiated only by the presence of incised shoulder motifs on Ramey Incised pottery (Figure 2.9). Knudson (1967:253) differentiates between “incised” and “broad trailed” based on a comparison between line width and depth, and also an overall consideration of line width. An incised line is deeper than it is wide, and rarely larger than 1 mm in width. A trailed line is wider than it is deep, and a broad trailed line is more than 3 mm wide. Although Knudson kept the Powell Plain type for Cambria, her choice to create a new type for Cambria’s decorated rolled rim vessels highlights a minor, but important distinction between the two types. The incising technique practiced at Cahokia was executed on partially dry or leather-hard clay, and usually produced grooves that were narrower in width. The Cambria technique of trailing typically involved impressing the pot while the clay was still wet, which created a cameo effect on the interior of the vessel. The type Ramey Broad Trailed emphasizes the perceived wider and deeper nature of the trailed motifs at Cambria. Knudson specified the Cambria variant of Ramey Broad Trailed as the New Ulm variety, but did not specify a local variant for Powell Plain.

Together the rolled rim types represent nearly 15 percent of the total vessel count. The overwhelming majority of these vessels are grit-tempered, but the presence of five shell-tempered and one grog-tempered vessel was recorded. Relatively few Powell Plain vessels, only seven, were recovered from Cambria, and all of them grit-tempered. This is substantially less than the 65 Ramey Broad Trailed vessels recorded from the site. All of the Ramey Broad Trailed vessels have rolled rims, but some divergent traits were noted, such as decorated rims, rounded shoulders, and smoothed-over cordmarking. In addition, 26 percent of the Ramey Broad Trailed vessels have handles, primarily of the small loop variety.

The pottery assemblages from the Price and Jones sites are very similar to Cambria wares, although not all of the ceramic types and varieties identified by Knudson were recovered from the less intensively occupied sites. Based on data from the 1974-1975 excavations, examples of all five major ceramic types, but only six varieties, were identified in the Price ceramic assemblage. *Linden Nicollet* is the most prevalent type at Price, and composes just over 40 percent of the assemblage, while *Linden Linden* rims makes up nearly 30 percent of the vessel total. The Mankato Incised varieties *Mankato Butternut* and *Mankato Mankato* make up approximately 2 percent and 10 percent of the Price site assemblage, respectively. Nearly 20 percent of the vessel total is comprised of rolled rim varieties, the majority of which are *Ramey Broad Trailed* (n= 22). There is only one example each of both *Powell Plain* and the "S"-rim type *Judson Composite* at the Price site (Table 2.1).

The ceramic assemblage from the Jones site was not formally reported in accordance with Knudson's typology, but Scullin does indicate that both Linden Nicollet and Mankato Incised rims were identified. Furthermore, he noted that no Ramey-like or "S"-rim vessels were recovered from his excavations at Jones. However, there is reportedly one example of a rolled rim from the Jones site in the private collection of the landowner's daughter (Scullin 1998).

As a whole, the Cambria ceramic assemblage is strikingly diverse. Cambria potters demonstrated a remarkably open-minded approach to ceramic production by incorporating vessel morphology, manufacturing technology, decorative techniques, design fields, and motifs from three different cultural traditions. Late Woodland influences can be seen in the cordmarked rims and bodies of a small number of vessels, and certain rim and body decorations like dentate stamping, punctates, and cordwrapped stick, knotted cord, and twisted cord impressions. However, twisted cord impressions may also be an influence from the west, as they are often associated with the small minority of "S"-rim vessels recovered from Cambria. Knudson (1967:278) argues that Cambria shared its closest ceramic affinities with the Over Focus sites, centered on the James River in southeastern South Dakota, and Anderson Phase sites of the Initial Middle Missouri, located along the Missouri River in central South Dakota. Scullin (2000:4) posits a different cultural source for some varieties of Cambria ware, particularly noting that the decorated varieties of Linden Everted Rim compare favorably with Sanford ware from the Mill Creek cultures in northwestern Iowa, but that Linden Linden, the undecorated ware, is "uniquely Cambrian". Any connection with Mill Creek is downplayed by Knudson (1967:279) who states: "The similarities between Cambria and Mill Creek appear to indicate common origins and/or influences, but with definitely divergent ceramic developments". These connections will be explored further in Chapters three and five, where cultural interpretation and data analysis are discussed.

Knudson (1967:255) suggests that Cambria emerged as a late prehistoric local development whose potters not only integrated various aspects of foreign cultural influence into their own vessels, but also actively played with exotic vogues to produce a ceramic assemblage that was unique and wholly their own. The amalgamation of several different cultural traditions illustrates the high degree of variation represented within Cambria pottery. One of the goals of this research is to document the full range of variation present within the entire Cambria ceramic complex, and attempt to understand that variation in terms of inter-site cultural interaction.

Lithics

Only one comprehensive lithic analysis has been completed for the Cambria phase, and it also was focused on the Cambria site. For his master's thesis, Charles Watrall (1968a, 1968b) examined all of the non-ceramic materials (lithics, bone, shell and copper) excavated by Nickerson and Wilford. This section focuses solely on the lithic materials, but the bone, shell, and copper artifacts will be discussed briefly in a later portion of the chapter.

The overwhelming majority of both the stone tools and lithic debris from Cambria are made from chert. Approximately 94 percent of the chipped stone tool assemblage, and 87 percent of the lithic debitage are comprised of "oolitic", "non-oolitic", and "fine gray oolitic" chert (Watrall 1968a:30). The first two examples most likely refer to the highly variable Prairie du Chien Chert, which is found in both oolitic and non-oolitic varieties (Bakken 1997). In southern Minnesota, Prairie du Chien Chert was widely utilized across all time periods, except during the Paleoindian (Bakken 2011). It is most easily identified in its oolitic form, while the non-oolitic variety is less common, and also more difficult to identify. Prairie du Chien oolitic chert originates within the Shakopee-Oneota Formation of the Prairie du Chien Group, which outcrops along the lower Minnesota River, in portions of south central and southeastern Minnesota, and in redistributed glacial till (Bakken 1997; Wilford 1945a). Watrall (1968b:6) believed the majority of the oolitic chert was imported from quarry sites in southeastern Minnesota or adjacent states, although both Wilford (1945) and Scullin (2000) identified it as a local resource. In fact, Scullin notes the presence of several oolitic chert workshops near Mankato.

The "fine gray non-oolitic" chert described by Watrall probably refers to Grand Meadow Chert, which was identified by Scullin (2000) at the Price site. Only 6 percent of the chipped stone artifacts and 1 percent of the debitage from Cambria are made from Grand Meadow Chert, which is finely textured, and light to medium gray in color. The natural range of Grand Meadow Chert is more restricted than that of Prairie du Chien, and the material itself is primarily known from a quarry site (21MW8) located approximately 129 km (80 mi) southeast of the Cambria locale, just northwest of the town of Grand Meadow in southeastern Minnesota (Trow 1981).

A minority of the chipped stone artifacts from Cambria were manufactured from materials other than chert, such as brown chalcedony, quartz, quartzite, and jasper. One flake made from obsidian was identified, as well. The brown chalcedony was identified as Knife River Flint by Watrall (1968b:5), which originates in quarries along the Knife River in west central North Dakota, and is located more than 650 km (404 mi) northwest of the Cambria locale. At the Cambria site, less than one percent of the chipped stone artifacts were made from Knife River Flint. Watrall (1968b:6) also identified a small amount of "Silver Hill Sugar Quartzite", a white to tan-colored quartzite more popularly known today as Hixton Silicified Sandstone. The largest and most intensively used prehistoric quarry site for the material is Silver Mound in Jackson County, WI, located approximately 320 km (200 mi) east of the Cambria Locale. If the artifacts manufactured from Grand Meadow Chert, Knife River Flint, and Hixton Silicified Sandstone are combined, they comprise just under ten percent of the total chipped stone tool assemblage, and nearly five percent of the lithic debris, including the obsidian flake. Clearly, exotic lithic materials are in the extreme minority at the Cambria site.

Data for the chipped stone and groundstone tool assemblages of the Cambria phase is taken primarily from the Cambria and Price sites (Anfinson 1997; Scullin 2000; Watrall 1968a), as there is very little information compiled or published for the Jones site. However, it should be noted that the Price site data only represents the 1974-75 field seasons. There is diversity in the kinds of chipped stone tools recovered from Cambria and Price, and the assemblage includes projectile points, scrapers, blades/knives, perforators/drills, gravers, spokeshaves, and chipped stone celts or hoes. At Cambria, there are 152 relatively complete projectile points identified as small, triangular points characteristic of the Late Prehistoric period in the Upper Midwest. The majority of these either lacked notches or were side-notched, and were manufactured from locally available oolitic and non-oolitic chert. In addition, there are three examples of small, triangular, tri-notched or "Cahokia" points fashioned from local oolitic chert. There are also several non-triangular points from Cambria, including one corner-notched, one single shouldered, and one Turkey Tail specimen, all made from either oolitic or non-oolitic chert. Only a small minority of the projectile points, approximately five percent, was produced from probable extra-local lithic materials (Watrall 1968a:13).

Based on information provided by Scullin, Anfinson (1997:101) reports that 49 projectile points were excavated from the Price site, and that the majority of them are small, triangular, side-notched points made from locally available oolitic chert. There is a moderately higher percentage of projectile points at the Price site (37%) when compared to Cambria (24%). At the Jones site, a total of seven projectile points were recovered by Wilford (1946:4), who described three of them as triangular, presumably without notches, and one as triangular and side-notched. The remaining three points were missing their bases, and could not be classified. Based on the available data, tri-notched "Cahokia" points appear to be absent from both the Price and Jones sites.

There are 401 scrapers from Cambria, making it the largest category of chipped stone tools at the site. They are varied in shape, and include end, side, and ovoid forms. Based on frequency tabulations comparing scrapers with triangular projectile points, Hall (1962:121-122) observed that the frequency of scrapers on archaeology sites throughout the Upper Midwest increases later in time and towards the Plains area. The scraper/projectile point index at Cambria is 263.8, which is relatively high, even amongst Oneota sites at the La Crosse Locality (McQuinn 2010:Table 2). As a point of comparison, the scraper index from the Mississippian site of Aztalan in southeastern Wisconsin is much lower at 3.8.

The remainder of the chipped stone tool assemblage from Cambria is comprised of 99 blades/knives, 20 perforators/drills, 14 gravers, and two chipped stone celts or hoes. Exotic lithic materials were used in slightly higher proportions for these categories when compared to projectile points, and represent 11.6 percent of the total assemblage. Perforators/ drills and gravers represent the tool categories made from the highest percentage of Grand Meadow, Knife River Flint, and Hixton Silicified Sandstone at 17.6 percent, followed by blades (13.1%), and scrapers (10.7%). However, the overwhelming majority of these artifacts, just over 85 percent, were manufactured from locally available oolitic and non-oolitic chert.

The rest of the chipped stone tool inventory from the Price site includes 47 scrapers, 18 knives, eight spokeshaves, three drills, and two gravers. The scraper/ projectile point index at the Price site is 95.9, quite a bit lower when compared to Cambria. Scullin (2000) notes the majority of scrapers from Price were made from exotic cherts, primarily Grand Meadow, but also Knife River Flint; however, he does not quantify the data. The picture of the lithic assemblage from the Jones is the least complete, as no formal analysis has yet been undertaken for the University of Mankato excavations. However, Scullin (1998) notes that “a full spectrum of tools" from the Jones was observed in the private collection of the landowner, including projectile points and cutting tools manufactured from local oolitic chert. Celts, bifaces, abraders and scrapers were identified also. Wilford (1946) reported that seven projectile points were recovered from the Jones site, four of them triangular in shape. He also recovered eight scrapers, six knives, and three abraders, but did not identify the raw lithic materials for any of the chipped stone tools.

The ground and pecked stone tool industry includes grooved mauls, celts, hoes, anvil stones, hammerstones, manos, and sandstone abraders. With the exception of the abraders, the majority of the groundstone tools were manufactured primarily from locally available granite, basalt, and quartzite (Watrall 1968a). At all three sites, the abraders are the most numerous type of groundstone artifact. They all are made from local ferruginous sandstone that varied in both color and texture, from red to white and very fine to very coarse. Nickerson (1988:8) identified an exposure of similar sandstone was located just below the Cambria site, in the creek bed at the south base of the hill, but questioned whether the cut had been opened too recently to have been quarried in antiquity. Upham (1888) described a more probable source of exposed sandstone that was located across the Minnesota River near the town of Courtland, approximately four miles to the northwest of Cambria. Watrall (1968a:58) believed the sandstone source may have been associated with the escarpment of Minneopa Falls, located approximately nine miles downriver.

In addition to the chopping, grinding, and shaping implements described above, Scullin (2000) mentions that three paint palettes manufactured from Sioux Quartzite were recovered from the Price site. One of the palettes was placed in an ultrasonic cleaner; the resulting clouded water was subsequently tested and determined to contain iron oxide, or hematite. Moreover, several pieces of ground hematite were identified from Cambria by Watrall (1968a:37), who interpreted them as raw material for pigments. At least two slate paint palettes are known from the Mississippian sites of Bryan and Silvernale, located in the nearby Red Wing Locality (Link 1976).

Bone and Shell Implements

The Cambria site yielded a diverse inventory of tools and objects made from animal bone, antler, and freshwater mussel shell, which Watrall (1974) divided into three use categories: miscellaneous, horticultural, and decorative. The miscellaneous tools include awls, punches, quill flatteners, beamers, projectile points, fishhooks and handles, and were used for a variety of tasks like hunting, fishing, making chipped stone tools, and hide and leather work (Watrall 1968a:40-49). The horticultural tools are primarily made from bison bone, and include numerous examples of scapula hoes, picks and knives. As Watrall (1968a:47-48) notes, the scapula picks may have been used as scrapers or knives, but they also could have been used for digging. The scapula knives are also known as squash knives, which were used only to slice up garden squash (Wilson 1987:106). Most of the objects in the decorative category are made from bone, and include beads, pendants and tubes, some incised with parallel lines or cross-hatching. A few decorative items were modified from shell, and include three pendants and three notched shells. Ornamental objects are not common at Cambria. Overall, there is very little worked shell at Cambria. In addition to the decorative objects, two shell spoons were identified. The modified shell implements were not identified to the species level, but it is assumed they were local as they are all referred to as “river muscle (sic)” (Watrall 1968a:50).

The information provided for the bone and shell tool industries at the Price and Jones sites is much less specific than Cambria, but the overall impression is that both assemblages are less varied. Bison scapula hoes were recovered from both sites; in fact, bison scapula hoes are the only type of bone or shell tool reported from the Jones site (Scullin 1998). Squash knives and quill flatteners were also recovered from Price, as were worked and polished deer mandibles, theorized to have been used for scraping boiled corn from the cob (Scullin 2000). Other tools such as awls, punches, projectile points or fishhooks were not identified from either site. Very few items of adornment were found at Price, and constitute two bone beads, two local mussel shell beads, and one fragment of carved turtle carapace. In addition, one notched shell item at the Price site was identified as *Prunum apicinum*, a Gulf Coast import (Anfinson 1997:102). There is no mention of decorative items recovered from the Jones site.

Subsistence

The majority of subsistence data for the Cambria phase is provided by faunal and floral analyses from the Cambria and Price sites. At Cambria, Watrall (1974) reported that white-tailed deer and bison elements dominated the mammalian assemblage, but that overall, the faunal assemblage was dominated by unidentified species of fish and turtle. Ten separate species of river mussel shell were also identified, and most likely indicate that shellfish were collected as a food source. Due to the early excavation techniques employed by Nickerson and Wilford, the floral data from Cambria is limited. Yet, nearly one and a half liters of charred corn was recovered from inside a large storage pit (Nickerson 1988:101; Watrall 1968a:61), indicating that Cambrians were most likely practicing maize horticulture. The corn was identified as Northern Flint, or Eastern Eight-Rowed Flint (Blake and Cutler 1974).

All subsistence data reported for the Price site is based on the 1974-75 excavations. Orrin Shane’s faunal analysis determined that beaver elements, followed by bison, dog and deer, dominated the mammalian assemblage (Scullin 2007:Figure 7.4). Overall, though, the Price site faunal material indicates a focus on riverine resources including fish, particularly bottom feeders like catfish and bullheads, as well as turtles, and river mussels.

The preservation of floral data afforded by flotation techniques has aided in creating a clearer picture of subsistence patterns for the Price site. Maize was identified as the primary domesticate, followed by *chenopodium*. Very small amounts of cucurbits and sunflower were also present (Scullin 2007:91 [from Shane 1980]). Scullin (2007:92) has identified the maize variety recovered from both the Price and Jones sites as Northern Flint, the same as from Cambria, and suggests that the Cambrian gardens may have been located on the silty soil of the adjacent floodplains. Wild seeds at Price include walnut (*Juglans*), plum (*Prunus*), smooth sumac (*Rhus glabra*) and polygonum. The Cambria and Price subsistence regimes are quite similar, and the faunal assemblages indicate that residents of both sites targeted riverine resources, but also relied upon the deer and bison found more in upland and plains settings. Moreover, the abundance of carbonized corn kernels and the accompanying digging tools indicate that horticulture was practiced at all three sites. However, the proportion and importance of maize horticulture within the Cambria diet remains unknown.

Settlement System

This study is focused on the three largest and most centrally located sites that make up the Cambria phase, but other sites are currently classified as part of the Cambria cultural phase. In practice, the Cambria phase is a ceramic culture, and inclusion within the phase is based on the presence of a generic “Cambria ware”. While many ceramic cultures are differentiated based on the characteristics of a formal typology, the highly varied nature of vessel morphology and decoration at and between sites has prevented an accurate description of what, exactly, Cambria phase ceramics are. Grit-tempered sherds with a smooth surface finish and trailed shoulder decorations characterize this ware grouping more so than defined rim form and decoration, and as a result, Cambria has become a “catch-all” ceramic classification for nearly all grit-tempered, smooth surfaced ceramics found in southwestern Minnesota. As Anfinson notes, “Western Minnesota sites yielding non-Great Oasis Plains village ceramics often are listed as Cambria sites” (Anfinson 1997:96). One result of this dissertation is the identification of specific attributes of a Cambria ceramic complex based on three of the most extensively excavated sites, in order to accurately define what “Cambria” is in terms of Minnesota prehistory.

A settlement pattern for the Cambria Phase was set forth by Elden Johnson (1991:307), who described the following four sites types: 1) large village sites located on Minnesota River terraces, 2) small villages located on the Minnesota River or adjacent tributaries, yet still closely positioned to the larger villages, 3) small sites in upland prairie-lake and riverine settings, and 4) burial sites. In this model, Johnson identifies Cambria as a large village site, and Price and Jones as smaller, secondary villages. The Gillingham site (21YM3), located approximately 110 km (68 mi) upstream from Cambria and on the south bank of the Minnesota River (Figure 2.9), is also classified as a large village site. Anfinson (1997:103), however, believes the Cambria site is a singularity in the region, and due to its large size and the obvious intensity of occupation, he recommends it as the only large village site for the Cambria phase.

Early descriptions of the Gillingham site indicate the village area was partially protected by a ditch enclosure (Winchell 1911:116), making it the only Cambria phase site with a confirmed defensive feature (Wilford 1951:1-2). In addition, Gillingham was associated with a mound group; nine conical mounds were strung out along the bluff edge, overlooking the Minnesota River (Winchell 1911:117). The ceramic assemblage of Gillingham is unique in that in addition to Cambria pottery, there also appears to be a Late Woodland and historic occupation at the site (Wilford 1951:29). Unfortunately, the Gillingham site in its entirety, including all but one mound, was destroyed by road construction and gravel pit operations. The results of a recent re-analysis of the Gillingham ceramics suggest multiple occupations with varied intensities at the site. Cambria pottery is the dominant ware at the site. Middle Woodland ceramics are moderately represented at the site, and the Late Woodland period is weakly represented (Holley and Michlovic 2013:32).

Another small secondary village site included within the Cambria phase is Gautefald (21YM1). This site is the only Cambria phase village site not located along the Minnesota River. It is situated roughly 60 miles northwest of the Cambria Locality on the Yellow Medicine River, at the junction of Spring Creek. Wilford (1953) tested the Gautefald site in 1948, where he recovered both grit and shell-tempered pottery, and a small number of lithic flakes, chipped stone tools and animal bone. No features were identified during excavation. Wilford believed the artifact patterning across the site was not dense enough to indicate a village, and so he interpreted Gautefald as an intermittent campsite for three different cultural components: Late Woodland, Cambria, and Oneota. Smaller vessel sizes at Gautefald are consistent with the interpretation of a briefly occupied site, where smaller groups of people would have eaten together (Holley and Michlovic 2013:31).

At least four new sites with ceramics consistent with Plains Village pottery, some more specifically with Cambria ware, were identified recently in accordance with an archaeological survey undertaken for DM & E Railroad as part of a rehabilitation program to rebuild and upgrade rail line between Winona, MN and Fort Pierre, SD (Terrell 2009). Located approximately 5 km (3 mi) southeast of the Cambria site, 21BE288, 21BE289, 21BE290, 21BE291 share the typical Cambria phase site setting, in that they are all located on the southern terraces of the Minnesota River. No rim sherds were found at either 21BE288 or 21BE289, but several grit-tempered body sherds with smoothed or smoothed-over-cordmarked surfaces were recovered, and deemed consistent with Cambria phase ceramics. At 21BE289, three of the body sherds exhibited linear, parallel trailed lines; a popular motif for Cambria body decoration. Twelve rim sherds were recovered from 21BE290, and included both everted and rolled rim forms. Six everted rims, one with shell temper, were tentatively typed as Linden Linden and Linden Nicollet. Three rolled rims were identified, but not enough of the shoulder was present to determine if the vessels were of the type Powell Plain or Ramey Broad Trailed. Site 21BE290 is unique in that it represents the only known Cambria phase site with rolled rims to be identified outside of the excavated village sites. Body sherds with sharply angled shoulders and linear trailed designs were also present. Only one rim sherd was recovered from 21BE291; it has a tool impressed exterior rim, as well as twisted cord impressed rim decoration, and a smooth vessel surface. It seems to incorporate both Cambria and Late Woodland traits. The body sherds from this site are all grit-tempered, and have either smooth or smoothed-over-cordmarked vessel surfaces. Body decoration is nearly non-existent, and is represented by one incised sherd. Both 21BE288 and 21BE289 were recorded as artifact scatters, while 21BE290 and 21BE291 are interpreted as habitation sites.

Small habitation sites in upland lacustrine and riverine settings have been tied to the Cambria phase through pottery similarities. As noted previously, grit-tempered sherds with a smooth surface finish and trailed shoulder decoration similar to “Cambria ware,” have been found in the upper levels of many of these sites. For the most part, they are scattered throughout southwestern Minnesota and adjacent portions of South Dakota (Anfinson 1997; Ready 1979), but are found also to the east, in the Red Wing locale (Gibbon 1991; Ready 1979), and as far north as Ottertail County in west-central Minnesota (Michlovic 1979).

Mortuary Practices

In the late 1800s, T.H. Lewis mapped approximately 80 flat-topped, conical mounds in southern Minnesota, which Johnson (1961, 1991) argues are Cambria phase burial sites. A number of these mounds were excavated in Big Stone County near Big Stone Lake, where numerous intact burials were identified, and pottery similar to Cambria types was recovered from the mound fill (Arzigian and Stevenson 2003:342-345). Mound forms in the Cambria region have been interpreted as evidence for Middle Mississippian cultural influence in Minnesota (Johnson 1961:75-77). For example, rectangular platform mounds are an important identifying trait of the Mississippian tradition, while conical burial mounds are Woodland in origin. The presence of flat-topped conical mounds could be an example of local Woodland groups adopting and incorporating Mississippian traits into their own native traditions. Similarly, a diamond-shaped, flat-topped mound was recorded at the Odessa site located on the upper portion of the Minnesota River, but it was never professionally tested, and has since been destroyed (Johnson 1991:313). The mortuary type site for the Cambria phase, the Lewis site (21BE6), is located less than a mile from the Cambria site, and is comprised of one large and four small conical mounds lining the bluffs of the Minnesota River.

Wilford (1956) excavated two of the mounds in this complex. Several primary extended burials were recovered from Lewis Mounds #1, the largest mound in the complex, along with a large flint knife, a few shell-tempered body sherds and one culturally unidentifiable shell-tempered vessel, crudely made. One grit-tempered sherd with a smoothed over cordmarked surface was recovered, also. Lewis Mounds #2 was a small conical mound that yielded no features and little cultural material. Disarticulated human remains in the form of two vertebrae were recovered from the mound fill along with small fragments of mammal bone, turtle carapace, clam shell fragments, one large lithic flake, three shell-tempered body sherds, and numerous grit-tempered sherds, including both rolled and everted rim forms (Arzigian and Stevenson 2003:349).

The relatively high frequency of shell-tempered pottery in Lewis Mounds #1 is curious for a Cambria phase burial site because shell-tempering is not a common trait for the cultural complex (Anfinson 1997:103-104). However, the higher incidence of grit-tempered sherds and rolled rims from Lewis Mounds #2 provides stronger support for a Cambria connection (Arzigian and Stevenson 2003:115). Wilford (1956: 9) interpreted the pottery from Lewis Mounds as “unquestionably Cambria”, further noting that the “strong Cambria component in Mound Two adds weight to the belief that Mound One is indeed a Cambria manifestation”. An attempt was made to include pottery from Lewis Mounds in this analysis, but the cultural items were repatriated under NAGPRA (National Park Service 1999).

Scattered and disarticulated human remains were identified at the Cambria site in non-mortuary contexts (Arzigian and Stevenson 2003:347-348). Nickerson (1988:25) documented fragments of human remains in habitation contexts, particularly pit features. Even though two mounds are associated with the Price site, no burials or human remains were documented from either the Price or Jones sites.

Radiocarbon Dates

There are radiocarbon dates for all three Cambria Locality sites, but the Price and Jones sites are more securely dated than Cambria. Overall, there are 17 radiocarbon dates from the three sites; two dates are from Cambria, seven are from Price, and eight are from the Jones site.

The original dating of the Cambria phase was based on a series of five radiocarbon dates from the Cambria and Price sites (Scullin 2007:Table 7.1; Shane 1980:409). The two original dates from the Cambria site are 815 ± 135 RCYBP and 775 ± 140 RCYBP; when calibrated at the 1-sigma level, the dates range from cal AD 1043-1286 and cal AD 1048-1387, respectively. The three original dates from the Price site are 845 ± 80 RCYBP, 885 ± 80 RCYBP, 1000 ± 80 RCYBP. When calibrated at the 1-sigma level, the dates range from cal AD 1051-1264, cal AD 1043-1218, and cal AD 976-1155. Based on the five original radiocarbon dates, the range of the Cambria phase spans roughly 400 years. The temporal placement of the Cambria phase in the published literature generally ranges anywhere between AD 1000-1300 (Anfinson 1997:96; Knudson 1967:247; Scullin 2007:85; Shane 1980:409), although an earlier emergence for the Cambria phase, around AD 900 or 950, has been suggested (Henning and Toom 2003:Table 5-7; Tiffany 1983:92).

Five additional radiocarbon dates for the Cambria phase were contributed from the Jones site excavations completed in the mid-1990s (Johnson 2007: Table C.2): 700±60 RCYBP, 750 ± 100 RCYBP, 780±100 RCYBP, 870±110 RCYBP, 920±90 RCYBP. When calibrated at the 1-sigma level, the dates range from cal AD 1259-1312, cal AD 1165-1308, cal AD 1154-1298, cal AD 1119-1252, and cal AD1027-1190. When compared to the original assays from the Cambria and Price sites, the temporal placement of the Jones site is a bit more restricted, spanning nearly 300 years. The Jones site dates support the latter portion of the temporal range of the Cambria phase established by the Cambria and Price assays, with a mean range of AD 1145-1272. Scullin (1998) asserts that the Cambria and Price sites were most likely contemporaneous, and that Jones was the last of the three sites to be occupied.

All of these previously reported assays have large standard deviations spanning 60 years or more, and are ineffective for establishing precise occupational histories for Cambria phase sites. All radiocarbon dates reported for the Cambria, Price and Jones sites are listed in Table 2.2, but the following discussion focuses on recent radiocarbon data obtained from the Price and Jones sites, where the standard deviation is 30 years or less. The result is a more accurate and nuanced representation of temporal occupation at the Price and Jones sites in the Cambria Locality.

A total of seven new AMS radiocarbon dates were recently obtained from the Price and Jones sites, funded by Minnesota's Clean Water, Land and Legacy Amendment (Holley and Michlovic 2013:141-143). Samples from the Cambria site were considered for analysis, but did not meet the criteria for submission because they were not excavated from feature contexts. All of the dates were run on charcoal samples from known feature contexts, and four of the assays represent two different charcoal samples that were split between two labs, Beta Analytic and Paleo Research Institute. Ron Schirmer from Minnesota State University Mankato provided initial identifications of wood type represented by the charcoal radiocarbon samples.

An attempt was made to correlate the provenience of charcoal samples with specific pottery types, particularly the rolled rim varieties. Four charcoal samples were dated from the Price site; three of them shared the same feature and depth provenience as several Ramey-like, New Ulm Broad Trailed and Linden Everted rims, as well as one Mankato Incised rim sherd. The fourth charcoal sample from the Price site is from a feature that contained pottery, but not at the same depth as the sample. Pottery and provenience information from the Jones site was more difficult to correlate because the provenience data is sparse, and the artifact catalog has not been located. Only one radiocarbon date is from a feature with rim sherds, although it is unclear whether the rim sherds and charcoal sample shared the same provenience in depth. The two remaining dates from the Jones site are from features that contained only body sherds. All reported dates are calibrated and at the one-sigma range.

The first set of recent dates for the Price site are from a split charcoal sample collected from the same feature depth as one Ramey Broad trailed vessel with a scroll motif, one Mankato Incised vessel, and several examples of the type Linden Everted rim. The dates are 720 ± 30 and 825 ± 15 RCYBP, which range from cal AD 1270-1290 and 1210-1250, respectively. The third sample shares its provenience with two rolled rims and one Linden Everted type rim, and is dated to 790 ± 20 RCYBP or cal AD 1220-1260. The last date is 870 ± 30 RCYBP, and spans from cal AD 1150-1220. It is from a feature where the charcoal sample could not be correlated with rim sherds from the same depth. Interestingly, the three Price site feature contexts that were directly associated with rolled rim vessels all date to post-AD 1200.

The three Jones site radiocarbon samples were all taken from feature contexts that could not be directly correlated with specific modal types. The first two dates are from a split charcoal sample, and are similar: 880 ± 30 and 875 ± 30. The first assay ranges from cal AD 1060-1080 and cal AD 1150-1210, while the second spans from cal AD 1160-1210. The third date, 795 ± 20 RCYBP, is a bit later, and ranges from cal AD 1220-1260.

The pooled mean for the seven new dates is 822 ± 8, which has a one-sigma range of cal AD 1220-1260. A total of three dates, two from Price and one from Jones, cluster between cal AD 1210-60, and correspond closely with the pooled mean. A fourth date from the Price site skews a bit later at cal AD 1270-1290. Another three dates, two from Jones and one from Price, cluster from cal AD 1160-1220, and minimally overlap with the range of the pooled mean. The result is a bimodal distribution that may indicate there were at least two successive occupations at both the Price and Jones sites, where an early component corresponds to the first cluster of dates circa AD 1150-1220, and a later component spans from approximately AD 1220-1300. However, one date each from both Price and Jones suggests the possibility that the site locations were initially occupied circa AD 1060.

The temporal difference between the two components is amplified when the dates are examined at the two-sigma range. The pooled mean at the two-sigma range spans from cal AD 1220-1270, which is very similar to the pooled mean at the one-sigma range. The date range of the earlier occupation skews further away from the pooled mean, spanning from cal AD 1040-1220. The temporal range of the later occupation encompasses the pooled mean, but it also shifts earlier in time, stretching from AD 1180-1300. The calibrated two-sigma age ranges for the recent radiocarbon assays are listed in Table 2.2.

Even with the new dates from the Jones and Price sites, the radiocarbon record from the Cambria Locality is sorely lacking. Consequently, chronologies founded on the present suite of dates should be considered provisional. However, if the broad date ranges from the Cambria site are briefly considered at the one-sigma range, it is evident that all three sites were occupied contemporaneously sometime after AD 1150 and until approximately AD 1300. The Price and Jones site dates are tightly grouped circa AD 1150-1300 (Figure 2.11), indicating that Cambria Locality sites are not only restricted in space, but also in time. This data could also suggest that people were fairly mobile within the Locality. The bimodal distribution indicates two possible successive occupations at both the Price and Jones sites, dating from AD 1150-1220 and AD1220-1300. One possibility is that people may have moved away from the Price and Jones sites at least once shortly after AD 1200, perhaps due to surrounding resource stress, and returned to them a short time later. Alternatively, these dates could also represent repetitive yet intermittent use of the two sites over a 150-year time span. If one considers the possibility of an initial occupation prior to AD 1100, the habitation could have recurred over a 250-year period, from AD 1050-1300. The Cambria phase as a unified cultural expression faded from the southern Minnesota landscape by AD 1300.

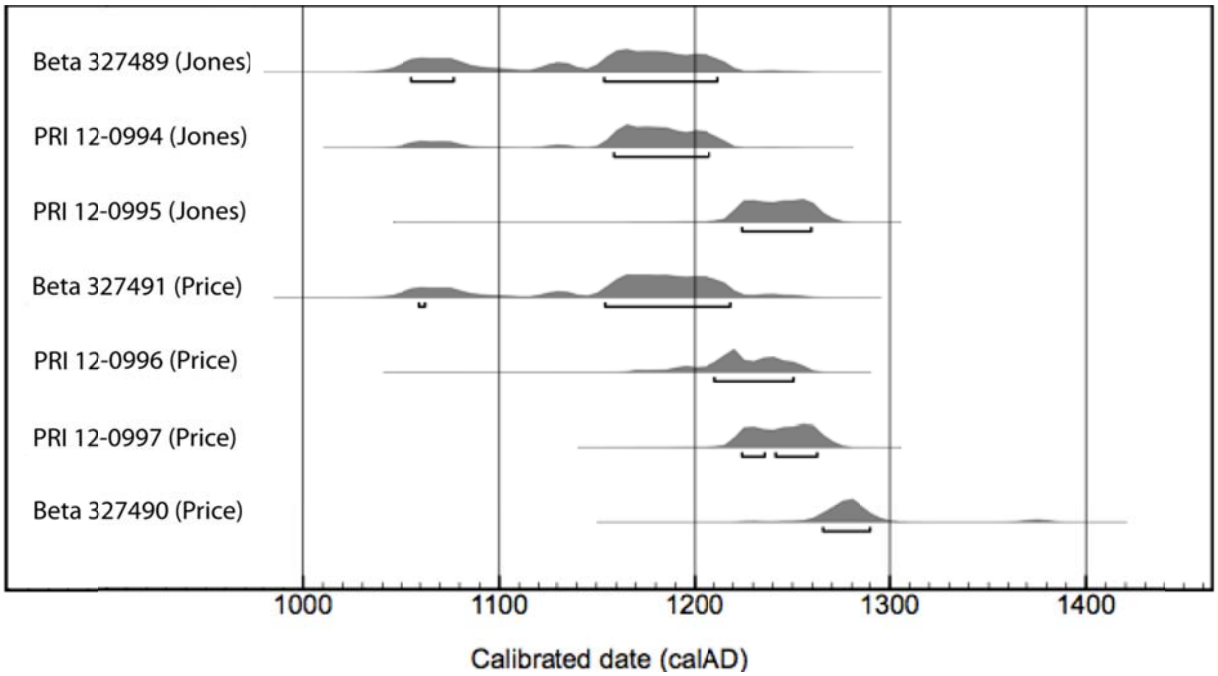

Figure 2.12: Calibrated radiocarbon age ranges (1σ) for the Price and Jones sites.

Note: Calibrations plot generated using OXCAL 4.2. (Bronk Ramey 2009). Calibration data set is Intcal13 (Reimer et al. 2013). Radiocarbon laboratory designations: Beta (Beta Analytic), PRI (Paleo Research Institute).

Table 2.2: Radiocarbon Dates for the Cambria, Price and Jones Sites

Site	**Lab/ Sample No.**	**$^{14}C \pm$ BP**	**Material**	**Cal AD 1σ Ranges**	**Relative Area**	**Cal AD 2σ Ranges**	**Relative Area**	**References**
Cambria (21Be2)	GX-6778	815 ± 135		1043-1102 1118-1286	22 78	975-1411	100	Shane 1981
	GX-6779	775 ± 140		1048-1086 1123-1138 1149-1311 1359-1387	13 4 74 9	994-1425	100	Shane 1981
Price (21Be36)	I-8881	845 ± 80		1051-1082 1129-1133 1151-1264	17 2 81	1029-1279	100	Johnson 2007: Table C.2
	I-8882	885 ± 80		1044-1101 1118-1218	37 63	1018-1271	100	Johnson 2007: Table C.2
	I-8883	1000 ± 80		976-1058 1065-1154	52 48	879-1220	100	Johnson 2007: Table C.2
	Beta 327490 (split with PRI 12-0996)	720 ± 30	Basswood	1267-1288	100	1246-1302 1367-1382	95 5	Holley and Michlovic (2013:142-143)
	PRI 12-0996 (split with 327490)	825 ± 15	*Acer saccharinum* (sugar maple)	1211-1248	100	1183-1259	100	Holley and Michlovic (2013:142-143)
	Beta 327491	870 ± 30	Basswood	1059-1063 1154-1218	3 97	1045-1093 1120-1141 1147-1248	18 5 77	Holley and Michlovic (2013:142-143)
	PRI 12-0997	790 ± 20	*Ostrya virginiana* (ironwood)	1224-1235 1241-1262	33 67	1218-1270	100	Holley and Michlovic (2013:142-143)
Jones (21Be5)	PRI 12-0994 (split with 327489)	875 ± 20	*Ulmus* (elm)	1159-1206	100	1050-1082 1127-1134 1151-1219	13 1 86	Holley and Michlovic (2013:142-143)
	Beta 327489 (split with PRI 12-0994)	880 ± 30	Honey locust	1055-1077 1153-1212	21 79	1042-1105 1117-1221	28 72	Holley and Michlovic (2013:142-143)
	PRI 12-0995	795 ± 20	*Populus* (Cotton Wood)	1224-1237 1241-1259	38 62	1216-1269	100	Holley and Michlovic (2013:142-143)
	Beta 113877	700±60		1259-1312 1358-1387	69 31	1219-1333 1336-1398	68 32	Johnson 2007: Table C.2
	Beta 83237	750±100		1165-1308 1362-1386	89 11	1043-1102 1118-1406	8 92	Johnson 2007: Table C.2

	Beta 083241	780±100		1057-1075 1154-1298 1371-1378	6 91 3	1031-1324 1345-1393	92 8	Johnson 2007: Table C.2
	Beta 083240	870±110		1044-1101 1119-1252	30 70	905-916 967-1303 1365-1383	0.5 99 0.9	Johnson 2007: Table C.2
	Beta 083242	920±90		1027-1190 1199-1201	99 1	970-1273	100	Johnson 2007: Table C.2

Note: Calibrations generated using CALIB 7.1 (Stuiver and Reimer 1993). Calibration data set is Intcal13 (Reimer et al. 2013). Radiocarbon laboratory designations: Beta (Beta Analytic), GX (Geochron), I (Isotopes, Inc.), PRI (Paleo Research Institute).

Chapter 3: Site Interpretation and Theoretical Framework

The sites of the Cambria Locality sites are situated geographically and culturally between the northern and western expressions of the Cahokia Mississippian tradition of the Eastern Woodlands, and the eastern expressions of the Middle Missouri tradition and Plains Village culture. The following chapter explores how the Cambria phase sites have been variously interpreted within the cultural context of both the Mississippian and Middle Missouri traditions. Additional discussions focus on the applicability of a world systems model to the Upper Midwest during the Mississippian period.

Cambria, Cahokia and the Northern Hinterlands

Much of the literature evaluating the cultural context of Cambria ties the site to Cahokia and other northern Mississippian sites. Two basic prime-mover explanations have been utilized to link Cambria with other Mississippian sites to the south and east. The first is migration, which was a popular concept for explaining culture change in the Midwest in the mid-20th century. One of the earliest cultural models for the Cambria site was an origin story that emphasized migration. Griffin (1960, 1967) asserted that a mixed population of local Late Woodland and mobile Mississippian groups established the occupation at Cambria. In this scenario, Cahokia-derived Mississippian groups journeyed westward from Aztalan to south-central Minnesota where they briefly settled down with a portion of the local Late Woodland population at the Cambria site. The end result of this western Mississippian migration was the emergence of the Mill Creek culture in northwest Iowa.

More recent explanatory models have focused on purported politico-economic relationships between Cahokia and other related cultural areas. Accordingly, exchange is the second prime mover. It has been long contended that the exchange of both utilitarian and exotic goods were important factors in fostering the emergence of the Cahokia polity, as well as propelling its expansion into the northern hinterlands (Claflin 1991; Finney and Stoltman 1991; Gibbon 1974, 1991; Hall 1991; Johnson 1991; Kelly 1990, 1991a, b; Peters 1976; Porter 1973; Tiffany 1991, 2003) The extent of the trade networks and degree to which Cahokia dominated them remains a matter of debate.

Gibbon (1974, 1991) argued that many northern hinterland sites, including the Silvernale phase sites at Red Wing, functioned as exchange nodes in a "symbiotic-extractive exchange network" that was centered at Cahokia (Gibbon 1974:133). In this model, Cahokia would have received many resources from central and western Minnesota, such as maize, wood, or large mammal hides and in return gifted magico-religious or high status items, such as Ramey Incised vessels or objects of the Southeastern Ceremonial Complex (SECC). Originally based on the hypothesis that Cahokia may have been the center of the Ramey state, and modeled on the theocratic state of Teotihuacan, Gibbon's theory is characterized by an asymmetrical exchange system where many more goods come into the central core than were sent out.

Expanding on Gibbon's model, Johnson (1991) postulates that the Cambria locale functioned as a production sphere for the Cahokia-centered extractive network, while the Cambria village site operated as the dominant trade node. Employing a bison-for-maize exchange protocol, it is suggested that Cambria phase groups living to the west of the village site hunted and processed bison into dried meat and hides, which they brought to the village sites to exchange for maize and other cultigens. Bison products were then funneled through the network, moving from Cambria to Silvernale phase sites in the Red Wing area, where Mississippian intermediaries directed the meat and hides to Cahokia itself. An important aspect of Johnson's model is that he accounts for inter-regional cultural dynamics. However, the exchange relationship remains asymmetrical, as it is focused primarily on indirect, mostly unidirectional trade, where Cambrian products, via Red Wing, were sent to Cahokia.

An additional aspect of Johnson's (1991:313) model is that he views the Cambria phenomenon as an *in situ* development stemming from local Woodland groups affected by interaction with extra-regional Great Oasis and Middle Mississippian groups. Interestingly, Johnson suggests the Middle Mississippian influence occurred via Mill Creek, which indicates that despite the classification of Cambria and Mill Creek as part of the IMMVe, Johnson really views them as part of the Cahokia machine. Although not explicitly stated, this is a transformation model, where Late Woodland-Mississippian interaction generated the origin of the Middle Missouri Tradition.

Interaction between Cahokia and northern hinterland sites also has been examined via a kinship model. Robert Hall (1991) posited that the distribution of Ramey Incised vessels throughout the upper Midwest represents Cahokia's interaction with regional leaders through adoption ceremonies. In this context, the decorated ware may have been used in rituals to cement fictive kinship relationships between previously unrelated groups. The benefits of such an arrangement might include the expansion of opportunities for trade and marriage partners. An effective aspect of this model is that it is not based solely on economic and trading relationships. Rather, it integrates and embeds several cultural institutions within one another, creating a more dynamic cultural exemplar.

Underlying these exchange and interaction models are basic core/periphery concepts originally outlined by a world-systems approach (Wallerstein 1974). The world-system model was initially constructed to account for the rise of capitalism in Europe, but since then has been modified to apply to many precapitalist and prehistoric cultures in the Eastern Woodlands (Dincauze and Hasenstab 1989; Jeske 1999, 2006; Peregrine 1991, 1992). A central aspect of classic world-systems theory is that the core must dominate the periphery. As a result, a hierarchy is created.

Alternatively, Chase-Dunn and Hall (1991; see also Hall and Chase-Dunn 1993) provide an archaeological vocabulary for a world-systems approach by utilizing the concepts of *core* and *periphery*, instead of *world-system*. They argue there are two different types of core/periphery relationships—differential and hierarchical. Differential core/periphery relationships are defined by "differences in societal size, complexity, technological productivity and internal stratification are related to intersocietal dominance (Chase-Dunn and Hall 1991:19). Hierarchical core/periphery relations are similar to those set forth by Wallerstein, but it is important to note that for Chase-Dunn and Hall not all core/periphery relationships must be hierarchical.

In the Cambria-Cahokia economic models previously discussed, Cahokia, the core, is portrayed as actively seeking out resources the hinterland sites are able to provide, and then controlling those resources through trade interactions. Gibbon describes the nature of his model as symbiotic, but functionally it is asymmetric, and as such, appears to be hierarchical. Hall provides a slightly more symbiotic model, but Cahokia is portrayed as the initiating polity. Chase-Dunn and Hall provide an alternative perspective with the concept of differential, as opposed to hierarchical, core/periphery relationships. This modification allows for the possibility that outlying sites like Cambria were actively looking towards Cahokia and the

Mississippian world for cultural inspiration. It is important to remember that although interaction is a two-way street, it does not necessarily mean both sides are interacting for the same purposes, or achieving the same results. For example, Cambria phase populations were most likely aware of Cahokia and what it represented. Cahokia, on the other hand, may have been aware of resources available in the northwest, but may have been less cognizant of the outlying cultural groups living among those resources.

Tiffany (2003) views the Mississippian influenced wares and decorative styles at Cambria and Mill Creek as evidence for a Stirling Interaction Sphere. He argues that IMMVe sites are part of a regional Stirling horizon, where locally produced ceramic wares demonstrate a mix of morphological, technical and decorative traits borrowed from Stirling phase vogues. At Cambria, Ramey Incised pottery seems to be the ware that most influenced local potters. Holley (1990) has argued that at Red Wing, Cahokia's Ramey Incised vessels are represented in a regionally distinct style. Tiffany (2003) extrapolates on that point by asserting that the rolled rim, Ramey-like vessels found at IMMVe sites are local expressions of the Stirling horizon style. In order to explain how Mississippian influence spread north and westward, Tiffany embraces the symbiotic-extractive network set-up by Gibbon, but tweaks the model by asserting that Mill Creek enjoyed direct contact with Cahokia and other Mississippian sites, including those at Apple River and in the Central Illinois River Valley, while Cambria's Mississippian interaction was primarily regional, and occurred via the Silvernale phase sites at Red Wing. This model is more flexible in that trade relationships between Cahokia and the northwestern hinterlands are portrayed with more equanimity, and it is suggested that different regions may have experienced different interactions with Cahokia or sought out other Mississippian settlements for regional trading purposes.

Jeske (1999) proposes a dynamic regional model for exchange in the prehistoric Midwest that utilizes shifting webs of nested core-periphery relationships cross-cut with direct lines of exchange. In this model, one site can be both core and periphery depending on the nature of exchange with different trading partners. Although this model prioritizes economic interaction, it does not posit a singular top-down approach, but rather seeks to explain multi-regional interaction from the bottom up, by focusing on site interaction at the regional level. The result allows for the consideration of political and symbolic motivations of local decision-makers who engaged with one another on a more restricted geographical scale.

Archaeological Correlates

Stoltman (1991:350-351) described five culture-contact scenarios between the American Bottom and its hinterlands that may be useful in determining the level of Mississippian cultural interaction with the Cambria Locality. Culture Contact Situation I is characterized by the limited presence of artifact traits and architectural features that originated in the American Boom. Powell/Ramey ceramics are always identified at these sites, but other American Bottom traits like wall-trench houses, marine shell beads, and tri-notched projectile points may be present, also. These Mississippian traits appear in the minority at sites demonstrating an overwhelmingly local artifact assemblage. Site residents are interpreted as indigenous people interacting with the American Bottom through direct or indirect exchange. Stoltman identifies the Cambria site with this situation, although he does not specifically discuss if or how locally-made imitation Mississippian vessels might affect the interpretation of this situation.

Culture Contact Situation II is recognized by a combination of American Bottom derived-traits with those of the local Late Woodland culture. However, the Mississippian cultural elements, like platform mound construction and site layout, tend to dominate. In this situation, a portion of the site's population was most likely derived directly from the Mississippian world. The Aztalan site is an example of this culture contact situation. Culture Contact Situation III is similar to Situation II, but the Late Woodland group also is not indigenous to the area, nor does it have any local antecedents. In this model, population movement is assigned to the Late Woodland group, who moved into a new area, and then began to acquire a minority of Mississippian artifacts, technology and ideas through direct trade with the Cahokian world.

Culture Contact Situation IV describes hinterland sites where the local Late Woodland population seems to have been displaced by the sudden arrival of Middle Mississippian groups. As a result, the cultural assemblage is wholly dominated by Mississippian cultural elements and practices. Late Woodland characteristics and customs are evident, but represent only a small minority of the entire cultural assemblage. The Mississippian component at Red Wing and Diamond Bluff are cited as examples of this contact situation.

Culture Contact Situation V is demonstrated by the presence of certain Mississippian ceramic vogues at sites, such as angled shoulders or trailed curvilinear motifs, but true Powell/Ramey vessels and Mississippian iconography were absent. Late Woodland jar forms or grit-tempered pastes often provided the canvas for these Mississippian traits. Stoltman characterized this type of cultural interaction as indirect influence from the American Bottom. A conservative interpretation of the Mississippian traits at Cambria suggests the Cambria complex may be a better fit for this situation.

If the Cambria Locality is to be recognized as Culture Contact Situation I, true Ramey Incised and Powell Plain vessels must be identified at the sites, along with a few other Mississippian traits. If the Cambria Locality is to be categorized as Culture Contact Situation V, there would be no true Mississippian vessels at the site, only local imitations of the

Powell/Ramey series. Rolled rims, angled shoulders, and curvilinear motifs or combinations thereof would appear on grit-tempered pots or with other local pottery forms and decorative techniques. The proposed ceramic analysis has been designed to determine American Bottom-derived Ramey Incised vessels from local copies. It is also sensitive enough to pick up differences in local expression amongst either Ramey Incised or Ramey-like vessels. The most useful categories to identify this difference will probably be temper, vessel morphology, rim form, surface treatment, motif width and depth, motif type, and design field layout.

Stoltman's model is admirable in that it attempts to operationalize different forms of cultural interaction between Cahokia and its hinterlands, but that interaction is still centered at Cahokia and the American Bottom. There is no acknowledgement for the possibility of interaction between hinterland sites, although it is not explicitly ruled out, either. Emerson (1991:230) points out that the connections between the northern hinterland sites and cultural areas often seem stronger than between them and Cahokia. An additional problem with Stoltman's models is that they tend to treat societies as homogeneous, closed systems. In contrast, recent hinterland researchers have begun to explore more dynamic constructs that focus on diversity and transformation as an important driver of culture change. Accordingly, Alt (2006) has discussed the creation of the Cahokia polity in terms of a hybridity concept, Millhouse (2012), reviewing the Mississippian presence in the Apple River Valley sees communities forming as a result of a creolization process that transformed both a local Woodland group and an in-migrating Mississippian contingent in order to produce an entirely new amalgam. Butler's (2015) recent work at the Collins site in northeastern Illinois suggests that this portion of the Mississippian hinterland may have been explored by Mississippian missionaries (see also Pauketat et al 2015). While these new perspectives provide a refreshing view of northern hinterland societal dynamics, the Cambria locality data is at present insufficient to fully address the myriad facets of these theoretical frameworks.

The proposed research has been designed to counter the biases perceived in Cahokia-centric models, and instead highlight and interpret ceramic variation in the Cambria Locality as its own entity. Understanding the variability within the Cambria ceramic complex at the site level will ground a bottom-up approach, and provide a solid foundation for regional hinterland comparisons.

Risk Management Strategies in the Hinterland

An alternative model eschews the Cahokia-centric, top-down approach in favor of an integrative discussion of risk management strategies. Building on recent research focused on the sourcing of various artifacts and minerals at northern hinterland sites, Finney (2000) demonstrates that the procurement-for-Cahokia model is not borne out by the evidence. Instead, he suggests that the quantity of American Bottom items known from the hinterland sites, such as Ramey Incised vessels, copper ear spools, and chunkey stones is best explained via down-the-line exchange practices. The northern hinterland sites are interpreted as participants of an Upper Mississippi Valley Interaction Sphere (UMVIS), where the benefits of exchange are but one of several risk management strategies utilized to buffer against annual fluctuations in the food supply. In addition to exchange, the other three strategies are diversification, storage, and mobility.

The following paragraphs summarize how communities in the UMVIS may have used these strategies (Finney 2000:358-365), which are effective at multiple levels of scale, from individuals and families at the intrasite level, to regional cultural interaction. The redistribution of local products such as maize, starchy seeds or other food stuffs amongst kin groups within and between sites created an additional safeguard against crop loss at the site level of analysis. The appearance of non-local, diagnostic ceramic vessels at the sites participating in the exchange network is viewed as a byproduct of the exchange of products between sites in different regions.

Diversification strategies identified included the intensification of more than one crop, and field locations in both upland and floodplain locations. This could include supplementing maize with indigenous crops of the Eastern Agricultural Complex, such as sunflower, squash, or chenopodium. All three of these were identified from feature contexts at the Price site (Scullin 2007:91-92). Regarding site location, the Price site is located on a very low terrace adjacent to the floodplain of the Minnesota River, while Jones is situated on a high triangle of land away from the main trench of the Minnesota River. These two different site locations would certainly provide access to both upland and floodplain field locations.

The role of storage provided seed corn, as well as the accumulation of prestige goods. Large storage pits were identified at all three sites in the Cambria Locality. Social and resource storage was important for linking communities in times of need. Finally, food shortages can be avoided by the population simply moving to a different location where the resources are less stressed. Cambria pottery is found upstream at Gillingham and Gautefald, two relatively large Late Woodland village sites. The residents of these sites were most likely frequent trading partners with Cambria Locality sites, but also could have provided alternative foodstuffs and portions of large land tracts primarily used for hunting and foraging that also were suitable for farming.

An interesting aspect of Finney's analysis is that the identification and distribution of American Bottom-made Ramey Incised pottery at UMVIS sites provides an example for how exotic products may circulate at different levels of scale, both regionally and within individual sites. In this model, Ramey Incised pottery made in the American Bottom is viewed as a prestige good. Its presence at UMVIS sites marks long-distance, down-the-the line exchange through a network of village leaders and trading partners, perhaps linked through the creation of fictive kin ties (Finney 2000:359). Furthermore, it is argued that these regular trading networks can be revealed through the identification of non-local UMVIS ceramic wares at individual sites. For Mill Creek culture sites, Finney (2000:360) recognizes a pan-regional trading network throughout the Upper Midwest, based on Mill Creek vessels identified at Hartley Fort in eastern Iowa, the Lundy site in the Apple River region of northwest Illinois, and the Diamond Bluff and Carcajou Point sites in western and eastern Wisconsin, respectively.

Based on an analysis of household artifact patterns at the Fred Edwards site in southwestern Wisconsin, Finney (2013:200) asserts that a core-periphery model is not supported at the site, due to the lack of evidence for local production being controlled centrally by Cahokia, or locally by Cahokians. Instead, he proposes an east-west axis of the UMVIS that includes the single sites of Fred Edwards, Hartley Fort and Aztalan, and the Mill Creek, Apple River, Red Wing, and Cambria sites (Finney 2013:202-203). This interaction sphere utilized exchange, diversification, storage and mobility "for coping with potential year-to-year variations in local food supplies prompted by semipermanent and permanent village life in this region" (Finney 2013:203). The multi-level scale of analysis utilized by this approach created a dynamic and integrative model that explained exchange both locally and inter-regionally.

Finney's discussion offers two points salient to the analysis and discussion of the Cambria Locality. First, hinterlands goods appear to move along an east-west axis more so than from north to south. Second, his model takes into account three different scales of analysis: individual sites, village groups within a region, and multiple regions, as well as various combinations of all three. This analysis of sites in the Cambria Locality primarily is focused on inter-site and inter-regional comparisons in order to develop a similarly dynamic model built from the bottom-up.

The Northeastern Plains Village Tradition

An underlying assumption of many of the theories discussed previously is that Cambria is part of something else. Most of them have focused on explaining the presence of a Mississippian-influenced minority ware at Cambria, and as a result have privileged Cahokia and the Mississippian world as the major cultural contributor to the complex. However, there is at least one recent model that downplays the Cahokia connection, and instead postulates that Cambria represents its own cultural entity and should be classified as part of the Northeastern Plains Village tradition (Henning and Toom 2003). Henning and Toom (2003:215) explicitly argue against Cambria's participation in a Cahokia-based trade network, but concede that if Cambria participated in a Mississippian Interaction sphere its role "was attenuated at best". Citing the minimal presence of true plains low wedge and "S"-shaped rim forms at Cambria, the lack of evidence for trade between Cambria and other IMMV sites, and divergent mortuary treatment in mound burials, Henning and Toom suggest that Cambria should not be classified as part of the IMMV either. Instead, they postulate that Cambria, as part of the Northeastern Plains Village tradition, represents a parallel cultural development to the Middle Missouri Tradition. Henning and Toom argue persuasively against the inclusion of Cambria as part of the IMMV, but provide little supporting evidence as to why a Northeastern Plains classification would be more accurate.

As currently modeled, the Cambria sites exist at the overlapping fringes of two cultural traditions. The boundary position of the Locality on the northwestern edge of the Mississippian

Tradition and the eastern edge of the Plains Village Tradition suggests an analytic framework focused on frontiers and boundaries might be a good fit. Furthermore, in order to examine the Cambria Locality from the bottom-up, analysis is centered at the site-level, and discussion is framed using nesting levels of community.

Frontier Theses

Advanced by Frederick Jackson Turner (1986) in the 1890s, the main argument of the Frontier Thesis was that the American character, and the concept of American democracy, was hewn from the continuous westward march of the American Frontier. Viewed as a slowly advancing wave, the frontier fostered change, individualism and democracy as antiquarian European ideals were eroded by fresh American concepts of land ownership and sociopolitical organization. This model situates the frontier as part of the nation-state, which is also viewed as its source; indigenous groups living in the boundary areas were not considered active players in frontier development. In more recent decades, the Turner thesis has been heavily critiqued for its historical glosses and broad conclusions, but it also provided the concept of "the frontier", a notion ripe for revision and refinement, and applicability across disciplines.

The anthropology of frontiers and boundaries has created myriad definitions for both the concepts of frontiers and boundaries. At a very general level, there is consensus that frontiers are "characterized by contact between previously distinct populations" (Rodseth and Parker 2005:9). In many of these examples, the frontier is described as a "No man's land". In practice, however, the frontier functions more as a ribbon of contacts or stringed points of interaction. The broad applicability of the frontier concept also includes ideas where groups from the same cultural background interact with one another as they rift and siphon off from original settlement communities. As a result, "frontiers are important sites of ethnic group formation or ethnogenesis" (Rodseth and Parker 2005:13). The emergence of the Cambria sites as long-term farming villages with a fully formed ceramic complex in a restricted locality suggests the possibility of emerging ethnic group formation.

Frontier studies are culture contact studies. In fact, frontier areas are more zones of interaction than zones of avoidance. Typically, the interaction is viewed as being between two culturally distinct groups; one indigenous to the region, and the other an interloper. Thompson and Lamar (1981:7) view a frontier as a "zone of interpenetration between two previously distinct societies. Usually, one of the societies is indigenous to the region, or at least has occupied it for many generations; the other is intrusive". Thompson and Lamar also break down frontier interactions in regards to restrictions placed by geography, as well as the economic orientations and social organizations of the meeting groups (Thompson and Lamar 1981:8-9). In this sense, frontier studies seek to examine how two groups interact with one another on a regional level.

Internal Frontier

Contrary to the traditional notion of a tidal frontier is the patchwork mosaic of an internal frontier. Developed by Igor Kopytoff to elucidate the reproduction of traditional societies in sub-Saharan Africa, the *internal frontier* refers to large patches of uninhabited or unpatrolled land between established polities (Kopytoff 1987:9). Alternately described as a *local* or *interstitial frontier*, the internal frontier had two basic characteristics: one, the frontier region was not guarded by members of an adjacent settled polity; and two, the group moving into the frontier was not doing so as an advance member of a settled polity (Kopytoff 1987: 10-11). Traditional African societies were reproduced through the frontier process, which was stimulated by new groups moving into these unoccupied geographical spaces, and sometimes, growing into established complex polities themselves. Unfortunately, Kopytoff's model does not discuss how material culture changes as groups fission and fuse to create new frontier communities.

For Kopytoff the source of change comes from internal forces, and his model chiefly focuses on socio-political reasons for polity-building, particularly as it relates to the genesis of small-scale societies (1987:77). Kopytoff's most important point is also quite simple: small-scale societies developed from other polities in the region, regardless of size or social complexity (1987: 78). The reproduction of these societies was based on a mental template of what a good society should be, and as it was understood by the culturally similar groups of sub-Saharan Africa (Kopytoff 1987:33). In this sense, the frontier is not a place of cultural change, but one where cultural ideas are continually reproduced and reaffirmed, creating an ideological component. The frontier was a place of cultural continuity.

Kopytoff's frontier thesis is unique in that it models a dynamic process that was developed to explain, in part, African societies that did not fit into the neatly defined anthropological model of a tribal society. Many of these groups were characterized by small size, a miscellany of cultural traits, and lack of time-depth (Kopytoff 1987: 4). The African frontier process is organized as a discussion around a series of eleven related issues, perhaps best described as "a set of conditions" (Schlegel 1992:377). Some of these are particular to the cultural and historical legacies of African societies, but others have potential for broader applicability to different regions of the world. Charles (1992) integrated several features of these conditions to describe the development of Havana Hopewell in the lower Illinois River Valley. Schlegel (1992) effectively adapted aspects of the African frontier process to Pueblo society in the American Southwest by further exploring and modifying the conditions related to group fissioning, movement and merging; the establishment of kinship; the tenuous grasp of authority;

and similar cultural backgrounds. Several of these conditions are applicable to the Upper Midwest, and are summarized from Kopytoff (1987: 16-17), Schlegel (1992:378-380) and Charles (1992:191) in the following paragraphs.

Frontier Expanse

Perhaps the most basic feature required for the frontier process is a large geographical area located beyond the periphery of a polity's known settlement boundaries. This expanse did not have to be completely devoid of people, and usually was not.

Continuous Movement into the Frontier

A noted feature of sub-Saharan African societies was that sometimes people, for a variety of reasons, left their communities. People who chose to leave of their own volition may have done so because they were unhappy with current leadership, desirous of creating new economic, political, or kinship opportunities, or perhaps reacting to extreme climate conditions by searching for more productive land with less people to nourish. People also may have been forced out due to accusations of witchcraft or for being the losing faction in a bid for political power. These segments of people had the option of moving into the frontier to create settlements of their own.

Movement in Groups

Fissioning from the original polity was accomplished primarily as part of a larger group. Individuals and small family units typically did not leave the larger settlement on their own. These groups brought with them communal cultural knowledge like origin myths, religious beliefs, and a shared world view that provided the foundation for kinship groups in the new community.

Kinship as integrating mechanism

The population segments leaving the community were often groups of kin. As the new settlement was established, it may have been desirous to attract additional groups of people. New community members would have provided a larger pool of candidates for marriage, defense, and resource procurement and production. The cultural institution of kinship provided a social model for formally integrating newcomers into the polity.

Similar Cultural Backgrounds

Outgoing groups shared a cultural background with both the polity they were leaving and one another. As a result, many frontier groups had similar subsistence regimes and technological capabilities in addition to the shared social and religious views mentioned previously.

The Internal Frontier Thesis in the Upper Midwest

The theoretical framework provided by the internal frontier concept suggests that the source of cultural change is often internal. This project utilizes a site-level unit of analysis in order to identify ceramic variation at a basic level. As a result, the Cambria Locality is reframed as a dynamic group of village sites with varied connections to one another and other cultural areas in the region. This approach shifts away from the economic models that have dominated the interpretation of the Cambria sites, and places more emphasis on internal aspects of culture change such as social, political, or ideological factors.

Several of the elements that structure the internal frontier process are evident for south-central Minnesota circa AD 1000. The prairie at this time was certainly a large expanse of primarily uninhabited land, including the area west of the Mankato bend of the Minnesota River. It should be noted, however, that several other cultural groups lived in the greater region. To the southeast, the Red Wing Locality was the most heavily populated area in the region. Small Late Woodland villages were located upstream on the Minnesota River, and larger village sites also were located to the northwest, immediately adjacent in South Dakota. Some Great Oasis communities may still have been living to the south at this time, but Oneota settlement on the Blue Earth River had not yet begun to nucleate. What makes this really interesting is that some groups were settled farmers, while others provided for themselves through a seasonal round of hunting and gathering. Perhaps the "frontier" here is actually representative of a scattered and dispersed contact zone between Late Woodland hunter-gatherer groups and Late Prehistoric agricultural village people.

The Concept of Community

Archaeologists have defined communities in a variety of ways, often in consideration of spatial concepts, but also including broader issues related to frequency of interaction, demography, and scale. At its most basic, a community binds together recurrent human interaction with geographical boundaries. Murdock (1949:79) defines community as "the maximal group of persons who normally reside together in face-to-face association". The regularity of these face-to-face relationships creates a form of cooperation among the group, leading to routinized decision-making processes. As such, the community also operates as a political group (Murdock 1949: 84).

A community is rarely completely self-sustaining, and often must look outside itself for all that it needs, be it suitable marriage partners, additional food supplies when subsistence means run short, or non-local materials required for esoteric purposes. For these reasons, communities exist at different scales. Mahoney (2000) differentiates between residential and sustainable communities. *Residential communities* closely follow Murdock's definition, and are described as “spatially distinct clusters of residences, where face-to-face interaction would have occurred on a daily basis” (Mahoney 2000:20). At this scale, the boundaries of a community are restricted geographically by the maximal distance of daily face-to-face interaction. However, a community at this scale is still primarily defined by territoriality and daily interaction.

A *sustainable community* is a social network on a larger scale, and includes the spatial and demographic components necessary to maintain residential communities (Mahoney 2000:20). The boundaries of sustainable communities tend to be quite flexible, and they may overlap with one another. Also, they include multiple residential communities. Computer simulations indicate that under most conditions the minimum number of individuals required to maintain a demographically stable social network is 475 people for a hunting and gathering society (Wobst 1974). A sustainable community refers to all those groups knitted together beyond their immediate residential community for survival.

Kolb and Snead (1997:609) argue that community studies are effective in documenting and comparing varied expressions of small-scale agricultural societies at a relatively local level. Their definition of a community includes cultural components related to social reproduction, agricultural production, and self-identification. Varien (2000:149-154) incorporates numerous concepts into his conceptualization of a community including geography, demography, temporal issues linked to a shared sense of identity, interaction and variation. The advantage of defining communities with basic yet integrated cultural tenets is that they can be identified within societies of differing sociopolitical complexities. Kolb and Snead also argue in order to effectively compare community organization archaeologically the concept of community must be defined with clear archaeological correlates.

Communities are dynamic, and interact with each other in varying frequencies and intensities. For this reason, a model that considers the diverse reasons for cultural interaction (e.g. social, economic, political) amongst communities is beneficial. Ruby, et al. (2005) have delineated an elegant model utilizing multiple lines of archaeological evidence to identify nested levels of community interaction for Illinois and Ohio Hopewell sites. They identified three types of nested communities with varying boundaries: residential, sustainable, and symbolic. The residential and sustainable communities are similar to the definitions provided previously by Mahoney, where a *residential community* is characterized by routine face-to-face interaction, often via individuals living together in the same geographical area, and a *sustainable community* is much larger, having a sizeable population required to meet the successful procreation needs of a society. The third type of community is a *symbolic community*, representing a much broader community across the landscape, bounded together through a shared expression of symbolic attributes and formed for any number of social, political or economic reasons (Ruby et al. 2005:123-124).

A residential community is defined by frequent and repetitive face-to-face interactions between individuals living in close proximity. Typically, this refers to the daily interactions that occur between household groups consisting of people, material culture, and their surrounding environment, as they reside in the same restricted geographical area. However, patterns of coresidence are varied, such as small hamlets comprising three to four nuclear families, densely occupied villages, as well as neighborhoods or districts in large cities. In addition to routine interaction, an important aspect of a residential community is that it is geographically restricted. In this sense, it is "*both people and place* (Ruby, et al. 2005:123)".

In many cases, the residential community can be equated to the archaeological site. However, daily interaction can also occur amongst a cluster of sites closely dispersed across the landscape, as is noted for Hopewellian living sites. Relationships between these inter-site communities could be fostered by the ongoing operation of risk management strategies, particularly exchange, diversification and storage. However, people also have to interact with those beyond their immediate residential community in order for survival. The sustainable community refers to the spatial and demographic scale necessary to maintain a viable mating network (Ruby et al. 2005:123).

A symbolic community utilizes symbols to define, identify, negotiate and maintain a group identity. An important aspect of this community type is that people self-identify with them, which creates a larger social unit "capable of united decision making and action" (Ruby et al. 2005:24). The symbols used for group identification may appear in material culture as part of design on a ceramic vessel or woven basket, personal ornamentation or carved figurines. It can also include monumental architecture in the form of burial mounds, ceremonial mounds and earthworks, or buildings. These symbols join social groups across the landscape for a variety of social, economic, religious, or political reasons (Ruby et al. 2005:123), and can include religious societies, fraternal and sororal organizations, and leadership cults.

Boundaries, be they geographical or social, are not necessarily restricted for symbolic communities. As stated previously, membership is self-identified, which creates more fluid social boundaries. In these situations, symbolic communities may draw their membership from across the landscape, knitting together specific individuals from numerous residential communities. This isn't to say that symbolic communities may not be geographically restricted. A *local symbolic community* is defined as "circumscribed geographically, either practically or by a common goal of owning, maintaining, or using a territory (Ruby, et al. 2005:124). A proxy measurement for local symbolic communities has been estimated by Ruby et al. (2005:124) based on studies examining the distances regularly traveled by both hunter-gatherers and farmers for subsistence-related activities. For intensive farmers, frequent daily interaction is usually between 1-2 km. For less intensive farmers, their fields may generally be between 3-5 km from their residence, but will travel a maximum of 7-8 km regularly. Hunters and gatherers travel much more frequently, and the extent of a local symbolic community for them may be approximately an 18 km radius. A local symbolic community requires both geographic restrictions and relatively regular interaction, but individuals are bound together as a group by shared symbols.

The utility of the nested community framework is that it allows for structuring the interpretation of interaction at the Cambria Locality at multiple levels: the individual site, between the sites, and potentially at the micro-regional or regional level. The Cambria Locality sites are located approximately two miles apart (3-4 km), with a distance of four miles (6.5 km) between the Price and Jones sites. The people who lived at these sites were settled farmers, suggesting the maximum extent of their daily interaction was somewhere between 1-8 km. This is well within the geographical boundary of the Cambria Locality. The results of the ceramic attribute and compositional analyses will be considered at the site level in order to develop how the sites within the Cambria Locality interacted with one another.

Discussion

The theoretical framework structuring this analysis is a composite assembled from different aspects of world systems theory, community studies and the internal frontier model. The primary objective of this project was to identify and interpret ceramic variation at the site level in order to develop a dynamic model of site interaction within the Cambria Locality. The foundational data derived from an inter-site analysis allows for more robust multi-scalar comparisons, such as at the micro-regional and regional levels, thus initiating an interpretation of the Cambria Locality from the bottom-up. The different bodies of theory are utilized to articulate concepts related to shifting perspectives on economic and sociopolitical interaction, migration and issues of culture change, and the identification of communities at different scales based on the symbolic aspects of cultural systems, such as social and religious institutions, that are more difficult to discern in the archaeological record.

The world systems model outlined by Jeske (1999) links a primarily economic model of culture change with nested cores to create a dynamic and ever-shifting perspective on site interaction. As a result, one site may demonstrate a multiplicity of roles locally or regionally, as the nature of site interaction is continually changing based on the different perspectives of participants at the site level. This model is utilized to tease apart different aspects of site interaction within the Cambria Locality, specifically, and more broadly in the Late Prehistoric landscape of southern Minnesota, including the intensity and duration of site interaction, as well as identifying cultural mechanisms for site interaction.

The concept of the internal frontier is incorporated to situate how and why large group movement could have occurred in what seemed to be a relatively open landscape, as well as identify possible causes for intra-regional group migration and the development of new polities. Based on several of the sets of conditions identified for the internal frontier, as well as radiocarbon data, a local migration model was developed to explain the cultural and temporal emergence of the Cambria Locality.

Finally, the concept of nested communities was utilized to highlight cultural mechanisms other than trade and exchange that bind sites together and stimulate cooperation. Similar to the concept of nested cores addressed previously, the notion of nested communities facilitates interpretations applicable to multiple levels of analysis. Distinctive trends in ceramic attribute data are identified at site, locality and regional levels, and are interpreted within a community rubric designed to both highlight variability and explain it in terms of less archaeologically visible cultural mechanisms that are often related more to social organization or religious ideas and practices. The integration of these different models allows ceramic attribute and compositional data to be interpreted dynamically at multiple levels of analysis, and with the perspective that cultural interaction and change is just as easily stimulated by internal factors related to social, political or religious issues.

Chapter 4: Methods and Description of Site Ceramic Assemblages

The data set is comprised of four collections representing three sites. The Cambria site ceramic assemblage is from three separate excavations sponsored by the Minnesota Historical Society (MNHS), the University of Minnesota, and the Minnesota Science Museum. All known excavated ceramic collections from the Cambria site are currently housed at MNHS, and were included for analysis. Also housed at MNHS, and included for analysis, were a handful of mostly complete vessels from the Cambria site donated by early private collectors. The Jones site ceramic assemblage includes two separate collections from excavations conducted by the University of Minnesota and MSU Mankato. The Jones site ceramics excavated by the University of Minnesota are curated at MNHS. MSU Mankato houses the ceramic material collected from their sponsored field investigations of the Jones and Price sites.

Methods

As noted previously, the only published ceramic analysis for the Cambria Locality was a typological analysis for the Cambria site. Although inherently useful as a heuristic device, there are problems with the typological method. One problem is that typologies focus on patterns between artifacts at the expense of variation within them. There is an assumption of continuity within types, and of discontinuity between types that highlights the static nature of typologies (Chilton 1999:44). Types and typologies are static because the focus is on the traits that are similar between them, and these similarities, which are based on fixed diagnostic attributes, never change. The typological method is an effective way to highlight similarities in material culture between regions, but by trying to make sense of variation in this manner, it is simultaneously masked (Conkey 1999:136). As a result, within-group variation and microchange are minimized (Arnold 1999:106).

Another critique of typologies is that the unit of scale used for analysis is quite large (Dobres 1999:13). Typologies were originally created to make sense of abundant variation in archaeological data at the regional level. However, variation at the site level does not register in typological comparisons, because the unit of scale is not appropriate. As a result, site-specific variation is often explained at the regional level (Dobres 1999:13). In addition, artifact typologies divorce material objects from the people who actually made and used them (Kehoe 1998:97-98). Focusing on artifact qualities and their presence or absence at the typological level separates artifacts from the prehistoric systems of human behavior that created them. Consequently, pottery types become mere chronological "tabs" that quickly pinpoint where a site should be situated in terms of space-time placement (Willey and Sabloff 1993:118-119). The continued use of typologies in ceramic studies outside of the American Bottom has made "meaningful regional comparison very difficult" (Emerson, et al. 2007:51).

Given the issues with the typological method, and the focus of this research project to explore variation and microchange within the ceramic assemblages of the three main sites in the Cambria Locality, a different methodology was chosen. For this study, both attribute and modal analyses were utilized to identify and define ceramic trends. An attribute is a variable that corresponds to different categories of manufacturing and decorative technique, vessel morphology, and metric data. Following Rouse (1964), attributes are used to identify modes, which are ceramic traits that cross-cut types. The advantage of the modal approach is that "the modes are more sensitive indicators of changes in culture within small regions and over short periods of time" (Rouse 1964:141). In a very general sense, modes related to vessel form are used to create groups or "modal types" that function, in part, to create a framework for discussing rim and body decoration. In addition, the creation of generalized modal types facilitates broad-scale ceramic comparison. As a result, attribute variation in Cambria ware is discussed on two levels. First, the relationship between vessel form and decoration is highlighted. Second, decorative, morphological, metric and other attributes are described for the Cambria site ceramic assemblage as a whole.

This study draws heavily from George Holley's (2008) work in developing a ceramic sequence for the Red Wing Locality of southeastern Minnesota. The Red Wing ceramic assemblage also contains a mixture of rolled rim and high neck jars, both shell and grit-tempered, which contributes to its suitability as an analytical model for the Cambria Locality. Holley primarily focused on temper, vessel shape, surface finish, design patterns and metric data. This study primarily examines vessel shape, decorative techniques of the lip, rim and neck, motif expression and design field, and related metric data. An emphasis is placed on tying morphological trends with decorative data, thus rim sherds with an intact neck and body were preferred over rims broken above the neck/body juncture and body sherds. Although some body sherds with complete motifs were noted and photographed, as a general rule they were not included for analysis.

Attributes

Rim sherds were examined for 36 attribute categories including manufacturing, morphological, and decorative traits. Manufacturing attributes considered were temper material; amount of temper in paste; paste texture; paste core cross-section; surface texture, treatment and finish, including polish; and color. Vessel, rim, lip and shoulder morphology were recorded, as well as neck angle. Decorative techniques for the lip, rim and neck areas of the vessel were documented, as were type of body decoration and the identification of specific motifs. In addition, metric data measuring the length, width and depth of decorative techniques were noted. Other forms of metric data collected include weight, orifice diameter, percentage of orifice present, rim and neck width, neck length, wall thickness, thickness of juncture at the neck and shoulder, and RPR and OD/NL values. Additional categories of analysis included handles and degree of interior cameo effect. Any attributes that could not be accurately determined due to weathering, exfoliation or sherd fragmentation were recorded as “indeterminate”. Not all of the categories for which data were recorded were chosen for further study. The following attribute descriptions represent the main categories chosen for comparative analysis.

Vessel Morphology

Vessel form within the Cambria Locality is limited to jars and bowls. Overall, the jar form dominates the ceramic assemblages of each site; however, individual jar morphology is quite varied both within and between sites. Vessel morphology is differentiated based on orifice constriction and its relationship to the area of maximum diameter (Rice 1987; Shepard 1956). A jar has a restricted or narrowed orifice that is located above the maximum diameter of the vessel, which is usually the upper body or shoulder area of the jar. A bowl has an unrestricted orifice that is equal to or greater than the point of maximum diameter.

Only ten mostly complete or reconstructed vessels were recovered from the three sites, and as a result, vessel morphology was determined primarily from the rim and neck form of rim fragments. However, morphological definitions for lip, rim and neck differ throughout the Midwest. Ceramic analyses from many late prehistoric sites in the upper Midwest, particularly those with high everted rims, define the jar rim as the entire area between the vessel neck and lip (see for example (Henning and Henning 1978; Hurt 1954; Knudson 1967; Tiffany 2007).

However, at Cahokia and related Mississippian sites, where jar rims are modified and temporally sensitive, the rim refers to the exterior margin of the vessel only (Holley 2008:7). This analysis utilizes the latter definition for jar rims, in order to more accurately incorporate rolled and other modified rim forms recovered from the Cambria Locality. The lip is simply defined as the uppermost margin of the orifice. Following Rice (1987), a distinction is made between the vessel neck and throat, where the throat is located at the base of the neck or collar. Typically, the throat is the most restricted point of the vessel, and it is often marked on the interior with a visible bend or break in the angle of orientation. The neck bridges the area between the throat and the rim, although some modal types are characterized as neckless jars. Jar morphology attributes are depicted in Figure 4.1.

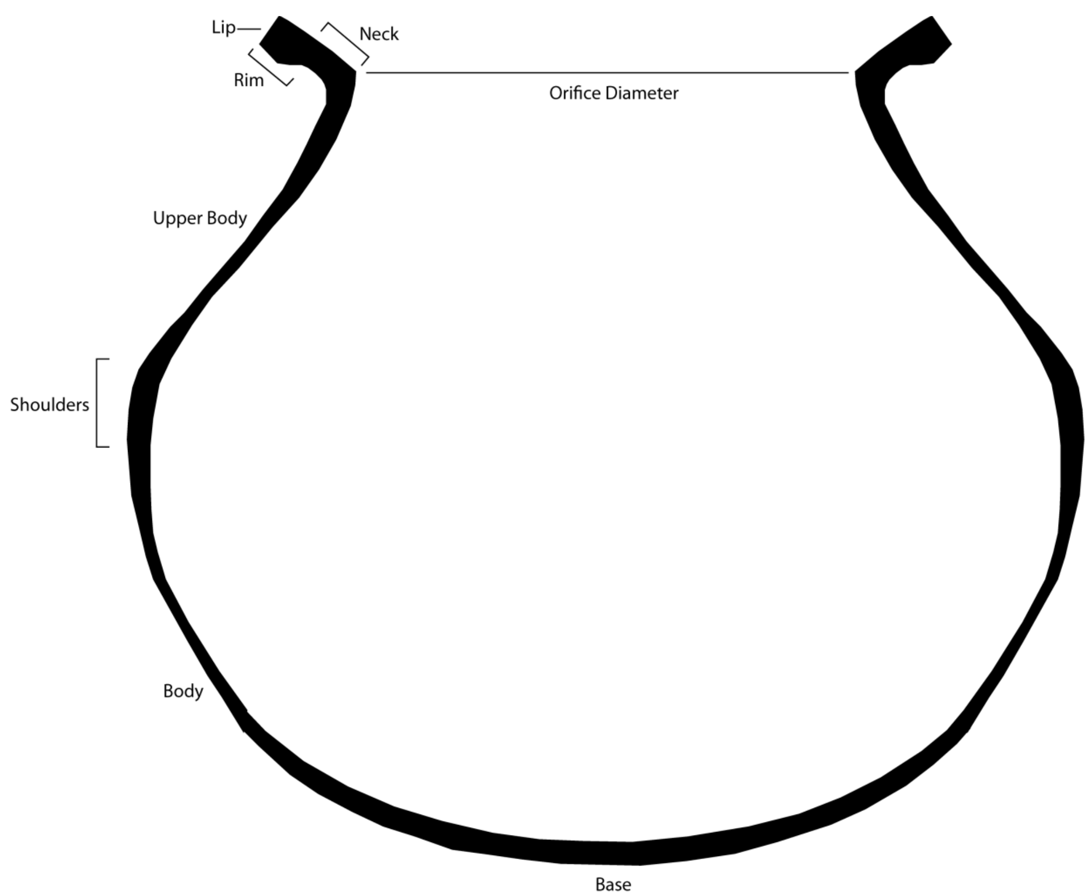

Figure 4.1: Jar morphology attributes

Modal Types

Most of the modal types were categorized based on a combination of vessel, neck and rim forms, although a few types represent elaborated rim forms only. An attempt was made to follow regional and cultural conformity in utilizing vessel and rim form terminology, while also creating a flexible and robust categorical system. The modal categories were informed by the analyses of Holley (1989, 2008) for Cahokia and the Red Wing site complexes; Rodell (1997) for Diamond Bluff; Richards (1992) for the Aztalan site; Emerson et al. (2007) for the Lundy site in the Apple River Locale; and Tiffany (2007) for his discussion and integration of separate ceramic typologies of the Middle Missouri Tradition as applied to the pottery from the Swanson site in South Dakota. Twelve different modal types were identified: angled-unmodified, angled-modified, angled-tapered, curved-unmodified, curved-modified, curved-tapered, rolled, partially rolled, S-rim, collared, everted, and everted-extruded.

The angled-unmodified type combines an angled neck form with an unmodified rim. Angled necks are identified by a sharp outward turn, or break, of the vessel interior where the neck meets the upper body. This juncture can sometimes appear exaggerated, due to the presence of a welding scar on the interior. The result is a linear band of thickened or excess clay at the throat, marking where the rim/neck was joined to the body of the vessel. An unmodified rim lacks additional elaboration, meaning the rim margins do not appear thickened, folded over, pinched together, or intentionally modified in any other way. Instead, unmodified rims have straight interior and exterior rim margins that remain parallel to one another. However, the rim margins of an angled-unmodified vessel are aligned at an angle, in concert with the diagonal linearity of the vessel's angled neck (Figure 4.2).

Angled-modified and angled-tapered vessels both share the sharply out-turned profile of the angled neck, but incorporate different rim forms. Modified rims are identified by a thickening of the exterior rim that often results in a squared off or slightly rounded bulge. The interior rim retains an angled, linear plane. Modified rims differ from rolled rims in that the lip and exterior rim surface of a modified rim has not been completely rolled over into a rounded coil. As a result, modified rims tend to have a slightly boxy appearance. Two different processes created most of the modified rims in the Cambria Locality. The first process is a manufacturing technique where the clay was folded over the exterior rim of the vessel and subsequently smoothed into the vessel surface in varying degrees of completeness. The shape of these folded exterior rims ranges from almost square to smooth and rounded. Some of the modified rims also could have been produced by welding a fillet to the exterior rim. The second process that created modified rims was the application of certain decorative techniques to the lip and rim, most likely tool impressions when the vessel was still quite wet. The pressure used to embellish the lip and/or exterior rim of the vessel, displaced clay towards the sides of each impression, creating a thickened exterior rim margin between individual tool marks.

A tapered rim is produced by drawing together the exterior and interior rim margins. The rim displays a somewhat pinched appearance, and narrows toward the lip. A characteristic feature of tapered rims is that the exterior and interior rim margins are not parallel. Tapered rims in the Cambria Locality vary in shape, ranging from squat, wedge-shaped forms to long and linear (Figure 4.2). Both angled and curved neck forms were identified with tapered rims as modal types, but the two categories were combined into a single modal type, tapered rim, to better facilitate comparative analysis.

The curved neck modal types share the same rim forms as the angled-neck vessels, and are identified as curved-unmodified, curved-modified, and curved-tapered. A curved neck is characterized by a continuously curved upper interior vessel surface, including at the vessel throat (Figure 4.2). This definition of a curved neck is similar to Richards (Richards 1992:237) description of a flared neck, although the term *flared* is used at Cahokia to describe vessels with both a "gently or a sharply out-turned upper body" (Holley 1989:14). The term *curved* was employed for this analysis in order to avoid any confusion envisioning the neck shape described.

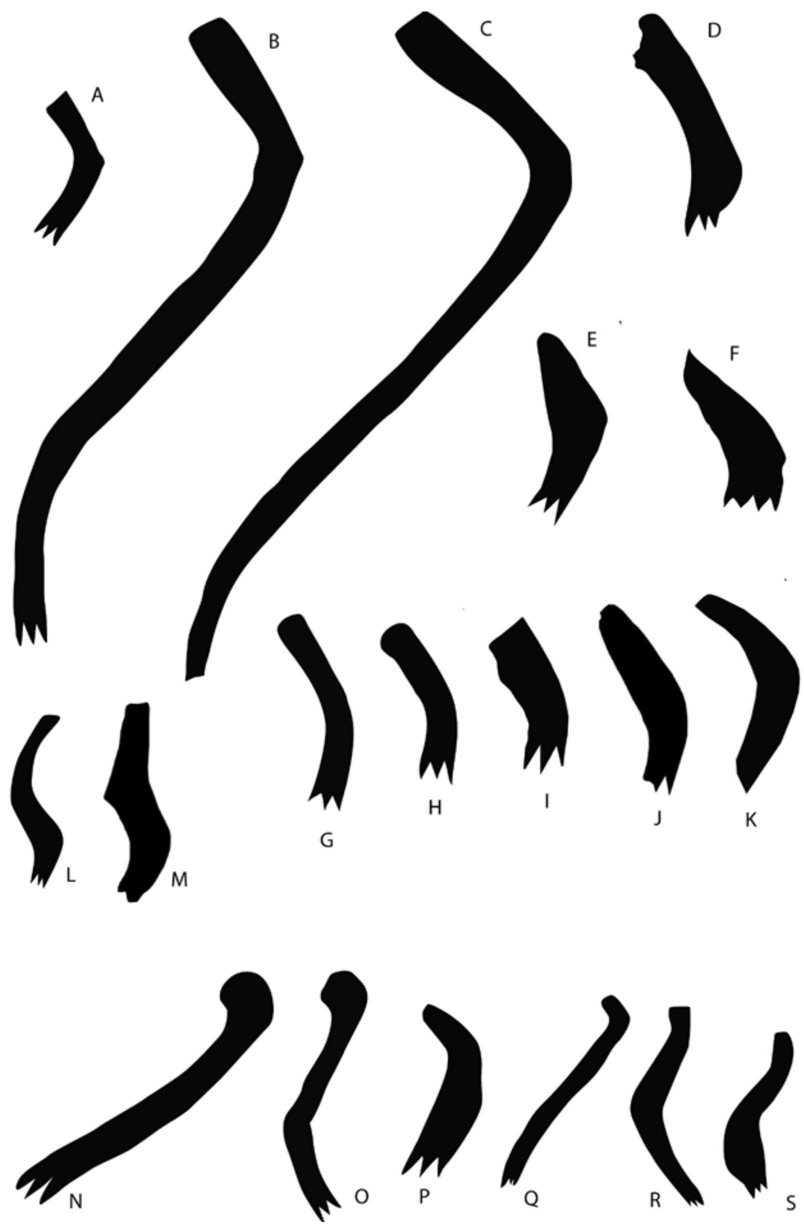

Figure 4.2: Modal types

(A-B) angled-unmodified; (C-D) angled-modified;
(E-F) angled-tapered; (G-H) curved-unmodified; (I) curved-modified; (J-K) curved-tapered;
(L-M) S-rim; (N-O) rolled; (P-Q) everted; (R-S) straight

Contrary to the angled and curved neck modal types, straight necked vessels lack the characteristic outward turn of the vessel neck. Instead, the interior margin of the neck and rim are aligned on the same plane, approaching verticality. Unmodified rims are typically associated with the straight necked vessel form, and are characterized by parallel upper rim margins. The straight-modified modal type has an elaborated rim form that is thickened or bulging at the exterior rim margin, and may protrude over the exterior neck margin; the interior neck/rim margin remains straight and nearly vertical. In the Cambria Locality, many of the straight-unmodified and straight-modified vessels are quite small, and have inslanting shoulders.

The rolled rim mode is based primarily on rim form, and features a coiled rim produced by curling the interior rim toward the exterior rim margin. Rolled rims vessels are essentially neckless jars exhibiting a rounded lip and exterior rim margin (Figure 4.2). Sometimes the rim coil is partially smoothed into the vessel exterior where the throat meets the inslanting plane of the upper body of the vessel. The lower exterior rim margins of these jars appear slightly boxy. An alternative method for producing rolled rims involves welding a fillet to the exterior rim margin at the lip juncture (Holley 1989:15; Richards 1992:232). Rolled rim vessels were originally produced at Cahokia, where they are associated with the types Ramey Incised and Powell Plain (Griffin 1949:49-51). The presence of grit-tempered, rolled rim emulations in the Cambria Locality traditionally is interpreted as evidence for interaction with cultures more closely associated with the Mississippian world.

Partially rolled rims are a separate category because they demonstrate slightly different manufacturing practices than rolled rim vessels. A partially rolled rim is often a hybrid of two rim forms, rolled and modified. The rolled part of the rim is rounded and represented by the typical rolled coil, which eventually grades into a thickened rim that is less round, and better resembles the boxiness of a modified rim. Also, many partially rolled rims were not fully smoothed into the vessel exterior, and are considered incompletely rolled. In these examples, the end of the coil is still visible as a curl tucked beneath the lower exterior rim margin. When considered culturally, partially rolled rim vessels may represent the emulation of Mississippian rolled rim vessel forms by individuals lacking the full knowledge of the manufacturing techniques required to successfully produce a robustly coiled, rolled rim vessel.

The S-rim modal type conflates the rim and neck of a vessel into a single form that when viewed in profile is vaguely S-shaped. The upper portion of the exterior rim is generally convex, and mirrored by a channel on the interior; the lower portion of the exterior rim is opposite, and thus more concave in appearance. However, overall rim shape is somewhat varied for this mode. Some rims conform to the classic S-shape just described, but others have a lazier shape, and are distinguished by gentler curves and shallower interior rim channels. This modal type also includes a rim form perhaps best described as a “C”-rim. It can be either tall or short, and is characterized by either a broadly curving exterior rim with a wide interior channel, or a more compact curved exterior with a shorter and deeper interior rim channel. An interesting feature of several rims is that when viewed head-on they appear to have a collar, but when viewed in profile, they have a clear S-shaped rim. All of these rim shapes are categorized as part of the S-rim mode because they broadly fit the definition of an S-rim, and were previously identified as S-rims at other IMMV sites. Furthermore, combining them into a single modal type was advantageous for statistical testing. S-rims represent stylistic influence from the Plains, particularly from North and South Dakota, where they are a dominant ware of the Middle Missouri Tradition (Lehmer 1971). An analysis by Craig Johnson indicated that the majority of S-rim sherds from the Cambria site were not true S-rims (Anfinson 1997:99).

Collared vessels are produced in one of two ways. The first method involves folding the rim over onto itself, from interior to exterior, in order to create a thickened band of clay over the entire length of the exterior rim that is then smoothed into the vessel surface. The area just below the bottom of the collar is typically the vessel throat. The second method utilizes a wide clay strip, or appliqué, that is fused to the exterior rim margin of a vessel. Appliqués differ from fillets due to "their greater elaboration and tendency to completely cover exterior or lower rim margins" (Richards 1992:233). True collared vessels are very rare in the Cambria Locality, and are primarily of the folded variety. Collared and S-rim forms sometimes were combined into a collared S-rim, which was created by welding an appliqué to the exterior of an S-rim. In profile, collared S-rims lack their signature exterior rim curves, resulting in a thickened middle area of the collar. The interior rim may still exhibit a channel, however. Collared S-rims are recorded with the S-rim modal category.

Everted rims are characterized by an abrupt outward turn of the rim, which creates a sharp break between the exterior rim margin and vessel neck. Generally, everted rims have roughly parallel exterior and interior rim margins. Everted rim vessels within the Cambria Locality have an orifice diameter of less than 10 cm, and seem to represent a rim form associated with small and miniature vessels. Everted-extruded rims share the distinct outward turn of the vessel rim with the everted modal type, but the exterior and interior rim margins are drawn together give the lip a tapered or pinched appearance.

A minimum number of vessels were categorized as indeterminate modal type due to the lack of neck and rim data required to properly classify them. Other categories sometimes are recorded as indeterminate, also. Reasons for this classification include heavily exfoliated interior or exterior surfaces, broken or split rims, and accidental author omission. Although not all rim sherds in the data set were classified in accordance with the modal scheme, they were included for analysis due to the viability of numerous other forms of collected data.

Lip Form

Lip form is represented by five categories in this analysis: rounded, flattened, pinched, beveled-exterior, and beveled-interior. Rounded lips are described as a purposeful rounding of the area between the interior and exterior rim margin. The degree of rounding may range from a gentle, continuous curve to a more extreme semi-spherical shape. Flattened lips are characterized by a distinct, flat surface connecting the interior and exterior rim margins. A pinched lip is created by drawing together the upper and lower rim margins into a gentle point. Beveled lips demonstrate a somewhat angled appearance. A lip beveled toward the exterior sits slightly higher at the interior rim margin and pitches downward toward the exterior rim, creating a flat and angled lip form. A lip beveled toward the interior slants the oppose way. It sits higher at the exterior margin, and angles downward toward the interior of the vessel. The beveled-interior lip form is very rare within the Locality, and is only associated with the bowl form.

Shoulder Form

Rimmed vessels with complete shoulders are rare in the Cambria Locality assemblages, and comprise less than ten percent of the data set (n=31; 7.1%). Three shoulder forms are recognized: angled, pronounced, and rounded. Angled shoulders feature a well-defined corner point where the upper and lower body vessel walls meet. The slope of the upper vessel walls is relatively flat, although some angled forms may demonstrate a slightly recurving upper body. A pronounced shoulder appears nearly rounded, but is marked by a subtle, yet defined line at the shoulder break that separates the upper and lower body vessel walls. Rounded shoulders lack a distinct break at the shoulder facet, which allows for a continuously curved contour between the upper and lower body. Vessels with rounded shoulders have a more globular vessel shape overall.

Surface Finish

Surface finish refers to a wide variety of processes that are used to "complete" the manufacture of a vessel after its initial construction. Some surface finishing methods encompass secondary shaping techniques that modify the overall shape and form of the vessel, as well as surface characteristics like texture. Other methods focus only on the smoothing and texturizing of the vessel surface (Rice 1987:136). Rim sherds were recorded as smoothed, cordmarked, or smoothed-over-cordmarked. Smoothed vessels have a fine and even vessel surface. Smoothing is usually done with a pliant material or implement, such as leather, textiles, or grasses (Rice 1987:138). Cordmarking results from the shaping of vessels with a cord-wrapped paddle and anvil. The corded imprints mark the vessel exterior as it is molded into shape. Smoothed-over-cordmarked vessels exhibit cordmarking that has been partially erased or smoothed away, leaving faint traces of the cordmarking on the vessel surface. There is also some visible evidence for scraping from the Cambria site, which is employed to thin vessel walls and remove surface imperfections (Rice 1987:137).

Surface finishes also may involve the addition of color to vessel surfaces (Rice 1987:148-152). These processes were not common in the Cambria Locality, and only three were identified: plain, smudged, and red-slipped. A plain surface is the natural, fired exterior that has not been modified through slipping or smudging. Smudged vessels have blackened surfaces due to the deposition of soot and carbonized material on the vessel exterior during the firing process (Shepard 1956:88). The smudging technique is highly variable, and degree of smudging may vary between vessels, as well as fluctuate on the same vessel surface. Well-smudged surfaces appear black and tarry, but vessels less thoroughly smudged may display a range of colors, including dark brown and reddish brown (Richards 1992:242). Generally, temper particles are still visible through the smudging, which is as a point of distinction between smudged and slipped vessels.

Slipped surfaces are produced by the application of a clay slurry, usually of a contrasting color, to the vessel surface prior to firing (Rice 1987:149; Shepard 1956:191). Slips are recognized in a variety of ways, but the most detectable is as a thin layer of different colored clay on a vessel surface. Also, slips may have a waxy or crazed appearance, and they tend to obscure any visible tempering on the vessel surface (Richards 1992:243). Slipping is extremely rare within the Locality, and only one red-slipped rim sherd from the Cambria site was identified in the entire data set.

Surface finish and color were recorded for both interior and exterior vessel walls, although only data for the exterior is included for analysis. Identification of surface treatment was determined macroscopically with the aid of a 10x-hand lens. A Munsell book was used to specify color.

Polish

A rim sherd was recorded as polished if the vessel surface reflected light under normal indoor lighting conditions. As Shepard (1956:123-124) notes, polishing traditionally refers to an activity completed by the potter to purposefully increase the luster of the pot. Many light reflective vessels within the data set exhibit “narrow parallel linear facets” on their surfaces that are more indicative of burnishing than polishing (Rice 1987:138). Polished vessels tend to lack the streak marks associated with burnishing, and as a result have a more uniform surface appearance. However, the focus of this category is not to determine the technique that produced the luster, but rather to record whether or not a vessel is light reflective. Also, it is important to note that polishing sheen may be affected by differential preservation (Holley 1989:12), and as such it may be underrepresented within the data set.

Temper

Temper was identified macroscopically with the aid of a 10x-hand lens. Nearly 98 percent of all vessels within the data set are grit-tempered. Grit temper was recognized by the presence of small, chunky pieces of rock included within the paste. At Cambria, the temper was identified as crushed granite (Knudson 1967:253). The paste from all three sites is marked by the inclusion of small, shiny, copper-colored particles. At the Cambria site, paste inclusions were identified as iron pyrite, or fool's gold (Knudson 1967:253). A cursory, yet microscopic examination of several sherds from the Price and Jones site indicated the inclusions were more likely a type of quartz (Holley, personal communication). In addition, numerous sherds from all three sites had relatively large chunks of a powdery red stone, perhaps sandstone, included within the paste.

Shell-tempered vessels are in the extreme minority in the Cambria Locality. Temper was identified by the presence of flat, crushed pieces of shell in the paste, or by similarly shaped voids if the shell had leached out. In the upper Midwest, shell tempering is traditionally associated with Mississippian and Oneota cultures. There are also a few vessels in the data set that contain a mixed temper, which were recorded as either grit-shell or shell-grit. These categories are distinguished by the recognition of the dominant temper type followed by the secondary tempering agent.

Lip, Rim and Neck Decoration

Decoration of the lip, rim and neck areas is highly varied within the Cambria Locality. It is not uncommon for two or more of these areas to be decorated in conjunction. Crosshatching is a technique most commonly executed on the vessel lip. As a decorative category, it is a combination of method and pattern, where a series of fine lines are lightly cut into the clay in a crisscross pattern. Many Cambria vessels with a crosshatched lip resemble the type Mitchell Modified Lip, first identified for the Over Focus in southeastern South Dakota (Hurt 1954). Rarely is the crosshatching positioned on the exterior or interior rim of a vessel, but when it is, it tends to be broader and deeper than when it is used as a lip decoration. Crosshatching is sometimes executed with twisted cord impressions; these are tabulated with the twisted cord decorative category.

The incised decoration placed on the lip, rim and neck area of a vessel differs from the incised motifs located on the vessel shoulders. Although the basic technique for creating the designs remains the same, the resulting incised decoration on the smaller surfaces of the lip and rim are usually fine lines less than 2.0 mm in width. Parallel diagonal, vertical, and horizontal lines are the most prevalent design patterns, but chevrons and barred triangles have been identified, also.

Tool impressions are the most prevalent and most varied group of rim decoration. Most tooled marks are located on the exterior rim, or at the exterior rim/lip juncture. Interior tool impressed rims are known within the Cambria Locality, but they are uncommon. The tooled shapes are circular, semi-circular, ovular, notched, diagonal, triangular, and crescent, or combinations thereof, and were created by an array of implements ranging from blunt to sharp, and most likely in different media, such as chipped stone, worked bone, shell, or wood. Initially, an attempt was made to categorize the impressions by shape and/or production tool, but the range of shape variation was so broad, sometimes even on the same vessel, that the tooled forms seemed to represent varying parts of a spectrum rather than different categories altogether. As such, formal shape categories were abandoned, and tool impressions are discussed more in terms of generalized forms.

Vertical impressions demonstrate the greatest range of variation within a formal tooled category. One form of vertical decoration is quite wide, and generally resembles a rectangle with vaguely rounded edges. Another form is best described as diamond shaped. Numerous tooled marks are a bit wider at the top, and occasionally appear textured towards the top, as well. These decorations may have been created with the end of a stick or twig, possibly wrapped in cord, which was pressed sidelong into the wet clay. Some vertical marks are very long and narrow; sometimes they are slightly curved, and may represent fingernail impressions. There is also a category of vertical tool impressions best characterized as notches. These marks are small and narrow vertical rectangles that were cut or gouged out of the vessel rim. Some of them may taper in towards the top of the rim, or end in a point at the bottom. Many of the vertical tooled marks were probably created with a gouging tool. Often made from wood or bone, gouging tools produces a smooth line because the clay is cut and removed, as opposed to the displacement that occurs with incising (Shepard 1956:199).

The diagonal tooled decorations range from narrow to wide, and are often spaced widely apart on the rim. Also, they are overwhelmingly right-leaning. The diagonal marks were created with both blunt and pointed tools. There are also examples of vaguely triangular or wedge-shaped marks in the data set. One side of the imprint is characterized by a sharp vertical line cut deeper into the rim than the remainder of the impression, which gradually slopes upwards. The wedge shaped decorations were probably created with a pointed tool that was held at an angle and pulled toward the potter to create an asymmetric profile (Shepard 1956:199).

Circular and ovular decorations are usually broad and smooth, and may be the result of finger pad impressions. Semi-circular impressions are flat at the top, but rounded towards the bottom. When viewed from above, these broad circular finger and tool impressions create the appearance of a wavy exterior lip margin. Punctates are small holes that have been pierced into the wet clay with a sharp instrument. They are usually round or semi-circular, but sometimes appear as a circular outline with an intact center, as if the decoration had been punched out of the vessel surface with a hollow tool, like a reed. Punctates made with a cutting tool may be more diagonal or triangular in shape. Punctate designs are infrequent within the Cambria Locality, and primarily appear as border elements within the body design field.

There are also two unique combinations of tool impressed techniques identified from the Cambria Locality. The first example includes a technique described by Knudson (1967:261) as "incised punctates", which is lip decoration in the form of deep diagonal jags that always are left-leaning. They are made with a sharp, thin instrument that is jabbed deeply into the lip and then dragged out and upwards to create a deep incised line. The area at the entry point is deeper and wider than the rest of the small incised gash. Incised punctates are accompanied by secondary tool impressions in the form of circular or ovular marks at the lip/rim juncture, or just below the exterior rim. Furthermore, many of these vessels have a small, wavy ridge of clay that either formed around, or was attached to, the exterior portion of the circular tooled marks, giving the impression of an undulating fillet threading along the exterior rim/lip juncture. The robustness of the incised punctate and associated techniques distorts the shape of the rim, resulting in a high number of modified rims for these vessels.

The second unique combination of tool impressed techniques utilizes a rounded or relatively blunt pointed implement that is pressed very deeply into the rim. The result creates a rim profile rendered in high relief, with alternating peaks and valleys. The peaks are quite pointed, and were created by the displacement of clay that was pushed out horizontally when the tooled valleys were created. It is possible the potter also used her fingers to help model the displaced clay into a more pointy form, which also would have created greater relief along the rim form.

The less common types of lip and rim decoration identified in the Cambria Locality are traditionally associated with earlier cultural periods or neighboring cultural traditions. Single twisted cords were impressed mainly into the upper rims and necks of vessels in several simple patterns, although there are a few examples of twisted cord impressions on vessel bodies. The majority of twisted cord decoration on vessel lips and rims was rendered as crosshatching, or diagonal or horizontal lines. Twisted cord neck decoration is associated primarily with S-rims within the Locality. Typically, these design patterns are more complicated and tend to cover nearly the entire upper half of the rim, often extending into the exterior rim decoration zone, as well.

Twisted cord impressed pottery came into prominence in the Upper Midwest during the Late Woodland period, and is primarily associated with Madison ware and the Effigy Mound complexes of the Quad-State region (Baerreis 1953; Benn and Green 2000; Hurley 1975). Locally, several varieties of Madison ware, including Madison Cord/Fabric Impressed and Madison Plain, were recovered from the Nelson site, a Late Woodland site with evidence for maize, located just south of Mankato on the Blue Earth River (Scullin 1981). The concept of Madison ware has been critiqued as a conflation of the type-variety and ware systems resulting in an overly broad identification of the pottery both geographically and temporally (Clauter 2012:10) . Recent studies designed to distinguish ceramic variation through ceramic attribute and compositional analyses have yielded significant insights into broader anthropological questions focused on explaining culture change, affiliation and population dynamics amongst Late Woodland Effigy Mound sites in Wisconsin (Clauter 2012; Rosebrough 2010). Twisted cord decoration is also associated with Foreman Ware, the S-shaped rim forms identified at Mill Creek/Over located further west (Hurt 1954; Ives 1962; Lehmer 1951, 1954).

Knotted cord and cordwrapped stick impressed rim decoration is extremely rare in the data set, and is mostly associated with a small collection of cordmarked sherds from an earlier Woodland period. These forms of decoration also have been identified on a few sherds with smooth surfaces and flared rims, which are more characteristic of Late Prehistoric pottery in southern Minnesota. Knotted cord decoration is created by impressing a tied knot on a corded string, or series of tied knots, into a plastic clay surface. Cordwrapped stick impressions are created by wrapping cordage around a stick or dowel, and then pressing the implement into wet clay. Often these types of decoration are arranged in repetitive patterns that encircle the vessel, such as parallel oblique lines.

Dentate stamped impressions are a series of small, rectangular punctates set into the surface of the vessel. The stamped marks are produced from comb-like tools carved from materials like bone or wood; the toothed ends are relatively blunt and largely square-shaped. The teeth are pressed into the clay, and the resulting linear stamps often are arranged in simple design patterns. In Minnesota, dentate stamping is most common during the Middle Woodland Period, but it does extend into the Late Woodland as a minor design practice (Anfinson 1979). At least two types of transitional Middle-Late Woodland pottery in Minnesota are dentate stamped (Onamia Dentate, St. Croix Dentate). Also, it is identified, albeit rarely, on pottery associated with the Late Woodland Lake Benton phase primarily found in southwestern Minnesota.

Body Decoration

The primary body decoration technique in the Cambria Locality is variously described as incised, trailed, or broad trailed, but the terms are not used consistently throughout the literature. The term *incising* is broadly defined as a decorative technique where a sharp tool is applied to plastic, leather-hard, dry, or post-fired surfaces (Rice 1987:146; Shepard 1956:198). Both the type of tool used and the plasticity of the vessel surface affect the appearance of the design. In the Midwest, incising is primarily discussed as occurring on plastic vessel surfaces prior to slipping and firing (Holley 1989:13; Richards 1992:248). Trailing is sometimes defined separately from incising based on factors like tool shape, track size, and vessel plasticity. Early descriptions of incising and trailing are focused on tool shape; trailed designs were created by "dull and rounded" instruments, whereas incised decoration was produced with "sharp pointed" tools (Holmes 1903:52).

In an analysis of Ramey Incised pottery from Aztalan, Bleed (1970:10-11) divided design execution into three categories: trailed, incised, and engraved. Trailed lines were created with a blunt tool on wet, plastic clay. The resulting tool track had a round bottom, was wider than it was deep, and often created a cameo effect on the interior of the sherd. Incised lines were produced with sharp instruments on leather-hard vessel surfaces. The sharp tools cut into and removed pieces of clay from the vessel exterior, which resulted in a "V" shaped track. Incised lines are deeper than they are wide, and do not produce a cameo on the vessel interior. Engraved lines are etched into the vessel surface post-firing, and were not identified in the data set. In this analysis, the terms incising and trailing are used interchangeably due to the range of variation exhibited throughout the data set in the shape of the tool track, width of line, and degree of interior cameo. However, the widths and depths of the incised/trailed designs were measured and used to create three size categories. Fine incising refers to decoration narrower than 2.0 mm, and broad trailing is wider than 5.0 mm. Line widths measuring from 2.0-5.0 mm are considered average, and simply referred to as incised or trailed decoration.

Metrics

Metric information recorded for analysis included weight, orifice diameter, width and depth of body incising, rim width, neck length, wall thickness, and OD/NL and RPR ratios. Weight was documented to the nearest 0.10 g for all vessels. Orifice diameter and percentage of orifice were estimated using a paper guide marked with a series of concentric circles comparable to vessel radii and percentage of orifice represented. The width and depth of incising were recorded to the nearest 0.10 mm, as were rim and wall thickness, and neck length. In addition, the length, width and depth of lip, rim and neck decorations were recorded, as were the length and width measurements of handles.

Both OD/NL and RPR are ratios designed to highlight morphological change in jars through time. Holley (2008) developed the OD/NL index to seriate temporal changes in neck morphology for ceramics from the Red Wing Locality in southeastern Minnesota. Ceramics from Red Wing sites represent at least two different cultural traditions: Mississippian vessels are primarily exemplified by rolled rim jars that are essentially neckless, while Oneota vessels typically have relatively long necks, but generally lack rim modification. The OD/NL ratio measures the orifice diameter (OD) of a vessel divided by its neck length (NL), although further comparison is needed to determine whether neck length is a function of vessel size. Holley

(2008:7-8) noted that rolled rim vessels have a higher average OD/NL value (17.1), while the average OD/NL values of several types of necked vessels are consistently much lower (5.5-11.0). He also noted that rolled rims and necked vessels trend differently in regards to correlation between neck length and orifice size (Holley 2008:7). A comparison of correlation coefficient values for orifice diameter and neck length measurements indicated that neck length in rolled rim vessels was unrelated to orifice size (0.39), meaning that the height of the neck was not an indicator of orifice, or vessel size. However, for necked vessels the length of the neck was more highly correlated with the overall size of the orifice (0.67-89); vessels with small orifices have short rims/necks, and vessels with larger orifices have taller or longer rims/necks. OD/NL ratios were tabulated for all vessels in the data set except for S-rims. The unique shape and combined rim/neck form of the S-rim mode, as well as its more westerly cultural derivation, place it outside of the Upper Midwestern Late Prehistoric jar neck continuum identified by Holley at Red Wing.

For angled and curved necked jars, neck length was measured from the point of vertical tangency on the interior of the vessel neck to the middle of the vessel lip. For rolled rim jars, the neck length was measured from the lowest point of rim modification to the top of the vessel lip, on the interior side of the vessel. When possible, neck length measurements were taken from three different parts of the neck, and the mean recorded. Many of the rim sherds in the excavated ceramic assemblages were broken above the neck joint, and lacked an accurate measurement for neck length. Consequently, they were not included for analysis.

The RPR, or rim protrusion ratio was developed by Holley (1989) to chart morphological change of Mississippian jar rims through time. In the Cahokia sequence, early jar rims were weakly protruded, but over time grew more pronounced (Holley 1989:21). This temporal trend corresponds to the RPR index, where early jar rims have an RPR value closer to 1.0, and later jars are closer to 0.1. RPR values are calculated with rim width and wall thickness measurements. Rim width is measured as the maximum distance between the upper interior and exterior rim margins. Wall thickness is measured at a point just below the initial swelling associated with rim modification. For tall necked jars lacking rim modification, wall thickness was measured at a point just below the neck juncture. When possible, rim width was measured from three different locations on the rim, and the mean recorded. For wall thickness, measurements were taken on each side of the rim sherd and averaged. In this analysis, the RPR index was calculated only for vessels with elaborated rims, meaning the rolled rim and everted modal types.

Motif Categorization

Body motifs from all three sites were categorized, quantified and compared. Numerous motifs originally identified from Ramey Incised pottery at Cahokia and other Mississippian northern hinterlands sites were identified also at Cambria. The Ramey Incised motif categories originally identified by Emerson (1989) and subsequently expanded by Richards (1992) and Mollerud (2005) provided the framework for this portion of the study. Many of the initial Ramey-derived motif types and categories were maintained, although slightly modified, for this analysis. In addition, the motif classification scheme was expanded to incorporate new motif categories and individual motif types identified from the Cambria Locality. In sum, the Cambria motif suite features 51 distinct motif types classified into 17 categories, including a category comprised of six border motif patterns (Figure 4.3).

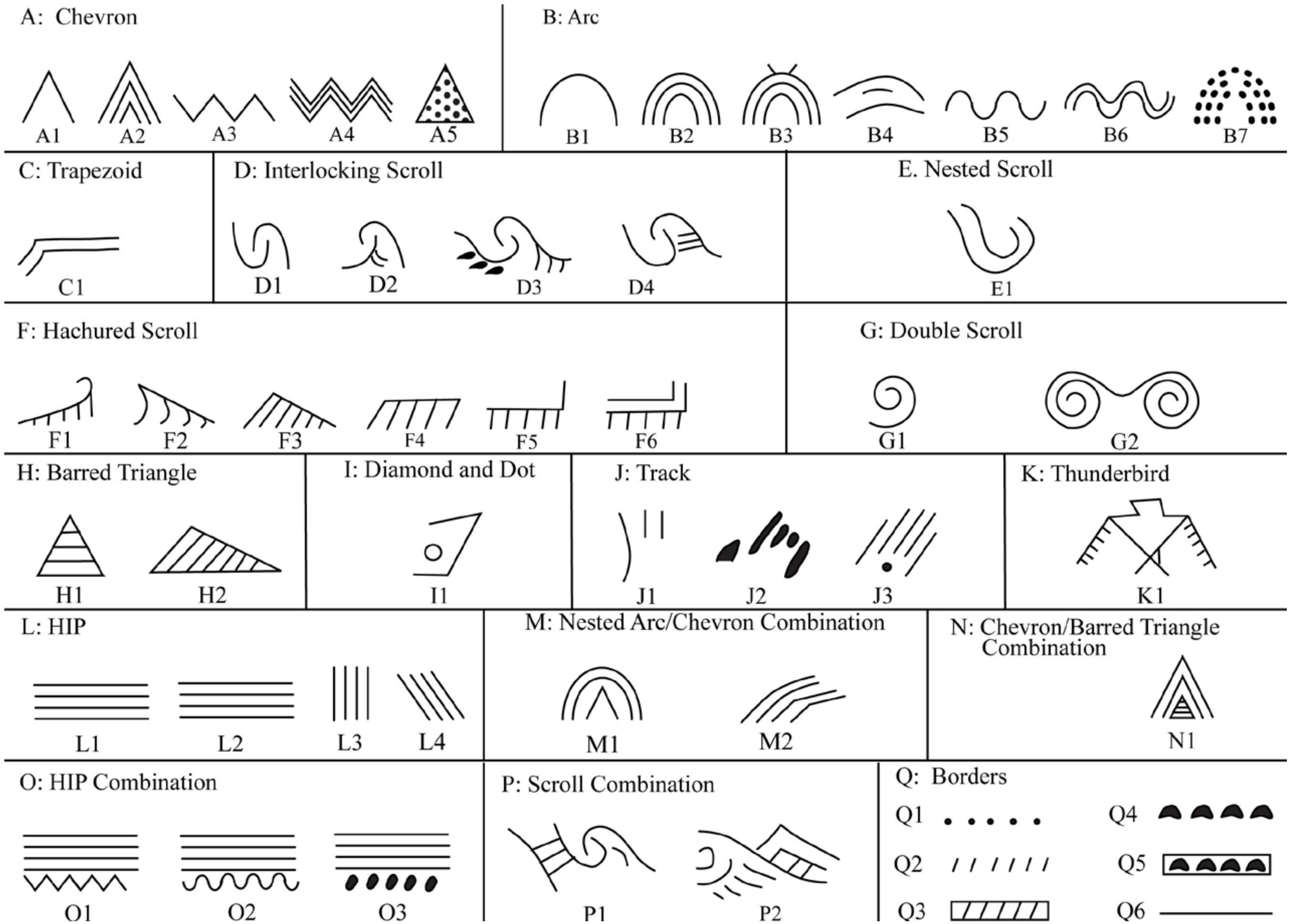

Figure 4.3: Cambria Locality motif suite

The methods for motif categorization were modeled on a previous comparative study of Ramey Incised pottery undertaken by the author (Mollerud 2005). A motif was only classified as a specific type if there was enough of the motif present to allow for positive identification. If there was not enough of a motif present for accurate identification it was considered *indeterminate*. Occasionally, enough of a motif was present to determine the broader category, but not the specific motif type. For example, enough of a motif might be present to determine that it is an interlocking scroll (Category D), but not whether it was plain (D1), hachured (D2, D3), or barred (D4). In these instances, the motif category was recorded, but the specific motif type was considered indeterminate.

In addition to recording motifs as specific types or categories, the linearity of a motif was classified. Motif linearity focuses on the overall shape of a motif, and is designated as curvilinear, rectilinear or linear. Curvilinear motifs are devoid of angles, and appear sinuous or rounded, while rectilinear motifs are characterized by straight lines joined together at varying angles. A linear category was included also due to the large number of sherds bearing the horizontal incised pattern (HIP), and is simply described as a group of parallel straight lines. Motif linearity was identified more frequently than specific motif types or categories because partial motifs, even those dubbed indeterminate, were often large enough to accurately identify the linear shape.

An attempt was made to identify and tabulate each different motif type on an individual vessel. For example, when two different motif types are displayed on the same vessel, both of the motif types and categories were identified as being present on that vessel. For quantification purposes, both motif types were recorded as one motif each. If a vessel is adorned with two examples of the same individual motif, one motif type was identified as present, but tabulated as two motifs of the same individual type. As a result, the motif analysis is flexible enough to be discussed on multiple levels, including the range of motifs represented, as well as the number of motifs present.

In addition to classifying motif types, technical aspects of the motifs themselves are examined. Categorizing *how* specific motifs are expressed is an attempt to discern the similarity with which potters illustrate various motifs at the three sites. For the most part, the orientation of certain motif types is noted, as is the number of elements used in the composition of the motif. The orientation of the chevron (Category A) and arc motifs (Category B) are recorded as opening upward, downward, both or running. Throughout, the “both” category is used to address the possibility that at least two separate motifs with different orientations are present. Running motifs are continuous, and composed of alternating upward and downward facing motifs linked together side by side. The orientation of the parallel lines motif (Category L) is handled through the separate categorization of horizontal (L1, L2), vertical (L3) and diagonal lines (L4), which are described in additional detail as either right- or left-leaning, or both. The orientation of the spiral motif (Category G) refers to the direction of the spiral as rotating right, left or both.

Nested motifs were identified as part of several motif categories, and the number of nested elements was recorded as a variable. For example, multiple arcs are incised one immediately below the other to form the nested motifs of the arc category (B1, B2, B3, B4 and B6). The number of individual arcs that make up these motifs are counted and recorded. However, the number of parallel lines that make up the HIP were not counted, as this pattern is more of a design that fills space than a specific emblematic motif. Furthermore, the majority of rim sherds that bear the HIP are broken above the base of the design, which hinders an accurate tabulation for the number of parallel lines. Nested motif numbers were calculated for the majority of motifs in Categories A (chevron), B (arc), C (trapezoid), E (nested scroll) and M (combination arc).

Motif analysis was applied only to rim sherds where enough of the vessel body was preserved to determine the presence of body decoration. An important aspect of this study is the correlation of modal types with motif data, so body sherds were not analyzed. Although some body sherds were quite large and demonstrated complete motifs or whole combinations of motifs, they were documented only through photography, and not included as part of the overall analysis. Including body data in the motif count would certainly increase the number and diversity of motifs represented in the Cambria Locality, but without the accompanying modal data body motifs cannot be incorporated into effective arguments relating the morphologic, technical and stylistic choices made by Cambria potters. An additional problem is related to quantification. Without an associated rim, it is difficult to determine how many vessels are represented by body data, and how many motifs are present per vessel.

Description of Site Ceramic Assemblages

Cambria (21Be2)

As noted previously, the Cambria ceramic assemblage was originally analyzed in accordance with the type-variety method (Knudson 1967; Shay 1966). Knudson reported examining a total of 17,015 sherds. Of these, 1,128 were rim sherds, representing 855 vessels. Body sherds numbered well over 15,000. In order to more advantageously highlight the diversity within the site's ceramic assemblage, and better package it for comparative purposes, Cambria site pottery was re-analyzed within the framework of an attribute analysis. Only rim sherds from Cambria were selected for re-examination because several research questions are related to the morphological and decorative data primarily demonstrated in vessel rims. More detailed information about Cambria site body sherds can be found in Knudson's comprehensive analysis of the Cambria site ceramic assemblage (Shay 1966).

The current analysis identified 1,203 rim sherds present in the Cambria ceramic collection. The increased number of rims may be accounted for by the addition of rim sherds from the University of Minnesota excavations, as well as possible rim fragmentation during storage. However, a much smaller number of vessels are included for analysis in this project. Many rim sherds were fragmented, eroded, or otherwise too incomplete for analysis. Furthermore, the successful and accurate collection of multiple attributes was a priority, so rim sherds broken above the neck joint, for example, were disregarded. The analyzed sample from the Cambria site numbers 452 rims, representing 442 individual vessels.

The overwhelming majority of vessel forms were jars (n=435; 98.4%). Other identified vessels forms included two bowls, and five miniature vessels. Grit temper dominates the assemblage (n= 432; 97.7%). Six shell-tempered rim sherds were identified from the Cambria site, as were a small number of rims tempered with a grit/shell mix (n=4; 0.9%). The ceramic assemblage from the Cambria site demonstrates the most variation in both morphological and decorative aspects. The following description of the Cambria site ceramic assemblage is discussed at two levels. The first level of discussion is more specific, focusing on data within the modal type. These sections attempt to detail the major lip and rim decoration categories associated with each modal type. The second level is more general, and discusses broader trends identified in the ceramic assemblage.

Modal Types

Angled-Unmodified

Jars with angled necks and unmodified rims represent the largest modal type from the Cambria site (n=164; 37.7%). Lip, rim and neck decoration is common, and is recognized on well over half of all angled-unmodified vessels (n= 102; 62.2%). This modal type exhibits the greatest variation in lip and rim decorative techniques and design placement combinations, which are broken down into 15 separate categories and listed in Table 4.1. Due to the decorative diversity, only major design modes, including zone, pattern and technique, are discussed. A few rims with singular design treatments are noted, as well.

Lip decoration is the most popular design treatment for angled-unmodified rims at the Cambria site, both as a singular treatment and combined with exterior and interior rim decoration zones (n=58; 35.4%). Crosshatched lips represent the single largest lip/rim decoration category for this modal type (n=20; 12.2%). There are two other lip only decoration categories: incised (n=8; 4.9%) and twisted cord impressed (n=4; 2.4%). Lip incised decoration is diverse, and includes both right- and left-leaning parallel diagonal lines (C-27 and C-283, respectively), as well as parallel vertical lines (C-206, C-345). Unique incised patterns are identified as chevrons (C-25), running chevrons (C-24, C-26), and a distinctive herringbone design (C-372). Twisted cord impressed lip designs mimic two incised patterns: crosshatched (C-18, C170) and left-leaning parallel diagonal lines (C-112, C-314).

Lips also are frequently decorated in combination with tool impressed exterior rims. Eight vessels are decorated with a combination of crosshatched lip and exterior tool impressions (C-45, C-47, C-97, C-294, C-315, C-328, C-355, C-437). The exterior tool impressions are mostly variations on oblong or semi-circular shapes with rounded tops and boxy or v-shaped bottoms. For the most part, they are oriented vertically, although there are two examples of oblique lines. Eleven vessels have both incised lips and exterior tool impressed rims. Vessel C-01 is unique within the Cambria Locality (Figure 4.4). The vessel is globular in shape with rounded shoulders, and the entire vessel is cordmarked, beginning just below the decorated rim. All-over cordmarking is traditionally associated with vessels from earlier time periods in Minnesota, particularly the Late Woodland. However, the morphology of vessel C-01, with its high rim, angled neck and globular body is more characteristic of ceramic vogues primarily associated with the IMMVe. Similarly, the incised lip and exterior tooled rim also are more characteristic of Cambria ware than Late Woodland twisted cord impressed decoration. The lip decoration is finely incised with right leaning, parallel diagonal lines, and the exterior rim impressions may be finger pad impressions as they are quite large and ovular, but also right-leaning.

Figure 4.4: Angled-unmodified mode, C-01

The next two largest rim decoration categories are exterior rim tool impressed (n=15; 9.1%), and both exterior and interior rim tool impressed (n=15; 9.1%). As a broad category, exterior tool impressions are a relatively frequent treatment for angled-unmodified vessels, and decorate just over 30 percent of the modal assemblage (n=50; 31.7%). For the most part, rim sherds decorated with only exterior tool impressions are adorned with overall larger impressions that appear more circular or oblong in shape. Again, some of these may be finger impressions. Thirteen vessels demonstrated both exterior and interior tool impressed rims. Interestingly, exterior and interior tool impressions were shaped differently on some vessels. Variations were noted in length and width of notched impressions, as well as the base shape of the impression, and whether it was rounded, pointed, or squared off. Interior tool impressions are less frequent, occurring on just under 20 percent of all angled-unmodified vessels (n=30; 18.3%). Despite the prevalence of lip and rim decoration among angled-unmodified vessels, the largest single category is undecorated rims, which make up nearly 40 percent of this modal type assemblage (n=62; 37.8%).

Eighteen angled-unmodified vessels have decorated necks, which makes up just over 10 percent of the modal type (n=18; 11.0%). When the frequency of neck decoration is compared by modal type at Cambria, angled-unmodified vessels have the most decorated necks (n=18; 4.1%). All angled-unmodified neck decoration is incised, but there are two different expressions of it. One form of neck decoration is tailored in size and design to that particular space, creating a specific decorative zone. For these vessels, the dominant neck decoration is represented by a single pattern unique to the Cambria Locality, where it is found at all three main sites. The design is patterned by a series of left-leaning, parallel diagonal lines completely encircling the vessel neck, intermittently crossed with a few right-leaning, parallel, diagonal lines (for example see C-228, Figure 4.5). In addition, many of the designs are bounded at the bottom by a separate panel of multiple parallel horizontal lines. There are seven examples of this intermittently crosshatched incised neck design for angled-unmodified vessels at the Cambria site (C-149, C-228, C-296, C-314, C-335, C-371, C-416). There are also two vessels decorated with left-leaning, parallel diagonal lines only (C-146, C-394). However, the total percentage of the rim orifice diameter recovered for both vessels is approximately 5 percent, and due to the limited portion of the design available for analysis, it is not known whether the incised neck designs bear any additional motifs beyond the left-leaning parallel diagonal lines design field.

Triangles comprised of diagonal and/or horizontal barred triangles represent other incised design patterns on angled-unmodified vessel necks (C-97, C-107, C-226). An additional aspect of a few of these designs is that the incised patterns do not fill up the entire design field, and a triangular blank space is created in between the figures (C-173, C-226). Some incised neck designs are not triangles, but rather a series of parallel diagonal lines paired opposite each other, creating a triangular shaped blank space in the middle (C-112, C-449). These alternating barred and blank triangle incised design patterns are very similar to those found on Chamberlain Incised and Anderson High Rim vessels at Mill Creek/Over culture sites. In fact, Knudson (1967:271) identified vessel C-173 as Chamberlain Incised Triangle, a Mill Creek pottery type.

The second form of incised neck decoration for angled-unmodified vessels begins somewhere below the rim but above the neck juncture, and extends over the neck and onto the upper shoulders of the vessels (C-23, C-425). The dominant design pattern is a series of parallel horizontal lines known as the Horizontal Incised Pattern (HIP). The HIP is well known in the Late Prehistoric period in the Plains, and has been identified on both the neck and body of Great Oasis pottery (Alex and Tiffany 2000; Fishel 2005:41; Henning and Henning 1978), and similarly on vessels associated with the village cultures of the adjacent Big Stone Region in southwestern Minnesota (Holley and Michlovic 2013:84).

Twisted cord impressions represent a minority decorative technique for angled unmodified vessels (n=11; 6.7%), but this modal type demonstrates the second highest number of twisted cord decorations after the S-rim mode. Vessel lips and interior rims are the primary zones for twisted cord adornment. Lip decoration is either in the form of crosshatching (C-18, C-170) or closely spaced parallel diagonal lines (C-112, C-314, C-404). For angled-unmodified vessels, twisted cord impressed interior rims are always paired with lip incising. Four of these vessels are quite similar, and exhibit stubby angled rims with smooth over cordmarked exterior surfaces, and weakly trailed body decoration. Combined motifs of nested chevrons, arcs and trapezoids fill the entire design field between the neck and shoulders (C-14, C-62, C-69, C-186). All vessel lips are incised with right-leaning parallel diagonal lines. The twisted cord impressions on the interior rim exhibit a bit more variation, and include parallel horizontal lines, as well as a series of right-leaning diagonal lines. The interior rim decoration zone is located between the rim and the sharp angle of the neck break. Two other vessels have incised lip and neck decoration, as well as twisted cord impressed interior rims (C-228, C-296).

The two most prominent lip forms for angled-unmodified vessels are nearly evenly split between flat lips (n=76; 46.3%) and those with an exterior bevel (n=74; 45.1%). There are far fewer round lip forms associated with this modal type (n=13; 7.9%), and only one example of a pinched lip was identified.

Shoulder form was variable for angled-unmodified vessels, although only seven rim sherds, less than 5 percent of the total modal sample, were complete through the shoulders. Angled shoulders were the most frequent for the angled-unmodified modal type, and identified for four vessels. Pronounced shoulders were evident for two vessels, and rounded shoulders were in the minority, recorded for only one vessel.

The majority of angled-unmodified vessels are smooth with a plain surface (n=125; 76.2%), but there are a small number of vessels with both cordmarked (n=3; 1.8%) and smoothed over cordmarked (n=10; 6.1%) exterior surfaces. Smudging is not a popular finishing technique for this modal type (n=27; 16.5%), although nearly half of the vessels demonstrate evidence for surface polishing (n=72; 43.9%). Less than 10 percent of all angled-unmodified rims have both smudged and polished surfaces (n=16; 9.8%).

Figure 4.5: Angled-unmodified mode with intermittent crosshatched neck decoration, C-228

Table 4.1: Lip and Rim Decoration for Angled-Unmodified Modal Type from Cambria

Lip/Rim Decoration	**Count**	**Percentage**
Lip Crosshatch	20	12.2
Lip Incised	8	4.9
Lip Twisted Cord	4	2.4
Lip Crosshatch/Ext Tool Imp	8	4.9
Lip Incised/Ext Tool Imp	11	6.7
Lip Twisted Cord/Ext Tool Imp	1	0.6
Lip Incised/Int Twisted Cord	6	3.7
Ext Tool Imp	15	9.1
Ext Incised	1	0.6
Ext/Int Tool Imp	15	9.1
Ext Cordwrapped Stick/Int Tool Imp	1	0.6
Int Tool Imp	7	4.3
Int Incised	1	0.6
Ext Neck Incised	4	2.4
Undecorated	62	37.8
Total	**164**	**99.9***

* Total may not sum due to rounding

The average neck length for angled-unmodified vessels is 25.6 mm, which is the third highest average neck length amongst modal types for the Cambria site. The average orifice diameter is relatively large also, measuring 17.8 mm, and is the second largest orifice size by modal type. The OD/NL measurement is 7.4, and the correlation coefficient is 0.55, indicating that neck length is not necessarily correlated with vessel size. The average width and depth of body incising is 2.5 mm and 0.9 mm, respectively.

Less than 10 percent of angled-unmodified vessels have handles (n=14; 8.5%), represented by both loop and semi-strap forms. Undecorated or plain, loop handles are the most popular for this modal type (n= 7). Five handles are decorated or embellished in some way. The primary adornment is a single vertical line running down the center of the handle, created either by incising (n=2) or twisted cord impression (n=2). Another handle is decorated with a combination of incised lines; one vertical incised line down the center of the handle, and multiple horizontal lines extending from it on both sides. The last form of handle ornamentation is a plain loop handle embellished with a projecting circular knob at the top of the handle, adjacent to where it attaches at the rim.

The classification of body decoration was hampered by the lack of rim sherds complete to the shoulder, or otherwise large enough to determine if body decoration was present. There are 108 angled-unmodified vessels with enough of the vessel body present to determine body decoration. Of these, 82 vessels, or just over 75 percent have body decoration on the upper shoulders of the vessel. The presence of 75 discernable motifs, including border motifs, is identified from 56 angled-unmodified vessels. Motif type was indeterminate for the remaining 26 vessels. All of the decoration is trailed/incised and ranges in width from narrow to broad. The angled-unmodified modal type has the second largest variety of motif expression for the Cambria site. Of the 52 motifs identified for the three sites in the Cambria Locality, angled-unmodified vessels at Cambria demonstrate one-third of them (n=17; 33.3%).

Just over half of all motifs expressed are the L1 motif, the Horizontal Incised Pattern (n= 40; 53.3%). The HIP motif is used in two different ways at the Cambria site. First, it is used as a single decorative pattern, covering the entire upper body of the vessel from just below the neck to just above the shoulder. Occasionally, the HIP pattern begins just below the rim, covering the neck, and continuing over the upper shoulders of the vessel. At Cambria, the HIP never extends below the shoulder break. In the second expression, the HIP is utilized in combination with another motif, often filling in the space between the other motifs decorating the vessel. For these vessels, nearly the entire design field between the neck and shoulders is completely decorated.

The HIP is typically used in conjunction with two other motifs, the nested chevron and barred triangle, or a combination nested chevron/barred triangle motif. Sometimes, the incising width varies noticeably between the main motif, a broadly trailed nested chevron, and a more finely drawn HIP pattern that filled in much of the interior design space on the upper shoulders of the jar (C-193).

The second and third largest motif categories identified for angled-modified vessels are A2, the nested chevron (n=11; 14.7%), and N1, the combination nested chevron/barred triangle motif (n=4; 5.3%). The remaining motif categories include nested arc (B2), nested trapezoid (C1), a rectilinear hachured scroll (F4), both horizontal and diagonal barred triangle (H1, H2), a tooled version of the HIP (L2), a diagonal incised pattern (L4), and a combination motif of arcs/trapezoids (M2). Interestingly, there is also one curvilinear motif, D2, an interlocking scroll that represents the only interlocking scroll motif at the Cambria site not found on a rolled rim vessel (C-29). However, the short everted rim associated with this vessel is within the range of rim variation exhibited for Ramey Incised vessels within the American Bottom, and at northern Mississippian sites like Aztalan, and in the Apple River region (Mollerud 2005). In addition, seven vessels were decorated with border motifs as part of their overall design pattern. Five of the six border motifs have been identified on angled-unmodified motif vessels. Only Q3, the barred border, is not represented. For the most part, not enough body decoration is present on these vessels to determine motif expression beyond the boundary motif. In only one vessel, C-149, could a motif (H2) be determined in association with a border (Q2).

Table 4.2: Motifs for Angled-Unmodified Modal Type from Cambria

Motif Type	Count	Percentage
A2	11	14.7
B2	3	4.0
C1	1	1.3
D2	1	1.3
F4	1	1.3
H1	1	1.3
H2	2	2.7
L1	40	53.3
L2	1	1.3
L4	1	1.3
M2	1	1.3
N1	4	5.3
Q1	1	1.3
Q2	2	2.7
Q4	1	1.3
Q5	1	1.3
Q6	3	4.0
Total	**75**	**99.7***

* Total may not sum due to rounding

Angled-Modified

The angled-modified category is only about a quarter of the size of the angled-modified group, but it represents the fourth largest modal type at Cambria. There are 46 vessels representing just over 10 percent of the site assemblage. Lip and rim decoration is common, appearing on over three-quarters of angled-modified jars in multiple combinations (n=35; 76.1%); plain vessels make up the remaining 24 percent of the modal sample. Lip decoration is evident on over half of the jars (n=24; 52.2%), but a small number of vessels have lip decoration only (n=7; 15.2%). Crosshatching decorates the lips of five vessels (C-247, C-305, C-306, C313, C428), while two are incised (C-32, C-60). Also, there is one vessel with a unique dentate-stamped lip. The stamping is in the form of right-leaning, parallel diagonal lines (C-38). In southern Minnesota, dentate stamping was a somewhat more popular decorative technique during the Late Woodland period, where it was used primarily as an exterior rim treatment for the type *Lake Benton Dentate* (Anfinson 1997:75-80).

Sixteen vessels have lip decoration in combination with another decorative rim attribute. The most popular decorative treatment for angled-modified vessels is the combination of lip incising with exterior tool impressions (n=12; 26.1%). Eleven of these twelve vessels exhibit a remarkably similar combination of decorative elements. The lip incising resembles deep, angular slits, and is termed "incised punctates" by Knudson (1967:261) (Figure 4.6). The incised marks were created by a pointed tool deeply inserted into the center of the lip, and then dragged down and to the right, narrowing in both width and depth. The deeply incised slits are all left-leaning, and extend to the edge of the exterior rim/lip juncture, where they are combined with wide, shallow tool impressions on the exterior rim. Many of the tool impressions appear to display the broad arc of finger impressions, but others have ridges, almost as if they were made with a shell. A few of these vessels exhibit a possible fillet in the form of a narrow, wavy strip of clay, overhanging or appending the broad tool impressions (C-13, C-31, C-197, C-324, C-326). However, the appearance of the fillet could also be due to clay displacement of the exterior rim, when the impressions were made in wet clay. The decorative techniques most likely created the modified rim profile, also. Additional aspects of these vessels include both smoothed and smudged surface finishes, and infrequent body decoration. The HIP is identified on three vessels, and it is the only motif type associated with them. This combination of deep, angled lip incising and broad tool impressions is also found at the Price site. A cursory review of published ceramic studies from southern Minnesota, IMMVe and Mill Creek sites suggests the incised punctate decorative style is unique to the Cambria Locality (Henning and Henning 1978; Holley 2008; Holley and Michlovic 2013; Holley, et al. 2011; Hurt 1954; Ives 1962; Lensink and Tiffany 2005; Tiffany 1982).

Figure 4.6: Angled-modified mode with incised punctate decoration and possible fillet lip/rim decoration, C-197

There is one angled-modified rim sherd from the Cambria site with a different combination of incised lip and exterior tooled rim decorations. The lip decoration on this vessel is made up of wavy, right-leaning, parallel diagonal lines that curve around wide tool impressions on the exterior rim (C-77). The broad, ovular shape of the tooled marks is evocative of finger impressions, but the overall shape and smooth edges also could be indicative of a bone tool. This decorative combination is more popular at the Price site, where it adorns multiple vessels.

Three angled-modified vessels have crosshatched lips and exterior tool impressions (C-40, C-41, C-391). The exterior tool impressions are either ovular/circular or semi-circular, with a rounded bottom and sides but relatively straight across the top at the lip/rim juncture. Two vessels have unique rim modifications in addition to their decoration. Vessel C-41 was manufactured with a rim much wider than its neck, resulting in a wedge shaped rim. Vessel C-391 is modified by a broad and horizontal lip lug that gradually widens a portion of the rim. The decorative lip and rim elements are smoothly incorporated into the broadened orifice margins. In addition, this vessel has a decorated neck incised with a horizontally barred triangle.

All three of these vessels are very similar to western ceramic types, particularly the Sanford Modified Lip and Chamberlain Wares of the Mill Creek culture. The similarities to Sanford Ware are based on the crosshatched lip, which is the most prevalent form of lip decoration for both Sanford Incised Shoulder and Mitchell Modified Lip, as well as the scalloped lip margins described for the outer rim, that were created by tool impressions or pinching techniques. Vessel C-391 is particularly comparable to the type Chamberlain Incised Triangle. The rim is tall and straight, and the decorative techniques include a combination of tooled rim and incised neck decoration. Interestingly, and similar to most motif depictions at the Cambria sites, the incised triangle is depicted with the point or arch facing up. A cursory review of Mill Creek ceramic analyses and site reports suggests that most incised barred triangle motifs depicted singly or as a band, are pendant, with the triangular point hanging down (Anderson 1981; Hurt 1954; Ives 1962; Tiffany 1982).

One vessel uniquely combines fine incising on both the lip and interior rim (C-163). The incised lip pattern is a series of right-leaning, parallel diagonal lines. The incising on the interior rim is located just below the lip margin, and represents a single horizontal line encircling the vessel interior. Decoration on the interior rim is not common for angled-modified vessels at the Cambria site, and only represents about 15 percent of the modal type sample. Furthermore, this is the only angled-modified vessel with an incised interior rim; the others are decorated with interior tool impressions. An additional aspect of vessel C-163 is that the vessel rim and body are finely incised with a HIP. The design pattern starts just below the rim, and continues over the vessel neck and onto the upper body.

Exterior tool impressions are the most popular decorative treatment for angled-modified vessels, and are found on well over half of the jars (n=26; 56.5%). Four rim sherds have exterior tool impressions only, which are represented by semi-circular and circular shapes, as well as short notches (C-37, C-251, C-342, C-403). Six vessels have both exterior and interior tool impressions (C-4, C-177, C-311, C-336, C-434, C-450). Typically, these vessels are decorated with long, vertical notches on both sides of the rim. However, one rim has a notched exterior and textured, v-shaped tooled marks on the interior. Other variations in tooling techniques and shapes include incised diagonals, and ovular or semi-circular impressions.

Of available angled-modified vessel bodies, over 60 percent are decorated (n=21; 63.6%). Fourteen vessels have identifiable motifs, including one sherd with an identifiable border motif only. The most popular motif is the HIP, or Motif L1 (n=10; 47.6%). The remaining motifs each were identified once amongst the angled-modified vessels: H2 (diagonal barred triangle), M2 (combination arc/trapezoid), and O3 (combination HIP/tooled border). Motif M2 primarily is associated with a group of stubby necked jars that have a smoothed over cordmarked surface treatment, which is an uncommon finish for the Cambria Locality. Motif O3 is part of a series of combination motifs that have been identified on at least two rim sherds and a few body sherds from the Cambria site, as well as on body sherds from the Price and Jones sites. Only two vessels have enough body present to determine shoulder form, but both of those vessels have rounded shoulders. They are associated with motifs H2 and O3, also.

Vessel C-04 is a large fragment of a finely manufactured and decorated vessel that is worth describing in full (Figure 4.7). The vessel has a tall rim (39.9 mm) and rounded shoulders, producing a sub-globular lower body. The rim is decorated with long, vertical notches on the exterior rim, and shorter notches with v-shaped bases on the interior rim. The upper shoulders of the vessel exhibit a wide, two-tiered design panel set off by border motifs located both above and below the primary design field. All body decoration was trailed narrowly with a blunt tool when the clay was still wet, resulting in small ridges around some areas of the design. Two parallel horizontal lines represent the top border (Motif Q6), encircling the vessel just below the neck/body juncture. The bottom of the design field is set off by a combination of Motifs Q2 and Q6, creating a boundary pattern of horizontal lined fringe, or vertical hachure marks. The motifs in the main design field are arranged in two levels, as alternating bands of diagonally barred triangles (Motif H2). The triangle motifs are also bounded by a barred border pattern (Motif Q3) that forms the apex of each triangle. In addition, the space formed in between Motifs H2 is a blank pendant, triangle. This vessel is a good example of an overall design pattern that has been identified at all three sites, and may be representative of the Cambria Locality.

Figure 4.7: Angled-modified mode, C-04

Table 4.3: Lip and Rim Decoration for Angled-Modified Modal Type from Cambria

Lip/Rim Decoration	**Count**	**Percent**
Lip Crosshatch	5	10.9
Lip Incised	2	4.3
Lip Dentate Stamped	1	2.2
Lip Crosshatch/Ext Tool Imp	3	6.5
Lip Incised/Ext Tool Imp	12	26.1
Lip Incised/Int Incised	1	2.2
Ext Tool Imp	4	8.7
Ext Incised	1	2.2
Ext/Int Tool Imp	6	13.0
Undecorated	11	23.9
Total	**46**	**100.0**

Table 4.4: Motifs for Angled-Modified Modal Type from Cambria

Motif Type	Count	Percentage
H2	1	5.9
L1	10	58.8
M2	1	5.9
O3	1	5.9
Q2	1	5.9
Q3	1	5.9
Q6	2	11.8
Total	**17**	**100.1**

* Total may not sum due to rounding

Six angled-modified vessels comprising 13 percent of the modal sample have incised neck decoration. For three vessels, the neck and body decoration were not different motifs. Part of the primary body design was placed high on the vessel, beginning somewhere on the vessel neck below the exterior rim. The remaining three vessels have specific motifs marking the neck decoration zone. Two vessels both depict left-leaning parallel lines, although one also has the intermittent crosshatching pattern. The last rim sherd was described previously, and is decorated with a horizontally barred triangle.

Three angled-modified vessels have handles, and all of them are of the loop variety. Vessel C-192 is represented by two rim sherds, each of which has a single plain handle. A grooved handle adorns vessel C-256, and C-313 is decorated with twisted cord impressions. At the top of the handle, the design is made up of several nested chevrons, arms open above them. Extending from the “v”-shaped base of the last chevron, a single vertical cord impressed line snakes down the center of the handle. All of the handles are attached at the rim, resulting in a gentle castellation of the rim area immediately above the handle on two of the vessels.

Plain vessels with a smooth surface treatment dominate the angled-modified sample (n=35; 76.1%). Many vessels also exhibit evidence of burnishing or polishing (n=25; 56.5%). Smudged vessel surfaces are identified in nearly 20 percent of angled-modified rims, but only six vessels, or 13 percent, are both smudged and polished. Two vessels demonstrate evidence for smoothed over cordmarking in small patches below the rim, but not on the vessel body.

Angled-modified vessels have the longest average neck length at 27.5 mm, and the largest orifice diameter at 19.4 cm, of all the modal types from the Cambria site. The correlation coefficient for the two variables is fairly high, 0.82, and may indicate a relationship between neck length and vessel size. Average width and depth of incising are 2.3 and 0.7 mm, respectively.

Curved-Unmodified

Curved-unmodified vessels are the third largest modal type category for the Cambria site (n=65; 14.9%). Over half of the rim sherds demonstrate lip or rim decoration (n=33; 50.8%), representing eleven different decoration combinations. Outside of rolled rims, the curved-unmodified mode has the highest percentage of undecorated rims and lips (n= 32; 49.2%). Lip decoration is popular for curved-unmodified rims, and occurs on nearly 30 percent of vessels (n=19; 29.2%). The most popular upper rim decorative treatment is lip incising only (n=13; 20%), which is typically represented as right-leaning diagonals or vertical lines. Three vessels have crosshatched lips only (C-179, C-320, C-414). Also, there is one example of a lip with intermittent crosshatching (C-358), and another marked with broad, circular tool impressions at the juncture of the lip and exterior rim (C-249). Lip decoration also occurs in combination with tool impressions, twisted cord impressions and incising on both the exterior and interior rims.

After lip incising, the other nine combinations of lip and rim decoration make up less than 10 percent of the modal sample each. Rims with either exterior tool impressions or both exterior and interior tool impressions have the second highest percentage of rim decoration (n=4; 6.2%). Wide angular and narrow diagonals are the most popular shapes for the exterior tooled marks only (C-198, C-271, C-417). One vessel has exterior semi-circular decorations that are textured, perhaps made with the end of a small long bone, or bifurcated twig (C-338). The vessels with both interior and exterior tool impressions all bear vertical notches on the interior side (C-104, C-165, C-189, C-318). However, the exterior tooled decorations differ, and are either notched or circular in shape. Two (3.1%) rim sherds are adorned with interior tooled impressions only. They are marked with either semi-circles (C-34), or a series of long, curved lines perhaps rendered with a fingernail (C-435).

Three vessels have twisted cord impressed interior rims in the form of two to four parallel horizontal lines encircling the interior rim of the vessel. Two of these vessels are further adorned with lip incising (C261, C312), and the third rim, in addition to the twisted cord, exhibits interior tool impressions in the form of right-leaning diagonals (C-244). Finally, one rim is decorated in all three upper decoration zones. Vessel C-156 combines a crosshatched lip with two parallel horizontal twisted cord impressed lines on the exterior rim. The interior twisted cord decoration is unique in the Cambria Locality, and represented by two sets of opposing right-leaning and left-leaning diagonal lines.

Neck decoration is identified on less than 10 percent of the curved-unmodified mode (n=4; 6.2%). At least two vessels have decorated necks because the neck and body are treated as the same decorative zone (C-164, C-198). Vessel C-164 exhibits Motif M2, a combined motif of arcs and trapezoids. Vessel C-198 bears an indeterminate trailed geometric motif. The other two vessels treat the neck and body decorative zones separately. Vessel C-435 demonstrates relatively unique decoration for the neck zone. The trailing is relatively wide, and the design resembles two nested arcs. A single horizontal line separates the neck and body decoration on C-104. The neck decoration is typical for the Cambria Locality, and is the intermittent crosshatching pattern described previously.

Table 4.5: Lip and Rim Decoration for Curved-Unmodified Modal Type from Cambria

Lip/Rim Decoration	Count	Percentage
Lip Crosshatch	3	4.6
Lip Incised	13	20.0
Lip Tool Imp	1	1.5
Lip Incised/Ext Tool Imp	1	1.5
Lip Crosshatch/Int Incised	1	1.5
Lip Incised/Int Twisted Cord	2	3.1
Lip Crosshatch/Ext & Int Twisted Cord	1	1.5
Ext Tool Imp	4	6.2
Ext/Int Tool Imp	4	6.2
Int Tool Imp	2	3.1
Int Tool Imp & Twisted Cord	1	1.5
Undecorated	32	49.2
Total	**65**	**99.9**

* Total may not sum due to rounding

Body decoration is recorded for 31 out of 46 vessels; not enough of the vessel body is present for 19 rims to determine is the body was decorated. The available data indicates that nearly 70 percent of curved-unmodified vessels had decorated bodies (C=31; 67.4%). All vessels are trailed or incised, except for one that bears a single horizontal line of dentate stamping high on the vessel, just below the neck (C-388). Curved-modified vessels have a relatively large number of identifiable motifs, and several of them are decorated with more than one motif, resulting in a tally of 23 vessels bearing 34 identifiable motifs. Furthermore, this modal type has the second largest variety of motif expression for the Cambria site. Of the 52 motif types identified for the three sites in the Cambria Locality, curved-unmodified vessels at Cambria demonstrate over one-third of them (n=18; 34.6%).

The most popular motif is the HIP or Motif L1 (n= 13; 38.2%). This motif occurs by itself nine times. The average width of HIP incising for this mode is quite narrow, measuring 1.5 mm. Four examples of the HIP are found in combination with other motif types. Vessel C-117 is distinctive because the two motif types have differing widths. The HIP motif (Motif L1) is fine incised (0.8mm), while the nested chevron is quite a bit wider, demonstrating an average width of 3.4 mm. Vessel C-104 also is decorated with a unique HIP motif. It is comprised of 2 horizontal parallel lines, which is the minimum number for identifying the HIP pattern in this analysis. However, on this vessel it is more or less functioning as part of a combined border with Motif Q4, a line of crescent shaped tool impressions. All of the incising on C-104 is narrow, including the neck decoration, and averages 1.5 mm in width. Vessel C-181 also represents the HIP pattern as a border motif, but on this jar it is represented as three horizontal parallel lines located just below the neck of the vessel. It is also narrowly trailed (1.9 mm). Only one curved-unmodified vessel is decorated with a trailed HIP motif larger than the narrow category (C-435).

The other motifs identified for curved-unmodified jars occur only once or twice in the sample, and represent a broad swath of motif categories. Some of the motif types are associated more often with rolled rim vessels in the Locality, or with Middle Mississippian ceramic types. For example, Vessel C-195 is decorated with a nicely rendered hachured, interlocking scroll (Motif D2). This curvilinear motif is typical of Ramey Incised pottery from both American Bottom and Mississippian hinterland sites. Furthermore, this vessel is shell-tempered, and has sharply angled shoulders—two additional traits that link it with classic Mississippian ceramic vogues. However, the upper portion of this vessel features a long, curved neck with no rim modification, and a lip beveled to the exterior. The inclusion of a hachured scroll motif with this type of rim appears to blend certain aspects of Mississippian vessel manufacture (temper), morphology (shoulder), and design (motif) with local notions of upper body/rim morphology, surface finishing and decorative techniques. Vessel C-195 exhibits broad trailing and a strong interior cameo, both of which are more indicative of hinterland manufacture. Furthermore, this vessel is not slipped or smudged, which are typical finishing techniques for Cahokia Ramey Incised jars, along with surface polishing (Holley 1989:383) This vessel does demonstrate evidence for polish.

Vessel C-75 appears to be decorated with a rectilinear hachured scroll (Motif F3), another motif also identified on Ramey Incised pottery in the American Bottom, where it is analogous to Emerson's Motif VIf. Possibly there are two hachured scroll motifs on this vessel, but neither is fully complete. Vessel C-75 exhibits manufacturing and morphological characteristics wholly consistent with Cambria vogues. However, the inclusion of a possible Mississippian motif suggests outside influence relating to the symbolic realm.

The third curved-unmodified vessel with a curvilinear body motif is C-277. It is probably a miniature vessel, which may contribute to its somewhat unique upper body and rim shape. In profile, the vessel neck appears almost straight, but it is very gently curved outward. The rim is short, and was fashioned with a more robust outward curve. Vessel C-277 is decorated with a combination of three different linear and curvilinear motifs, two of which are more often associated with rolled rim vessels. An incomplete motif was categorized as part of the "track" category (J3), which is found on rolled rim vessels only in the Cambria Locality. A second incomplete motif was identified as a possible spiral (G1). This curvilinear motif also is often found with rolled rim vessels, both within the Cambria Locality, and at Mississippian sites like Aztalan, and in the neighboring Red Wing area of southeastern Minnesota. Located below the track and spiral motifs, just above the vessel shoulders, is a series of horizontal vertical lines (Motif L3).

Vessel C-229 is a globular jar with thick walls, rounded shoulders, and a finely incised Thunderbird motif as the only body decoration (Figure 4.8). It is a very unique vessel for the Cambria Locality, in terms of both morphology and symbolism. According to MHS records, it came into the collection very early, even before Nickerson initiated his excavations at the Cambria site. Jacob Brower donated the vessel sometime prior to his death in 1906, and it was labeled as coming from “Cambria, Jones Village, MN”. Based on the provenience data available, it is believed to have come from the Cambria site (Pat Emerson, personal communication). This vessel was not described in Knudson’s analysis, and was perhaps only reunited with the bulk of the Cambria materials sometime after the 1960s.

Much of the upper body and rim are missing, but enough remains to identify a short, curving neck with an unmodified rim. This vessel shape is not common for Cambria ware, and the vessel walls are quite thick, averaging 6.5 mm in width. It is a relatively small jar with an orifice diameter of only 8 cm. The exterior surface is smoothed, but not smudged or polished, and the vessel interior demonstrates smoothing marks that look wispy, as if they were made from grasses. The fractured remnants of two partial suspension holes are located at the extreme upper edges of the broken rim, indicating the vessel was hung at some point in its lifespan. Lastly, there are some indeterminate incised marks on the area of the vessel opposite the remaining portion of the rim.

Figure 4.8: Thunderbird motif, C-229

The motif is very clearly a thunderbird. It is composed of fine incised rectilinear lines possibly drawn when the vessel was mostly dry, as some of the lines appear almost etched into the vessel surface. The thunderbird has a triangular body formed from two crossed diagonal lines, and two feathered wings depicted by hachure marks extending out from the body. The head of the figure is rectilinear, and forms a partial rhombus. The feet are uneven, and a single horizontal line extends from the bottom of the body to the top of the leg on the right side. This figure is similar to other Thunderbird figures in Minnesota dating from Link phase or early Oneota contexts in the Red Wing Locality. A ceramic vessel decorated with a thunderbird motif was recovered from the Vosburg site, and associated with an archaeological context recently dated to cal. AD 1310 (Ron Schirmer, personal communication 2015). The Cambria emblematic motif may be the earliest example of a Thunderbird on a ceramic vessel in Minnesota.

Four (6.2%) vessels have evidence for handles, including one with a handle scar (C-261). One vessel has a plain loop handle (C-318), and another has a looped handle adorned with a small circular knob near where the handle attaches to the rim (C-189). The third rim also has a plain handle, but it is a semi-strap handle. Curved-unmodified vessels have the lowest percentage of handles for all modal types from the Cambria site.

Table 4.6: Motifs for Curved-Unmodified Modal Type from Cambria

Motif Type	Count	Percentage
A2	2	5.9
A4	1	2.9
B2	1	2.9
B5	1	2.9
C1	2	5.9
D2	1	2.9
F3	1	2.9
G1	1	2.9
J3	1	2.9
H2	2	5.9
K1	1	2.9
L1	13	38.2
L3	1	2.9
O1	1	2.9
Q2	1	2.9
Q4	2	5.9
Q5	1	2.9
Q6	1	2.9
Total	**34**	**99.5**

* Total may not sum due to rounding

Surface treatment is dominated by smooth, plain vessel surfaces (n=44; 67.7%). Two (3.1%) rims have evidence for smoothed over cordmarked treatment on the rims, just below the lip. Nearly one-third of all curved-unmodified vessels are smudged (n=19; 29.2%), and over one-half demonstrate evidence for polish (n=36; 55.4%). Comparatively, this modal type also exhibits a relatively high number of smudged and polished vessels (15; 23.1%).

The averaged metric data indicates that curved-unmodified vessels are on the smaller end of the size range, as the average orifice diameter is 14.9 cm. The average neck length is 20.8 mm. The average OD/NL is 8.0, and the correlation coefficient is 0.51, suggesting that neck length and orifice size are not linked. The average width of body incising is 2.4 mm, and average depth is 0.8 mm.

Curved-Modified

Curved-modified vessels are in the minority at the Cambria site (n=11; 2.5%). Decoration of the lip/rim zone is very popular for this modal type (n=10; 90.9%), and only one vessel has an undecorated rim. Most of the decoration is focused on rim adornment. Lip decoration is limited to crosshatching on two rims (C-49, C-176). Exterior rim decoration is the most common (n=8; 72.7%), but unique exterior rim crosshatching decorates two jars. An incised crosshatched pattern decorates the exterior lip/rim juncture of C-281, which is a rare placement for this design at Cambria. A twisted cord crosshatched pattern decorates C-325, which also has a distinctive folded rim. Crosshatched exterior rims are associated more commonly with Foreman and Chamberlain ware vessels of the Initial Middle Missouri Variant, although they are minority wares at many IMMV sites (Alex 1981; Anderson 1981; Ives 1962; Tiffany 1982).

Over one-half of curved-modified rims are decorated with exterior tool impressions (n= 6; 54.5%). Three vessels have tooled exterior rims only. Vessel C-61 is decorated with broad ovular impressions at the lip/rim juncture that are large and deep enough to have distorted the shape of the rim through pressure displacement. Two other rims have wedge-shaped tool impressions that are either wider at the top (C-298), or along the linear, left side of the mark (C-353). Exterior rims also are decorated in combination with interior rims (n=3; 27.3%). Vessel C-402 is decorated with fine vertical notches on both the interior and exterior rims. The rim was probably decorated when the clay was nearly dry, as the narrow notches have more of a scratched appearance. Vessel C-422 also has two notched rims, but the exterior notches are short and square, while the interior notches are longer with more rounded bottoms. This vessel also has a decorated neck exhibiting the intermittent crosshatched pattern unique to the Cambria Locality.

Vessel C-160 is decorated with long, linear notches on the exterior rim, and the interior rim is adorned with an incised pendant triangle motif comprised of left-leaning diagonal lines. This is the only known example of the barred triangle motif as interior rim decoration in the Cambria Locality. The exterior neck decoration is a diagonally barred triangle also, but it is made up of right-leaning diagonal lines, and the apex is oriented up. In addition, the triangles in the neck decoration zone have a hachure border. This neck design mimics the diagonally barred triangle (Motif H2) identified as body decoration in the Cambria Locality. Furthermore, the surface treatment is smoothed over cordmarked, which is uncommon for both the modal type and the site.

Seven out of eleven curved-modified rim sherds were large enough to determine the presence of body decoration and, of these, four (57.1%) vessels had decorated bodies. Three identifiable motifs were discerned from three different vessels. Vessel C-402 is decorated with a nested chevron (Motif A2). The incised body motif on C-422 is categorized as HIP (L1), but based on other vessels with the intermittent crosshatched neck design the HIP could be a border motif (Q6). The third identified motif is a combination motif (O3), the HIP with a tooled border (C-61). Although only three motifs were identified for curved-modified vessels, the HIP pattern is the most popular motif for this modal category.

Two (18.2%) vessels demonstrated smooth-over-cordmarked surfaces, and one (9.1%) jar was smudged. Consistent with the description for Cambria ware, the most common vessel exteriors are plain and smooth (n=8; 72.7%). Polishing is in the minority, and occurs on less than 30 percent of the vessels (n=3; 27.3%). Only one vessel is both smudged and polished. Handles are uncommon also (n=1; 9.1%), and the singular representative for this mode is an exfoliated loop handle, peaked at the rim.

The average neck length for curved-modified vessels is 22.0 mm, and the average orifice diameter is 16.6 cm. When orifice diameter and neck length are used as proxy measurements for overall vessel size, curved neck vessels are smaller than those with angled necks. The OD/NL measurement averages 8.5, which is the highest for any of the angled or curved neck categories. The correlation coefficient is 0.88, which is also a high value, and indicative that neck length is related to orifice size. Furthermore, it is the highest averaged correlation coefficient value for the Cambria modal sample. The second highest averaged correlation coefficient is from angled-modified vessels, perhaps indicating that there is a more direct relationship between neck length and vessel size for modified rim jars. The average width of body incising is 2.4 mm wide and 0.8 mm deep.

Table 4.7: Lip and Rim Decoration for the Curved-Modified Mode from Cambria

Lip/Rim Decoration	Count	Percent
Lip Crosshatch	2	18.2
Ext Tool Imp	3	27.3
Ext Crosshatch	1	9.1
Ext Twisted Cord Imp	1	9.1
Ext/Int Tool Imp	2	18.2
Ext Tool Imp/Int Incised	1	9.1
Undecorated	1	9.1
Total	**11**	**100.1**

* Total may not sum due to rounding

Tapered

There are a total of 15 tapered rim vessels from the Cambria site, which represents less than 4 percent of the site assemblage. The tapered rim mode originally was split into angled and curved types, but only one rim was classified as curved-tapered from the Cambria site (C-310). They are discussed together here, but were separated for the comparative analyses.

Rim and lip decoration is extremely common among tapered vessels, appearing on over 85 percent of the jars. Only two vessels, or less than 15 percent of the modal sample, have plain rims. Just over one-quarter of tapered vessels have lip decoration (n=4; 26.7%). Three rims have crosshatched lips only (C-42, C-213, C-438), and the remaining rim is incised with right-leaning, parallel diagonal lines (C-316). Interestingly, none of the tapered vessels have combined lip and rim decoration.

Tool impressions on the exterior rim only represent over one-quarter of the tapered rim modal type (n=4; 26.7%). The tooled marks are varied, and appear circular (C-33), ovular (C-310), notched (C-167), and as right-leaning broad, angular marks (C-288). This vessel also bears vertical cordmarking at the lower neck. Three tapered rim vessels, or 20 percent of the modal sample, have linear notched tool impressions on both the exterior and interior rims (C-09, C-147, C-291). Two of these sherds are decorated with notches that are squared off at the base, while the exterior and interior notches on the third vessel have bases that range between pointy and rounded. In addition, two of these vessels have decorated necks. The design pattern on the neck of both jars comprises left-leaning, parallel diagonal lines; however, the intermittent crosshatch pattern is evident on only one of them. Twisted cord impressions in the form of a diagonally barred triangle decorate a third rim (C-188). Three tapered rims, or 20 percent of the modal sample, have decorated necks, which is the highest percentage of neck decoration at Cambria outside of the S-rim/Collared jars.

Lastly, a single tapered rim vessel is adorned with tool impressions on the interior rim only. Vessel C-76 was manufactured with a chunky and uneven tapered rim, and demonstrates a short flap of extra clay sloppily folded over the exterior rim. The neck is quite long, nearly 45 mm, and cordmarked. The interior tool decorations are wide and semi-circular, possibly representing finger impressions.

Out of ten vessels with enough body present for identification, trailed body decoration was identified on four vessels (40%), though specific motifs were discerned for only three of them. Vessel C-42 is decorated with two motifs, a single chevron (Motif A1) and a HIP (Motif L1), arranged jointly. Vessel C-213 displays a nested version of the chevron (Motif A2). A HIP motif was identified on vessel C-291.

Of 15 tapered rim jars, three are cordmarked or smoothed over cordmarked, representing 20 percent of the sample. Similarly, three vessels are smudged. The remaining nine vessels have smoothed and plain surfaces. Just over one-quarter of the rims are polished (n=4; 26.7%), and only vessel, C-316, is both smudged and polished. Two vessels have plain, loop handles

(C-93, C-188), and at 13 percent of the tapered sample, this is the second highest percentage of handles from the Cambria site.

Tapered vessels have an average neck length of 25.0 mm, which is relatively long, comparatively. The average orifice diameter is 16.9 cm wide. The OD/NL measurement is 7.5. The correlation coefficient is fairly low at 0.50, indicating there is no relationship between the length of the neck and how wide the orifice diameter is. Tapered vessels average 4.3 mm wide for body incising, making it the second widest modal group at Cambria. Body incising depth averages 1.0 mm.

Table 4.8: Lip and Rim Decoration for Angled-Tapered Modal Type from Cambria

Lip/Rim Decoration	**Count**	**Percent**
Lip Crosshatch	3	20.0
Lip Incised	1	6.7
Ext Tool Imp	4	26.7
Ext/Int Tool Imp	3	20.0
Int Tool Imp	1	6.7
Ext Neck Twisted Cord Imp	1	6.7
Undecorated	2	13.3
Total	**15**	**100.1**

* Total may not sum due to rounding

Rolled

Rolled and partially rolled rims are the second largest modal type for the Cambria ceramic assemblage (n= 80; 18.4%), after angled-unmodified rims. One neckless jar with inslanting upper body vessel walls and a modified rim also is included in this category (C-71). Although the rim technically is not rolled, its thickened form and rounded lip place it on the rolled rim spectrum. Rolled rim vessels are basically neckless by definition, and the overall morphology of this single neckless jar is more similar to rolled rim vessels than any other modal category. It is grouped with the rolled rim mode for the statistical analyses, but discussed separately in this section.

Nearly all rolled rim vessels have undecorated rims (n=79; 98.8%); this is the lowest percentage of modal rim decoration in the Cambria ceramic assemblage (n=1; 1.3%). One partially reconstructed vessel is adorned with a single, shallow arc motif incised on the interior rim, and placed directly behind a grooved handle (C-220). The interior rim incising is not continuous around the rim, and is only placed in association with the handle. This is the only example of this rim treatment at Cambria, but it also occurs on rolled rim vessels from the Price site.

Only seven rolled rims were too small to determine if body decoration was present. Decorated bodies occur on over 70 percent of the rolled rim vessels (n=53; 72.6%), which is the second highest percentage of decorated bodies for a modal type at the Cambria site. Twenty rims have smooth undecorated bodies, which were typed as Powell Plain by Knudson. Surface treatment for rolled rim vessels is primarily plain and smooth (n=52; 65.6%), but nearly one-third of the vessels are smudged with a smooth surface (n=26; 32.9%). One vessel exhibits cordmarking below the shoulder (C-220). In addition, polishing is a popular surface finish for the rolled rim modal type at Cambria (n=49; 62.0%). These are the highest numbers for smudged, polished, and smudged/polished vessels for all modal types from the Cambria site. Shell temper is very rare at the Cambria site, and has been identified in only six vessels (1.4%). The total number of vessels increases by two, if you include a grit/shell temper mixture (n=8; 1.8%). However, at least 5 percent (n=4) of the rolled rim modal type is shell tempered, which is much higher than the overall frequency for the site. American Bottom Ramey Incised pottery is typically shell tempered, as well as smudged and polished. The increased frequency of these attributes may represent a suite of manufacturing techniques that local potters are purposefully borrowing and incorporating into their own rolled rim jars.

Rolled and partially rolled rim vessels demonstrate the widest variation in motif type expression for the Cambria site (n=21; 41.2%). A total of 26 motifs were identified from 21 vessels (Table 5.11). Spiral motifs (Motifs G1, G2) and interlocking scroll motifs (D1, D3, D4) were the most popular at the Cambria site. The remaining motif types were nearly equally split between the chevron category (Motif A1, A2), arc (Motif B2, B5, B6), and hachured scroll (Motif F1, F2, F3) categories. Motif categories with two examples each were the track category (Motif J1, J3), parallel lines (Motif L1, L4) and scroll combination category (Motif, P1, P2).

Figure 4.9: Rolled rim mode, track motif (J3), C-88

Figure 4.10: Rolled rim mode, scroll combination motif (P1), shell temper, C-230

Motif categories E1 and I1 were identified only once. Motif linearity was identifiable for 36 vessels. Curvilinear motifs were the most prevalent (n=20; 55.6%), followed by rectilinear motifs (n=12; 33.3%). Contrary to most other modal types, linear motifs were in the minority (n=4; 11.1%). Four vessels were decorated with a combination of two different types of linearity. Interestingly, no border motifs were identified from rolled rim jars.

Ten rolled rim sherds were complete enough to determine shoulder morphology. The most common shoulder form for the rolled rim mode is angled (n=6; 60%), which is the highest frequency of angled shoulders for all modal types at Cambria. Pronounced shoulders were identified for two jars, and two more have rounded shoulders. Less than 10 percent of rolled rim vessels have handles, including two small jars with handle scars only (n=7; 8.8%). All five full handles are loop handles that attach at the rim. Only one of them, C-230, is undecorated (Figure 4.10). The handle on C-190 is ornamented with a small, raised circle at the top of the rim where the handle is attached. Both vessels C-159 and C-386 have widely grooved handles. Vessel C-220 also has a grooved handle, but it is further embellished with two short incised lines placed on the diagonal on either side of the central groove. As noted previously, this handle is paired with an incised shallow arc placed directly behind it on the interior rim of the vessel. This vessel is large enough to determine that the handles probably were paired, and that their placement was incorporated into the design field of the upper body.

Table 4.9: Motifs for Rolled Rim Modal Type from Cambria

Motif Type	Count	Percentage
A1	1	3.8
A2	2	7.7
B2	1	3.8
B5	1	3.8
B6	1	3.8
D1	2	7.7
D3	1	3.8
D4	1	3.8
E1	1	3.8
F1	1	3.8
F2	1	3.8
F3	1	3.8
G1	3	11.5
G2	1	3.8
I1	1	3.8
J1	1	3.8
J3	1	3.8
L1	1	3.8
L4	1	3.8
P1	1	3.8
P2	2	7.7
Total	**26**	**99.2**

* Total may not sum due to rounding

The average orifice diameter for the rolled rim mode is 14.6 cm, which is the third smallest for the Cambria site. One reason for this may be the high number of vessels in this category with orifice diameters less than 10 cm (n=13; 16.3%). However, the range of orifice diameters is 5-32 cm, which is quite broad. Alternatively, it could reflect a functional difference for rolled rim vessels perhaps related to serving or display. The average RPR value is 0.56.

The average width of body incising is 3.9 mm, and the average depth is 1.1 mm, which are among the widest and deepest averages for the entire site. Interestingly, despite the depth of body incising, the most frequent cameo classification is “absent”, indicating that most body decoration does not produce a cameo effect on the vessel interior (n=26; 49.1%). Perhaps these vessels were decorated at a point in the manufacturing process when the clay was less wet. Rolled rim vessels with a strong interior cameo are the second largest group (n= 16; 30.8%), while vessels with weak cameos are the least frequent (n=8; 15.4%). These vessels may have been decorated shortly after being shaped, at a time when the clay was still wet.

S-Rim/Collared

S-rims represent a relatively small, but distinct portion of the Cambria ceramic assemblage (n=28; 6.4%). Due to the unique morphology of the S-shaped rim, the exterior rim and neck zones are combined. Accordingly, the entire area above the throat of the vessel is discussed as the rim, and its decoration zone referred to as rim decoration; neck decoration as a category is eliminated for this modal type. Three-quarters of S-rim vessels have lip and rim decoration (n=21; 75.9%). Lip decoration is in the minority (n=3; 10.7%), and represented by one vessel with a crosshatched lip (C-212), and two vessels with vertically incised lines (C-55, C-344). Twisted cord impressions on the exterior rim are the most popular form of rim embellishment (n=16; 57.1%). Multiple designs were produced by the twisted cord impressions, but the most common pattern is a group of three or four horizontal parallel lines crossed with opposing pairs of diagonal lines (n=12). One of these vessels is ornamented also with wedge-shaped tool impressions on the exterior rim (C-132). Vessel C-245 is decorated with opposing pairs of diagonal lines, but only the area between them is filled with parallel horizontal lines. The area outside the diagonal line boundaries is blank. Additional twisted cord impressed designs include crosshatching (C-50) and parallel horizontal lines (C-420). Vessel C-420 also has the unique feature of a lip lug.

Three vessels have exterior rims decorated with fine incised designs echoing those created by the twisted cords. Vessels C-86 and C-89 are adorned with a HIP as a background or base pattern, similar to Great Oasis designs. Incised over the HIP are opposed sets of paired diagonal lines, either tilted towards one another or meeting at the bottom or top of the set. An incised crosshatched pattern covers the exterior rim of the third vessel (C-344). This vessel also has a vertically incised lip, and a grooved handle. The central feature of the handle resembles a turkey track motif. The track is incised at the top of the handle, and a single line stems from it creating the central groove down the middle of the handle. In addition, multiple short lines are incised horizontally down the side of the handle.

One quarter of S-rim vessels have undecorated rims (n=7; 25%). However, one rim sherd appears to have a red-slipped exterior (C-81). This is the only known example of red-slipping identified for the Cambria Locality. Interestingly, the majority of undecorated S-rims are taller and a somewhat different shape than their decorated modal companions. The average neck length is 33 mm for the undecorated rims, which is nearly 7 mm taller than the rest of the category (25.9 mm). In addition, they exhibit more of a broad and gentle C-curve.

A large number of the S-rim vessels are broken just below the neck, making identification of body decoration problematic. Only six vessels (21.4%) were complete enough to determine presence of decoration, as well as decorative technique. Three vessels have undecorated bodies, two are incised, and the remaining vessel is decorated with twisted cord impressions. Vessel C-162 is a partially reconstructed pot comprised of several large rim and body sherds (Figure 4.11). The motifs are arranged in a continuous pattern of alternating nested arcs (B2, B3) linked by the HIP (L1). At least four separate nested arc motifs are identified, and probably formed a quadripartite design field. The nested arc motifs were most likely paired, and placed opposite their match. However, only three of the four motifs are wholly complete. Two of them are “horned” nested arcs (B3), and the third is a basic nested arc motif (B2). The fourth motif is damaged just above the top arc precluding a definitive classification. Each nested arc and HIP contains three lines. Although the individual elements of each motif are widely spaced, the overall feel of the design field is continuous and quadripartite. A small amount of body incising was identified on Vessel C-180, and it is believed to be the “horns” associated with the nested chevron category. The motif was classified as B3 because of its similarity to the horned elements found on C-162, and the similarity in rim form between the two vessels. The horned elements do not appear in combination with any other motif types identified at Cambria.

Figure 4.11: S-rim mode, arc motif and HIP (B2, B3 and L1), C-162

The decoration zone for IMMV Foreman S-rim wares is restricted to the rim; typically, they do not have decorated bodies (Hurt 1954; Ives 1962; Lehmer 1954). The incorporation of trailed line body decoration on S-rim vessels has been interpreted as a secondary cultural influence from Mississippian groups to the south and east (Knudson 1967:278). Knudson identified the S-rim vessels at Cambria as Judson Composite, which is probably a nod to the visible fusion of both Middle Missouri and Mississippian ceramic traits incorporated into the overall style of the vessel.

Twisted cord impressions decorate the third vessel with body decoration (C-221). No individual motifs could be discerned with any certainty, but what is visible includes a series of horizontal lines and one left-leaning diagonal line. The overall form of the design structure may indicate a chevron with parallel horizontal lines, which is a popular trailed motif for the Cambria site.

S-rim vessels primarily have plain and smooth surfaces (n=19; 67.9%). As noted previously, one vessel is red-slipped with a smooth surface, although it is does not exhibit any polish. Another vessel is plain, but exhibits some smooth over cordmarking at the neck break. One-quarter of the vessels are smudged (n=7; 25.0%), and under half are polished (n=12; 42.9%). Six (21.4%) vessels are both smudged and polished, which is at the higher end of the frequency range for the Cambria site.

According to the metric data, S-rim vessels have the longest average neck length, measuring 27.7 mm. However, the different rim structure of this mode lessens the comparability of this measurement. The orifice diameter is 15.5 cm, which is smaller than the average orifice diameter of most of the angled and curved neck modes. The OD/NL measurement is 7.0, and the correlation coefficient is -0.04, indicating there is not a relationship between neck length and vessel size. The average body incising width for S-rim vessels is 3.6 mm, and the average depth is 1.5 mm. This is the deepest average depth of body incising for any mode at the Cambria site. However, the mean width and depth of body incising for the S-rim mode at Cambria is limited by sample size, as only two S-rim vessels had body decoration.

Table 4.10: Lip and Rim Decoration for S-rim/Collared Modal Type from Cambria

Lip/Rim Decoration	Count	Percentage
Lip Crosshatch	1	3.6
Lip Incised	1	3.6
Lip Incised/Ext Fine Inc	1	3.6
Ext Twisted Cord Imp	15	53.6
Ext Tool Imp & Twisted Cord Imp	1	3.6
Ext Incised	2	7.1
Undecorated	7	25.0
Total	**28**	**100.1**

* Total may not sum due to rounding

Table 4.11: Motifs for the Everted Rim Mode from Cambria

Motif Type	Count	Percentage
A2	1	11.1
A5	1	11.1
A3	1	11.1
B1	1	11.1
B5	1	11.1
L1	1	11.1
M1	1	11.1
N1	1	11.1
Q1	1	11.1
Total	**9**	**99.9**

* Total may not sum due to rounding

Everted

The everted mode is represented by four everted-plain and four everted-extruded rim sherds (n=8; 1.8%). Due to small sample size the two rim form categories were combined into one mode. The everted rim mode has the second lowest number of decorated rims at the Cambria site, behind rolled rim vessels (n=2; 25%), but it has the highest number of decorated bodies (n=7; 87.5%). Nine different motif types were identified from four vessels, and two vessels had indeterminate motifs. One vessel possibly is painted, and one vessel is completely undecorated (C-253).

Vessel C-218 is a small, nearly complete vessel with an everted-plain rim, angled shoulders and a globular base. This is the only vessel at Cambria with a punctated lip. The body decoration is a unique combination of fine incising and body punctates. The incised motifs are recorded as a combination of two different chevron motifs: the nested chevron (A1) and the punctate chevron (A5). However, some of the nested chevron motifs were drawn with a gently rounded apex and bowed sides, producing a combination nested arc/chevron motif (M1). In between each nested/punctate chevron is a vertical border motif, also punctate (Q1). The vertical punctate breakers create six distinct spaces encircling the vessel shoulders. Five separate nested/punctate chevrons are identified on the vessel, as are the remnant legs of a partial sixth motif that would have been located in the small area of the upper body that is missing. The lower body of the vessel is covered in variously angled diagonal scratch marks either emanating from or directed towards the bottom of the vessel. They do not appear to be from any formal decorative techniques such as incising or engraving, and instead perhaps represent an aspect of vessel production or finishing such as wall thinning, scraping or combing. The motifs, punctates and design field of this vessel are more similar to Oneota design schema. This vessel had two handles, which were welded to the rim and riveted into the upper body. They were paired opposite one another, and only one grooved, loop handle remains.

Vessel C-12 has a notched exterior rim, and a lumpy vessel interior. It is not carefully crafted or decorated, but it is smudged. The body is adorned with two fine incised arc motifs: an uneven running arc (B5) above a single incomplete arc (B1). Vessel C-53 is also a small, unevenly thinned vessel. There are a few fingernail marks on the vessel interior, possibly from thumb-molding it into shape. The pot has rounded shoulders that stretch long and low on the vessel body and ease into a rounded base. Incised on the upper shoulders of the sherd is a slightly modified lineate-chevron design pattern comprised of a nested chevron paired with a barred triangle (N1) and HIP motif (L1). The design was not drawn with a practiced hand, and as a result some of the elements of each motif appear skewed or asymmetrical. In addition, there is a suspension hole placed at the neck break. The clay around the hole on the inside forms an elevated rim, and was probably formed from pressure displacement when a tool pierced the vessel rim from the outside, indicating the suspension hole was produced as part of the initial manufacturing process of the vessel. The last everted rim vessel with an identifiable motif is C-200, which is decorated with running chevron motif (A3). The rounded lip on this vessel places it on the spectrum of Ramey Broad Trailed rim forms, but the sharply angled line the forms the lower rim was more in line with an everted rim.

Two vessels have trailed body decoration, but no identifiable motifs. Vessel C-51 is decorated with rectilinear motifs, while Vessel C-103 appears curvilinear, and may represent an interlocking scroll. Vessel C-268 appears to have been decorated with black paint. Just below the neck on the upper shoulders is a thin, sinuous black line that snakes underneath an attached semi-strap handle and out the other side. Black paint has been identified on one rim sherd and a handful of body sherds from the Cambria site (Knudson 1967:273), but C-268 does not match the given description of the rim sherd or the painted design. Alternatively, the sinuous black line could be a relatively recent addition to the rim sherd, such as an ink doodle. The extension of the line underneath the handle is curious, though, as it would have been very difficult to extend a pen, marker or paintbrush in the shallow space behind the handle, where the inside of the handle measured less than 1 cm from the vessel wall. The handle is a semi-strap, and grooved with three vertical incised lines.

The majority of everted rim vessels have a plain and smooth surface (n=6; 75.0%). Two (25.0%) vessels are smudged, and three (37.5%) more exhibit some evidence for polish. None are both smudged and polished.

All vessels of the everted rim mode are small, with some bordering on miniature. Orifice diameters range from 7-14 cm, with a mean of 10.4 cm. Everted rims also have the smallest neck length (8.8 mm). However orifice size and neck length do not appear to be correlated, as the correlation coefficient is -0.11. The width of body incising is 2.4 mm, and depth is 0.9 mm.

Straight Necked

There are only ten vessels from Cambria classified as either straight-unmodified or straight-modified; together they make up less than three per cent of the entire site assemblage. The two modal types are collapsed into one category in the next chapter for statistical purposes, but are described separately here.

The straight-unmodified mode is slightly more frequent (n=8; 1.8%) than its modified rim counterpart (n=2; 0.5%), and mostly seems to represent vessels that could be classified as miniatures. The largest orifice diameter for any straight-unmodified rim is 10 cm. Very little lip/rim decoration is associated with this modal type, and is represented by a single vessel with a crosshatched lip (C-201). The other seven (87.5%) rims are undecorated.

All eight rim sherds were large enough to determine presence of body decoration, and three motif types were discerned for the vessels with body decoration (n=3; 37.5%). All three vessels were decorated with fine incised motifs, but two of them were accompanied by different decorative techniques, also. Vessel C-201 is a short-necked jar with angled shoulders, and a plain, smooth surface. Two nested arc motifs are rendered in punctates just above the vessel shoulders. The nested arc motif is relatively common at Cambria, but this is the only known example of punctation used to execute a specific motif type in the Locality. Additionally, there is a single, fine incised, horizontal line encircling the vessel just below neck/body juncture (Motif Q6). On the interior of the vessel, there are smoothing or possible thinning marks on the rim. Below the shoulders on the interior body, there are numerous fingernail marks. They do not appear to be arranged in an easily identifiable pattern or design, and perhaps resulted from manual production techniques related to the final shaping of the vessel body.

Vessel C-464 also combines two types of decorative techniques: dentate stamping and incising. The upper body of the vessel is ornamented with left-leaning, diagonal dentate stamping. A single, horizontal line incised just below the undecorated rim provides an upper boundary for the body decorative zone (Motif Q6). The vessel was most likely decorated when the clay was still wet because the sides of the incised line appear ragged. This vessel is at the large end of the spectrum for this mode, and has an orifice diameter of 10 cm.

The third straight-necked jar with body decoration is not uniform in its morphology or surface treatment, demonstrating variations in rim thickness, uncharacteristically thick shoulders and uneven surface smoothing (C-209). The body incising is very fine, and depicts two motifs in combination: a chevron with HIP (Motifs A1 and L1). This vessel is quite small, and has an orifice diameter of 5 cm.

Plain and smooth surfaces were recorded for all straight-unmodified vessels. However, not all exterior vessel surfaces were effectively or uniformly smoothed. Polish was identified for two (25%) vessels. Only one handle was identified. It is a loop handle adorned with a very shallow central groove down the middle.

Both of the straight-modified vessels have lip or rim decoration. A unique tool impressed, or possibly finger pinched rim characterizes vessel C-248 (Figure 4.12). The rim elaborations are sub-labial triangular projections that jut out from the side of the rim. A smooth, rounded tool could have been impressed deeply into a folded or filleted rim, producing the triangular points from displacement pressure. Alternatively, the triangular projections could have been formed by the thumb and index finger pinching together and briefly drawing out small segments of the rim. Additional attributes of this vessel include cordmarking, smudging on both the exterior and interior surfaces, and interior polish. Similar rims have been identified at the Late Woodland Nelson site in Blue Earth County, as well as Late Woodland site contexts in neighboring Le Sueur County (Ron Schirmer, personal communication 2015).

The second straight-modified rim sherd is decorated with a crosshatched lip and indeterminate body incising. This vessel is small, with an orifice diameter of 8 cm, and thing walls. Exterior surface treatment is smoothed, and the vessel is smudged on both the exterior and interior. In addition, some polish was noted on the interior rim.

Straight-necked rims are the shortest necked vessels in the Cambria ceramic assemblage, with an average neck length of 8.3 mm. It is difficult to determine the length of straight necks because many of them are combined with straight or unmodified rims. Accordingly, there is no clear break in neck form, like angled or curved necks have, from which to take a length measurement. Nearly two-thirds of straight-unmodified rims lack neck length measurements for this reason (n=5; 62.5%). Alternatively, short neck length may be due to vessel size. The majority of straight-necked vessels are quite small, with orifice diameters ranging from 5-10 cm. Unfortunately, an accurate correlation coefficient for orifice diameter and neck length is unavailable, to do the paucity of accurate neck lengths for this modal type. The average OD/NL ratio is 7.7, which is squarely within the range of mean ratios for both angled and curved neck vessels from Cambria. The average width (0.8 mm) and depth (0.5 mm) of body incising is the lowest for any modal type at Cambria.

Figure 4.12: Straight-modified mode with tool impressed pyramidal projections, C-248

Indeterminate

Eight vessels from the Cambria site were categorized as indeterminate for modal type. This category does not represent a cohesive mode because the neck forms are unidentified, and thus could not be considered in relation to rim form. It is this pairing of neck and rim forms that created the categorical basis of modal types utilized for this study. Consequently, the morphological, decorative and metric traits of these eight indeterminate rims are not described in detail as part of a unified group, as the previous modal categories were. However, much data from other attributes was able to be collected from these vessels, and is presented as part of the attribute overviews for the Cambria site that comprise the next section of this chapter.

Table 4.12: Modal Types from Cambria

Modal Type	Count	Percentage
Angled-Unmodified	164	37.8
Angled-Modified	46	10.6
Angled-Tapered	14	3.2
Curved-Unmodified	65	14.9
Curved-Modified	11	2.5
Curved-Tapered	1	0.2
Straight-Unmodified	8	1.8
Straight-Modified	2	0.5
Rolled	60	13.8
Partially Rolled/Mod	20	4.6
S-Rim/Collared	28	6.4
Everted	4	0.9
Everted-Extruded	4	0.9
Indeterminate	8	1.8
Total	**435**	**99.9**

* Total may not sum due to rounding

Decoration

Lip

Nearly thirty per cent of all Cambria jars have lip decoration (n=122; 28.0%), which is more frequent than either exterior or interior rim decoration. Lip incising is the most popular form of lip decoration (n=63; 14.5%), followed by an incised crosshatched pattern (n=50; 11.5%). Diagonal lines, both right- and left-leaning, are the most popular form of incised lip decoration. Vertical lines incised across the lip are well represented, also. Less common incised designs are chevrons and a herringbone pattern. Twisted cord impressed designs make up the third largest group of lip decoration (n=6; 1.4%). Echoing the variation in lip incising, the most popular form of twisted cord impressions were diagonal lines. Twisted cord crosshatched patterns were identified, also. Finally, there is one example each of punctation, dentate stamping, and tool impressions as lip decoration. The Cambria site has the highest percentage of lip decoration for all three analyzed sites.

Table 4.13: Lip Decoration from Cambria

Lip Decoration	Count	Percentage
Crosshatch	50	11.5
Incised	63	14.5
Twisted Cord Impressed	6	1.4
Tool Impressed	1	0.2
Dentate Stamped	1	0.2
Punctate	1	0.2
Undecorated	313	72.0
Total	**435**	**100.0**

Exterior Rim

The Cambria site has the lowest frequency of exterior rim decoration in the entire sample (n=111; 25.4%). Tool impressions are the most common form of exterior rim decoration (n=103; 23.6%), and were rendered in a wide variety of shapes and sizes, from smooth and rounded to long, linear notches. Some tooled marks are wavy and textured, perhaps representing a shell, and others look as if they were punched or stamped into the rim with a distinctively shaped implement. Twisted cord impressed and incised designs were identified on three vessels each. The twisted cords were impressed into a single horizontal line, and crosshatched patterns. The incised designs decorating the exterior rim are a chevron pattern, and a single horizontal line. There is also one example each of an incised crosshatched pattern, and a single cordwrapped stick impressed horizontally into the vessel rim just below the lip.

Table 4.14: Exterior Rim Decoration from Cambria

Exterior Rim Decoration	Count	Percentage
Tool Impressed	102	23.4
Incised	3	0.7
Twisted Cord Impressed	3	0.7
Cordwrapped Stick Impressed	1	0.2
Crosshatch	1	0.2
Indeterminate	1	0.2
Undecorated	324	74.5
Total	**435**	**99.9**

* Total may not sum due to rounding

Interior Rim

Interior rim decoration is uncommon at the Cambria site (n=56; 12.9%). Tooled marks are the most popular type of decoration in this zone (n=42; 9.7%). The majority of these are notches, which come in a range of forms probably due to the different tools used to create them. For example, the interior notches on several vessels are very long and thin, and were most likely created with a fingernail because some of them also appear to be slightly arced. Other notched forms are long and linear with rectangular bases, while others are quite wide and have rounded bases. Vessel C-266 is marked with unique interior tool impressions for the Cambria Locality. The tool impressions are deep and roughly circular, and located just above the interior neck juncture. Most interior rim decoration in the Cambria Locality is limited to the area just below the rim. Similar decoration in both form and decorative zone has been identified at the Pederson site (21LN2) in the Prairie Lakes region of southern Minnesota (Holley and Michlovic

2013:Figure 4.4 e, Figure 4.7 c-d), as well as in Sandy Lake pottery found to the north (Anfinson 1979:175-176; Holley and Michlovic 2013:48).

Twisted cord impressions are the second most popular form of interior rim decoration at Cambria (n=10; 2.3%). Parallel horizontal lines are the most prevalent twisted cord design, followed by parallel right-leaning diagonal lines. Interestingly, all vessels with twisted cord impressed interior rims also have decorated lips. Vessel C-244 is adorned with both tool impressed notches and two parallel horizontal lines of twisted cord impressions on the interior rim. Lip and neck decoration was not present on this vessel.

Incised interior rim decoration is rare at the Cambria site (n=5; 1.1%). Two vessels are decorated with a single arc in association with a handle (C-163, C-220). The arc is placed directly behind the handle on the interior rim, and the motif mimics the gentle castellation of the rim shape that was created by welding the handle at the top of the rim. Other interior rim designs are a pendant diagonally barred triangle, a horizontal line, and a series of right-leaning parallel lines.

Over 80 percent of all interior rim decoration was done in combination with another rim decoration zone (n=46; 82.1%). Interestingly, it is not uncommon on vessels with both interior and exterior tool impressions, to have them be different. For example, some vessels may have circular exterior tool impressions but interior notches. Or, a vessel may have short exterior notches with rectangular bases, but the interior tooled marks are longer and v-shaped. These differences indicate that a diversity of tools and techniques were purposefully chosen to embellish the different decoration zones above the vessel throat.

Table 4.15: Interior Rim Decoration from Cambria

Interior Rim Decoration	Count	Percentage
Tool Impressed	42	9.7
Incised	5	1.1
Twisted Cord Impressed	10	2.3
Indeterminate	1	0.2
Undecorated	378	86.9
Total	**436***	**100.2**

* One vessel has both tool and twisted cord impressed decoration

Neck

The Cambria site has the highest frequency of neck decoration in the Cambria Locality (n= 51; 11.7%). However, this figure may be artificially inflated by the number of decorated S-rim vessels that were included in the category. S-rim vessels were not assigned a neck form due to their unique morphology, but they are included in the neck decoration category because the boundaries of the neck decorative zone are from just above the vessel throat to the just below the rim.

Incising is the dominant form of neck decoration (n=34; 7.8%), and includes designs fitted to the neck decoration zone, as well as those that continue without breaking from vessel neck to upper body. The intermittent crosshatched pattern is the most popular, followed by a variety of designs related to the barred triangle and opposed pairs of diagonal lines. Two S-rim vessels are decorated with a background HIP design further adorned with opposed pairs of incised diagonal lines. Other incised neck patterns crosshatching, and parallel horizontal and diagonal lines.

Twisted cord impressions are the only other form of neck decoration for Cambria vessels (n=16; 3.7%). All rim sherds with twisted cord impressed necks are S-rims, except for one vessel with a tapered rim. The overall design structure of the twisted cord patterns is similar for all the S-rim vessels, as well. A series of three to five widely spaced horizontal lines forms a background pattern over which were created groups of parallel diagonal lines and opposed pairs of diagonal lines. Other variations on the central design include chevrons and barred triangles. The twisted cord impressed design associated with the tapered rim vessel is different, as there is no background pattern of horizontal lines. Instead, the pattern is made up of alternating groups of right- and left-leaning parallel diagonal lines that form at least one diagonally barred triangle (C-188).

Table 4.16: Neck Decoration from Cambria

Neck Decoration	Count	Percentage
Incised	34	7.8
Crosshatched	1	0.2
Twisted Cord Impressed	16	3.7
Indeterminate	2	0.5
Undecorated	382	87.8
Total	**435**	**100.0**

Table 4.17: Body decoration from Cambria

Body Decoration	Count	Percentage
Incised	207	67.6
Tool Impressed	1	0.3
Punctate	2	0.7
Twisted Cord Impressed	1	0.3
Dentate Stamped	2	0.7
Painted	1	0.3
Undecorated	96	31.4
Total	**310***	**101.3**

* Some vessels have more than one type of body decoration

Body

In the Cambria ceramic assemblage there are 306 rim sherds complete enough to determine the presence of body decoration. Of these, nearly 70 percent have body decoration (n=210; 68.6%). Trailed lines dominate the sample (n=207; 67.6%), but punctates (n=2), dentate stamping (n=2), tool impressions (n=1), twisted cord impressions (n=1), and possibly painting (n=1) were identified in small numbers, as well. They are combined with incised body decoration on four rim sherds.

The Cambria site has the widest expression of motif types in the Cambria Locality, where all 17 motif classes are represented. Of the 51 motif and border elements recognized as part of this study, 46 (90.2%) were identified from Cambria site pottery (Table 5.20). A total of 178 motifs were categorized by individual type, while 80 were considered indeterminate. The majority of motif types are represented by only one or two examples each. Furthermore, only four individual motif types were identified on more than five vessels. Also identified were several motifs unique to the Cambria Locality. These include the “horned” nested arc (B3), the “track” (J1), and the Thunderbird (K1) motifs.

Motif L1, the HIP, is the most common motif at the Cambria site (n=70; 39.3%). This motif is depicted by itself the majority of the time (n=48; 27.0%), which makes it the most popular motif and design pattern at the Cambria site. The parallel horizontal lines comprising the HIP vary in size, and range from 0.4–4.6 mm in width. The simple HIP design pattern represented by Motif L1 is one of four major body design programs identified for the Cambria Locality. Typically, the motif spans the entire upper body of the vessel from just below the throat to the shoulder break (Figure 4.13), but sometimes the horizontal lines are incised higher up on the vessel, closer to the rim, and continue down over the neck, and onto the vessel body.

Motif L1 is also portrayed in combination with nine other motifs (n=22; 12.4%). Most often, it is found with the nested chevron (Motif A2) and the nested chevron/barred triangle combination motif (N1). In this design pattern, the HIP is placed as a connecting element between several individual chevron motifs. A similar design layout is recognized for the HIP in combination with individual arc motifs (B2, B3). Vessel C-162 is partially reconstructed, and with much of the vessel's upper shoulders present, it is apparent that the design field is quadripartite. Each quadrant of the vessel is anchored by an individual motif that is connected to the rest of the design through the parallel horizontal lines (Figure 4.11). This trailed decorative pattern is the second of four major body design programs identified for the Cambria Locality. Both of the design programs featuring the HIP also share a similar design field. It is a continuous pattern that encircles the vessel orifice, and encompasses the entire area between the vessel shoulders and throat juncture. However, there is a technical difference between the two design patterns. When L1 is expressed as a single motif, the average width of body incising is 1.8 mm, but when the HIP is combined with another motif, the average width of incising is much broader, measuring 3.2 mm.

Figure 4.13: Body Design Program 1, HIP, C-153

Figure 4.14: Body Design Program 2, lineate-chevron, C-3

Motif A2, the nested chevron, is the second most common motif identified from the Cambria site (n=18; 10.1%). Most often, it is found in combination with other motifs, particularly the HIP (L1). Vessel C-218 is a nearly complete, reconstructed vessel decorated with a fairly unique set of motifs. A total of six nested chevrons (A2) or nested arc/chevrons (M1) with a punctate filling (A5) encircle the upper shoulders of the vessel, each separated by a punctate border (Q1). This design field is not quadripartite, although it is continuous and much of the space between the shoulders and rim is decorated. The use of border or breaker patterns to separate individual motifs is not common for the Cambria design program. The use of accent and border punctates coupled with the repetitive chevron motifs and continuous design field, give this vessel a different cultural feel; something more akin to Oneota (Dobbs 1984:105; Wilford 1945:34-35).

Vessel C-113 is a large vessel fragment decorated with at least two separate motifs (A2, F4). Although these two motifs are touching at their bases, the overall feel of the design does not exhibit the same continuous, in-filled pattern noted for previously described nested chevron motif combinations. The second most popular expression of the nested chevron is as a single motif (n=7; 3.9%). Unfortunately, less than 20 percent of the vessels' upper shoulders were preserved, so it could not be determined how many individual motifs may have filled the decoration zone. Motif A2 is consistently rendered boldly, both in combination and as an individual motif. The average width of body incising is 3.6 mm, and the average depth is 1.1 mm.

Seemingly related to the nested chevron is the nested arc (Motif B2). Nested chevrons and nested arc motifs sometimes decorate the same vessel. In these examples, the nested arc and nested chevron motifs are arranged similarly in the design patter, but the nested arc motifs are rounded just enough at the top that they appear more curvilinear (see C-218). Nested arc motifs are also identified in combination with the HIP, similarly taking the place of the nested chevron in the previously described design program (C-91, C-162). Motif B2, the nested arc is identified on six (3.4%) vessels from the Cambria site. However, there are no clear examples of its representation as an individual motif on a vessel.

The third most popular motif is Q6 (n=8; 4.5%), a border motif, expressed as a horizontal line. Most often it is located just below the neck juncture, where it visually separates the rim from the body. Motif Q6 is always associated with an additional design pattern located on the upper shoulders of the vessel; it is never depicted singly.

As a motif category, border or breaker motifs (Category Q) also are quite popular at the Cambria site (n=21; 11.7%), where they are the third most frequently expressed category behind parallel lines, Category L (n=74; 41.1%), and chevrons, Category A (n=25; 13.9%). Category Q motifs function in two ways, as either border or breaker motifs. Border motifs either bound a design pattern within its decoration zone (see Motif Q6, horizontal line, vessel C-165), or are directly appended to a specific motif, creating a different edge, or boundary form for it (see Motif Q3, barred hachure, vessel C-04). Breaker motifs are purposefully placed to break up space within a specific design pattern (see Motif Q1, punctates, vessel C-218). They are not common at the Cambria site. Overall, border and breaker motifs were not commonly used at the Cambria site, nor are they associated with Mississippian design patterns. However, they do appear more commonly in the region later in time, as part of the Oneota design program (Dobbs 1984:105; Wilford 1945:34-35).

The third major body design program identified for the Cambria Locality incorporates Motif H2, the diagonally barred triangle, with horizontal lines and border motifs (n=4; 1.9%).

Vessel C-04 is a large vessel fragment that demonstrates a sizeable portion of the body's design pattern (Figure 4.7). There are two rows of alternating diagonally barred triangles, finely incised with apexes up. This motif placement also creates pendant triangles in the blank spaces in between the diagonally barred shapes. The two angled sides of each incised triangle are bordered by Motif Q3, barred lines, while the bottoms of the triangles are further underscored by an additional horizontal line (Motif Q6). Finally, the base of the design field is comprised of hachure marks creating a border fringe (Motif Q2). Other vessels exhibit different combinations or types of border motifs (C-181, C-165). Typically, this body design pattern is associated with vessels that have long, decorated necks and rims, as well as rounded shoulders. There are also some differences in the metric data, although it should be noted the following averages are comprised from only four vessels. As noted previously, the average neck length is quite long, at 30.8 mm. The average width and depth of incising are relatively narrow (1.6 mm) and shallow (0.9 mm).

The last major body design program identified for the Cambria Locality is perhaps the most well-known, or at least the most discussed in the literature. Vessels with curvilinear Mississippian scroll motifs including spiral (Category G), interlocking (Category D), nested (Category E) and hachured (Category F) varieties comprise ten per cent (n=21) of all vessels with decorated bodies. The interlocking (n=6; 3.4%) and spiral (n=5; 2.8%) scroll categories are the most popular forms of curvilinear Mississippian motifs. The design field for these motifs mimics the quadripartite design described for Ramey Incised vessels. Four single motifs (see for examples C-110, C-159), or four combined motif patterns decorate the upper shoulders of the jar (C-230). Furthermore, space is incorporated into the design field, so the motifs do not take up the entire space between the shoulders and rim. Vessel C-220 is decorated with an interesting combination of a continuous pattern (Motif B5) coupled with two double spiral scrolls (Motif G2) placed on either side of a grooved handle, creating a quadripartite design field. The curvilinear motifs associated with the Mississippian design program have both the widest and deepest averages for body incising of all four design programs. The average width of body incising is 4.4 mm, and the average depth is 1.5 mm. Relatedly, nearly three-quarters of vessels with these motifs have strong interior cameos. The percentage of body design program by site is displayed in Figure 4.17.

Motifs, except for border motifs (Category Q) were classified by linear shape, as well. Nearly half of all motifs at the Cambria site are linear (n=78; 43.8%). This is consistent with the popularity of the HIP pattern at Cambria. Rectilinear motifs are represented on approximately one-third of decorated bodies (n=60; 33.7%). Curvilinear motifs are the least common form of motif shape (n=40; 22.5%), and primarily are associated with rolled rim vessels. It is not unusual for vessels to be decorated with motif combinations of different linearities (n=32; 18.0%). The most frequent combination unites rectilinear and linear motifs (n= 21; 11.8%), and is exemplified by the popular combination of nested chevron and HIP motifs. As noted previously, this design pattern is also one of the major body design programs identified for the Cambria Locality. Curvilinear motifs are combined less frequently with linear motifs (n=4; 2.2%) and rectilinear motifs (n=6; 3.4%). All three forms of motif linearity are combined on a single, small vessel (C-277).

Vessels with trailed body decoration (n=207) also were examined for a companion category, interior cameo. The majority of incised bodies at the Cambria site did not exhibit a cameo effect on the vessel interior (n=143; 69.1%). Of the 48 (23.1%) vessels that did, strong cameos (n=26; 12.6%) were slightly more prevalent than weak cameos (n=22; 10.6%). The presence or absence of an interior cameo could not be discerned for sixteen vessels (7.7%), which were classified as indeterminate.

Figure 4.15: Body Design Program 3, diagonally barred triangle, P-83

Figure 4.16: Body Design Program 4, curvilinear, C-94

Table 4.18: Motif Types from Cambria

Motif Type	Count	Percentage
A1	3	1.7
A2	18	10.1
A3	1	0.6
A4	1	0.6
A5	1	0.6
B1	1	0.6
B2	6	3.4
B3	2	1.1
B5	3	1.7
B6	1	0.6
B7	1	0.6
C1	3	1.7

Motif Type	Count	Percentage
D1	2	1.1
D2	2	1.1
D3	1	0.6
D4	1	0.6
E1	1	0.6
F1	1	0.6
F2	1	0.6
F3	2	1.1
F4	1	0.6
G1	4	2.2
G2	1	0.6
H1	1	0.6
H2	5	2.8
I1	1	0.6
J1	1	0.6
J3	2	1.1
K1	1	0.6
L1	70	39.3
L2	1	0.6
L3	1	0.6
L4	2	1.1
M1	1	0.6
M2	2	1.1
N1	5	2.8
O1	1	0.6
O3	2	1.1
P1	1	0.6
P2	2	1.1
Q1	2	1.1
Q2	5	2.8
Q3	1	0.6
Q4	3	1.7
Q5	2	1.1
Q6	8	4.5

Motif Type	Count	Percentage
Total	**178**	**100.6**

* Total may not sum due to rounding

Table 4.19: Motif Linearity from Cambria

Linearity	Count	Percentage
Rectilinear	60	33.7
Curvilinear	40	22.5
Linear	78	43.8
Total	**178**	**100.0**

Vessel Morphology

Lip Form

Flattened lips dominate the Cambria ceramic assemblage (n=175; 40.2%), and were associated with every rim form except for rolled rims. Lips beveled to the exterior (n=132; 30.3%) make up nearly one-third of the sample, and also were associated with multiple rim forms. Cambria is the only site in the sample where beveled-exterior lips are more prevalent than rounded lips (n=123; 28.3%). All rolled and partially rolled rim vessels have rounded lips, but they are identified with all rim forms from the Cambria site. Pinched lips are rare (n=4; 0.9%), and only are associated with unmodified, tapered and everted rim forms.

Table 4.20: Lip Form from Cambria

Lip Form	Count	Percentage
Flattened	175	40.2
Beveled-Exterior	132	30.3
Rounded	123	28.3
Pinched	4	0.9
Indeterminate	1	0.2
Total	**435**	**99.9**

* Total may not sum due to rounding

Shoulder Form

Only a small number of rim sherds were complete enough to determine shoulder morphology (n=31; 7.1%). Although less than 10 percent of the Cambria sample contained data relating to shoulder morphology, some patterns were identified. Angled shoulders are the most popular at Cambria, and represent over half of the shoulder assemblage (n=18; 58.1%). Angled shoulders are associated with seven different modal types, but primarily are identified with the rolled rim and angled-unmodified modes. Rounded shoulders are the second most popular shoulder form (n=9; 29.0%), and also are identified with numerous modal types. Pronounced shoulders are relatively uncommon at Cambria (n=4; 12.9%), and are only identified with the angled-unmodified and rolled rim modal types. The rolled rim (n=10; 32.3%) and angled-unmodified modes (n=8; 25.8%) have the most vessels with complete shoulders. This is most likely a function of sample size, as these are also the two most popular modal categories for the Cambria site.

Table 4.21: Shoulder Form from Cambria

Lip Form	Count	Percentage
Angled	18	58.1
Pronounced	4	12.9
Rounded	9	29.0
Total	**31**	**100.0**

Handles

Handles were identified on a small number of vessels (n=36; 12.1%). As evidenced by handle scars (n=3; 8.3%), the handles were riveted into the body, and attached at the rim. Many of the vessels with handles exhibit a slight castellation of the rim where the handle is attached. Handle shape is primarily loop, but there are at least two examples of semi-strap handles. Handle shape tends to grow flatter and wider through time, as evidenced at the La Crosse Locality, where most later Oneota handles are described as strap handles (Boszhardt 1994). The presence of handles became more frequent by Oneota times, as well (Anfinson 1997:114). There are slightly more decorated handles (n=17; 47.2%) than plain (n=15; 41.7%) at the Cambria site. Decorated handles are grooved, incised, twisted cord impressed, or knobbed. One handle was exfoliated, and presence of decoration was not discernable.

Surface Finish and Polish

As noted in the description for Cambria ware, the majority of vessels have a smooth surface (n=408; 93.8%). The remaining vessels have cordmarked (n=5; 1.1%) or smoothed-over cordmarked (n=21; 4.8%) surfaces. Also, many vessels are plain, and lack the addition of color to the vessel surface (n=335; 77.0%). Smudged vessels, either partial or whole, represent nearly one-quarter of the site assemblage (n=98; 22.5%). Slipping is very rare within the Cambria Locality, and only one vessel from the Cambria site has a red-slipped rim. Nearly half of all vessels demonstrate evidence for polish (n=211; 48.5%). Vessels that are both smudged and polished are uncommon (n=70; 16.1%). Rolled rim vessels demonstrate the highest frequency of smudged and polished vessels (n=21; 26.3%).

Miniature Vessels

Five miniature vessels were identified in the Cambria ceramic assemblage. All are grit-tempered with smooth, plain surfaces and unmodified rims. Overall, C-66 is the smallest of the miniature vessels; although the neck is slightly inverted, it has more of a bowl shape. This is the only miniature vessel with exterior body decoration, which is an awkwardly incised nested chevron motif (A2). Also, this is the only vessel with a decorated lip, which is also a chevron pattern. Vessel C-210 is uniquely decorated with a series of horizontal incised lines on the interior of the vessel body. Vessel C-384 has a notched interior rim marked with unevenly spaced and oriented notches. Vessel C-439 is plain and undecorated, but was delicately crafted with thin walls. The four other miniature vessels were not uniformly produced. They are lumpy and uneven within the rim zone, and become thicker towards the base. The overall impression is that they were produced and decorated by more inexperienced potters.

Bowls

Two bowl rim sherds were identified in the Cambria ceramic assemblage (n=2; 0.2%). Vessel C-21 has a mixed grit/shell temper, although the shell temper was identified based on the presence of voids. The vessel is straight-sided, and the walls are quite thin (3.0 mm). This bowl is plain in all aspects; it is not decorated, nor is there evidence for surface smudging or polishing. The second bowl rim sherd has an angled shoulder, and an inverted neck. It is tempered with large chunks of grit, and is similarly undecorated as the other bowl sherd. The bowls range in size from 14 to 16 cm at their orifices. Knudson (1967:271) identified five bowls in her analysis. Curiously, the two rim sherds described above do not appear to be in her description of bowls. This discrepancy may be due to a slightly different sample universe, as a few other illustrated sherds from Knudson's analysis were not identified in the current Cambria assemblage. Alternatively, researcher bias may be a factor. Either way, bowl form is most likely underrepresented in this analysis.

Middle Woodland Rims

One Middle Woodland vessel, C-105, was identified in the Cambria ceramic assemblage (Figure 4.17). The vessel has a straight to slightly outcurving neck, and an unmodified rim. It is grit tempered with a coarse paste, partially smudged and not polished. The rim is decorated with diagonal twisted cord impressions, and the neck adorned with a row of punctates. At the juncture of the neck and upper body, just below the row of punctates, are horizontal rows of twisted cord impressions. Middle Woodland pottery in southwestern Minnesota typically is attributed to Fox Lake Ware (Anfinson 1997).

Late Woodland Rims

Two Late Woodland rims were identified from the Cambria site, and are characterized by grit-temper, a straight and unmodified rim profile, and decorative techniques. Vessel C-151 has a notched exterior rim combined with a horizontal dentate stamped exterior surface. Vessel C-264 has a cordmarked exterior surface and wide interior notched tool impressions. Based on vessel morphology and the presence of diagonal dentate stamping, C-464 could possibly be Late Woodland, as well. However, it was classified as part of the Cambria sample due to its small size, thin and even walls, and the presence of a finely incised horizontal line situated just below the rim. The incised line acts as a border motif (Q6), setting off the body design pattern.

Great Oasis

There are four rim sherds representing four different Great Oasis vessels at the Cambria site (C-106, C-108, C-109, C-280). All four vessels are grit-tempered with a medium to coarse paste, a smooth vessel surface, and thin walls. For the most part, rims are unmodified, necks are angled, and neck lengths are relatively long, with a mean height of 26.7 mm. Decoration is limited to the exterior rim and neck zones. Three vessels have vertically notched exterior rims; all neck zones are decorated with a background panel of closely spaced horizontal parallel lines (Figure 4.18). Additional neck incising is in the form of a set of diagonal parallel lines, or sets of two to three parallel diagonal lines drawn in a widely spaced crisscrossed pattern. The rim and neck decoration on the Great Oasis vessels is very finely controlled, and obviously done by a practiced hand.

Oneota

Two Oneota vessels were identified in the Cambria ceramic assemblage (C-184, C-185; Figure 4.19). These vessels do not appear to have been recovered as part of Nickerson's early excavations or the University of Minnesota excavations, but rather were donated to the Minnesota Historical Society by a local collector. Although noted as coming from the Jones Village site, the provenience of these two vessels is less secure.

Both vessels are shell-tempered, and have angled necks with slightly tapered rims. One vessel has a rounded shoulder with a globular vessel body. Decoration is limited to the interior rim and the upper shoulders of the vessels. Body decoration is similar on both pots, and is represented by nested chevrons, panels and border patterns of vertical horizontal lines, and horizontal lines of punctation that form the bottom border of nested or parallel line designs. One vessel is adorned with a characteristic semi-strap handle, also.

Figure 4.17: Middle Woodland vessel, C-105

Figure 4.18: Great Oasis vessel, C-109

Figure 4.19: Oneota vessel, C-185

Discussion

Decoration is prevalent on both rims and bodies of Cambria vessels, although there are intra-modal differences. Just over half of all Cambria site rims are decorated (n=221; 50.8%), but the curved-tapered, curved-modified, angled-tapered, angled-modified and S-rim modal types all have more than 75 percent decorated rims. Some of these high frequencies may be due to sample bias as four of these modal types have less than 25 rims. Another reason is probably a function of the modal categorization scheme. Two of the modal categories have modified rim components, and some robust decorative techniques modify rim form. Conversely, rolled rim vessels have a very low frequency of rim decoration. The exterior rim zone is decorated less frequently at Cambria than at the Price or Jones sites, while the exterior neck zone has the highest rate of decoration.

Body decoration is very common in the Cambria site sample (n=210; 70.9%). Excluding the single curved-tapered vessel in the assemblage, none of the modal types have less than 40 percent decorated bodies. Angled-unmodified and everted rim vessels have the most decorated bodies, closely followed by rolled rim vessels. The overwhelming majority of this body decoration was rendered as trailed or incised lines. Only two vessels (0.7%) are decorated differently, with either dentate stamping or twisted cord impressions. However, three vessels are decorated with a combination of trailed lines and either punctates or dentate stamping.

Angled-unmodified vessels are the most prevalent modal type in the Cambria site ceramic assemblage, followed by rolled rim vessels. The vessel morphology, surface treatment, and body decoration associated with rolled rim vessels comprise a ceramic package of manufacturing and decorative techniques very similar to the Mississippian Powell/Ramey series. Although slightly more than one-quarter of rolled rim vessels at Cambria are plain, the decorated vessels get most of the press.

Rolled rim vessels at the Cambria site differ from the other modal types in a number of ways. Obviously, the rolled and partially rolled rim morphology represents a different method of rim manufacture than the tall, angled and curved neck vessels that dominate the assemblage. Rolled rim vessels represent the only modal type where curvilinear motifs are the most popular. Of these, the spiral and interlocking scroll motifs are the most common. Furthermore, they appear almost exclusively with rolled rim vessels. Only four vessels at the Cambria site have spiral or scroll designs associated with different rim forms. Rolled rim vessels have a higher incidence of angled shoulders, as well as smudged and polished vessel surfaces. Also, rolled rim vessels have relatively wide incising depths, and a higher incidence of strong cameos, suggesting they were being decorated differently. Finally, the presence and variation in rim decoration that is so prominent in other modal types, is virtually absent for this category. These differences suggest that Cambria potters were shaping, finishing, firing and decorating rolled rim vessels in accordance with a mental template that differed from the angled and curved neck majority modal types. Overall, these vessels appear to be faithful reproductions of Ramey Incised and Powell Plain Mississippian jars in form and design, but incorporating local, grit-tempered paste recipes and finishing techniques.

Three other major body design programs were identified from the Cambria site ceramics, and are either linear or rectilinear in form. The first body design is the simplest, and is comprised simply of incised parallel horizontal lines, also known as the HIP (horizontal incised pattern), encircling the upper shoulders of the vessel (Figure 4.13). None of these vessels were complete below the shoulder, so it is not known for certain that the design pattern stops at the shoulder. The HIP pattern primarily is associated with the angled and curved neck modal types, but not the rolled, everted, straight or S-rim modes.

Another major body design program is described as lineate-chevron by Knudson (1967). This pattern is a combination of nested chevron (A2 or N1) and HIP motifs (L1) that adorns the entire area between the vessel shoulders and neck juncture (Figure 4.14). The angled-unmodified modal type is typically associated with this design program.

The third major rectilinear body design program is comprised of two rows of alternating diagonally barred triangle motifs (H2). This design program often includes border motifs, particularly in the form of parallel horizontal lines located just below the throat juncture or just above the vessel shoulders. Border motifs may also be appended to the exterior of the triangle motifs, or as a vertical fringe to the lower set of parallel lines (Figure 4.7). Both angled and curved neck modal types are associated with this design program.

Ceramic traits more closely associated with the Late Woodland Period are evident in Cambria pottery. Blended with smooth vessel surfaces and angled necks are cordmarked surface treatments, and the decorative techniques of cordwrapped stick impressions, twisted cord impressions and dentate stamping. Rim sherds with cordmarked or smoothed over cordmarked surfaces make up 6 percent (n=26) of the sample. Knudson reported that roughly 15 percent of Cambria body sherds are cordmarked. Some small vessels also have straight necks and rims, although this also could be a function vessel size. In addition to the blending of Late Woodland ceramic traits at Cambria, there are at least two Late Woodland vessels identified from the site. The presence of these sherds at Cambria in combination with the blending of Late Woodland pottery characteristics suggests that the Cambria site may have a small earlier Late Woodland occupation, or a sustained interaction with Late Woodland communities living in the region. The presence of Great Oasis pottery at Cambria may indicate similar ties with Great Oasis groups to the south and west.

The Mississippian influence in the Cambria ceramic assemblage is well documented, and includes multiple aspects of vessel morphology, surface finish, and decoration. Cambria pottery may have one or more of the following Mississippian traits: rolled rims, angular shoulders, loop or semi-strap handles, polished vessel surfaces, boldly trailed shoulder decoration, and curvilinear motifs. However, there is very little shell temper, surface slipping, whole vessel smudging, or a proliferation of vessel shapes beyond jars and bowls (Knudson 1967:278). Many of these traits co-occur as a package, and represent locally-made, grit-tempered copies of Ramey Incised pottery. These rolled/partially rolled rim vessels are both plain and decorated, and are associated with angled shoulders and a higher percentage of both slipped and smudged vessel surfaces. Curvilinear motifs representing Mississippian symbolism are a part of this package, also. Excepting temper and paste recipes, the individuals who made the majority of rolled rim vessels at the Cambria site were very faithful to the American Bottom template of Ramey Incised pottery. Only two vessels were decorated with motif types not identified in the Mississippian world. The nature and intensity of Mississippian influence and interaction will be discussed more thoroughly in the concluding chapter.

Price (21Be36)

The ceramic assemblage from the Price site is made up of 7,788 rim and body sherds. A total of 329 rim sherds representing 310 vessels were recovered from the site, as were 7,459 body sherds. Many of the rim sherds were fragmented, eroded, or otherwise too incomplete for analysis limiting the analyzed sample for the Price site to 105 rims. Jars overwhelmingly dominate the vessel assemblage (n=104); only one bowl was identified in the collection. Body sherds were sorted into categories and counted, based on temper, surface treatment, and decoration, but no further analysis was conducted.

Modal Types

Angled-Unmodified

Jars with angled necks and unmodified rims are the most prevalent modal type at Price, and make up nearly half of the vessel assemblage (n=46; 44.2%). Half of angled-unmodified rims are decorated (n=23; 50.0%), and this type also demonstrates the most variation in lip, rim and neck decoration (Table 5.21). Lip decoration alone occurs on only one vessel, and is represented by large circular punctates at the extreme outer edge of the lip (P-84). Vessel P-2 combines lip decoration, in the form of vertical incised lines, with neck decoration. It is the only angled-unmodified rim with an incised neck. Unless otherwise noted, all incised neck decoration at the Price site is the intermittent crosshatched pattern described previously for the Cambria site.

The majority of decorated rims are marked with a combination of techniques on both the lip and exterior rim (n= 11; 23.9%). The most popular decorative treatment for angled-unmodified vessels is a combination of lip incising and exterior tool impressions (n=7; 15.2%). The lip incising is similar on six of the vessels: a series of arced or slightly wavy right-leaning diagonal lines are woven in and around tool impressions located on the upper exterior rim (P-19, P-46, P-62, P-63, P-98, P-99). The tool impressions are varied, and include wide circular shapes, uneven vertical notches, and diagonal slashes. The remaining vessel, P-114, is decorated differently. The lip design appears to be a crudely incised running chevron, and the exterior tool impressions are narrow and diagonal. A grooved handle dominates this rim sherd, interrupting the lip and upper exterior rim design fields. As a result, only a small portion of the lip incising and tool impressions are visible at the edges of the sherd, making the exact design patterns difficult to discern in full.

Four (3.8%) angled-unmodified vessels have crosshatched lips and exterior tool impressed rims. Three sets of the tool impressions angle to the right, and include both narrow slashes and wide ovals (P-16, P-20, P-116). The remaining vessel demonstrates circular tooled marks, possibly impressed by fingertips (P-44).

The second most popular form of rim decoration for angled-unmodified vessels is exterior tool impressions. This group of exterior tooled rims has four vessels with consistently shaped and closely spaced decoration, although the tool marks are varied, and include shallow and circular, wide semi-circles, short and deep diagonal slashes, and solid vertical notches (P-18, P-21, P-107, P-113). Two vessels have widely spaced and unevenly tooled rims with vertical notches that are either short and stubby or long and wispy (P-38, P-42).

Vessel P-60 is uniquely decorated with a series of widely spaced, non-uniform, knotted cord impressions at the exterior rim. This vessel is not uniformly constructed. Some areas of the vessel walls are quite thick, giving the jar a lumpy feel, and the rim and lip are not evenly formed throughout. However, small chunks of the rim have broken off, which may contribute to the inconsistent feel of the vessel.

Two vessels have both exterior and interior tool impressed rims (P-5, P-33). They are both decorated with evenly spaced, short notches that have pointy bottoms. Vessel P-51 is the only jar at the Price site decorated solely on the interior rim, and with somewhat unusual tool marks. They are triangular in shape, and impressed slightly deeper into the rim on one side, perhaps indicating the tool was pointed or wedge-shaped, and held at an angle.

Thirty angled-unmodified rim sherds were large enough to determine presence of body decoration, and of these, 70 percent (n=21) were decorated with incised motifs. Individual motifs were identified on well over half of the vessels (n= 13; 61.9%), while eight (38.1%) vessels were classified with indeterminate motifs.

Similar to the Cambria site, the most prevalent motif at Price is Motif L1, or the HIP (n=10; 47.9%), where it also is utilized in two different design patterns. The HIP is used in conjunction with the chevron category (Category A), to fill in space between chevron motifs (A1, A2). The incising is quite broad in these examples, averaging 5.3 mm in width. The HIP is used as a repetitive single motif for six vessels. However, the average width of the single HIP incising is narrower, measuring just under 3.0 mm in width. Motif L1 is not used as a single emblematic design element, but rather as a complete design pattern, or part of a complete design pattern that fills the entire upper shoulders of the vessel.

Two vessels are decorated with a variation of the barred triangle motif (H2). The diagonally barred triangle is a repetitive element in the design field, often rendered as a series of connecting triangles. Vessel P-83 is a large rim sherd complete to the shoulder that displays a finely executed example of the overall design pattern primarily associated with the diagonally barred triangle motif (Figure 4.16). The design is characterized by two lines of barred triangles, one above the other, in a staggered layout. In addition, two border elements are added to the design field. Immediately adjacent to the right leg of each triangle, is a single line of vaguely circular punctates (Motif R1). The second border motif is located below the baseline of the bottom row of triangles, and is depicted as a horizontal line of long and narrow hachure marks hanging below the triangles (Motif R2). There is also a single horizontal line drawn above the upper “point” of the first row of triangles, just below the rim, setting off the design field located on the upper body of the vessel. Vessel P-42 is a much smaller rim than P-83; the motifs and body design patterns are similar, but the incising on P-42 is executed much less carefully. Vessel

P-5 may demonstrate a similar design pattern, but only a small portion of a hachured border element is present (Motif R2). The width and depth of incising for this design pattern is relatively narrow and shallow, less than 2.0 mm in width and 1.0 mm in depth.

The final motif identified for an angled-unmodified jar is a variation of the nested arc motif (Category B), and consists of two wide, nested arcs with a short, small arc nestled in between them (Motif B3). This motif is unique to the Price site (P-79), where it is also the only example from the arc category identified (Figure 4.20).

Nearly 85 percent (n=39; 84.8%) of angled-unmodified vessels were plain with a smooth surface. Six vessels or 13 percent were smudged, and the remaining vessel was smoothed-over-cordmarked. Evidence for polishing was found on over half of the vessels (n=26; 56.5%). The average neck length for angled-unmodified vessels is 24.3 cm, while the average orifice diameter is 17.0 cm. The average OD/NL ratio for this category is 7.7, with a correlation coefficient of 0.79, indicating that neck length is most likely a function of vessel size.

Figure 4.20: Unique nested arc motif (B3), P-79

Angled-Modified

There are significantly less angled-modified (n=7; 6.7%) jars at the Price site than angled-unmodified vessels. Lip decoration is rare for angled-modified vessels at Price, and is identified on only one vessel. The rim of vessel P-11 was thickened by folding it over, and the lip is decorated with short, irregularly spaced notches. Two vessels have exterior tool impressions. The rim of vessel P-40 is decorated with long, linear notches, while P-80 is marked with circular impressions. No angled-modified vessels have decorated necks or interior rims. The remaining four vessels have plain rims (P-24, P-32, P-45, P-78).

Nearly 60 percent of angled-modified jars have body decoration (n=4; 57.1%), and motifs were identified for three vessels. Two vessels were decorated with the HIP motif (P-32, P-80). Vessel P-80 is comprised of two large rim sherds, both complete to the shoulder, and decorated with the HIP combination motif O1. Interestingly, this motif is made up of incised lines in two different widths. The HIP portion of motif O1 is very finely incised, with a width of only 0.9 mm, whereas the running chevron at the bottom of the motif is broad, measuring 5.0 mm. A smaller portion of the decorated body of P-32 was recovered, and does not include the terminal portion of the design. Based on the visible motif data, it was categorized as the HIP (L1). Only a small portion of body decoration was available to identify the incised design on P-40, which was categorized as two border motifs: Q2, the hachure, and Q6, the single line.

Nearly all vessels are plain with a smooth vessel surface, and demonstrate some evidence for polishing; one rim sherd is both smudged and polished. The average neck length and orifice diameter for the angled-unmodified modal type is 26.5 mm and 19.8 cm, respectively. The average OD/NL ratio is 7.8, with a correlation coefficient of 0.75. Due to the small number of vessels in the modal category (n=6), the correlation coefficient may be skewed. Angled-unmodified vessels are nearly 2 mm taller at the neck, and 3 cm wider at the orifice than angled-unmodified vessels. The longer neck length and wider orifice diameter recorded for angled-modified vessel, in combination with the correlation coefficient data, may indicate that a taller neck is correlated with larger vessels for this mode. At both the Cambria and Price sites, the angled-modified mode has the tallest average neck length and the widest average orifice diameter of all modal types.

Angled-Tapered

Angled-tapered jars represent a minority of the Price site sample (n=5; 4.8%). There are no angled-tapered vessels with lip decoration, although three vessels are tool impressed. One vessel, P-17, has exterior tooled marks that are deeply impressed, square at the top, and taper towards a rounded base. Cordmarking also was visible on this rim sherd, located above the neck juncture and toward the middle of the neck, where it had escaped the smoothing process. Two vessels are decorated with long, linear tool impressed notches on both the exterior and interior rims (P-47, P-108). Vessel P-47 also has an incised neck decorated with the intermittent crosshatched pattern. Two angled-tapered rim sherds are undecorated (P-41, P-57).

Only three of the angled-tapered vessels were large enough to determine if body decoration was present. Motifs were identified from all three vessels. Only a small portion of body decoration was visible for vessels P17 and P41, but they were categorized as Motif L1, the HIP pattern. Vessel P-57 bears a fragmented rectilinear design (Motif C1) that bears resemblance to the trapezoid motif (Category III) associated with Ramey-Incised vessels in the American Bottom (Emerson 1989). This is the only example of a trapezoid-like motif in the Cambria Locality; it has not been identified at either the Cambria or Jones sites.

Four of the angled-tapered vessels have smooth, plain surfaces, and one vessel is smudged. Three rim sherds are polished, and one vessel is both smudged and polished. The average neck length for this group is 25.6 mm, with an average orifice diameter of 18.6 cm. The OD/NL measurement average is 7.4, and the small sample size of this modal type precludes an accurate analysis of the correlation coefficient.

Curved-Unmodified

The curved-unmodified category is the third largest group of modal types from the Price site (n=15; 14.4%). Just under half of the rims in this group are decorated (n=7; 46.7%). Lip decoration is minimal, and occurs on just two rim sherds. Vessel P-74 is embellished with lip incising only, in the form of a single horizontal line incised in the middle of the lip. The edges of the horizontal line are ragged, indicating the clay was quite wet when incised. Vessel P-91 is very small and decorated with a combination of lip crosshatching and semi-circular tool impressions on the exterior rim. Three curved-unmodified rim sherds are tooled on the exterior rim only. Two of these vessels are decorated with short, linear notches (P-39, P-104), and the third rim is decorated with circular tool impressions (P-22). Two vessels are ornamented on both the exterior and interior rims. Vessel P-71 is decorated with similarly sized and shaped linear notches on both sides, but Vessel P-73 appears to have been marked with two different kinds of tools. The exterior rim is decorated with sharp, triangular-shaped imprints, while the interior markings are more wedge-shaped and slightly textured, as if the tip of a cord-wrapped implement created them. The remaining majority of rims in this group are undecorated (p-4, P-23, P-75, P-90, P-96, P-97, P-101, P-115).

Many of the curved-unmodified rim sherds were broken just below the neck juncture. Consequently, only seven vessels were large enough to determine presence of body decoration. Four of those are incised (57.1%). Only one vessel exhibited an identifiable motif, L1, the HIP

(P-04). Three vessels were considered to have indeterminate motif classifications (P-22, P-39, P-75).

Only one curved-unmodified vessel is smudged; the rest of the modal sample are plain with smooth surfaces (n= 14; 93.3%). Polishing occurs on two-thirds of the jars (n=10; 66.7%), and one vessel is both smudged and polished. Neck length is shorter when compared to angled-unmodified vessels, but this could be due to the difficulty of accurately determining where the point of vertical tangency is on a curved neck vessel, and then measuring accurately from it. The average orifice diameter of a curved-unmodified vessel is 15.8 mm, which also is smaller in size when compared to the angled-unmodified mode. The OD/NL measurement is slightly higher at 8.2, and the correlation coefficient is 0.20, indicating that neck length and orifice diameter are not positively correlated.

Curved-Modified

Curved-modified vessels are a minority modal type at the Price site, representing less than 5 percent of the site data set (n=4; 3.8%). Decorated rims dominate the category (n=3; 75.0%), as only one rim sherd is plain (P-69). Rim decoration is varied, and includes twisted cord impressions. Only one vessel has lip decoration, and it is adorned with a continuous series of short, vertical incised slash marks (P-87). Another vessel has wedge-to-rectangular-shaped tool impressions on the exterior rim (P-92). The third decorated rim is adorned with a combination of twisted cord and tool impressions on the upper exterior rim (P-30). The tooled marks are circular and relatively deeply impressed into the rim, accounting for most of the rim modification. The twisted cord impressions are left-leaning diagonals located at the lip/rim juncture, and link to the top of each circular tool impression. No body decoration was identified for any of the curved-modified vessels.

Three vessels have plain, smooth surfaces, and one vessel is recorded as partially or incompletely smudged (p-92). Approximately half of this small rim sherd is smudged on the exterior, and this sooting also could be reflective of a fire bloom or cooking incident. Polishing was evident on half of the vessel (n=2). Curved-modified vessels have the shortest average neck length and smallest average orifice diameter for all angled or curved neck vessels at the Price site, measuring18.2 mm and 12.3 cm, respectively. The OD/NL measurement is 7.2, which also is lowest for all angled and curved neck categories in the site sample. The small sample size does not allow for an accurate correlation coefficient test.

Curved-Tapered

Only two curved-tapered vessels were identified in the Price site ceramic assemblage (P-01, P-03), which makes it the smallest of all the angled and curved neck categories. Both vessels are similarly decorated on the exterior and interior rims with long, linear notches, and neck incising. The neck decoration is fine incised, and comprised of the intermittent crosshatched design. Unfortunately, the rim sherds are broken just below the neck juncture, so body decoration was not available for analysis.

Both vessels were smoothed over, but had different surface treatments. Vessel P-01 is plain, and P-04 is smudged; neither vessel was polished. Curved-tapered vessels have the longest average neck length (25.2 mm), and the largest orifice diameter (24.0 cm), of all modal types at the Price site. However, this data may not be wholly representative due to the small size of the modal sample.

Rolled

Vessels with rolled and partially rolled rims represent the second largest modal type at the Price site (n=19; 18.3%). The percentage of the rolled rim mode at Cambria and Price is very similar, with both sites yielding 18.3 percent of the total ceramic assemblage. The majority of the Price site mode is comprised of fully rolled rims, but two examples of partially rolled rims are included, also. Rim decoration is limited to three vessels (15.8%) decorated with two broad horizontal lines on their interior rims, placed in association with handles. No other form of lip, rim or neck decoration adorns rolled rim vessels.

The Price site yielded two nearly complete rolled rim vessels with remarkably similar motif and metric dimensions from the same bell-shaped pit, Feature 14. The two vessels, P-81 and P-82 were reconstructed (Figures 4.21–4.24). A third partial vessel, P-29, was recovered from the same feature. The two reconstructed vessels are elliptical in shape, and are widest where they are ornamented with bilobed handles; the third vessel is estimated to have the same shape and size (Scullin 2012). The handles of the two reconstructed vessels are attached at the rim, and the interior rim area associated with each handle is incised with two wide, parallel horizontal lines of differing lengths. Furthermore, the handles on these jars do not create castellations or otherwise alter the height of the rim as is evidenced for numerous other handles attached to angled and curved neck jars in the ceramic assemblage. The average orifice diameter for the three vessels is 14 cm, with individual diameter measurements recorded at 13, 14 and 15 cm. All the jars are brown (10YR5/3), and demonstrate some evidence for polishing on either the exterior surface and/or rim. The specific motifs represented are discussed in the next section, but the overall similarity in vessel shape, size and decoration is highly indicative of a single potter manufacturing all three vessels. Another similar rim sherd is made up mostly of the handle itself. It mirrors the rolled rim vessels and handles previously described, including the two broadly incised horizontal lines placed on the interior rim above the handle. This rim either represents a missing piece of one of the two reconstructed rolled rim vessels described previously, or represents yet another one of these unique vessels. All of the bi-lobed handles are loop handles.

Figure 4.21: Rolled rim vessel with unique nested line motifs (F5), side view, P-81

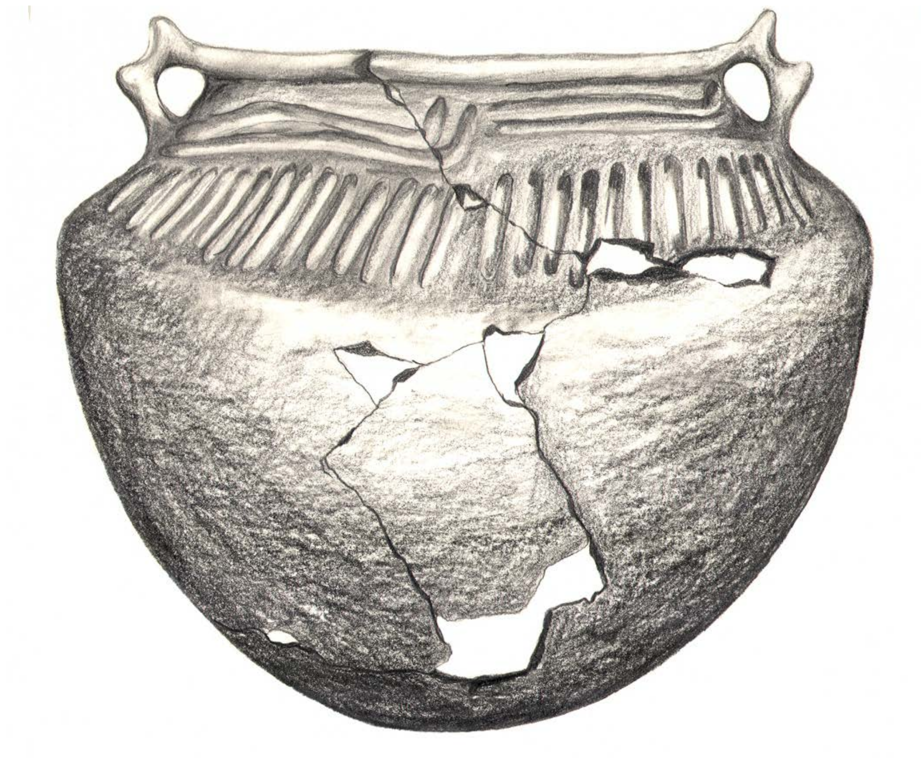

Figure 4.22: Illustration of P-81, side view (Illustrated by Jill Stoffgren)

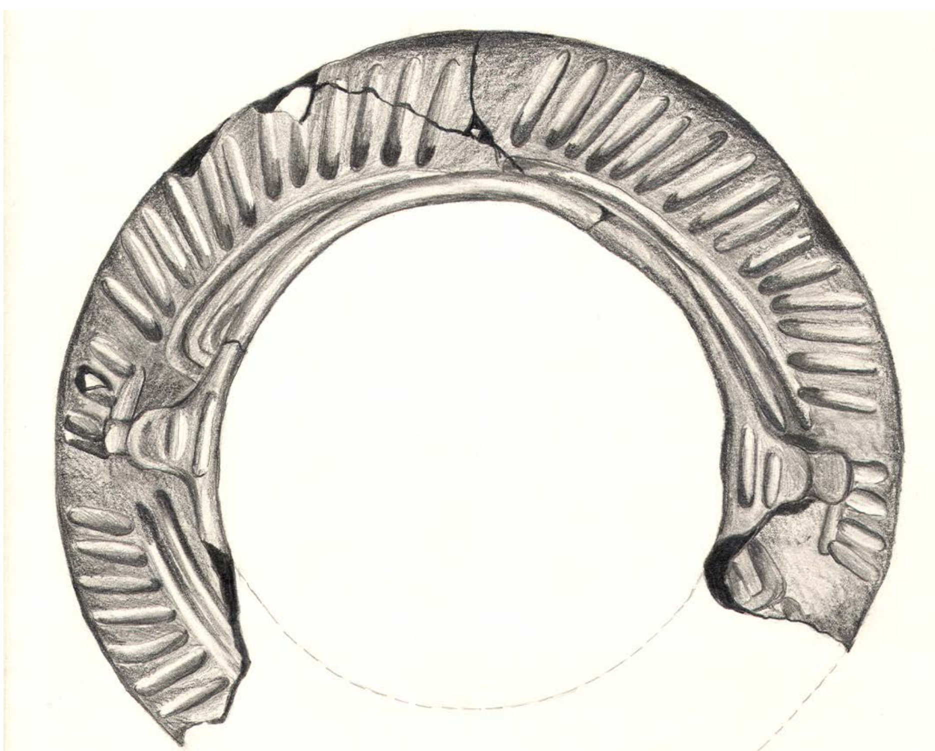

Figure 4.23: Illustration of P-81, top-down view (Illustrated by Jill Stoffgren)

Figure 4.24: Rolled rim vessel with unique nested line motifs (F5), side view, P-82

Table 4.22: Rim and Lip Decoration by Modal Type from Price

Modal Type	Count	Percentage
Angled-unmodified	**46**	**44.2**
Lip Incised	1	1.0
Lip Punctate	1	1.0
Lip Crosshatch/Ext Tool Imp	4	3.8
Lip Incised/Ext Tool Imp	7	6.7
Ext Tool Imp	6	5.8
Ext Knotted Cord	1	1.0
Ext/Int Tool Imp	2	1.9
Undecorated	23	22.1
Angled-modified	**7**	**6.7**
Lip Incised	1	1.0

Modal Type	Count	Percentage
Ext Tool Imp	2	1.9
Undecorated	4	3.7
Angled-tapered	**5**	**4.8**
Ext Tool Imp	1	1.0
Ext/Int Tool Imp	2	1.9
Undecorated	2	1.9
Curved-unmodified	**15**	**14.4**
Lip Incised	1	1.0
Lip Crosshatch/Ext Tool Imp	1	1.0
Ext Tool Imp	3	2.9
Ext/Int Tool Imp	2	1.9
Undecorated	8	7.7
Curved-modified	**4**	**3.8**
Lip Incised	1	1.0
Ext Tool Imp	1	1.0
Ext Tool Imp &Twisted Cord	1	1.0
Undecorated	1	1.0
Curved-tapered	**2**	**1.9**
Ext/Int Tool Imp	2	1.9
Rolled	**19**	**18.3**
S-rim/Collared	**3**	**2.9**
Lip Crosshatch	1	1.0
Ext Twisted Cord	1	1.0
Everted	**3**	**2.9**
Total	**104**	**100.0**

Nearly 85 percent of all rolled rims had decorated bodies (n=16; 84.2%), but only nine rim sherds were large enough for the identification of specific motif types. Twelve motifs were identified from those nine vessels, including the only curvilinear motifs known from the Price site. One of the most popular motifs associated with the rolled rim mode is the interlocking scroll (D1), a curvilinear motif identified on three vessels (P-6, P-49, P-55).

Another popular motif category for rolled rim vessels at the Price site is a variant of the hachured line (Category F), which is classified as part of the hachured scroll motif category originally identified for Ramey Incised pottery in the Cahokian heartland (Category VI). Motifs F5 and F6 are rectilinear, and unique to the Price site, where they are associated with rolled rim jars only. These motifs were identified on the three similar, elliptical vessels from Feature 14 described previously. Vessels P-81 and P-82 are decorated with two different, but similar, motif types, F5 and F6, which are incised on separate areas of the vessel. Motif F5 is small in size and located just below each handle, in between the two sections of larger F6 motifs. There are four big F6 motifs, each one covering approximately one-quarter of the vessel's upper body. Akin to the design field of Ramey Incised vessels, these two reconstructed vessels exhibit a quadripartite design field. Vessel P-29 is a large rim fragment also bearing Motif F6, and it most likely shares the same quadripartite design field.

A variation of the "track" motif, J2, decorates two vessels from the Price site (P-7, P-36). One of them co-occurs with a nested chevron motif (A2) on a small vessel. The track motif category seems to be unique to the Cambria Locality, where it is identified with rolled rim vessels at both the Cambria and Price sites. At the Price site, the track motifs are associated exclusively with rolled rim jars. The final motif associated with the rolled rim mode at the Price site is the horizontally barred triangle, Motif H2, heretofore known only from Ramey Incised pottery from the Aztalan site in southeastern Wisconsin, where it was one of the most commonly expressed motif types (Mollerud 2005).

The rolled rim motif types were classified for linearity, as were a number of the indeterminate motifs. Rectilinear motifs were the most prevalent for Price site rolled rims, and were depicted on half of the incised vessels (n=8; 50.0%). Six vessels demonstrated curvilinear elements (37.5%), and two jars were classified with indeterminate linearity (12.5%). No rolled rim vessels from the Price site had linear motif types. Motif types for rolled rim vessels are listed in Table 4.23.

The incidence of smudging at the Price site is highest in the rolled rim modal sample (n=8; 42.1%). The number of polished vessels is comparatively high, also (n=14; 73.7%). The combination of smudging and polishing is also the highest for this mode (n=7; 36.8%). When compared to rolled rim vessel from Cambria, the Price site has higher occurrences of smudging, polishing, and the two techniques combined. However, slipping was not recognized on any rolled rim jar from either site. A characteristic of Ramey Incised vessels from the American Bottom is that they are slipped, smudged and polished. The lack of slipping is an important difference in manufacturing techniques between Cahokia-made Ramey Incised pottery, and the Ramey-like vessels produced within the Cambria Locality.

Table 4.23: Motifs for Rolled Rim Modal Type from Price

Motif Type	Count	Percentage
A2	1	8.3
D1	3	25.0
F5	2	16.7
F6	3	25.0
H1	1	8.3
J2	2	16.7
Total	**12**	**100.0**

Metric data indicates that the rolled rim mode has the widest and deepest averages of body incising amongst all Price site modal types, measuring 4.4 mm and 1.7 mm, respectively. When the cameo effect is considered, the majority of incised vessel have a strong cameo effect (n=10; 62.5%), followed by a weak cameo effect (n=4; 25.0%). Only two (12.5%) incised jars did not exhibit an interior cameo effect. Based on this data it seems likely that most rolled rim jars from the Price site were incised when the clay was still quite wet.

Metric data also indicates the rolled rim mode is smaller on average than most of the angled and curved neck modal types. The average orifice diameter for rolled rim jars is 14.6 cm, whereas the average orifice diameters for angled and curved neck vessels are 17.5 and 15.9 cm, respectively. Although rolled rim jars are technically neckless, a neck length was taken to provide comparable data for the OD/NL category. The "neck length" for a rolled rim jar is better described as a measurement of rim height. The average neck length for the rolled rim modal type is 10.3 mm, and the OD/NL ratio is quite high, measuring 14.2. The correlation coefficient is 0.47, which indicates that neck length and vessel size are not correlated. The average RPR value for rolled rim vessels from the Price site is 0.55. When compared to the Cahokia data, this ratio falls within the Early-Late Stirling RPR range (Holley 1989: Figure 67). The inclusion of the Cahokia data is not meant to suggest that the Cambria Locality vessels are directly derived from the Mississippian heartland, and therefore directly comparable. Rather, it is included as an indicator of the sensitivity of jar rim measurements through time, and as a suggestion of similar applicability to locally-produced rolled rim vessels.

S-rim and Collared

Only two S-rim vessels (1.9%) and one collared vessel (1.0%) were identified from the Price site ceramic assemblage (P-09, P-34, P-104). Although the number of collared rims is consistently low at all three sites, the incidence of S-rims at Price is notably lower than at the Cambria site, where S-rims represent over 6 percent of the site sample. Both S-rim vessels from the Price site have decorated rims but are broken below the neck, limiting analysis of body decoration. Vessel P-105 has a relatively short rim with a deep channel on the interior. It is not a classically shaped S-rim, but it does have enough of a concave-convex appearance to be included within the S-rim group. Furthermore, it fits within the range of variation exhibited by the S-rim modal type from the Cambria site. Rim decoration for P-105 is crosshatching restricted to the lip. A small area of the vessel body is present, but only enough to identify fine incised body decoration, which was recorded as an indeterminate motif. Vessel P-09 has more of a classic S-rim shape, and is decorated on the upper exterior rim with twisted cord impressions. The design pattern is composed of three parallel horizontal lines intermittently crossed by left-leaning diagonal lines. This vessel was smudged with a smooth surface finish. Polish was not identified on either S-rim vessel. Finally, the average orifice diameter for the S-rim mode is 12.5 cm, which is small for the Price site data set. It is also small when compared to the average orifice diameter of the S-rim/Collared mode at the Cambria site, which is 15.5 cm.

The collar on vessel P-34 was created by folding a longer piece of clay over onto the exterior side of the rim, creating a relatively long, thickened collar running the entire length of the rim. The collar is set off at the lower rim juncture by a noticeable indentation below the bottom of the fold where the collar stops. The lip and rim are undecorated, and the vessel is broken at the neck precluding identification of body decoration. The rim sherd is plain with a smooth surface, and not polished. Similar to the S-rim vessels, the orifice diameter is quite small for the site, and measures 12 cm.

Everted

Everted and everted-extruded rims make up a small minority in the Price site ceramic assemblage (n=3; 2.9%). Two everted rims and one everted-extruded rim sherd make up the everted rim modal type. None of these vessels were decorated on the lip or rim. Two vessels were complete enough to determine the presence of body decoration. Vessel P-28 is a very small vessel, and has an orifice diameter of 5 cm. It is sparsely tempered with grit, and pockmarked by several large voids on the vessel interior. This jar most likely was shaped through finger-molding, and although it is relatively uniform in wall thickness, the rim ranges in shape from everted to unmodified, and has a thin, pinched lip. It is decorated at the shoulder with a series of short, unevenly tooled vertical notches that encircle the vessel at its widest point. Vessel P-110 is also a very small jar, and is represented by a rim sherd broken just below the neck. As a result, no body decoration could be identified. Vessel P-08 is incised with an indeterminate motif. All three vessels have a smooth surface finish, and one is also smudged and polished.

The orifice diameter ranges 5-14 cm for the everted rim mode, and the average diameter is 8.3 cm. This is the smallest average orifice diameter for any modal type from the Price site. The neck length is short, also, averaging 8.9 mm. A correlation coefficient comparing orifice diameter and neck length was not calculated due to the small sample size of the modal type. An RPR measurement was calculated because the everted rim form is associated with Ramey Incised jars from Cahokia and other Mississippian sites in the northern hinterlands. The RPR value for Price site everted rims is 0.81, which is above the range for Lohmann phase vessels (Holley 1989: Figure 67). The OD/NL is 9.3.

Decoration

Rim Decoration

The Price site has the lowest incidence of lip, rim and neck decoration in the Cambria Locality (n=43; 41.3%). At both the Cambria and Jones sites, over half of the rim sherds were decorated in these zones. When rolled rims are excluded from the sample because typically they are not decorated, the percentage of decorated rims jumps to 50.6%. Exterior rim decoration is the most prevalent form of rim adornment at the Price site (n= 36; 34.6%). Nearly one-third of all jars have tool impressed exterior rims (n= 34; 32.7%). Minority forms of exterior rim decoration include both knotted (n=1; 1.0%) and twisted cord impressions (n=2; 1.9%), which make up less than 3 percent of the total exterior rim decoration combined. As noted in a previous section, the tool impressed category is dominant because it encompasses a wide variety of shapes and tool types.

Table 4.24: Decoration by Zone from Price

Decoration Zone	Count	Percentage
Lip	**18**	**17.3**
Crosshatched	6	5.8
Incised	11	10.6
Punctate	1	1.0
Exterior Rim	**36**	**34.6**
Tool Impressed	34	32.7
Twisted Cord Imp	2	1.9
Knotted Cord Imp	1	1.0
Interior Rim	**9**	**8.7**
Tool Impressed	9	8.7
Neck	**4**	**3.8**
Incised	4	3.8
Body	**52**	**3.8**
Incised	51	98.1
Notched	1	1.9

The frequency of lip decoration at Price is also the lowest for the Cambria Locality sites (n=18; 17.3%). Incising is the most popular form of lip decoration (n=11; 10.6%), but is varied in shape and form. Six rim sherds are decorated with artistically rendered, right-leaning, wavy diagonal lines. The remaining forms of incised lip decoration include: three vertically incised lips; one sporadic and crudely-drawn chevron pattern; and one vessel with a single horizontal line incised in the middle lip. The second most popular form of lip incising is crosshatching (n= 6; 5.8%). The only other form of lip decoration at the Price site is punctation (n= 1; 1.0%), which is rare for the Cambria ceramic tradition.

Interior rim decoration is comparatively rare at the Price site. Less than 10 percent of all Price site rims are decorated on the interior (n=9; 8.7%), and they are all tool impressed. Interior rim decoration at the Cambria and Jones sites is a bit more varied, due to the presence of additional techniques like crosshatching and twisted cord impressions. The Price site also has the lowest prevalence of neck decoration (n=4; 3.8%). The incised pattern on all four rim sherds is the previously identified intermittent crosshatched pattern.

Body Decoration

There are 71 jar rims at the Price site large enough to determine the presence of body decoration. Of these, nearly three-quarters have decorated bodies (n=52; 73.2%), nearly all in the form of incised motifs. The only decorated vessel not incised is very small, practically a miniature, and it is ornamented with a series of short, unevenly notched vertical lines encircling the shoulder area (P-28). The Price site demonstrates less range in motif expression than Cambria. At the Price site, 15 separate motif types were identified. They represent nine motif categories and one border pattern category. The majority of the incised decoration was recorded as indeterminate (n=23; 44.2%). Motif count and frequency for the Price site are listed in Table 5.29.

The most popular motif types expressed at the Price site are the HIP (L1) and nested chevron (A2). Three motifs are unique to the Price site. These include the two variations of the hachured hooked line motif (F5, F6), and a unique iteration of the nested arc (B4). Motifs identified that are traditionally associated with Ramey Incised pottery include the interlocking scroll (D1) and barred triangle motif (H1). Outside of the Price site example, the barred triangle motif is found only on Ramey Incised vessels from the Aztalan site, where it is the second most popular motif. Uncommon motifs at Price include the diagonally barred triangle (H2), track motif (J2), and a combination motif joining the HIP with a running chevron (O1). Finally, three border elements were identified (Q2, Q4, Q6), and depicted in association with the diagonal barred triangle motif. Rectilinear motifs are the most prevalent (n=17; 42.5%), closely followed by linear motifs (n= 16; 40.0%). Curvilinear motifs were depicted with the least frequency (n=7; 17.5%). A relatively large number of decorated vessels did not contain enough of a motif to determine linearity, and were classified as indeterminate (n=15; 37.5%).

Motifs not depicted at the Price site include a number of curvilinear types such as variations of the arc and hachured interlocking scroll motifs, nested scrolls, hachured scrolls, and combination scroll motifs. Rectilinear examples not identified at the Price site include diagonal parallel lines, diamond dot motif, and the combination nested chevron and barred triangle motif.

Of the 52 jars with body decoration, over one-third demonstrate a cameo effect on the interior surface (n=19; 36.5%). Eleven (21.2%) vessels had a strong cameo, and eight (15.4%) had a weak cameo effect. Of the eleven vessels with a strong cameo, all but one had a full or partially rolled rim. The remaining vessel was angled-unmodified. Of the eight vessels with a weak cameo, half of them had rolled rims, while the remaining four were angled-unmodified. In sum, nearly 75 percent of vessels demonstrating an interior cameo also had a rolled rim, which points toward most rolled rim vessels being decorated when the clay was still wet. However, most vessels with decorated bodies at the Price sites do not exhibit an interior cameo (n=33; 63.5%).

Table 4.25: Motif Types from Price

Motif Type	Count	Percentage
A1	1	2.3
A2	4	9.3
B4	1	2.3
C1	1	2.3
D1	3	7.0
F5	2	4.7
F6	3	7.0
H1	1	2.4
H2	2	4.7
J2	2	4.7
L1	13	30.2
O1	1	2.3
Q2	5	11.6
Q4	1	2.3
Q6	3	7.0
Total	**43**	**100.1**

* Total may not sum due to rounding

Table 4.26: Motif Linearity from Price

Linearity	Count	Percentage
Rectilinear	17	42.5
Curvilinear	7	17.5
Linear	16	40.0
Total	**40**	**100.0**

Vessel Morphology

Lip Form

Rim sherds from the Price site display the most variation in lip form. Flattened lips are the most popular lip form at the Price site, and make up over one-third of the site's ceramic assemblage (n= 39; 37.5%). Rounded and beveled lips are prominent, also, and roughly equivalent in number (Table 5.28). There is one example each of a pinched lip, and a lip beveled towards the interior of the vessel. Interior beveled lips are rare in the region, and the bowl from the Price site represents the only known example in the Locality.

Shoulder Form

At the Price site, there are 13 rim sherds with enough vessel body present to accurately identify shoulder form. This is a very small sample, representing only 12.5 percent of the rim sherds analyzed. Angled shoulders predominate, and represent well over half of the sample (n=8; 61.5%). Four vessels with angled shoulders are associated with rolled or partially rolled rims. One of these vessels could be described as having a hyper-angular shoulder. Vessel P-27 is a poorly made, rolled rim jar. Both the interior and exterior walls are quite lumpy, and demonstrate pronounced finger marks from molding. The hyper-angular shoulder is most likely a result of thickening at the shoulder due to the potter's inexperience with vessel shaping, as opposed to a purposeful morphological choice influenced by early Mississippian vessel shapes. The second largest category is rounded shoulders (n=4; 30.8%). Three vessels with rounded shoulders are associated with angled-modified rims. Also, there is a single vessel with pronounced shoulders (n=1; 7.7%).

Table 4.27: Lip Form from Price

Lip Form	Count	Percentage
Flattened	39	37.5
Rounded	33	31.7
Beveled-ext	30	28.8
Beveled-int	1	1.0
Pinched	1	1.0
Total	**104**	**100**

Table 4.28: Shoulder Form from Price

Shoulder Form	Count	Percentage
Angled	8	61.5
Pronounced	1	7.7
Rounded	4	30.8
Total	13	100

Handles

Handles adorn only a small portion of vessels at the Price site. Out of 104 jars, only 13 vessels, or 12.5 percent of the Price site ceramic jar assemblage, demonstrated evidence for the presence of handles, including handle scars (n=2; 15.4%). The overwhelming majority of handles are of the loop variety (n=10; 76.9%), and there is one example of a semi-strap handle (n=1; 7.7%). No strap handles were identified from the Price site. Similar to the Cambria site, handled vessels at Price are elevated at the rim where the handles are attached, creating a peak or castellation in the rim profile.

Plain loop handles are the most common at the Price site (n=5; 38.5%), and are characterized by a lack of decoration or morphological elaboration. Loop handles are associated with angled-unmodified (n=3), modified-curved (n=1), and rolled rim vessels (n=1). There are three (23.1%) examples each of both bi-lobed and grooved handles. All of the bi-lobed handles are loop handles, and were fashioned with two separate flanged appendages oriented vertically. They are associated with the large, reconstructed rolled rim vessels that were described in detail in a previous section (P-81, P-82, P-88).

The three grooved handles are characterized by any number of vertical, incised lines marking the length of the handle. Two of the grooved handles are of the loop variety, and the third is a semi-strap handle. The semi-strap handle is at least 1.5 times wider than the length of the handle, and adorns P-89. It is associated with a rolled rim jar, and is decorated by three deeply incised parallel vertical lines. Both of the grooved loop handles are associated with angled-unmodified vessels. One is decorated with a single incised line running down the length of the handle (P-94). Although a portion of the top part of the handle has broken off, two knob-like projects most likely adorned the handle on either side of the incised decoration. The second grooved loop handle is decorated with three vertical incised lines running down its length (P-114).

When handles are considered in association with modal types, it appears that angled-unmodified and rolled rim vessels have the most handles. Nearly half of all vessels with handles have angled-unmodified rims (n=6; 46.2%). The majority of these are plain, loop handles (n=4), but there are two examples of grooved handles associated with angled-unmodified rims. Four rolled rim vessels have handles (30.8%), and none of them are undecorated. Three of them are bi-lobed and one is a grooved semi-strap handle. The remaining plain loop handle ornaments a curved-modified vessel. Handles scars are associated with one curved-unmodified and one S-rim vessel.

Surface Finish/Polish

Nearly all vessels from the Price site have a smooth vessel surface. The three Late Woodland vessels are cordmarked, and one vessel is smoothed over cordmarked (P-13); a surface treatment where smoothing is still part of the manufacturing process. Another vessel exhibits areal cordmarking just below the rim (P-17), indicating that it was most likely shaped with a corded paddled, and then smoothed over as part of the finishing process. The majority of vessels at Price have a plain or untreated surface (n=84; 80%). The remaining vessels exhibit various degrees of smudging, from partial to full (n=21; 20%). Evidence for polish is exhibited just under half of the analyzed sample (n=48; 46.2%). A much smaller number of jars are both smudged and polished (n=13; 12.5%). There is no evidence for slipping at the Price site.

Bowl

One bowl was recovered from the Price site, representing just one percent of the site sample (P-58). It is grit-tempered with a relatively coarse paste, and a smooth vessel surface. It has a plain surface finish, and is not polished. The shoulders of the bowl are sharply angled, and the upper portion of the vessel is inslanted. The rim is unmodified with a lip that bevels inward. The lip is decorated with a thick crosshatched pattern that is somewhat weathered. The upper portion of the vessel, just below the rim, is decorated with a single running chevron motif that most likely encircled the vessel. Vessel P-58 has an orifice diameter of 20 cm, and would have been fairly large when complete.

Woodland Ceramics

In addition to the vessels included for analysis, several rim sherds representing earlier time periods were recovered from the Price site. Two vessels are identified as Middle

Woodland. They are thicker than Cambria ware on the average, and have straight necks with unmodified rims. Vessel P-31 is marked by alternating bosses and punctates on both the exterior and interior rims. Above the row of punctates and bosses is a series of right-leaning, cord-wrapped dowel impressions also decorating both the exterior and interior rim surfaces. Vessel P-122 is similar to P-31, in that both rim sherds are decorated with bosses and punctates on their inner and outer rims. P-122 also is adorned with a series of parallel, right leaning dentate stamped impressions on the upper exterior rim only. In addition, there is a small hole in the upper rim, perhaps representing a hole for mending, or for hanging the vessel. These rim sherds bear a strong resemblance to Onamia ceramics that span from late Middle Woodland-early Late Woodland times, circa A.D. 800-1000, and have been recovered from central Minnesota (Anfinson 1979:149-155).

A few Late Woodland rim sherds were found at the Price site, also. Three cordmarked rim sherds were identified, all of which are quite small in size. Cordmarking is a minority trait for the Cambria site assemblage, where it is sometimes found below the shoulder. Smoothed over cordmarking is recognized with a bit more frequency in the Cambria Locality, including at least one vessel from the Price site. However, the combination of strong, visible cordmarking at the vessel rim with straight necks and unmodified rim forms points indicates these vessels date to the Late Woodland (P-123, P-124, P-125). None of these rim sherds have any lip, rim or neck decoration.

There are two other small yet unique rims from the Price site that appear to be related to other sites in southwestern Minnesota, or the Mill Creek/Over cultural patterns from South Dakota and Iowa. Vessel P-126 is broken just below the rim, which is straight and thickened with a pointed lip. It is decorated with a relatively wide crosshatched pattern on the exterior rim, and long, thin, right-leaning diagonal incised lines on the interior. The exterior cross-hatched rim has been identified at the Swanson site in South Dakota (Tiffany 2007). Vessel P-127 appears to be filleted, and is decorated with a combination of crosshatched twisted cord impressions on the vessel lip with deeply tooled impressions at the lip/rim juncture. The end result is a three-dimensional rim comprised of spatially segregated "pyramids" jutting out horizontally from the exterior rim of the vessel. A few examples of this rim type were identified in the Cambria assemblage, as well.

Owen D. Jones (21Be5)

The Jones site ceramic assemblage is the smallest sample in the dataset, despite encompassing two collections. A total of 52 rim sherds were recovered, representing a minimum number of 38 vessels. Based on the size and attribute criteria discussed previously, 29 rim sherds representing 29 distinct vessels were analyzed. All vessels from Jones are grit-tempered jars with smooth surfaces. No alternative vessel forms or shell tempering was identified from the site. A total of 733 body sherds were sorted into categories and counted based on temper, surface treatment, and decoration, but no further analysis was conducted.

Modal Types

Angled-Unmodified

Nine modal types were identified from the Jones site ceramic assemblage. The number and percentages of modal types and associated rim/lip decoration are displayed in Table 5.34. Similar to both the Cambria and Price sites, angled-unmodified rims are the most prevalent modal type at Jones, where they make up nearly half of the entire ceramic assemblage (n=14; 48.3%). Also similar to angled-unmodified vessels at the Cambria and Price sites, this mode demonstrates the most variation in lip and rim decoration (See Table 5.34). All lip decoration is crosshatched (n=4; 28.6%), and sometimes co-occurs with exterior tool impressions (n=3; 10.3%). Half of all angled-unmodified rims are decorated with exterior tool impressions, and two rims (14.3%) also have tool impressed interior rims. Both rim sherds are adorned with vertical notches, but of different lengths; J-60 has short notches, and J-110 (Figure 4.25) has long notches. Vessel J-101 is unique in that both the exterior and interior of the rim is decorated with a linear series of "X"s that are not incised close enough to be considered a crosshatched pattern. This vessel also exhibits an extremely coarse paste with large chunks of temper, and is quite a bit thicker than the average sherd from the Jones site. Five (35.7%) vessels have undecorated rims (J-35, J-36, J-39, J-57, J-104).

Figure 4.25: Angled-unmodified mode with tool impressed rim, J-110

Nine vessels were complete enough to determine the presence of body decoration. Of these, two-thirds had incised vessel bodies (n=6; 66.7%). Four motif types were identified representing three different categories. Nested chevrons were represented twice (Motif A2), and the diagonally barred triangle (Motif H2) and HIP motif (L1) once each. One vessel was categorized with a border motif only, a single line incised just below the vessel neck (Q6). The remaining vessel was classified with an indeterminate motif type or category.

The majority of angled-unmodified vessels have a plain surface finish (n=11; 78.6%), but three (21.4%) are smudged. Three (21.4%) vessels also exhibit evidence for polish, but only one (7.1%) vessel is both smudged and polished. The average neck length for angled-unmodified vessels is 24.2 mm, and the orifice diameter is17.8 cm. When neck length and orifice diameter are compared, the correlation coefficient is fairly strong at 0.81 indicating that neck length may be a factor of vessel size for this modal group.

Table 4.29: Motifs for Angled-Unmodified Modal Type from Jones

Motif Type	**Count**	**Percentage**
A2	2	40.0
H2	1	20.0
L1	1	20.0
Q6	1	20.0
Total	**5**	**100**

Angled-Modified and Angled-Tapered

There are two examples each of angled-modified and angled-tapered rims, which each structure 6.9 percent of the total site assemblage. Vessel J-34 is an angled-modified vessel with an incised lip intermittently decorated with “X”s and hash marks. The body decoration is classified as a nested arc/chevron combination motif (M1). Vessel J-45 is an angled-modified vessel with a plain rim. Both examples of this mode most likely have modified rims due to vessel forming practices, as modification through lip or rim decorative technique does not seem likely. One vessel has a plain surface finish, and the other is both smudged and polished. Angled-modified rims have the longest average neck length of all modal types in the Jones site assemblage (26.3 mm), but with a relatively small average orifice diameter (15 cm).

Both of the angled-tapered vessels have non-matching exterior and interior tool impressions. The exterior rim tool impressions on J-56 are triangular notches placed at or just below the lip/rim juncture, while the interior rim decoration is represented by a series of slightly right-leaning diagonal notches. Vessel J-56 also has a finely incised neck decorated with the intermittent crosshatched pattern. The apex of a rectilinear motif, perhaps a chevron or triangle, was identified as body decoration, but was classified as indeterminate because the specific motif type or category could not be distinguished. A border motif in the form of a single incised line was identified below the neck, and classified as Motif Q6. Vessel J-62 has a relatively long tapered rim and a well-defined welding scar on the interior surface. Exterior tool impressions are fairly wide, with a rounded to v-shaped bottom, while interior tool impressions are linear notches. Two different tools were apparently utilized to decorate each side of the vessel; one was wide and blunt, and the other had more of a cutting edge. Both angled-tapered vessels have a plain surface finish and are not polished. The neck length and orifice diameter metric data for this mode averages 24.7 mm and 19 cm, respectively, and are similar to the angled-tapered measurements from the Cambria and Price sites. A correlation coefficient test comparing neck length and orifice diameter was not done for either angled neck mode due to small sample size.

Curved-Modified

Curved-unmodified vessels are the second most frequent modal type at the Jones site, yet with only five examples they comprise less than 20 percent of the overall ceramic assemblage. All curved-unmodified vessels have tooled rims, but no lip decoration. In fact, no vessels with curved necks have decorated lips. Decoration is restricted to the exterior and interior decoration zones. Vessels with curved necks do not have plain rims, either. Four (80%) curved-unmodified vessels are decorated with exterior tool impressions (J-38, J-42, J-44, J-59), and one (20%) with interior tool impressions (J-102). The exterior tooled marks are varied, and include diagonal slashes, as well as triangular and semi-circular impressions. Vessel J-102 is distinctive because it is the only rim with a smoothed-over-cordmarked exterior, and rim decoration confined to the interior rim only. The wide and relatively deep tool impressions range in shape from semi-circular to triangular, and may have been made by either a broad, blunt tool, or possibly finger impressions.

Two (66.7%) out of three vessels large enough for body decoration exhibited body incising. No specific motif types or categories were discerned, but both vessels were decorated with rectilinear motifs. The most popular surface finish for curved-unmodified vessels is plain and smooth (n=3; 60.0%), although one vessel is plain with smoothed over cordmarking (20.0%). One vessel is smudged. Polishing is not demonstrated for any rim sherds of this mode. Vessel size is small, comparatively, both within the Jones site ceramic assemblage, and when compared to curved-unmodified vessels at the Cambria and Price sites. The average neck length is 18.6 mm, and the average orifice diameter is 18.0 cm. A test to determine the correlation coefficient between neck length and orifice diameter was not done due to small sample size.

Curved-Modified and Curved-Tapered

Curved-modified and curved-tapered vessels are infrequent modal types at the Jones site. Vessel J-58 represents the only curved-modified rim sherd in the site sample. It is decorated with semi-circular tool impressions on the exterior rim. The tool marks are relatively deep and spaced fairly close together; they are most likely the cause of the rim modification. This rim sherd was not large enough to identify body decoration. It has a plain surface finish and exhibits polish.

Both of the curved-tapered rim sherds have similarly decorated rims and necks (J-32, J33). Both vessels have finely incised necks decorated with an intermittent crosshatched pattern that is underscored by a border motif (Q6) in the form of a single horizontal line, and located just below the neck juncture. In addition, each rim sherd has both exterior and interior tool impressions in the form of vertical notches. Vessel J-33 was broken just below the neck and is not associated with any body decoration, but a diagonally barred triangle motif (H2) with a punctate border (Q1) was identified for J-32. Both vessels have a plain surface finish and are not polished. The average neck length of curved-tapered vessels is 24.3 mm, and the average orifice diameter is 20.5 cm. A correlation coefficient comparing these two categories was not done due to small sample size.

Rolled

A single partially rolled rim sherd represents the rolled rim mode at the Jones site (n=1; 3.4%). It is the second largest modal type at both the Cambria and Price sites, where it makes up 18 percent of each site's ceramic assemblage. The paucity of the rolled rim mode at Jones is notable, as is the lack of true rolled rim vessels at the site. Vessel J-63 is a small rim sherd broken below the rim, and is lacking enough body to determine the presence of decoration. The vessel is small, with an orifice diameter measuring 7 cm. The RPR is 0.45, which trends more towards Late Stirling or Early Moorehead RPR values in the American Bottom. The surface finish is plain, and it is not polished.

Everted

There is one everted rim vessel at the Jones site, representing 3.4 percent of the site assemblage. Vessel J-61 is a plain, everted rim vessel with no decoration on either the rim or the body. This is a small vessel with an orifice diameter of 10 cm. The short rim could be due to the small size of the jar just as much as it could be any stylistic choice of the potter. It is both smudged and polished. Due to the small sample size, the correlation coefficient comparing orifice diameter and neck length was not calculated.

S-rim/Collared

The collared vessel J-55 represents an aberrant rim within the Cambria Locality, as there is nothing similar at either the Cambria or Price sites. J-55 is classified as a collared rim due to a thickened and flared ridge of clay located at the exterior juncture of the rim and neck. Although the actual rim of the vessel is unmodified, or parallel-sided, the outward projection of clay at the neck/rim juncture distorts the overall shape of the rim, and creates a more “collared” profile. No true S-rim vessels were recovered from the Jones site. In addition to the unique rim form, the lip decoration is also distinctive within the Cambria Locality. The vessel lip is incised with a series of short horizontal lines that create the impression of a running, uneven dashed line encircling the lip of the vessel (J-55). Exterior rim tool impressions are oval in shape, and may have been created by the side of a finger pad. The vessel body is decorated with a finely incised HIP motif (L1) that is separated by a grooved, semi-strap handle ornamented by three vertical incised lines.

J-55 has a plain surface finish and is not polished. This vessel mixes typical Cambria decorative traits, such as tool impressions at the exterior rim and the finely incised HIP motif on the vessel body with traits that are geographically or temporally different, like the flanged collar and the wide grooved handle.

Table 4.30: Rim and Lip Decoration by Modal Type from Jones

Modal Type	Count	Percentage
Angled-unmodified	**14**	**48.3**
Lip Crosshatch	1	3.4
Lip Crosshatch/Ext Tool Imp	3	10.3
Ext Tool Imp	2	6.9
Ext/Int Tool Imp	2	6.0
Ext/ Int Crosshatch	1	3.4
Undecorated	5	17.2
Angled-modified	**2**	**6.9**
Lip Incised	1	3.4
Undecorated	1	3.4
Angled-tapered	**2**	**6.9**
Ext/Int Tool Imp	2	6.9
Curved-unmodified	**5**	**17.2**
Ext Tool Imp	4	13.8
Int Tool Imp	1	3.4
Curved-modified	**1**	**3.4**
Ext Tool Imp	1	3.4
Curved-tapered	**2**	**6.9**
Ext/Int Tool Imp	2	6.9
Rolled	**1**	**3.4**
Undecorated	1	3.4
Everted	**1**	**3.4**
Undecorated	1	3.4
S-rim/Collared	**1**	**3.4**
Lip Inc and Ext TI	1	3.4
Total	**29**	**100.0**

Decoration

Rim Decoration

When lip, rim and neck decoration is considered separately from modal types, proportionately more vessels from the Jones site are decorated compared to Cambria and Price (n=21; 72.4%). Well over half of all Jones vessels are decorated on the exterior rim (n=18; 62.1%), which is nearly twice as much exterior rim decoration identified at Price, and more than twice the frequency of the same category at the Cambria site. Similarly, the Jones site has the highest incidence of vessels decorated on the interior rim (n=8; 27.6%). At Jones, nearly all of the vessels with interior rim decoration also have decorated exterior rim. Of the seven vessels with both exterior and interior rim decoration, six of them are adorned with linear notches on both sides; one is crosshatched on both sides. Vessel J-102 is decorated on the interior rim only with broadly tooled, semi-circular to v-shaped impressions. As noted previously this is the only vessel in the Jones site ceramic assemblage that has a smoothed over cordmarked surface treatment.

Lip decoration was identified on less than one-quarter of the ceramic assemblage from the Jones site (n=6; 20.7%). Crosshatching is the preferred lip treatment at Jones (n=4; 13.8%), which is unique in the Locality. Lip decoration at the Cambria and Price sites is dominated by incising, but less than 10 percent of Jones site rims are incised (n=2; 6.9%). Vessel necks are decorated only with fine incising at the Jones site (n=3; 10.3%). The neck incising is attributable to the same unique pattern previously described, and referred to as the intermittent crosshatched pattern. It is a series of left-leaning parallel diagonal lines encircling the orifice of the vessel, intermittently crossed with a few right leaning parallel lines. All three neck incised vessels are decorated with both exterior and interior notches, and most likely would fit comfortably within Knudson's type Mankato Incised.

Despite the proliferation of overall rim decoration at Jones, the range of decorative techniques at this site is most restricted. For example, there are no rim sherds decorated with punctates, twisted or knotted cord, or cordwrapped stick impressions. Instead, all lip, rim and neck decoration is classified into three categories: crosshatched, tool impressed, or incised. When all of these decorated vessels are taken together, they represent nearly three-quarters of the sample, as is indicated in Table 5.37.

Body Decoration

Body decoration at the Jones site is limited to incised motifs and patterns decorating the upper body of the vessel between the rim and shoulders. Nineteen vessels were complete enough to determine the presence of body decoration, and of those, thirteen (68.4%) have decorated bodies. This proportion of body decoration is comparable to the Cambria site, but slightly below that for the Price site ceramic assemblage. There are only a few rim sherds from the Jones site where enough of the decoration is present to accurately determine motif type. A total of eight motifs representing five different types and categories were identified from the Jones site (Table 5.38). There are two nested chevrons (Motif A1), two diagonally barred triangles (Motif H2), two HIP (Motif L1), one hachured "wing" (Motif F4), and one chevron/arc combination motif (M1). In addition, three border motifs were identified (Motif Q1, Q2, Q6). The diagonally barred triangle motif on J-32 is unique because it is the only known example in the dataset where the diagonal lines are left-leaning. Jones site body decoration expresses a much smaller set of motif types and categories than the other two sites. For example, only one motif type per category is represented. This may be due to small sample size, but an alternative possibility is that Jones site potters were choosing to work with a smaller set of conceptualized symbols and patterns.

When the linearity of motif types and classes is considered, rectilinear motifs are the most prevalent (n=8; 61.5%). Linear and curvilinear motifs are much less frequent (Table 5.39). Linear decoration occurs on two vessels (15.4%), which is a much lower percentage than at the Cambria and Price sites, where linearity exceeds 40 percent of motif expression. There is only one example of a curvilinear motif, which was identified as part of Motif Category M, the chevron/arc combination motif. No scroll motifs were identified at Jones. The lack of scrolls or other curvilinear elements may be related to the lack of rolled rims recovered from the site. Unfortunately, the one partially rolled rim recovered from the Jones site is broken just below the rim, and is lacking an associated body. The average width of body incising at the Jones site is 2.1 mm, which is the narrowest average of all three sites. The average depth of body incising is 1.0 mm, and is similar amongst all three sites in the Locality.

Table 4.31: Decoration by Zone from Jones

Decoration Zone	Count	Percentage
Lip	**6**	**20.7**
Crosshatched	4	13.8
Incised	2	6.9
Exterior Rim	**18**	**62.1**
Tool Impressed	17	58.6
Crosshatched	1	3.4
Interior Rim	**8**	**27.6**
Tool Impressed	7	24.1
Crosshatched	1	3.4
Neck	**3**	**10.3**
Fine Incised	3	10.3
Body	**13**	**44.8**
Incised	13	44.8

Table 4.32: Motif Types from Jones

Motif Type	Count	Percentage
A2	2	18.2
F4	1	9.1
H2	2	18.2
L1	2	18.2
M1	1	9.1
Q1	1	9.1
Q2	1	9.1
Q6	1	9.1
Total	**11**	**100.1**

Table 4.33: Motif Linearity from Jones

Linearity	Count	Percentage
Rectilinear	8	72.7
Linear	2	18.2
Curvilinear	1	9.1
Total	**11**	**100.0**

Vessel Morphology

Lip Form

Similar to both the Cambria and Price sites, the dominant lip form at Jones is flattened (n=16; 55.2%). Lips beveled to the exterior are the second largest group, and are identified on nearly one-third of the sample (n=9; 31.0%). Rounded lips are in the minority, and make up the remaining 13.8 percent of the sample. No vessels with pinched lips, or lip forms beveled towards the interior rim were recovered from the site. Comparatively, Jones has both the highest percentage of flattened lips and the lowest percentage of rounded lips within the Locality. The beveled-exterior lip form comprised nearly 30 percent of the assemblage at all three sites. Jones site lip forms are displayed in Table 5.35.

Shoulder Form

Only three rim sherds, approximately 10 percent of the sample from the Jones site, were large enough to determine shoulder form. Of these, two vessels (66.7%) exhibit rounded shoulders, while the third vessel has an angled shoulder. No pronounced shoulders were identified. Jones is the only site where rounded shoulders are more common than angled. Although the sample size is small, the higher preponderance of rounded vessel forms at Jones may be a reflection of the lack of rolled rim vessels at the site, or that the site is representative of a later time period. Angled shoulders emerged as part of the Mississippian ceramic package in the American Bottom. Hyper-angled and sharp-shouldered vessels are associated more with the earlier phases of the Cahokia chronology, while rounded shoulders increase in frequency during the Late Stirling and Moorhead phases (Holley 1989). Alternatively, Jones site potters may have been choosing to form their vessels differently than their neighbors in the Cambria Locality. Jones site shoulder form is displayed in Table 5.36.

Table 4.34: Lip Form from Jones

Lip Form	**Count**	**Percentage**
Flattened	16	55.2
Rounded	4	13.8
Beveled-ext	9	31.0
Beveled-int	0	0.0
Pinched	0	0.0
Total	**29**	**100.0**

Table 4.35: Shoulder Form from Jones

Shoulder Form	Count	Percentage
Angled	1	33.3
Pronounced	0	0.0
Rounded	2	66.7
Total	**3**	**100.00**

Handles

Handles are most frequent at the Jones site, and appear on nearly one-quarter of all analyzed rims (n=7; 24.1%). On the average, handles from the Jones site are also the longest and widest group of handles in the dataset. Of the modal types, vessels with angled necks have the most handles. Three angled-unmodified rims and two angled-modified rims have handles or handle scars. The remaining two handles are associated with curved-tapered and collared rims. Four loop and two semi-strap handles were identified from the Jones site, as well as a handle scar on one vessel rim. The handles are evenly split between being plain and decorated, at three vessels each. Handles, associated rim types, and their decorative features are displayed in Table 5.40.

Vessel J-45 technically is adorned with a loop handle, defined as when the length is more than twice the width of the handle; although visually this handle appears more like a semi-strap due its comparatively larger width. It is a grooved handle, decorated with two incised vertical lines snaking down the full length of the handle. The decorated, semi-strap handle on vessel J-55 is the only handle at the Jones site that attaches slightly below the rim of the vessel, allowing the exterior tool impressions on the rim to continually encircle the vessel without interruption. Due to the lower rim placement of the handle, the rim is not peaked where the handle is attached. This handle is grooved, decorated with three deeply incised vertical lines extending down the full length of the handle. Vessel J-60 has a small loop handle decorated with three successive horizontal bands of punctates.

Surface Finish and Polish

Surface treatment and surface finish at Jones are quite uniform. As reported in Table 5.41, the overwhelming majority of vessels are plain with a smooth surface; only one vessel bears evidence for smoothed over cordmarking. No cordmarked rim sherds were identified from the Jones site. Approximately 20 percent of all vessels are smudged, and the same amount is polished. However, only three vessels, or roughly 10 percent of the Jones site sample are both smudged and polished. This is the lowest incidence of smudging and polishing by site in the Cambria Locality. Based on rim morphology, surface treatment and rim decoration, a few rim sherds from both the Cambria and Price sites appear to be from earlier temporal-cultural periods like the Middle and Late Woodland. All rim sherds recovered from the Jones site, however, can be attributed to a Late Prehistoric time period.

Discussion

Cambria is the largest site in the sample, so perhaps it is not surprising that it also demonstrates the most diversity in modal types, rim decoration and body motif expression. Lip, rim and neck decoration from the Cambria site embody a multitude of combinations, including small numbers of decorative techniques typically associated with earlier cultural periods. The Cambria site ceramic assemblage also yields the most sherds from other contemporary or temporally overlapping regional cultures, such as Late Woodland, Great Oasis, Mill Creek, Mississippian and Oneota. The inclusion of a few Late Woodland sherds, as well as the presence of Late Woodland traits like cordmarking, dentate stamping, and twisted cord, cord-wrapped stick and knotted cord impressions, point toward relatively early habitation at the Cambria site that allowed for interaction with Late Woodland groups. Similarly, the presence of Oneota sherds, as well as possible Oneota decorative traits on some Cambria pottery in the form of punctates, border and breaker motifs, and strap handles may indicate a late presence at the Cambria site, as well. Although these sherds represent a very small minority of the Cambria site sample, their combined presence at the site may indicate that Cambria is a central place, both culturally and geographically, in the Locality.

The Price and Jones ceramic assemblages also share certain aspects of these temporal traits. A slightly higher frequency of Woodland sherds was recovered from the Price site (n=5; 4.8%). In addition, a small number of vessels are decorated with twisted or knotted cord impressions. The Price site also may have been established fairly early in the Cambria Locality, allowing for interaction with Late Woodland groups. The Jones site ceramic assemblage did not have any Woodland types, and no Late Woodland decorative techniques. Yet Jones vessels do have higher frequencies of rounded shoulders and handles, particularly wider semi-strap handles, and a punctuated handle, all of which typically are associated with Oneota ceramic traits. Occupation at the Jones site may have been initiated at a later date in the Cambria Locality. Site occupation is discussed more thoroughly, and in relation to more recent radiocarbon assays in Chapter 7.

For the most part, the same modal types identified at Cambria also occur at the Price site, and in similar frequencies. However, there are less S-rim/collared vessels at the Price site, and no straight-necked vessels. The Jones site demonstrates the least amount of diversity in modal types, and lacks fully rolled, S-rim and straight-necked modal types altogether, as well as the bowl form.

In general, angled and curved neck vessel forms at all three sites demonstrate the most variation in lip, rim and neck decoration. In particular, it is the angled-unmodified mode that exhibits the widest range of lip, rim and neck decoration at all three sites, as well. S-rim vessels, identified primarily at the Cambria site, are associated with twisted cord impressions. The majority of rolled/partially rolled rims and everted rims from all three sites are not decorated. A few rolled rim jars from the Cambria and Price sites have an incised design on the interior rim, associated with the peaked handle. Holley (2008:26) notes a similar phenomenon in the Red Wing Locality, and suggests these vessels were specifically marked by potters to indicate a special purpose. Potters within the Cambria Locality seem to have shared similar mental templates relating rim form with the presence of decoration. Functionality may have played a role here, as well, since the relatively broad, flat lips and rims, and the long necks of the angled and curved neck modal types provided a bigger and better surface area for the application and expression of these decorative techniques.

There are some notable differences in the frequency of decorative traits amongst the three sites (Table 5.42). Overall, the Jones site has the highest incidence of overall rim decoration, which includes all aspects of lip, rim and neck decoration. Conversely, it has the least diverse expression of these decorative techniques. Cambria site vessels exhibit the widest range and most combinations of lip, rim and neck decoration. The Cambria site also has the highest percentages for both lip and neck decoration. Both exterior and interior rim decoration are highest at the Jones site, where they are represented by tool impressions. The Price site has the lowest incidence of overall rim decoration, and lip, interior rim and exterior neck decoration numbers are all the lowest for Price site ceramics. Potters at the Price site do not seem to have placed as much emphasis on overall rim decorative techniques, while Jones site potters spent considerable artistic and technical effort towards lip and rim decoration, particularly in the exterior and interior rim decorative zones. The lip, rim and neck decorative zones may have been areas where potters experienced with techniques or tools, perhaps expressing themselves individually or as members of a particular lineage, or otherwise playing with their craft.

As noted previously, the majority of incised neck decoration in the Cambria Locality is of the same design pattern. It is described as intermittent crosshatching, and is comprised of a series of parallel, left-leaning diagonal lines that are intermittently crossed with three or four parallel, right-leaning diagonal lines. This pattern is usually bordered with a single horizontal parallel line at its base, and often paired with both exterior and interior vertical notches. This design is the only pattern identified on jar necks at both the Price and Jones sites. The Cambria site demonstrates considerably more diversity in incised neck decoration, but the intermittent crosshatched pattern is the most popular. A total of two examples of this neck design were associated with the diagonal barred triangle motif (H2), one each from the Cambria and Jones sites. Unfortunately, the majority of vessels with the intermittent crosshatched neck design are broken just below the neck juncture, so confidently associating this pattern with body decoration is not possible. The intermittent crosshatched neck design pattern appears to be unique to the three main sites in the Cambria Locality, as it has not been identified at any other sites in the region, or with any other regional culture complexes, particularly Great Oasis, Mill Creek/Over, or Red Wing.

Four major design programs for body incising have been identified within the Cambria Locality. The most popular design program is the horizontal incised pattern or HIP (Body Design Program 1), represented by Motif L1. Sometimes this pattern begins on the vessel neck, and continues downward onto the upper shoulders of the vessel. It is believed the horizontal lines encircle the vessel fully, and fill in the entire design field between the neck and shoulders, but a complete vessel with this pattern has not been recovered. This pattern is identified at all three sites, but is most prevalent at the Cambria and Price sites. The lines composing the HIP are typically fine incised and comparatively shallow, with an average line width of 1.9 mm, and an average depth of 0.8 mm. Nearly all vessels decorated with the HIP are lacking an interior cameo, demonstrating either the shallowness of the body incising, the relatively dry condition of the vessel when decorated, or both. Angled and curved neck modal types are typically associated with the HIP body design, particularly the angled-unmodified mode; however, there is one example of it decorating a collared vessel.

Body Design Program 2 combines the HIP (Motif L1) with singular or nested chevrons (Motifs A1, A2), or nested arcs (Motifs B2, B3), with the apex at top. At least one partially reconstructed vessel demonstrates that the design field for this decorative program was quadripartite, and comprised of four nested arc elements connected by widely spaced HIP motifs. Based on the percentage of rim available, other large rim sherds with the same design program also indicate a quadripartite design structure. The structure of this design field also incorporates the entire upper body of the vessel, filling in nearly all of the space between the neck juncture and shoulders. The combined chevron or arc and HIP motif was identified only for the Cambria and Price site ceramic assemblages. Both nested chevrons and the HIP motif are represented on broken rim sherds at the Jones sites, but were not depicted together. The average width (3.8 mm) and depth (1.1 mm) of incising for this body design program is quite a bit wider and deeper than the HIP design described previously. Furthermore, the majority of vessels have an interior cameo, indicating that the vessels were incised with these bold decorations when still wet. This body design program decorates multiple modal types, but primarily is associated with angled-unmodified vessels.

Body design program 3 is identified at all three sites in the Cambria Locality. The main element of the design is the diagonally barred triangle (Motif H2), apex oriented up, which is often accompanied by border elements (Motif Category Q). This design field is continuous, in that it wraps around the entire vessel as a series of similar, repetitive elements connected by a basal boundary line typically provided by Motif Q6. Also, much of the space between the neck and shoulders is utilized, but is not completely filled in. There are numerous blank gaps in the design field due to the alternate spacing of the triangle elements. All of the vessels decorated with the diagonally barred triangle are angled or curved neck modal types, but angled-unmodified vessels are predominately associated with this design program. Typically, these vessels are fine incised, with an average incising width of 1.5 mm, and an average depth of 0.9 mm. The majority of these vessels are not marked with an interior cameo effect.

For the most part, this design program is very cleanly and evenly incised. However, there is at least one vessel at Cambria that may represent a less practiced attempt at representing this design pattern. The diagonally barred triangle motif also has been identified at Aztalan, where it appears on a Ramey Incised jar in a continuous pattern of alternating triangles, apexes both up and down. The horizontally barred triangle is also associated with Ramey Incised pottery at the Aztalan site, where it is the most prevalent motif. In the Cambria Locality, it is identified on a rolled rim vessel from the Price site. The appearance of these design patterns and individual motif types on rolled rim jars may represent a connection between the Cambria Locality and the Aztalan site. A discussion of Ramey Incised motifs at the regional level is set forth in Chapter 6.

Curvilinear scroll motifs (Motif Categories D, E, G, P and Motifs F1, F2) represent Body Design Program 4, and the majority of these are associated with rolled or partially rolled rims. Only three vessels with scroll motifs do not have rolled rims. This combination of rolled rims and curvilinear motifs is identified only from the Cambria and Price sites ceramic assemblages. As noted previously, one partially rolled rim jar was identified from Jones, but it was broken just below the rim. No curvilinear scroll motifs were identified from the Jones site.

The primary curvilinear motif category expressed at the Cambria and Price sites is the interlocking scroll (Motif Category D). The interlocking scroll also is identified as part of a combination motif more frequently found at Mississippian sites (Motif Category P). One rolled rim vessel from the Cambria site is shell-tempered, and decorated with an interlocking scroll combination motif. The high incidence of scrolls at both Cambria and Price, and the presence of this shell-tempered vessel, may point towards the Mississippian sites in the Red Wing Area as the primary source of inspiration for this body design program. Holley (2008:12) notes that variations of the Mississippian scroll motif are very popular body decoration for shell-tempered Silvernale vessels in the Red Wing Locality.

Potters at the Cambria and Price sites also utilized a unique motif category that is primarily associated with rolled rim vessels at the two sites. This motif category is referred to as the *track* (Motif Category J), and is represented by three variations of a linear motif. The motif resembles an animal track or paw print, and is made up of a series of parallel lines, all different sizes, somewhat arranged adjacent to a central focal point. This motif category appears to be unique to the Cambria Locality. In addition, two reconstructed rolled rim vessels from the Price site were decorated with the same set of unique rectilinear motifs (F5, F6). A third jar from the Price site, represented by a large rim sherd, was also decorated with Motif F6. They were all recovered from the same pit feature (F. 14) that also included rim sherds attributable to the angled-unmodified mode. The design field on the rolled rim jars is rectilinear, but also quadripartite. The track motifs and Motifs F5 and F6 may represent local potters co-opting the Ramey-like package to express and deliver local ideologies. The presence of both Ramey Incised-like and Powell Plain-like vessels may indicate that potters at Cambria and Price were familiar with the Powell-Ramey series as a whole, and that the display of visually arresting imagery was not the only reason these vessels were produced.

Previously it was noted that the rolled rim vessels comprise a complete “package” that includes aspects of vessel morphology, surface finish, decorative technique and symbolic expression. Morphologically, these vessels are constructed to look like Ramey Incised pottery with rolled rims, inslanting vessel shoulders and angled shoulders. Similar to other examples of Ramey Incised pottery in the northern hinterlands, these vessels are often smudged and polished, but not slipped. Typically, hinterland Ramey Incised vessels have lower rates of slipping when compared to the American Bottom, either because hinterland potters were not aware of this production step in manufacturing the ware, or they simply chose not to do it. Decoration is bold, evenly drawn, and often visible as an intaglio on the interior of the vessel. This also exhibits a difference in manufacturing techniques, as Ramey Incised pottery at Cahokia is typically incised when at a leather hard stage, so interior cameo effects do not appear. In the hinterlands, however, interior cameos are frequent because the vessels are decorated when the clay is wetter. Finally, many of the motifs chosen to decorate these vessels are curvilinear, completing the package. However, similar to Ramey Incised pottery in the northern hinterlands, both rectilinear and unique motifs also decorated the inslanting shoulders of these jars.

All four major body design programs were identified at both the Cambria and Price sites, but only the HIP and diagonally barred triangle patterns were identified in the Jones site ceramic assemblage. The Jones site also has the least amount of variation in motif expression of all three sites; only one motif type or variation for each category is represented, and no curvilinear motifs were identified at all. Jones is also different in having the least diversity of modal types, decorative techniques, and combinations of lip, rim and neck decoration. Despite the lower diversity in range of expression, the Jones site ceramic assemblage has the highest frequency of exterior and interior rim decoration, particularly in the form of tool impressions. Chapter 6 will discuss these differences in relation to temporal trends and new radiocarbon assays.

Table 4.36: Motif Types by Site

	Cambria		**Price**		**Jones**	
Motif Type	**Count**	**Percentage**	**Count**	**Percentage**	**Count**	**Percentage**
A1	3	1.7	1	2.3	0	0
A2	18	10.1	4	9.3	2	18.2
A3	1	0.6	0	0	0	0
A4	1	0.6	0	0	0	0
A5	1	0.6	0	0	0	0
B1	1	0.6	0	0	0	0
B2	6	3.4	0	0	0	0
B3	2	1.1	0	0	0	0
B4	0	0	1	2.3	0	0
B5	3	1.7	0	0	0	0
B6	1	0.6	0	0	0	0
B7	1	0.6	0	0	0	0
C1	3	1.7	1	2.3	0	0
D1	2	1.1	3	7.0	0	0
D2	2	1.1	0	0	0	0
D3	1	0.6	0	0	0	0
D4	1	0.6	0	0	0	0
E1	1	0.6	0	0	0	0

	Cambria		**Price**		**Jones**	
F1	1	0.6	0	0	0	0
F2	1	0.6	0	0	0	0
F3	2	1.1	0	0	0	0
F4	1	0.6	0	0	1	9.1
F5	0	0	2	4.7	0	0
F6	0	0	3	7.0	0	0
G1	4	2.2	0	0	0	0
G2	1	0.6	0	0	0	0
H1	1	0.6	1	2.3	0	0
H2	5	2.8	2	4.7	2	18.2
I1	1	0.6	0	0	0	0
J1	1	0.6	0	0	0	0
J2	0	0	2	4.7	0	0
J3	2	1.1	0	0	0	0
K1	1	0.6	0	0	0	0
L1	70	39.3	13	30.2	2	18.2
L2	1	0.6	0	0	0	0
L3	1	0.6	0	0	0	0
L4	2	1.1	0	0	0	0
M1	1	0.6	0	0	1	9.1
M2	2	1.1	0	0	0	0
N1	5	2.8	0	0	0	0
O1	1	0.6	1	2.3	0	0
O2	0	0	1	2.3	0	0
O3	3	1.7	0	0	0	0
P1	1	0.6	0	0	0	0
P2	2	1.1	0	0	0	0
O1	2	1.1	0	0	1	9.1
Q2	5	2.8	5	11.6	1	9.1
Q3	1	0.6	0	0	11	0
Q4	3	1.7	1	2.3	0	0
Q5	2	1.1	0	0	0	0
Q6	8	4.5	3	7.0	1	9.1
Total	**178**	**100.0**	**43**	**100.0**	**11**	**100.0**

Chapter 5: Comparative Analysis

Statistical analyses compared 568 ceramic jars from the Cambria, Price and Jones sites. The results described in this chapter are separated into two sections: attribute analysis, including morphological, decorative and metric data; and compositional analysis focused on comparing vessel paste at an elemental level. All statistical tests reported in this dissertation were run using the R Statistical Analysis Program versions 2.15.0 or 3.0.2 (R Core Development Team 2009). A variety of tests were run: Chi-square (X^2), Fisher tests with Monte Carlo simulated p-values, Haberman residual analysis, analysis of variance (ANOVA) and its associated post-hoc test (Tukey HSD), Non-Symmetric Correspondence Analysis (NSCA), Principal Component Analysis (PCA), and a robust form of PCA. Only those tests with statistically significant results are reported in this chapter. A total of 95 statistical tests were executed as part of the attribute analysis. All comparative attribute analyses, including those determined not significant, are presented in Appendix B. The results of all statistical techniques utilized for the compositional analysis are presented in Appendix C.

Attribute Analysis

Chi-square tests use nominal data to compare counts of observed frequencies with expected frequencies derived from a hypothesized larger population (Drennan 1996; Hinton 1995). In this analysis, the chi-square test is used as a test of independence, where two or more frequency patterns are compared to see if they are different from one another (Hinton 1995:246). Chi-square analyses were conducted for two attributes only, surface polish and handles, because of restrictions related to sample size.

Fisher tests were frequently chosen over Chi-square tests because they are better suited for small sample sizes (Drennan 1996:197-198). As a general rule, Fisher tests were employed when the expected value of any cell count in the contingency table was calculated below 5.0. Fisher tests are exact tests, and do not require the calculation of an expected value because the significance probability is calculated directly (Drennan 1996:197-198). All Fisher tests were run with 10,000 replications, also referred to as Monte Carlo simulations, which repetitively substitute random values into the matrix in order to produce a probability distribution of the outcomes (Metropolis and Ulam 1949). This simulated probability distribution is then compared with the observed distribution in order to determine the likelihood it would occur.

The Fisher tests and Monte Carlo simulations are employed to determine if there is a significant difference between sites, but additional statistical analyses are required to determine where those significant differences are within the data. Haberman adjusted residuals are utilized in this analysis because they represent the most accurate estimation of fit for contingency tables with small cell counts (Haberman 1973, 1988). Dr. J. Patrick Gray at the University of Wisconsin-Milwaukee designed an R source code to produce the Haberman residual values. A residual value above 1.96 or below -1.96 is considered significant, and indicates overrepresentation or underrepresentation, respectively. Fisher tests with Monte Carlo simulations and Haberman residual analyses were executed for all morphological (modal types, rim, lip, neck and shoulder forms) and decorative (lip, exterior, interior and neck decoration, motif type, linearity and cameo) attributes.

Analysis of variance (ANOVA) allows for a comparison between three or more samples (Drennan 1996:171). ANOVA is used in this analysis to investigate differences between the metric data at each site. If a significant difference is identified through ANOVA testing, a post hoc test is required to specifically determine what and where those differences are located. The Tukey HSD test is a multiple comparison test that compares the random variation between pairs of means in the form of a standard error of difference between the pairs, with the specific difference between two pairs of means (Hinton 1995:131-133). Metric data, including orifice diameter, neck length, width and depth of incising, and the OD/NL values for each site are compared through ANOVA and the subsequent Tukey HSD post hoc test. ANOVA was also used in the compositional analysis to compare elemental data by site.

The Kruskal-Wallis test is a non-parametric alternative to ANOVA, which means that the test looks for differences between more than two samples and conditions at the same time, but does not make any assumptions regarding population parameters or estimates of them (Hinton 1995:226). Basically, it is used to compare more than two samples that are independent of one another, or not related. In this analysis, the Kruskal-Wallis test is run in addition to ANOVA, and compares the same data situations.

Non-Symmetrical Correspondence Analysis (NSCA) is an exploratory form of data analysis used to assess two or more sets of categorical variables organized in a contingency table (D'Ambra and Lauro 1992). NSCA assumes a dependence structure within the matrix, which allows for the variables to be evaluated as a prediction problem, where the distribution of the row, or response variable, is based on the value of the column, or predictor variable (Lombardo, et al. 2000:108). The prediction problems set up for this analysis maintain Site as the predictor variable, and the morphological and decorative attributes as the response variables. For example, it can be asked: does knowing which site a vessel comes from predict rim form? Or lip decoration? The Light and Margolin C statistic tests for significance. It was originally developed to test categorical data in a two-way contingency table, where one margin was viewed as fixed, and the other variable (Margolin and Light 1974:755). Thus, it can be assumed that the response variable does not depend on the fixed variable. NSCA was used to analyze modal type, vessel morphology (lip, rim, neck, and shoulder form), rim decoration (lip, neck, exterior and interior rim decoration), interior cameo effect, and linearity.

Three different types of plots are employed to graphically interpret NSCA results. The first is a graphical depiction of the dependence structure, or more specifically the dependence of the response variable on the predictor variable. NSCA uses a biplot graph known as a column-isometric biplot because it better depicts how columns predict rows (Lombardo, et al. 2000:111). The columns are depicted as the biplot axes, and the rows are superimposed on to these vectors, graphically depicting the distribution of the response variable on the predictor variable (Lombardo, et al. 2000:113). In this analysis, the biplot axes represent archaeology sites, and the attribute category is projected onto them.

The centered column profile plot depicts the value of each cell that is divided by its column marginal followed by the subtraction of the row marginal. The confidence circle plot displays the significance of the columns based on their grid coordinates. If a circle does *not* cross the 0,0 coordinate, it adds to the prediction of the dependent variable, and is considered significant. The size of the circles designates the proportion of the column variable in the sample. So, a smaller circle indicates a larger proportion of the variable is present in the sample.

Data Coding

The variables were set up in a number of different ways. The motif categories were expressed in terms of presence/absence. As such, the motif analysis undertaken for this study is a comparison of how often a motif type is present at the site; it is *not* a comparison of the total number of each motif type depicted in the ceramic assemblage. However, the total number of each motif type per site has been tabulated, and is located in Appendix B. Variables of vessel morphology, decorative treatment and surface treatment are treated as categorical data, while metric data is recorded as the value of the actual measurement.

Sample Size

Disparate sample sizes could affect the results of the comparative analysis, although the statistical tests utilized do attempt to control for sample size. The Cambria data represents the largest sample (n= 435), and is nearly four times as large as the Price site sample (n=104), which is the second largest. As noted previously, the Jones site is the smallest sample (n=29). The datasets submitted for statistical analyses from each site include jars only. Bowls and miniature vessels with an orifice diameter below 5 cm were not included for statistical analysis.

Results

Lip Decoration

Fisher's exact tests with Monte Carlo simulations did not produce a significant result for lip decoration. However, NSCA indicated there is a significant difference between site and lip decoration (p= 0.028). The centered column profile plot displayed in Figure 5.1 indicates that potters from the Price site tended to produce vessels with undecorated lips, but not vessels with crosshatched lips. Jones site potters primarily generated vessels with either no lip decoration or with crosshatched lips, but not vessels with incised lips. The most important distinction in lip decoration appears to be between the Price and Jones sites, as most of the decorative variables hover around zero for the Cambria site. However, Cambria site potters did not tend to produce vessels with undecorated lips. As noted previously, decorated lips are most prevalent at the Cambria site, where there is also the greatest variation in lip decorative techniques.

In the biplot (Figure 5.2), an examination of the decorative variables indicates that undecorated lips are opposed to nearly all other lip decorative techniques. The Price site is directed towards the undecorated category, while the Cambria site is opposed to both the Price site and undecorated lips, complimenting the analysis in the column centered plot. Similarly, the Jones site is not directly opposed to either Cambria or Price, but it is opposite of lip incising, and appears to be directed more towards both crosshatched and undecorated lips. Incised and crosshatched lips are opposed to one another, reflecting the higher incidence of crosshatched lips at the Jones site. Based on the biplot, the most important differences are between the Price and Jones sites regarding the prevalence of undecorated, incised and crosshatched lip decoration. However, in the confidence interval plot (Figure 5.3), all three of the site confidence circle plots cross the 0,0 coordinate, indicating that none of the sites predict lip decoration. Although there appears to be a correlation between lip decoration and site, it is very weak.

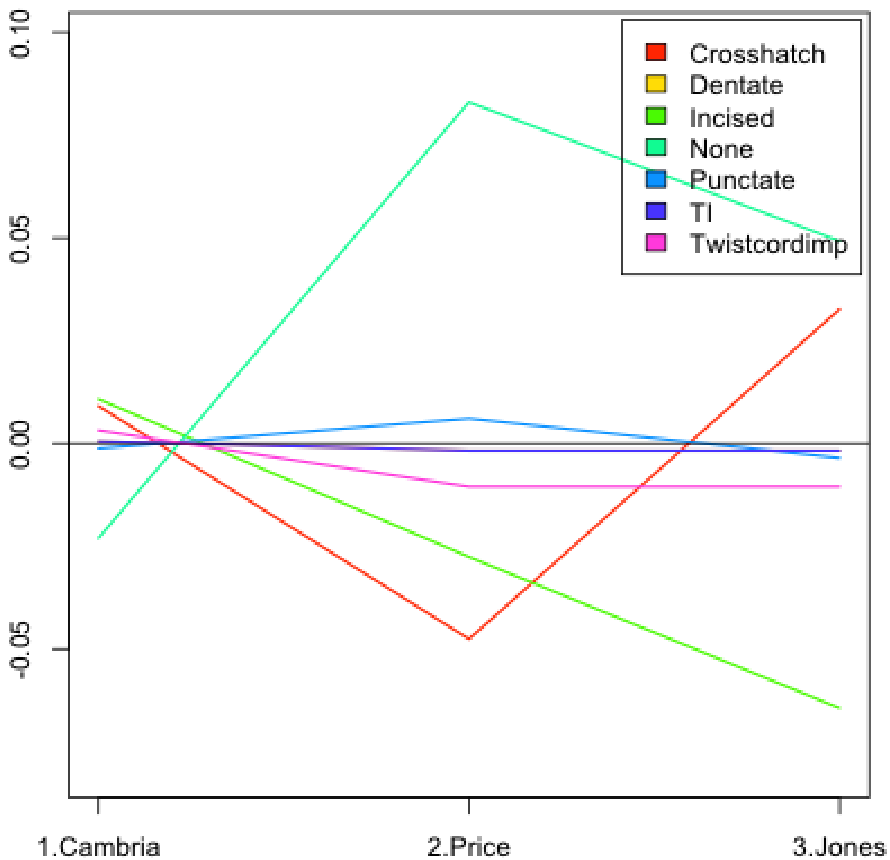

Figure 5.1: Centered column plot depicting site and lip decoration

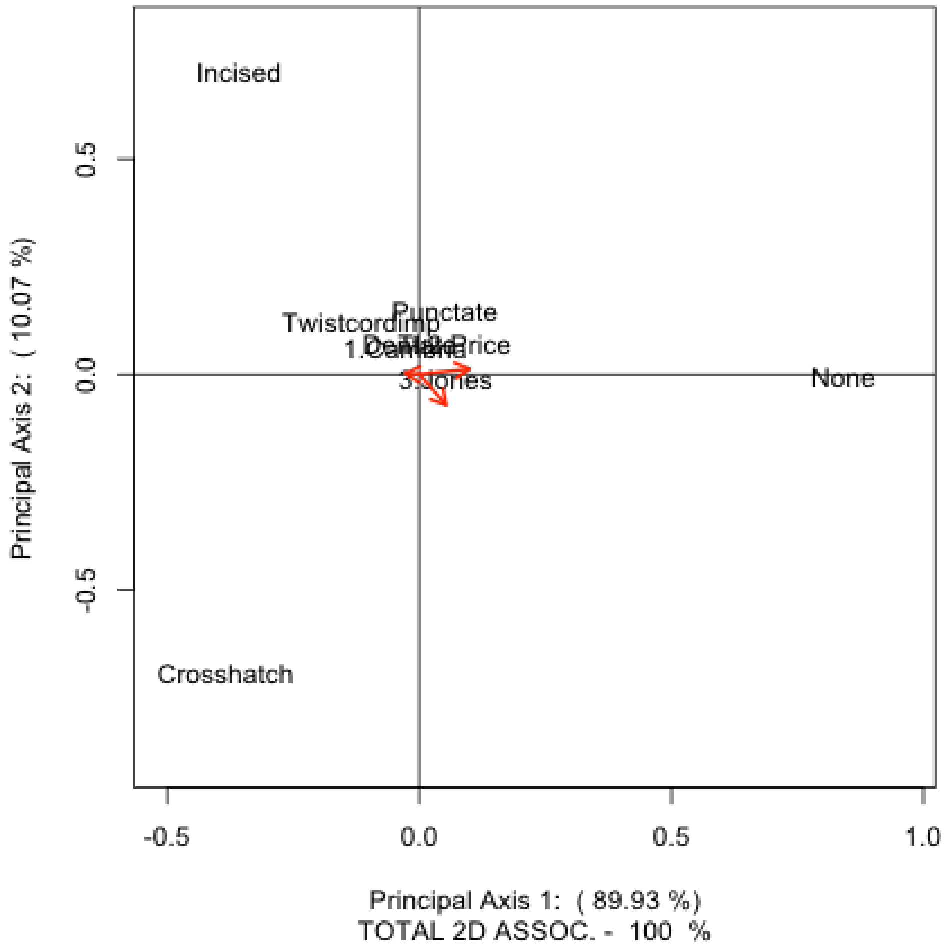

Figure 5.2: Biplot depicting site and lip decoration

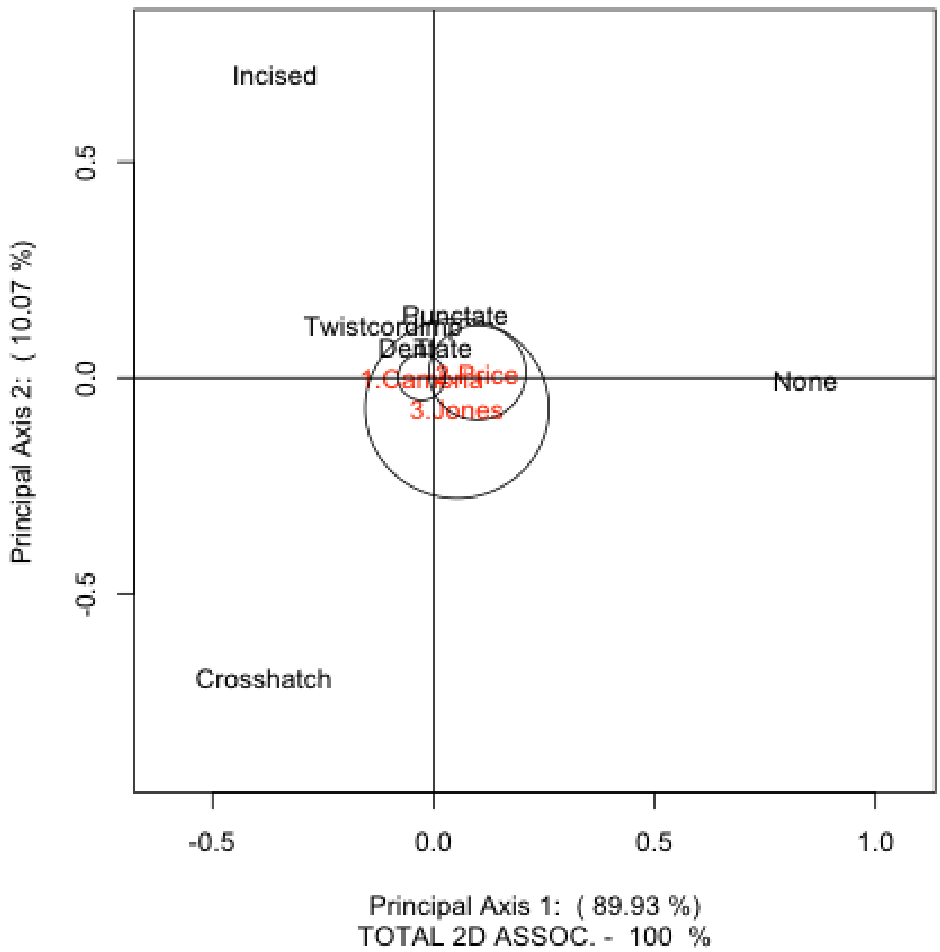

Figure 5.3: Confidence circle plot depicting site and lip decoration

Exterior Rim Decoration

Fisher's exact tests with Monte Carlo simulations demonstrate a statistically significant difference between site and exterior rim decoration (p= 0.001). According to the Haberman residuals, the Jones site is the most different (Table 5.1). Vessels with tool impressed exterior rims are overrepresented at Jones, while undecorated exterior rims are underrepresented. Crosshatched exterior rims are also overrepresented at the Jones site, but less emphasis is placed on this result due to low cell count; crosshatched exterior rims are represented by a single vessel each at both the Jones and Cambria sites. Knotted cord impressed exterior rims are overrepresented at the Price site, where low cell count is most likely an issue as this category is represented by a sole vessel recovered from Price. The Cambria site has more undecorated exterior rims and fewer tool impressed exterior rims than expected.

NSCA also demonstrates a statistically significant difference between site and exterior rim decoration ($p= 0.00$). In accordance with the column centered plot displayed in Figure 5.4, the largest difference is between the Cambria and Jones sites regarding both undecorated and tool impressed rims. The Jones site produces substantially fewer vessels with undecorated exterior rims, and more vessels with tool impressed exterior rims, especially when compared to the Cambria site. Other forms of exterior rim decoration such as incised, crosshatched, cordwrapped sick, twisted cord, and knotted cord impressed were identified in very small quantities at all three sites, but do not appear to effect the data much overall.

Based on the length and directionality of the arrows, the biplot demonstrates that the Jones site is the most important for predicting exterior rim decoration, and that the Jones site produces tool impressed exterior rims (Figure 5.5). The Jones site is opposed to both the Cambria site and vessels with undecorated exterior rims, which replicates the data from the column centered plot. The Cambria and Price sites are not important for predicting exterior rim decoration, and the five remaining types of exterior decoration located along the 0 axis on PC2 are not associated with a specific site. The Jones site is also significant on the confidence circle plot (Figure 5.6), as it is the only site circle that does not cross the 0,0 point.

Several tests indicate that there is a statistically significant difference between site and exterior rim decoration, and that this difference is primarily focused on the higher incidence of tool impressed rims at the Jones site. An overabundance of undecorated exterior rims from the Cambria site also contributes to the difference. However, neither the Price or Cambria sites are statistically significant for this variable.

Table 5.1: Haberman Residuals for Site and Exterior Rim Decoration

Site	Cord wrapped Stick Imp	Cross hatched	Incised	Knotted Cord Imp	Tool Imp	Twisted Cord Imp	None
Cambria	0.556	-0.881	0.965	-1.801	-3.261	-0.868	3.442
Price	-0.477	-0.675	-0.827	2.102	1.345	1.245	-1.500
Jones	-0.232	2.890	-0.403	-0.232	3.918	-0.521	-3.992

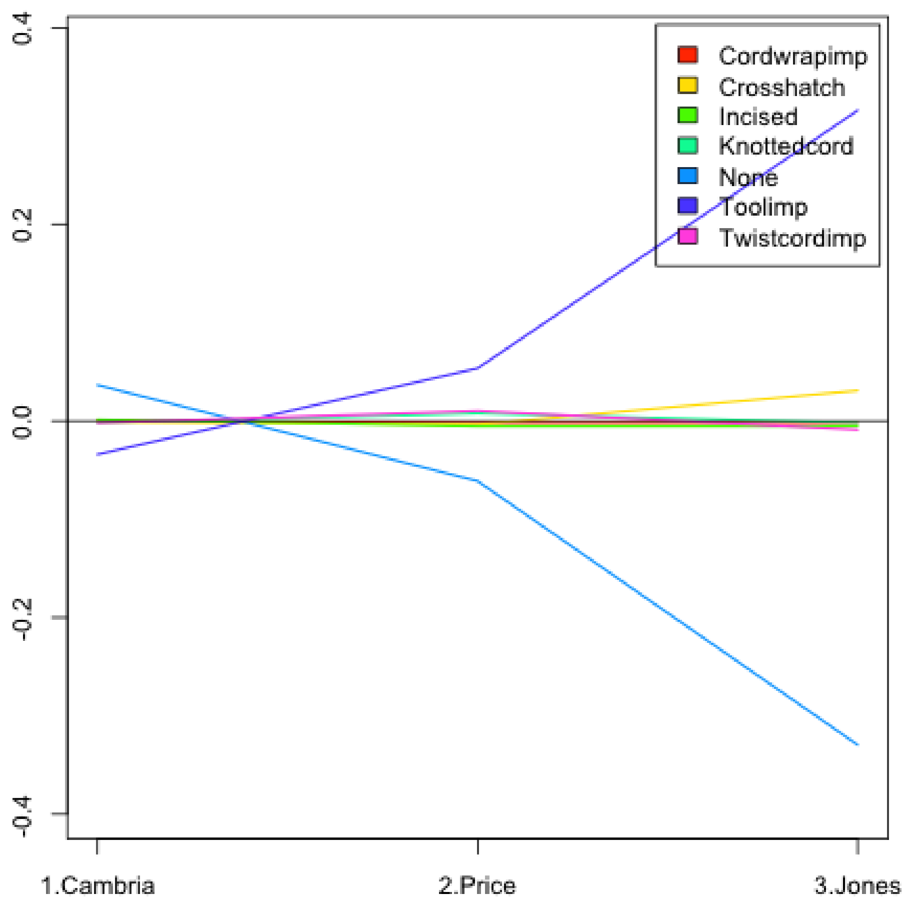

Figure 5.4: Centered column plot for site and exterior rim decoration

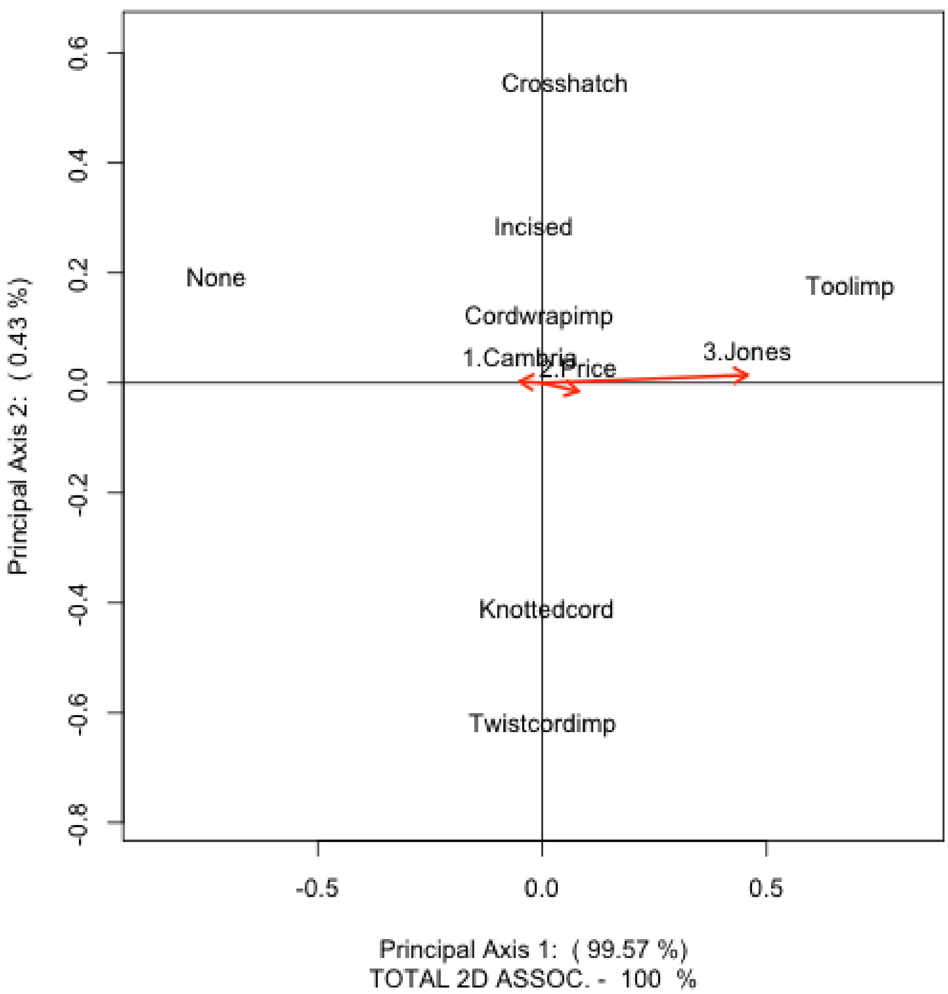

Figure 5.5: Biplot for site and exterior rim decoration

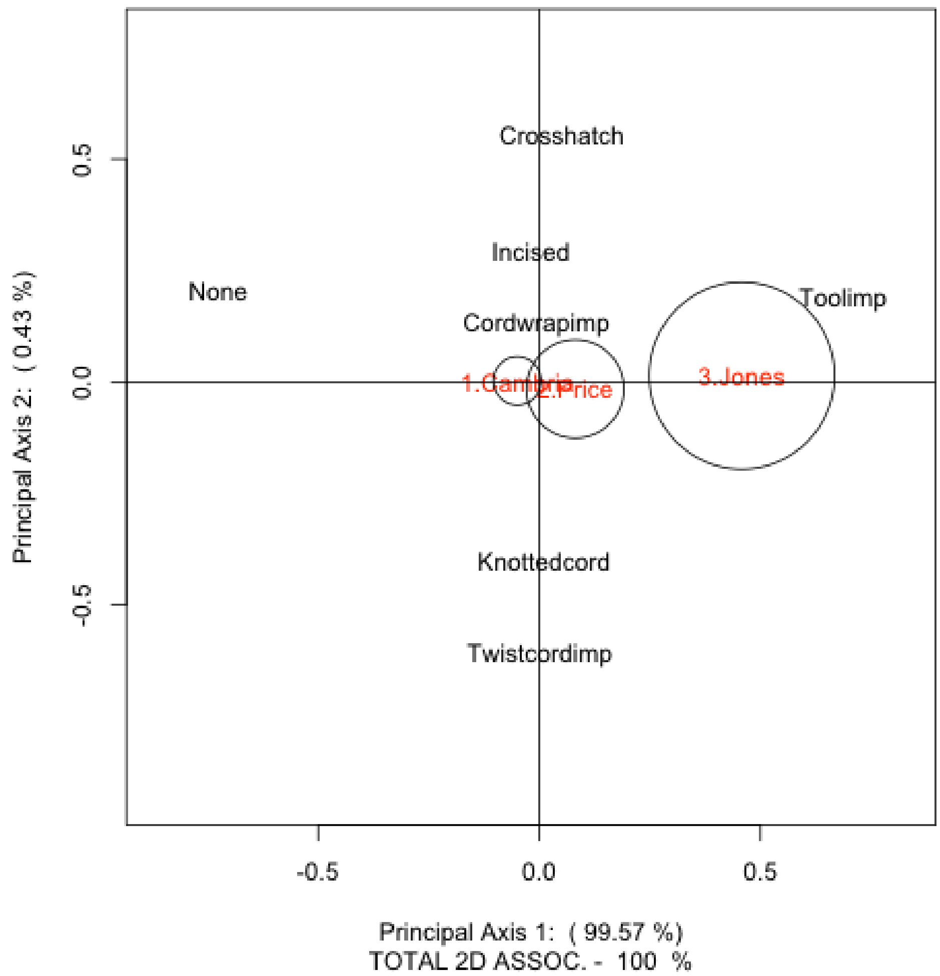

Figure 5.6: Confidence circle plot for site and exterior rim decoration

Interior Rim Decoration

Interior rim decoration is significant by site (Fisher sim. p= 0.034). Haberman residuals indicate the main difference stems from the Jones site. Both crosshatched and tool impressed interior rim deocration is overrepresented at the Jones site, while plain interior rims are underrepresented (Table 5.2). However, crosshatched decoration is identified on only one vessel from the Jones site, making low cell count an issue.

NSCA also confirms a significant difference between site and interior rim decoration (p-value= 0.001). The column centered plot depicts the largest difference between tool impressed and undecorated interior rims at the Jones site (Figure 5.7). Significantly more tool impressed interior rims were produced at Jones. The plot also demonstrates that vessels with plain interior rims were produced at the Price site. None of the sites tended to produce vessels with crosshatched, incised or twisted cord impressed interior rim decoration.

The biplot corroborates the information demonstrated in the centered column plot. The relatively longer arrow length for the Jones site when compared to the Cambria and Price sites indicates that Jones is the most important site for predicting interior rim decoration (Figure 5.8). Furthermore, the Jones site is directed towards tool impressed decoration, and opposed to the undecorated category. The Jones site is also associated with the production of vessels with crosshatched interior rims, but the low frequency of this trait in the Locality minimizes its importance (n=1).

Table 5.2: Haberman Residuals for Site and Interior Rim Decoration

Site	**Cross hatched**	**Incised**	**Tool Imp**	**Twisted Cord Imp**	**None**
Cambria	-1.810	1.242	-0.710	1.764	-0.164
Price	-0.474	-1.063	-0.641	-1.510	1.517
Jones	4.315	-0.521	2.492	-0.740	-2.349

The confidence circle plots depicts only one site, the Jones site, as being statistically significant (Figure 5.9). Based on the results of the statistical analyses previously described for site and interior rim decoration, it appears that the primary differences are from the Jones site, where potters produced vessels with significantly more tool impressed interior rim decoration. Undecorated interior rims are underrepresented at the Jones site. Price site potters also produced a higher number of vessels with plain interior rims, but not enough to be statistically significant. The Cambria site is not significant for this variable category.

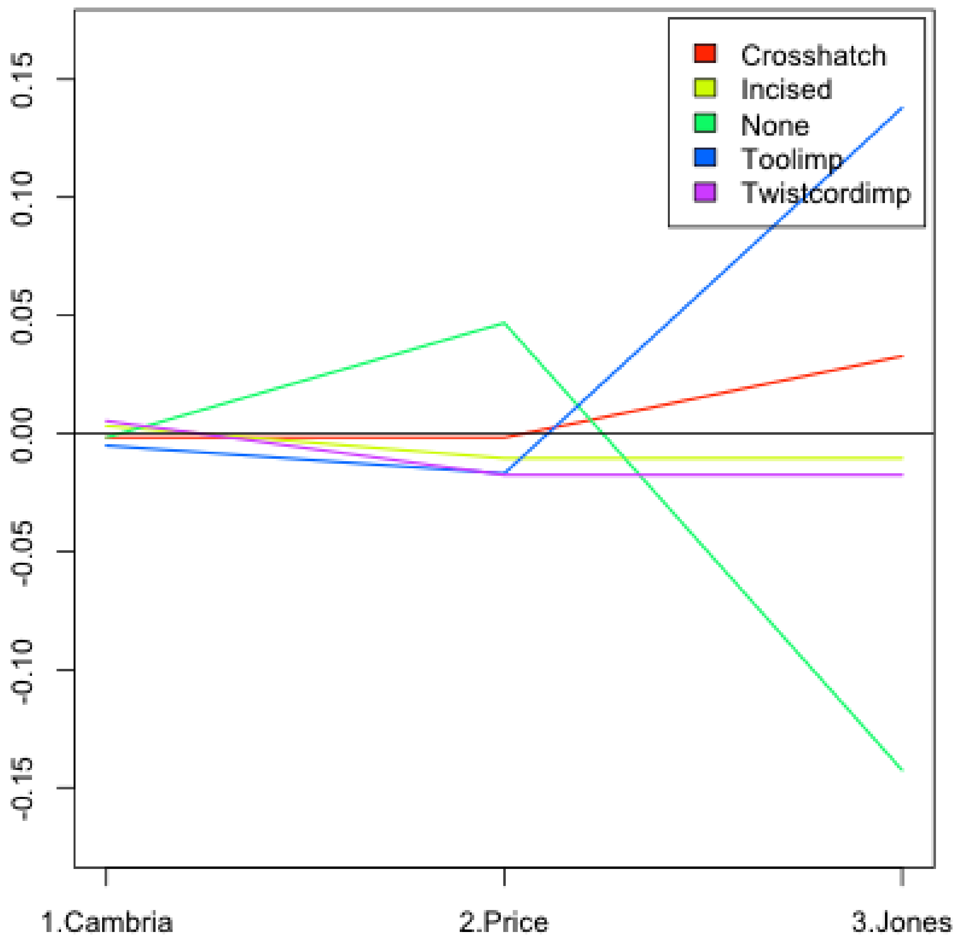

Figure 5.7: NSCA centered column plot for site and interior rim decoration

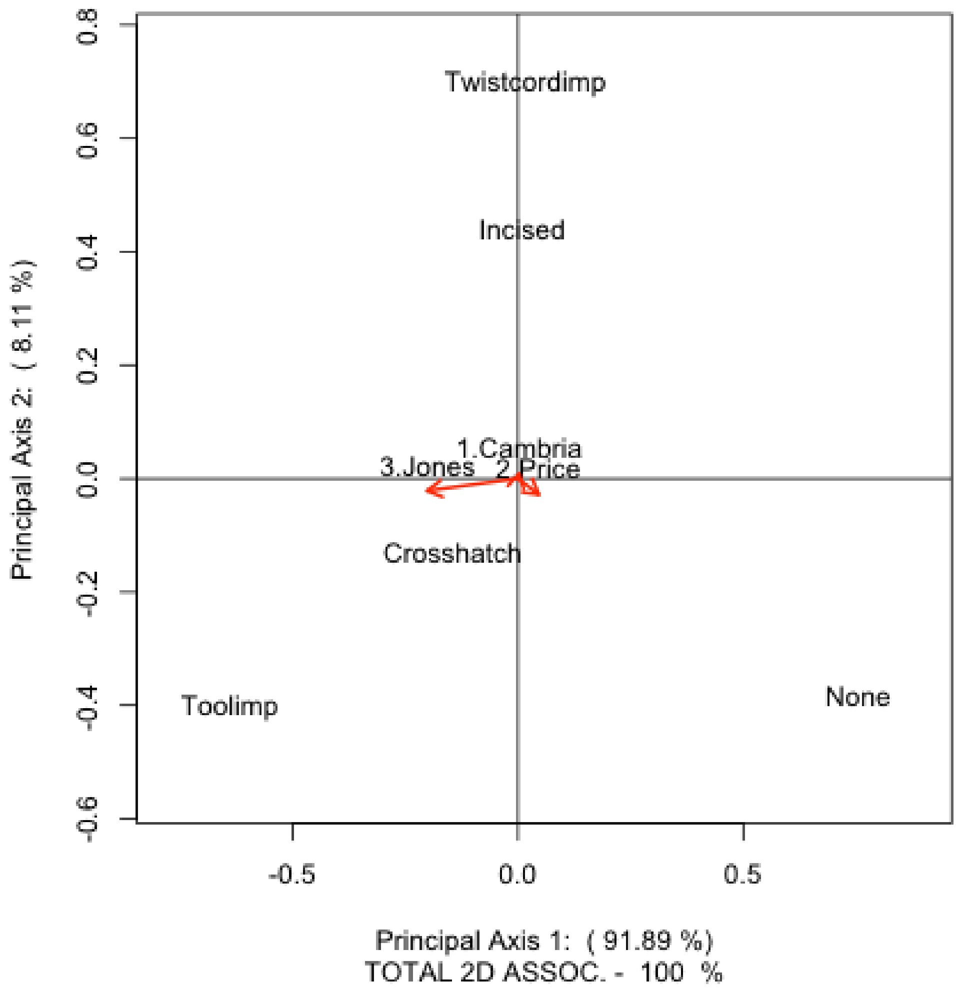

Figure 5.8: NSCA biplot for site and interior rim decoration.

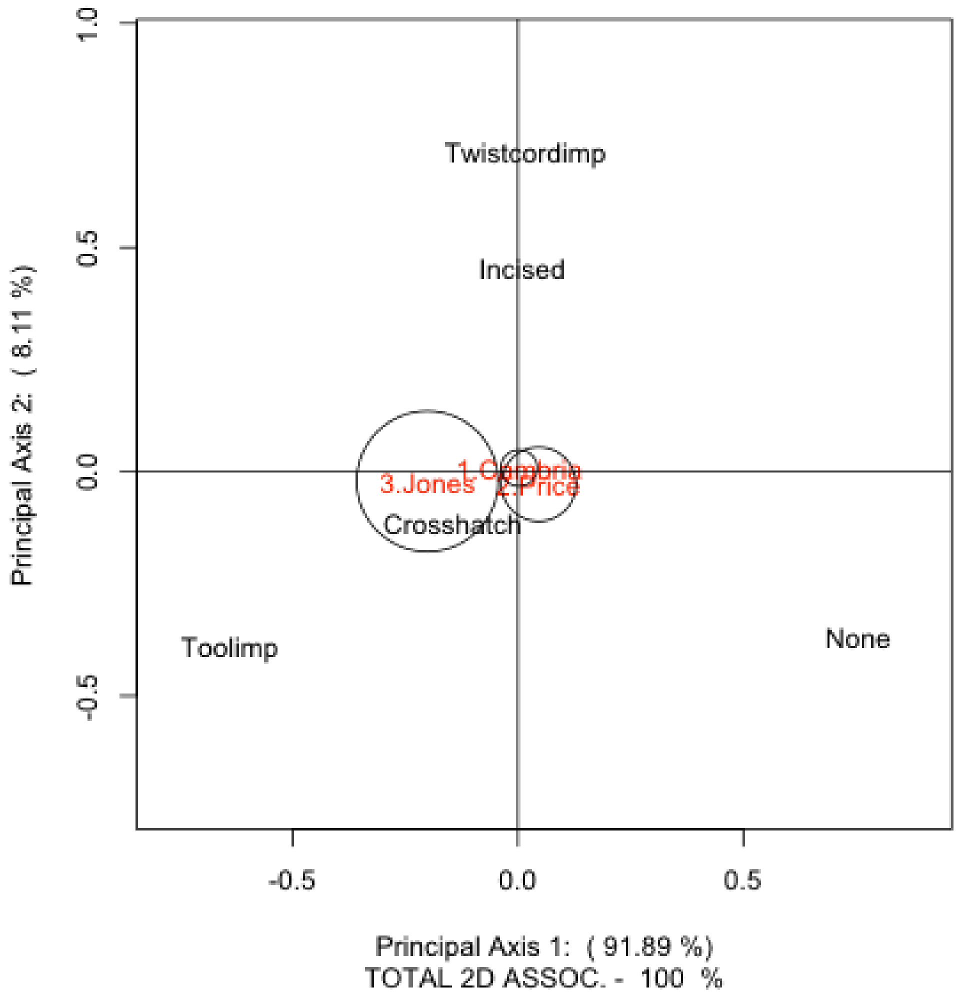

Figure 5.9: NSCA confidence circle plot for site and interior rim decoration

Rim Form

Rim form is significant by site (Fisher sim. p= 0.007). Haberman scores demonstrate that the main differences are between the Cambria and Jones sites (Table 5.3). S-rims are overrepresented at Cambria, while rolled rims are underrepresented at Jones. Tapered and collared vessels are underrepresented at Cambria, although collared vessels have a low cell count in the dataset (n=2). The Price and Jones site ceramic assemblages have one collared vessel each, but none were identified from Cambria. The Jones site has higher than expected frequencies of both collared and tapered rims. NSCA was not significant for rim form.

Table 5.3: Haberman Residuals for Site and Rim Form

Site	Collared	Everted	Everted/ Extruded	Modified	Rolled	S-rim	Tapered	Unmod
Cambria	-2.562	-1.222	0.181	1.166	0.0831	2.226	-2.329	-0.920
Price	1.161	0.706	0.098	-0.982	0.250	-1.694	1.163	0.447
Jones	2.890	1.110	-0.521	-0.519	-2.037	-1.305	2.438	0.985

Cameo Effect

Degree of cameo effect is significant by site (Fisher sim. p= 0.028). The Haberman scores show that cameo effect at the Price site has the most significant differences (Table 5.4). Vessels with a strong cameo are overrepresented at the Price site, while vessels lacking interior cameo are underrepresented. Also, vessels without a cameo are more frequent at the Cambria site.

Similar results are born out via NSCA (p= 0.004). The centered column plot reveals the largest differences are between the Price and Jones sites regarding vessels with either Strong or Absent interior cameos (Figure 5.10). Potters from the Price site tended to produce vessels with both Strong and Weak cameo effects on the vessel interior, but not vessels that lacked an interior cameo. Conversely, vessels from the Jones site frequently lacked cameos.

The biplot echoes the results of the centered column plot (Figure 5.11). It appears that both the Price and Jones sites are controlling the data for this variable, and are opposed in the biplot. The Price site is directed towards both Strong and Weak interior cameos, while Jones is primarily associated with Absent. In contrast with the Haberman scores, the Cambria site is not significant for NSCA, and has little effect on the data.

The confidence circle plot demonstrates the statistical significance of the Price site only (Figure 5.12). Potters from the Price site tended to produce vessels with both Strong and Weak cameos, but not vessels that lacked an interior cameo. When the other significant analyses are considered, the Cambria site is also significant for cameo effect, where vessels without an interior cameo are more frequent than expected. None of the statistical tests analyzing site and cameo effect indicated that the Jones site was significant.

Table 5.4: Haberman Scores for Site and Cameo Effect

Site	Strong	Weak	Absent
Cambria	-1.659	-1.401	2.301
Price	2.490	1.627	-3.111
Jones	-1.289	-0.188	1.140

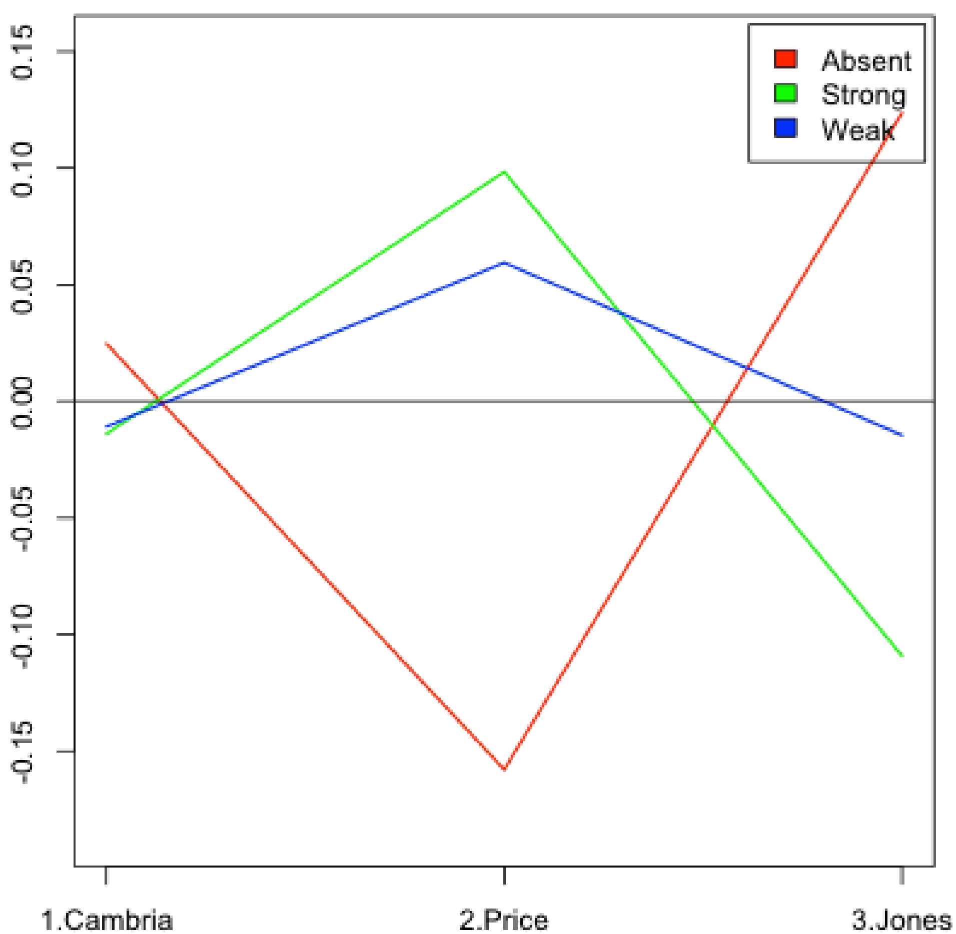

Figure 5.10: NSCA centered column plot for site and cameo effect

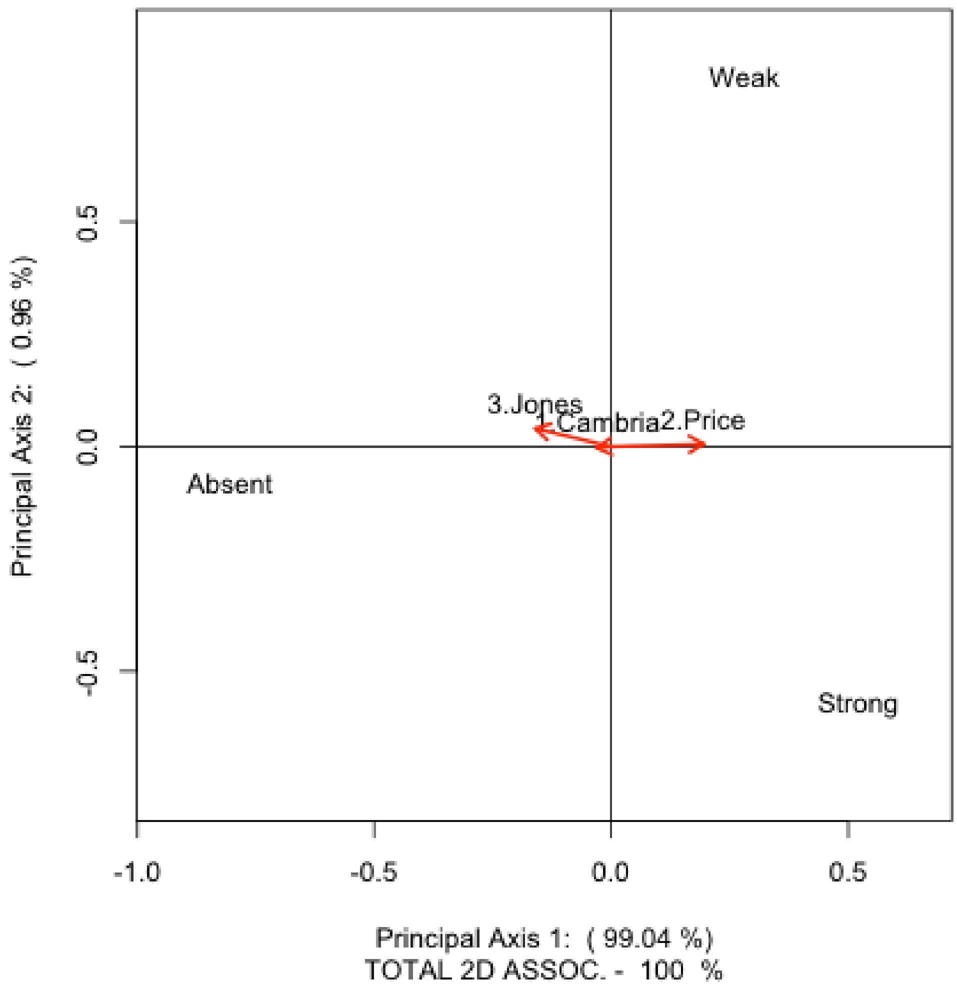

Figure 5.11: NSCA biplot for site and cameo effect

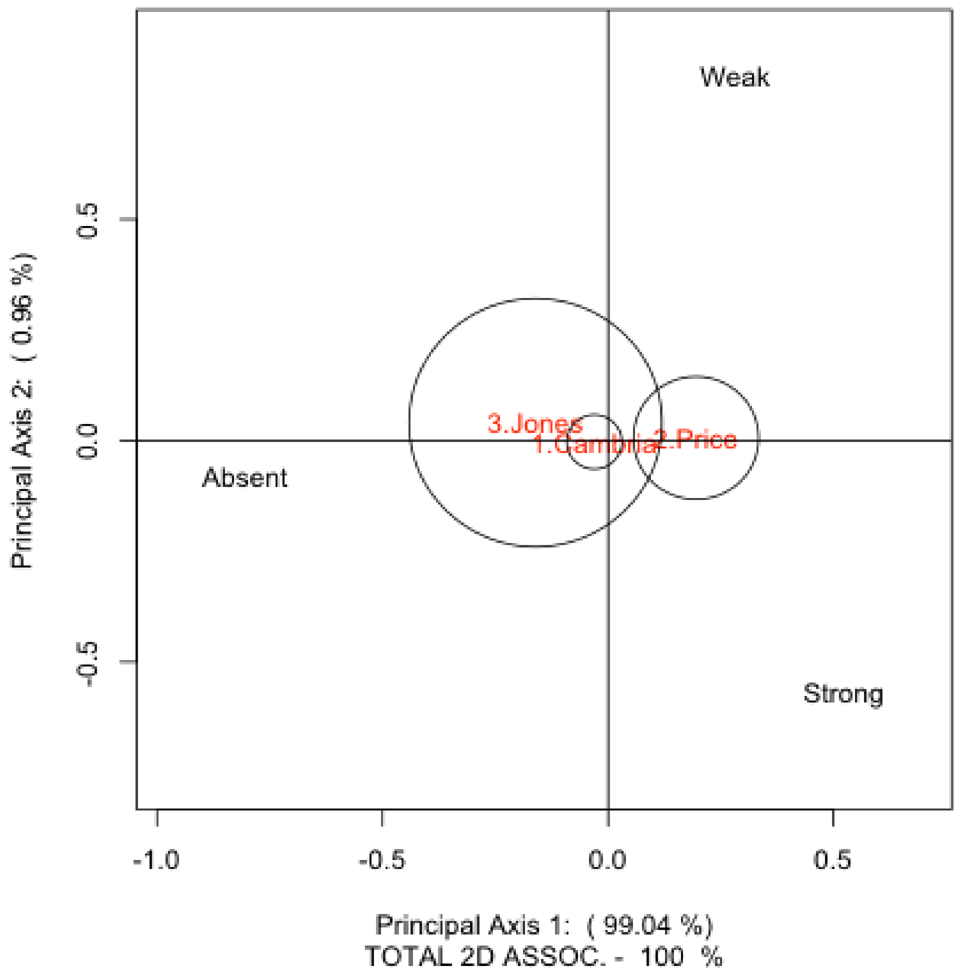

Figure 5.12: NSCA confidence circle plot for site and cameo effect

Surface Polish

Chi-square test results demonstrate a statistically significant difference between site and surface polish (p=0.006). Haberman residual scores indicate that this difference is focused on the Jones site, where unpolished vessels are overrepresented (Table 5.5). The lack of surface polish on Jones site vessels may be due to issues of differential preservation amongst the three sites. Storage pits are U-shaped at the Jones site, and the average depth is shallower; perhaps these differences created soil conditions that stripped ceramic vessels of their polish at higher rates than the other sites. Alternatively, this could be an intentional choice on the part of Jones site potters. The statistical analyses previously described for lip and rim decoration demonstrate that Jones site potters are decorating the upper portions of vessels differently. The lower frequency of polished vessels may be another example of individuals at the Jones site doing something differently by choosing not to finish vessel surfaces with a polished sheen.

Table 5.5: Haberman Scores for Site and Polish

Site	Yes	No
Cambria	0.382	-0.382
Price	1.306	-1.306
Jones	-3.029	3.029

Table 5.6: Haberman Scores for Site and Presence of Handles

Site	Yes	No
Cambria	-2.289	2.289
Price	1.000	-1.000
Jones	2.648	-2.648

Handles

Significant differences occur between the three sites of the Cambria Locality for presence of handles (p=0.013). Haberman scores indicate the Jones site has significantly more vessels with handles, while the presence of handles at the Cambria site is underrepresented (Table 5.6). Handles are primarily associated with angled necks at the Jones site, but not with a particular modal type. However, handle presence may not be a wholly representative category because many of the rim sherds are vessel fragments. It is possible that handles may have been present on rim fragments missing the area where a handle would have attached.

Metric Data

ANOVA and Kruskal-Wallis tests were run on all variables with metric data, including orifice diameter, neck length, rim width, wall thickness, incising width, incising depth and OD/NL. Only two categories were statistically significant by site, incising width and depth, and are reviewed in full. Statistical analyses for all tests performed on metric data are displayed in Appendix C.

The average width of body incising for the Cambria, Price and Jones sites is 2.9 mm, 3.3 mm, and 2.1 mm, respectively. Results of the Tukey HSD post hoc test demonstrate that the significant difference is between incising at the Price and Jones sites, which have the widest and narrowest widths, respectively (Table 5.7). However, the significant difference in depth of body incising is between the Cambria and Price sites (Table 5.8). The average incising depths for Cambria (0.9 mm), Price (1.1 mm) and Jones (1.0 mm) demonstrate a relatively restricted range. As a result, it appears that Price site vessels are decorated with body incising that is significantly wider and deeper than the other two sites in the Locality. Depth of incising may be related to cameo effect. At the Price site, a strong interior cameo effect was overrepresented.

The wide and deep body incising at the Price site could represent a temporal difference between the sites, although the cumulative series of radiocarbon assays previously discussed squarely date the Price site contemporaneously with both Cambria and Jones. Alternatively, it may be that Price site potters favored decorative or production techniques that resulted in wider and deeper incised body motifs with strong interior cameo effects.

Table 5.7: Statistical Test Results for Incising Width and Site

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	20.00	10.008	3.79	0.024
Kruskal-Wallis				
Degrees of Freedom	**Chi-Squared**		**Probability**	
2	8.336		0.015	
Tukey HSD				
Site	**Probability**			
Cambria-Jones	0.225			
Cambria-Price	0.114			
Jones-Price	0.031			

Table 5.8: Statistical Test Results for Incising Depth and Site

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	2.76	1.381	7.001	0.001
Kruskal-Wallis				
Degrees of Freedom	**Chi-Squared**		**Probability**	
2	8.992		0.011	
Tukey HSD				
Site	**Probability**			
Cambria-Jones	0.538			
Cambria-Price	0.001			
Jones-Price	0.635			

Motifs

Chi-square or Fisher's tests with Monte Carlo simulations were run for all 51 individual motif types and each of the 16 generalized motif categories. However, only two of the tests were statistically significant. A combination of low cell counts and large variances in site sample sizes may be contributing factors to the low rate of test significance. For example, nearly half of all motif types were represented by only one vessel each. Also, the Jones site motif sample is represented by only seven vessels, while the Cambria site sample was represented by 122 vessels large enough to determine motif type. Alternatively, it is possible the motif suite is remarkably uniform over the three sites, with only a few significant differences in motif expression.

Motif F6 is the only individual motif type to demonstrate a statistically significant difference between sites (Tables 5.9 and 5.10). This motif is a nested hooked line with hanging hachure marks. It is only found at the Price site, and is associated with three notably similar rolled rim vessels. The motif does not appear to be Mississippian in origin, although it is arranged in a Mississippian style, in accordance with a quadripartite design field. In the Mississippian world, this design field is typically related to Ramey Incised vessels, and hypothesized to be a reflection of the four-quartered world identified within Mississippian cosmology. Motif F6 may be a stylized, local version of the hachured scroll, a popular motif decorating Mississippian Ramey Incised pottery. Hachured scroll motifs were known in the region, as Holley (2008:12) notes their ubiquity during the Silvernale phase at neighboring Red Wing Locality.

Table 5.9: Fisher's Test with Monte Carlo Simulations for Motif F6 and Site

Site	Absent	Present	Total
Cambria	435	0	435
Price	101	3	104
Jones	29	0	29
Total	565	3	568
Fisher's sim. p	0.018		

Table 5.10: Haberman Scores for Motif F6 and Site

Site	Absent	Present
Cambria	3.141	-3.141
Price	-3.668	3.668
Jones	0.403	-0.403

Table 5.11: Fisher's Test with Monte Carlo Simulations for Motif Category H and Site

Site	Absent	Present	Total
Cambria	430	5	435
Price	101	3	104
Jones	27	2	29
Total	558	10	568
Fisher's sim. p	0.034		

Table 5.12: Haberman Scores for Motif Category H and Site

Site	Absent	Present
Cambria	2.003	-2.003
Price	-0.964	0.964
Jones	-2.159	2.159

The other statistically significant test for motifs was for Motif Category H, the barred triangle (Table 5.11). The Haberman residual scores indicate that the barred triangle category is overrepresented at Jones, and underrepresented at Cambria (Table 5.12). Apparently, Jones site potters are choosing to depict the barred triangle motifs with greater frequency than the other two sites in the Locality, and Cambria in particular. Only the diagonal barred triangle (Motif H2) appears at Jones, whereas both diagonal and horizontal barred triangles (Motif H1) were identified from the Cambria and Price sites. As noted previously, the diagonal barred triangle is associated with Body Design Program 3, indicating a comparatively high frequency of that design program at the Jones site, as well.

Discussion

The majority of statistically significant test results demonstrate that Jones site pottery is the most different. In eight separate morphological, decorative and metric categories Jones site ceramics demonstrate significant differences. In two categories, interior rim decoration and surface polish, the Jones site differs from Cambria and Price. The Jones site differs significantly from Cambria in four categories: exterior rim decoration, rim form, presence of handles, and expression of Motif Category H. The Jones site differs significantly from the Price site in two metric categories, the width and depth of body incising. The Cambria and Price sites are significantly different from one another in only one category, interior cameo. Also, the Price site differs significantly from Cambria and Jones for Motif F6, which is only found at the Price site. Finally, lip decoration amongst the three sites is significantly different, but weakly correlated. The lack of significant differences between the Cambria and Price sites suggests their ceramic assemblages are quite similar to one another.

The significantly different variables identified for the Jones site highlight some of the notable aspects of the site’s ceramic assemblage. Rolled rim vessels are underrepresented at Jones, while the presence of handles is more frequent than expected. Exterior and interior tool impressed rim decoration is overrepresented at the site. Jones site vessels demonstrate significantly less surface polish than Cambria and Price pottery. There is a significant difference in body incising width and depth between the Jones and Price sites, where Price site body incising is the widest and deepest in the Cambria Locality, and Jones site incising is the most narrow and shallow. Finally, the diagonal barred triangle motif is overrepresented at Jones.

When considered together, many of these traits are indicative of ceramic vogues consistent with later Oneota pottery. For example, Blue Earth pottery post-dates the rolled rim horizon, and instead is characterized by tall, outsloping rims that are frequently decorated on the both the interior and exterior. Furthermore, handles are often present. Vessel surfaces were polished occasionally, and body design is dominated by rectilinear motifs embellished with tool impressions, vertical fringe or punctates (Anfinson 1979:39-40). The diagonal barred triangle is associated with these types of border elements at the Jones site.

The overrepresentation of the barred triangle category is worth noting, particularly since the Jones site has very few identifiable motifs. This significant difference in motif category expression could be due to sampling error, but it is suggested that comparatively, Jones site potters were decorating more of their vessels with barred triangle motifs. This assertion is explored further in the following chapter.

The most significant differences occur in the decorative categories, demonstrating the most variation occurs in the decoration zones of the lip and rim. Conversely, body decoration is quite uniform. Of all 17 motif categories and 51 motif types, only one of each is significantly different by site. Overall, motif expression and design structure is encompassed by the four body design programs described previously. The lip and rim decorative zones may represent areas that potters in the Cambria Locality utilized for personal or familial identification, or experimentation with tools and technique. The significant differences at the Price site are primarily related to decorative technique, specifically incising. Price site potters utilize the widest and deepest incised lines in the Cambria Locality, and as a result, many of these vessels have an interior cameo.

PXRF Statistical Analysis

Portable XRF (PXRF) technology and analytical techniques have become increasingly popular in the field of archaeology—due in part to non-destructive sampling methods, the convenience of using it in the field, and ability to create large datasets—where it has been applied to a wide variety of research questions focused on mineral and materials sourcing, trade and exchange patterns, and identification of ceramic wares as compositional groups (Shugar and Mass 2012). For a more comprehensive overview of the physical and chemical principles and methods that structure how this technique works see Shackley (2011).

PXRF is a bulk sampling method capable of identifying the elemental composition of heterogeneous matrices (Forster, et al. 2010:389). As such, it reports the chemical composition of everything within a localized x-ray beam, including both internal and exterior portions of the small area sampled. It is unable to separate paste from temper, or eliminate modern additions to sherd surfaces like ink or glue. The final readings represent a mixed report of all elements that compose the raw clay matrix, natural inclusions, temper, and any other modifications. Accordingly, PXRF largely distinguishes between different compositional groups- discussed in this analysis as ceramic paste recipes- rather that isolating raw clay sources (Speakman, et al. 2011). Based on the "criterion of abundance" which states that "a ceramic unit strongly represented at a site is presumed to be of local manufacture", compositional groups in this analysis are interpreted as local and site-specific (Bishop, et al. 1982:301).

The primary statistical technique used to analyze the PXRF data is an exploratory data-analytic technique known as Principal Component Analysis (PCA). This type of multivariate analysis transforms possibly correlated variables into linearly uncorrelated variables known as principal components, or PCs, the properties of which can be explored graphically in a biplot (Baxter 2003:73). In this sense, PCA is useful for constructing a visual representation of how the data is structured. The first principal component explains the largest amount of variance in the data, while the following PCs explain successively less of the overall variation in the data. A high percentage of variation explained on the first component indicates a data set with a strong structure. In this analysis, the first and second principal components together explain 62.8 percent of variance, which is enough to identify the general trends within the data set.

A total of 191 rim sherds were compared at the elemental level through PXRF analysis: 18 vessels were sampled from the Jones site, 76 vessels from Price, and 97 vessels from the Cambria site. Rim sherds were chosen for analysis based on several criteria: paste color, temper, vessel morphology, rim form, and decorative attributes. In addition, an attempt was made to represent all types of pottery defined by Wilford (Types A, B, and C), and Knudson (Linden Everted, Judson Composite, Mankato Incised, Ramey Broad Trailed, and Powell Plain). The majority of the rim sherds were grit-tempered, but three shell-tempered sherds were included also. Care was taken to avoid any materials that could skew the reading such as large chunks of temper visible on the sherd surface, or modern inclusions such as ink, glue, or metal.

Elemental data was collected using a Bruker Trace III-V+ portable X-ray fluorescence analyzer mounted in a test stand. The procedures and settings utilized are consistent with protocols established by the Archaeological Research Laboratory of the University of Wisconsin-Milwaukee. The analyzer was operated at 50 Kv and 50uA using a filter consisting of 12 mil AL+6 mil Ti+6 mil Cu without vacuum. This configuration is considered optimal for targeting elements 17 keV to 40 keV and thus excites elements from Fe to Mo (Kaiser and Wright 2008). Two readings were taken for each rim sherd, one on the exterior and the other on the interior surface of the sherd, for a time interval of 180 seconds, or three minutes. Bruker's S1PXRF software was used in conjunction with the Tracer portable analyzer to collect elemental readings, which are returned as a spectrograph. Based on the peaks in those readings, 12 elements were chosen for more detailed analysis: arsenic (As), copper (Cu), iron (Fe), manganese (Mn), nickel (Ni), niobium (Nb), rubidium (Rb), strontium (Sr), titanium (Ti), yttrium (Y), zirconium (Zr), and zinc (Zn). The elemental data was downloaded from the Bruker analyzer through software developed by Artax® (version 7.4), which displays the net intensity readings for each element. Net intensity readings were utilized in this analysis because they are more precise than calibrated values (Lee Drake, personal communication). The elemental net intensity readings for each sample are presented in Appendix C.

J. Patrick Gray and Elissa Hulit from the University of Wisconsin-Milwaukee developed the multivariate statistical protocols used to process and analyze the PXRF data. The techniques utilized and command calls for R are fully described in Hulit (2012), and primarily cover PCA, Data Partitioning, Outlier Detection and ANOVA.

The elemental data must be cleaned and prepared before it can be subjected to PCA. The first step in pre-processing the data is to find negative or missing case values in the net intensity data set. These readings are assumed to be below the detection level, not missing entirely from the data set (Martín-Fernández, et al. 2003). Out of 387 readings, there were a total of 18 cases that had either missing or negative case values, which is equivalent to 0.4 percent of all readings in the data set. All 18 missing cases were associated with the element Yttrium, and represent less than 5 percent of all Yttrium readings. Six missing readings were from the Cambria site, and the remaining 12 cases were from Price. No missing or negative case values were recorded for the Jones site.

The second step creates two new data sub-sets: one for all cases with no missing values, and the other for imputed data. Missing data is a problem for many statistical techniques, and is often dealt with through listwise deletion, a technique that removes the missing cases from the data set entirely. However, the wholesale deletion of missing cases can affect sample size and reduce statistical power (Allison 2003:547), as well as possibly introduce other forms of bias into the results. The process of imputation replaces missing or negative readings with a substituted, yet suitably small value, which creates a complete dataset free from missing values. Multivariate statistical analysis can then be performed from the complete imputed dataset (Martín-Fernández, et al. 2003:256-257). In this analysis, the detection level for imputation is set at 65 percent of the lowest observed compositional value for each element.

The two data sub-sets (all cases without missing values and imputed data) are then statistically manipulated and compared in order to determine which elements, if any, should be removed before the application of multivariate techniques. The geometric means for both data sub-sets demonstrate that Fe is the dominant element in the pottery of the Cambria Locality. However, the centered log-ratio (clr) variances indicate that different elements explain the majority of the variance for each data sub-set. For all cases without missing zeros, Mn was clearly the most important element explaining matrix variation. Ni and Cu are the second and third most important elements explaining the variation in the data. Mn is also the most important element for the imputed data sub-set. However, Y is the second most important element in the matrix, while Ni is the third most significant for explaining variance in the imputed data. The clr values for both all cases without missing values and imputed data are displayed in Appendix C.

The covariance plots for both data sub-sets are differentiated by rotated axes, but are otherwise identical. Both plots are displayed in Appendix C, but are represented in this chapter as a single figure (Figure 5.13). In the covariance plot, Mn is opposed to nearly all other elements on PC 1, but primarily to Y, Nb and Zr. The opposition on PC 2 is mostly between Ni and Cu on the positive axis, and Fe and Ti on the negative axis. In keeping with the clr variance scores, the length and directionality of the arrows in the covariance plot indicate that Mn, Ni, Cu and Y are all important elements for explaining the variation in the data set.

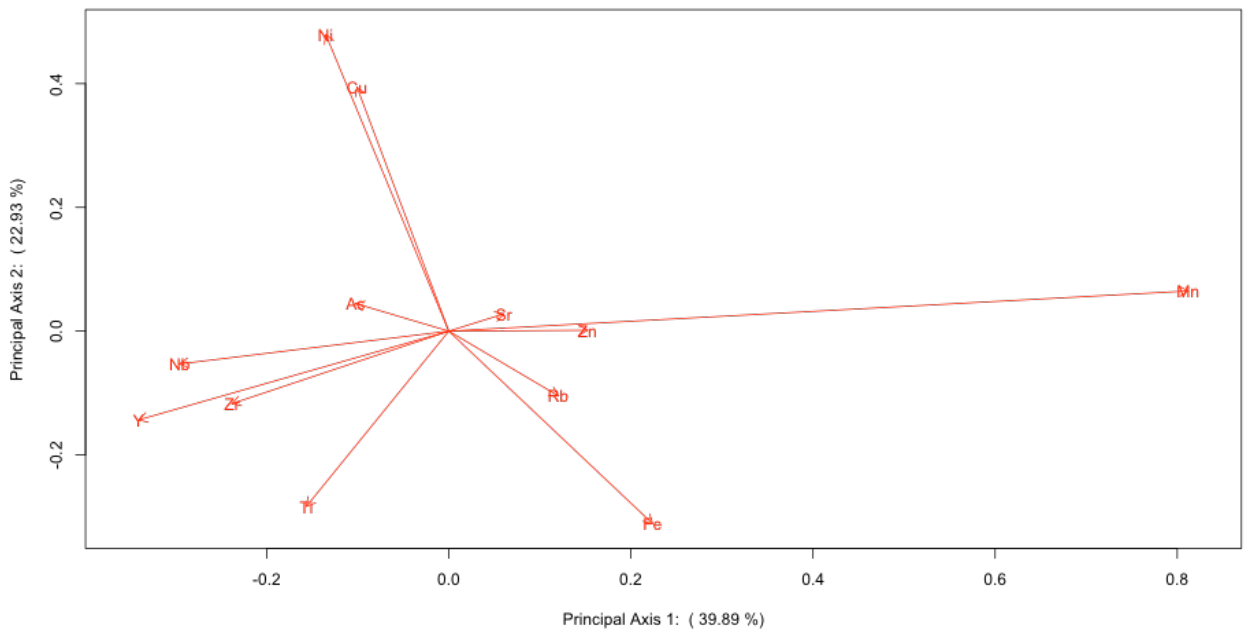

Figure 5.13: Covariance plot emphasizing elements and representing both all cases without missing values and imputed data sub-sets

The final step in pre-processing the compositional data is to determine which elements are not important in the dataset, and can be removed. The variable selection function utilizes a U-cutoff value of ± 1.64, indicating that As should be removed from both data sub-sets. As a result, 11 of the original 12 elements are retained. The complete results of the variable selection function are listed in Appendix C.

The elemental data was subjected to a second round of pre-processing analysis once As was removed from the dataset. For the most part, the results of the reduced data sub-sets mirror the original results. For example, Fe maintains its position as the most dominant element in both reduced data sub-sets, and Mn, Ni and Cu are the three most important elements for explaining the variation in the reduced all cases data sub-set. Similarly, the top three elements for explaining variance in the reduced imputed data sub-set are Mn, Y and Ni, but Y has increased in importance. The covariance plot of the reduced imputed dataset now demonstrates the primary opposition of elements on PC1 as between Mn and Y (Figure 5.14). The elemental opposition for PC2 remains mostly the same, where Ni and Cu are primarily opposed to Fe and Ti. The variable selection results for the reduced all-cases data sub-set does not indicate any more elements should be dropped. However, the results for the reduced imputed data sub-set suggest that two more elements should be dropped, Sr and Zr, leaving nine of the original 12 elements for further analysis.

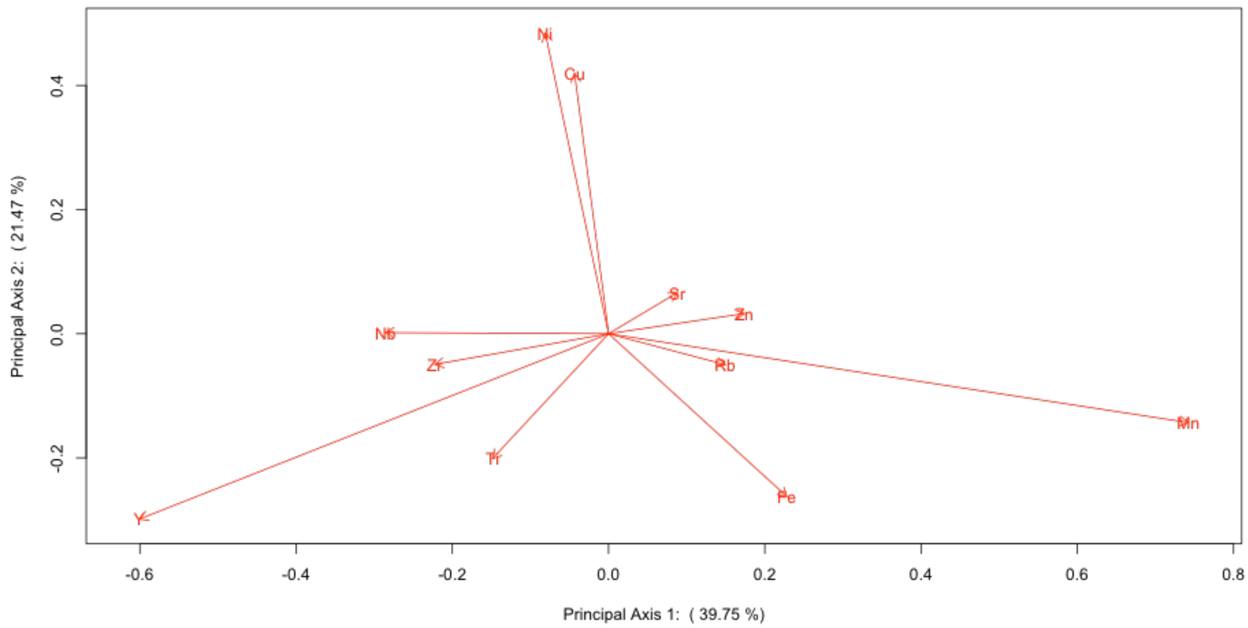

Figure 5.14: Covariance plot emphasizing elements and representing reduced imputed data sub-set

Principle component analysis was performed on both the complete imputed dataset representing all 12 original elements, and the reduced imputed dataset comprised of nine elements. As noted previously, As, Sr and Zr were dropped from the complete imputed dataset, leaving Cu, Fe, Mn, Nb, Ni, Rb, Ti, Y and Zn as the nine elements represented in the reduced imputed data. The raw net intensity data was not used for PCA, but rather converted into a composition, or closed array, through Isometric Log Ratio (ILR) transformation (Hulit 2012:47). In addition to the different datasets, PCA was also performed on two different versions of the compositional data. PCA was first run on all cases, meaning all readings for each vessel were included for analysis. Generally, this consisted of two readings per vessel, one each for the interior and exterior vessel surface. PCA was run a second time on the mean compositions for each vessel, where the net intensities for each sample were averaged together before being converted into a composition. As a result, the mean compositional data consists of only one averaged reading per vessel. The biplots, scores and loadings for all four PCA tests are located in Appendix C.

The PCA results of the two imputed datasets were similar overall, but an increased role for Y was detected for the reduced dataset. This outcome confirms the findings originally identified during pre-processing, where Y was identified as the second most important element for explaining variance in the reduced imputed data. Of the four PCA tests completed, the imputed reduced dataset consisting of mean compositions is described fully in the following paragraphs because it had the highest percentage of total variance explained. However, the first and second dimensions explain only 50 percent of the variance, which indicates a weak structure in the data. Table 5.13 lists the percentage of variance explained for each PCA test.

The biplot depicted in Figure 5.15 simultaneously displays the mean composition of each rim sherd plotted as a single case, along with the loading scores for each element, which are depicted as rays representing the strength and directionality of the element within the dataset. Three pairs of elements are strongly correlated with one another: Fe and Rb, Mn and Zn, and Ni and Cu. However, the main source of variation in the dataset is the opposition between Mn, which loads negatively, and Y, located on the positive axes. Niobium is also an important element in controlling the data on the first component. The second most significant source of variation is identified on PC 2, and is between Ni and Ti, although Cu and Y are important elements, as well. Interestingly, Y appears to play a role in controlling the data on both dimensions, although Mn and Ni are the strongest elements for explaining variance overall. This data is further supported by the elemental loadings for the first two principal components (Table 5.14).

Table 5.13: Percentage of variance explained for the mean composition of PXRF reduced imputed data principal components

PCA Imputed Dataset	% of Total Variance Explained on PCs 1 and 2
Complete with all cases	39.1
Complete with mean compositions	41.9
Reduced with all cases	47.8
Reduced with mean compositions	50.0

Table 5.14: Loadings for imputed reduced dataset consisting of mean compositions

Element	PC 1	PC 2
Cu	0.182	-0.389
Fe	-0.323	0.257
Mn	-0.532	-0.227
Nb	0.375	0.087
Ni	0.246	-0.605
Rb	-0.313	0.231
Ti	0.174	0.473
Y	0.436	0.267
Zn	-0.246	-0.095

When the cases are examined in the biplot, the vessels are sorted into two main groups. The vast majority of vessels from the Cambria site are grouped on the diagonal in the bottom half of the biplot. The vessels from the Price and Jones sites are intermingled as a large diagonal grouping on the top portion of the biplot (Figure 5.15). When the mean compositions of the cases are considered in accordance with the elemental data, Cambria vessels are characterized by a relative abundance of Mn, Cu and Ni. In fact, of the four main elements controlling the data (Mn, Ni, Ti, Y), Cambria site vessels have comparatively less of only one element, titanium (Ti). The main opposition between Mn and Y on PC 1 is most likely due to the lower amount of Mn detected in vessels from both the Price and Jones sites, and the low amount of Y discovered in Price site vessels only.

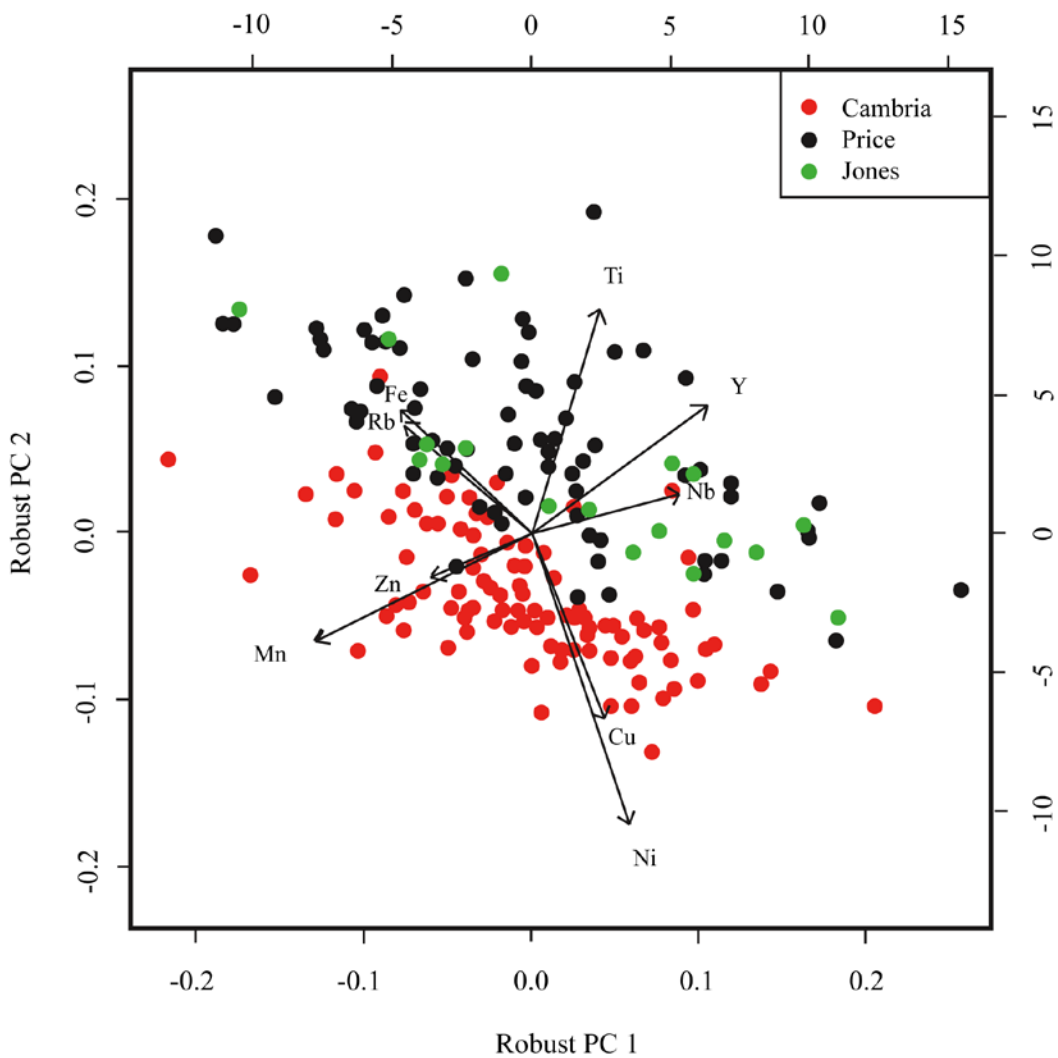

Figure 5.15: Biplot of vessels based on mean compositions and elements for reduced imputed dataset

The ANOVA results comparing site and the principal component scores for both PC1 and PC2 indicate that there are significant differences in elemental composition between the three sites (Tables 5.15 and 5.16). For PC1, a Tukey post hoc test demonstrates that the Jones site differs significantly from both the Cambria and Price sites (Table 5.17). As noted previously, the first dimension is primarily characterized by an opposition between Mn and Y. The mean composition data indicates that vessels from the Jones site have lowers values of Mn, especially when compared to Cambria site vessels. The importance of Y in the dataset is less clear, as the main difference in abundance of Y appears to be between Cambria and Price, with Jones site vessels located somewhere in between (Figure 5.17). The difference between the Cambria and Price sites for PC 1 was not statistically significant.

The results of the Tukey post hoc test for PC 2 determined that all three sites are significantly different from one another (Table 5.18). The main opposition on PC 2 is between Ni and Ti. Based on the biplot, a significant difference between Cambria and the Price and Jones sites is expected, at least for Ni. Interestingly, vessels from the Jones site have the most Ti, while Cambria and Price site vessels have lower amounts of Ti that are similar to one another (Table 5.19). In sum, the Tukey post hoc tests establish that the Jones and Price sites are significantly different from one another on both components, as do the Jones and Cambria sites. However, Cambria is only significantly different from the Price site on PC 2.

Table 5.15: ANOVA Comparing Site and PC 1

	Degrees of Freedom (df)	**Sum Sq**	**Mean Sq**	**F**	**Probability**
Between Groups	2	33	16.508	6.708	0.001
Within Groups	384	945	2.461		

Table 5.16: Tukey HSD Comparing Site for PC 1

Site Comparison	**Probability**
Price-Cambria	0.408
Jones-Cambria	0.001
Jones-Price	0.015

Table 5.17: ANOVA Comparing Site and PC 2

	Degrees of Freedom (df)	Sum Sq	Mean Sq	F	Probability
Between Groups	2	249.5	124.77	83.61	0.000
Within Groups	384	573.0	1.49		

Table 5.18: Tukey HSD Comparing Site for PC 2

Site Comparison	Probability
Price-Cambria	0.000
Jones-Cambria	0.000
Jones-Price	0.005

Table 5.19: Geometric Means of Elements for Cambria Locality Sites

Site	Cu	Fe	Mn	Nb	Ni	Rb	Ti	Y	Zn
Cambria	0.0091	0.7593	0.0076	0.0245	0.0517	0.0662	0.0326	0.0235	0.0255
Price	0.0028	0.8561	0.0052	0.0130	0.0124	0.0515	0.0307	0.0122	0.0162
Jones	0.0035	0.8251	0.0049	0.0198	0.0132	0.0505	0.0444	0.0218	0.0167

A comparison of covariance plots of elements for each site further supports the notion that paste composition at the Jones site is significantly different from the Cambria and Price sites (Figures 5.16–5.18). The Cambria and Price site covariance plots are remarkably similar, although the axes have been rotated in the Price site plot. In these two plots, the primary opposition is on PC 1 between Mn and Y. In addition, Mn and Y are opposed to nearly every other element on PC 2. At the Jones site, the primary opposition on the first component is between Mn and the eight other elements. Mn is one of the most important elements on PC1 for explaining variance at all three sites, but its opposition to Y is lessened in the Jones site data. Furthermore, Zn appears to have a more important role in explaining variance at the Jones site.

A comparison of the geometric means of elements for each site indicates that Jones site paste composition is characterized by less Mn, especially when compared to Cambria vessels. Jones site vessels also have less Mn than Price site pottery, although the difference in abundance is quite a bit smaller. The increased importance of Zn at the Jones site is not reflected in the geometric means data. Cambria pastes have more Zn when compared to Price and Jones and vessels, which both have lower levels of Zn. Interestingly, Jones site pastes do not appear to have the lowest amount of Zn, overall; Price site vessels do. Perhaps the increased importance in Zn at the Jones site is more related to its opposition with Y on the second dimension.

Aitchison's test for the equality of sites suggests that all of the sites differ significantly for both the geometric means and covariances (Table 5.20). In order to determine which sites are the most similar, a site dissimilarity matrix was generated using the geometric means data; the results in the distance matrix are Aitchison distances (Figure 5.21). There are only three sites to compare, so the distance matrix is relatively simple. The cluster dendrogram demonstrates that Jones and Price site vessels are more closely related to one another than to Cambria, most likely due to the lower levels of Cu, Mn, and Ni in Price and Jones site ceramic pastes.

Table 5.20: Aitchison's Test for Equality of Sites

Site	Test	Degree of Freedom (df)	Q	Probability
Cambria-Jones	Both equal	44	511.741	0.00
	Equal covariances	36	154.930	0.00
	Equal means	8	164.393	0.00
Cambria-Price	Both equal	44	747.585	0.00
	Equal covariances	36	117.316	0.00
	Equal means	8	488.852	0.00
Jones-Price	Both equal	44	183.754	0.00
	Equal covariances	36	149.045	0.00
	Equal means	8	49.411	0.00

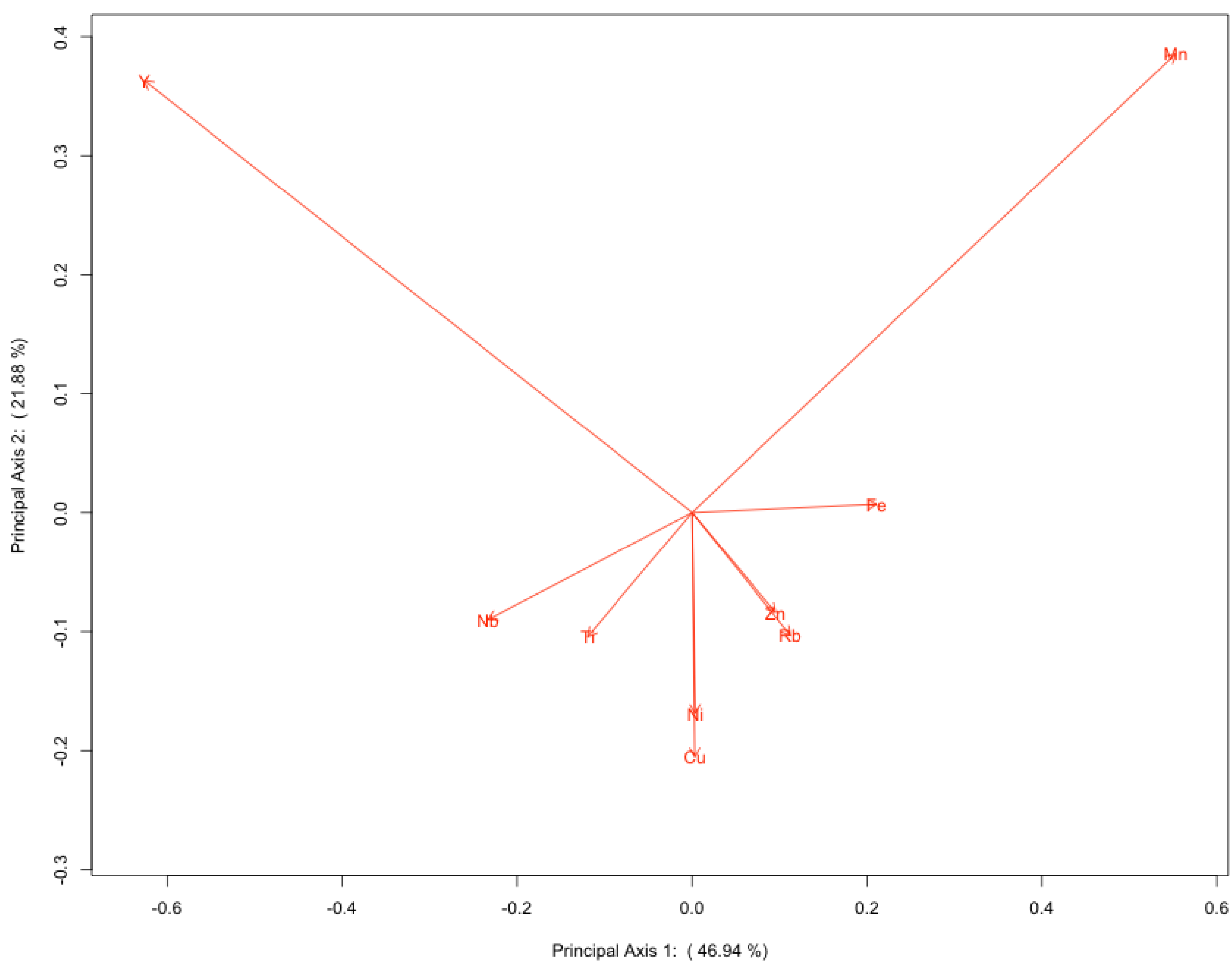

Figure 5.16: Covariance plot of elements for Cambria site

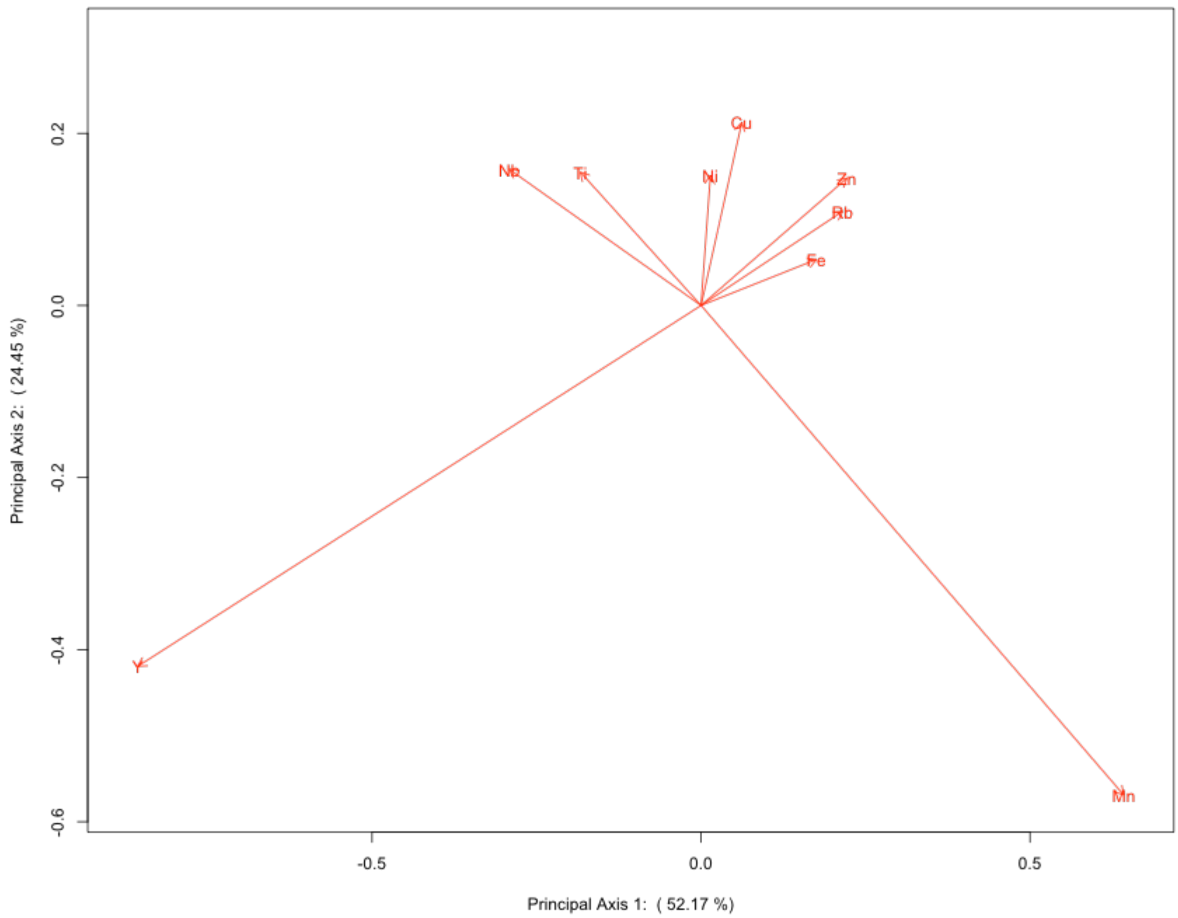

Figure 5.17: Covariance plot of elements for Price site

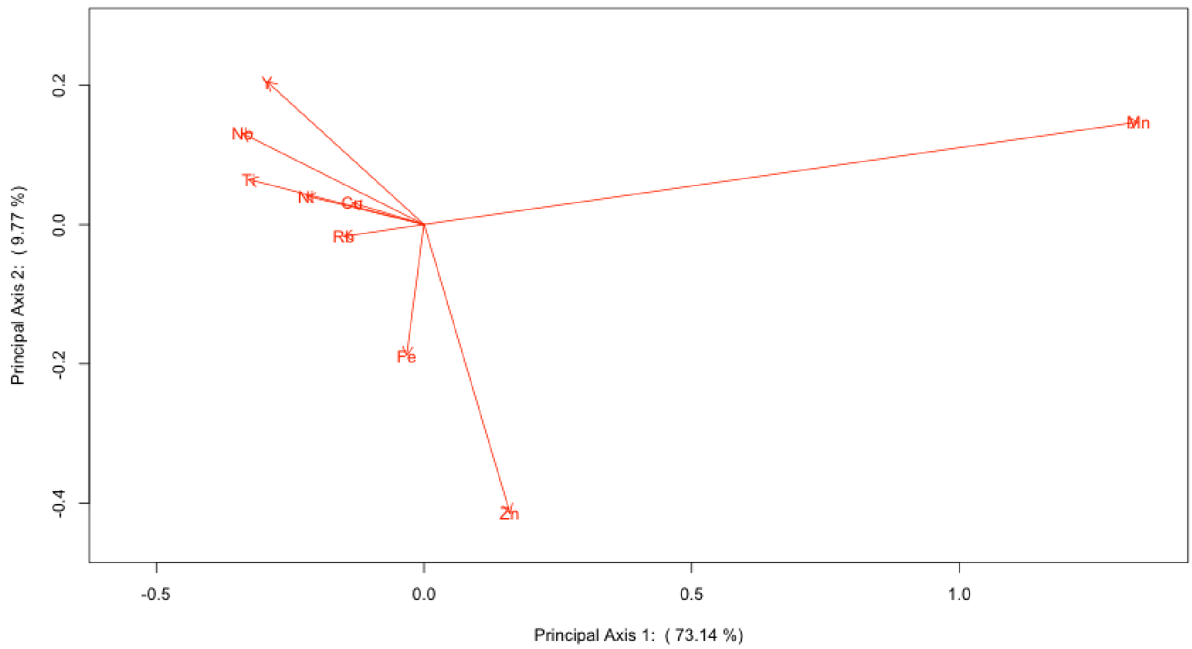

Figure 5.18: Covariance plot of elements for Jones site

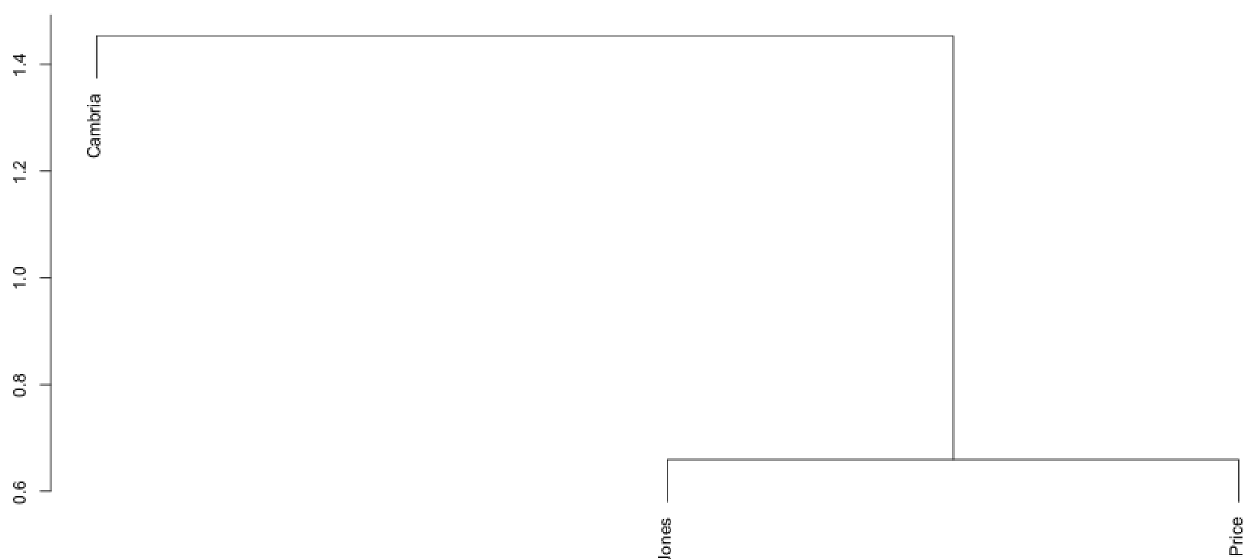

Figure 5.19: Cluster dendrogram comparing geometric means
of elements by site

The two most extreme outliers in the sampled compositional dataset are differentiated by high and low levels of Mn and Nb, respectively. Vessel P-19 is from the Price site, and has a very low level of Nb, while vessel J-45 from the Jones site has a high level of Mn. Aside from their unique compositional features, neither vessel is remarkable for morphological or decorative attributes. Both of these vessels are representative of the Cambria ceramic complex.

Discussion

The results of the statistical techniques used to analyze the ED-XRF data strongly imply the vessels can be sorted into three separate groups based on site. Cambria site pottery, however, exhibits greater differences in chemical composition with both Price and Jones ceramics than they do with each another. The primary difference in groupings is due to Cambria pastes being richer in Mn, Cu and Ni, and to a lesser extent, possibly Y and Ti. Significant differences between Price and Jones site pottery were detected also, perhaps due to the lower amount of Mn and higher amount of Ti in Jones site vessels. It is suggested the three different paste groups represent distinct paste recipes. This possibility considers site-specific techno-cultural practices, where different methods may have been used to clean or prepare raw material, or different kinds and proportions of grit were used as tempering agents, resulting in final paste products with differing compositional profiles. However, Price and Jones vessels are more similar to one another than to Cambria pottery, suggesting Price and Jones site potters may have used more similar paste recipes.

The rim sherds sampled for compositional analysis included examples representing Knudson's four ceramic types, as well as the six rim form categories employed in this analysis. According to the biplot in Figure 5.15, vessels are not grouped by rim form. For example, rolled rim or Powell/Ramey-like vessels are scattered throughout the larger site groupings, indicating that potters at both the Cambria and Price sites likely manufactured rolled rim vessels from site-specific paste recipes. Similarly, the single S-rim vessel from the Price site is solidly grouped with other Price and Jones site vessels. Presumably, potters at all three sites were knowledgeable about the production of multiple vessel forms, although jars with rounded bodies, angled necks and unmodified rims were favored. Alternatively, perhaps only a limited number of potters at each site were responsible for the minority wares.

There is some evidence to suggest that vessels were traded between sites. Three vessels from the Cambria site (C-25, C-90, C-223) are grouped with the Price/Jones vessels, and one vessel from the Price site (P-44) is grouped with the Cambria sample (Figure 5.20). The three Cambria vessels grouped with the Price/Jones sites represent minority wares in the sample, and include both rolled and S-rim modal types. The third Cambria vessel is neatly decorated with large angular tool impressions on the exterior rim, and a deeply incised lip marked with diagonal lines. This combination of decorative techniques is specific, and is recognized on a limited number of Cambria vessels. The extra-regional attributes demonstrated for at least two of these vessels would make them highly desirable gifts or trade items for individuals at the smaller and less-centralized villages of Price and Jones.

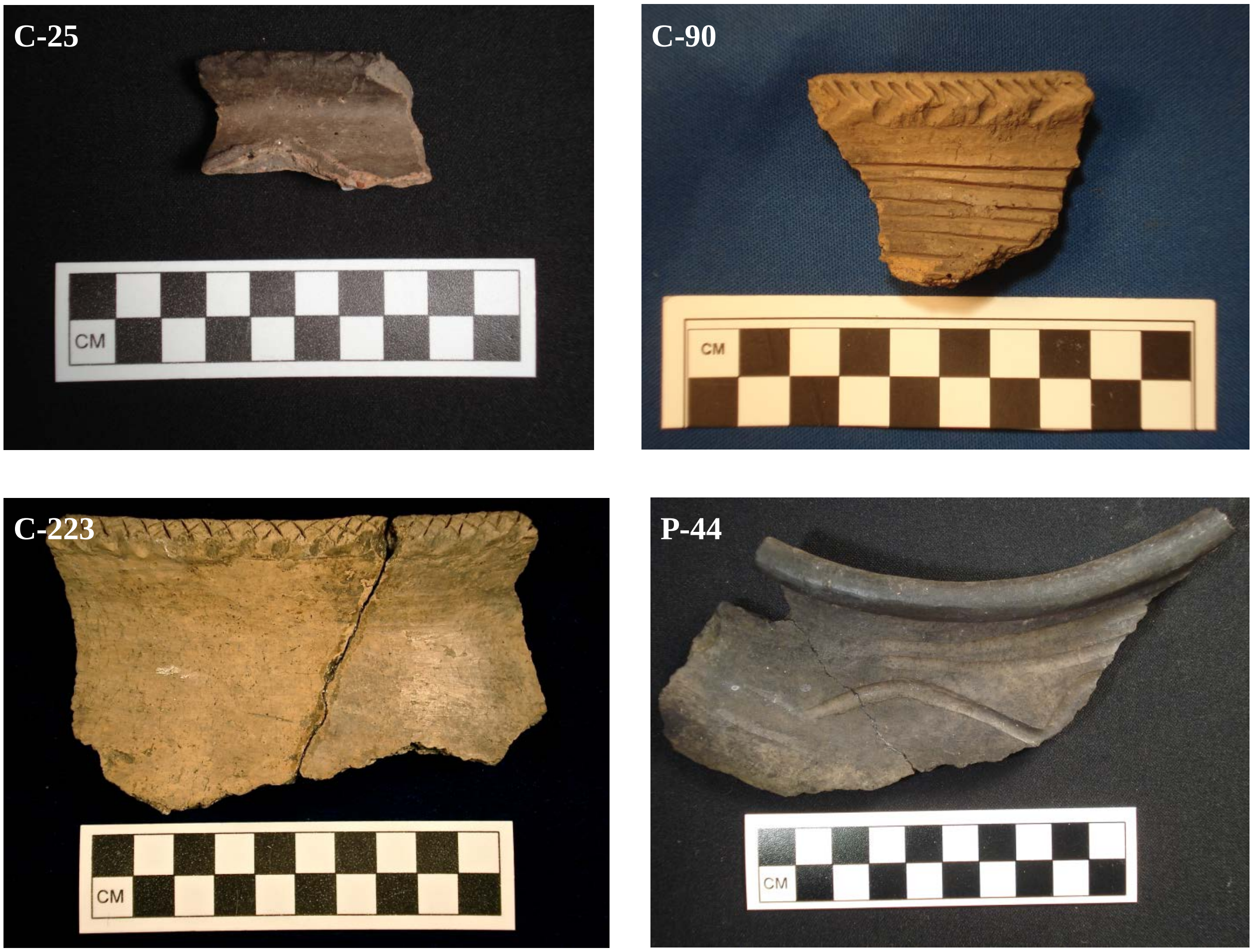

Figure 5.20: Possible trade vessels identified through XRF analysis

Robust PCA

The compositional dataset also was subjected to a relatively new method of statistical testing known as robust principal component analysis (Scealy, et al. 2015). This technique utilizes a power transformation to map the data onto a manifold, or complex surface, instead of first applying a log-ratio transformation to the compositional dataset, which was the standard approach previously. The data for a power transformation "is first rescaled relative to a centering parameter which is estimated from the whole compositional dataset" (Scealy, et al. 2015:138). This differs from the centering parameter of the log-ratio transformation because it "rescales by taking ratios of components from within each composition separately (Scealy, et al.

2015:138)”. As a result, the compositional data subjected to power transformation reflects a bulk analysis of the entire dataset as a single paste. One major advantage of robust PCA is that smaller variables and outliers have much less influence on the structure of the data. The results of this type of analysis are also interpreted as differences in paste recipes.

The following results were obtained from a dataset comprising averaged readings because a variance test demonstrated that there were not significant differences between exterior and interior readings. The specific results of the robust PCA are indeed different, mostly because they rely on elements that were removed from the classic PCA dataset, particularly Sr and Zr. However, the overall interpretation of the results remains similar. In addition, this analysis was replicated using the interior and exterior readings as separate data points, and is published in Appendix C.

Robust PCA demonstrates that nearly 90 percent of data variance is explained by the first two dimensions. Pottery from the three sites differed significantly on the first dimension. Cambria rims have lower amounts of Fe and higher amounts of Zr than rims from the Price and Jones sites. However, none of the bivariate comparisons between sites are significant for dimension one. The three sites also differed significantly on the second dimension, although dimension two explains less than 20 percent of variation in the data. A comparison of the site means suggests that on dimension two Cambria vessels have more of both Sr and Ni than Price and Jones ceramics. The bivariate comparisons between each site on dimension two detected significant differences between Cambria and the Price site, and Cambria and the Jones site, but not between the Price and Jones sites. When the elemental means of each site were compared, Cambria rims were distinguished by a lower amount of Fe, but higher amounts of Zr, Sr and Ni than vessels from the Price and Jones sites. Pottery from the Price site is differentiated by lower mean values of Sr and Zr than vessels from the Jones site. Finally, when the biplots are examined four distinct compositional groups are recognized: one group represents Cambria vessels, another group for Price, and two separate groups from the Jones site sample (Figures 5.21 and 5.22). Price and Jones site potters were most likely using the same, or very similar site-specific paste recipes for the duration of their occupation. The distinct groupings representing Jones site vessels may indicate that at least two separate paste recipes were used. One possible suggestion is that the two different compositional groups represent different temporal components. Radiocarbon assays identified at least two separate occupations at the Jones site, and the distinct compositional groups could be reflecting changes or modifications to paste recipes that occurred between habitation sequences. An alternative possibility is that the differing compositional groups are due to elemental variances in different clays. PXRF is a bulk analysis technique, and as such differences in compositional groups by site could indicate the usage of similar clays with differing temper or cleaning recipes, or the utilization of different clays.

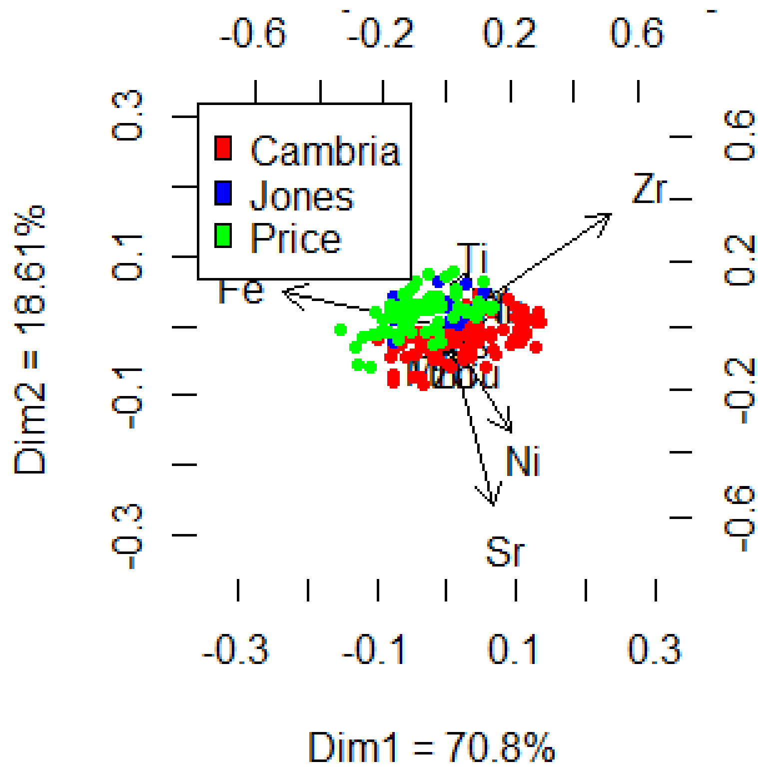

Figure 5.21: Biplot comparing robust estimates and elements by site

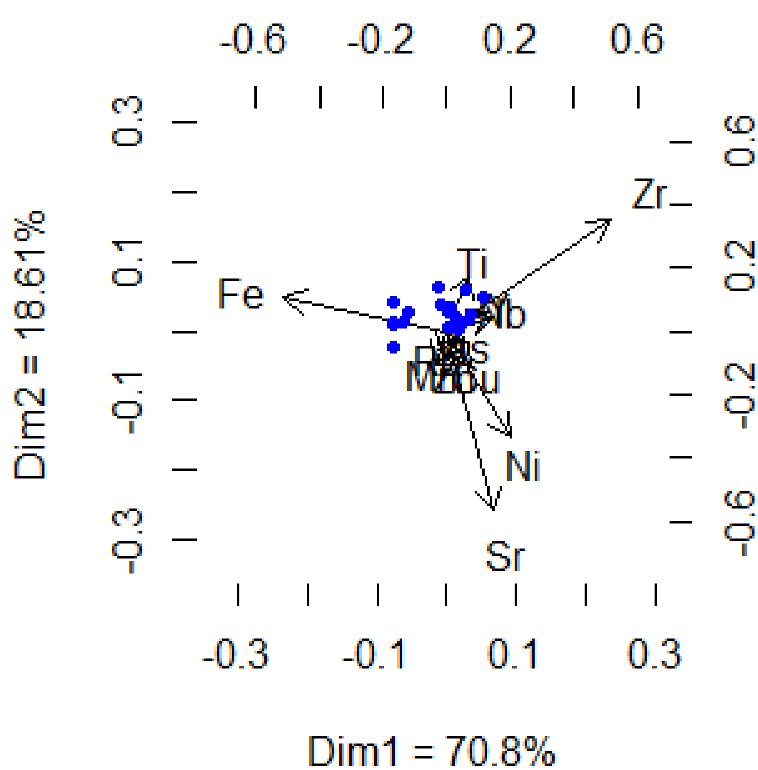

Figure 5.22: Biplot comparing robust estimates and elements for the Jones site

PXRF Discussion

Both the classic and robust PCA results identified at least three separate compositional groups corresponding to site. There were two primary compositional groups representing Cambria individually, and the Price and Jones sites clustered together. Classic PCA determined the primary difference in groupings is due to Cambria pastes being richer in Mn, Cu and Ni, and to a lesser extent, possibly Y and Ti. Robust PCA indicated that Cambria paste recipes are distinguished by less Fe, and more Zr, Sr, and Ni when compared to the Price/Jones vessels. Significant differences were established between Price and Jones site pottery, also. Classic PCA results identified a lower amount of Mn and a higher amount of Ti in Jones site vessels, whereas robust PCA pointed towards lower mean values of Sr and Zr in pottery from the Price site.

The results of PXRF compositional analysis identified four distinct compositional groups interpreted as site-specific ceramic paste recipes, or possibly the usage of clays with different elemental compositions. Price and Jones potters most likely utilized paste recipes more similar to one another than to the Cambria paste recipe. However, potters at the Price and Jones site seem to have employed enough differences in their paste recipes to create distinct compositional groups. Cambria and Price site potters appear to have utilized a single, relatively uniform paste at their respective sites, but Jones site potters may have been working with at least two separate paste recipes. One possible cause may have been that modifications were made to vessel pastes over time, and are related to two successive occupation sequences ranging from AD 1150-1220 and AD 1220-1300. Finally, four possible trade vessels were identified, indicating interaction between the Cambria and Price sites.

Chapter 6: Conclusions

This project presents ceramic data from attribute and compositional analyses from three sites in the Cambria Locality. The attribute analysis reveals distinctions in decoration zones. Decoration in the lip/rim zone is highly varied within and between sites, but some patterns are significant at the site level. Body decoration, on the other hand, is more homogenized amongst the three sites, and is primarily represented by four major body design programs. The following section identifies the significant differences in decoration zones, and seeks to explain them within cultural parameters consistent with an internal frontier.

Lip/Rim Decoration

As noted previously, lip and rim decoration in the Cambria Locality is highly varied, even within the ceramic assemblages of each site. Cambria site pottery exhibits the widest range of decorative techniques on vessel lips, rims and necks, and in the most varied combinations. The most notable differences in the lip/rim decoration zone occur between sites. Jones site pottery has the highest incidence of decoration for this zone, but the least amount of diversity in decorative technique. Tool impressions are the primary decorative method at Jones, and statistical analyses indicate significant differences for both exterior and interior rim decoration at the site. Simply put, the Jones ceramic assemblage has high frequencies of tool impressed rims (both exterior and interior), and a low incidence of undecorated rims. Conversely, the Price site has the highest percentage of vessels lacking decoration in the lip/rim zone. This difference is statistically significant for undecorated lips and interior rims, which are overrepresented at Price.

Potters at the Price site were less focused on the lip/rim decorative zone, which is demonstrated by the lowest overall frequencies for lip, interior rim and neck decoration in the

Cambria Locality. Jones site potters, however, put considerable artistic and technical effort towards decoration in this zone, particularly by focusing on the adornment of both the exterior and interior rims. Lip decoration was most frequently applied by Cambria potters. The large amount of variation demonstrated in the lip/rim decoration zone, including technique, tool, shape and frequency of markings, may indicate these areas of the vessel were reserved for individual expression, or were areas where potters experimented with different techniques, tools, or design patterns.

Another possibility may be that lip/rim decoration patterns were owned by individual potters who passed them on to the novices they were instructing in the craft. For the historic Mandan of the Upper Missouri River region, those who wanted to be potters had to buy the technical knowledge and rights to specific designs from kin or clanswomen (Bowers 1950:283). Perhaps Cambria potters utilized a similar system of apprenticeship. This would help to explain the different broad patterns of lip and rim decoration at each site. Different lineages at a site may have decorated their vessels with particular combinations or frequencies of lip and rim decorative techniques, creating the specific site frequencies noted as significant in the comparative analysis.

Alternatively, some of these differences between sites could be due to temporal factors, particularly at the Jones site. The higher incidence of exterior and interior rim decoration at Jones may be tied to similar ceramic trends noted for later Oneota vogues (Anfinson 1979:39-40).

Body Decoration Zone

While lip and rim decoration patterns are quite varied between the three sites, incised body decoration is more coherent. Four major design programs were recognized for the Cambria

Locality. A brief description of each program, its geographical scope, and possible cultural derivation and symbolic meaning are set forth in the following paragraphs.

Body Design Program 1 is the horizontal incised pattern, or HIP. It comprises numerous horizontal lines that encircle the vessel body. It is not uncommon for the incising to begin on the vessel neck somewhere above the neck/body juncture, but below the exterior rim decoration zone. No vessels with this pattern have been recovered below the shoulder, so it is unknown if the incising terminates at the shoulder similar to the three other design programs. The HIP was identified at all three sites. It is the most popular design program at both the Cambria and Price sites, and is well represented at Jones (Figure 6.1). However, a possibility for the popularity of the HIP motif may be because some vessel fragments are too small to determine the full parameter of the body design. Some sherds may actually be small portions of lineate combination motifs, such as the lineate-chevron pattern of Body Design Program 2.

The HIP is a well-known design pattern in the Upper Midwest- particularly after AD 1000- where it is associated with Initial Middle Missouri ceramics. This pattern dates back to at least AD 900 because it has been identified as body decoration on some Great Oasis pottery. Wilford noted that nearly 10 percent of body sherds at the Minnesota type site were decorated with "horizontal parallel incised lines, encircling the vessel" (Wilford [ca. 1954]:6). The HIP also has been identified on at least one large body sherd from the DeCamp mortuary site in central Iowa (Alex and Tiffany 2000: Figure 9). Similarly, many high-necked Great Oasis rims are decorated with narrowly incised horizontal parallel lines employed as a background for a variety of other motifs (i.e. triangles, zig-zags, diamonds, trapezoids, oblique lines, turkey track, or conventionalized maize) (Henning and Henning 1978; Johnson 1969). HIP body decoration also appears contemporaneously at Mill Creek sites where it primarily decorates Sanford and

Chamberlain Wares (Henning and Henning 1978:24; Ives 1962), but also is noted as a minority body decoration on some S-rim (Foreman Ware) varieties (Ives 1962:18-20). It seems likely that Great Oasis was the cultural contributor for the horizontal incised body design program.

The HIP also has been identified on at least eight Ramey Incised vessels from Aztalan, and on three vessels from Cahokia. Again, it is noted that the partial patterns identified on these vessels may actually represent fragmented portions of other motifs, such as the nested mound motif. Alternatively, the integration of this motif with Mississippian ceramic vogues may indicate attempts by the local populace to express local Upper Midwest design patterns and cosmology via the recognized symbolic messaging system that was Ramey Incised pottery.

Figure 6.1: Body Design Program 1, HIP, J-55

Figure 6.2: Body Design Program 2, lineate-chevron, C-161

Body Design Program 2 is a combination lineate-chevron pattern that links chevrons with horizontal incised lines. These two motifs are found separately on vessels at the Jones site, and are identified as a complete design program only at the Cambria and Price sites (Figure 6.1). Typically, this pattern is incised boldly and broadly, creating a sizeable and highly visible design. The presence of this body design program on several large vessel fragments indicates that it was organized into a quadripartite design field. Mississippian Ramey Incised pottery originated the quadripartite design field expressed via incised shoulder decoration, and it is most likely the cultural seed for both the boldly incised shoulder technique and quadripartite design field associated with many Cambria vessels. Potters in the Cambria Locality appear to have combined these Mississippian decorative elements with resident manufacturing and finishing techniques, aesthetic sensibilities and symbolic knowledge to create a uniquely local, and popular, ceramic expression.

There are several possibilities for the derivation of the lineate-chevron design program. Chevrons, zig-zags, triangular motifs and the lineate design field are associated with the cleanly incised tall necks of Great Oasis vessels, as well as Late Woodland corded wares found throughout the Upper Midwest (Baerreis 1953; Benn and Green 2000; Cole and Deuel 1937; Hurley 1975; Keyes 1949; Logan 1976). These elements are constructed differently on the rim, where they are arranged as part of a tripartite stacked band pattern where the lineate motif functions mostly as a background pattern (Benn and Green 2000:453). On vessel bodies, however, the horizontal incised lines and chevron motif are combined into one single repetitive pattern. In this arrangement, the lineate pattern functions more as a space-filler between chevron motifs. Knudson (1967:279) pondered whether popular Late Woodland triangular rim motifs were simply transferred to vessel shoulders by Cambria potters. Perhaps the lineate-chevron design program resulted from the relocation and recombination of lineate and chevron-like motifs from the rim to the vessel body as local potters were exposed to the Mississippian design program.

Chevrons and parallel lines are recognized motifs in the Mississippian world, where they decorate Ramey Incised pottery. Nested chevron motifs have been symbolically associated with the Thunderbirds or falcon, and most likely represent the tail of the animal (Hall 1991:29). Many Thunderbird tails are depicted as a single chevron containing multiple interior tiers of inverted chevrons or arcs, perhaps creating a ringed tail pattern (Figure 6.1). Benn reports that for Oneota vessels the chevron motif embodies many different forms from simple nested chevrons to those adorned with pendant triangles, punctates and oblique or vertical lines (Benn 1989:243). The nested chevron also has been interpreted as a stylized representation of a Thunderbird's wing (Lothson 1976:39). The nested chevron may function as a synecdoche (Hall 1991:29), and whether representing tail or wing, is meant to represent the entire avian creature.

Figure 6.3: The Link Vessel, Bryan Site, Red Wing Locality, Minnesota
(Science Museum of Minnesota)

In Mississippian culture, birds such as eagles, hawks, and falcons are symbolic expressions of themes involving aggressive warfare (Emerson 1989; Hall 1991) and strong leadership (Hall 1991:30). In Siouan cosmology, Thunder Beings were supernatural creatures that resembled eagles, were situated at each of the four cardinal points of direction, and discharged lightning bolts from their eyes (Lothson 1976:78). Thunderbird imagery is known from ceramic vessels in southern Minnesota. Vessel C-229 from the Cambria site illustrates a simple Thunderbird with an asymmetrical chevron tail, and outstretched wings represented by oblique lines hung with vertical hachured “feathers”. The most famed example is the Link pot from the Bryan site in the Red Wing Locality (Link 1975). It depicts two thunderbirds- although there were most likely four represented on the original complete vessel- with wings outstretched, and chest, head and tail adorned with punctates. Adjacent to the avian figure is a zig-zag motif encased in a possible forked eye motif, perhaps representing lightning bolts. Holley (2008:31) observed that Golden Eagles have ringed tail feathers and a splotchy breast when immature, and argues that the Link Thunderbird may actually reference spring and renewal instead of aggression and warfare (see also Berres (2001) for a discussion of the thunderbird motif in Oneota culture).

Many of the stylized tail and wing nested chevrons are accompanied by vertical or oblique parallel lines. The horizontal parallel lines of the lineate-chevron pattern are more difficult to relate to Thunderbird imagery. Perhaps they represent the outspread wings of the Thunderbird, or express the emanation of the being’s supernatural powers. Lineate combination motifs, including both arcs and chevrons have been identified on Ramey Incised pottery at the Aztalan site in southeastern Wisconsin and the Lundy site in the Apple River Locality of northwestern Illinois (Mollerud 2005). It may be that Design Program 2 has a different cultural referent altogether, but one that is recognized across the Upper Midwest.

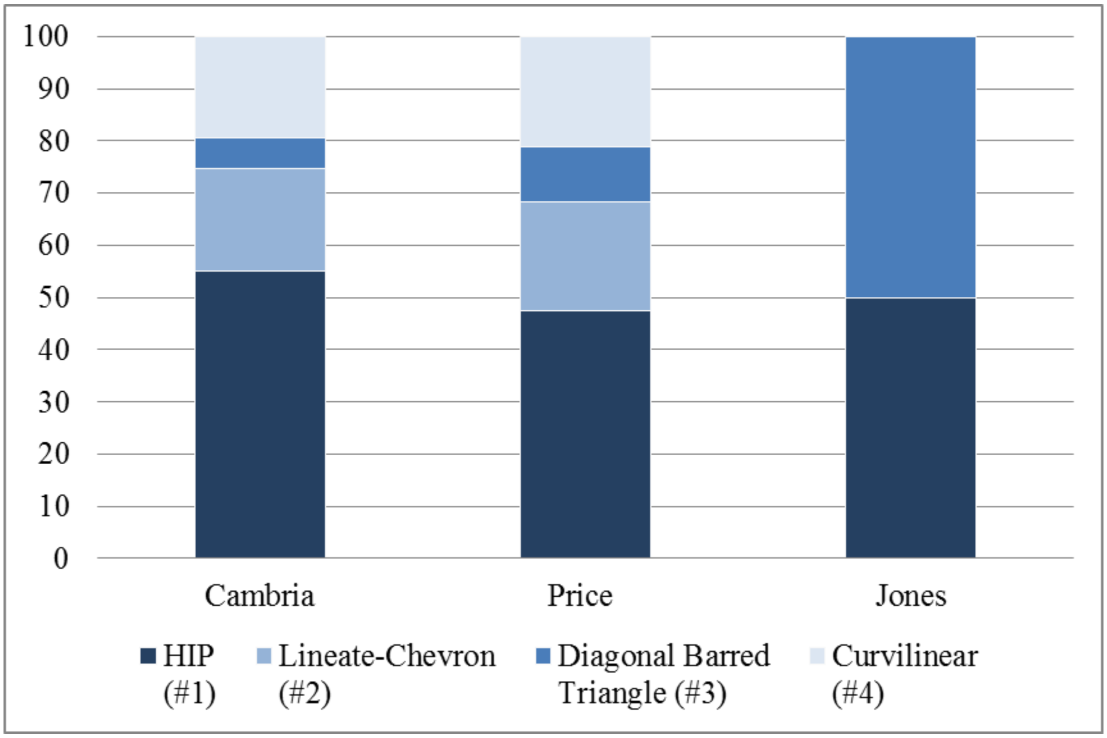

Figure 6.4: Bar graph of body design programs by site

Body Design Program 3 is unique to the Cambria Locality where it is found at all three sites (Figure 6.1). It is a series of diagonally barred triangles arranged in an alternating pattern in a double row. The outer edge of the triangles and the base of the design are often accompanied by border fringe. Motif H2, the diagonally barred triangle is the main component of this design program, and it may have its roots in the Late Woodland cultures of the Upper Midwest. A few Late Woodland vessels from Iowa and Illinois have been identified with similar triangular motifs rendered in twisted cord impressed designs just below the rim. The most similar design pattern is from the Gooden site in Illinois, where it was identified on three separate mortuary vessels (Sampson 1988). This motif pattern consists of two adjoining, but offset triangles- one big, one small (Figure 6.2). The smaller triangle is located on top, and is devoid of interior design. The larger triangle is on the bottom, and is filled with either right- or left leaning diagonal lines. The diagonally barred triangle design program at Cambria perhaps references this Late Woodland pattern in its alternating, double-rowed layout where a blank triangular space is placed adjacent to the main motif element. Sampson (1988:177) interpreted these motifs as possible raptor representations, which are expressive of the Upperworld.

Another similar design pattern was identified on a Lane Farm Cord Impressed vessel from Delaware County, Iowa (Alex 2000:Plate 10). Located below the rim, the cord impressed decoration depicts alternating triangular motifs; the basal triangles are filled with left-leaning diagonal lines and bordered on either the right or left edge with a series of punctates. A third vessel with alternating double rows of diagonally barred triangles was identified from the Clear Lake site in central Illinois (Fowler 1952:Plate XLI). This vessel has a castellated rim decorated with twisted cord impressions, and the barred diagonals of the motif are left-leaning. In the Cambria Locality, all diagonally barred triangles have right-leaning diagonals. More broadly, various alternating barred triangle design patterns are known from the high rims of numerous twisted cord impressed wares across Iowa, Wisconsin and southern Minnesota (Baerreis 1953; Benn 1980; Hurley 1975; Logan 1976). Based on the triangular shape and barred filling of the motif, as well as its pairing with punctates, Knudson (1967:279) asserted the Late Woodland was the cultural source for this design pattern:

> "[c]ould the Cambria potters, with their emphasis on shoulder area decoration gained from the Mississippians, have transferred a popular Woodland rim motif to the shoulder area? In view of the presence of an alternating triangle rim motif on many Cambria, Great Oasis, Over Focus and Woodland rims, I suggest this could be the case. The presence of punctates appears to be definitely Woodland related."

This explanation recognizes the technological fluidity of Cambria potters, and their practice of breaking down and reinterpreting separate technological or decorative elements only to recombine them into something fresh and distinctive.

This body design program demonstrates traits more characteristically associated with later Oneota vessels. Body decoration on Blue Earth Trailed Oneota pottery is described as incised triangular or chevron motifs bordered by rows of punctates or short vertical lines. Furthermore, vessel shapes are characterized as globular jars with rounded shoulders, angled necks and straight to outcurving rims (Dobbs 1984:104-105; Wilford 1955:140-141). Cambria Locality vessels with this design program typically exhibit angled necks and straight rims; substantial shoulder data is lacking, but one vessel each with rounded and angled shoulders was identified. The similarity of Design Program 3 to later Oneota design patterns in the Blue Earth Locality suggests the Cambria Locality may be a possible origin for this aspect of the Oneota design program.

Figure 6.5: Body Design Program 3, diagonally barred triangle, J-32

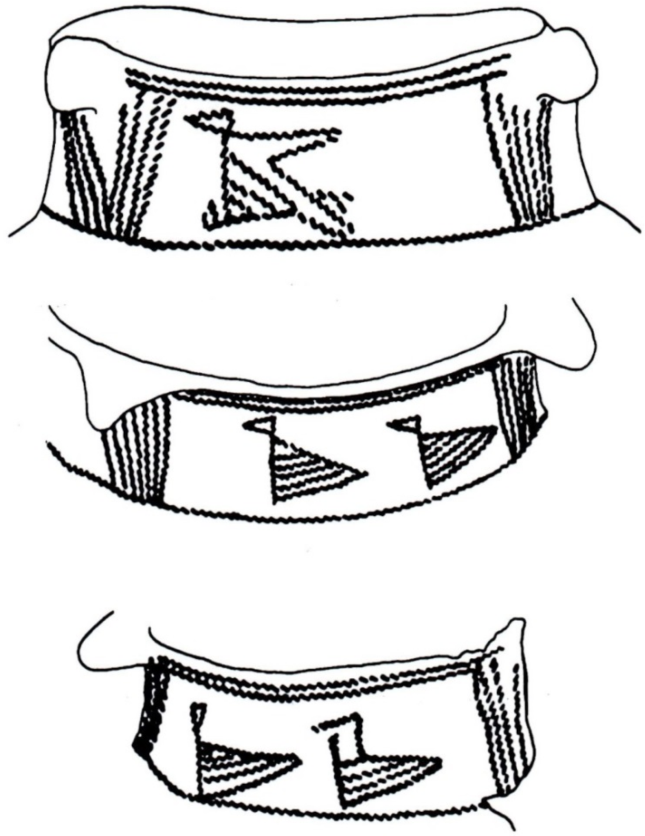

Figure 6.6: Late Woodland mortuary vessels from the Gooden site, Illinois

Figure 6.7: Body Design Program 4, curvilinear, C-110

The fourth design program comprises numerous curvilinear motifs, including arcs, spirals, and varied scrolls that are very similar to motif categories identified for Mississippian Ramey Incised pottery. Emerson utilized ethnographic and ethnohistoric sources from the southeast, as well as a series of Missouri flint clay effigy figurines found in the American Bottom and at other Mississippian-affiliated sites in the South and Southeast to interpret Ramey symbolism (Emerson, et al. 2007; Emerson, et al. 2003; Emerson 1989, 1995, 1997a, b; Emerson and Hughes 1999). He asserted that the stone statues were imbued with fertility symbolism, and that the primary theme depicted was the Mississippian Underworld. Water, water monsters and snakes were symbolically associated with the Underworld, and most likely were represented by curvilinear motifs such as spirals and interlocking scrolls.

Yet other curvilinear motifs, particularly arcs and hachured scrolls, may express Upperworld imagery. Hall (1973) has suggested the nested arc motifs may represent rainbows, whereas Griffith (1981:17) interpreted hachured arcs (not identified in the Cambria Locality) as representations of the rising or setting sun, the sun's rays, or even as rain clouds. Arc motifs have been identified at multiple cave sites throughout the Upper Midwest. Nested arcs appear on the Red Horn figure at Gottschall, and on the kilted individual at Picture cave. Arcs and nested arcs were identified at Tainter cave in southwest Wisconsin, where Boszhardt (2003:45) noted their affinity to Ramey Incised motifs. In addition, nested arcs may symbolize Red Horn through his shoulder tattoos. Arcs are the most frequently expressed curvilinear category at the Cambria site, and the only example of a curvilinear motif from Jones.

Motifs F1-F3 in this analysis represent Ramey Incised motifs from Emerson's Category VI, the "Wing" category (Emerson 1989, 1995, 1997a, b; Emerson and Hughes 1999). Hall referred to these motifs as "feathered" scrolls, which evokes avian imagery. These motifs may represent the wings of Mississippian falcon-dancers or bird-men. In the northern hinterlands, an alternative suggestion may be that they represent the wings of Thunderbirds. Interlocking hachured scrolls are the most frequently expressed curvilinear motif at the Price site, and the second most popular curvilinear motif at the Cambria site.

Another aspect of the curvilinear design program is that it is primarily associated with rolled rim vessels from the Cambria and Price sites (Figure 6.1). The Jones site ceramic assemblage is marked by a paucity of curvilinear motifs, particularly spirals and scrolls. Only one curvilinear motif was represented at the Jones site, a nested arc, and it was combined with a rectilinear chevron (Motif M1). One partially rolled rim fragment was recovered from the Jones site, but the vessel body was missing precluding the identification of body decoration. Rolled rims are typically associated with the shell-tempered Ramey/Powell series first identified at Cahokia, and are one aspect of a suite of morphological, technical, and decorative traits that represent a Mississippian-inspired ceramic package reinterpreted for south-central Minnesota. Other characteristics of this package include sharply angled shoulders, an inslanting upper body, smudged and polished vessel surfaces, and boldly drawn, incised motifs on the wide inslanting plane between the vessel rim and shoulder. The overwhelming majority of these vessels at Cambria and Price are grit-tempered and locally produced. Yet, they also represent faithful emulations of specific Mississippian ceramic vogues by potters who were very familiar with the attribute suite primarily defining the Ramey/Powell package in the hinterlands, and very capable of reproducing it.

Many of the classic Mississippian Ramey Incised traits have been stripped down or reinterpreted for the hinterlands. The most notable difference for the Cambria Locality rolled rim vessels is the substitution of grit for shell temper, or the reliance on local paste recipes.

Ramey Incised pottery in the American Bottom often has a more complex surface finish, typically exhibited by the extra step of slipping. Nearly 94 percent of Ramey Incised pottery from the ICT-II, Tract 15A and Dunham Tract at Cahokia was either slipped or slipped then smudged (slip/smudged) (Mollerud 2005:135). Smudged-only vessels were quite rare, and represented less than 5 percent of the sample (Mollerud 2005: Table 4.4). Conversely, well over half of all rolled rim vessels at the Cambria (58.8%) and Price (78.9%) sites have smudged-only surface treatments. Similarly, Ramey Incised pottery in the northern hinterlands typically has a higher percentage of smudged vessel surfaces when compared to slipped or slip/smudged vessels. Less than 15 percent of Ramey Incised jars from Aztalan are either slipped or slip/smudged, while nearly 60 percent are smudged-only. No slipping was reported for the Lundy site in Apple River, where more than 80 percent of all Ramey Incised pottery was smudged. Interestingly, at the neighboring John Chapman site, a slight majority of vessels were slipped or slip/smudged (38.5%), when compared to smudged-only vessels (30.8%) (Mollerud 2005: Table 4.4).

Finally, decoration of rolled rim vessels is different in the Cambria Locality, both technically and formally. Cahokia Ramey Incised pottery is incised when the clay is leather-hard, which does not alter the interior vessel surface. Cambria and Price rolled rim vessels are decorated when the clay is still wet, which leaves a raised cameo impression on the interior of the vessel. Also, there are a handful of motifs, both curvilinear and rectilinear, that are unique to Cambria Locality rolled rim vessels. These are the nested scroll (E1), double spiral (G2), track motifs (Category J), and two hachured scroll variations (F5, F6). Motifs F5 and F6 were identified only at the Price site, and on three separate Ramey-like vessels found broken in the same pit feature, Feature 14. This feature contained much pottery in addition to the rolled rim vessels, including rim sherds representative of Knudson's Linden Everted and Mankato Incised types.

Similar to Mississippian Ramey Incised pottery, the upper shoulders of rolled rim jars at the Cambria and Price sites seem to have been utilized to depict specific symbolic information. Local innovation is represented by the unique Cambria motifs, both in form and meaning. It should also be kept in mind that Ramey-like jars may not have been used the same way in the Cambria Locality as they were at other northern hinterland sites, or in the American Bottom. Similarly, the same motifs may have had different meanings or symbolic associations based on the region.

Decorated Silvernale phase ceramics from the Bryan Site in the Red Wing Locality were incised primarily with single hachured scroll motifs (Holley 2008:12). Interlocking scroll motifs were identified, also, but spiral motifs were not represented at the site. Outside of the arc category, the most frequent curvilinear motifs from the Cambria and Price sites were interlocking and spiral scrolls. Curvilinear single hachured scrolls were not popular in the Cambria Locality, and were only identified on two vessels from the Cambria site. The Red Wing Locality was most likely the source of cultural influence for rolled rim vessels in the Cambria Locality, but local potters clearly were choosing to depict different motifs, and by extension, perhaps different symbolic referents.

The most frequently expressed motifs on Ramey Incised vessels differ between sites in the northern hinterlands. At Aztalan, the most frequently expressed motifs are parallel lines, the barred triangle, and the spiral. In the Apple River Locality, the most popular motifs at both the John Chapman and Lundy sites are parallel lines, nested chevrons, and nested arcs

(Mollerud 2005). A detailed motif analysis has not been undertaken for rolled rim vessels at Mill Creek sites in Iowa.

The curvilinear design program, as well as the vessel morphology, surface finishing and decorating techniques associated with the rolled rim vessels indicate familiarity with Mississippian vogues, but not necessarily direct contact with Cahokia or other hinterland Mississippian communities. The nature of this connection is most likely emulation, while the locus is probably the Red Wing Locality. It is the closest Mississippian occupation to Cambria, located approximately 100 miles to the northeast. Cambria and Red Wing vessels both have similar rates of body decoration, and higher frequencies of interlocking and hachured scrolls when compared to ceramics at other Mississippian sites in the Upper Midwest (Holley 2008).

The recognition of the four major body design programs serves to impose a degree of unity on a dataset otherwise known for its diversity. More so than vessel morphology or rim decoration, it is suggested that specific attributes of the body design programs primarily determine classification as part of the Cambria cultural complex. Interestingly, the appearance of rolled rim vessels paired with curvilinear scroll motifs does not appear to be one of these traits since classic examples of neither attribute were identified from the Jones site. Rather, unique Cambria decorative traits are intermittent cross-hatched neck decoration and Design Program 3. Only occasionally do both of these patterns adorn the same vessel. In addition, Cambria complex pottery should include numerous vessels decorated with the HIP, and another group with the lineate-chevron, or simple nested chevron pattern.

With the exception of the curvilinear motifs, it is hypothesized that this grouping of body design programs signifies a local symbolic community for the Cambria Locality. The curvilinear motifs, as part of the Ramey horizon, are most likely tied into a larger symbolic community scattered across the northern hinterlands, but only indirectly related to American Bottom groups. A local symbolic community refers to a symbolic community that is “circumscribed geographically, either practically or by a common goal of owning, maintaining, or using a territory” (Ruby, et al. 2005:124). The three Cambria Locality sites are certainly restricted geographically, and the compositional analysis has demonstrated that each site was manufacturing ceramic vessels decorated with Body Design Programs 1 and 3, as well as chevrons and arcs. The ongoing exploitation of site-specific clay sources by potters from each site over approximately 200 years is a good indication members of the Cambria symbolic community were using the territory. Although the specific clay sources for each site remain unknown, ethnographic data suggests they would typically be no more than 7 km distant from the potting site and likely within 1 km of the settlement (Arnold 1980:49).

It is suggested the body design programs functioned to create a local symbolic community. Based on the amount of variation exhibited in Cambria ceramics overall, the community boundaries were probably fairly fluid. However, the adherence of potters at each site to the formal and possible symbolic content of the design programs suggests they may have aided in the development of a common Cambria identity. Taken one step further, this may be the emergence of distinct ethnic groups in southern Minnesota, a process that continued through the development of the Blue Earth Oneota. However, one must be careful not to conflate archaeological cultures with ethnic groups (Emerson 1999:9). Following Jones (1997), the formation of an ethnic identity is a continuous process of social interaction focused on actively maintaining cultural boundaries, which often results in an opposition of “us” and “them” (see Berres (2001) and Jeske (2003) for additional critiques of the ethnic identity issue). Emerson (1999:10) counsels that in order to understand and identify the development of ethnic identities, archaeologists must first “build strong historical sequences in those areas”. Understanding the range of ceramic variation at each of the sites in the Cambria Locality aids in establishing a pattern of interaction amongst the sites; these are among the cultural and material building blocks for construction of a local historical trajectory.

Discussion

Modeling the Cambria Locality

The three sites of the Cambria Locality differ in duration and intensity of occupation in the Locality, as well as degree of participation in regional cultural interaction. For most of their histories the three sites were occupied contemporaneously and most likely maintained continuous contact with one another. The Cambria and Price sites share the most similarities in modal types, motif expression, and body design programs. The Jones site is less diverse in nearly every one of these categories, perhaps due to a more isolated existence resulting from less overall interaction with Late Woodland or Mississippian groups outside of the Cambria Locality. Alternatively, the Jones site may have been utilized for a less diverse range of habitation activities than either Cambria or Price, or may not have been occupied year-round.

Cambria site ceramics are the most diverse in nearly every category: morphology, decoration, and cultural attribution. The Cambria site has a small amount of pottery consistent with Middle Woodland, Late Woodland, Great Oasis, Mill Creek and Oneota ceramic types. Furthermore, notable aspects of Late Woodland and Mississippian ceramic vogues were incorporated into local Cambria wares. The high amount of diversity exhibited in the Cambria ceramic assemblage most likely is indicative of both an enduring occupation sequence, and multiple and continuous regional and extra-regional contacts. Radiocarbon and archaeological data suggest Cambria was occupied initially around AD 1050, and functioned both geographically and sociopolitically as the central site in the Locality. Ceramic data suggests Cambria may have its origin in Late Woodland times, but the presence of locally-made, grit-tempered copies of the Ramey/Powell series at the Cambria site demonstrates at least peripheral cultural interaction with Mississippian groups during the Stirling phase, which commenced in the American Bottom circa AD 1050. Lohmann phase Mississippian groups are known from several sites in west-central Wisconsin, located in the Upper Mississippi River valley (Benden 2004; Stoltman, et al. 2008), indicating Mississippian groups were well-established in that region. If the Cambria site was occupied prior to AD 1050, it does not appear there was any interaction with the early Middle Mississippian groups to the southeast. Later ceramic vogues more typically associated with Oneota pottery, such as rounded shoulders, paired handles, high frequencies of body decoration, and body designs bordered with punctates and fringe, also are evident at the Cambria site.

The Price site most likely was initially occupied at the same time as Cambria, around AD 1050. The inclusion of rolled rim pottery in the Price ceramic assemblage also indicates a cultural connection with Mississippian societies. The compositional data demonstrates that rolled rim vessels were made by both Cambria and Price site potters, which suggests that people at both sites had contact with extra-regional Mississippian groups. There is less integration of Late Woodland traits like cord marking and twisted cord impressions into Price site ceramics. Also, there is less rim decoration overall. However, there is a higher proportion of Late Woodland pottery in the Price site ceramic assemblage. Similar to Cambria, the origin of the Price site may be in the Late Woodland, and the low frequency of lip/rim decorative techniques relative to the Cambria and Jones sites may suggest an earlier temporal placement. The Price site also lacks higher frequencies of other later ceramic traits, such as rounded shoulders or handles, further indicating the major period of occupancy at the Price site was perhaps prior to AD 1300.

The Cambria and Price ceramic assemblages share a similar diversity in modal types and extra-regional cultural traits. Rolled rim and S-rim vessels were manufactured at both sites, indicating some form of cultural interaction with both eastern and western extra-regional groups. The presence of a very small number of Late Woodland vessels at both sites suggests either a small initial occupation or, more likely, direct interaction with Late Woodland groups early in the Cambria cultural sequence. Wilford (1951, 1953) identified a large amount of Cambria ware at two other sites in the Cambria Locality, Gillingham and Gautefald, which are located approximately 125 km northwest of the Cambria Locality on the Minnesota and Yellow Medicine Rivers, respectively. In a re-analysis of the Gautefald ceramics, Holley and Michlovic (Holley and Michlovic 2013:30-31) identified nearly 60 percent of the site's ceramic assemblage as Cambria pottery, although a lack of numerous Cambria traits were noted, including rolled and S-rims, high-necked jars, smudged vessel surfaces and the Mankato Incised type. A re-analysis of the Gillingham site ceramics revealed a surprisingly high proportion of S-rim vessels, but no rolled rim jars or examples of the Mankato Incised type (Holley and Michlovic 2013:31-34). In addition, three different cultural occupations were identified in the Gillingham ceramic assemblage: a large Cambria village site, a moderately sized Middle Woodland habitation, and a small Late Woodland presence. Based on the lower frequency of Late Woodland pottery recovered from both of these sites, it seems likely the primary occupation was Cambrian, but that there was a higher interaction with and incorporation of Late Woodland groups in this part of the Locality.

The Cambria and Price sites both demonstrate all four major body design programs. Both sites have the same frequency of rolled rim vessels in their ceramic assemblages, although the Price site has a more restricted set of curvilinear motifs. Only one type of interlocking scroll and one arc motif were identified in the Price site ceramic assemblage. However, two examples of unique rectilinear motifs were found on multiple rolled rim vessels at Price, indicating that the rolled rim motif set was malleable and open to local interpretation. Other examples of local motif types, particularly the track motif category, are found at these two sites only. The numerous connections between the Cambria and Price sites suggest direct intensive interaction between the two sites. There may have been some difference in site function between the two sites because the Price site seems to have been a small village with two mounds, whereas Cambria was an intensively occupied village site. The high number of scrapers at Cambria may signal an increased effort put towards hide processing, which is an economic activity. Perhaps Cambria functioned as an interaction and economic center for the Locality, while the Price site was the center for mound-based activities that aligned more with religious aspects of Cambrian culture.

The Jones site is different from the Cambria and Price sites in numerous ways. Geographically, it is located comparatively far from the Minnesota River, on a secondary terrace in an apparent defensive position. Archaeologically, it has shallow U-shaped storage pits, and a less intensive occupation based on feature/artifact density and clustering. The ceramic assemblage demonstrates less morphological and decorative diversity. It lacks vessels with true rolled rims or S-rims, scrolls or spiral motifs, or the blending of ceramic traits typically associated with Late Woodland types. Jones site ceramics also have higher frequencies of traits more evocative of Oneota pottery, such as vessels with tall angled necks and rounded shoulders, interior and exterior rim decoration, paired handles, and body decoration with border punctates and fringe. The lack of Late Woodland pottery at the site, and lack of Late Woodland and Mississippian traits incorporated into the assemblage suggests a later temporal placement for the Jones site, a conclusion also buoyed by the higher incidence of Oneota traits. In addition, the Jones site appears to be the most insular of the three sites in the Cambria Locality, as its ceramic assemblage lacks evidence for extra-regional interaction.

The radiocarbon data, however, suggests the Jones site was occupied by AD 1150, approximately the same time as the Price site. The bimodal distribution of the new radiocarbon assays from Jones may indicate two separate occupation dates: an initial occupation circa AD 1150-1220, and a second occupation from AD 1220-1280. Some data in radiocarbon record, albeit weak, indicates the possibility of earlier habitation at Price and Jones, and most likely Cambria, as well. The Ramey horizon, associated with the northward expansion of Mississippian culture outside of the American Bottom began with Cahokia's Stirling phase, securely dated from AD 1100-1200, and continued into the Moorehead phase, which spanned from AD 1200-1275. Based on the current radiocarbon data, the entire occupation span of the Jones site is within the Ramey horizon. The lack of rolled rims and curvilinear motifs at Jones could be explained if interaction with Mississippian people occurred early and briefly in the history of the Locality, prior to AD 1150 and primarily at Price and Cambria. More likely, though, temporal factors alone do not explain the lack of rolled rim vessels and later ceramic trends at the site. Similarly, there is a lack of S-rim vessels at Jones, which are typically associated with more western Plains Village groups.

A more serviceable explanation considers site location and ceramic attribute data to hypothesize a more insular community at the Jones site. The site was located away from the main trench of the Minnesota River Valley in a defensive position, and the ceramic assemblage demonstrates the least amount of diversity in modal type, morphology, and lip/rim decoration. This insularity may have created a different cultural developmental trajectory for descendants of Jones site residents, perhaps culminating in the eventual transformation to an Oneota base. Alternatively, the Jones site could be a special function site in the Cambria culture, and the ceramic assemblage reflects the more restricted set of activities that took place there.

The main connection between the Price and Jones sites is through compositional analysis, which suggests the pastes between the two sites are more similar to one another than with Cambria vessels. One possible reason for this may be that the small Jones village budded from the larger Price village and mound center. As a result, Price and Jones potters would have shared similar paste recipes due to their shared origin. The Jones site vessels also demonstrate two possible groupings, perhaps indicating two separate paste recipes. This difference may reflect a temporal separation and a subsequent minimal evolution in paste recipes between an earlier and later occupation at the site.

Interaction almost certainly occurred between the three sites, and is manifest in the neck decoration unique to the Cambria Locality. The intermittent cross-hatched neck pattern has not been identified elsewhere in the Upper Midwest, but it is evident on multiple vessels at each of the Cambria, Price and Jones sites. Body design programs 1 (HIP) and 3 (diagonally barred triangle) are identified at all three sites, also. The nested chevron motif is amongst the most popular motifs at Jones, but it does not appear to co-occur with the HIP (Motif L1). Perhaps body design programs 2 (lineate-chevron) and 4 (curvilinear) are earlier or more restricted cultural expressions in the Cambria Locality. Finally, the modal types with the highest frequencies, particularly angled- and curved-unmodified types, have consistently high frequencies at all three sites. The similarities in morphology, surface treatment, and neck and body decoration suggest all three sites are part of the same ceramic complex, and that there was direct interaction between them.

The Cambria and Price sites, however, share a greater frequency of ceramic traits between them. All four body design programs are represented at both sites, and in roughly the same frequencies. Also, they are the only two sites that have curvilinear scroll motifs, rolled rims, S-rims, and twisted cord impressed decoration. Interaction between Cambria and Price was most likely frequent and continuous throughout the occupation histories of both sites, which were in all likelihood contemporaneous from settlement to dissolution. Jones site ceramics demonstrate more distance, either as a result of less frequent interaction, temporal difference, or both. The limited diversity of the Jones ceramic assemblage would be expected for a budded village that maintained only limited or infrequent interaction with other sites in the Locality, particularly its closest neighbors the Cambria and Price sites, and was more restricted temporally.

Each site developed its own trajectory of cultural development in the local community. Cambria was a central place and primary actor in regional and extra-regional interaction. As a densely occupied village with a lengthy continuous habitation sequence, Cambria accepted external cultural ideas, but reframed them through their own technologies. Cahokian Mississippian ceramic vogues were incorporated into an already evolving and mobile base that included Late Woodland groups, as well as transforming Great Oasis groups already familiar with maize horticulture, and intent on intensifying it. The Price site was a small village also home to two mounds, and may have integrated the Locality through religious functions such as annual or seasonal ceremonies. Cahokian Mississippian ceramic vogues and symbolism at the site suggest the acceptance of external cultural ideas, but several of these vessels, perhaps recovered from a ritual context, demonstrate local motif expression. It is suggested the Mississippian vessel form and design field were sometimes co-opted by local potters to render Cambria symbolic ideas in a local style, which included paste technology and symbolic expression. The Cambria and Price sites may have functioned as the economic and ceremonial engines, respectively, of the local community, but also integrated cultural concepts from outside the region. The Jones site was much more isolated, and probably did not initiate or receive cultural contact from outside the Locality. Interaction within the Cambria Locality most likely occurred, but on a limited and infrequent basis.

How Mississippian is it?

One of the goals of this project was to evaluate the nature and degree of the relationship between the Cambria Locality and Cahokia. Considering new data from the attribute and compositional analyses in combination with synthesized archaeological data describing the Cambria complex, the three sites in the locality are evaluated in the context of Stoltman's Culture Contact Situations.

Stoltman (1991:350) classified Cambria as part of Culture Contact Situation I, which was defined as a minority of Cahokian Mississippian-derived or inspired traits in a local cultural assemblage. Culture Contact Situation II is similar to this, but includes a greater number and diversity of American Bottom-derived or inspired cultural elements. Mississippian traits that frequently appeared in the hinterlands include platform mounds, wall-trench houses, tri-notched triangular projectile points, marine shell ornaments, and numerous Mississippian ceramic vogues, which always include vessels from the Powell/Ramey series (Stoltman 1991:350). The Cambria Locality, however, has very few of these Mississippian-derived traits. No structures of any kind, including wall trench construction, have been recognized at any of the three sites. The two mounds at the Price site were conical in shape, as were those from the adjacent Lewis Mounds complex that contained Cambria pottery. The majority of flat-topped conical mounds so often discussed in association with the Cambria phase are primarily located roughly 120 miles upriver from the Cambria Locality in Big Stone County.

The lithic and ceramic assemblages provide a bit more evidence for Cahokian-inspired traits in the form of three tri-notched triangular projectile points from the Cambria site, and local grit-tempered copies of the Powell/Ramey series from the Cambria and Price sites. Only four of these vessels were shell-tempered, however, and they do not exhibit characteristics that typically exemplify high-church Ramey Incised pottery from the American Bottom. For example, none of the Cambria jars are slipped or slipped-smudged, and only half are smudged or polished. Of the three vessels that are incised, all of them have strong interior cameos. The identifiable motifs are consistent with the Ramey Incised motif suite, though, and represent variations of the curvilinear interlocking scroll. It is suggested these vessels did not come from the American Bottom, but rather another Mississippian hinterland site, most likely from the Red Wing Locality.

Finally, there is very little evidence for marine shell or copper items, or objects made from other exotic materials like obsidian or mica. Evidence from the Cambria Locality does not support a Cahokia-dominated model of cultural interaction. As part of the discussion of Cahokia's role as a Gateway Center, Kelly (1991a) included a list of artifact types made at or primarily associated with Cahokia and American Bottom sites that often are also recovered from hinterland sites: Ramey Incised and Powell Plain jars, tri-notched triangular points, Mill Creek chert hoes and Ramey knives, chunky stones, ear spools, ceremonial spuds, and marine shell objects. In a core-periphery or prestige-goods economy these high status objects should appear in the Cambria Locality as objects received by local trading partners from their contacts in the American Bottom. However, non-local raw materials and exotic artifact styles are quite rare at all three sites.

Copper is found only at the Cambria site, and is represented by a single awl (Nickerson 1988:22). Although native copper items are known to have been produced from materials sourced in the Upper Peninsula of Michigan and on Isle Royale, copper is available also in glacial drift throughout the Midwest (Hill 2012). Marine shell is found only at the Price site; a notched object identified as *Prunum apicinum*, an import from the Gulf Coast (Anfinson 1997:102). As noted previously, nearly 95 percent of the chipped stone tools at Cambria were made from local oolitic chert and quartz/quartzite. Exotic lithic materials identified at Cambria include Knife River Flint (1.0% of the total assemblage) and a single obsidian flake (Anfinson 1997:100), but no Mill Creek chert. Also, there is no evidence within the Cambria Locality for certain artifacts in the Mississippian style, such as Ramey knives, ear spools, or chunkey stones.

Shell-tempered pottery makes up less than 2 percent of the Cambria and Price ceramic assemblages, and is not represented at the Jones site. Even if it is assumed that all the shell-tempered vessels were trade vessels from Mississippian trading partners, it does not indicate a thriving return on the investment of Cambrian individuals. In sum, it does not appear that high-status or exotic items typically associated with out-going Mississippian trade can be identified in any quantity that would signify an economic relationship with the American Bottom, be it of brief, sporadic, or continuous duration.

Johnson (1991:315-316) hypothesized that Cambria may have functioned as a major exchange node in a Cahokia-centered trade system that collected and forwarded meat and hide products from western communities to the American Bottom via the Red Wing Locality in exchange for dried comestibles. Interestingly, there is a comparatively high frequency of end/side scrapers at Cambria, perhaps indicating abundant deer or bison meat and hide production occurred at the site. The frequency of scrapers at the Price site was much lower, and suggests that significantly less hide production occurred at the site. This data contributes to the hypothesis that the Cambria site may have been the economic center of the Cambria Locality communities. Currently there is no quantifiable information for scraper frequencies from the Jones site.

Culture Contact Situation III also is focused on a minimal number of Mississippian traits in a Late Woodland context, but the Late Woodland group is not local, either. The archaeological assemblage suggests a site-unit intrusion of Late Woodland people, but also incorporates a low frequency of Mississippian traits. The Cambria and Price sites could possibly be classified as Situation III due to the minority of Mississippian influenced traits discussed previously considered in combination with the sudden appearance of a cultural group living in small nucleated villages, practicing corn horticulture, and producing pottery in a non-local style primarily characterized by tall angled rims, smooth surfaces and incised body decoration. There are very low frequencies of local Late Woodland pottery at the Cambria and Price sites, but current settlement data suggests Late Woodland groups were not living in the Minnesota River Valley at the time the Cambria Locality was settled. Certain traits from Great Oasis ceramics are clearly seen in Cambria ware, such as tall rims, smoothed and smoothed-over-cordmarked surface finish, finely incised neck decoration, and the HIP. One possibility is the people who initially settled in the Cambria Locality were descendants of Great Oasis groups who were moving northward, and becoming more reliant on horticulture. This suggestion, however, does not explain the low frequency of admixture of certain Late Woodland traits like cordmarked vessel surfaces or twisted cord impressed rim decoration on some Cambria vessels.

The Cambria culture most certainly is not classified as part of Culture Contact Situation IV, which represents Mississippian site-unit intrusions into areas formerly occupied by Late Woodland groups. These archaeological assemblages are heavily dominated by Middle Mississippian material culture, though a minority of Late Woodland traits and practices may still be present.

It is postulated that Culture Contact Situation V is the most likely scenario for the Cambria Locality.

> [It] is defined on the basis of more tenuous lines of evidence for American Bottom-hinterland interaction, primarily stylistic copying of Powell/ Ramey technology and iconography. In these sites true Powell Plain and Ramey Incised types are absent, but the presence of angular shoulders on some ceramic jars or of distinctive trailed scroll motifs, typically on non-Powell/Ramey or even on grit-tempered forms, reflect what can logically be interpreted as indirect cultural influences from American Bottom culture [Stoltman 1991:351].

The results of this project have demonstrated that the majority of rolled rim ceramics at the Cambria and Price sites are local copies of the Powell/Ramey series primarily due to the preponderance of grit-tempered jars, and the likelihood that they were manufactured from vessel pastes specific to each site. The majority of decorated vessels are adorned with curvilinear interlocking scrolls easily identifiable from the American Bottom Ramey Incised motif suite. It is suggested that emulation is the indirect cultural influence most likely represented in the Cambria Locality. Residents of the Cambria and Price sites faithfully reproduced the Mississippian ceramic vogues and motifs of the Powell/Ramey series only, which created an easily identifiable ceramic package. Perhaps this basic recognizability was one of the reasons this ceramic type was chosen for emulation. Very few other Mississippian traits, like platform mounds, wall-trench houses, or marine shell objects appear in the Locality.

Emulation of certain aspects of another society's material culture does not require that the donor culture be in control of the recipient's economic or political systems (Stein 2002). Furthermore, it should be remembered that "interaction is organized not just by core states but by the actions of all participants in the network" (Stein 2002:907), and as such, these interacting groups are heterogeneous entities. One additional factor to consider is that the emulated objects are interpreted within the borrower's cultural framework, so their original function and symbolic content may be transformed by a different cultural context (Stein 2002:908). The three Cambria Locality sites were analyzed as separate entities in order to discern if cultural functions could be identified for the sites.

Similar frequencies of rolled rim vessels Cambria and Price may indicate the vessels had similar functions at both sites. Yet, the more expansive motif suite at the Cambria site may indicate more frequent interactions with hinterland Mississippian groups. In combination with the high frequency of scrapers at the site, and the increased diversity in ceramics representative of other cultures, is it suggested that economic activities integrating multiple groups of local and regional people occurred more at the Cambria site. The Price site with its mounds may have hosted more ceremonial and ritual activities within the Cambria Locality to strengthen local relationships. Several rolled rim vessels from Price were decorated with the same set of motifs, F5 and F6, and recovered from the same pit feature. The inclusion of these specific motifs and design pattern, which are known only from the Price site, suggests local symbolic knowledge was utilized. It is possible rolled rim vessels played a similar role at both sites in ceremonies designed to maintain social relationships.

The ceramic evidence also points to distinctions in the different types of communities outlined by Ruby, et al (2005). Three separate residential communities are delineated within the Cambria Locality, not only by the space between each village, but by the distinct differences identified in the lip and rim decoration for each site. Since residential communities are "*both people and place* (emphasis in original) (Ruby, et al. 2005:123)", it is suggested that a community identity is being reflected in the site-specific lip and decoration patterns of each site. Furthermore, separate historical trajectories may also be represented. For example, the increased frequency of tool impressed rim decoration at the Jones site may be linked to later temporal ceramic trends, while the greater diversity of decorative techniques at the Cambria site may be indicative of a longer occupation sequence and more frequent and continuous extra-local cultural contact.

The four major body design program of the Cambria Locality suggest the presence of a local symbolic community, or perhaps multiple local symbolic communities. The barred triangle motif represented by Body Design Program 3 has been identified at all three sites, in addition to the unique intermittent cross-hatched neck decoration. These patterns have not been identified outside the Cambria Locality. Other motifs identified on multiple vessels at only one or two of the Cambria Locality sites include variations of the track motif (Category J), the horned nested arc (Motif B3), and the hachured hooked line motifs (Motifs F5 and F6). A local symbolic community is geographically restricted, and the typical boundaries for regular foot travel for less agriculturally intensive communities are between seven and eight kilometers (4-5 miles) (Ruby et al 2005:124). These three sites in the Cambria Locality span approximately four miles along the Minnesota River, and would have been within the time and energy constraints of a day's walk from one another.

Two of the other major body design programs may be part of broader symbolic communities known across the Upper Midwest. Symbolic communities are social groups that crosscut residential units, and are characterized by symbols used to identify and negotiate memberships for economic, political, religious or other social purposes (Ruby et al 2005:123 from Charles 1995). The curvilinear motifs associated with the Ramey-like vessels certainly link the Cambria Locality with other northern hinterland Mississippian sites and the American Bottom. However, the differing scales of social complexity demonstrated by this diverse group of sites, as well as their unique local historical trajectories, begs several questions. Do the curvilinear motifs have the same symbolic meanings at each site? Is the pottery used in the same way at each site? If the symbolic meaning of the same motifs differs between Cambria and Cahokia, are they still part of the same symbolic community? It is suggested that the purposeful emulation of the Powell/Ramey package, which includes morphology, dark vessel surfaces, and polishing, as well as a high frequency of curvilinear motifs, was an effort made by Cambria and Price potters to access an aspect of Mississippian culture that was both attractive and useful to the culture of the Cambria Locality. The increased reliance on maize that emerged as part of the Cambria culture could have popularized ideas and symbols related to fecundity. Previous discussion focused on the possible association between curvilinear motifs, the Mississippian Underworld and fertility symbolism. As a result, perhaps the curvilinear motifs and rolled rim vessels were incorporated into Cambria culture as part of a package related to the fertility and agriculture.

Another symbolic community may be represented by Body Design Program 2, the lineate-chevron pattern. Similar patterns, some with arcs instead of chevrons, have been identified at other northern hinterland sites. A previous study conducted by the author identified a northern hinterland design field for Ramey Incised pottery at the Aztalan site, and the John Chapman and Lundy sites in the Apple River Locality (Mollerud 2005). In contrast to the quadripartite Mississippian design field the northern hinterland expression continually encircled the vessel, and filled the entire inslanting portion of the upper vessel body, from shoulder to rim. Although these similar design patterns were not identified on Ramey Incised jars in the Cambria Locality, the identification of these similar patterns broadens the regional scope of this design.

These symbolic communities may have analogs in southeastern Wisconsin during Oneota times. Schneider's (2015) recent analysis of a series of Oneota sites and associated ceramic assemblages has identified a number of economically autonomous localities linked together by varying degrees of interaction. Schneider argues that although each locality's ceramics are easily differentiated from one another, there is an overall similarity in vessel morphology and some design elements suggesting that Oneota pottery was produced from a basic shared template. Some of those similarities, like curvilinear scroll motifs and shell tempering, may have ultimately been derived from influences originating in the Cahokia-American Bottom area, but Schneider argues that southeastern Wisconsin is well outside the direct influence of a Cahokia Core.

Settlement and Mobility in the Driftless Area

Recent research in the Driftless Area of the Upper Midwest has yielded a model for the cultural transformation from hunting-gathering to agriculturally-based societies in the region, which occurred circa AD 950-1150. Theler and Boszhardt (2006) argue that circa AD 950 the Driftless Area became a packed landscape, where both the interior river drainages and the main channel of the Mississippi River were occupied year-round. As a result, the seasonal round of the hunter-gatherers living in the area was disrupted, which created a scarcity of resources, particularly deer and firewood, due to collecting them in such a locally intensified manner. Into this already crowded region, it appears Mississippian immigrants from Cahokia settled near Trempealeau, Wisconsin, where they established several site complexes including a possible multiple mound and causeway complex interpreted as a Cahokian shrine (Benden 2004; Green and Rodell 1994; Pauketat, et al. 2015; Stoltman, et al. 2008). The Mississippian entrada into the Upper Minnesota River Valley (UMRV) is supported by exotic raw materials and artifact styles consistent with the Emergent and Early Mississippian Edelhardt and Lohmann phases (AD 1000-1100), as well as a suite of radiocarbon assays from the Fisher Mounds and Trempealeau Site Complexes that date the occupations from roughly AD 1030-1100, spanning the later Edelhardt phase and all of the Lohmann phase at Cahokia (Benden 2004; Green and Rodell 1994; Pauketat, et al. 2015; Stoltman, et al. 2008). By AD 1050, the Late Woodland Effigy Mound culture had disappeared from nearly the entirety of the Driftless Area, and two palisaded horticultural villages with ties to the northern expansion of Middle Mississippian culture emerged on the bluffs of the Mississippi River in the southern portion of the Driftless Area. The ceramic complexes from both the Fred Edwards and Hartley Fort sites are described as representing:

> an amalgamation of groups exhibiting ties to Woodland producers of complex cord-impressed wares from the south (Canton ware) and possibly remnant Madison ware from the Driftless Area, collared wares (e.g., Aztalan and Starved Rock) to the east, the Mill Creek culture to the west, and Mississippian societies in the American Bottom [Theler and Boszhardt 2006: 463].

Clearly, the cultural histories of the sites' occupants are varied and most likely multi-regional. However, while there is evidence for early Cahokian interaction with multiple communities in the UMRV, there is no evidence that interaction extended to the Cambria Locality. The final stage of this cultural transition began circa AD 1150, as the two villages faded from the landscape, and populations started to congregate at two separate localities at either end of the Driftless Area: Red Wing in the north and Apple River in the south. Between AD 1150-1250, the Oneota established a new seasonal round that included clustered agricultural villages in the summer, and winter bison hunts in the west.

Migration from Cahokia or possibly the central Illinois River Valley also has been posited as the impetus for development of local Mississippian communities in the Apple River Locality, which is situated within the Driftless Area of extreme northwestern Illinois (Emerson, et al. 2007; Emerson 1991a). Mississippian immigrants settled in an area already occupied by indigenous Woodland people circa AD 1100 (Emerson, et al. 2007:103), in concert with the onset of the Stirling phase at Cahokia, which is nearly two generations later than the probable early Mississippian entrada into the UMRV. Two Apple River sites, John Chapman and Lundy, demonstrate ceramic assemblages with an admixture of Late Woodland and Mississippian vessel attributes. The production of this hybrid material culture physically exemplified the blending of two cultural traditions, as well as the creation of a new and unique local cultural identity that could be glimpsed through the Apple River culture complex (Millhouse 2012:9). In this model, external influences provide a basis for local development that over time will likely produce unique regional cultural trajectories (Emerson 1991b), as has been demonstrated by the variant cultural expressions that characterize other northern Mississippian hinterland sites and localities such as at Aztalan (Goldstein and Richards 1991; Richards 1992, 2003) the Lower Illinois River Valley (Delaney-Rivera 2004; Farnsworth, et al. 1991), Central Illinois River Valley (Conrad 1991; Harn 1991), Red Wing-Diamond Bluff (Gibbon 1991; Gibbon and Dobbs 1991; Holley 2008; Rodell 1991, 1997), and Mill Creek (Tiffany 1991a, b). Due to its geographical location, Apple River may be a more plausible donor society to the Cambria Locality than either the American Bottom or central Illinois River Valley.

As outlined by Theler and Boszhardt, the chronology of the cultural transformation in the Driftless Area may have implications for the Cambria Locality. If the landscape in this region was packed by AD 950, and largely abandoned by AD 1050 it is possible that some of the groups may have moved westward into the Cambria Locality. Similar to the Fred Edwards and Hartley Fort sites, the Cambria Locality sites also appear to be home to groups of people exhibiting ties to different cultural and geographical regions including Late Woodland, Mill Creek and Mississippian. The sites also demonstrate evidence for corn horticulture, large and deep storage pits, and at the Cambria site, an intensive village occupation. Furthermore, the Cambria economy also included deer, some bison, and varied riverine resources.

As discussed previously, the radiocarbon chronology has been refined for the Price and Jones sites. Typically, the Cambria phase is dated from AD 1000-1300, but the more refined chronology utilizing the new assays from the two smaller village sites demonstrates a bimodal distribution roughly dating to AD 1150-1225 and AD 1250-1300. Previous assays from the Cambria and Price sites, however, indicate occupation by AD 1050, and two assays from the new radiocarbon series date both the Price and Jones sites to around AD 1050. These dates coincide with a hypothesized diaspora from the Driftless Area, which was virtually depopulated by AD 1050.

Coincident with the settlement reorganization and establishment of two multicultural villages at the southern end of the Driftless Area was the possible initial settlement of all three sites in the Cambria Locality circa AD 1050. Occupation may have intensified within the Cambria Locality around AD 1150. One possibility may be an immigration of Terminal Late

Woodland groups living in the Red Wing Locality that brought with them the mental template for the Ramey/Powell package.

Grit-tempered ceramics in small numbers are known from all cultural phases in the Red Wing Locality, but are associated most frequently with the Silvernale phase (AD 1125-1175) (Holley 2008:Table 6). Cambria-affiliated ceramic wares are reported from the Silvernale site (Wilford 1955:140), and rolled rim vessels are the most common form of grit-tempered jar type at the Bryan site (Holley 2008:Table 12). The grit-tempered rolled rim jars found at both the Red Wing and Cambria Localities provide the main link between the two sub-regional cultural complexes because the majority high-necked ceramic types at Cambria, Linden Everted and Mankato Incised, are not represented at Red Wing (Holley 2008:16).

Certain aspects of the Cambria ceramic assemblage are evident in the grit-tempered ceramics from Red Wing. Holley (2008:8,16) notes the presence of well-defined necked jars at Red Wing, as well as a strong interior cameo associated with rolled rim vessel bodies at both Localities. Additional Silvernale traits at Cambria may include a focus on the hachured scroll in the curvilinear motif suite, as well as the high percentage of body incising. During the Silvernale phase at Red Wing, over 90 percent of all jars were incised (Holley 2008: 27). The frequency of incising is slightly lower at the Cambria Locality, where it occurs on approximately 70 percent of vessel surfaces at all three sites. Finally, the Red Wing grit-tempered assemblage is quite diverse in both rim and vessel shape, as well as decoration (Holley 2008:14-16). Vessel forms at Red Wing include a seed jar, the inslanted Ramey-like jars, and vessel forms with short necks ranging from well-defined to gradually-curved. Rim forms consist of unmodified, everted, modified or thickened, rolled, faceted, and T-shaped. Decoration includes tool impressions on both the exterior and interior rims, crosshatched lips, and twisted cord impressions on the neck and rim.

This overall variation in jar morphology and lip/rim decoration is most certainly a characteristic of pottery recovered from the Cambria Locality. Holley (2008:2) tentatively identified the grit-tempered assemblage from Red Wing as Terminal Late Woodland.

The Late Woodland pottery of the Driftless Area of the Upper Mississippi River Valley circa AD 1000 typically includes Madison Ware, as well as two collared wares, Aztalan and Point Sauble. Madison Cord Impressed and Madison Fabric Impressed are the dominant Madison Ware types in this region. Twisted cord impressed decoration is evident at both the Price and Cambria sites, but not with the Late Woodland rim sherds identified from each site. There is a disconnect with this model, in that the Effigy Mound people who left the Driftless Area did not arrive in the Cambria Locality making similar cord impressed wares. Numerous similarities can be traced between Great Oasis pottery and Cambria ceramics, including smooth vessels surfaces, globular bodies, both tall angled rims and short stubby rims, crosshatched lips, fine incised neck decoration, and HIP body decoration. Based on geographic boundaries and temporal overlap, the Great Oasis culture may be a more fruitful source for Cambria origins.

There is sparse data in the form of one biodistance study based on dental morphology that suggests biological continuity between Kathio Late Woodland, Effigy Mound, and Big Stone groups in southern Minnesota (Scherer 1998). Kathio complex ceramics are typically found in central Minnesota, and date from AD 800-1300 (Gibbon 2012: Figure 1.2). The Effigy Mound cultural manifestation in Minnesota is restricted to southeastern Minnesota, and sites of the Big Stone phase (AD 1200-1300) are clustered around Big Stone Lake and Lake Traverse at the Minnesota-South Dakota border. The possibility of biocontinuity linking these groups also indicates mobility through time, as people moved from the center of the state southward, and laterally across the southern half of the state from east to west. Groups leaving the Driftless Area or the Red Wing Locality and settling at Cambria may represent a similar pattern of local westward migration sometime after AD 1050.

The Minnesota River valley just west of the big bend at Mankato may have been an area where people escaping the packed landscape of southeastern Minnesota could have moved. Located in a prairie landscape just west of the forest biome and within the floodplain of the Minnesota River valley, the sites in the Cambria Locality are well situated to take advantage of prairie, forest, and riverine resources. Furthermore, the floodplain soils would have been beneficial for groups relying more and more on corn horticulture. Perhaps most importantly, this area of the Minnesota River valley seems to have been sparsely occupied immediately preceding the establishment of the sites forming the Cambria Locality.

Late Woodland sites in Blue Earth County are scarce. Anfinson (1997: Figure 36) does not report any Late Woodland Lake Benton phase (AD 700-1200) sites in Blue Earth County, and only three of these sites were identified in the adjacent counties to the west and northwest. Great Oasis sites are primarily restricted to the shallow prairie lakes in southwestern Minnesota (Anfinson 2007:95), and have not been identified within the Minnesota River trench (Anfinson 2007: Figure 42). The Minnesota State Historic Preservation Office lists a total of 63 Woodland sites in Blue Earth County, but only nine sites are recorded specifically as Late Woodland. Adjacent counties bordering the Minnesota River immediately to the north, northeast and northwest all have less than ten recorded Late Woodland sites, with some counties as low as one or two Late Woodland sites total. The low frequency of Late Woodland sites in the Minnesota River valley could be due to sampling bias, as no surveys have focused on the Minnesota River trench or upland terraces as a whole (Bruce Koenen, personal communication). However, fieldwork is currently underway on a systematic survey project for the entirety of the Minnesota

River trench that was funded through Minnesota's Clean Water, Land and Legacy Amendment. As of May 2015 only minimal survey work had been conducted in the upper portion of the trench, resulting in a flake findspot, along with some coring of alluvial fans to detect buried soils (Bruce Koenen, personal communication). Results and the report of fieldwork are not expected until the winter of 2016.

Yet, some survey corridors have intersected portions of the Minnesota River valley as part of other projects (e.g. Holley, et al. 2011; Schirmer, et al. 2014). As part of an archaeological survey of Swift County supported by Minnesota's Clean Water, Land and Legacy Amendment, the author conducted a surface survey of a small area (156 acres) adjacent to the Minnesota River in the southwestern corner of the county (Holley, et al. 2011). Four prehistoric sites were identified on the sideslope margins of the Minnesota River, as well as one tightly clustered historic scatter. All four sites were diffuse lithic scatters where no pottery was recovered. Although one site (21SW27) is believed to have a Late Woodland/Late Prehistoric occupation, no Cambria complex sites were definitively identified near the Minnesota River in Swift County.

However, pottery was recovered from several other site locations throughout the county. Sherds broadly consistent with Cambria ceramics- grit-temper, smooth surfaces, rounded to angular shoulders, plain and tool impressed rims, broad body incising- are associated with at least two sites in Swift County (Holley, et al. 2011). One of them is the Pomme de Terre Village and Mound Complex (21SW5), which contained a total of six conical mounds. Reportedly nearby was one flat-topped mound (Winchell 1911:202). No rolled rims or curvilinear motifs were identified in the Swift County ceramic collections. These Late Prehistoric sites in Swift

County are interpreted as marginal participants in the Cambria phenomenon due to the minority of Cambria traits in the ceramic assemblage (Holley, et al. 2011:97-98).

In addition, a recent survey of neighboring Le Sueur County- located immediately northeast of Blue Earth County and bordering the Minnesota River to the east- provided sorely needed settlement data for a poorly known area in southern Minnesota. Fifty new archaeological sites were identified, spanning nearly every major cultural period from Late Paleoindian through Terminal Late Woodland (Schirmer, et al. 2014).

Eleven of the newly identified sites are recorded as having Terminal/Late Woodland components. When the survey results are combined with previously known site data from the county, there are a total of 40 sites classified as Woodland; eighteen of them have Late/Terminal Woodland components (Schirmer, et al. 2014:176). However, only one of these sites is located within the Minnesota River valley or on upland terraces, as the majority of Late Woodland sites are located in the southern and eastern portions of the county in lacustrine environments (Schirmer, et al. 2014:Figure 156). Although never surveyed as a whole unit, the Minnesota River valley and adjacent uplands have been the focus of most of the archaeological work done in LeSueur County (Schirmer, et al. 2014:9). Sample bias may still be a factor, but due to the relatively widespread survey coverage given the river valley, the dearth of Late Woodland archaeological sites in that area also could be explained by a preference for lacustrine settlement locations.

In addition to the survey, archaeological collections from previously identified sites were reviewed for diagnostics. New cultural components were identified at two sites via pottery examination that were consistent with smoothed and burnished Cambria ware, and shell-tempered Oneota ceramics (Schirmer, et al. 2014:176). Although only represented by one burnished sherd, Site 21LE20 is the only site in LeSueur County with possible Cambria ceramics; it is located on a lake in relative close proximity to the Minnesota River (Schirmer, et al. 2014:48). These two sites represent the only Plains Village and Oneota sites in Le Sueur County, and expand the breadth of cultural occupation in the county.

The survey data from Le Sueur County is intended to highlight both the quantitative and qualitative information that can be obtained from systematic survey as a contribution to the regional settlement pattern. It is meant to inform the settlement data from neighboring Blue Earth County, but due to differences in overall survey coverage between the two counties, is not necessarily suitable for direct comparison or contrast.

Summary

This project utilized ceramic and compositional analyses to address questions about local and regional interaction patterns in southern Minnesota and the Upper Midwest. A statistical analysis of morphological, technical and decorative attributes demonstrated that there are significant differences between the sites regarding rim decoration and to a lesser extent, motif expression. It is hypothesized that the lip and rim decoration zones were reserved for more individual or local expression, or possibly were areas where potters experimented with different tools, techniques or patterns. Incised body decoration, however, was much more uniform, and the majority of motif patterns can be divided into four body design programs. It is suggested that these major design programs were used to knit the sites together into a local symbolic community. However, some of the designs can be linked to other regions, indicating the presence of larger symbolic communities in the Upper Midwest.

A specific component of this project focuses on the grit-tempered, rolled rim Powell/Ramey-like vessels in order to determine the range of variation within the Cambria assemblage, particularly regarding motif expression, and to investigate how similar Cambria Ramey-like pottery is to the Cahokian ideal. A detailed analysis of these vessels indicates they are faithful replicas of the Mississippian ware made with local grit-tempered pastes, but a few technical differences were noted. The majority of curvilinear motifs in the Cambria Locality are associated with the rolled rim jars, although a few regionally unique motifs were depicted, as well. The style and message-bearing function of Ramey Incised pottery seems to have arrived in south-central Minnesota intact, but the role of the pottery and meaning of those messages most likely differs between regional hinterland sites.

Compositional analysis through energy dispersive X-ray fluorescence was employed to identify and compare the elemental makeup of pottery from each site, as well as specific ceramic types (e.g. rolled rims or S-rims). Two basic research questions were asked: 1) do the samples separate out by site; 2) and, do the samples separate out by type? Different clusters by site would signify that each site was utilizing a unique paste recipe. Different clusters by type would signify that specific types were being made at a certain site, and then circulated to the other sites most likely via direct contact.

The results of the compositional analysis suggest two major vessel groupings separated by site: Cambria and Price/Jones. ANOVA tests determined that the chemical composition of vessels from each site group is significantly different. However, Price and Jones vessels share more compositional similarities with one another than with ceramics from the Cambria site. It is suggested that at least two different clay sources were being utilized in the Cambria Locality, one by potters from the Cambria site, and another by potters from the Price and Jones sites. The results of the robust principle component analysis indicate Cambria and Price site pottery is represented by two distinct and relatively uniform paste recipes specific to each site. However, the Jones site sample was split into two groups, suggesting the possibility that Jones vessels were made from two different paste recipes. One explanation for this may be that paste recipes for Jones site pottery changed around AD 1200, as part of a suite of factors related to a possible habitation cycle of site abandonment and reoccupation suggested by the radiocarbon data.

This dissertation also integrated new radiocarbon assays, fieldwork data, and ceramic analyses from other sites in southern Minnesota to help situate the three Cambria sites temporally and culturally. It is argued that the three sites of the Cambria Locality probably were initially occupied contemporaneously by related groups of people who moved into either a sparsely populated or unoccupied portion of the Minnesota River Valley that was suitable for growing large amounts of corn. Residents of the sites most likely came from within the region circa AD 1050, particularly Great Oasis-descended groups from the south, and Effigy Mound and Red Wing related people from the Driftless Area located to the east. Approximately 100 years later, around AD 1150, settlement may have intensified within the Locality, and the Jones site was established as a budded village from Cambria, Price or both. Although Mississippian influence is evident in the rolled rim modal type, emulation is the most likely mode of cultural interaction.

The theoretical framework informing this interpretation is a composite model constructed from intersecting facets of world systems theory, the internal frontier and nested concepts of community. The recognition of core-periphery relationships as nesting and varied promotes a bottom-up explanation of cultural interaction capable of demonstrating the multiple roles a single site may inhabit in a regional context (Jeske 1999). For example, the Cambria site is interpreted as the core of interaction for the Cambria Locality, but a more peripheral participant in far-reaching regional exchange networks, such as at Red Wing. Furthermore, it is proposed that different types of communities are built into and cross-cut these shifting webs of core-periphery relationships. A frequent archaeological correlate for a residential community, which is characterized by patterned and repetitive face-to-face interactions, is the archaeological site, particularly if that site appears to be a small, nucleated village settlement.

The attribute analysis highlighted different decorative trends between the sites, which reflect the routinized choices made by the potters at each site. For example, Jones vessels have the highest frequency of lip/rim decoration, while pottery from the Price site has the lowest percentage of overall rim decoration. These patterns contribute to the interpretation of each site as a separate residential community. The results of the motif analysis, however, identified four body design programs frequently utilized in the Cambria Locality. Potters from all three sites decorated vessels with the HIP and diagonal barred triangle patterns, while all four body design programs were employed at the Cambria and Price sites. The expression of multiple body design programs at the three sites most likely indicates the residents of the Cambria Locality shared certain symbolic ideas, and that the three sites together constituted a local symbolic community. Furthermore, the lineate-chevron and curvilinear design programs have been recognized at other northern hinterland and Mississippian sites in the Eastern Woodlands, suggesting participation in, or at least awareness of, other broader symbolic communities across the Upper Midwest.

The Cambria Locality sites were interacting with one another in both practical and symbolic ways. However, they were also part of a much larger regional theatre of interacting symbolic communities that were structuring an internal frontier in southern Minnesota. Several interrelated features of the internal frontier model are applicable to the Cambria Locality and late prehistoric southern Minnesota. The primary feature is an available geographic expanse into which a group can move. Other main traits include movement in groups and similar cultural backgrounds. As noted previously, the sites of the Cambria Locality were established along a stretch of the Minnesota River with sparse evidence of Late Woodland settlement. The apparent abrupt appearance of small farming villages with smoothed and incised pottery is evidence of an in-migration of a large enough group of people to populate two small settlements contemporaneously. Also noted previously, are similarities between certain Great Oasis ceramic traits and Cambria ware, as well as the emulation of the Powell Plain and Ramey Incised Mississippian ceramic types. It is argued that the group (or groups) of people who established the Cambria occupation were from the greater southern Minnesota region, and could have included Great Oasis-related peoples from the south, or been part of a western migration from the Driftless Area. Through the identification of motif suites and body design patterns, specifically the incised HIP and cord impressed rectilinear triangular and chevron patterns, both of these culture areas demonstrate possible links as symbolic communities with the Cambria Locality. The related religious and symbolic communities of these southern Minnesota culture groups would have facilitated their settlement and integration, as they may have already been known to each other. On the other hand, similar, albeit greatly attenuated community building processes may have been operating at Cambria analogous to those documented in the American Bottom (Alt 2012; Emerson and Hedman 2015; Slater, et al. 2014) and the Fort Ancient area (Cook and Price 2015; Cook and Schurr 2009) or suggested for the Aztalan site (Price, et al. 2007; Schroeder and Goldstein 2015; Zych 2013. If so, the ethnic composition of the Cambria site may have been far more diverse than suggested by the ceramic assemblage alone.

Future Research

The results of this research, and related ideas and issues discussed foster numerous avenues for further research. Two topics are linked to compositional analysis. First, Nickerson (1988:8) proposed that a possible clay source for Cambria pottery was located in the creek outwash at the south base of the terrace. A comparison of Cambria Locality pottery with clay samples taken from the micro-region, including Nickerson's proposed clay source, could possibly provide more detailed information about how people and communities in the Cambria Locality utilized and negotiated clay-based resources in their environment.

Second, ceramic petrography or thin-section analysis, which uses mineralogical properties to characterize ceramic pastes, has been used successfully at northern Mississippian hinterland sites to differentiate ceramic pastes of locally-made from American Bottom produced Mississippian vogues (Stoltman 1991; Stoltman, et al. 2008). This has facilitated discussions of northern Mississippian migration and cultural interaction. Recent ceramic analyses from the Upper Midwest have used these techniques in tandem to address questions of cultural and community interaction for societies demonstrating different economic and socio-political organizations (Clauter 2012; Schneider 2015). A petrographic analysis of pottery from sites in the Cambria Locality could lend further support to the findings of this analysis, or provide new data for modeling interaction between the three sites. In addition, possible comparisons of Cambria Locality pottery with ceramics from other regions, particularly Red Wing or the American Bottom, would inform discussions of cultural interaction, particularly topics related to economic exchange, at a regional level.

Another avenue for future research involves further refinement of the ceramic series at the Price and Jones sites. Radiocarbon assays produced a bimodal distribution at both sites, possibly indicating two successive occupations at each site. There is sufficient provenience and feature data recorded from the Price site to test for different temporal occupations within the ceramic assemblage; the first cluster dates to approximately AD 1150-1220, and the second cluster from AD 1220-1280. The Jones site was also excavated with recorded provenience information, but the subsequent loss of the artifact catalog has relegated much of the pottery to unknown provenience. Ceramics were recorded from at least five features at the Jones site, which may have produced enough cultural material to identify possible temporal trends in the data. A fine-grained analysis of lithics and identification of lithic materials from the Price and Jones site is also recommended, as is a re-analysis of the chipped stone material from the Cambria site. Newer material identification and comparative analytic techniques may provide a better understanding of the range of variation for the lithic material utilized in the Cambria Locality.

Motif and attribute analyses of Ramey Incised and Ramey-like pottery have identified the range of variation for this ceramic type at the sites of Aztalan, John Chapman and Lundy in the Apple River region of northwestern Illinois, and the Cambria Locality in the northern hinterlands, as well as at Cahokia. New motif types and categories were identified, as were differences in rim morphology, and surface treatment and finish. Furthermore, a different design field was recognized in the hinterlands that utilized the entire area of the vessel between rim and shoulders, and lacked quadripartite organization. The Mill Creek culture ceramic assemblages of northwestern Iowa also contain grit- and shell-tempered vessels consistent with the Ramey/Powell series, and a similarly designed motif and attribute analysis of Ramey Incised pottery from Mill Creek sites would most likely add to the hinterland motif suite, and identify ceramic variation within a new hinterland region. The results would contribute to a discussion of symbolic knowledge and expression of world view at another group of sites associated with both the Mississippian and Middle Missouri Traditions, as well as inform on the frequency and intensity of cultural interaction with other hinterland sites and Cahokia.

Now that the range of variation has been identified for the Cambria Locality ceramic assemblage, creating a baseline, comparative analyses with ceramic assemblages from other sites typically associated with the Cambria phase are called for. The re-analysis of the Gillingham and Gautefald sites by Holley and Michlovic (2013) suggests a focus on rim and neck morphology and decoration, as well as shoulder decoration could be fruitful. For example, the shoulder decoration at these two sites sometimes is characterized by border fringe just above the shoulder in the form of large jags or hash marks. This is a broader and less controlled form of border decoration than what is associated with Body Design Program 3, and may represent a different design trajectory than the Oneota feel of the Jones site. Ceramic assemblages from other possible Cambria phase sites suggested for assessment are Saienga (21CP2) and Harbo Hill (21BE10), both of which are located on the Minnesota River.

Finally, it is suggested that more comprehensive survey work should be undertaken in the Minnesota River valley, especially to the areas northwest of the Cambria Locality, and following the river northward past the big bend at Mankato. The DM & E railroad survey demonstrates the utility of a survey focused on a waterway, as five sites new sites were identified along a limited portion of the Minnesota River between New Ulm and Mankato. At least two of these sites exhibit material culture consistent with the Cambria complex, indicating an extension of the Cambria Locality a few miles to the southeast. A similarly focused survey should be considered for the approximate eight mile stretch of the Minnesota River between Judson and Mankato, as well.

This project has successfully identified variation within the ceramic assemblages of the Cambria Locality, and identified differences at the site level in lip and rim decoration patterns. These patterns were related to choices made by potters possibly identifying personal or lineage markers, which when combined also identified a residential community. Four major body design programs were also identified, which were linked to both local symbolic communities, and broad Upper Midwestern cosmologies. The grit-tempered rolled rim vessels were discussed as emulations in the context of interregional interaction, but local experimentation in the form of unique motifs was identified, also. Finally, compositional analysis suggested that the diverse range of ceramic wares in the Cambria Locality were made locally at each site. Probable separate paste recipes were noted for each site. The Jones site possibly had vessels made from two different paste recipes, possibly based on temporal differences as reflected by the bimodal distribution of radiocarbon dates.

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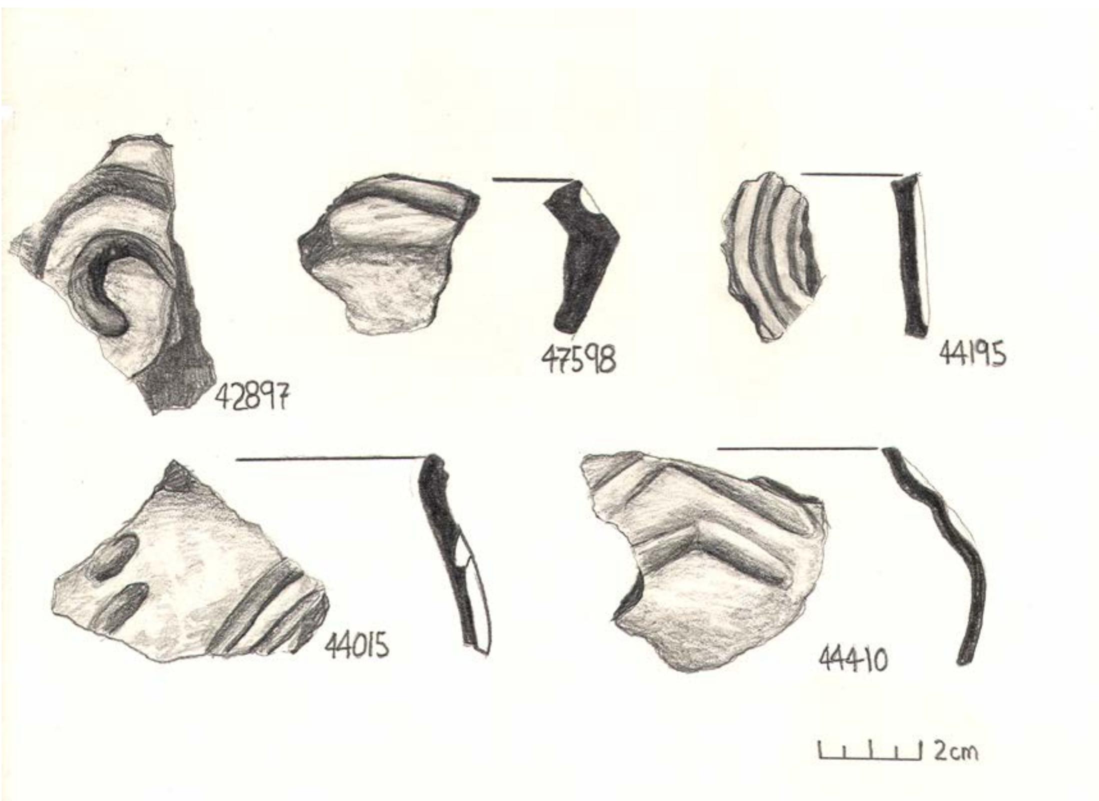
APPENDIX A:

Vessel Profiles and Photographs by Site

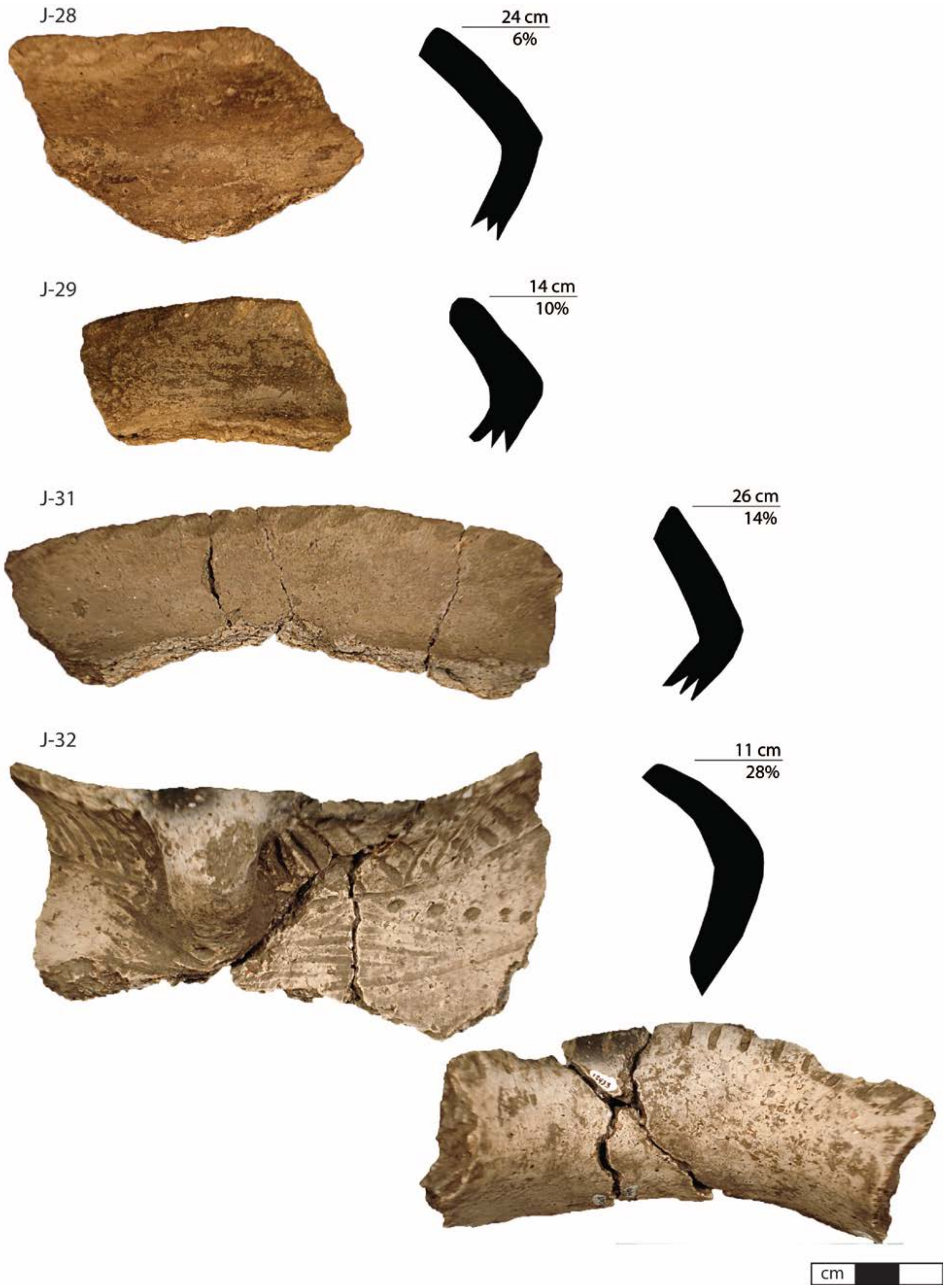
Viewing Notes

1. Profiles and plan views of Price and Jones site rim sherds include all analyzed vessels.
2. Profiles and plan views of Cambria site sherds include a representative sample of analyzed Cambria vessels. Illustrations of Cambria rimsherds not included in the sample are available from the author or from the University of Wisconsin-Milwaukee Archaeological Research Laboratory.
3. Exterior views are on the left, decorated interior or lip views are on the right, unless otherwise noted.
4. Vessel numbers correspond with ceramic data located in Appendix D.



Price site body sherds. Illustrations by Jill Stoffgren.

Jones Site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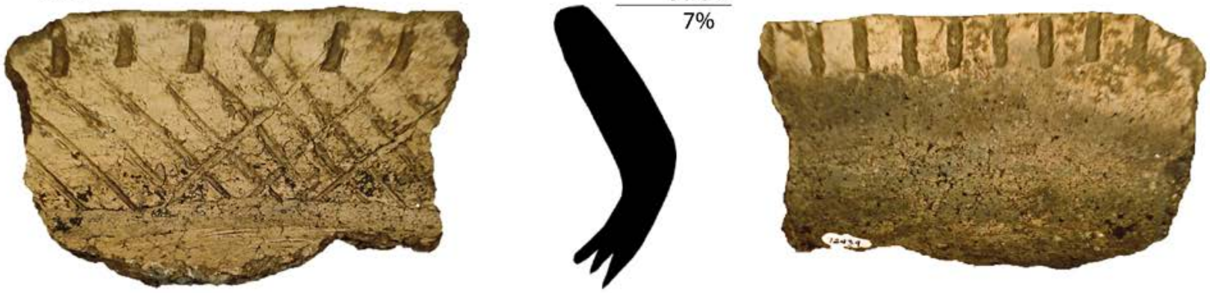
24 cm
6%
J-29
14 cm
10%
J-31
26 cm
14%
J-32
11 cm
28%
cm

J-33



J-34

J-35

J-36

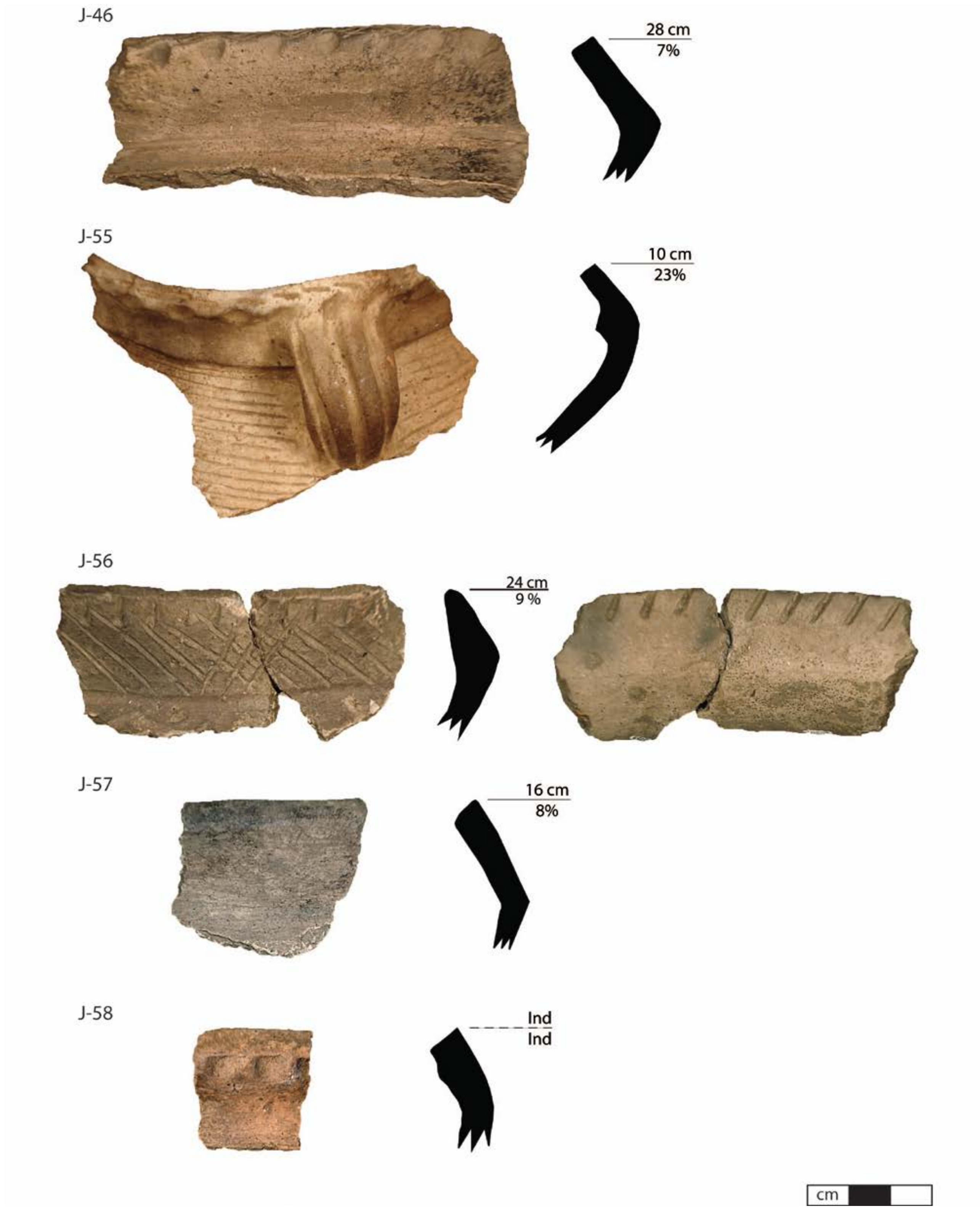
J-38

J-39

J-42

J-44

J-45


J-46
28 cm
7%
J-55
10 cm
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J-56
24 cm
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J-57
16 cm
8%
J-58
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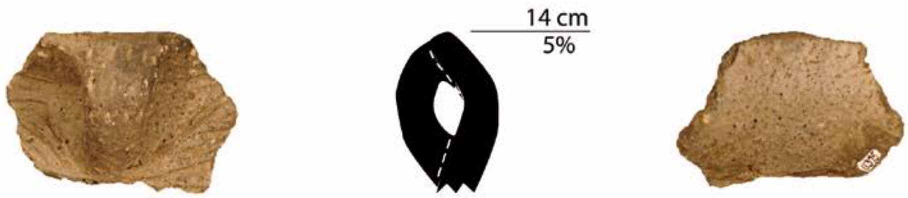
Ind
cm

J-59

J-60



J-61

J-62

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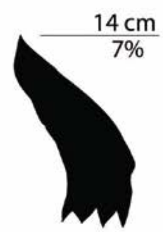
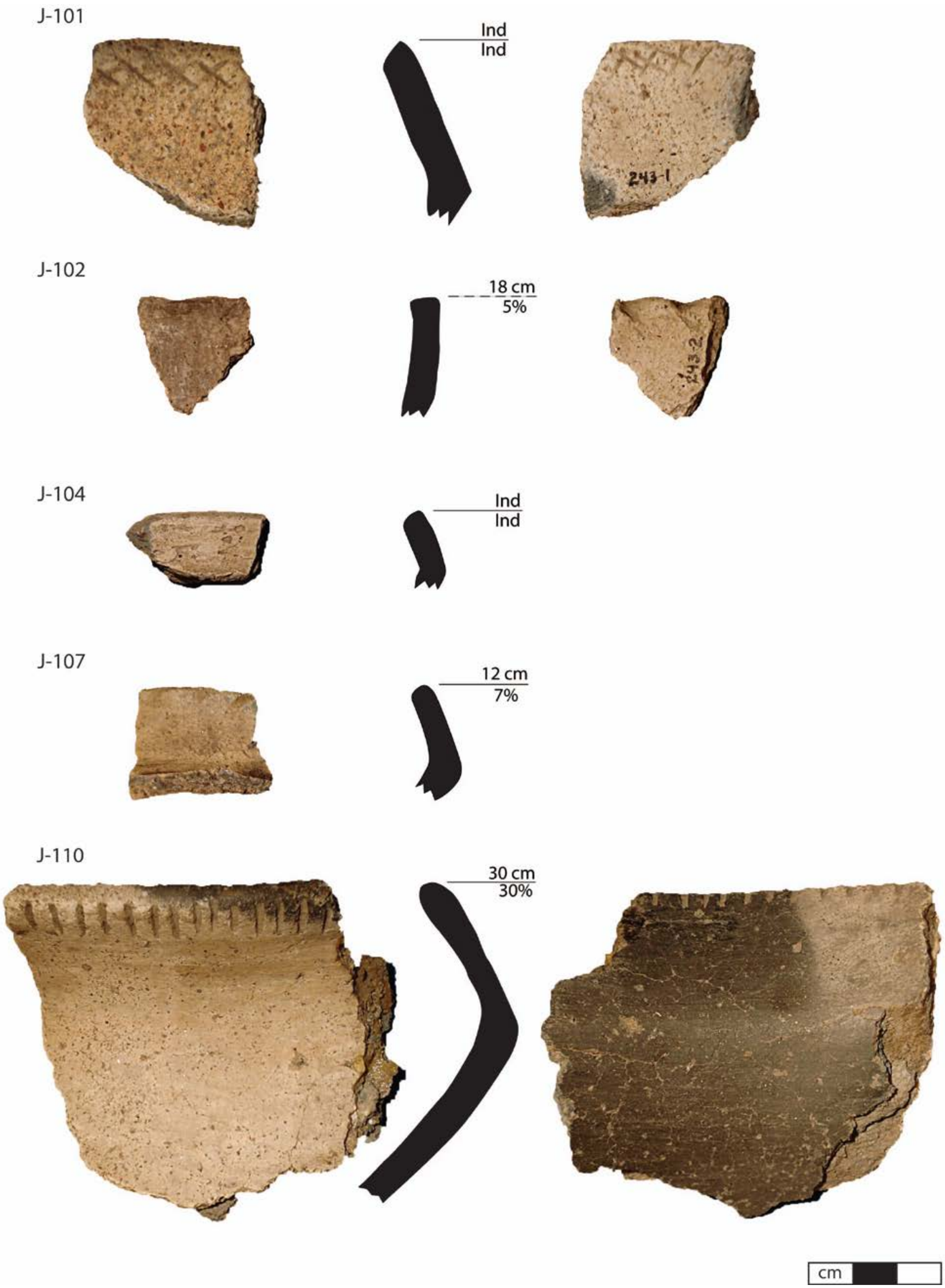


J-63

J-100

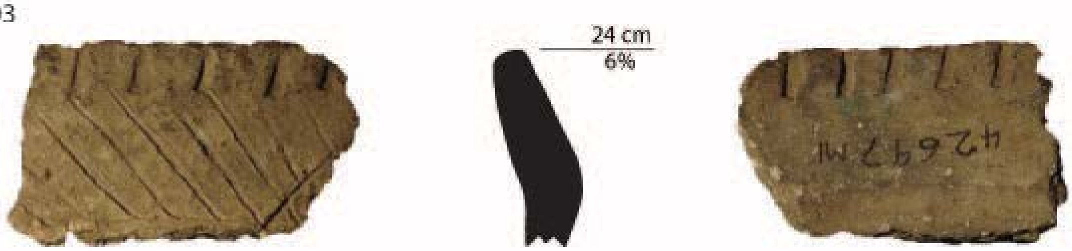

J-101
Ind
Ind
J-102
18 cm
5%
J-104
Ind
Ind
J-107
12 cm
7%
J-110
30 cm
30%
cm

Price Site

P-01

P-02

P-03



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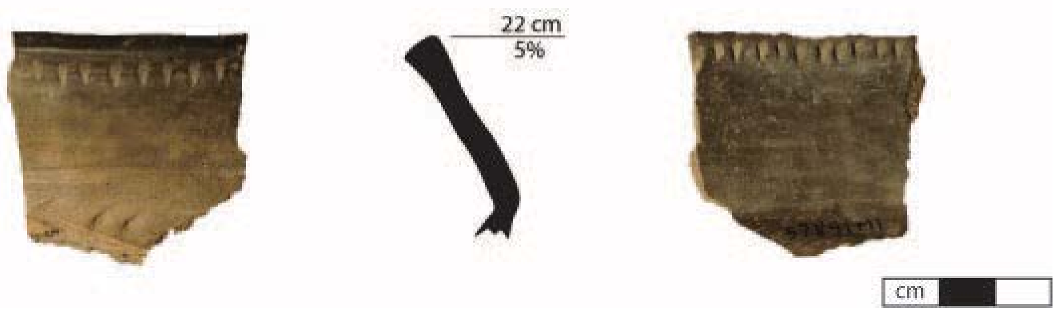
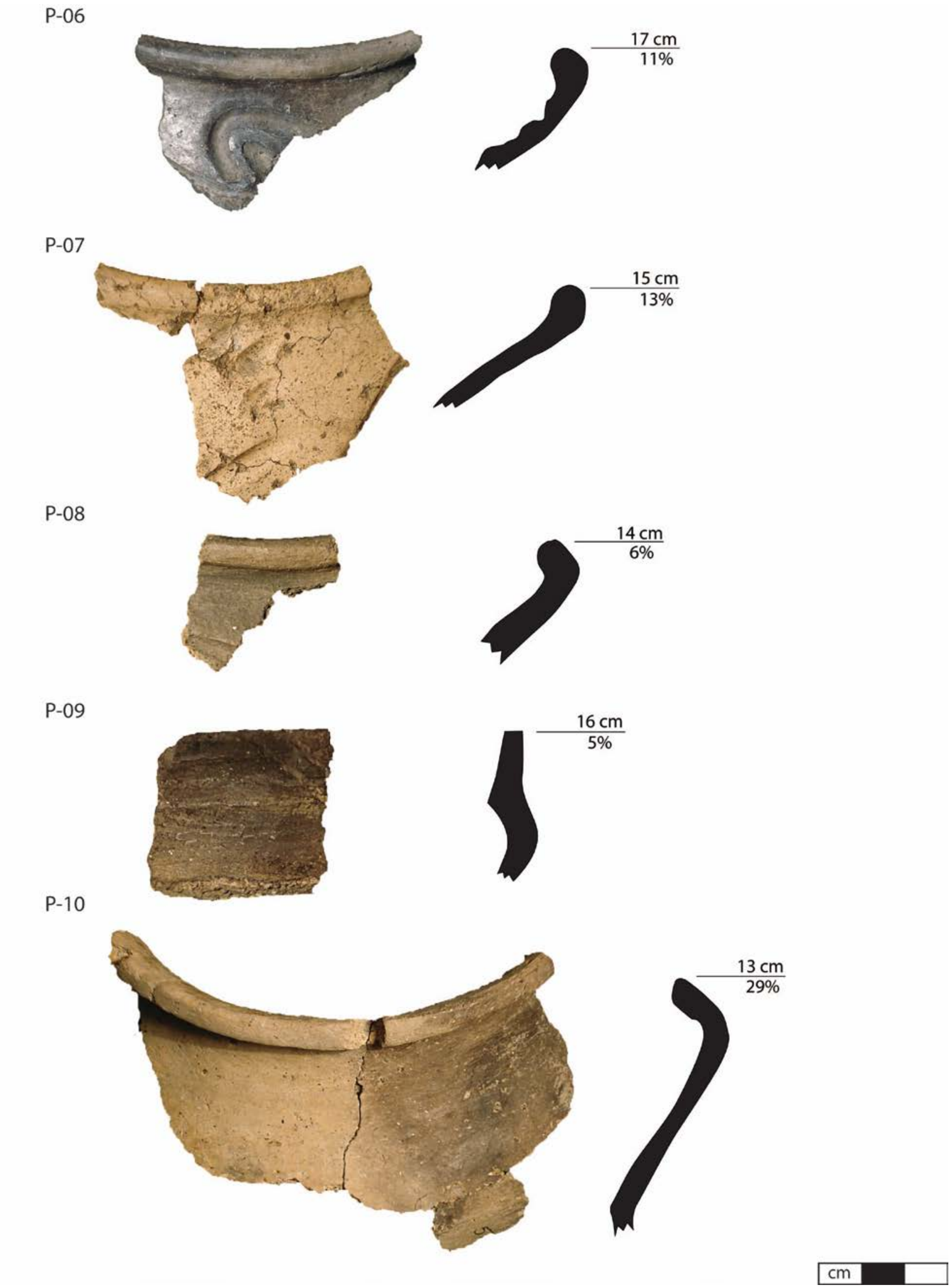
P-05




P-06
17 cm
11%
P-07
15 cm
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P-08
14 cm
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P-09
16 cm
5%
P-10
13 cm
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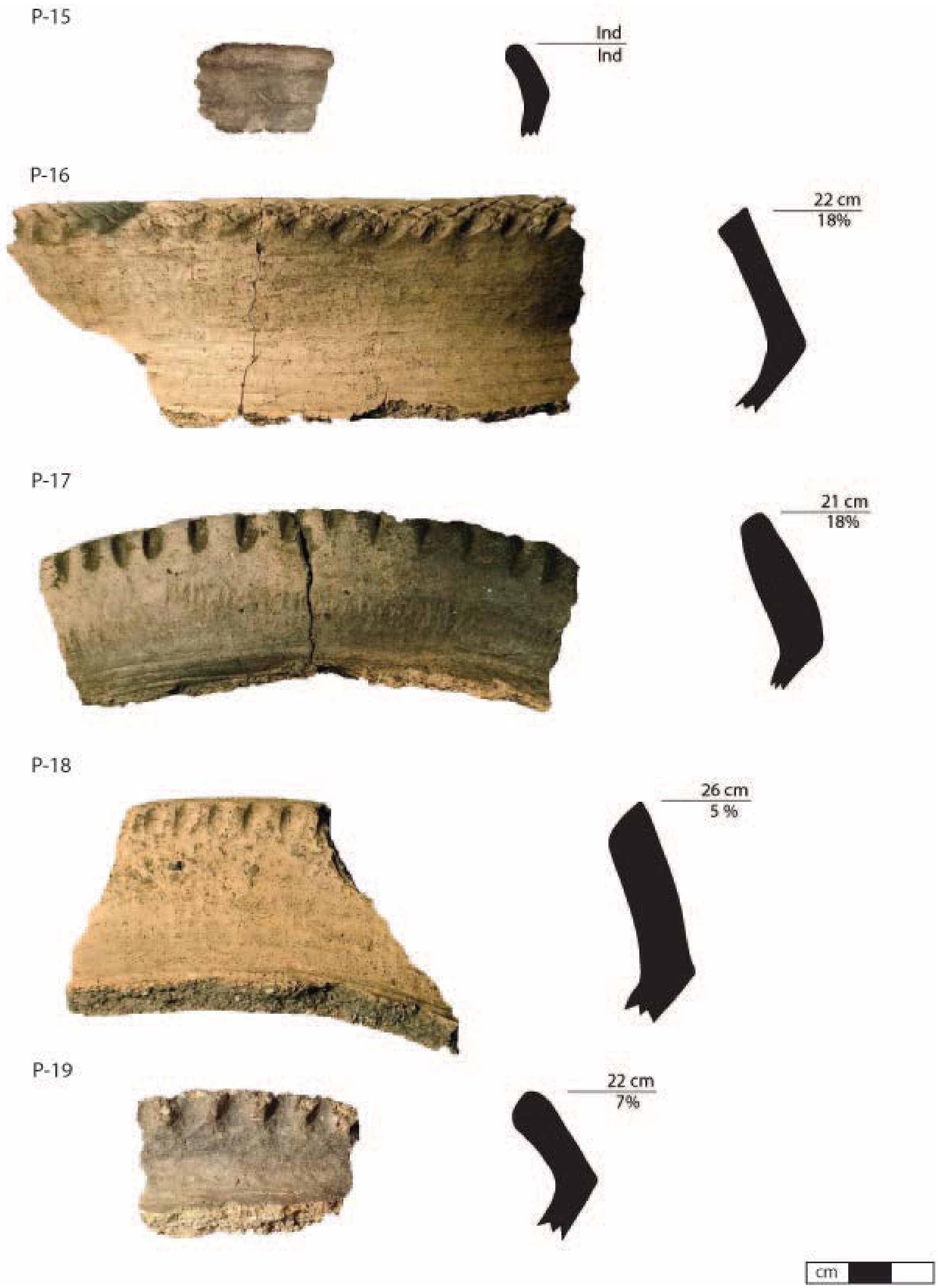
cm


P-11
43638 M1
9 cm
9%
P-12
22 cm
22%
P-13
15 cm
27%
P-14
20 cm
11%
cm


P-15
Ind
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P-16
22 cm
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P-17
21 cm
18%
P-18
26 cm
5 %
P-19
22 cm
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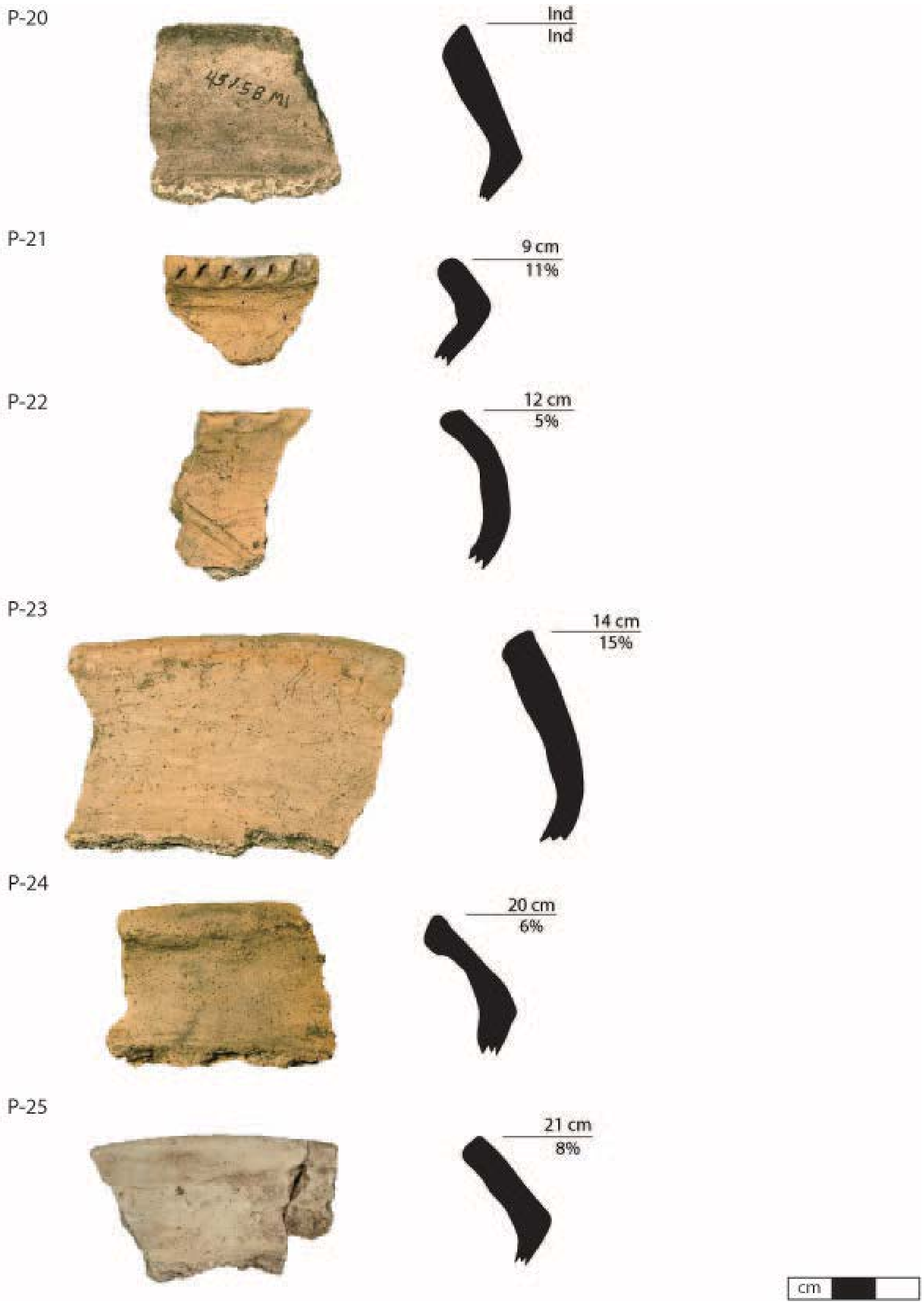
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P-21
9 cm
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12 cm
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P-23
14 cm
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P-24
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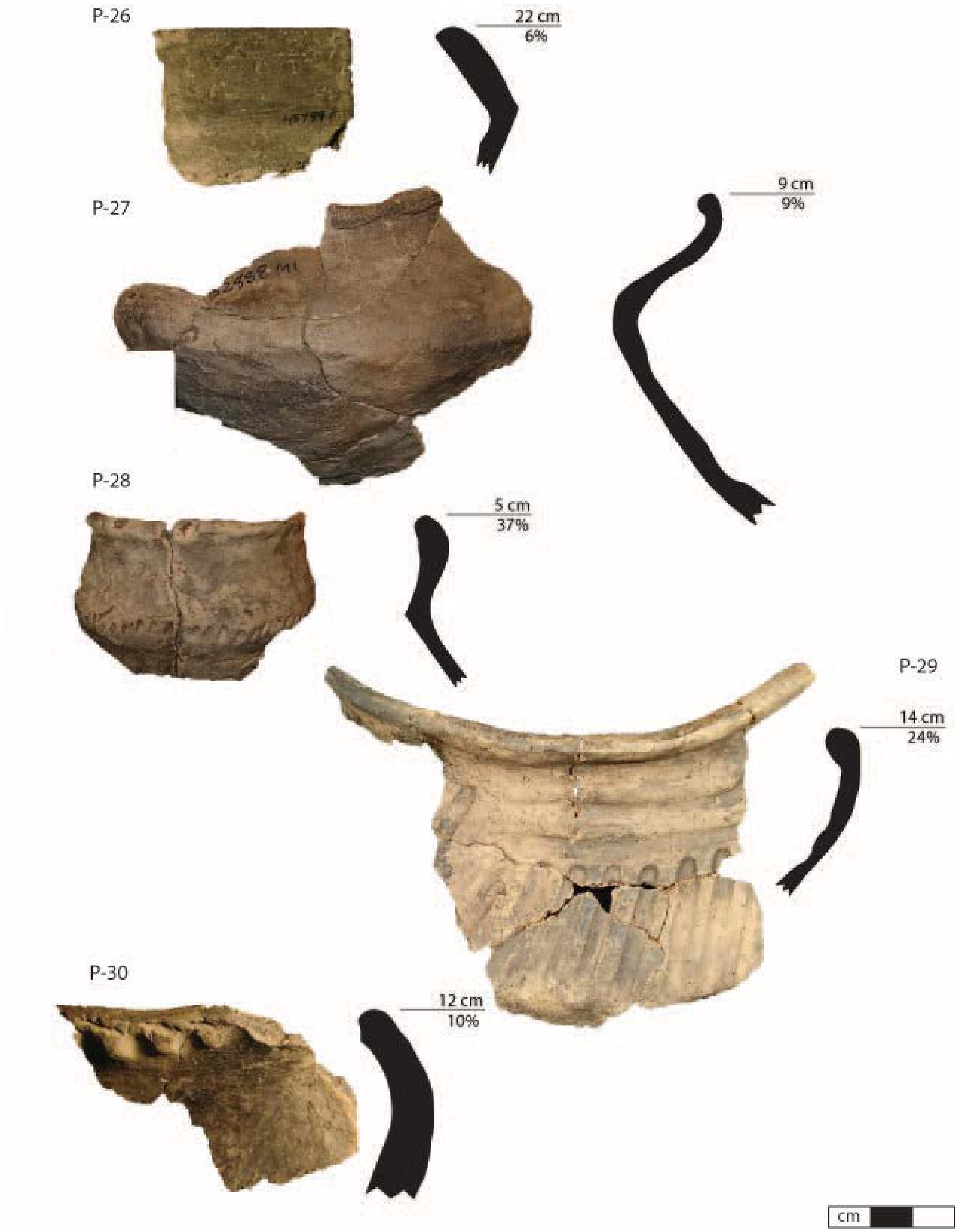
P-25
21 cm
8%
cm


P-26
22 cm
6%
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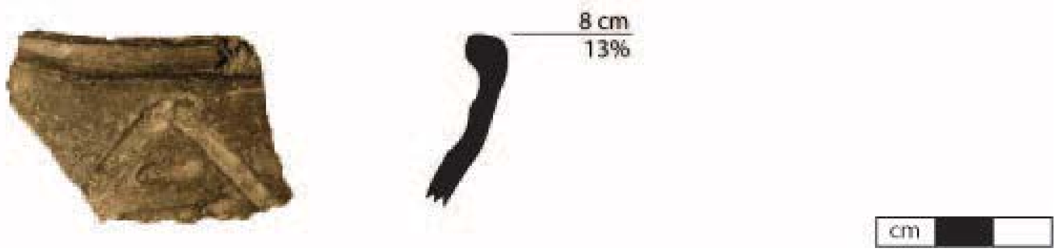
P-34

P-35

P-36

P-37

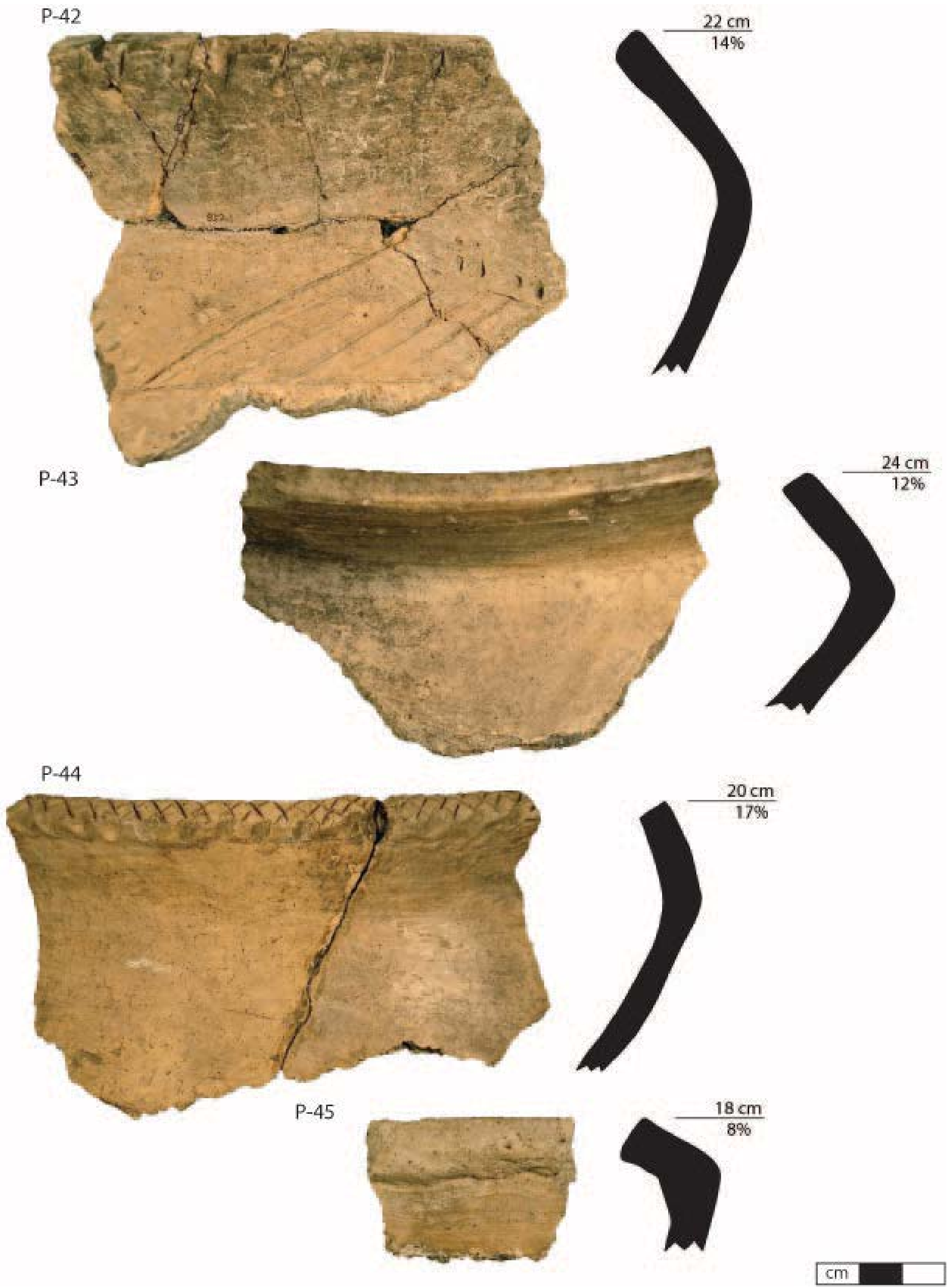


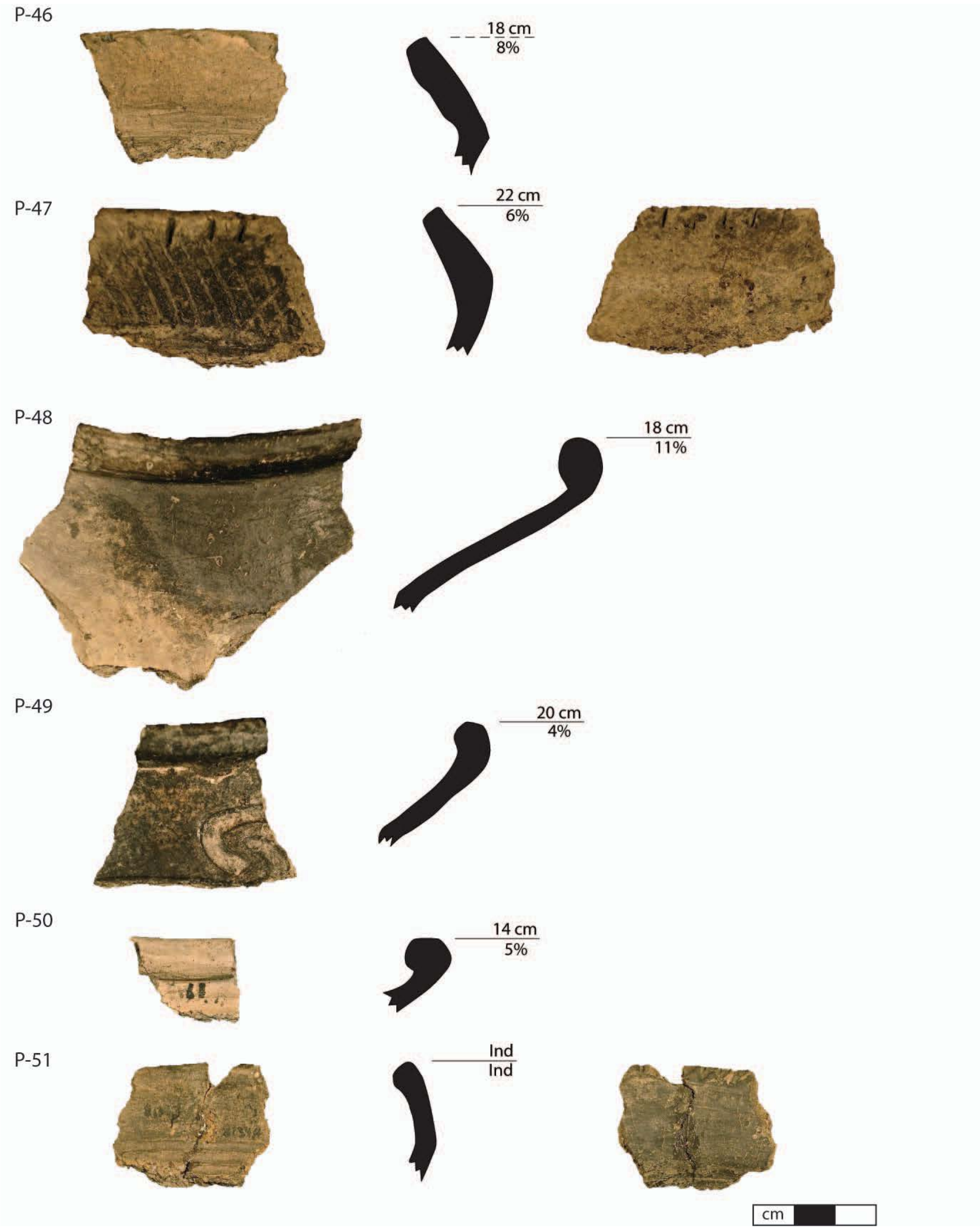
P-38

P-39

P-40

P-41


P-42
22 cm
14%
P-43
24 cm
12%
P-44
20 cm
17%
P-45
18 cm
8%
cm


P-46
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8%
P-47
22 cm
6%
P-48
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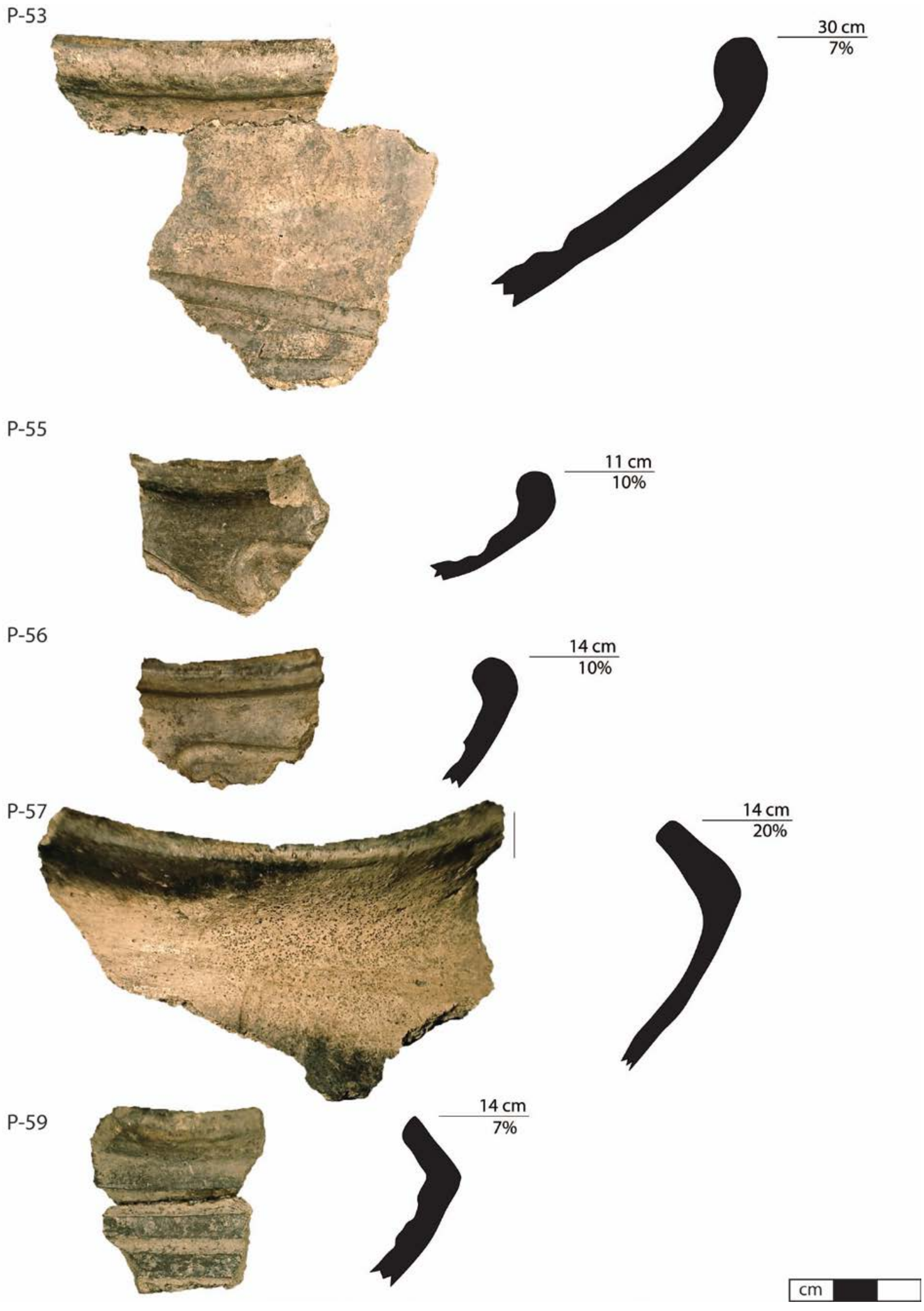
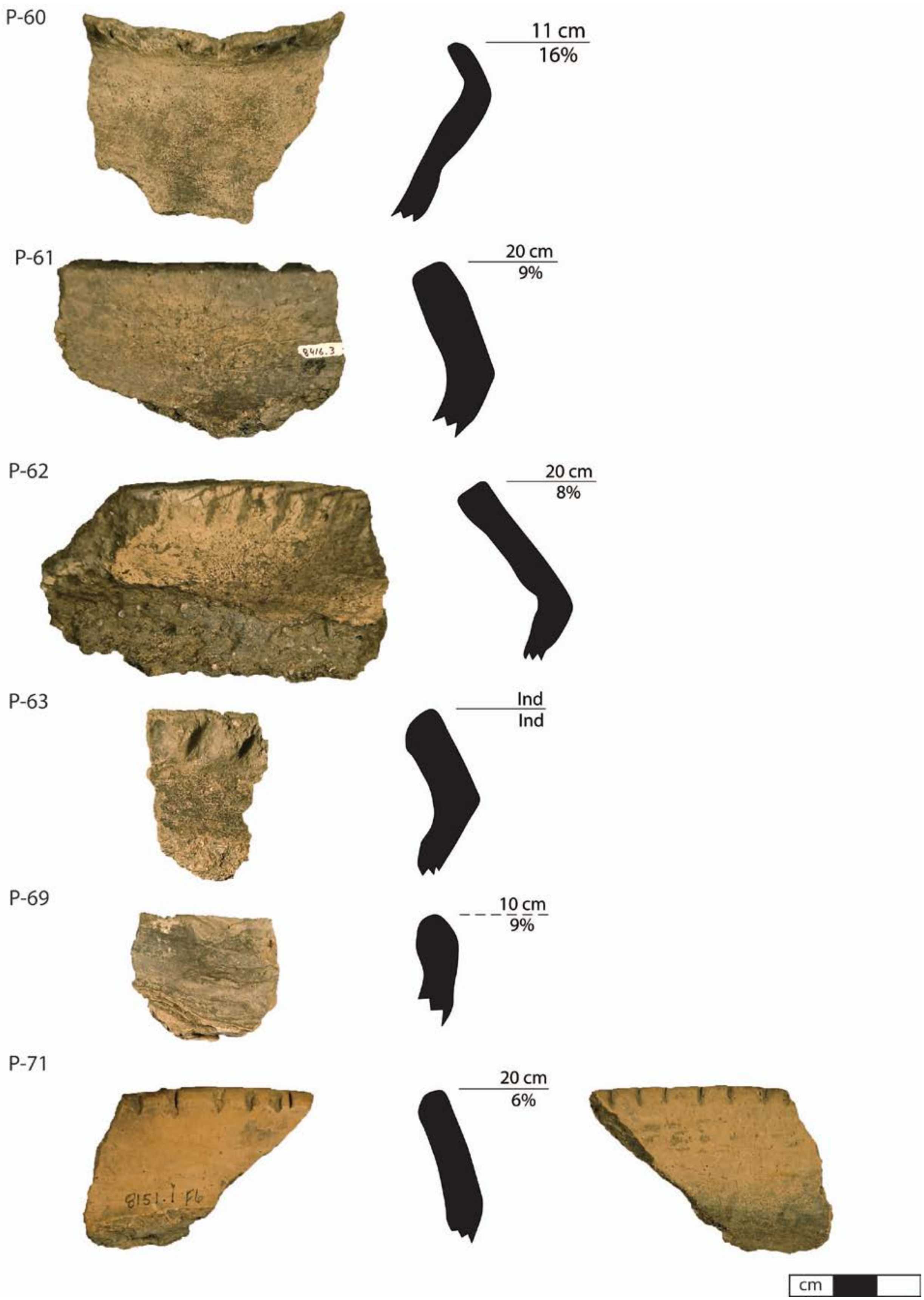
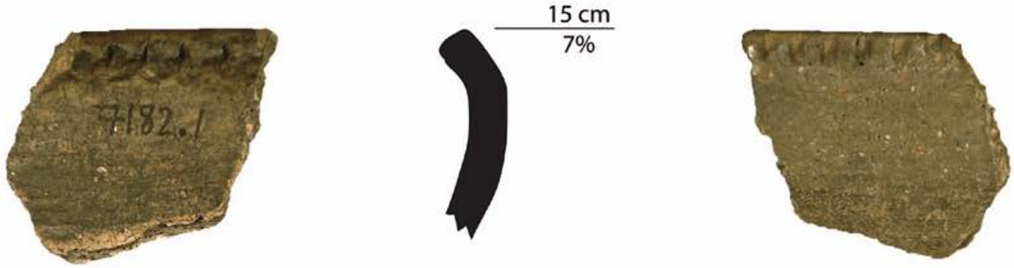
11%
P-49
20 cm
4%
P-50
14 cm
5%
P-51
Ind
Ind
cm


P-53
30 cm
7%
P-55
11 cm
10%
P-56
14 cm
10%
P-57
14 cm
20%
P-59
14 cm
7%
cm


P-60
11 cm
16%
P-61
20 cm
9%
P-62
20 cm
8%
P-63
Ind
Ind
P-69
10 cm
9%
P-71
20 cm
6%
cm

P-73



P-74

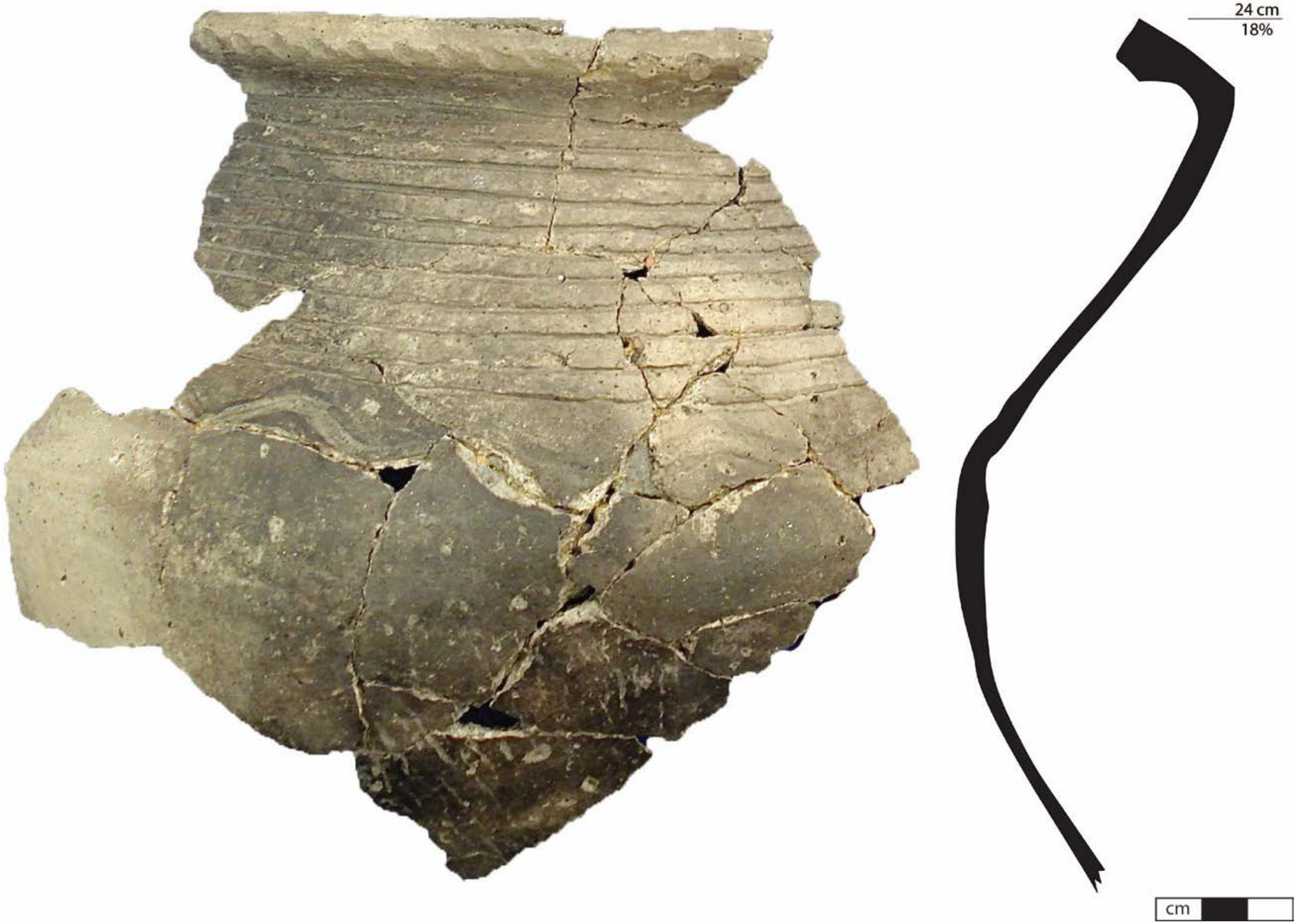
P-75

P-76

P-78

P-79

P-80



P-81

P-82

P-83

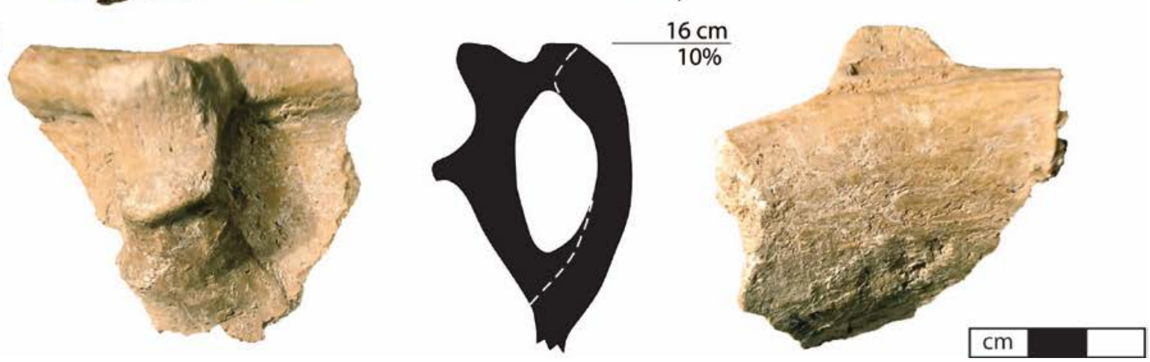
P-84

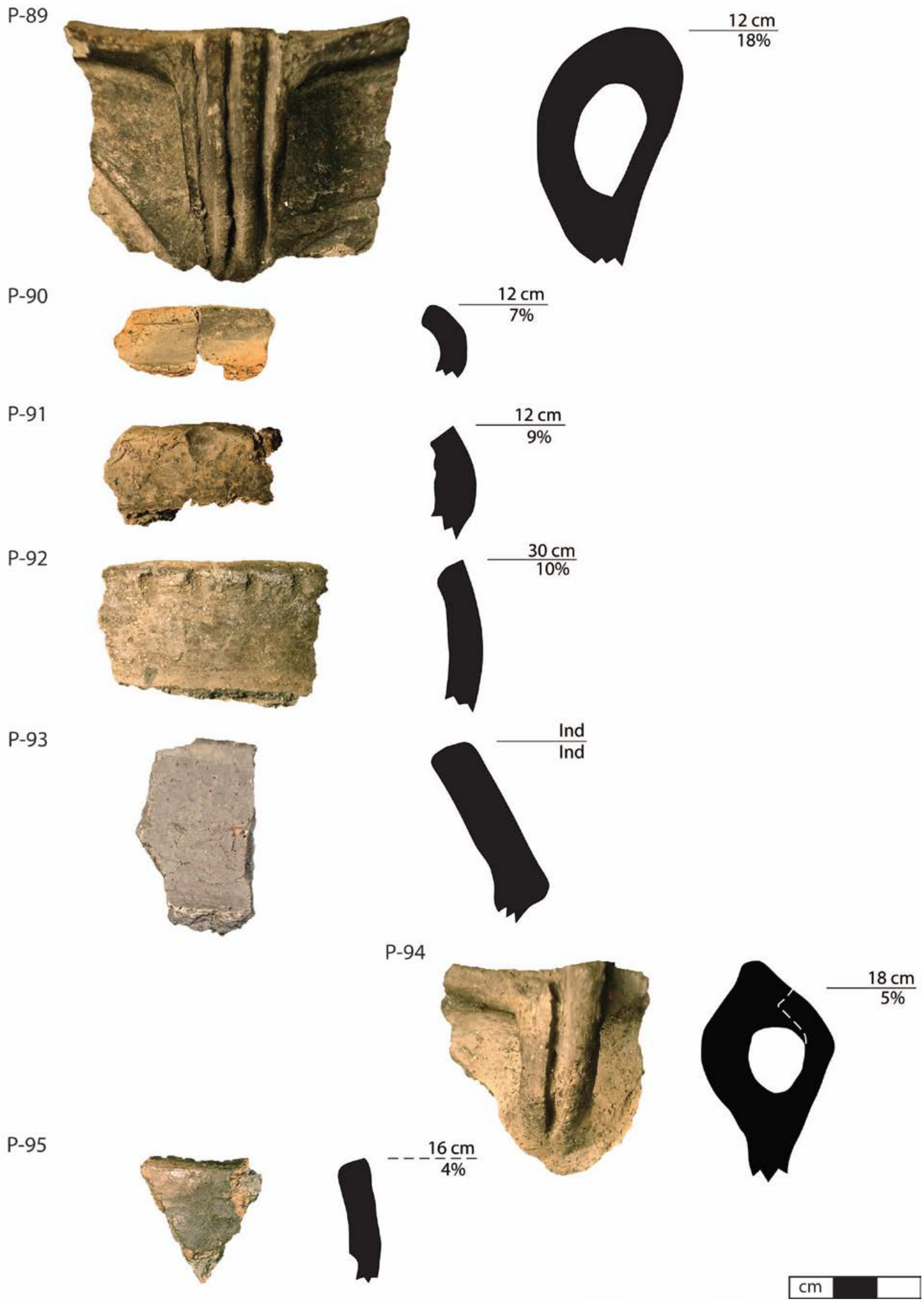
P-85

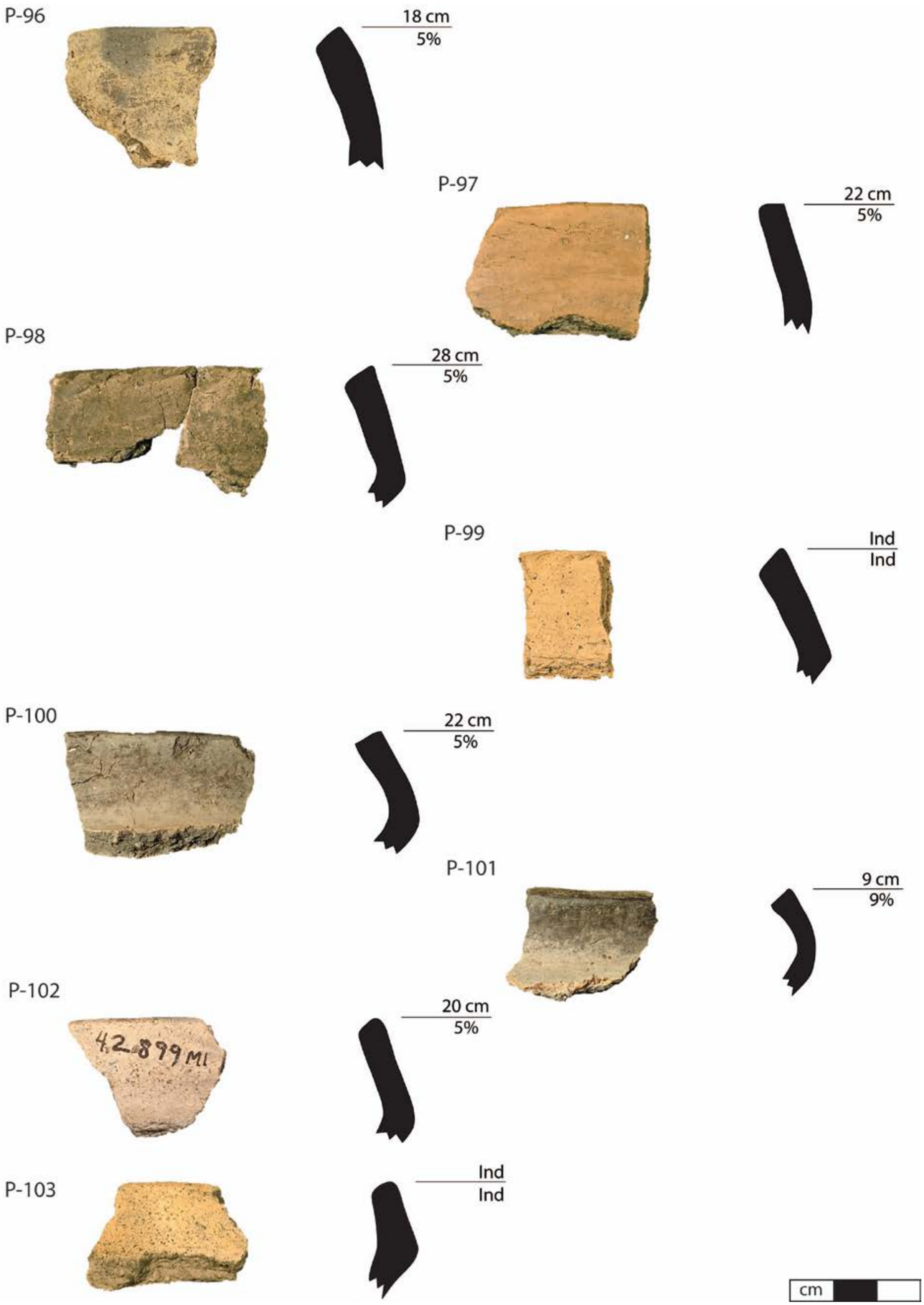
P-86

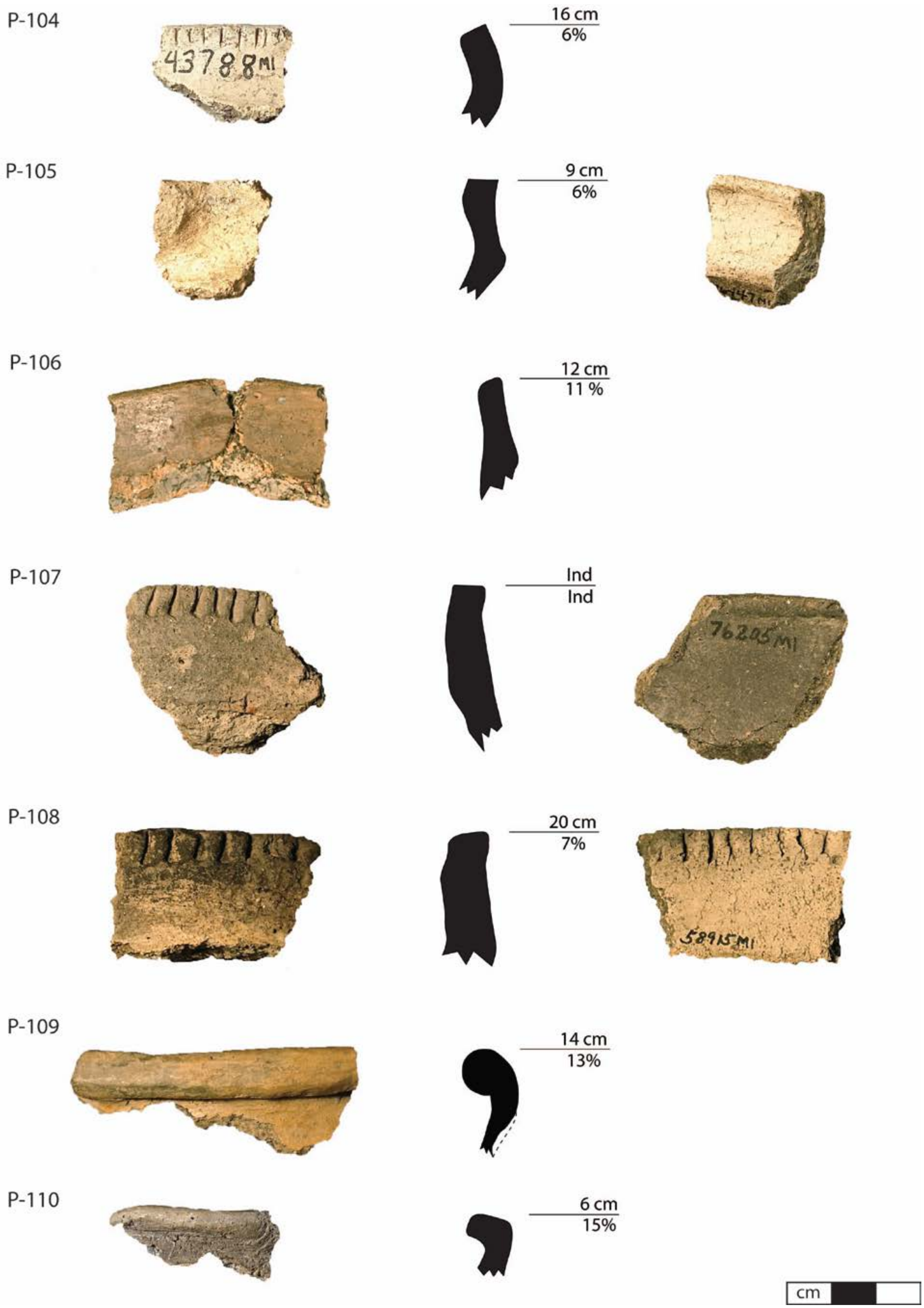
P-87

P-88




P-89
12 cm
18%
P-90
12 cm
7%
P-91
12 cm
9%
P-92
30 cm
10%
P-93
Ind
Ind
P-94
18 cm
5%
P-95
16 cm
4%
cm


P-96
18 cm
5%
P-97
22 cm
5%
P-98
28 cm
5%
P-99
Ind
Ind
P-100
22 cm
5%
P-101
9 cm
9%
P-102
42.899 MI
20 cm
5%
P-103
Ind
Ind
cm


P-104
43788 MI
16 cm
6%
P-105
9 cm
6%
P-106
12 cm
11 %
P-107
Ind
Ind
76205 MI
P-108
20 cm
7%
58915 MI
P-109
14 cm
13%
P-110
6 cm
15%
cm

P-111

P-113

P-114

P-115

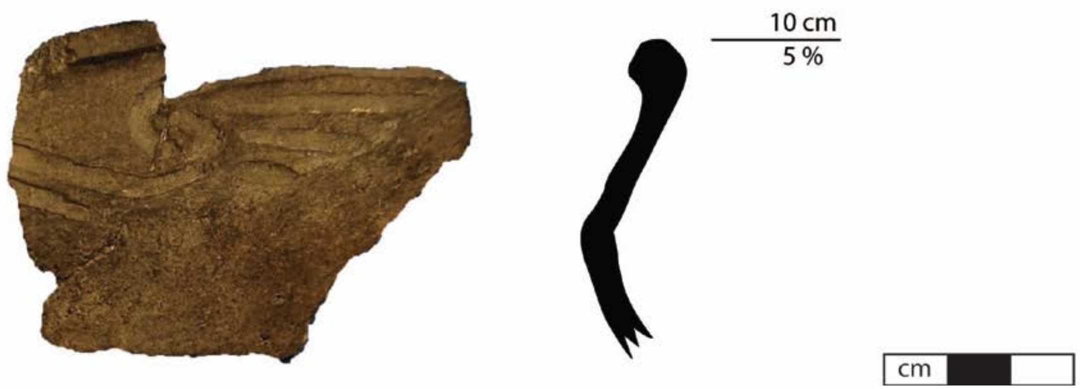
P-116

P-117

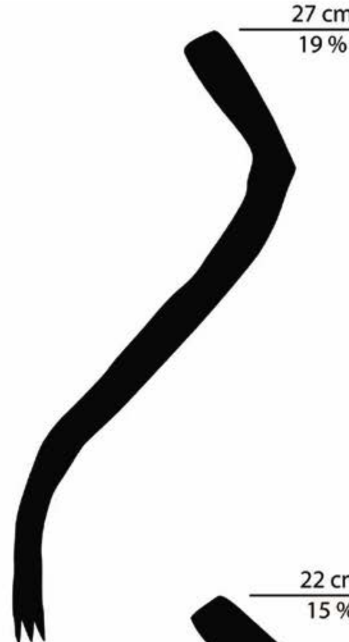
Cambria Site

C-01

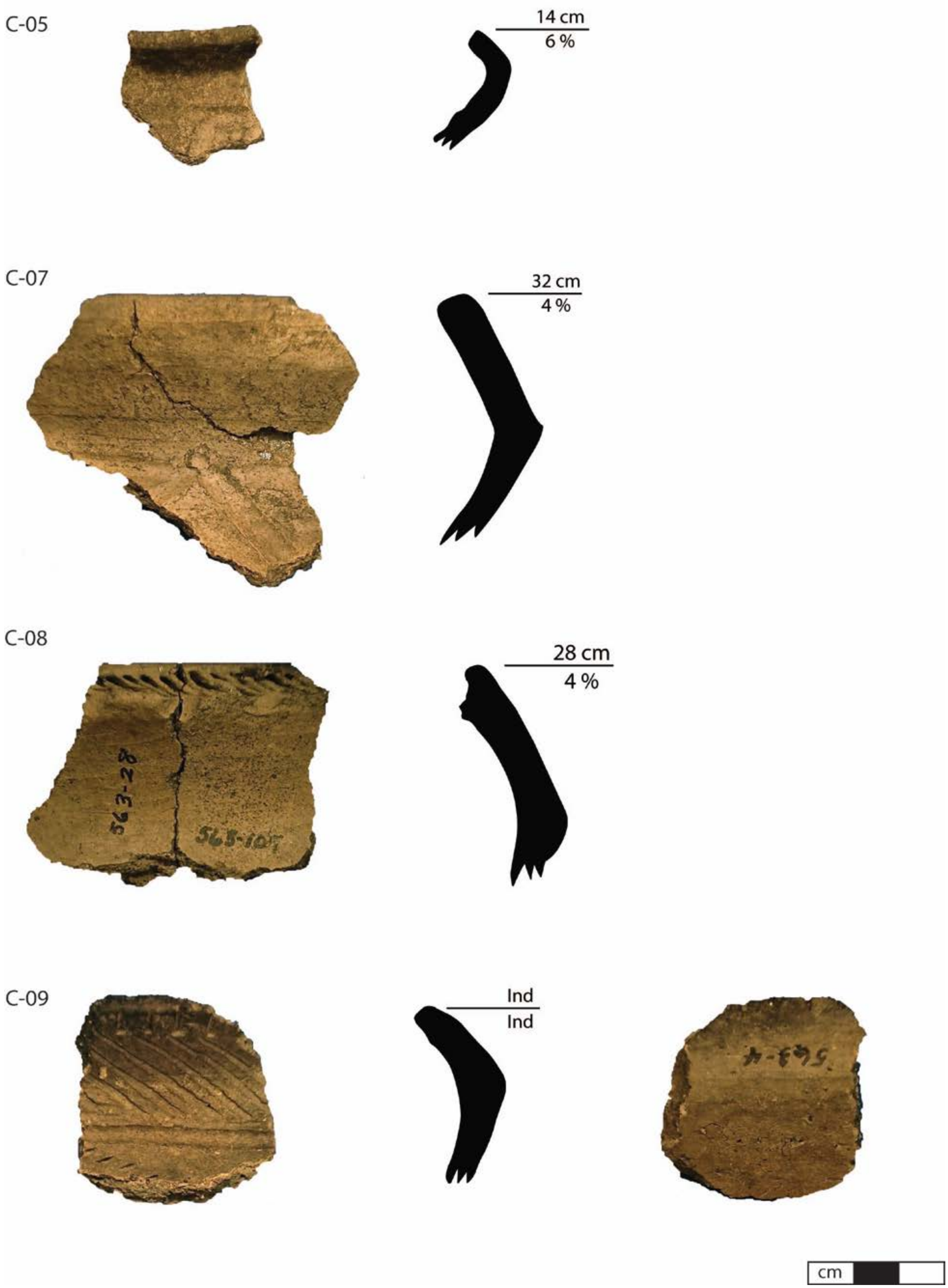
C-02

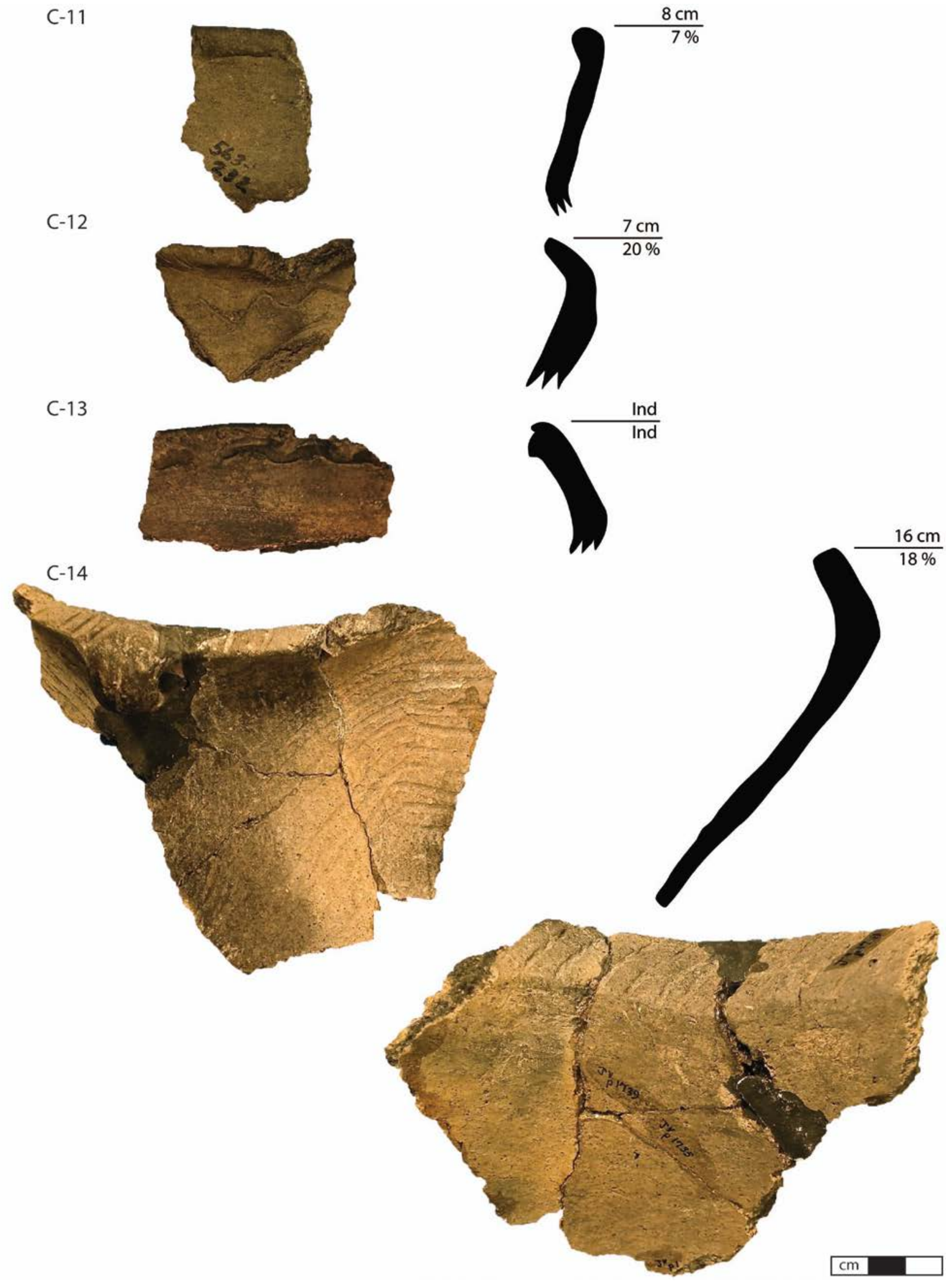


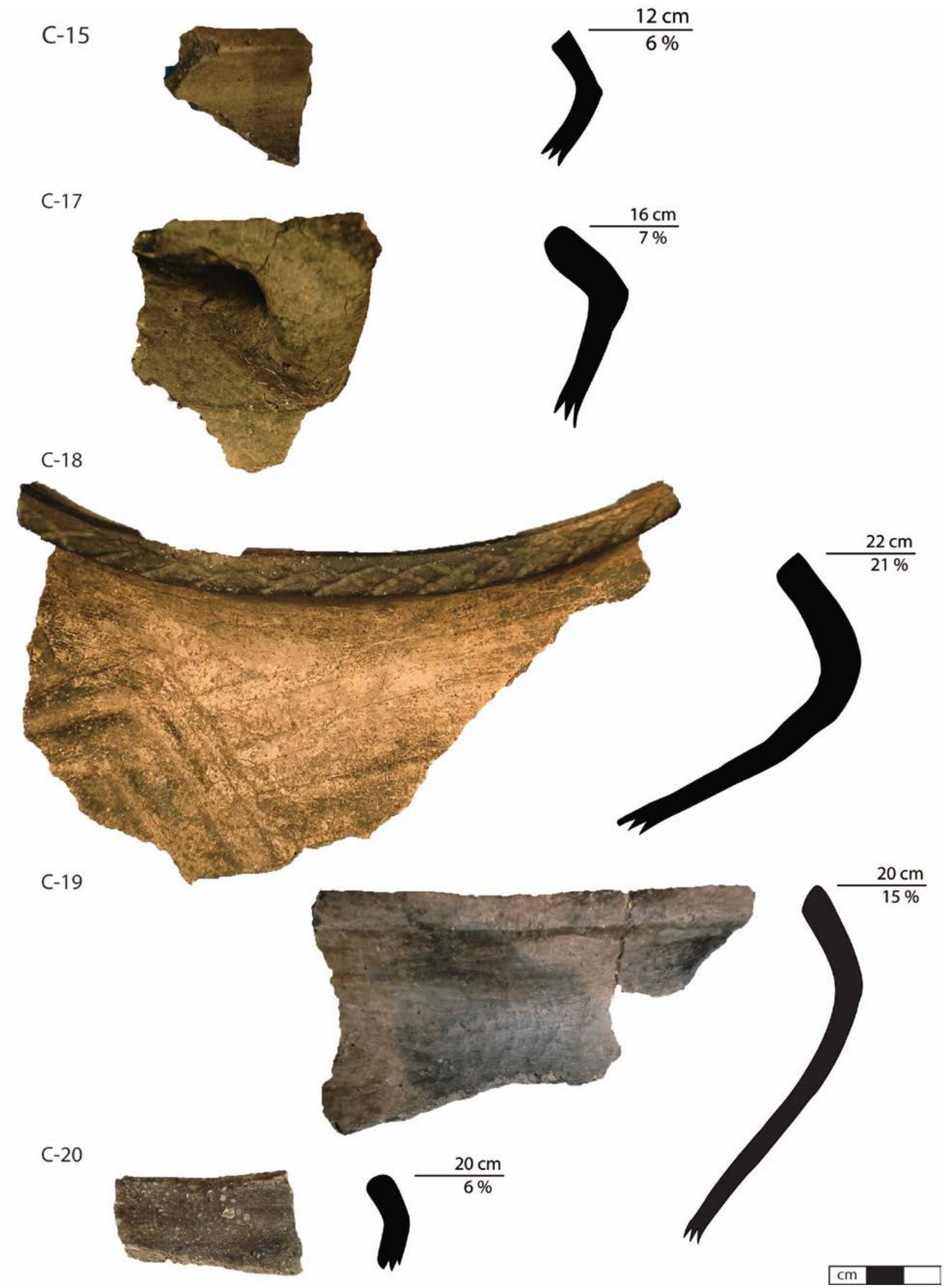
C-03

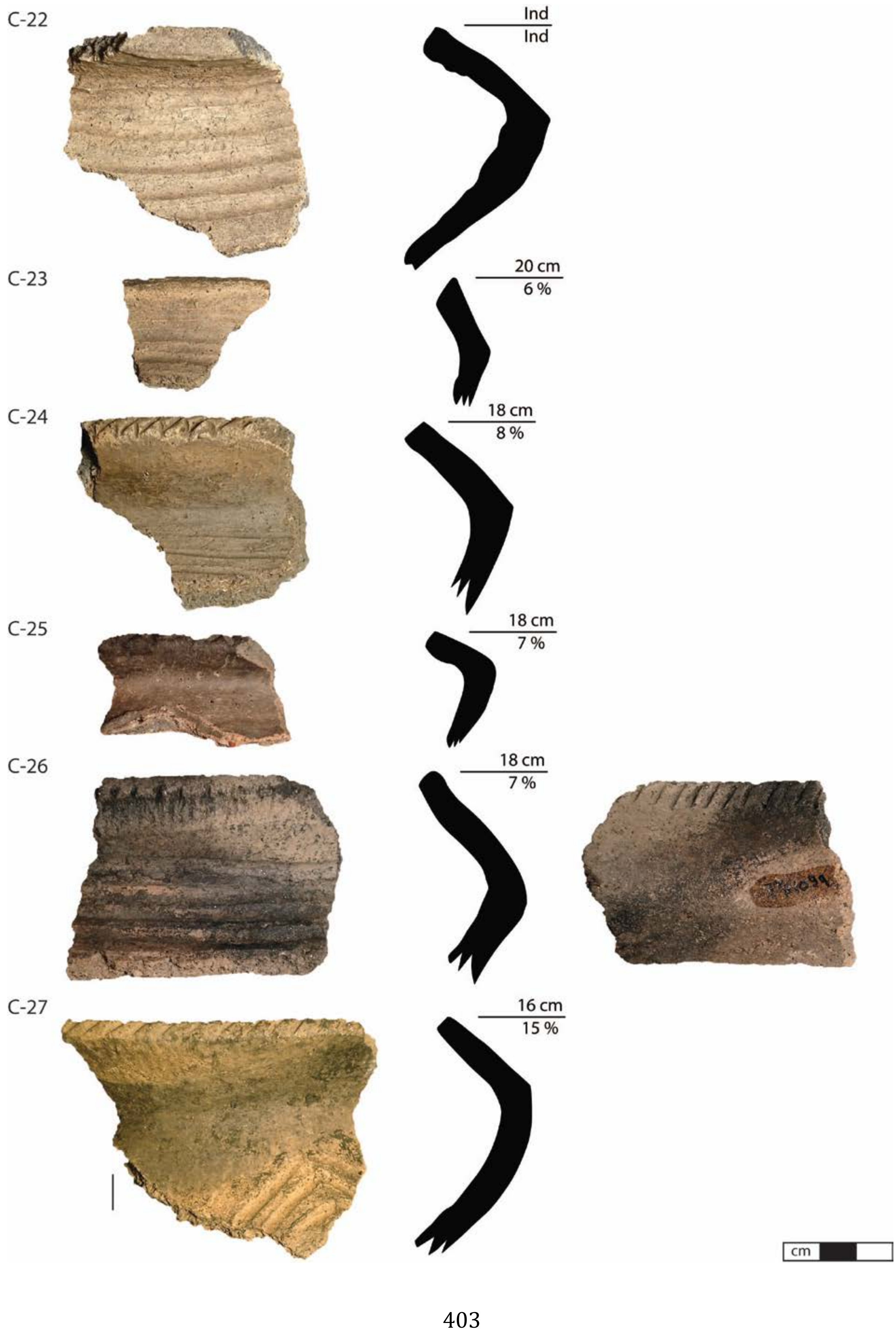


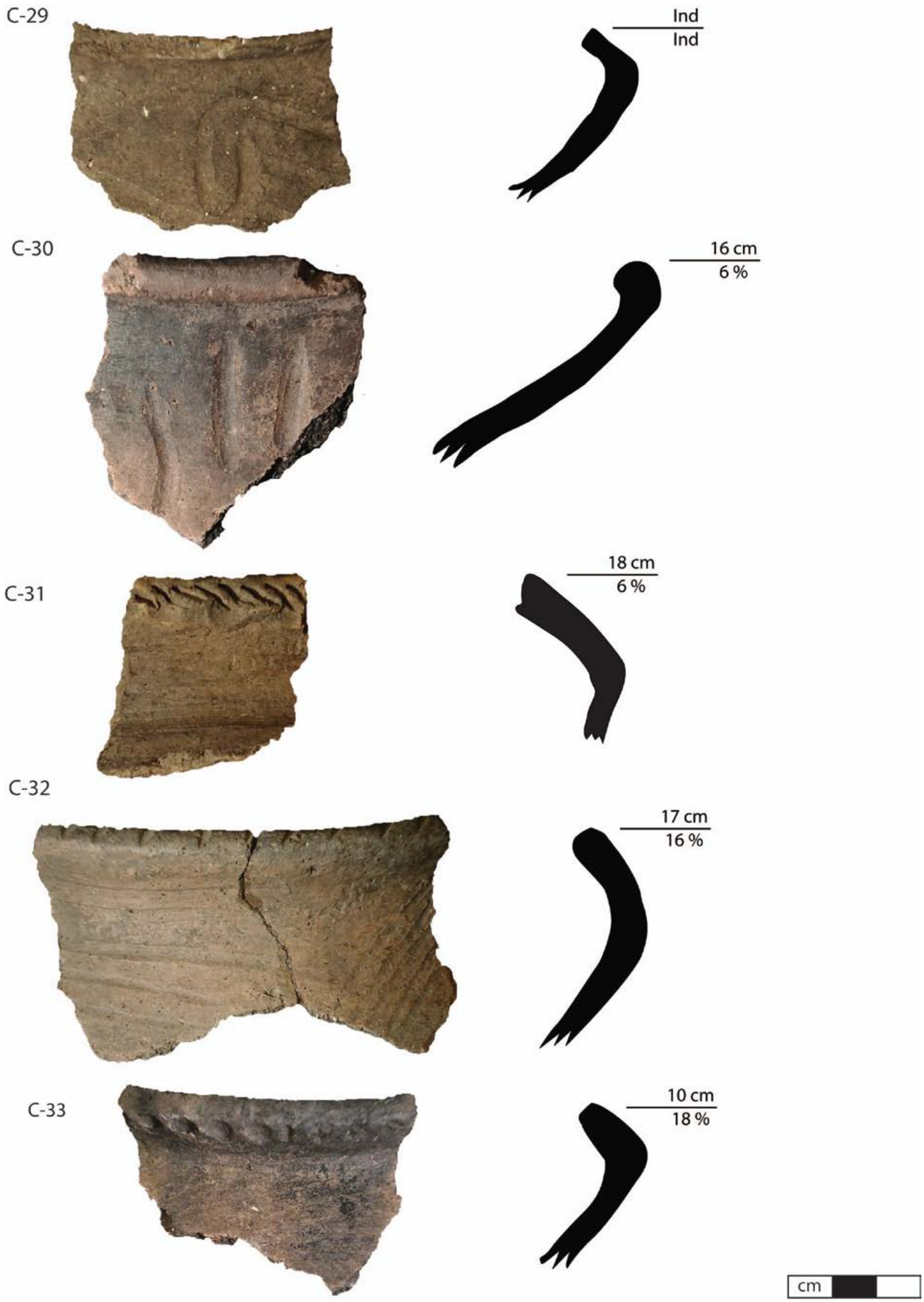
C-04

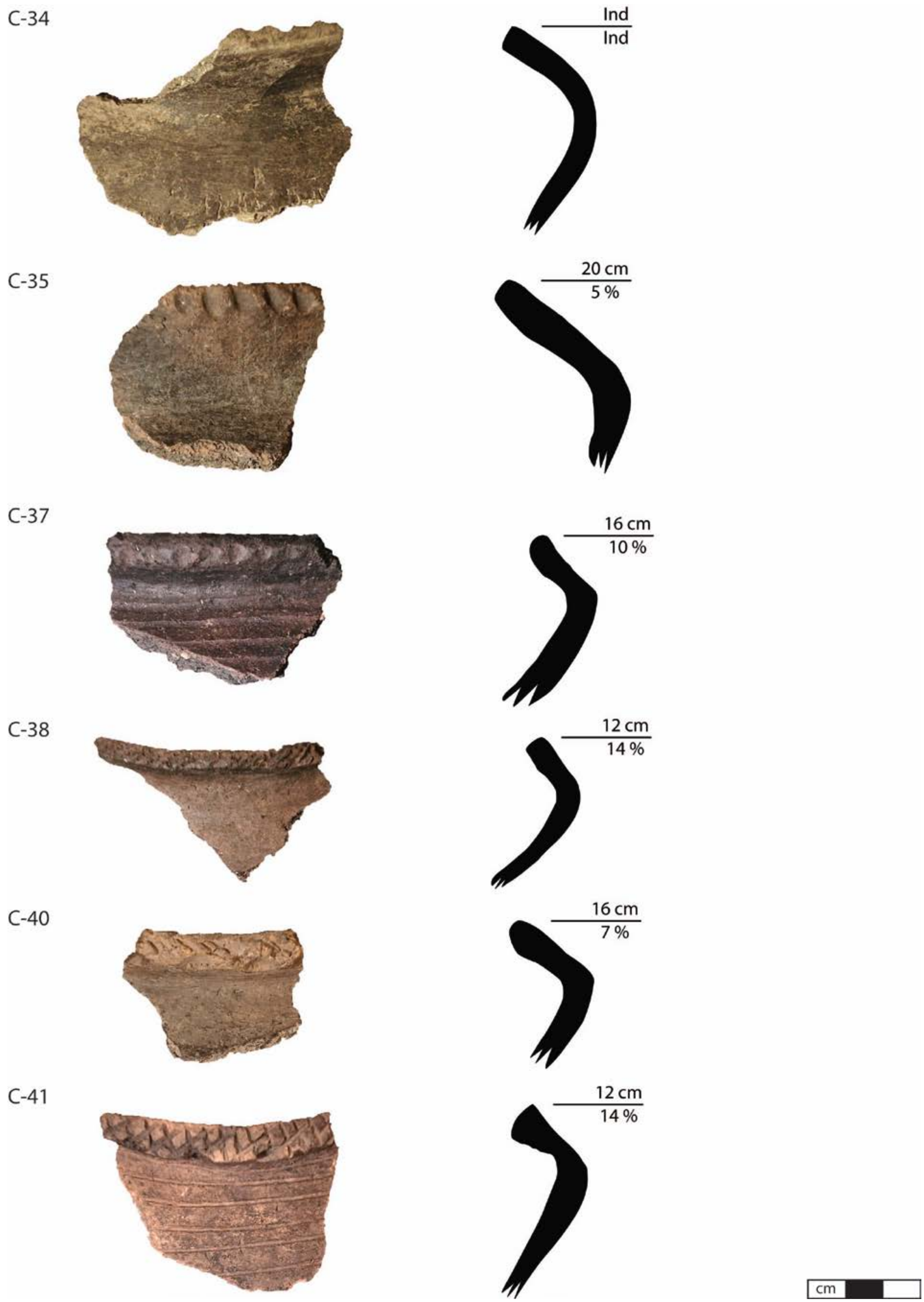

C-05
14 cm
6 %
C-07
32 cm
4 %
C-08
28 cm
4 %
C-09
Ind
Ind
cm

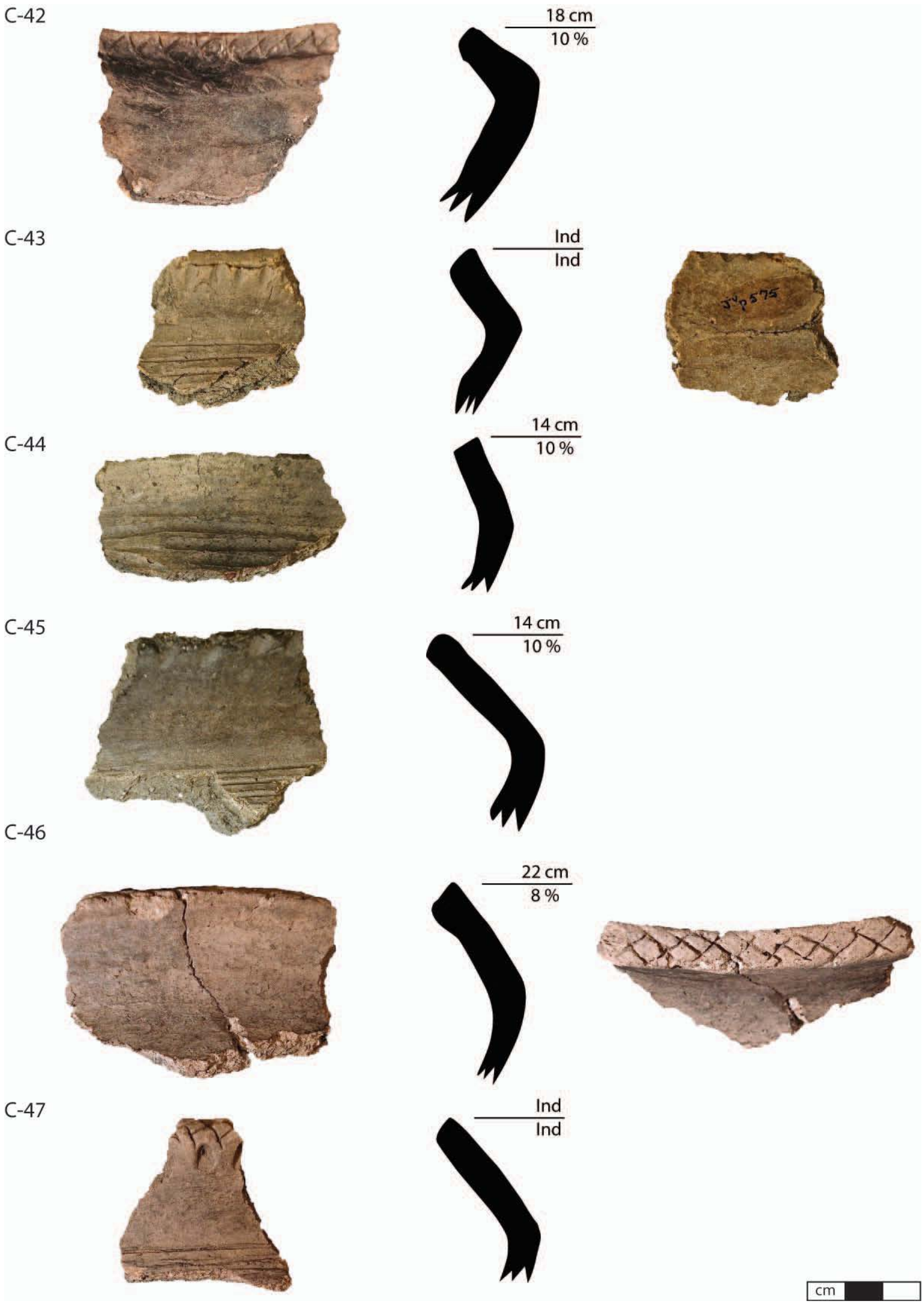

C-11
8 cm
7 %
C-12
7 cm
20 %
C-13
Ind
Ind
C-14
16 cm
18 %
cm

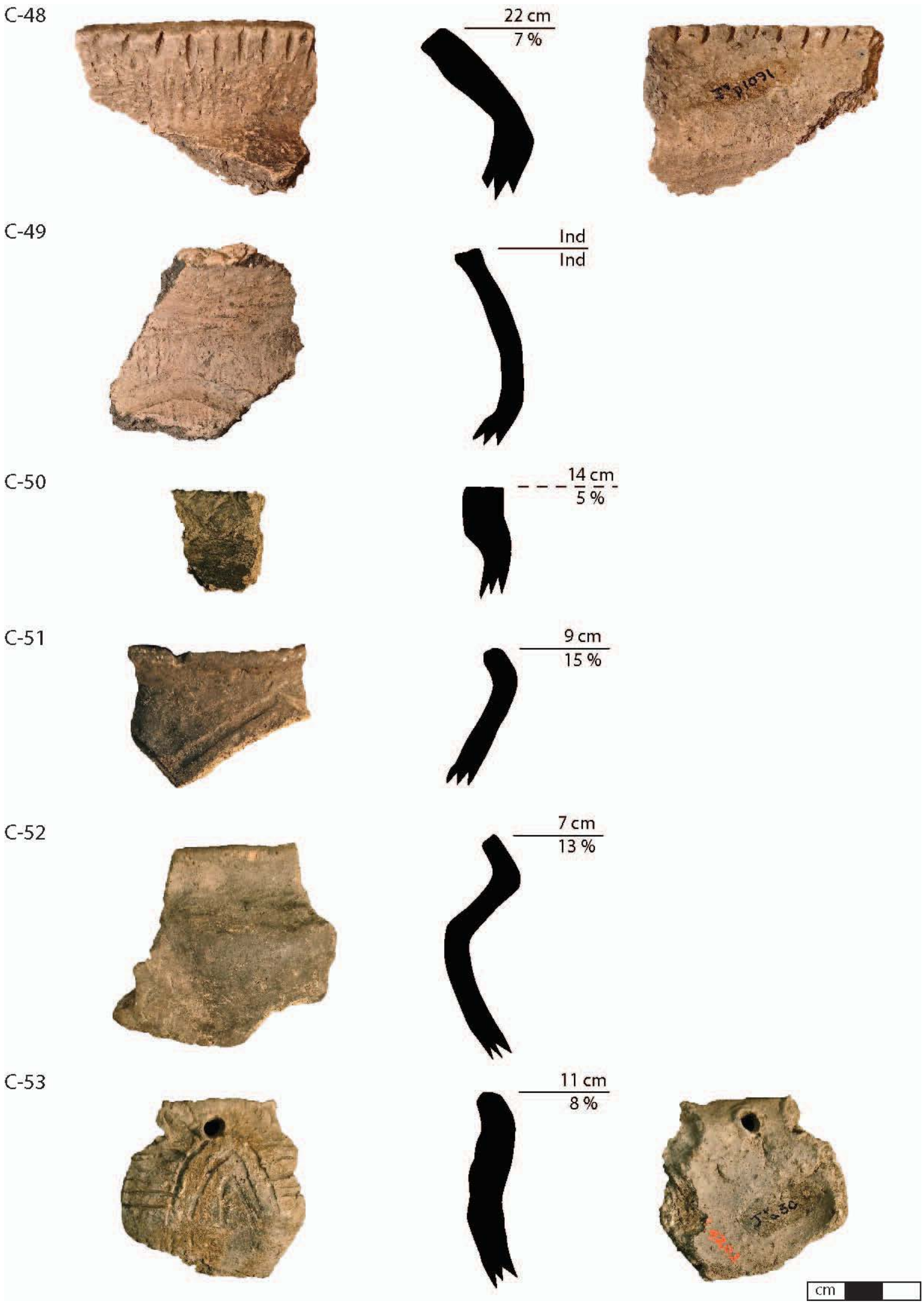

C-15
12 cm
6 %
C-17
16 cm
7 %
C-18
22 cm
21 %
C-19
20 cm
15 %
C-20
20 cm
6 %
cm

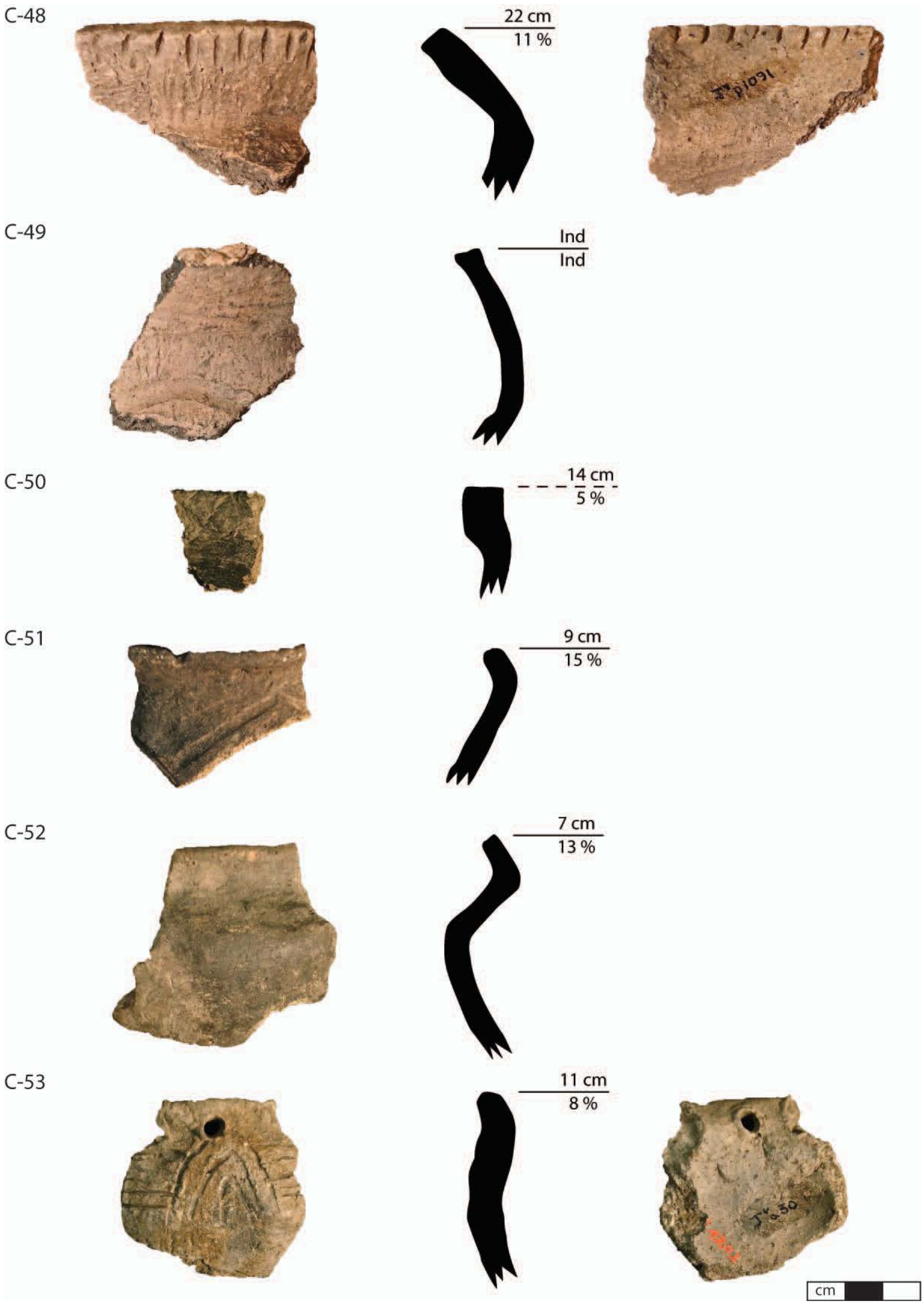

C-22
Ind
Ind
C-23
20 cm
6 %
C-24
18 cm
8 %
C-25
18 cm
7 %
C-26
18 cm
7 %
C-27
16 cm
15 %
cm

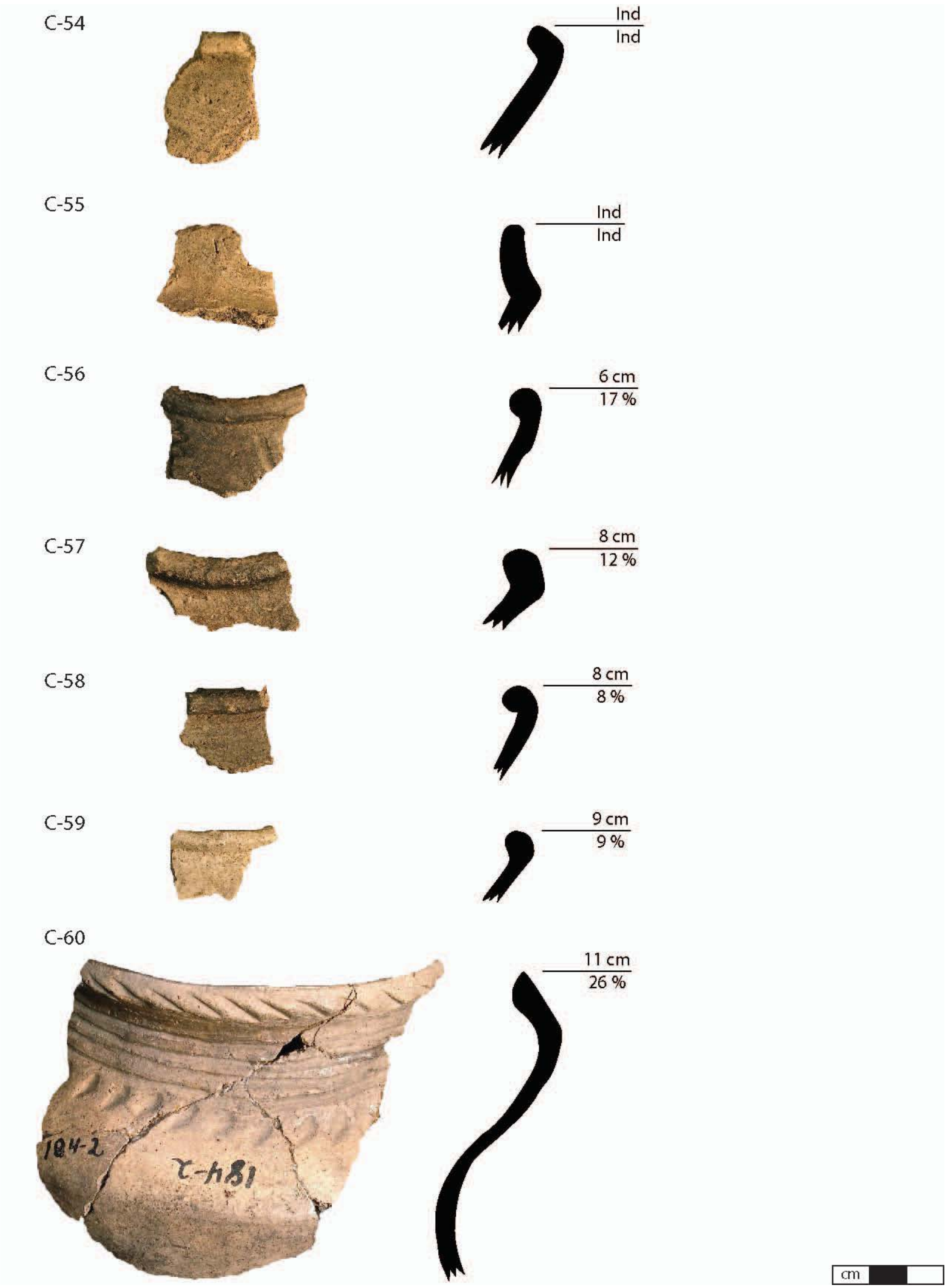

C-29
Ind
Ind
C-30
16 cm
6 %
C-31
18 cm
6 %
C-32
17 cm
16 %
C-33
10 cm
18 %
cm


C-34
Ind
Ind
C-35
20 cm
5 %
C-37
16 cm
10 %
C-38
12 cm
14 %
C-40
16 cm
7 %
C-41
12 cm
14 %
cm

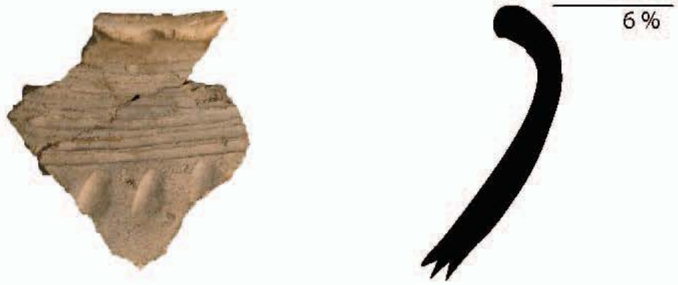

C-42
18 cm
10 %
C-43
Ind
Ind
C-44
14 cm
10 %
C-45
14 cm
10 %
C-46
22 cm
8 %
C-47
Ind
Ind
cm


C-48
22 cm
7 %
C-49
Ind
Ind
C-50
14 cm
5 %
C-51
9 cm
15 %
C-52
7 cm
13 %
C-53
11 cm
8 %
cm

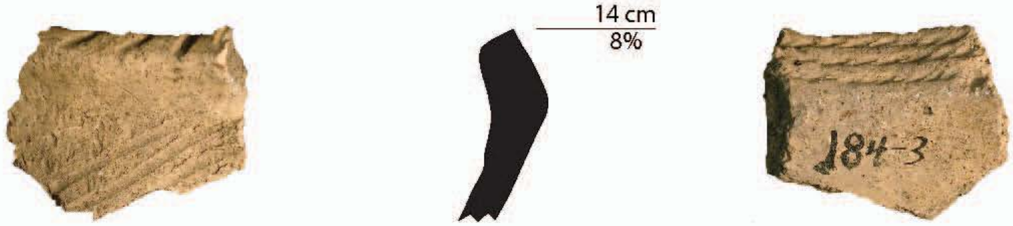

C-48
22 cm
11 %
C-49
Ind
Ind
C-50
14 cm
5 %
C-51
9 cm
15 %
C-52
7 cm
13 %
C-53
11 cm
8 %
cm


C-54
Ind
Ind
C-55
Ind
Ind
C-56
6 cm
17 %
C-57
8 cm
12 %
C-58
8 cm
8 %
C-59
9 cm
9 %
C-60
11 cm
26 %
184-2
184-2
cm

C-61

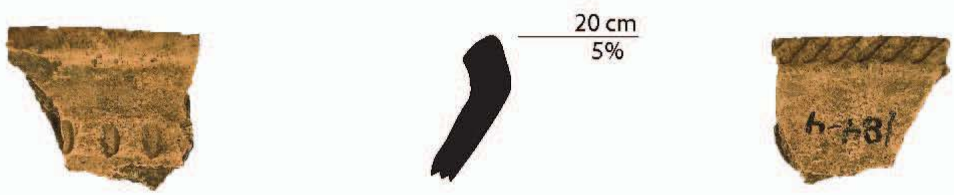


C-62



C-63

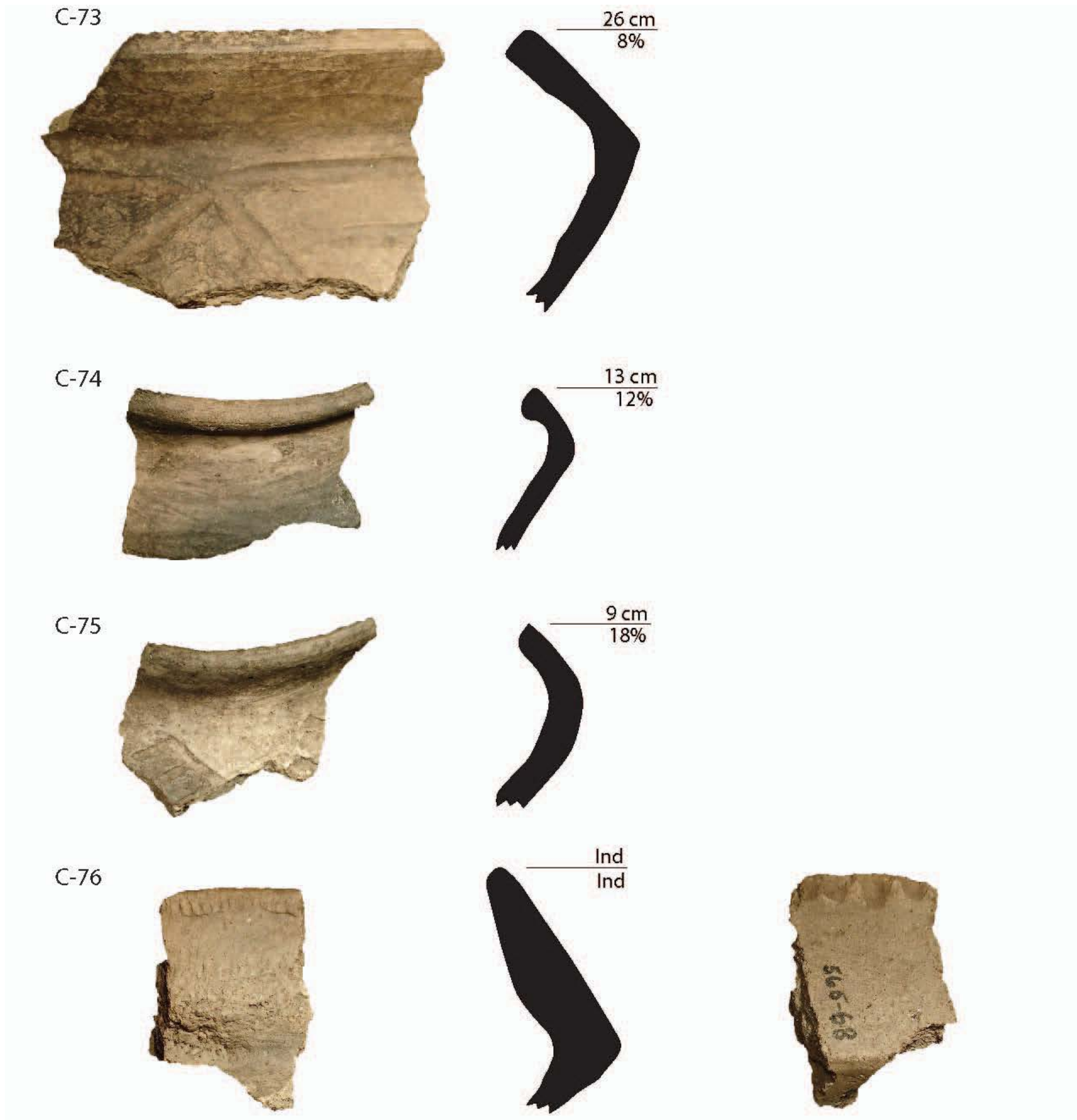
C-64

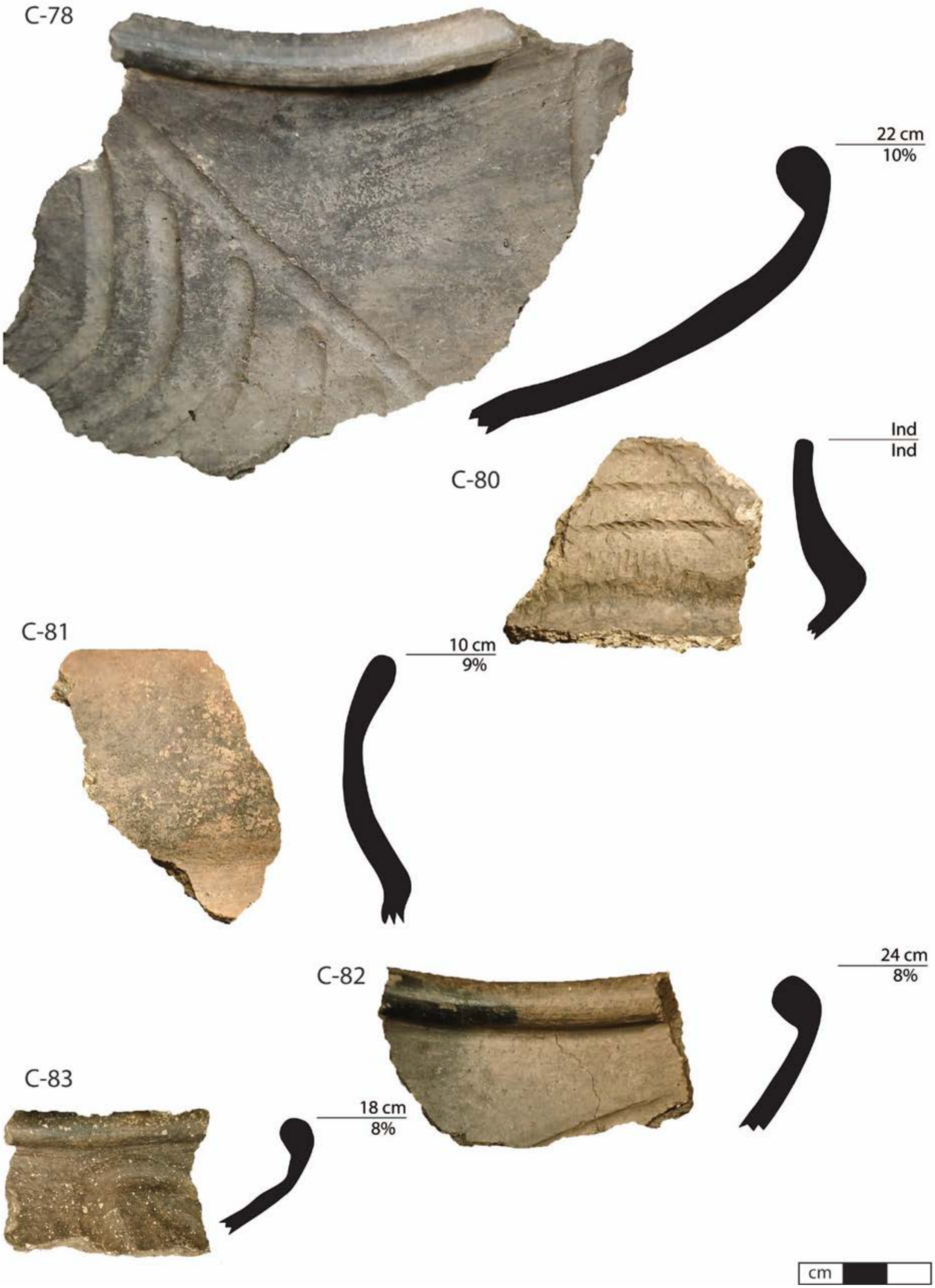


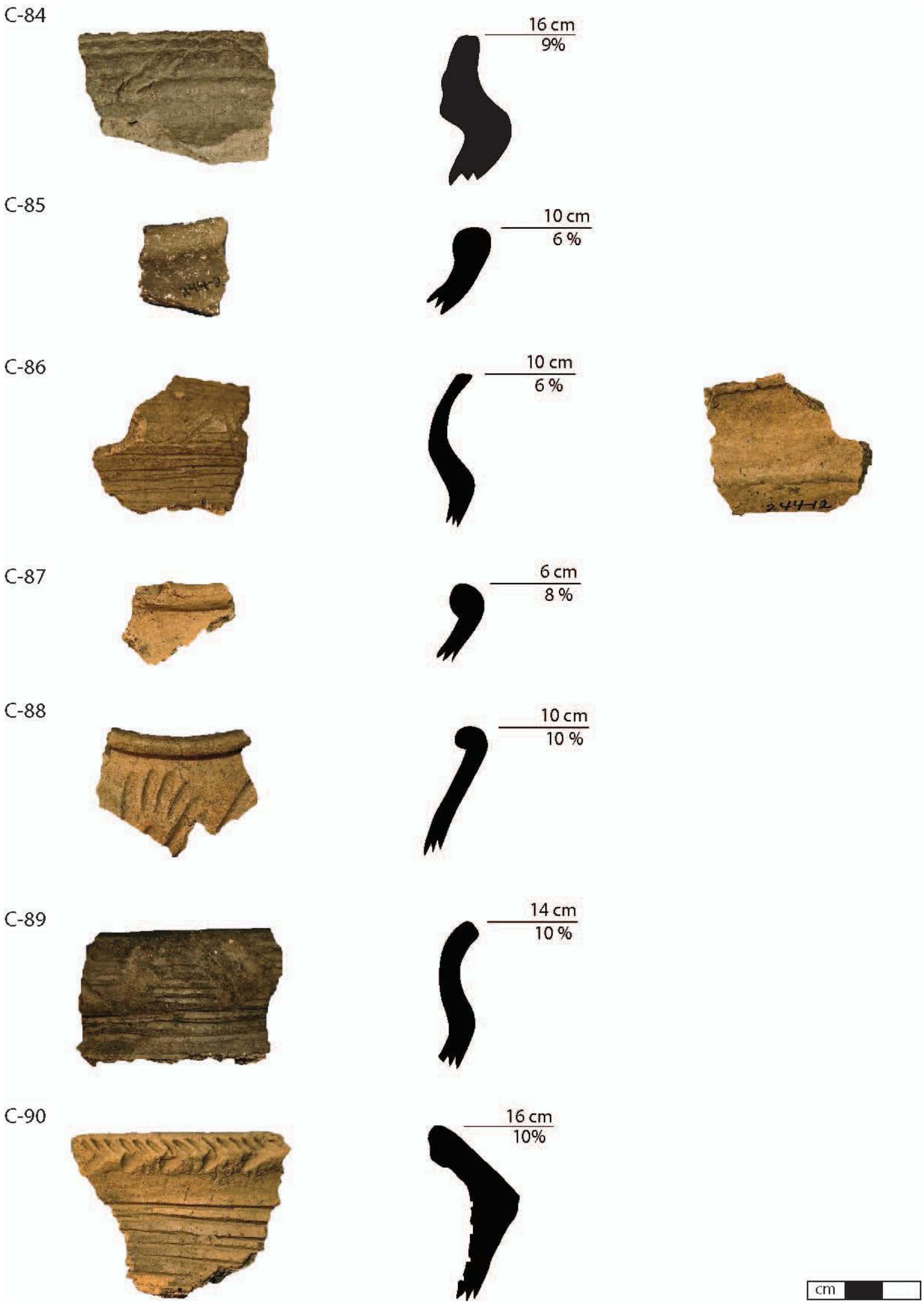
C-65

C-67


C-69
12 cm
8%
C-70
25 cm
13%
C-71
12 cm
7%
C-72
15 cm
7%
cm


C-73
26 cm
8%
C-74
13 cm
12%
C-75
9 cm
18%
C-76
Ind
Ind
C-77
28 cm
5%
cm


C-78
22 cm
10%
Ind
Ind
C-80
C-81
10 cm
9%
C-82
24 cm
8%
C-83
18 cm
8%
cm


C-84
16 cm
9%
C-85
10 cm
6 %
C-86
10 cm
6 %
C-87
6 cm
8 %
C-88
10 cm
10 %
C-89
14 cm
10 %
C-90
16 cm
10%
cm

C-92

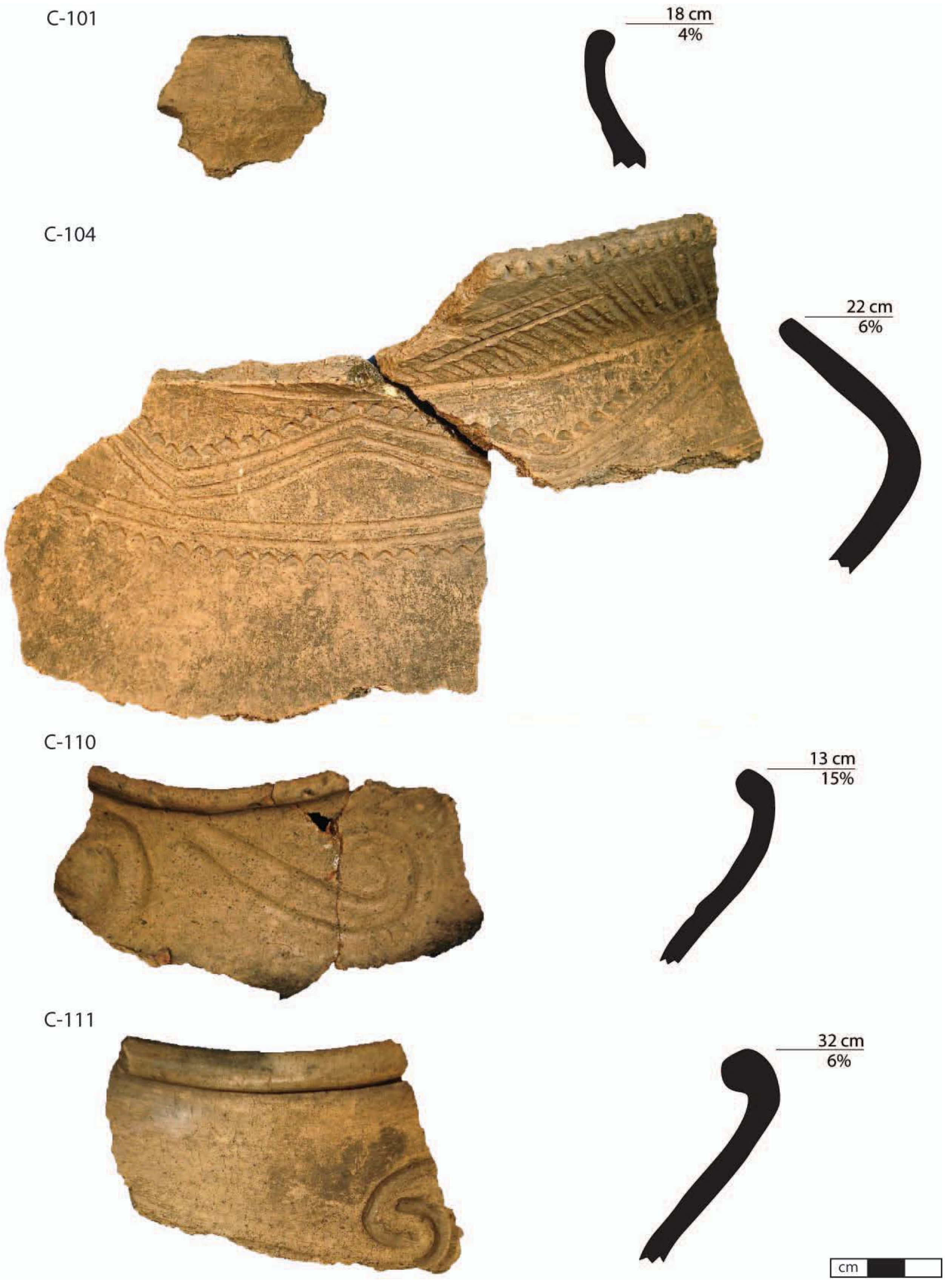
C-93

C-94

C-97

C-98

C-100


C-101
18 cm
4%
C-104
22 cm
6%
C-110
13 cm
15%
C-111
32 cm
6%
cm

C-112

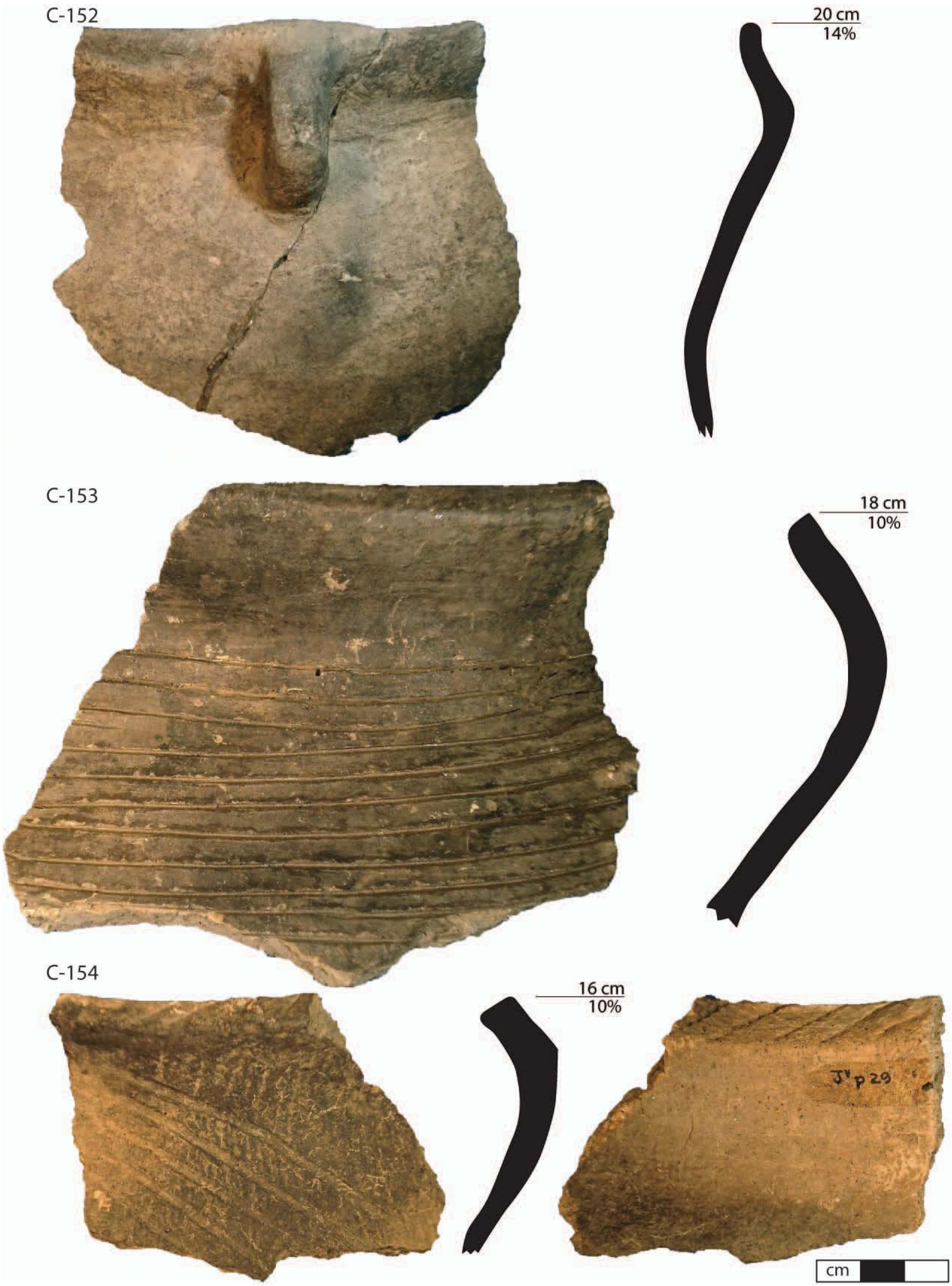
C-113

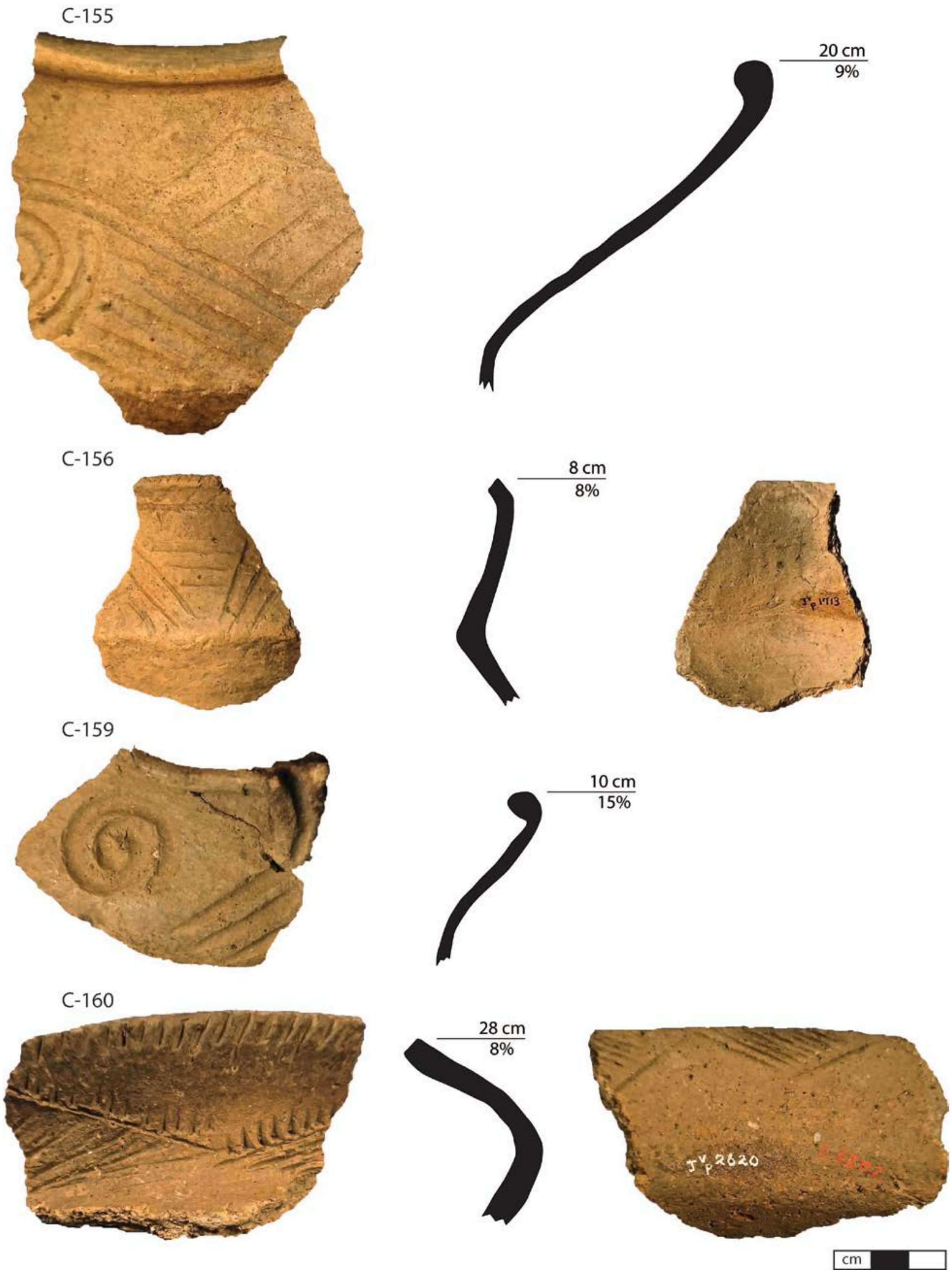
C-127

C-128

C-129

C-145


C-152
20 cm
14%
C-153
18 cm
10%
C-154
16 cm
10%
cm


C-155
20 cm
9%
C-156
8 cm
8%
C-159
10 cm
15%
C-160
28 cm
8%
cm

C-161

C-162

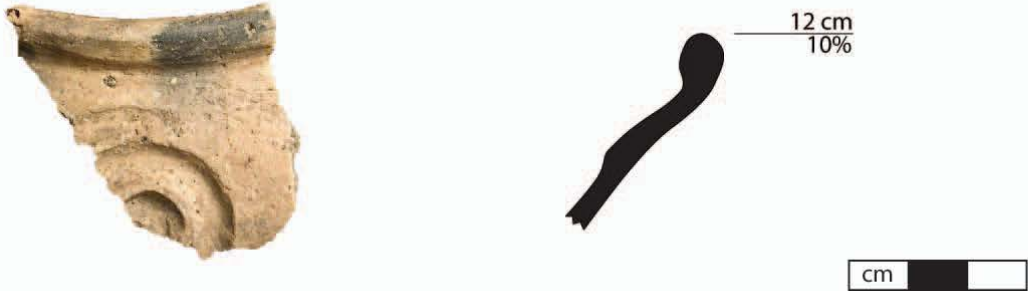
422

C-180

C-181

C-182

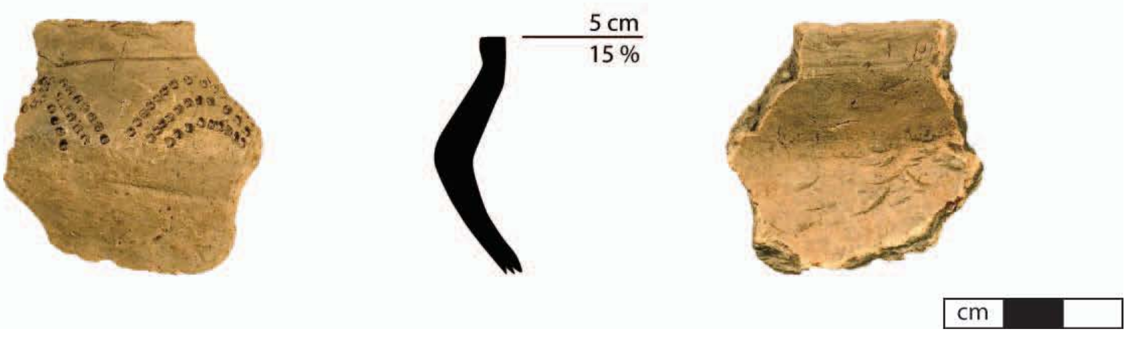
C-183



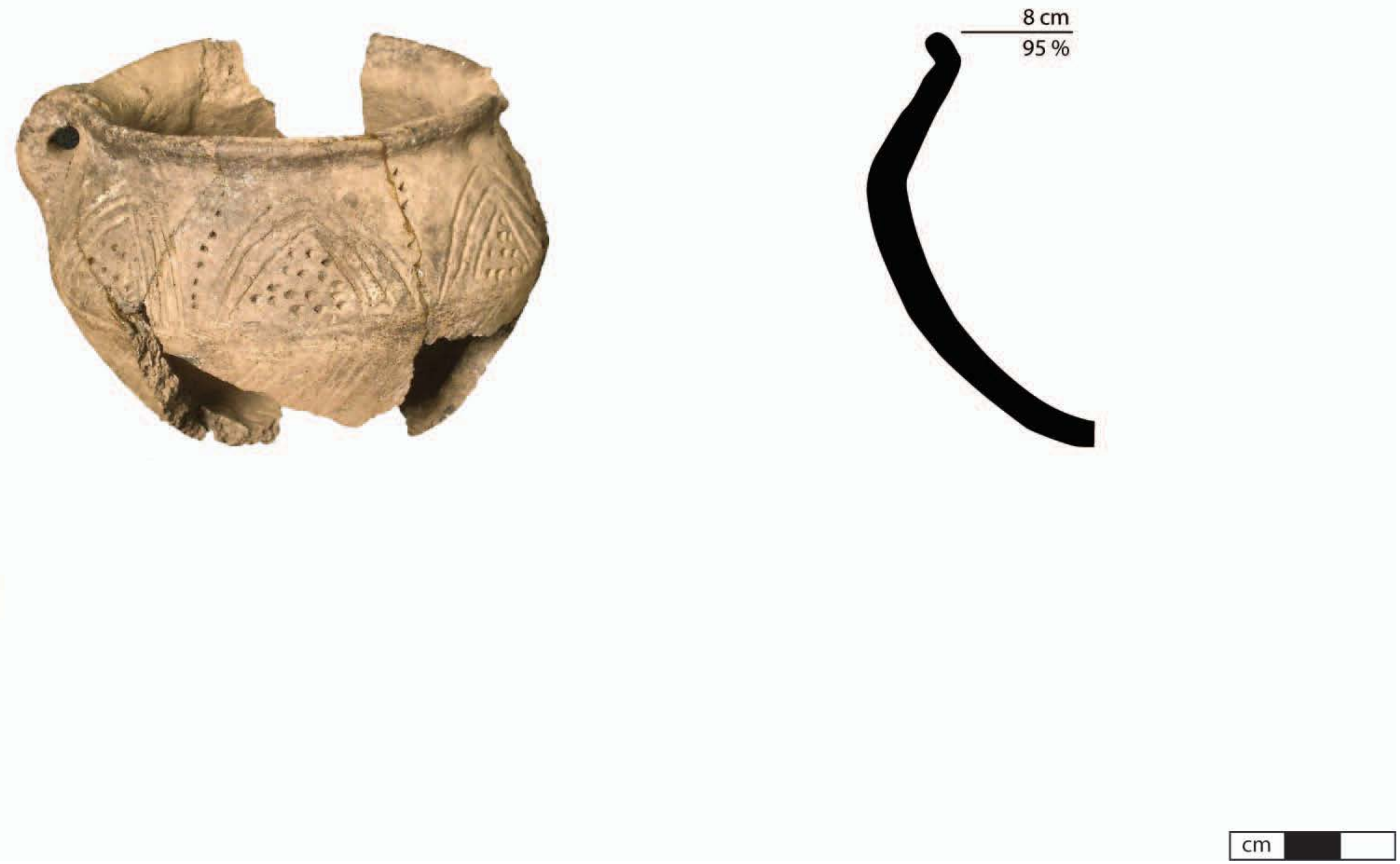
C-194

C-195

C-201

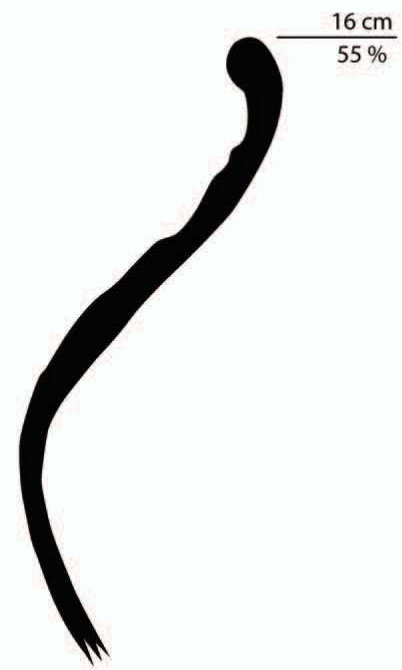


C-218




C-219
22 cm
80 %
cm

C-220

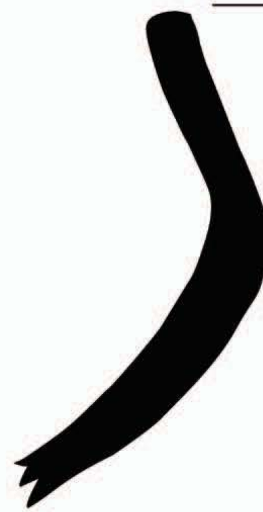


cm

C-223

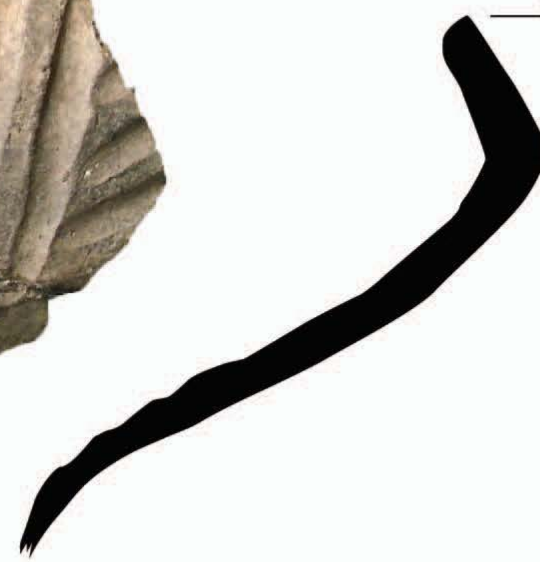
C-225

C-226



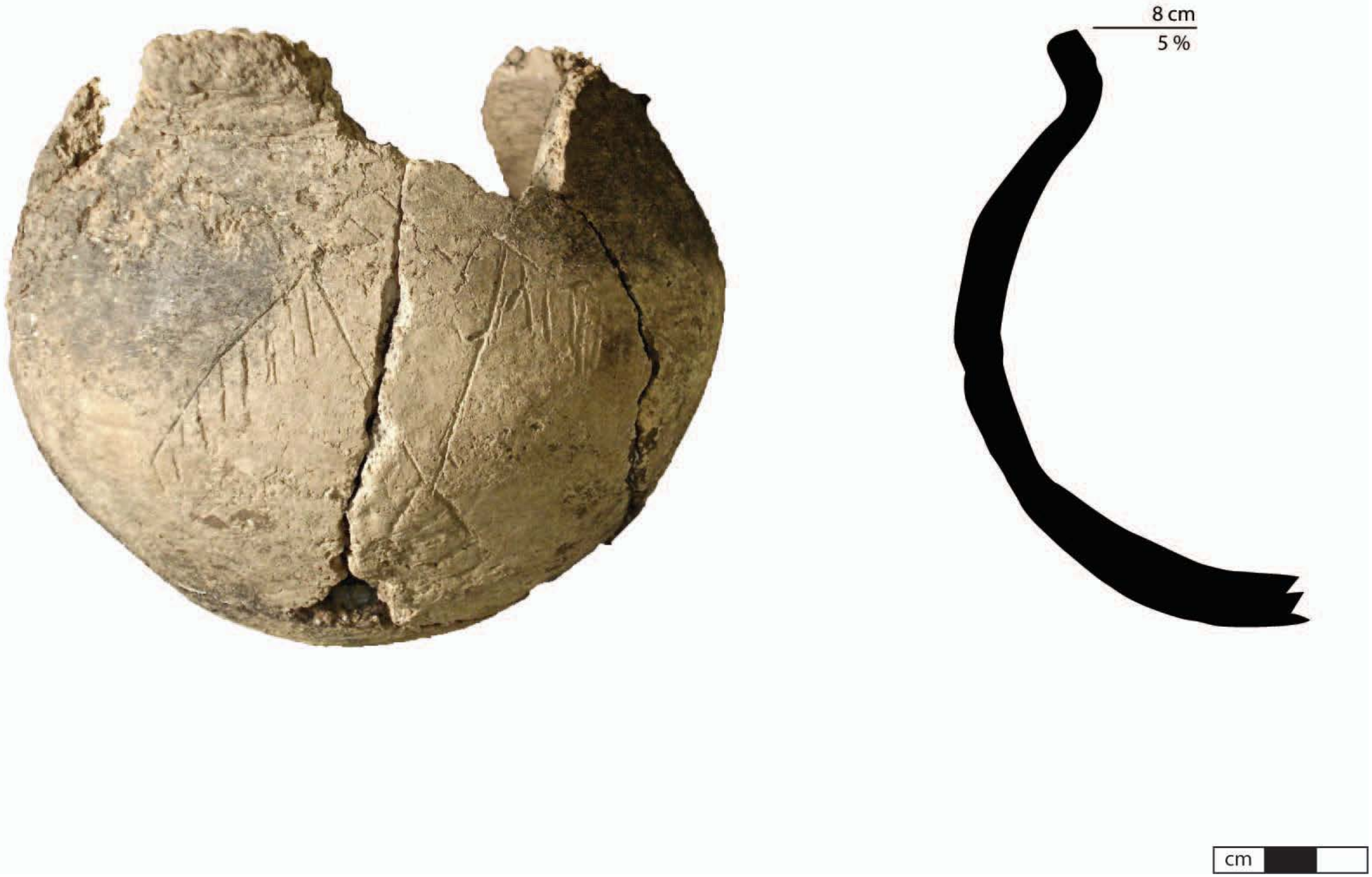
cm

C-227



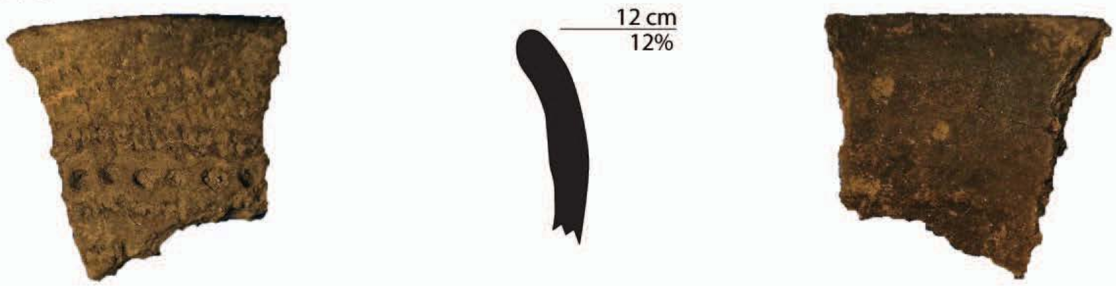
cm

C-229



C-230

C-105



C-109

C-185

APPENDIX B:

Statistical Results of Attribute Analyses

Table B.1: Fisher's Exact Test with Monte Carlo Simulations for Modal Type

Site	**Angled-unmodified**	**Angled-modified**	**Angled-tapered**	**Curved-unmodified**	**Curved-modified**	**Curved-tapered**	**Rolled**	**S-rim/ Collared**	**Everted**	**Straight**	**Indeter-minate**	**Present**	**Total**
Cambria	164	46	14	65	11	1	80	28	8	10	8	5	435
Price	46	7	5	15	4	2	19	3	3	0	0	3	103
Jones	14	2	2	5	1	2	1	1	1	0	0	2	30
Total	224	55	21	85	16	5	100	32	12	10	8	10	568
p-value	**0.062**												

Table B.2: Fisher's Exact Test with Monte Carlo Simulations for Rim Form

Site	**Unmodif ied**	**Modified**	**Tapered**	**Rolled**	**S-rim**	**Collared**	**Everted**	**Everted-Extruded**	**Total**
Cambria	242	63	15	79	28	0	4	4	**435**
Price	61	11	7	19	2	1	2	1	**104**
Jones	19	3	4	1	0	1	1	0	**29**
Total	**322**	**77**	**26**	**99**	**30**	**2**	**7**	**5**	**568**
p-value	**0.007**								

Table B.3: Haberman Scores for Rim Form

Site	**Unmodified**	**Modified**	**Tapered**	**Rolled**	**S-rim**	**Collared**	**Everted**	**Everted-Extruded**
Cambria	-0.920	1.166	-2.329	0.831	2.226	-2.562	-1.222	0.181
Price	0.447	-0.982	1.163	0.250	-1.694	1.161	0.706	0.098
Jones	0.985	-0.519	2.438	-2.037	-1.305	2.890	1.110	-0.521

Table B.4: Fisher's Exact Test with Monte Carlo Simulations for Lip Form

Site	**Flat**	**Round**	**Pinched**	**Beveled Exterior**	**Beveled Interior**	**Indeter-minate**	**Total**
Cambria	175	123	4	132	0	1	**435**
Price	39	33	1	30	1	0	**104**
Jones	16	4	0	9	0	0	**29**
Total	**230**	**160**	**5**	**171**	**1**	**1**	**568**
p-value	**0.322**						

Table B.5: Fisher's Exact Test with Monte Carlo Simulations for Neck Form

	Angled	**Curved**	**Channeled**	**Straight**	**Neckless**	**Indeter-minate**	**Total**
Cambria	227	78	28	10	83	9	**435**
Price	61	21	2	1	19	0	**104**
Jones	20	8	0	0	1	0	**29**
Total	**308**	**107**	**30**	**11**	**103**	**9**	**568**
p-value	**0.129**						

Table B.6: Fisher's Exact Test with Monte Carlo Simulations for Shoulder Form

Site	**Angled**	**Rounded**	**Pronounced**	**Total**
Cambria	18	9	4	**31**
Price	8	5	1	**14**
Jones	1	2	0	**3**
Total	**27**	**16**	**5**	**48**
p-value	**0.847**			

Table B.7: Fisher's Exact Test with Monte Carlo Simulations for Lip Decoration

Site	**Tool Impress ed**	**Cross-hatched**	**Incised**	**Twisted Cord Impressed**	**Punctate**	**Dentate Stamped**	**None**	Total
Cambria	1	50	63	6	1	1	313	435
Price	0	6	11	0	1	0	86	104
Jones	0	4	2	0	0	0	23	29
Total	**1**	**60**	**76**	**6**	**2**	**1**	**422**	**568**
p-value	**0.433**							

Table B.8: Fisher's Exact Test with Monte Carlo Simulations for Exterior Rim Decoration

Site	Tool Impressed	Cross-hatched	Incised	Twisted Cord Impressed	Cordwrapped stick impressed	Knotted Cord	None	Indeter-minate	Total
Cambria	103	1	3	3	1	0	323	**1**	**435**
Price	34	0	0	2	0	1	68	**0**	**105***
Jones	17	1	0	0	0	0	11	**0**	**29**
Total	**154**	**2**	**3**	**5**	**1**	**1**	**402**	**1**	**569**
p-value	**0.001**								

* Some vessels demonstrated multiple exterior rim decorative techniques

Table B.9: Haberman Scores for Exterior Rim Decoration

Site	Tool Impressed	Cross-hatched	Incised	Twisted Cord Impressed	Cordwrapped stick impressed	Knotted Cord	None
Cambria	-3.261	-0.881	0.965	-0.868	0.556	-1.801	3.442
Price	1.345	-0.675	-0.827	1.245	-0.477	2.102	-1.500
Jones	3.918	2.890	-0.403	-0.521	-0.232	-0.232	-3.992

Table B.10: Fisher's Exact Test with Monte Carlo Simulations for Interior Rim Decoration

Site	Tool Impressed	Cross-hatched	Incised	Twisted Cord Impressed	None	Total
Cambria	43	0	5	10	377	**435**
Price	9	0	0	0	95	**104**
Jones	7	1	0	0	21	**29**
Total	**59**	**1**	**5**	**10**	**493**	**568**
p-value	**0.034**					

Table B.11: Haberman Scores for Interior Rim Decoration

Site	Tool Impressed	Cross-hatched	Incised	Twisted Cord Impressed	None
Cambria	-0.710	-1.810	1.242	1.764	-0.164
Price	-0.641	-0.474	-1.063	-1.510	1.517
Jones	2.492	4.315	-0.521	-0.740	-2.349

Table B.12: Fisher's Exact Test with Monte Carlo Simulations for Neck Decoration

Site	Incised	Twisted Cord Impressed	None	Indeter-minate	Total
Cambria	35	16	382	**2**	**435**
Price	4	0	100	**0**	**104**
Jones	3	0	26	**0**	**29**
Total	**42**	**16**	**508**	**2**	**568**
p-value	**0.086**				

Table B.13: Fisher's Exact Test with Monte Carlo Simulations for Interior Cameo Effect

Site	Strong	Weak	Absent	Total
Cambria	26	22	224	**272**
Price	11	8	34	**53**
Jones	1	1	12	**14**
Total	**38**	**31**	**270**	**339**
p-value	**0.028**			

Table B.14: Haberman Scores for Interior Cameo Effect

Site	Strong	Weak	Absent
Cambria	-1.659	-1.401	2.301
Price	2.490	1.627	-3.111
Jones	-1.289	-0.188	1.140

Table B.15: Chi-Square Test for Surface Polish

Site	Yes	No	Total
Cambria	211	224	**435**
Price	56	48	**104**
Jones	6	23	**29**
Total	**273**	**294**	**568**
X-squared	**10.133**		
Degrees of freedom	**2**		
p-value	**0.006**		

Table B.16: Haberman Scores for Site and Polish

Site	Yes	No
Cambria	0.382	-0.382
Price	1.306	-1.306
Jones	-3.029	3.029

Table B.17: Chi-Square Test for Presence of Handles

Site	Yes	No	Total
Cambria	36	399	**435**
Price	13	91	**104**
Jones	7	22	**29**
Total	**56**	**512**	**568**
X-squared	**8.696**		
Degrees of freedom	**2**		
p-value	**0.013**		

Table B.18: Haberman Scores for Site and Presence of Handles

Site	Yes	No
Cambria	-2.289	2.289
Price	1.000	-1.000
Jones	2.648	-2.648

Table B.19: Fisher's Exact Test with Monte Carlo Simulations for Motif A1

Site	Present	Absent	Total
Cambria	3	432	**435**
Price	1	103	**104**
Jones	0	29	**29**
Total	**4**	**564**	**568**
p-value	**0.658**		

Table B.20: Fisher's Exact Test with Monte Carlo Simulations for Motif A2

Site	Present	Absent	Total
Cambria	18	417	**435**
Price	4	100	**104**
Jones	2	27	**29**
Total	**24**	**544**	**568**
p-value	**0.620**		

Table B.21: Fisher's Exact Test with Monte Carlo Simulations for Motif A3

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.22: Fisher's Exact Test with Monte Carlo Simulations for Motif A4

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.23: Fisher's Exact Test with Monte Carlo Simulations for Motif A5

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.24: Fisher's Exact Test with Monte Carlo Simulations for Motif B1

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.25: Fisher's Exact Test with Monte Carlo Simulations for Motif B2

Site	Present	Absent	Total
Cambria	6	429	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**6**	**562**	**568**
p-value	**0.706**		

Table B.26: Fisher's Exact Test with Monte Carlo Simulations for Motif B3

Site	Present	Absent	Total
Cambria	2	433	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**1.0**		

Table B.27: Fisher's Exact Test with Monte Carlo Simulations for Motif B4

Site	Present	Absent	Total
Cambria	0	435	**435**
Price	1	103	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**0.235**		

Table B.28: Fisher's Exact Test with Monte Carlo Simulations for Motif B5

Site	Present	Absent	Total
Cambria	3	432	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**3**	**565**	**568**
p-value	**1.0**		

Table B.29: Fisher's Exact Test with Monte Carlo Simulations for Motif B6

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.30: Fisher's Exact Test with Monte Carlo Simulations for Motif B7

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.31: Fisher's Exact Test with Monte Carlo Simulations for Motif C1

Site	Present	Absent	Total
Cambria	3	432	**435**
Price	1	103	**104**
Jones	0	29	**29**
Total	**4**	**564**	**568**
p-value	**0.657**		

Table B.32: Fisher's Exact Test with Monte Carlo Simulations for Motif D1

Site	Present	Absent	Total
Cambria	2	433	**435**
Price	3	101	**104**
Jones	0	29	**29**
Total	**5**	**563**	**568**
p-value	**0.102**		

Table B.33: Fisher's Exact Test with Monte Carlo Simulations for Motif D2

Site	Present	Absent	Total
Cambria	2	433	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**1.0**		

Table B.34: Fisher's Exact Test with Monte Carlo Simulations for Motif D3

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.35: Fisher's Exact Test with Monte Carlo Simulations for Motif D4

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.36: Fisher's Exact Test with Monte Carlo Simulations for Motif E1

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.37: Fisher's Exact Test with Monte Carlo Simulations for Motif F1

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.38: Fisher's Exact Test with Monte Carlo Simulations for Motif F2

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.39: Fisher's Exact Test with Monte Carlo Simulations for Motif F3

Site	Present	Absent	Total
Cambria	2	433	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**1.0**		

Table B.40: Fisher's Exact Test with Monte Carlo Simulations for Motif F4

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.41: Fisher's Exact Test with Monte Carlo Simulations for Motif F5

Site	Present	Absent	Total
Cambria	0	435	**435**
Price	2	102	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**0.057**		

Table B.42: Fisher's Exact Test with Monte Carlo Simulations for Motif F6

Site	Present	Absent	Total
Cambria	0	435	**435**
Price	3	101	**104**
Jones	0	29	**29**
Total	**3**	**565**	**568**
p-value	**0.018**		

Table B.43: Haberman Scores for Motif F6

Site	Present	Absent
Cambria	-3.141	3.141
Price	3.668	-3.668
Jones	-0.403	0.403

Table B.44: Fisher's Exact Test with Monte Carlo Simulations for Motif G1

Site	Present	Absent	Total
Cambria	4	431	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**4**	**564**	**568**
p-value	**1.0**		

Table B.45: Fisher's Exact Test with Monte Carlo Simulations for Motif G2

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.46: Fisher's Exact Test with Monte Carlo Simulations for Motif H1

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	1	103	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**0.408**		

Table B.47: Fisher's Exact Test with Monte Carlo Simulations for Motif H2

Site	Present	Absent	Total
Cambria	5	430	**435**
Price	2	102	**104**
Jones	2	27	**29**
Total	**9**	**559**	**568**
p-value	**0.0714**		

Table B.48: Fisher's Exact Test with Monte Carlo Simulations for Motif I1

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.49: Fisher's Exact Test with Monte Carlo Simulations for Motif J1

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.50: Fisher's Exact Test with Monte Carlo Simulations for Motif J2

Site	Present	Absent	Total
Cambria	0	435	**435**
Price	2	102	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**0.055**		

Table B.51: Fisher's Exact Test with Monte Carlo Simulations for Motif J3

Site	Present	Absent	Total
Cambria	2	433	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**1.0**		

Table B.52: Fisher's Exact Test with Monte Carlo Simulations for Motif K1

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.53: Fisher's Exact Test with Monte Carlo Simulations for Motif L1

Site	Present	Absent	Total
Cambria	70	365	**435**
Price	13	91	**104**
Jones	2	22	**24**
Total	**85**	**483**	**568**
p-value	**0.350**		

Table B.54: Fisher's Exact Test with Monte Carlo Simulations for Motif L2

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.55: Fisher's Exact Test with Monte Carlo Simulations for Motif L3

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.56: Fisher's Exact Test with Monte Carlo Simulations for Motif L4

Site	Present	Absent	Total
Cambria	2	433	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**1.0**		

Table B.57: Fisher's Exact Test with Monte Carlo Simulations for Motif M1

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	1	28	**29**
Total	**2**	**566**	**568**
p-value	**0.134**		

Table B.58: Fisher's Exact Test with Monte Carlo Simulations for Motif M2

Site	Present	Absent	Total
Cambria	2	433	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**1.0**		

Table B.59: Fisher's Exact Test with Monte Carlo Simulations for Motif N1

Site	Present	Absent	Total
Cambria	5	430	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**5**	**563**	**568**
p-value	**0.683**		

Table B.60: Fisher's Exact Test with Monte Carlo Simulations for Motif O1

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.61: Fisher's Exact Test with Monte Carlo Simulations for Motif O2

Site	Present	Absent	Total
Cambria	0	435	**435**
Price	1	103	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**0.235**		

Table B.62: Fisher's Exact Test with Monte Carlo Simulations for Motif O3

Site	Present	Absent	Total
Cambria	2	433	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**1.0**		

Table B.63: Fisher's Exact Test with Monte Carlo Simulations for Motif P1

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.64: Fisher's Exact Test with Monte Carlo Simulations for Motif P2

Site	Present	Absent	Total
Cambria	2	433	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**1.0**		

Table B.65: Fisher's Exact Test with Monte Carlo Simulations for Motif Q1

Site	**Present**	**Absent**	**Total**
Cambria	2	433	**435**
Price	2	102	**104**
Jones	1	28	**29**
Total	**5**	**563**	**568**
p-value	**0.057**		

Table B.66: Fisher's Exact Test with Monte Carlo Simulations for Motif Q2

Site	**Present**	**Absent**	**Total**
Cambria	5	430	**435**
Price	4	100	**104**
Jones	1	28	**29**
Total	**10**	**558**	**568**
p-value	**0.792**		

Table B.67: Fisher's Exact Test with Monte Carlo Simulations for Motif Q3

Site	**Present**	**Absent**	**Total**
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.68: Fisher's Exact Test with Monte Carlo Simulations for Motif Q4

Site	**Present**	**Absent**	**Total**
Cambria	3	432	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**3**	**565**	**568**
p-value	**1.0**		

Table B.69: Fisher's Exact Test with Monte Carlo Simulations for Motif Q5

Site	Present	Absent	Total
Cambria	2	433	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**2**	**566**	**568**
p-value	**1.0**		

Table B.70: Fisher's Exact Test with Monte Carlo Simulations for Motif Q6

Site	Present	Absent	Total
Cambria	8	427	**435**
Price	3	101	**104**
Jones	1	28	**29**
Total	**12**	**556**	**568**
p-value	**0.421**		

Table B.71: Fisher's Exact Test with Monte Carlo Simulations for Motif Category A

Site	Present	Absent	Total
Cambria	24	411	**435**
Price	5	99	**104**
Jones	2	27	**29**
Total	**31**	**537**	**568**
p-value	**0.878**		

Table B.72: Fisher's Exact Test with Monte Carlo Simulations for Motif Category B

Site	Present	Absent	Total
Cambria	12	423	**435**
Price	1	103	**104**
Jones	0	29	**29**
Total	**13**	**555**	**568**
p-value	**0.639**		

Table B.73: Fisher's Exact Test with Monte Carlo Simulations for Motif Category C

Site	Present	Absent	Total
Cambria	3	432	**435**
Price	1	103	**104**
Jones	0	29	**29**
Total	**4**	**564**	**568**
p-value	**0.652**		

Table B.74: Fisher's Exact Test with Monte Carlo Simulations for Motif Category D

Site	Present	Absent	Total
Cambria	6	429	**435**
Price	3	101	**104**
Jones	0	29	**29**
Total	**9**	**559**	**568**
p-value	**0.522**		

Table B.75: Fisher's Exact Test with Monte Carlo Simulations for Motif Category E

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.76: Fisher's Exact Test with Monte Carlo Simulations for Motif Category F

Site	Present	Absent	Total
Cambria	6	429	**435**
Price	3	101	**104**
Jones	0	29	**29**
Total	**9**	**559**	**568**
p-value	**0.510**		

Table B.77: Fisher's Exact Test with Monte Carlo Simulations for Motif Category G

Site	Present	Absent	Total
Cambria	5	430	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**5**	**563**	**568**
p-value	**0.683**		

Table B.78: Fisher's Exact Test with Monte Carlo Simulations for Motif Category H

Site	Present	Absent	Total
Cambria	5	430	**435**
Price	3	101	**104**
Jones	2	27	**29**
Total	**5**	**558**	**568**
p-value	**0.034**		

Table B.79: Haberman Scores for Motif Category H

Site	Present	Absent
Cambria	-2.003	2.003
Price	0.964	-0.964
Jones	2.159	-2.159

Table B.80: Fisher's Exact Test with Monte Carlo Simulations for Motif Category I

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.81: Fisher's Exact Test with Monte Carlo Simulations for Motif Category J

Site	Present	Absent	Total
Cambria	3	432	**435**
Price	2	102	**104**
Jones	0	29	**29**
Total	**5**	**563**	**568**
p-value	**0.422**		

Table B.82: Fisher's Exact Test with Monte Carlo Simulations for Motif Category K

Site	Present	Absent	Total
Cambria	1	434	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**1**	**567**	**568**
p-value	**1.0**		

Table B.83: Fisher's Exact Test with Monte Carlo Simulations for Motif Category L

Site	Present	Absent	Total
Cambria	73	362	**435**
Price	13	91	**104**
Jones	2	27	**29**
Total	**88**	**480**	**568**
p-value	**0.262**		

Table B.84: Fisher's Exact Test with Monte Carlo Simulations for Motif Category M

Site	Present	Absent	Total
Cambria	3	432	**435**
Price	0	104	**104**
Jones	1	28	**29**
Total	**4**	**564**	**568**
p-value	**0.214**		

Table B.85: Fisher's Exact Test with Monte Carlo Simulations for Motif Category N

Site	Present	Absent	Total
Cambria	5	430	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**5**	**563**	**568**
p-value	**0.678**		

Table B.86: Fisher's Exact Test with Monte Carlo Simulations for Motif Category O

Site	Present	Absent	Total
Cambria	3	432	**435**
Price	1	103	**104**
Jones	0	29	**29**
Total	**4**	**564**	**568**
p-value	**0.652**		

Table B.87: Fisher's Exact Test with Monte Carlo Simulations for Motif Category P

Site	Present	Absent	Total
Cambria	3	432	**435**
Price	0	104	**104**
Jones	0	29	**29**
Total	**3**	**565**	**568**
p-value	**1.0**		

Table B.88: Fisher's Exact Test with Monte Carlo Simulations for Motif Category Q

Site	Present	Absent	Total
Cambria	17	418	**435**
Price	5	99	**104**
Jones	3	26	**29**
Total	**25**	**543**	**568**
p-value	**0.184**		

Table B.89: ANOVA and Kruskal-Wallis Tests for Orifice Diameter

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	11.00	5.39	0.154	0.857
Kruskal-Wallis				
Degrees of Freedom	**Chi-Squared**		**Probability**	
2	0.028		0.987	

Table B.90: ANOVA and Kruskal-Wallis Tests for Neck Length

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	98.00	49.05	0.522	0.594
Kruskal-Wallis				
Degrees of Freedom	**Chi-Squared**		**Probability**	
2	0.736		0.692	

Table B.91: ANOVA and Kruskal-Wallis Tests for Wall Thickness

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	0.2	0.112	0.052	0.95
Kruskal-Wallis				
Degrees of Freedom	**Chi-Squared**		**Probability**	
2	0.0074		0.996	

Table B.92: ANOVA, Kruskal-Wallis and Tukey HSD Tests for Incising Width

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	20.00	10.008	3.79	0.024
Kruskal-Wallis				
Degrees of Freedom	**Chi-Squared**		**Probability**	
2	8.336		0.015	
Tukey HSD				
Site	**Probability**			
Cambria-Jones	0.225			
Cambria-Price	0.114			
Jones-Price	0.031			

Table B.93: ANOVA, Kruskal-Wallis and Tukey HSD Tests for Incising Depth

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	2.76	1.381	7.00	0.001
Kruskal-Wallis				
Degrees of Freedom	**Chi-Squared**		**Probability**	
2	8.992		0.011	
Tukey HSD				
Site	**Probability**			
Cambria-Jones	0.538			
Cambria-Price	0.001			
Jones-Price	0.635			

Table B.94: ANOVA, Kruskal-Wallis and Tukey HSD Tests for OD/NL

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	5.00	2.338	0.132	0.876
Kruskal-Wallis				
Degrees of Freedom	**Chi-Squared**		**Probability**	
2	0.914		0.633	

Table B.95: Margolin C and Light Statistics for Modal Type by Site

C statistic	23.194
Tau numerator	0.003
Tau	0.004
Probability	0.279
Degrees of Freedom	20

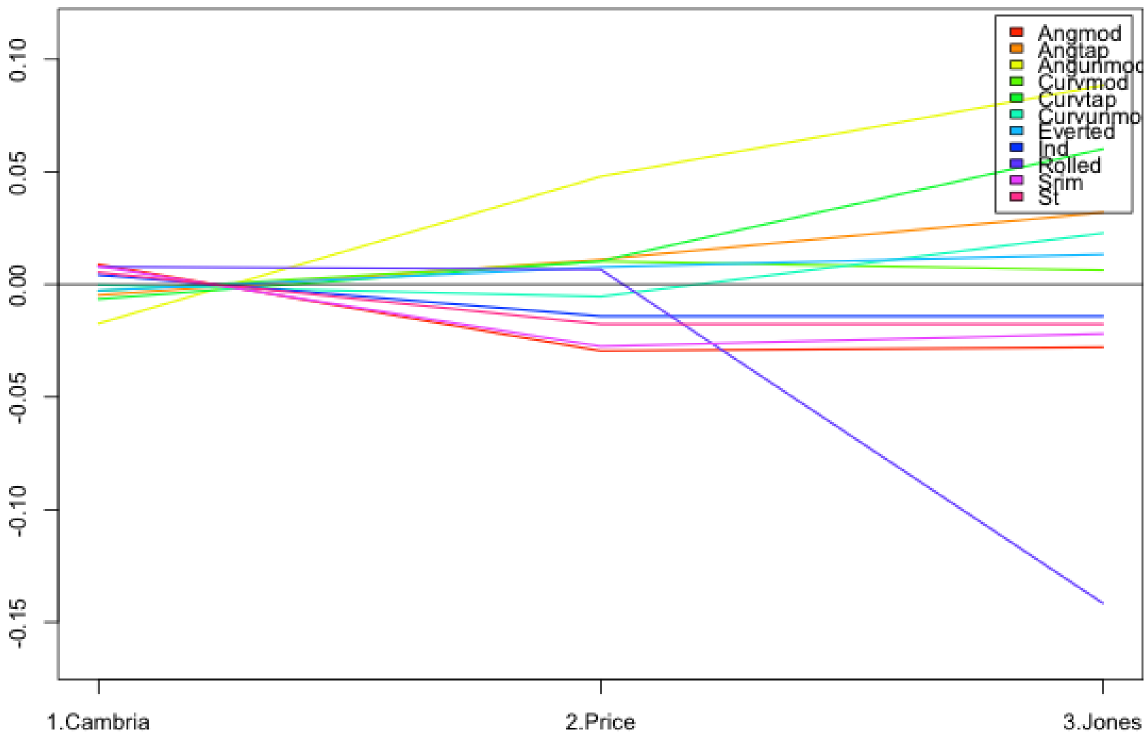


Figure B.1: Centered column plot for modal types by site

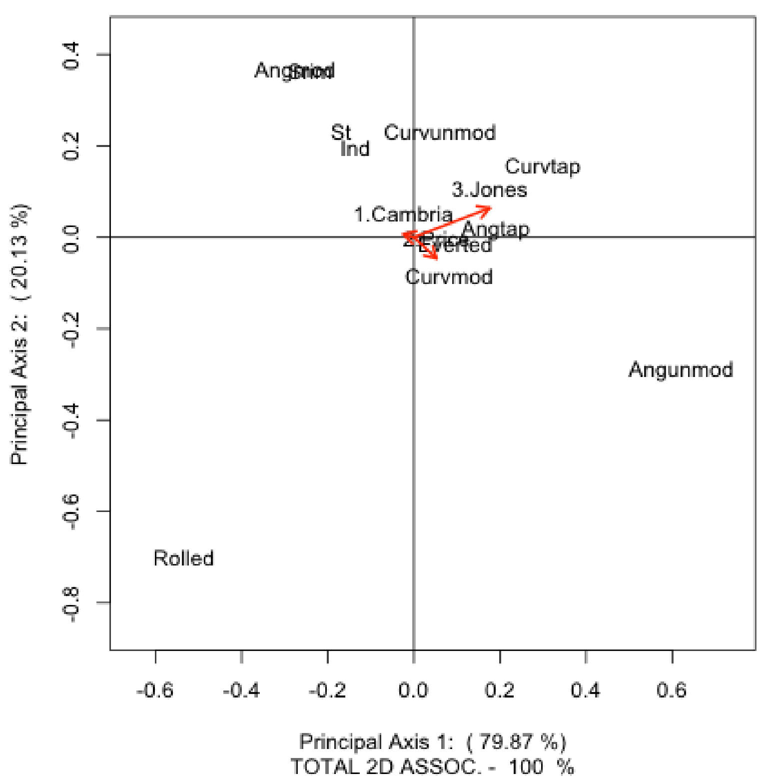


Figure B.2: Biplot with modal types by site

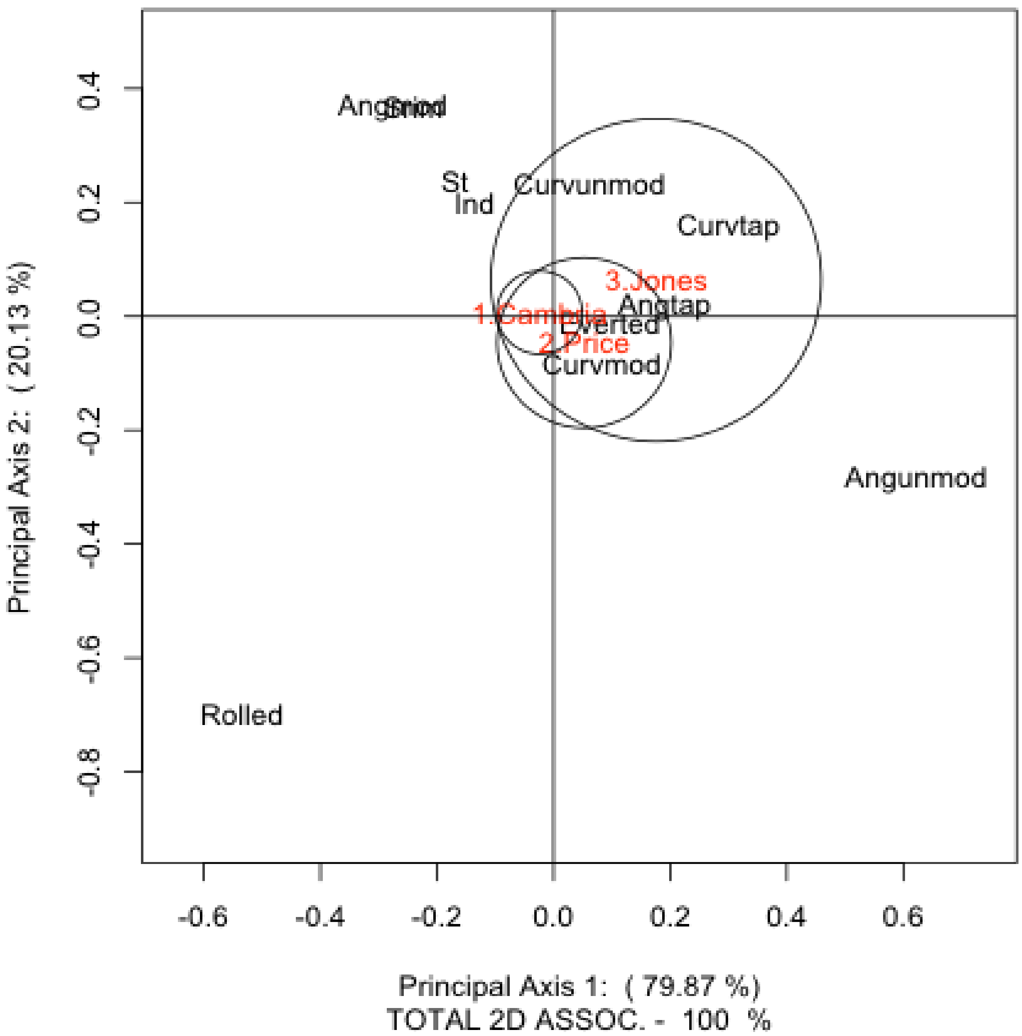


Figure B.3: Confidence circle plot with modal types by site

Table B.96: Margolin C and Light Statistics for Rim Form by Site

C statistic	18.217
Tau numerator	0.003
Tau	0.005
Probability	0.197
Degrees of Freedom	14

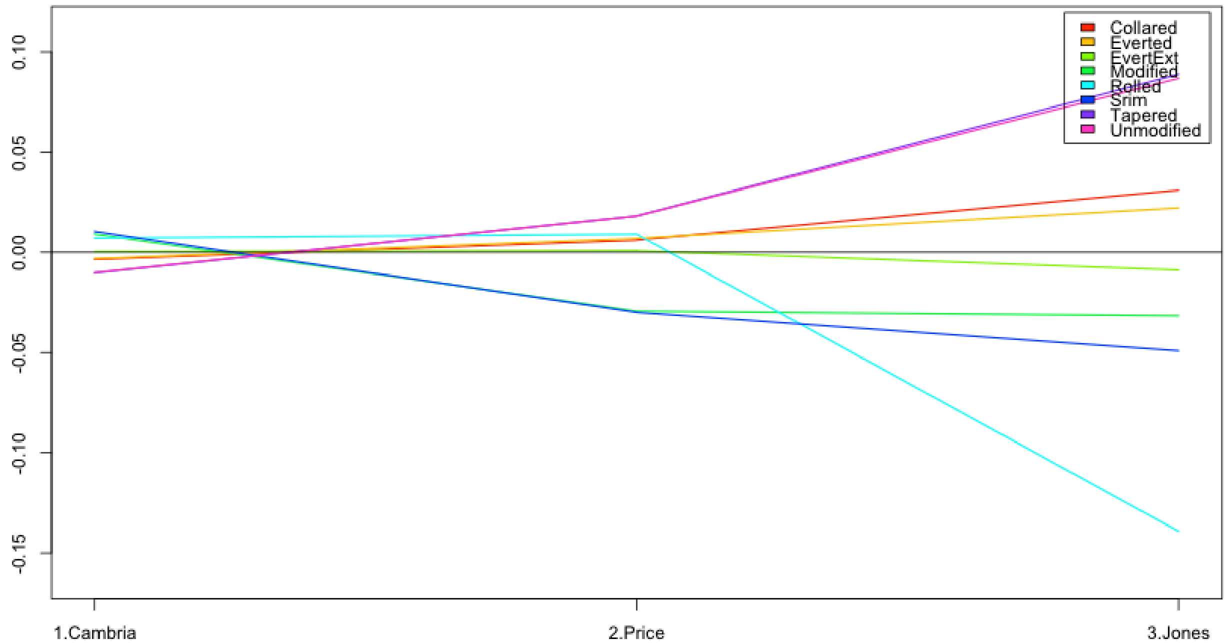


Figure B.4: Centered column plot for rim form by site

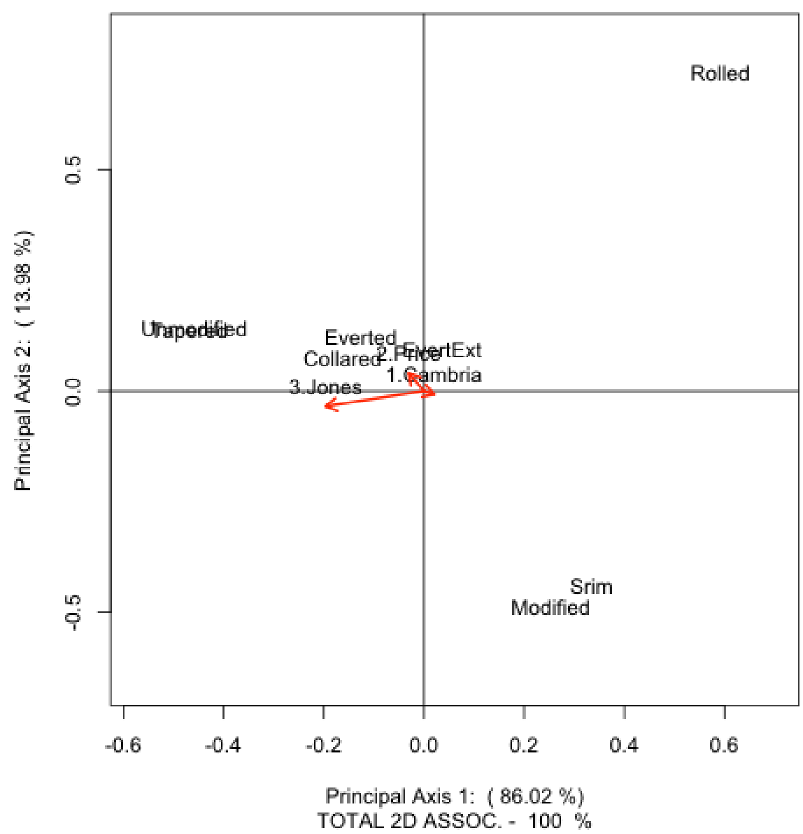


Figure B.5: Biplot with rim form by site

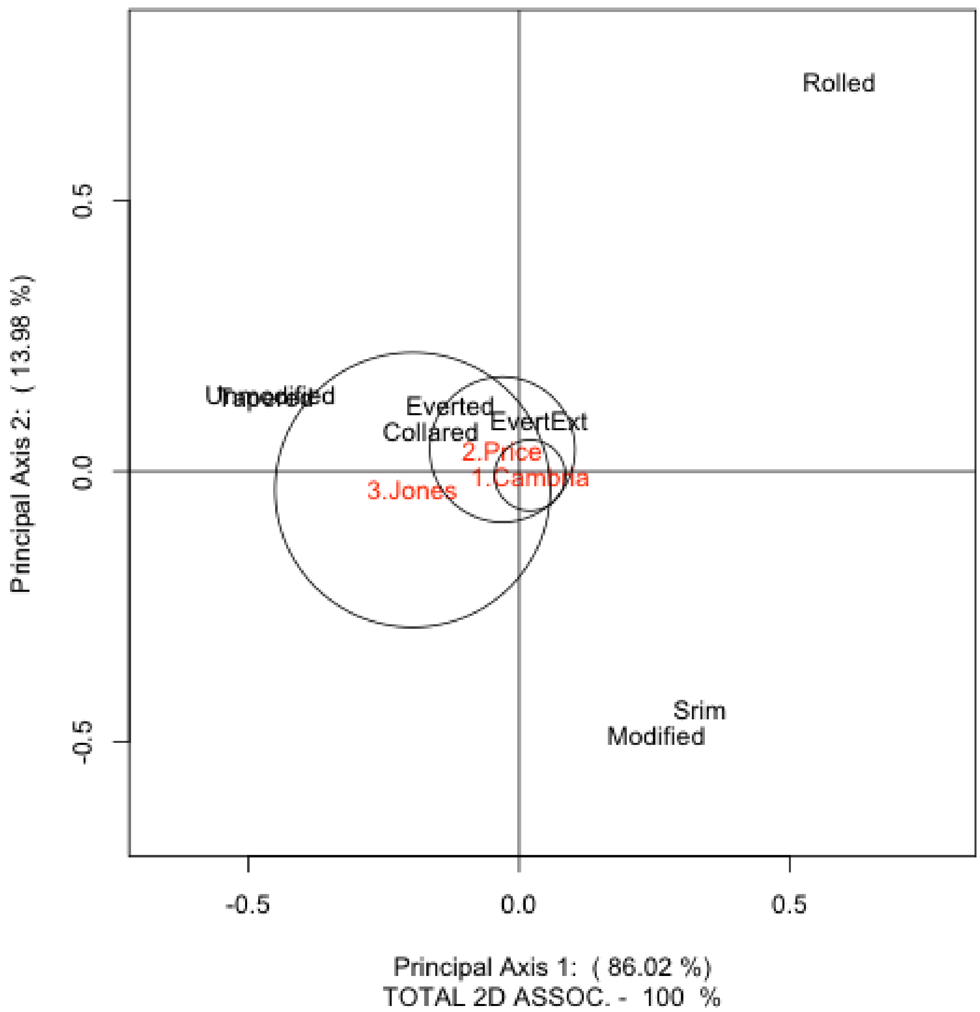


Figure B.6: Confidence circle plot with rim form by site

Table B.97: Margolin C and Light Statistics for Lip Form by Site

C statistic	11.123
Tau numerator	0.003
Tau	0.004
Probability	0.348
Degrees of Freedom	10

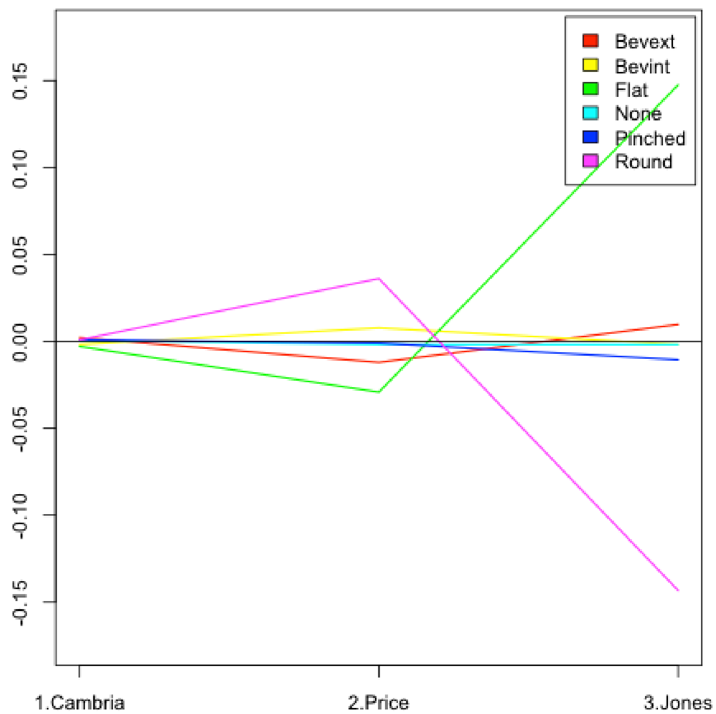


Figure B.7: Centered column plot for lip form by site

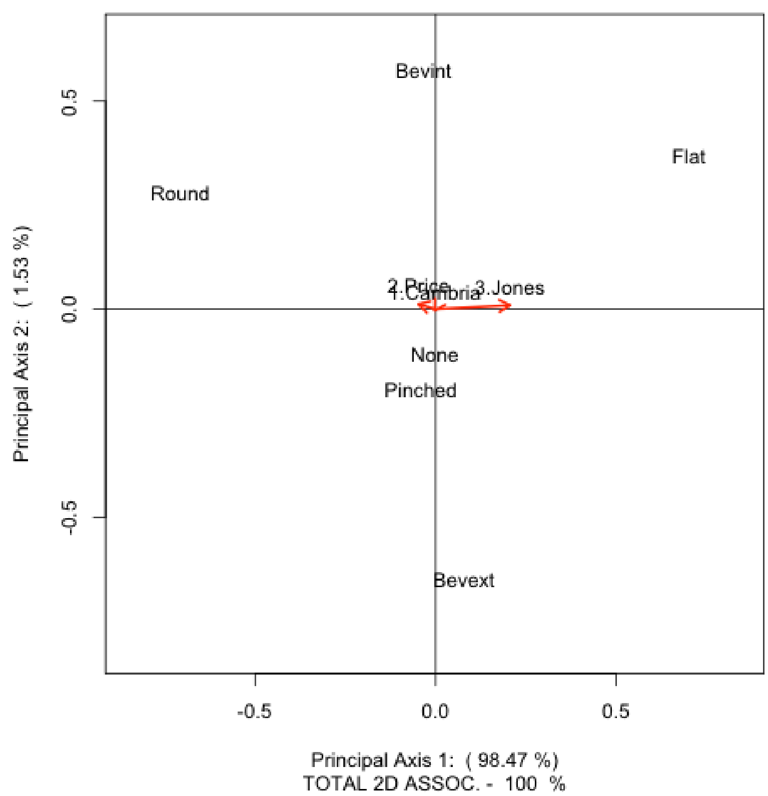


Figure B.8: Biplot with lip form by site

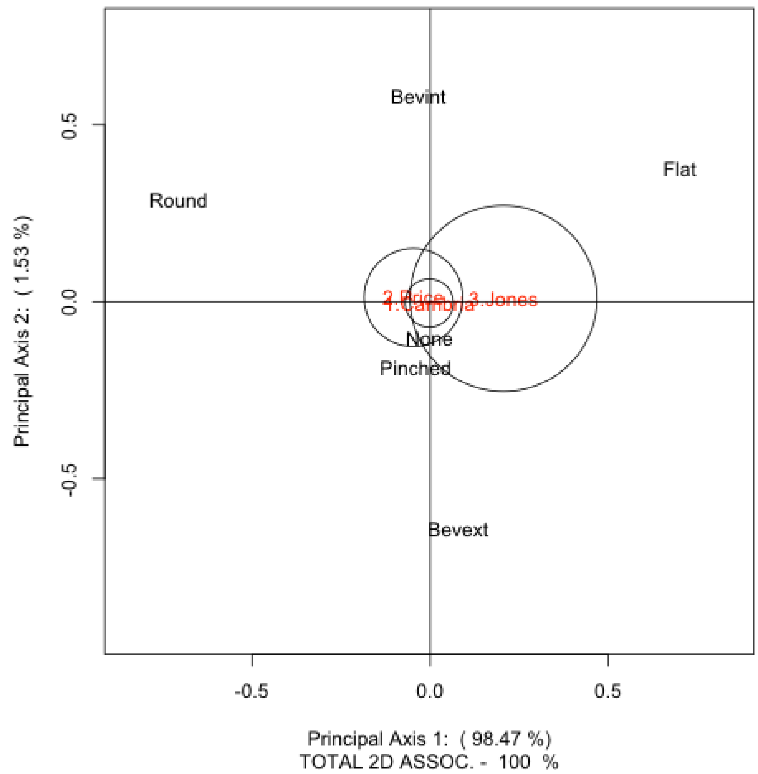


Figure B.9: Confidence circle plot with lip form by site

Table B.98: Margolin C and Light Statistics for Shoulder Form by Site

C statistic	1.938
Tau numerator	0.011
Tau	0.020
Probability	0.747
Degrees of Freedom	4

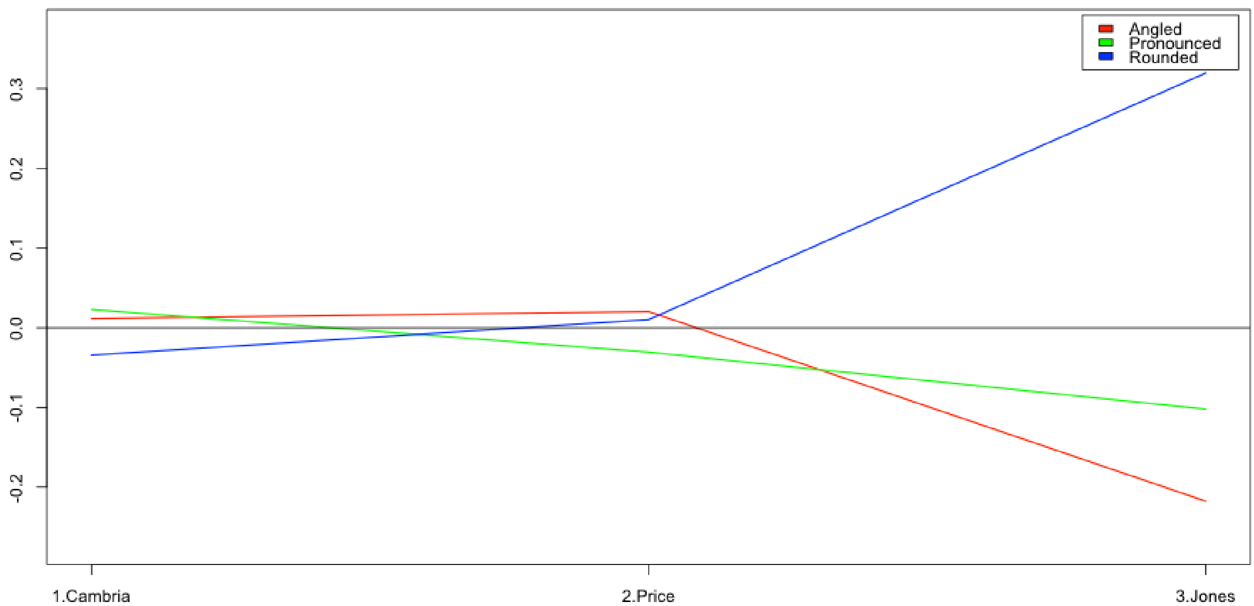


Figure B.10: Centered column plot for shoulder form by site

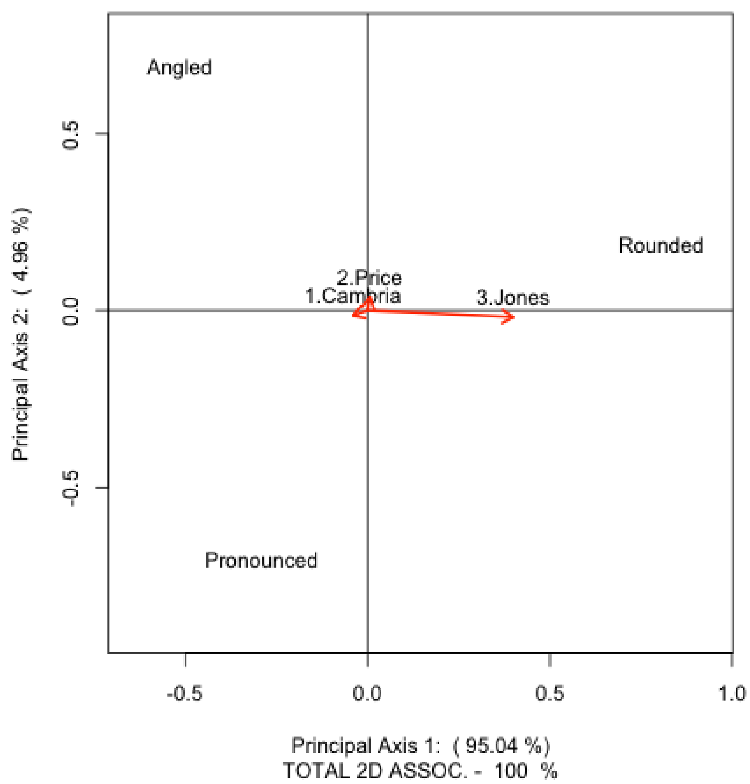


Figure B.11: Biplot with shoulder form by site

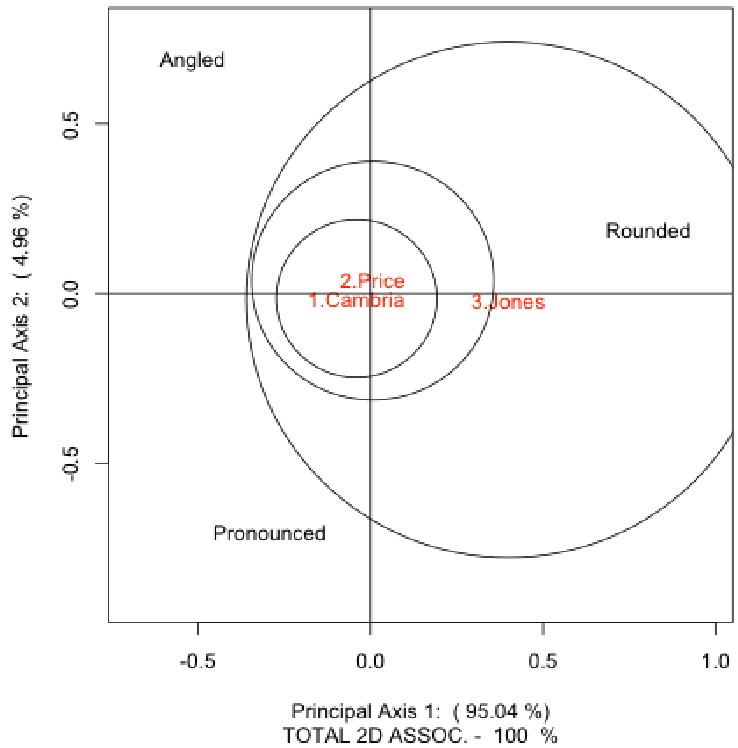


Figure B.12: Confidence circle plot with shoulder form by site

Table B.99: Margolin C and Light Statistics for Lip Decoration by Site

C statistic	22.919
	0.003
Tau	0.007
Probability	0.028
Degrees of Freedom	12

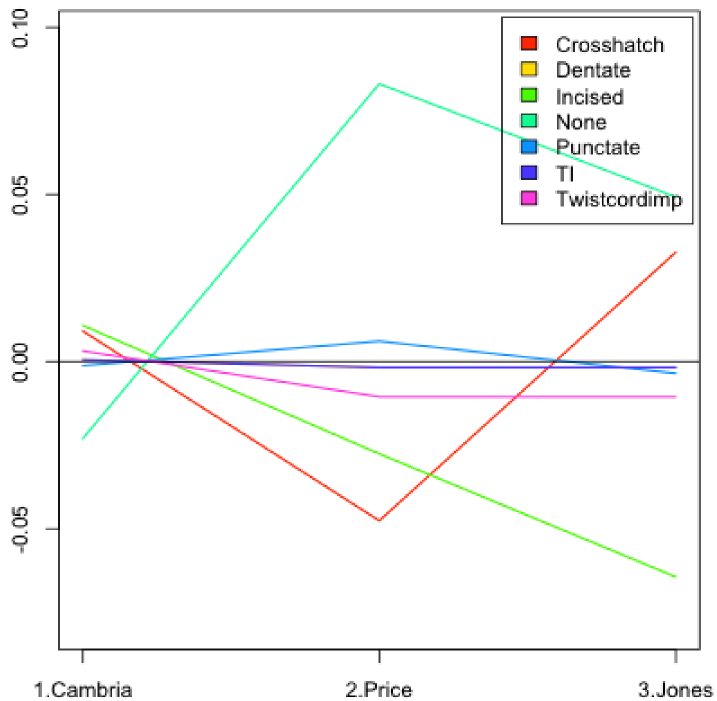


Figure B.13: Centered column plot for lip decoration by site

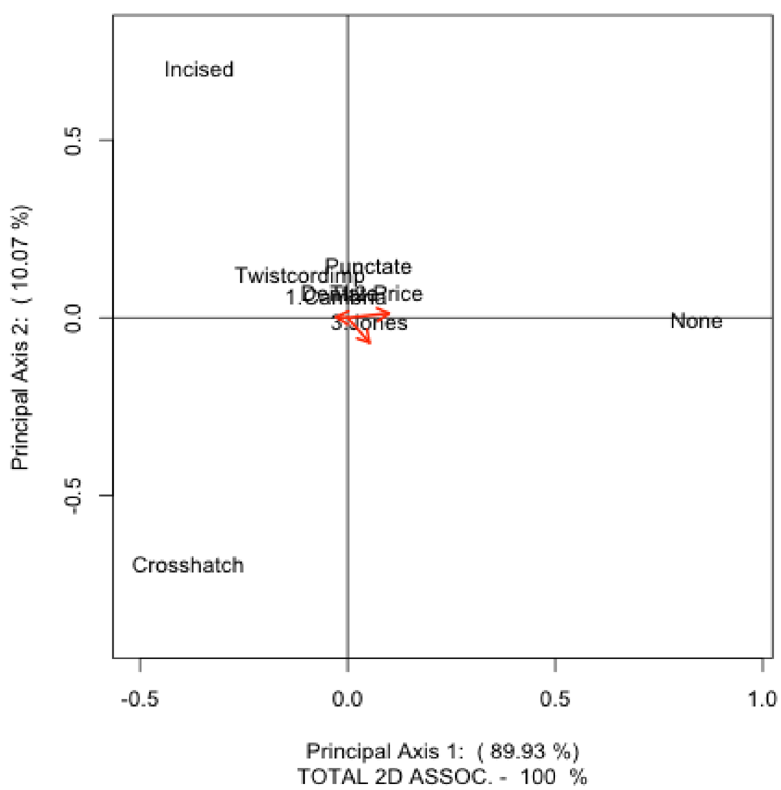


Figure B.14: Biplot with lip decoration by site

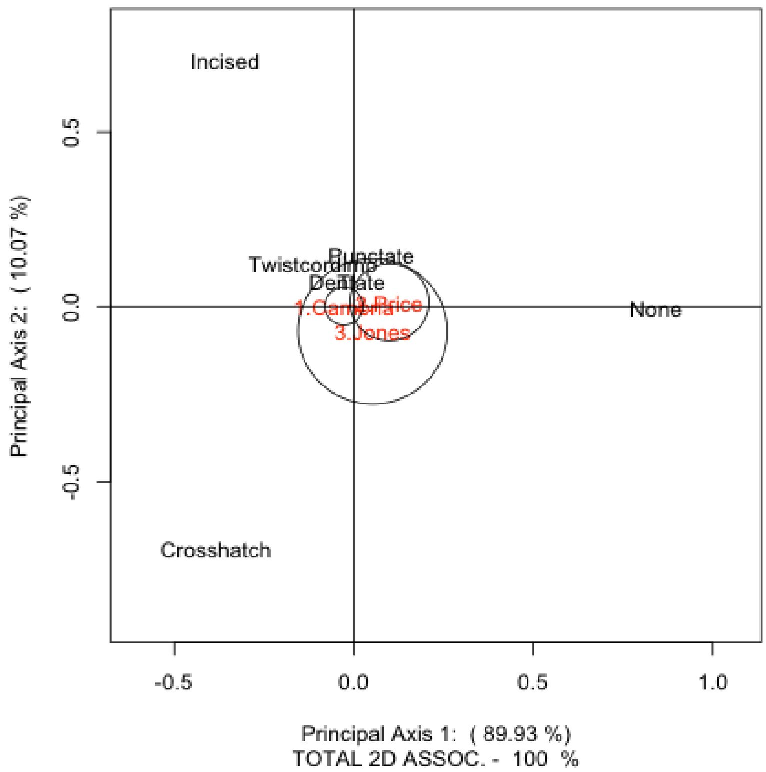


Figure B.15: Confidence circle plot with lip decoration by site

Table B.100: Margolin C and Light Statistics for Exterior Rim Decoration by Site

C statistic	111.236
	0.014
Tau	0.033
Probability	0.00
Degrees of Freedom	12

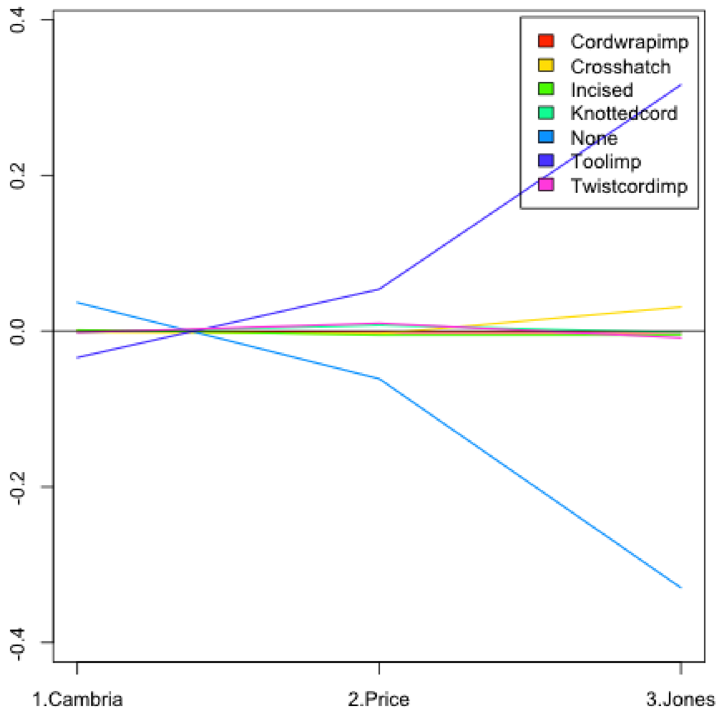


Figure B.16: Centered column plot for exterior rim decoration by site

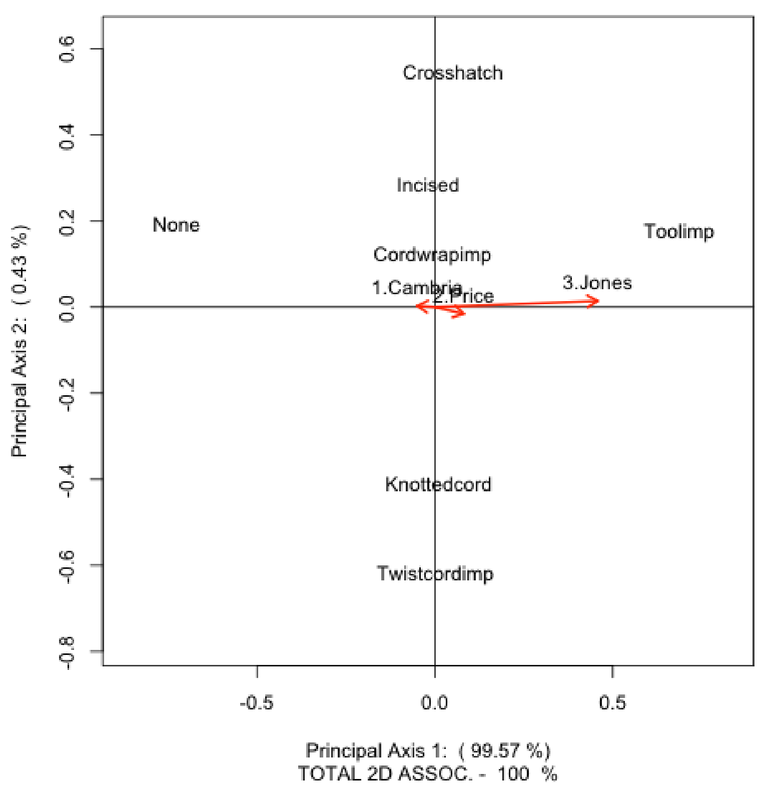


Figure B.17: Biplot with exterior rim decoration by site

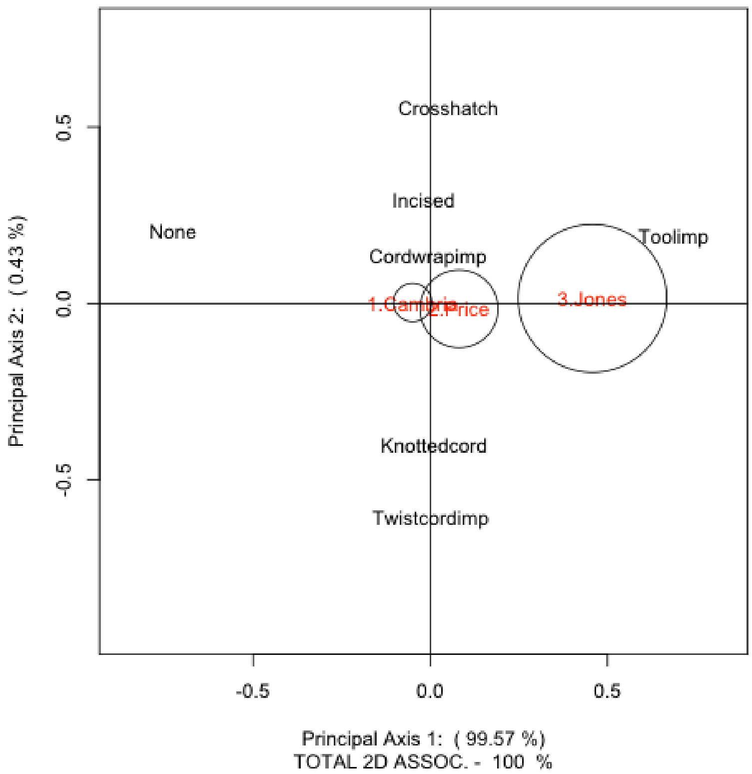


Figure B.18: Confidence circle plot with exterior rim decoration by site

Table B.101: Margolin C and Light Statistics for Neck Decoration by Site

C statistic	8.872
	0.001
Tau	0.008
Probability	0.064
Degrees of Freedom	4

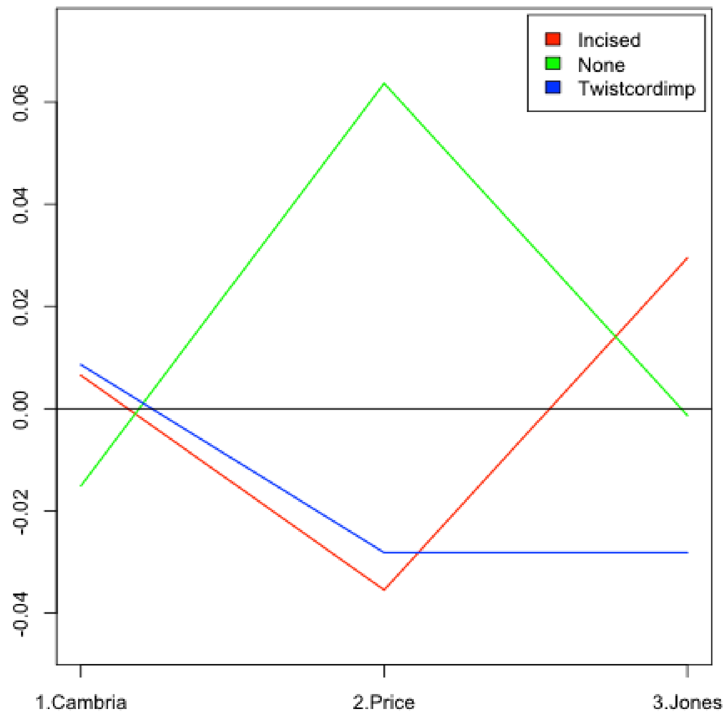


Figure B.19: Centered column plot for neck decoration by site

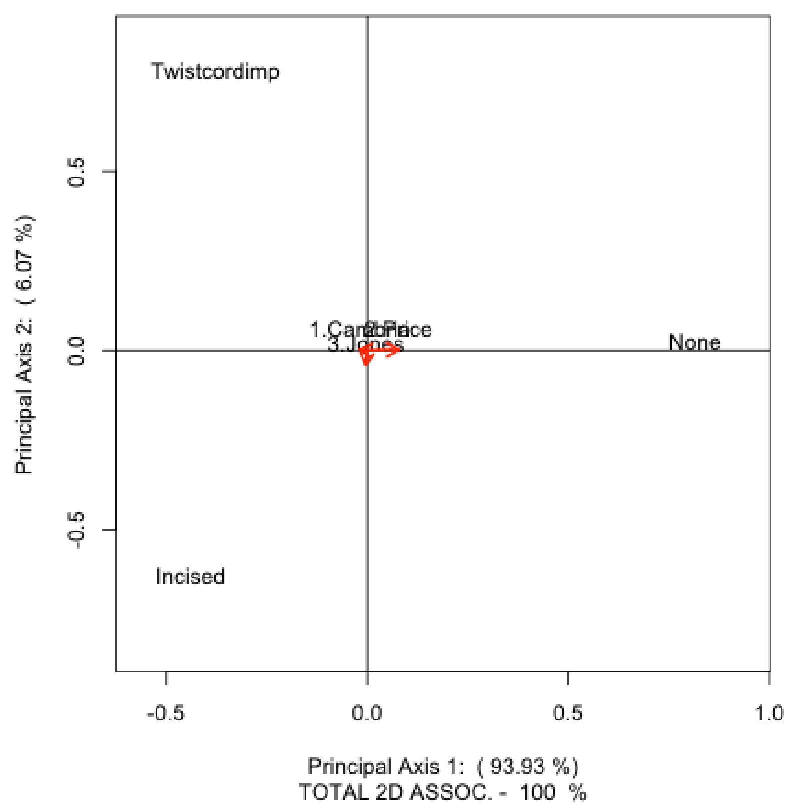


Figure B.20: Biplot with neck decoration by site

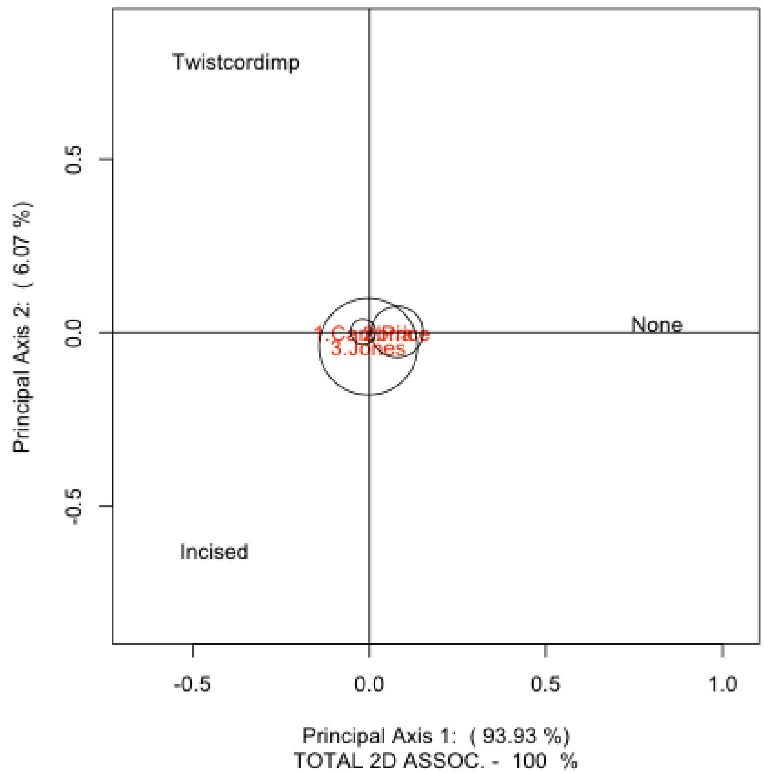


Figure B.21: Confidence circle plot with neck decoration by site

Table B.102: Margolin C and Light Statistics for Interior Rim Decoration by Site

C statistic	25.461
	0.003
Tau	0.011
Probability	0.001
Degrees of Freedom	8

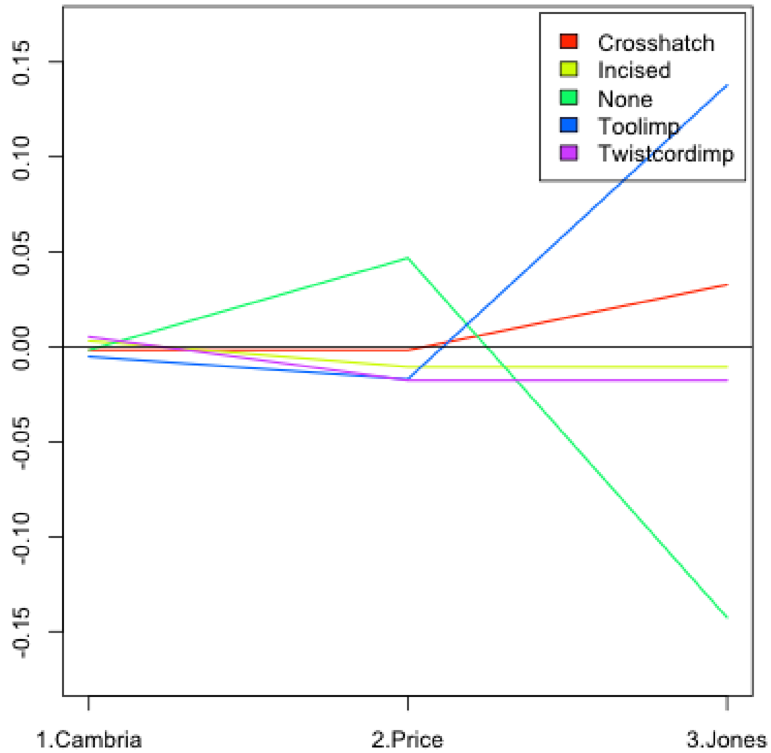


Figure B.22: Centered column plot for interior rim decoration by site

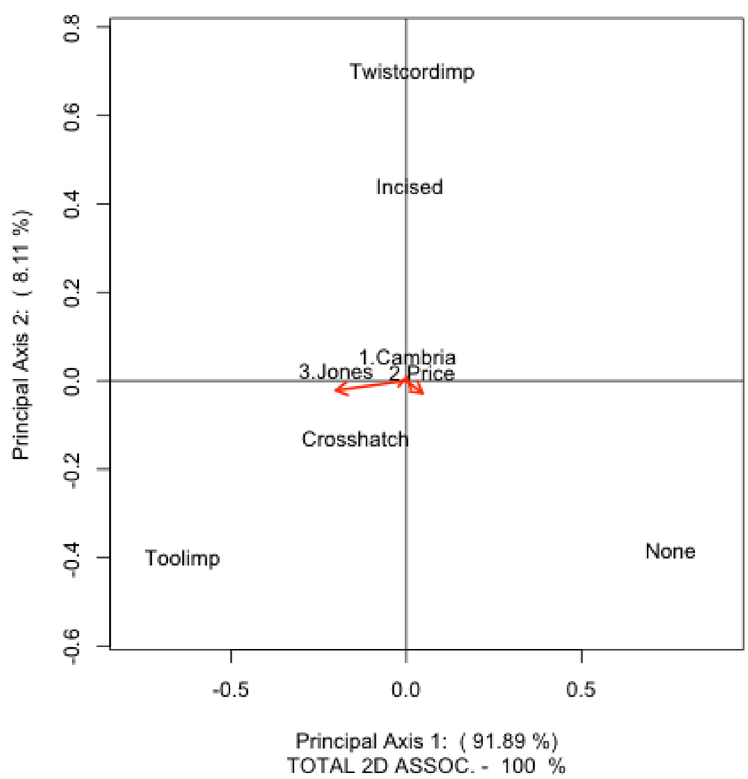


Figure B.23: Biplot with interior rim decoration by site

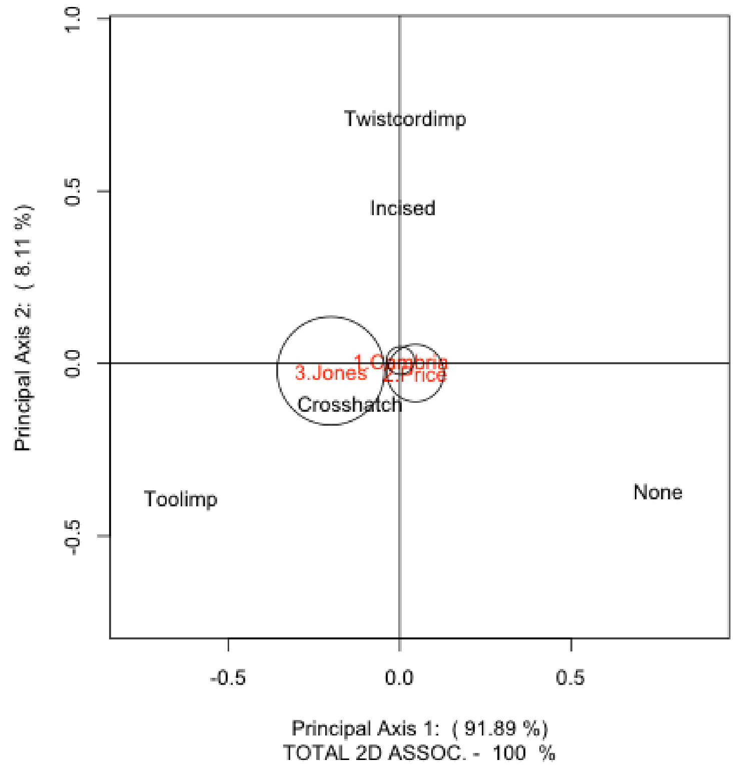


Figure B.24: Confidence circle plot with interior rim decoration by site

Table B.103: Margolin C and Light Statistics for Interior Cameo Effect by Site

C statistic	15.401
	0.008
Tau	0.023
Probability	0.004
Degrees of Freedom	4

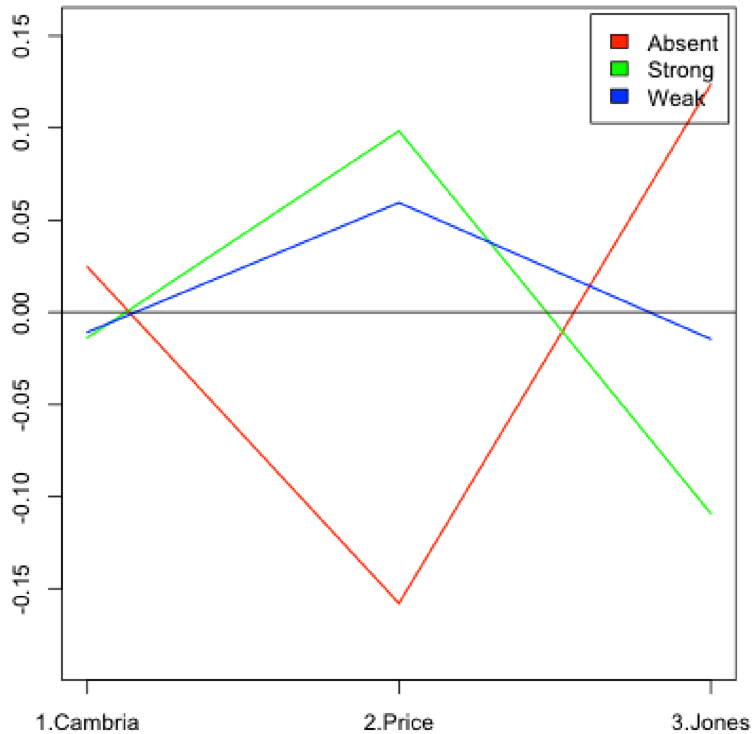


Figure B.25: Centered column plot for interior cameo effect by site

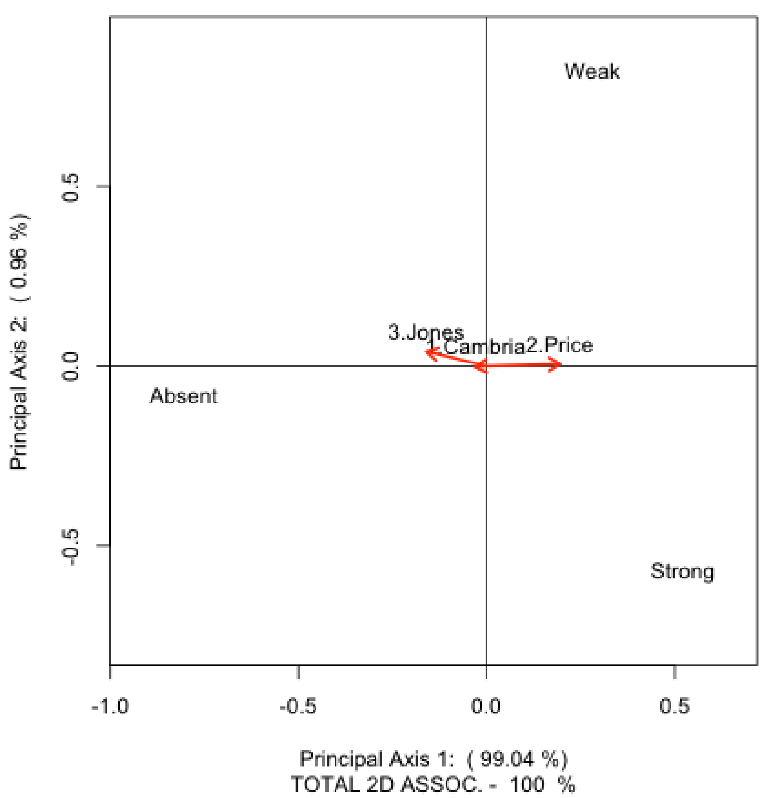


Figure B.26: Biplot with interior cameo effect by site

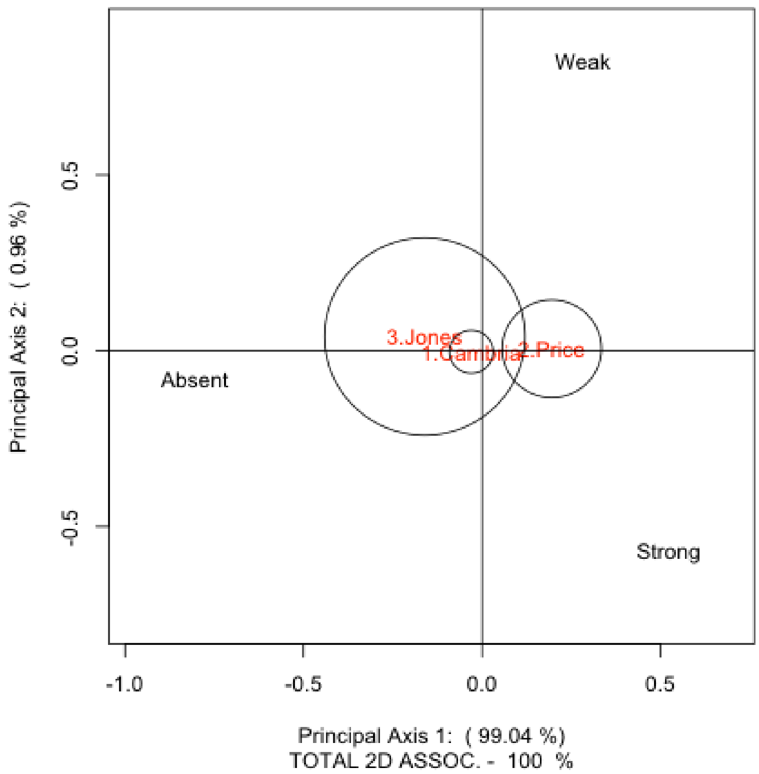


Figure B.27: Confidence circle plot with interior cameo decoration by site

APPENDIX C:

Statistical Results of Compositional Analyses

Table C.1: Geometric Means of Elements for All Cases Without Missing Values, Net Intensities

Element	Geometric Means
As	0.0051
Cu	0.0032
Fe	0.4899
Mn	0.0038
Nb	0.0119
Ni	0.0161
Rb	0.0355
Sr	0.1148
Ti	0.0206
Y	0.0133
Zn	0.0126
Zr	0.2182

Table C.2: Centered Log-Ratio (clr) Variances for All Cases Without Missing Values, Net Intensities

Element	clr
As	0.0701
Cu	0.2260
Fe	0.2116
Mn	0.7712
Nb	0.1421
Ni	0.2815
Rb	0.1089
Sr	0.1105
Ti	0.1433
Y	0.1236
Zn	0.1878
Zr	0.1131

Table C.3: Loadings for All Cases Without Missing Values, Net Intensities

Element	PC 1	PC 2
As	-0.0443	0.0341
Cu	0.1730	-0.5504
Fe	0.1982	0.3773
Mn	0.5243	0.1136
Nb	-0.3131	-0.1132
Ni	0.1171	-0.5764
Rb	0.1520	0.3320
Sr	0.1019	0.0370
Ti	-0.2969	0.2758
Y	-0.3987	-0.0323
Zn	0.2389	0.0803
Zr	-0.4522	0.0221

Table C.4: Loadings for All Cases Without Missing Values, Mean Compositions

Element	PC 1	PC 2
As	0.0515	0.0556
Cu	-0.1238	-0.5623
Fe	-0.2214	0.3579
Mn	-0.5190	0.0399
Nb	0.3224	-0.1024
Ni	-0.0981	-0.5952
Rb	-0.2168	0.2972
Sr	-0.0556	0.0724
Ti	0.2855	0.2786
Y	0.4020	-0.0041
Zn	-0.2610	0.1120
Zr	0.4343	0.0505

Table C.5: ANOVA and Tukey HSD tests for PC1 All Cases Without Missing Values

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	49.3	24.660	10.1	0.000
Tukey HSD				
Site	**Probability**			
Cambria-Jones	0.880			
Cambria-Price	0.000			
Jones-Price	0.008			

Table C.6: ANOVA and Tukey HSD tests for PC2 All Cases Without Missing Values

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	213.8	106.92	51.27	0.000
Tukey HSD				
Site	**Probability**			
Cambria-Jones	0.000			
Cambria-Price	0.000			
Jones-Price	0.327			

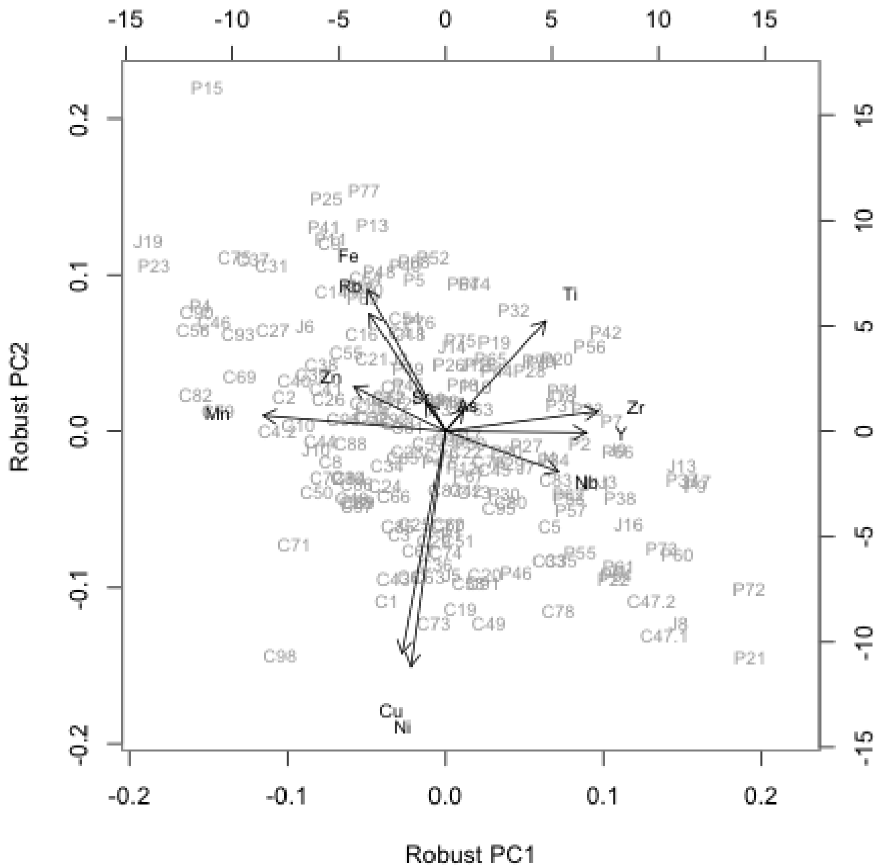


Figure C.1: Biplot for all cases without missing values, mean compositions

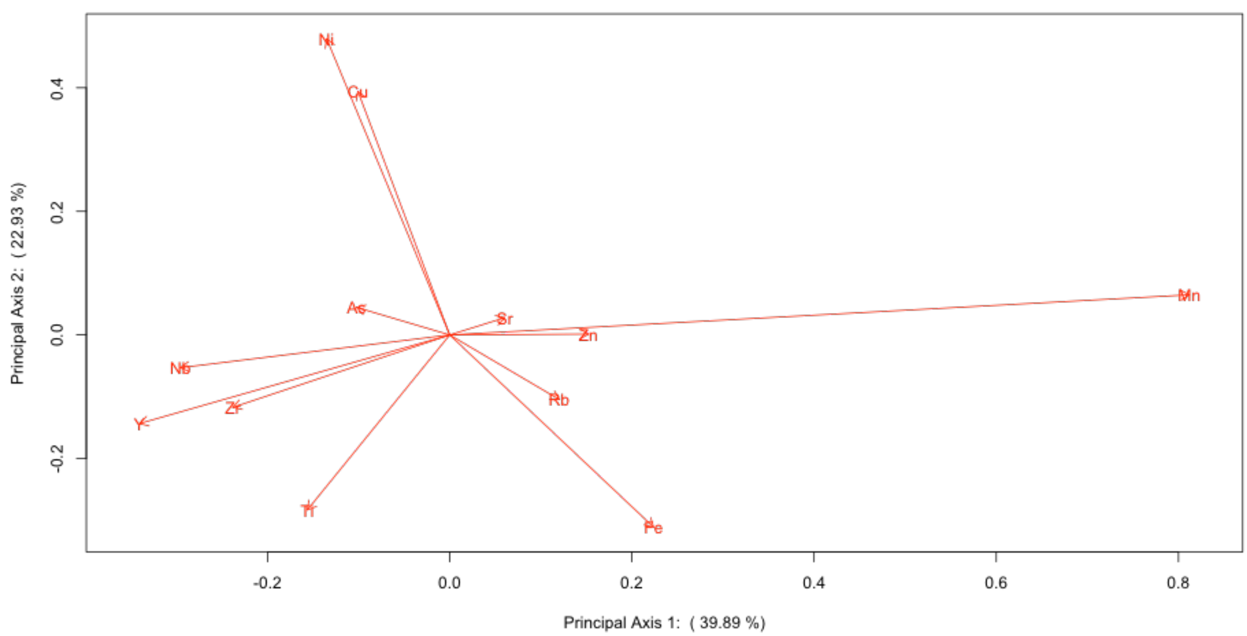


Figure C.2: Covariance plot for all cases without missing values, mean compositions

Table C.7: Geometric Means of Elements for Imputed Dataset

Element	Geometric Means
As	0.0051
Cu	0.0032
Fe	0.4948
Mn	0.0039
Nb	0.0115
Ni	0.0159
Rb	0.0360
Sr	0.1148
Ti	0.0202
Y	0.0121
Zn	0.0126
Zr	0.2137

Table C.8: Centered Log-Ratio Variances for Imputed Dataset

Element	clr
As	0.0719
Cu	0.2228
Fe	0.2179
Mn	0.7600
Nb	0.1492
Ni	0.2812
Rb	0.1201
Sr	0.1114
Ti	0.1400
Y	0.2728
Zn	0.1924
Zr	0.1151

Table C.9: Loadings for Imputed Dataset, mean composition

Element	PC 1	PC 2
As	-0.0211	0.0676
Cu	-0.0152	-0.5708
Fe	0.2996	0.2885
Mn	0.5116	-0.0788
Nb	-0.3423	-0.0324
Ni	-0.0402	-0.6000
Rb	0.2642	0.2453
Sr	0.0867	0.0676
Ti	-0.2213	0.3531
Y	-0.3896	0.0720
Zn	0.2820	0.0356
Zr	-0.4142	0.1525

Table C.10: ANOVA and Tukey HSD tests for PC1 of imputed dataset, mean compositions

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	102.9	51.44	18.07	0.000
Tukey HSD				
Site	**Probability**			
Cambria-Jones	0.864			
Cambria-Price	0.000			
Jones-Price	0.000			

Table C.11: ANOVA and Tukey HSD tests for PC2 of imputed dataset, mean compositions

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	191.8	95.89	43.48	0.000
Tukey HSD				
Site	**Probability**			
Cambria-Jones	0.000			
Cambria-Price	0.000			
Jones-Price	0.199			

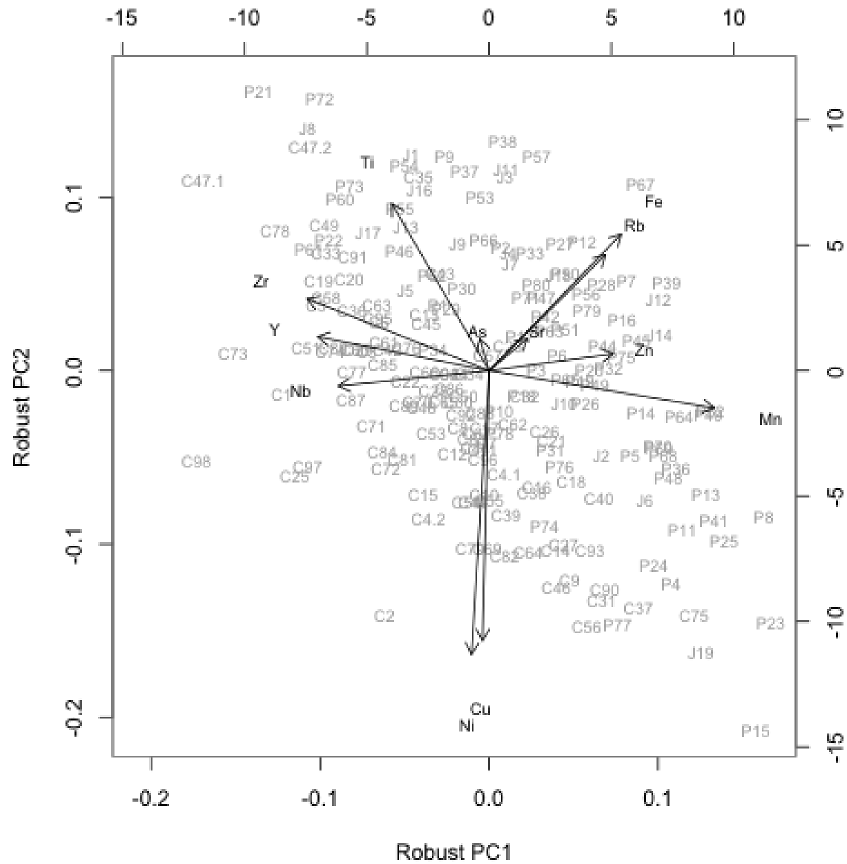


Figure C.3: Biplot of imputed dataset, mean compositions

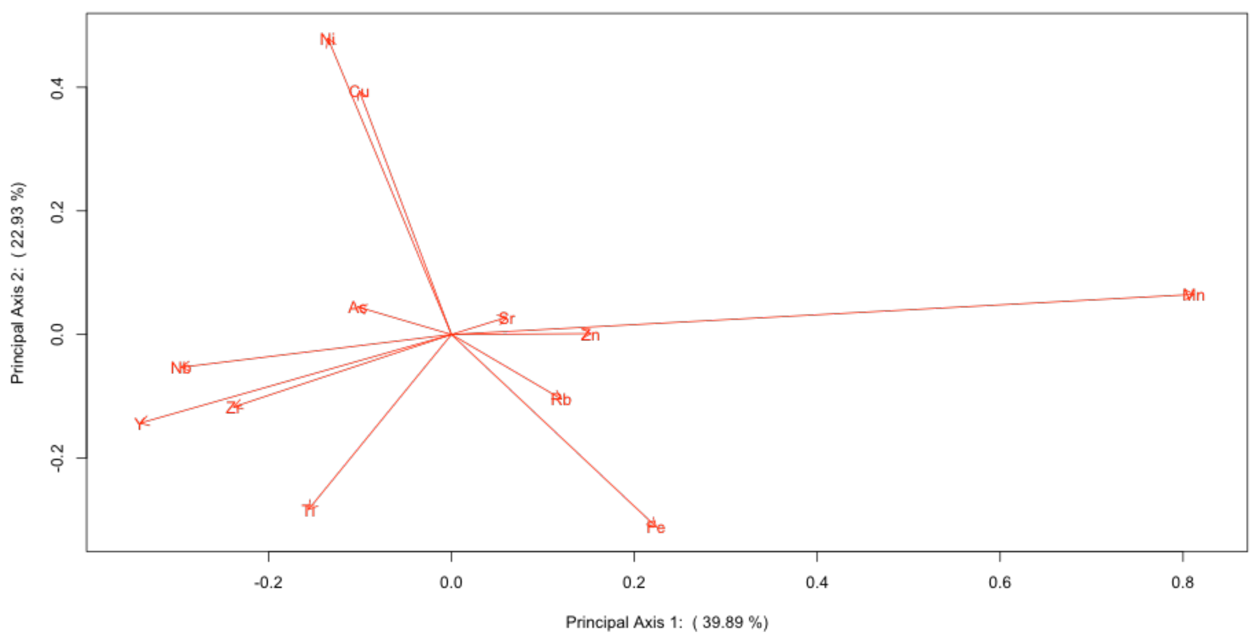


Figure C.4: Covariance plot of imputed dataset, mean compositions

Table C.12: Element Variance for Imputed and Reduced Dataset, First Run

Element	Variance	U
As	2.6141	-1.1979
Cu	1.4030	-4.0314
Fe	1.1032	-5.3150
Nb	2.0596	-2.8317
Ni	0.7290	-7.1300
Rb	2.2378	-2.0122
Sr	2.4926	-1.8684
Ti	1.6405	-3.6500
Zn	1.8598	-3.2624
Zr	2.3657	-1.9706

Table C.13: Element Variance for Imputed and Reduced Dataset, Second Run

Element	Variance	U
Cu	1.7226	-3.4378
Fe	1.3803	-4.8366
Nb	2.4151	-2.2648
Ni	0.9529	-6.2315
Rb	2.5894	-1.8311
Sr	2.8551	-1.6151
Ti	1.9783	-2.9619
Zn	2.2029	-2.8142
Zr	2.7288	-1.6223

Table C.14: Geometric Means of Elements for Imputed Reduced Dataset, Mean Compositions

Element	Geometric Means
Cu	0.0051
Fe	0.7815
Mn	0.0061
Nb	0.0182
Ni	0.0251
Rb	0.0569
Ti	0.0320
Y	0.0175
Zn	0.0199

Table C.15: Centered Log-Ratio Variances for Imputed Reduced Dataset, Mean Compositions

Element	clr
Cu	0.2304
Fe	0.2214
Mn	0.7170
Nb	0.1617
Ni	0.2899
Rb	0.1245
Ti	0.1589
Y	0.6633
Zn	0.1895

Table C.16: Loadings for Imputed Reduced Dataset, Mean Composition

Element	PC 1	PC 2
Cu	0.1822	-0.3886
Fe	-0.3230	0.2573
Mn	-0.5315	-0.2266
Nb	0.3752	0.0872
Ni	0.2464	-0.6053
Rb	-0.3126	0.2309
Ti	0.1736	0.4729
Y	0.4359	0.2674
Zn	-0.2462	-0.0951

Table C.17: ANOVA and Tukey HSD tests for PC1 of Imputed Reduced Dataset, Mean Compositions

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	33	16.508	6.708	0.000
Tukey HSD				
Site	**Probability**			
Cambria-Jones	0.001			
Cambria-Price	0.408			
Jones-Price	0.015			

Table C.18: ANOVA and Tukey HSD tests for PC2 of Imputed Reduced Dataset, Mean Compositions

ANOVA				
Degrees of Freedom	**Sum Sq**	**Mean Sq**	**F Value**	**Probability**
2	249.5	124.77	83.61	0.000
Tukey HSD				
Site	**Probability**			
Cambria-Jones	0.000			
Cambria-Price	0.000			
Jones-Price	0.005			

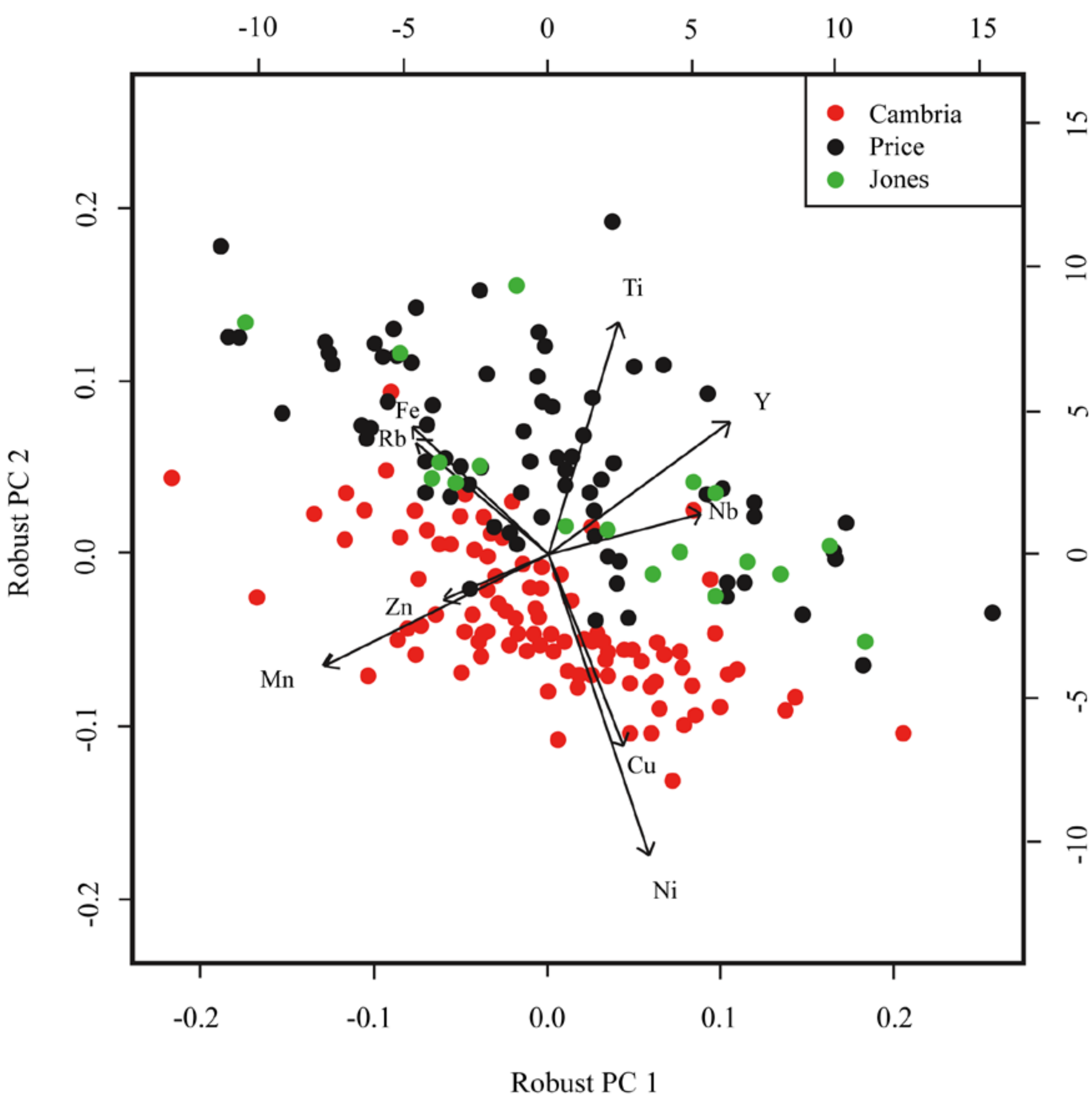


Figure C.5: Biplot of imputed reduced dataset, mean compositions

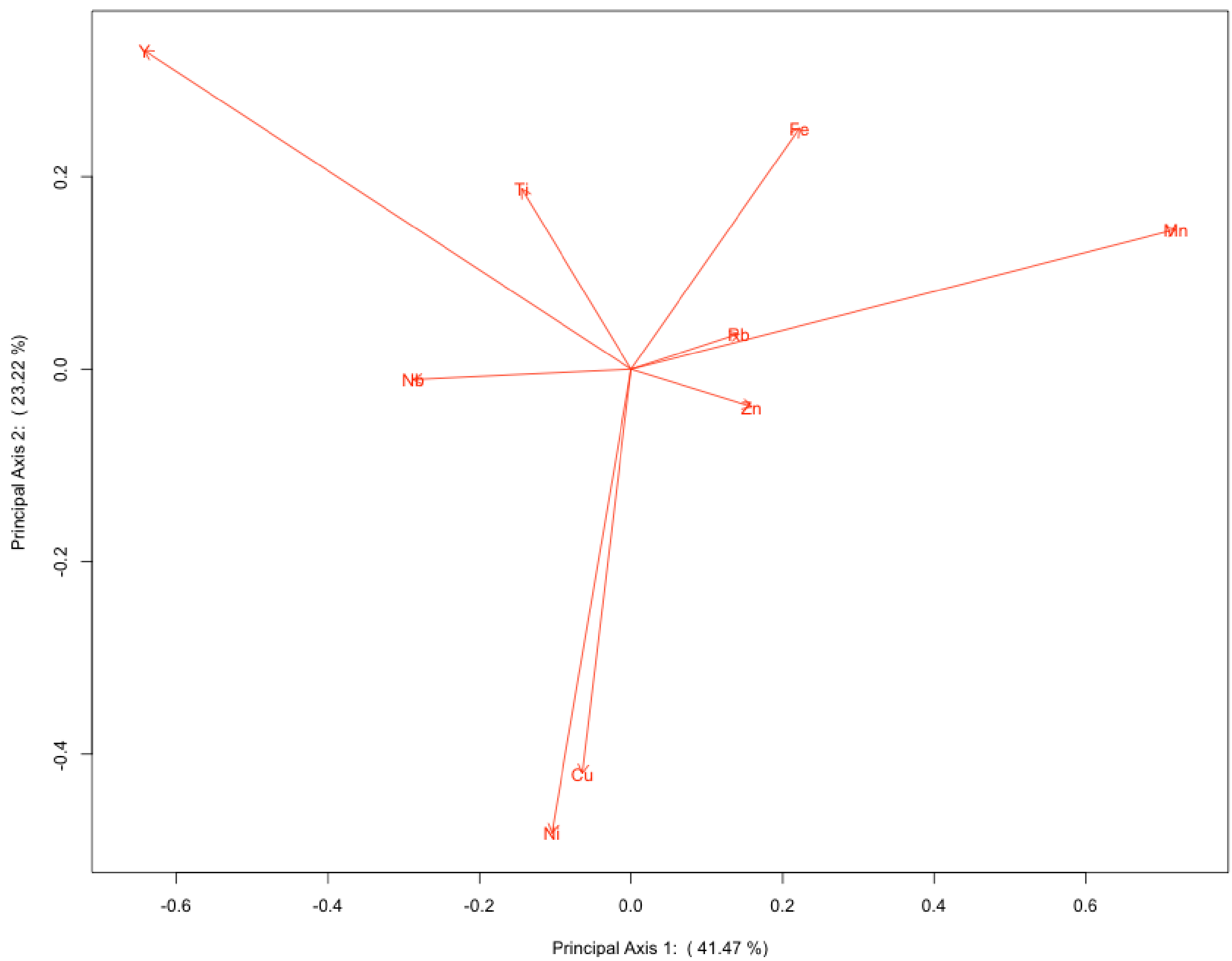


Figure C.6: Covariance plot of imputed reduced dataset, mean compositions

Table C.19: Aitchison's Test for Equality of Sites

Site	Test	Degree of Freedom (df)	Q	Probability
Cambria-Jones	Both equal	44	511.741	0.00
	Equal covariances	36	154.930	0.00
	Equal means	8	164.393	0.00
Cambria-Price	Both equal	44	747.585	0.00
	Equal covariances	36	117.316	0.00
	Equal means	8	488.852	0.00
Jones-Price	Both equal	44	183.754	0.00
	Equal covariances	36	149.045	0.00
	Equal means	8	49.411	0.00

Table C.20: Geometric Means of Elements for Cambria Locality Sites

Site	Cu	Fe	Mn	Nb	Ni	Rb	Ti	Y	Zn
Cambria	0.0091	0.7593	0.0076	0.0245	0.0517	0.0662	0.0326	0.0235	0.0255
Price	0.0028	0.8561	0.0052	0.0130	0.0124	0.0515	0.0307	0.0122	0.0162
Jones	0.0035	0.8251	0.0049	0.0198	0.0132	0.0505	0.0444	0.0218	0.0167

Figure C.7: Cluster dendrogram comparing geometric means of elements by site

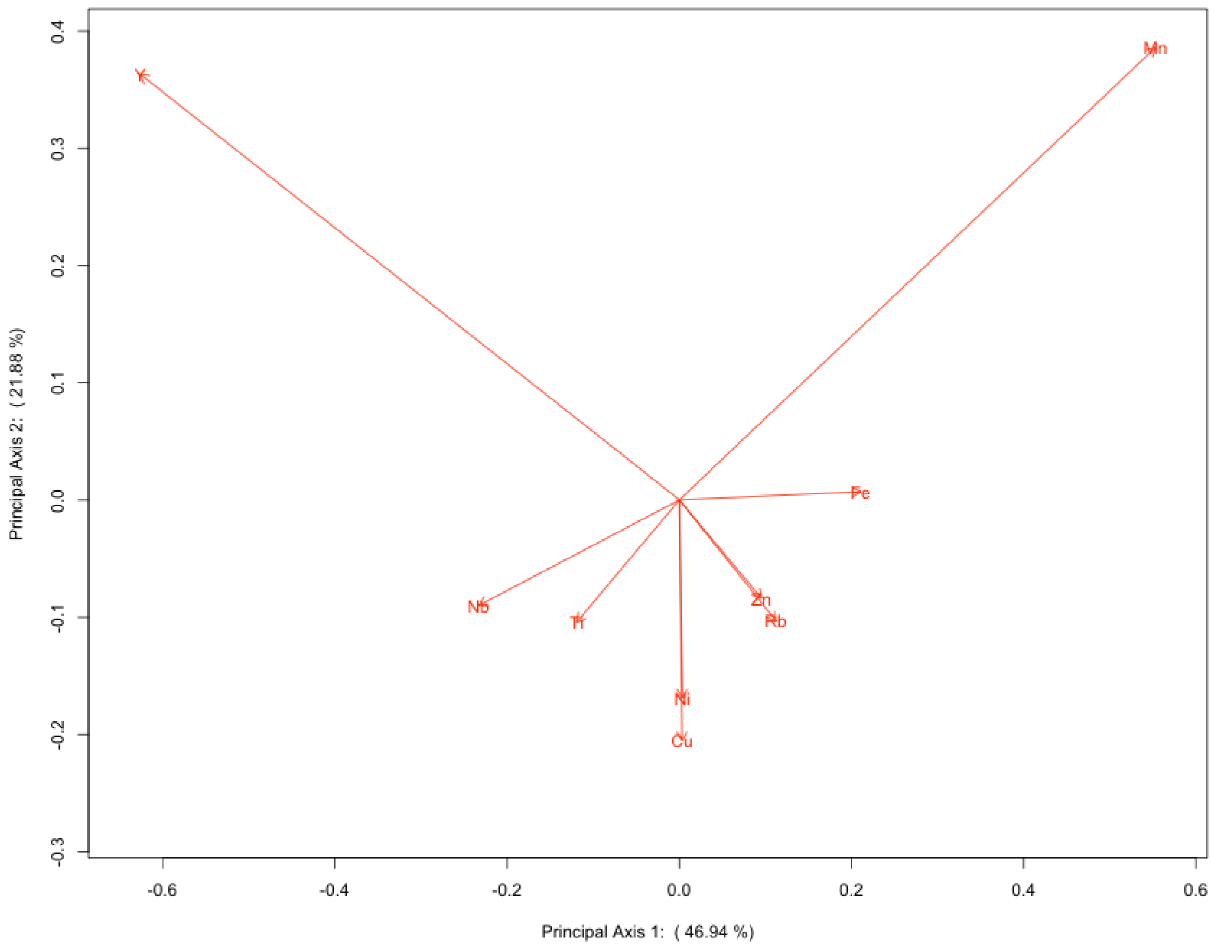


Figure C8: Covariance plot of imputed reduced dataset for Cambria site

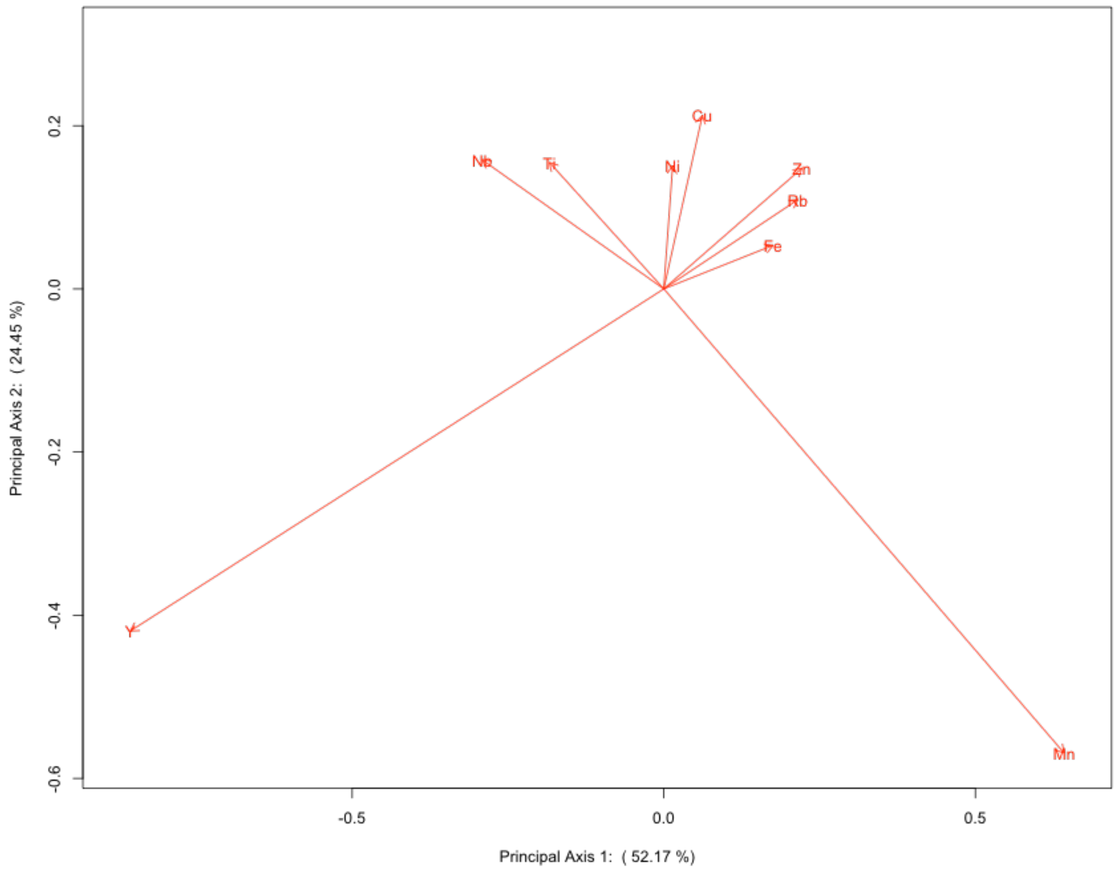


Figure C9: Covariance plot of imputed reduced dataset for Price site

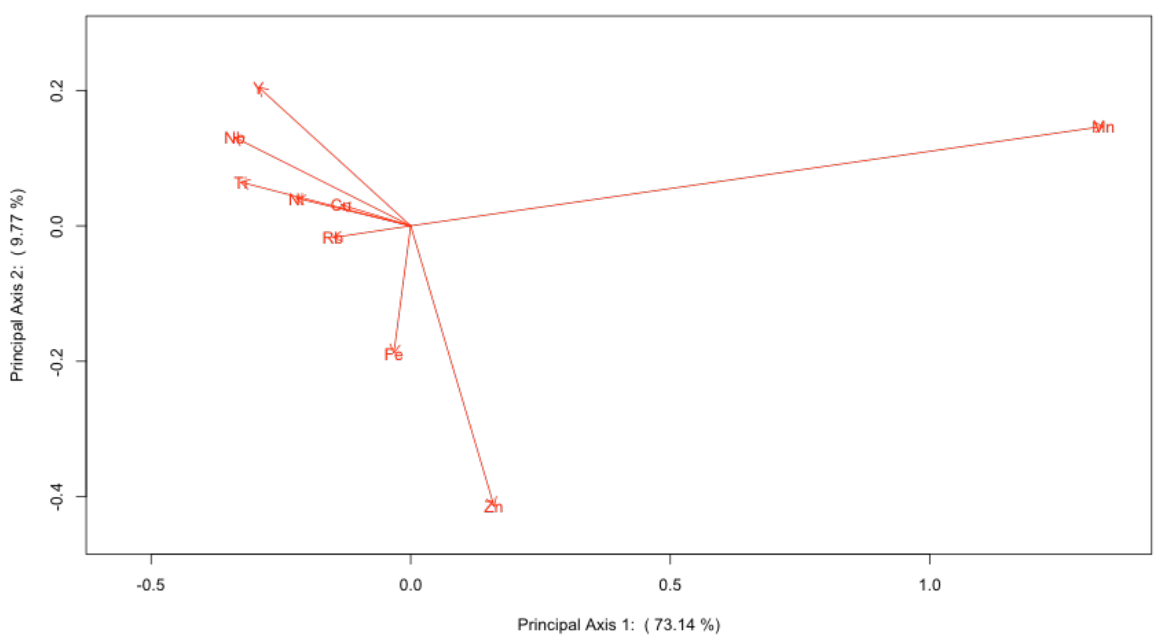


Figure C.10: Covariance plot of imputed reduced dataset for Jones site

Table C.21: Variance and Permutation Tests for first two components, all cases

Attributes	Variance
First Two Components	
Total	9.207
Between Group	2.397
Within Group	6.810
Observed Between Group	2.397
Probability	0.000
PC1	
Observed Between Group	1.782
Probability	0.000
PC2	
Observed Between Group	0.616
Probability	0.000

Table C.22: Site means PC1, all cases

Site	Means
Cambria	0.062
Price	-0.081
Jones	-0.021

Table C.23: Site means PC2, all cases

Site	Means
Cambria	-0.039
Price	0.037
Jones	0.054

Table C.24: Permutation test for site differences on PC1, all cases

Site	Probability
Cambria-Jones	0.109
Cambria-Price	0.113
Price-Jones	0.289

Table C.25: Permutation test for site differences on PC2, all cases

Site	Probability
Cambria-Jones	0.000
Cambria-Price	0.000
Price-Jones	0.003

Table C.26: Means of Elements for Cambria Locality Sites, all cases

Site	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
Cambria	0.007	0.006	0.448	0.005	0.015	0.032	0.039	0.143	0.019	0.016	0.016	0.254
Price	0.004	0.002	0.588	0.005	0.010	0.009	0.036	0.100	0.022	0.011	0.013	0.200
Jones	0.005	0.003	0.534	0.007	0.014	0.009	0.035	0.103	0.030	0.015	0.012	0.234

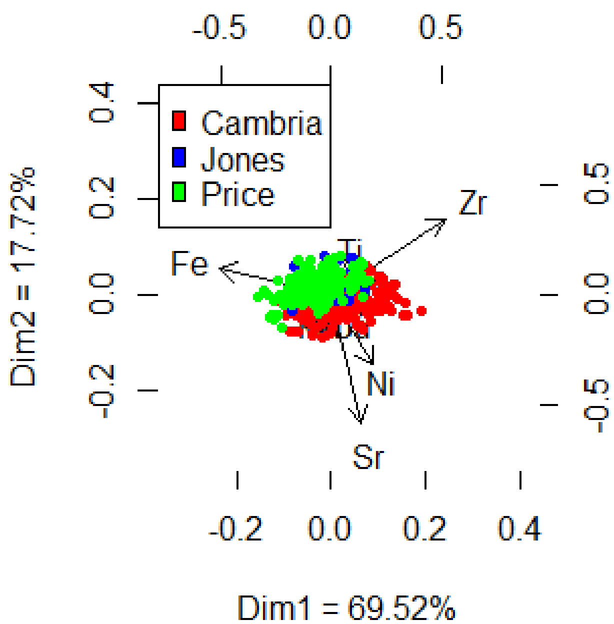


Figure C.11: Biplot of robust PCA results for all sites, all cases

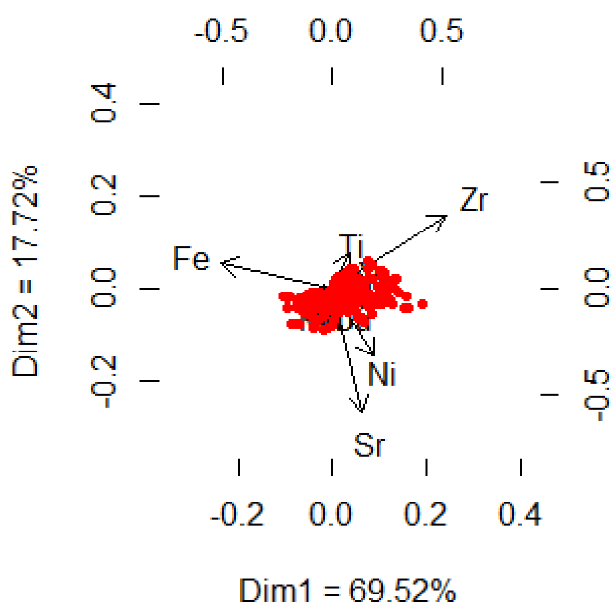


Figure C.12: Biplot of robust PCA results for Cambria site, all cases

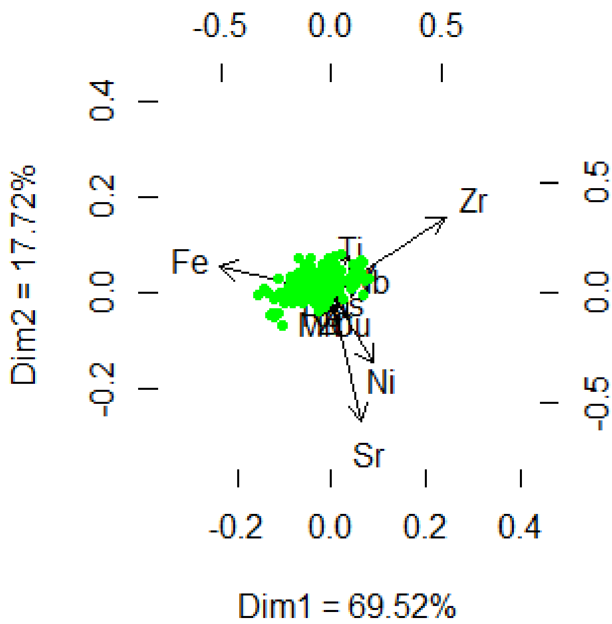


Figure C.13: Biplot of robust PCA results for Price site, all cases

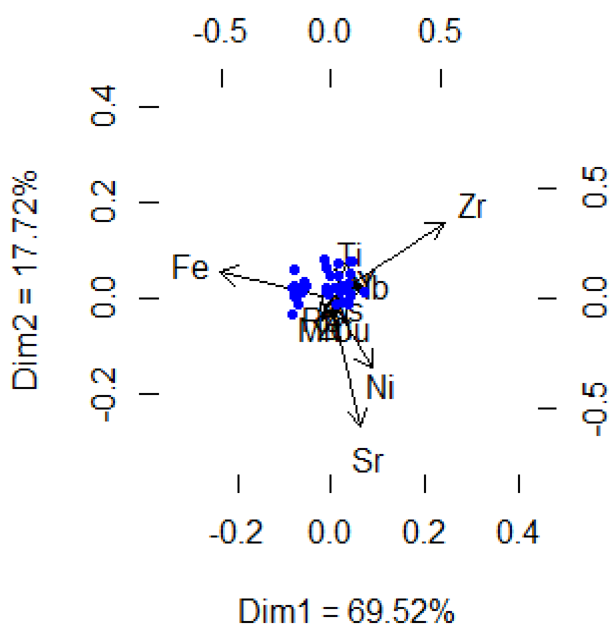


Figure C.14: Biplot of robust PCA results for Jones site, all cases

Table C.27: Variance and Permutation Tests between Exterior and Interior Reads

Attributes	Variance
Total	9.021
Between Group	0.002
Within Group	9.019
Observed Between Group	0.002
Probability	0.909

Table C.28: Variance and Permutation Tests for first two components, averaged readings

Attributes	Variance
First Two Components	
Total	4.220
Between Group	1.153
Within Group	3.067
Observed Between Group	1.153
Probability	0.000
PC1	
Observed Between Group	0.869
Probability	0.000
PC2	
Observed Between Group	0.283
Probability	0.000

Table C.29: Site means PC1, averaged readings

Site	Means
Cambria	0.058
Price	-0.085
Jones	-0.030

Table C.30: Site means PC2, averaged readings

Site	Means
Cambria	-0.036
Price	0.038
Jones	0.054

Table C.31: Permutation test for site differences on PC1, averaged readings

Site	Probability
Cambria-Jones	0.264
Cambria-Price	0.686
Price-Jones	0.296

Table C.32: Permutation test for site differences on PC2, averaged readings

Site	Probability
Cambria-Jones	0.005
Cambria-Price	0.000
Price-Jones	0.054

Table C.33: Means of Elements for Cambria Locality Sites, averaged readings

Site	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
Cambria	0.007	0.006	0.452	0.005	0.015	0.030	0.039	0.142	0.019	0.016	0.016	0.253
Price	0.004	0.002	0.589	0.005	0.010	0.008	0.035	0.100	0.022	0.011	0.013	0.200
Jones	0.004	0.002	0.540	0.007	0.014	0.009	0.035	0.102	0.029	0.015	0.013	0.230

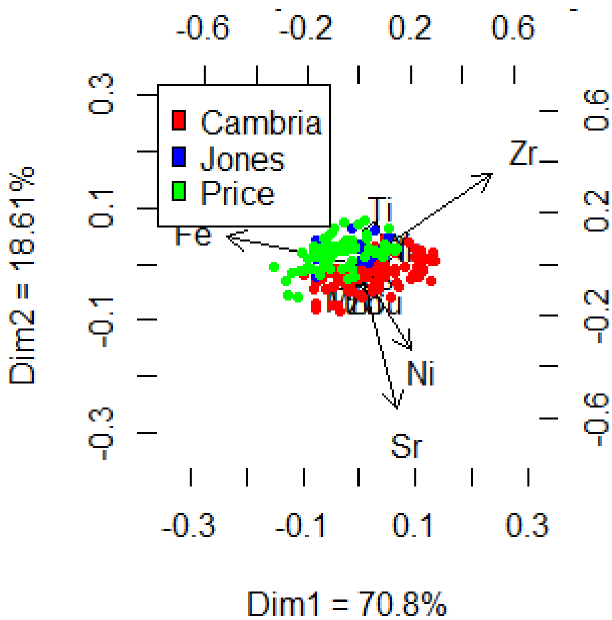


Figure C.15: Biplot of robust PCA results for all sites, averaged readings

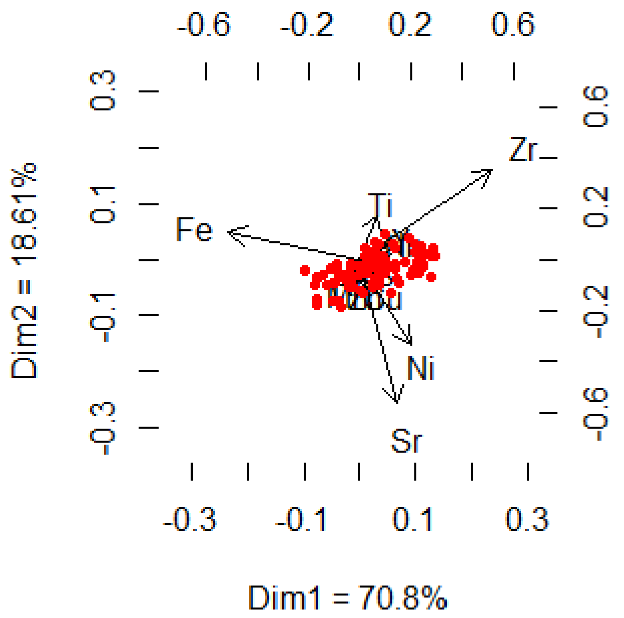


Figure C.16: Biplot of robust PCA results for Cambria site, averaged readings

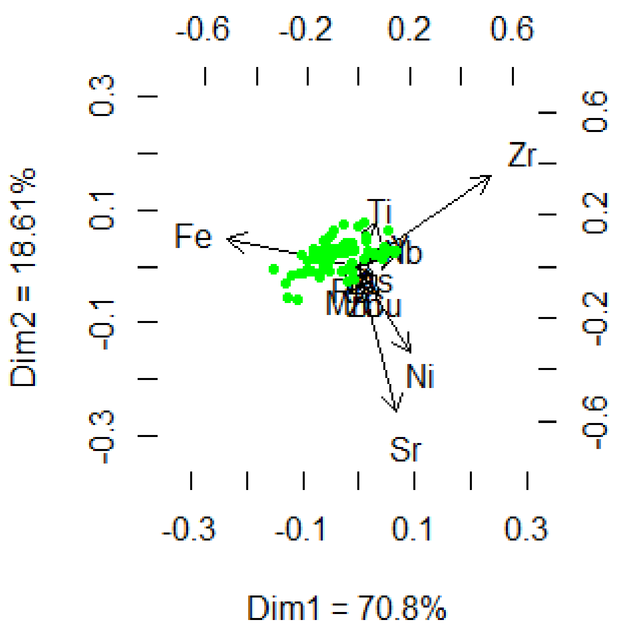


Figure C.17 Biplot of robust PCA results for Price site, averaged readings

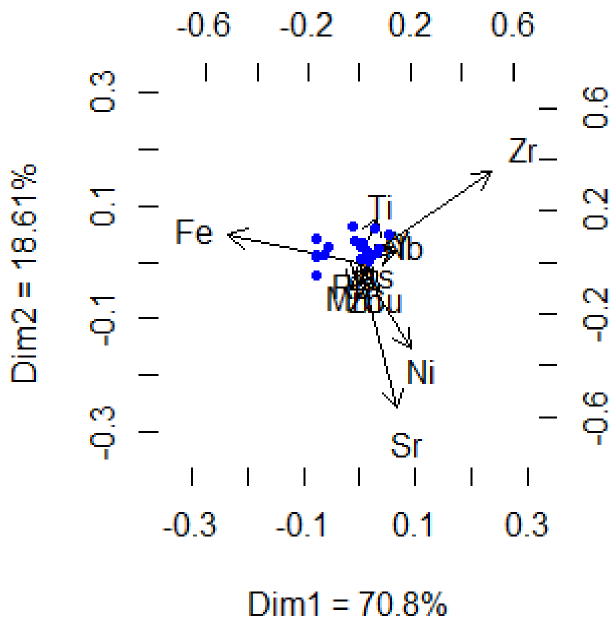


Figure C.18: Biplot of robust PCA results for Jones site, averaged readings

Table C.34: Cambria Locality Net intensity readings

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
J1.1	J-32	305	200	24115	55	967	533	2799	2546	2303	910	423	14169
J1.2	J-32	364	115	26587	97	2028	530	2476	5144	2676	905	713	19828
J2.1	J-33	299	74	67248	743	842	478	2461	4589	1852	768	2149	17024
J2.2	J-33	238	86	60831	374	819	604	2399	6461	2051	832	4350	12871
J3.1	J-36	324	126	40608	1	765	671	1547	3522	2004	1113	338	18567
J3.2	J-36	475	144	32107	266	549	686	3000	7630	1627	886	375	14054
J4.1	J-35	222	111	20038	354	1145	736	5135	5987	1555	1688	625	12880
J4.2	J-35	257	185	25659	275	1113	660	5197	5329	1546	2079	776	14738
J5.1	J-34	276	390	38927	271	1235	630	1870	3663	1718	1108	1215	18285
J5.2	J-34	338	123	39674	101	1083	631	1951	4146	2461	1113	586	17926
J6.2	J-29	307	106	62958	793	802	540	3051	7593	1581	991	1666	14266
J6.1	J-29	219	235	61518	2011	674	708	2771	7890	1487	925	2251	12726
J7.1	J-39	298	209	29102	506	1203	670	1718	10009	2367	1658	818	19119
J7.2	J-39	377	159	40021	655	1077	556	2144	5985	2489	1667	850	19100
J8.1	J-55	227	117	22775	83	1003	499	1924	3023	1728	1367	285	17840
J8.2	J-55	273	144	31792	55	1472	599	2145	4790	3193	1920	389	25097
J9.1	J-60	330	215	25413	12	807	573	4642	6071	2103	653	735	17935
J9.2	J-60	271	170	27554	128	1068	649	3670	8208	2278	640	702	18427
J10.1	J-56	302	325	38100	586	538	708	2259	7942	1565	1190	1077	16360
J10.2	J-56	404	247	35631	2003	844	713	2348	5121	1896	1288	1356	21411
J11.1	J-46	259	143	23877	185	818	643	1872	5799	1704	743	260	13861
J11.2	J-46	295	150	36604	356	1177	700	2093	9007	2577	1194	351	18330
J12.1	J-42	397	113	48159	975	610	638	1549	5489	1832	537	678	13458
J12.2	J-42	389	99	52698	231	660	430	2520	8428	2019	814	637	15488
J13.1	J-31	251	131	28415	95	806	695	1362	11185	2374	910	525	14944
J13.2	J-31	230	106	41136	62	947	565	2167	9319	2493	912	771	16955
J14.1	J-44	717	215	66964	1193	766	554	2348	7839	2202	909	619	13596
J14.2	J-44	331	127	66227	527	790	476	1808	12186	2038	805	877	14228
J16.1	J-28	384	207	32342	146	1119	583	1533	7889	2497	1159	549	16715
J16.2	J-28	246	163	41899	89	1380	466	2160	7387	2994	750	546	21139

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
J17.1	J-57	399	147	31341	70	644	631	2163	12118	2152	1174	784	15018
J17.2	J-57	293	136	29943	38	1177	709	1706	8411	2375	978	778	16060
J18.1	J-38	349	124	61159	264	858	646	1945	9237	2629	887	633	13859
J18.2	J-38	408	150	58624	316	751	549	1904	10241	1891	892	570	14619
J19.1	J-45	224	273	56739	3355	670	558	3333	10154	1454	880	3040	12589
J19.2	J-45	284	453	49947	1889	425	547	2730	10756	1033	284	1550	8954
P1.1	P-6	266	150	17328	587	1281	709	1243	4832	1574	857	1547	16087
P1.2	P-6	275	184	20312	101	835	691	1636	5267	1956	1004	372	16739
P2.1	P-7	391	101	37739	320	811	639	1943	8896	2107	862	608	18097
P2.2	P-7	145	165	30005	232	868	634	1772	9781	2128	979	537	15897
P3.1	P-37	352	247	36448	183	379	727	2280	7426	1377	602	748	17045
P3.2	P-37	262	200	51594	480	665	551	2821	8057	1571	1016	944	18444
P4.1	P-109	109	188	20195	237	161	693	2178	3148	440	232	516	5114
P4.2	P-109	338	168	53900	516	385	554	2939	6429	824	0	935	7322
P5.1	P-2	297	175	51292	510	424	592	2284	9569	1424	418	1245	10326
P5.2	P-2	243	91	36634	305	453	614	1974	8595	923	517	593	8175
P6.1	P-3	361	252	47717	595	785	657	2210	8256	1856	975	549	14471
P6.2	P-3	244	129	54389	149	452	566	2211	6596	1717	732	900	12260
P7.1	P-9	471	117	39576	92	888	578	3753	5597	1823	679	783	16922
P7.2	P-9	292	122	27862	252	562	593	2609	3746	1299	0	369	11992
P8.1	P-33	158	107	29204	139	211	589	2963	4858	666	0	545	8189
P8.2	P-33	352	161	48997	285	196	585	5319	8336	1073	0	855	10820
P9.1	?3 F7	336	157	33146	181	1154	547	2622	14539	2244	995	593	17999
P9.2	?3 F7	347	121	24950	102	1180	583	1655	6659	2093	1179	422	23223
P10.1	P-29	240	191	55608	57	374	661	3365	5336	1289	864	1539	13338
P10.2	P-29	305	197	59009	103	560	526	5108	5316	1178	581	628	12296
P11.1	P-36	351	170	66504	899	458	502	3238	8272	1162	739	1401	8513
P11.2	P-36	160	122	52414	298	399	580	2592	6955	995	336	861	6144
P12.1	P-11	361	216	44701	926	763	567	2219	4810	1929	1302	462	20058
P12.2	P-11	382	190	37640	544	801	607	2699	6790	1707	1243	438	16043
P13.1	P-10	348	172	63156	608	345	734	3425	9986	1091	503	1377	10229
P13.2	P-10	412	107	71341	679	529	541	3472	9276	929	684	958	10327

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
P14.1	P-30	277	146	52406	253	501	590	2645	5088	1501	842	731	11872
P14.2	P-30	281	252	58885	506	324	490	3978	6195	1573	0	799	13080
P15.1	P-19	126	124	40855	543	361	638	2885	8043	729	0	1528	4431
P15.2	P-19	199	118	49135	455	129	679	3621	8527	957	233	2818	5231
P16.1	P-108	373	121	57949	713	857	585	3066	7153	1693	744	805	16366
P16.2	P-108	253	120	47684	171	782	607	2709	5944	1497	673	582	10910
P17.1	45800	99	98	19602	145	503	705	2201	4039	1219	582	696	11658
P17.2	45800	328	149	43495	401	847	605	2859	5867	1868	809	983	17711
P18.1	P-13	207	202	49000	94	522	629	2747	7113	1501	895	1151	10489
P18.2	P-13	192	111	49675	240	481	588	2665	5225	1307	534	497	12268
P19.1	P-14	287	197	63361	392	593	526	3450	9013	1623	589	1345	10137
P19.2	P-14	267	72	42076	238	806	566	2173	8877	1923	860	968	15722
P20.1	P-5	432	165	54302	139	604	627	3370	9293	1205	906	780	14088
P20.2	P-5	371	146	57682	179	626	492	3668	7978	1286	0	1024	14810
P21.1	P-17	272	164	28010	2	1140	688	1565	2972	2370	1332	377	17155
P21.2	P-17	428	87	40658	35	900	636	2425	4248	2221	1419	636	22151
P22.1	P-16	441	175	37068	77	1251	606	1455	4787	2386	1117	1283	20152
P22.2	P-16	340	130	31692	41	764	603	1421	5737	2252	1161	1060	18624
P23.1	52433	499	267	83712	2209	689	829	3735	5745	1340	764	1705	7810
P23.2	52433	380	334	70772	779	328	503	4030	5792	1230	-1	1398	5863
P24.1	92731.74	341	207	65283	228	246	539	3453	10703	1290	0	1541	11611
P24.2	92731.74	284	272	52206	122	571	622	3069	9642	1067	0	1338	12359
P25.1	53977	167	94	54024	502	515	569	2316	4902	788	527	788	5672
P25.2	53977	255	126	54591	887	97	509	2833	10686	898	408	851	5639
P26.1	P-128	302	116	41106	446	779	508	2221	6484	1547	900	2777	16243
P26.2	P-128	314	110	60120	453	619	539	3252	8373	2149	680	1074	19187
P27.1	P-34	241	105	52028	241	829	532	2371	4670	1495	795	637	17040
P27.2	P-34	195	64	34739	215	808	530	1814	3188	1221	507	365	11704
P28.1	76446	423	183	76273	333	630	585	4976	6074	1847	1059	682	11067
P28.2	76446	325	80	43245	96	569	764	2925	4704	1267	899	277	7600
P29.1	51094	183	214	20640	135	547	772	1322	5031	864	506	320	8973
P29.2	51094	282	91	66990	99	884	552	1818	9093	2424	959	551	15490

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
P30.1	44263	395	156	19838	212	703	693	1077	5323	1177	828	859	13904
P30.2	44263	231	119	29864	372	889	672	1666	7502	2052	1097	578	16902
P31.1	P-8	89	77	21943	95	392	704	2005	3948	657	0	1586	7725
P31.2	P-8	292	110	48474	378	732	524	3121	8007	1774	937	915	26670
P32.1	P-1	157	50	45994	154	399	548	2342	5666	1435	786	653	8715
P32.2	P-1	317	174	55150	350	535	583	3055	11913	1815	478	640	10061
P33.1	P-20	243	160	41501	324	795	583	2326	8705	2067	887	533	16275
P33.2	P-20	280	122	35758	169	705	664	2404	11021	2084	864	486	15275
P34.1	P-23	330	110	42239	231	920	635	1947	9393	1884	1321	3400	26722
P34.2	P-23	247	97	33637	188	929	595	1707	7622	2066	1069	1619	17163
P36.1	P-35	179	152	53145	506	680	598	2995	6682	1097	706	1162	11075
P36.2	P-35	394	120	64241	1150	324	463	3801	7954	1095	635	1554	15954
P37.1	P-100	418	84	33970	67	815	589	1865	4928	1683	1122	472	16232
P37.2	P-100	304	86	37315	80	699	563	2587	6193	1788	809	586	15135
P38.1	P-87	230	112	27990	191	723	753	1373	4629	1813	908	262	13775
P38.2	P-87	361	78	33971	191	708	641	1163	6867	1849	760	185	13079
P39.1	P-107	359	211	52267	483	941	568	5215	3842	2138	902	541	15215
P39.2	P-107	405	144	53027	913	710	526	3182	5678	1893	1018	577	13356
P40.1	P-4	241	150	54467	1197	471	595	4237	9544	981	483	607	8583
P40.2	P-4	217	105	59256	750	660	568	3619	7348	1384	1235	765	11400
P41.1	53807/ 53808	260	145	68128	871	548	565	3755	8264	1177	537	1399	10120
P41.2	53807/ 53808	265	151	53076	781	494	614	3104	8499	1004	440	982	8213
P42.1	59839	293	204	46438	186	683	552	2146	19805	1704	1070	743	14127
P42.2	59839	456	118	40276	288	866	563	2934	14719	1822	735	794	15284
P44.1	P-18	347	113	50618	553	982	574	3020	6867	1866	815	2934	18045
P44.2	P-18	325	50	43849	342	798	591	2994	6238	1791	844	963	20547
P45.1	P-38	208	107	30654	781	451	691	2101	4368	1134	584	674	10072
P45.2	P-38	342	128	49073	520	685	539	3329	5500	1551	1129	577	16534
P46.1	P-25	330	163	24595	148	909	680	3513	3604	1964	1125	1487	19970
P46.2	P-25	383	230	22777	80	1231	779	2538	3552	2064	1084	745	22420

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
P47.1	P-106	329	135	52009	1826	892	595	2040	9938	1971	1283	888	15738
P47.2	P-106	254	186	47209	24	684	666	1198	4646	1679	815	366	10907
P48.1	P-12	196	101	58570	319	428	547	3514	6791	1069	454	1286	12012
P48.2	P-12	217	120	50507	598	264	495	3243	6228	897	645	1042	11018
P49.1	P-75	290	117	24409	358	410	635	1696	5527	825	541	650	9925
P49.2	P-75	312	148	36978	696	632	601	2615	9255	1382	715	638	12438
P50.1	P-102	214	149	33217	407	596	730	2891	3689	1233	826	384	12963
P50.2	P-102	192	92	30760	145	534	662	2532	3892	1266	596	389	12652
P51.1	P-22	302	112	57505	154	439	551	3848	8180	1385	992	1037	17055
P51.2	P-22	240	126	53325	163	540	554	3169	5964	1293	540	538	14138
P52.1	P-24	187	111	53387	568	369	548	2885	6453	1030	584	788	10428
P52.2	P-24	238	42	56127	555	415	559	3581	7085	1160	536	765	10386
P53.1	P-26	298	292	27917	371	1130	735	2532	6786	2341	1220	472	18724
P53.2	P-26	364	120	24971	105	843	716	2019	7954	2490	720	383	17071
P54.1	P-31	281	94	32787	41	1041	632	1467	3179	1836	757	571	18710
P54.2	P-31	367	121	36667	128	1035	663	1757	4277	2076	1138	553	18455
P55.1	P-74	329	215	26846	48	824	646	1411	4166	1715	753	620	15498
P55.2	P-74	272	134	35393	175	1254	641	2409	6306	2549	1245	443	19838
P56.1	P-99	340	59	59718	457	861	608	2538	10848	1881	949	919	14082
P56.2	P-99	349	116	52184	237	919	629	2393	11229	1865	1048	821	14825
P57.1	P-101	489	176	43315	258	1046	605	2413	5657	2165	1389	410	18917
P57.2	P-101	435	102	71560	458	1211	527	1815	4687	1806	1497	383	19012
P60.1	P-49	278	170	23693	112	1119	676	1428	11879	2056	1235	828	20038
P60.2	P-49	419	107	24842	70	1541	584	1926	4891	2475	1562	1205	23908
P61.1	P-56	276	194	20274	46	1245	690	1492	6801	1873	1343	983	20941
P61.2	P-56	281	176	22465	87	716	588	1723	7053	1722	977	829	17274
P62.1	P-50	342	180	28810	220	1066	671	2306	6915	1995	1162	1194	16319
P62.2	P-50	293	115	26086	108	1027	515	2076	6593	1953	1138	998	18163
P63.1	P-47	302	158	46634	305	760	590	2664	6131	1270	979	666	12778
P64.2	P-60	258	160	47508	467	400	615	3076	8229	945	0	594	12860
P64.1	P-60	257	103	40570	356	227	677	2490	8265	1032	643	511	9645
P65.2	P-44	233	106	50096	317	645	533	2427	10494	1690	640	1233	12613

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
P65.1	P-44	227	119	42937	290	525	498	2254	5626	1321	884	836	13050
P66.2	P-46	319	144	57250	154	914	510	2556	8079	2179	1301	674	16482
P67.1	P-57	380	107	43915	1043	703	571	3438	2898	2181	739	416	15670
P67.2	P-57	383	148	35127	112	980	571	3000	3276	2262	995	401	17818
P68.1	P-71	266	158	50787	570	447	570	3169	10115	1144	518	978	12073
P68.2	P-71	329	109	50413	418	450	597	3000	9018	1105	555	1218	12404
P69.1	P-40	218	174	44545	979	594	638	2601	9779	1095	691	842	12030
P69.2	P-40	224	173	47520	1025	422	613	3146	8797	1185	695	766	12833
P70.1	P-42	166	144	25498	277	259	592	1853	5608	635	365	435	7692
P70.2	P-42	262	127	52972	922	418	479	3082	8760	1141	546	735	12076
P71.2	P-58	281	83	28278	217	859	633	1375	5738	1545	736	511	13087
P71.1	P-58	322	211	39472	161	465	608	3375	14083	1892	692	762	13289
P72.1	P-48	348	208	29168	58	1655	501	1594	7555	2167	1147	425	25054
P72.2	P-48	672	230	33237	42	1320	602	1574	10915	2525	1402	425	22519
P73.1	P-55	307	301	27043	100	1379	613	2152	8363	2238	1475	487	21675
P73.2	P-55	381	204	29293	68	948	629	1909	10770	2219	1123	573	19966
P74.1	P-53	324	71	39425	190	829	515	3151	13996	1655	714	10195	14428
P74.2	P-53	370	122	34857	339	363	619	2416	12161	1588	816	1389	14970
P75.1	P-62	272	160	43153	1137	687	642	1949	12799	1894	690	885	12784
P75.2	P-62	213	118	40699	396	575	594	2060	8831	1748	712	471	14413
P76.1	P-45	247	144	36411	99	402	629	2922	5834	926	294	962	9045
P76.2	P-45	371	250	50875	198	635	507	3807	7972	1353	622	1556	13148
P77.1	P-63	230	119	47538	375	449	590	2708	14511	1097	514	1335	5337
P77.2	P-63	202	164	56937	490	758	485	3251	11659	1063	793	3809	6190
P78.1	P-43	256	106	55124	269	689	472	2049	6664	1566	793	1964	12466
P78.2	P-43	230	177	55368	174	636	586	2537	6138	1687	1072	1656	13817
P79.1	P-61	383	75	52161	183	708	577	2554	8035	1793	775	676	12814
P79.2	P-61	248	157	57726	268	710	526	2957	6696	1574	682	696	11983
P80.1	P-41	426	174	58822	373	1275	580	2665	5822	1867	1009	1094	17571
P80.2	P-41	306	128	49530	142	988	445	2920	4465	2087	910	775	14469
C1.1	C-1	122	69	8585	27	296	342	473	1530	310	404	824	6814
C1.2	C-1	80	61	2256	29	199	342	173	779	121	159	85	2565

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
C2.1	C-3	65	66	6022	39	160	339	562	1932	184	152	1134	2544
C2.2	C-3	46	61	2798	39	120	411	294	1646	133	103	121	1693
C3.1	C-4	79	60	3185	75	253	341	295	1591	193	177	128	3281
C3.2	C-4	71	90	1885	30	124	389	267	1429	194	132	87	2743
C4.1	C-14	92	74	9140	69	211	318	774	3546	269	174	301	2970
C4.2	C-14	87	59	7589	58	201	394	667	2419	130	159	155	2306
C5.1	C-18	75	60	3293	33	163	393	350	1588	241	174	148	3606
C5.2	C-18	108	57	3606	1	230	394	429	2780	380	241	180	4051
C6.1	C-19	110	109	7624	118	365	402	561	1571	378	348	278	4900
C6.2	C-19	99	50	6326	34	258	336	379	998	295	362	155	4323
C7.1	C-22	85	73	7472	43	86	360	1012	1909	218	115	271	2754
C7.2	C-22	108	72	6351	40	186	334	594	1777	193	192	140	3311
C8.2	C-20	95	57	6192	137	208	374	474	1909	225	256	189	3620
C8.1	C-20	85	95	5381	131	210	412	370	1786	201	210	199	3066
C9.1	C-26	56	59	6515	97	83	377	462	3825	157	112	301	2117
C9.2	C-26	60	47	10369	127	154	324	626	3854	191	158	194	2500
C10.1	C-27	119	86	7980	118	208	292	609	1662	314	197	580	3221
C10.2	C-27	101	82	7173	127	211	372	484	2009	246	250	183	2973
C11.1	C-29	68	57	6073	69	142	346	411	1718	205	210	173	2480
C11.2	C-29	86	76	7969	96	151	357	624	2484	256	161	207	3127
C12.1	C-30	88	72	4336	33	108	398	443	1573	200	88	244	2797
C12.2	C-30	94	43	6952	65	177	329	504	2970	220	202	226	3769
C13.1	C-32	51	52	6207	26	174	332	365	1564	307	218	121	4500
C13.2	C-32	103	72	8958	107	290	370	614	2635	302	237	165	4865
C14.1	C-48	106	77	12286	80	254	338	889	2712	311	154	455	2284
C14.2	C-48	97	71	13197	76	162	355	766	2645	297	149	251	1731
C15.1	C-60	48	109	9653	50	162	438	480	3081	248	281	254	3157
C15.2	C-60	81	72	9528	88	110	365	525	3009	288	208	235	3313
C16.1	C-61	87	84	8251	237	162	389	732	3014	384	231	231	3557
C16.2	C-61	87	78	8254	114	195	380	579	5098	299	216	321	2758
C17.1	C-62	92	72	5339	162	203	416	409	2662	226	172	200	2855
C17.2	C-62	92	64	6460	90	242	362	466	3391	250	225	181	3593

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
C18.1	C-64	108	76	12050	47	255	344	981	2425	304	152	232	2466
C18.2	C-64	132	80	12695	48	178	376	960	2328	294	0	238	2654
C19.1	C-67	95	99	6182	43	300	351	426	1562	379	250	162	4826
C19.2	C-67	125	84	4803	35	340	385	284	1304	361	311	151	4250
C20.1	C-70	72	64	3835	23	228	381	557	1706	349	270	189	5514
C20.2	C-70	112	62	3830	43	171	416	348	1078	286	241	128	4034
C21.1	C-72	131	51	8188	78	130	367	794	1949	252	174	227	2673
C21.2	C-72	72	52	7433	79	155	377	574	1696	197	141	160	2548
C22.1	C-73	89	87	7944	56	290	339	468	3635	295	289	216	3948
C22.2	C-73	95	92	7715	96	235	344	481	3480	307	330	169	4008
C23.1	C-77	85	59	7560	240	245	334	529	1970	282	274	188	4117
C23.2	C-77	89	67	7959	123	279	352	585	2536	354	276	162	5370
C24.1	C-78	98	80	9957	61	279	364	833	1908	302	251	219	4774
C24.2	C-78	89	90	7409	131	293	356	633	1572	322	330	238	4481
C25.1	C-80	122	50	5296	92	310	366	295	3099	408	349	1091	5451
C25.2	C-80	59	70	4048	38	263	352	299	2333	434	282	958	4877
C26.1	C-81	67	71	7156	151	299	365	753	2208	340	328	194	4618
C26.2	C-81	47	54	7939	262	109	412	666	1749	242	130	186	2411
C27.1	C-83	87	62	13307	69	129	309	624	1648	161	138	257	1872
C27.2	C-83	95	60	11593	111	130	351	520	1495	198	164	207	1763
C28.1	C-84	75	70	6799	146	234	434	686	1768	269	295	238	4344
C28.2	C-84	74	91	5496	63	208	401	494	1388	322	232	183	4107
C29.1	C-86	90	45	4110	89	263	385	413	1849	320	330	267	5007
C29.2	C-86	81	67	2669	25	153	415	327	1315	191	180	155	3117
C30.1	C-89	71	70	8276	100	270	394	723	1519	368	373	204	4916
C30.2	C-89	77	63	4461	42	124	382	424	1001	179	35	163	2562
C31.1	C-90	95	69	11393	247	97	404	906	2517	263	155	690	2589
C31.2	C-90	63	50	10622	139	136	343	944	3118	189	237	313	3002
C32.1	C-91	78	43	7409	89	214	363	508	2439	241	227	173	2918
C32.2	C-91	72	62	7322	283	168	379	404	1838	295	247	151	3593
C33.1	C-93	123	89	4614	49	314	432	484	2402	395	303	132	6085
C33.2	C-93	96	95	4128	41	365	376	448	3330	404	354	179	5799

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
C34.1	C-94	64	91	5308	66	168	400	483	1450	377	198	137	3317
C34.2	C-94	91	41	8541	123	246	362	707	2175	351	213	234	4513
C35.1	C-97	183	32	5455	43	504	376	1558	1114	387	333	145	5683
C35.2	C-97	111	105	5151	27	434	390	1119	1377	385	361	162	6866
C36.1	C-98	150	73	4769	63	310	334	415	2047	347	366	176	5364
C36.2	C-98	92	70	1251	41	115	450	222	1254	216	148	107	2474
C37.1	C-104	139	83	11313	115	144	400	1043	3741	275	-1	288	1703
C37.2	C-104	61	83	8212	115	131	421	739	2661	236	132	208	1226
C38.1	C-106	63	53	7708	93	156	366	672	1431	152	168	212	2127
C38.2	C-106	92	61	10529	77	134	408	907	1727	182	224	234	2884
C39.1	C-107	106	95	10979	64	163	414	876	1796	194	192	303	2603
C39.2	C-107	86	68	9586	57	101	362	744	1538	258	193	238	2285
C40.1	C-108	100	54	11527	117	146	465	875	2792	250	0	219	2982
C40.2	C-108	74	73	6698	65	78	352	618	1331	220	122	140	2224
C41.1	C-109	72	93	9886	40	157	367	676	1766	274	111	235	2813
C42.1	C-110	106	67	5133	33	227	430	387	2075	244	197	154	3766
C42.2	C-110	73	72	7189	60	259	445	453	2589	403	203	201	4430
C43.1	C-111	96	24	3000	52	145	401	347	357	197	170	97	3118
C43.2	C-111	89	59	6235	52	191	435	420	954	393	221	157	3889
C44.1	C-112	91	72	6661	100	202	399	704	1406	335	136	229	3151
C44.2	C-112	39	46	4290	71	116	459	407	1244	194	188	185	2355
C45.2	C-113	65	44	4221	43	154	426	440	1622	215	140	137	2375
C45.1	C-113	109	41	7998	56	315	360	621	2291	338	401	196	5942
C46.1	C-149	55	117	6530	100	171	447	832	1350	137	149	226	1562
C46.2	C-149	102	48	7840	64	113	385	742	1445	212	79	232	1300
C47.1	C-150	120	91	3891	8	420	439	553	1731	345	384	131	6354
C47.2	C-150	112	85	2974	7	263	431	659	2110	352	323	132	5229
C48.1	C-153	111	165	7956	87	201	426	584	1982	230	269	214	5110
C48.2	C-153	79	69	8231	124	227	379	579	2124	339	332	225	4914
C49.1	C-123	108	38	6019	37	443	395	521	1264	411	474	113	6534
C49.2	C-123	64	61	1389	40	197	451	276	935	175	201	79	2626
C50.1	C-116	54	64	3178	60	86	432	224	855	199	101	102	2106

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
C50.2	C-116	97	48	5765	93	173	390	516	1278	293	184	147	3421
C51.1	C-117	41	60	3047	39	170	434	485	2108	267	176	169	3979
C51.2	C-117	71	64	1290	11	111	477	196	1181	144	125	77	2332
C52.1	C-154	34	108	5909	74	72	386	284	1346	136	104	125	1362
C52.2	C-154	69	58	5308	39	138	384	354	1628	185	181	123	1952
C53.1	C-155	85	102	6039	61	157	424	473	2647	249	175	150	2569
C53.2	C-155	47	53	5562	50	120	430	457	2257	275	181	153	3051
C54.1	C-157	75	58	6243	33	111	465	568	2664	155	153	116	1256
C54.2	C-157	45	48	3754	13	91	442	423	1803	197	55	103	921
C55.1	C-159	74	49	5064	57	111	382	363	2478	188	93	115	1847
C55.2	C-159	48	81	5951	84	125	414	401	2609	194	131	193	2346
C56.1	C-160	52	76	4560	63	72	457	359	1433	138	70	132	1090
C56.2	C-160	62	65	4713	69	49	413	461	1783	129	-2	116	1115
C57.1	C-161	134	33	7531	76	226	339	640	1633	299	203	175	3020
C57.2	C-161	116	113	9071	53	282	350	732	2057	297	203	229	5328
C58.1	C-162	83	93	4133	50	273	496	343	2604	320	276	240	4972
C58.2	C-162	102	37	3799	5	325	400	339	1200	322	314	116	5129
C59.1	C-163	83	52	3433	20	276	397	695	1528	323	369	136	6347
C59.2	C-163	80	48	3959	28	453	334	617	2030	392	407	102	6705
C60.1	C-167	119	104	7668	35	499	427	785	2230	424	473	199	4758
C60.2	C-167	61	52	2491	38	159	427	329	1273	204	163	142	1968
C61.1	C-170	172	95	9137	74	259	414	292	1507	360	336	245	4446
C61.2	C-170	84	38	8147	53	183	373	322	1505	282	291	170	3996
C62.1	C-171	117	57	11160	115	277	363	918	2242	322	255	385	3645
C62.2	C-171	98	78	9445	83	205	398	751	2136	274	225	185	4038
C63.1	C-172	120	105	8026	65	331	389	491	1444	375	504	216	5639
C63.2	C-172	98	68	8777	89	338	427	568	1533	349	353	177	4768
C64.1	C-173	129	92	14162	72	193	364	891	4674	320	200	366	1709
C64.2	C-173	54	60	9224	59	145	384	723	2440	178	165	191	1741
C65.1	C-175	102	89	8351	100	178	428	621	2357	217	256	219	4034
C65.2	C-175	166	77	9702	44	301	448	728	1990	316	304	343	5706
C66.1	C-181	89	82	8032	88	318	431	603	1921	310	267	227	4991

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
C66.2	C-181	93	64	4605	58	183	384	430	1380	222	191	167	3271
C67.1	C-182	99	88	7029	99	188	416	641	2948	303	211	302	3396
C67.2	C-182	109	58	4276	85	160	397	389	1714	203	176	153	2873
C69.1	C-186	45	41	3218	42	83	422	236	954	91	36	123	906
C69.2	C-186	54	69	4502	57	107	391	269	1334	177	90	94	1462
C70.1	C-188	56	23	3266	40	146	393	232	1056	190	144	293	2373
C70.2	C-188	163	58	7914	53	181	346	359	3206	345	182	160	4223
C71.1	C-152	123	101	5743	31	277	406	954	1791	303	286	292	4924
C71.2	C-152	45	33	412	32	76	422	114	328	92	58	105	1117
C72.1	C-193	55	64	2638	30	65	474	267	943	177	91	143	1756
C72.2	C-193	67	54	5638	25	216	414	384	1397	207	105	215	2933
C73.1	C-194	93	100	4471	44	307	393	413	1417	284	319	175	5913
C73.2	C-194	64	129	3538	16	239	442	262	1879	238	253	250	4557
C74.1	C-195	135	37	3769	50	147	402	237	1612	191	284	172	3515
C74.2	C-195	61	104	5332	32	200	355	294	1900	285	273	166	3648
C75.1	C-197	107	135	9927	276	118	370	946	2612	180	0	301	2533
C75.2	C-197	67	59	10936	439	147	409	937	2493	194	153	236	2880
C76.1	C-202	121	106	6868	27	251	450	622	2906	376	300	172	4961
C76.2	C-202	94	71	8608	90	255	409	591	3787	379	249	232	4871
C77.1	C-213	101	88	6262	21	265	454	660	1178	338	304	286	3533
C77.2	C-213	82	62	6661	32	297	347	828	1587	338	255	293	3986
C78.1	C-218	110	66	3669	31	313	425	626	2006	365	360	180	5557
C78.1	C-218	87	132	4046	13	357	410	619	1642	372	354	112	5874
C79.1	C-133	63	103	3323	76	102	444	280	1063	116	93	140	1451
C79.2	C-133	55	63	8029	66	77	354	545	1657	190	154	154	2265
C80.1	C-50	59	55	7982	30	270	333	297	3811	305	267	163	4916
C80.2	C-50	75	77	7302	47	258	391	358	2155	208	248	166	4032
C81.1	C-127	94	52	5583	154	193	423	325	3310	315	191	274	3468
C81.2	C-127	90	107	5264	26	218	402	271	4908	336	226	325	3647
C82.1	No label	65	90	7780	75	105	417	471	1199	142	147	154	1335
C82.2	No label	53	60	5814	90	142	360	324	780	100	114	98	1000
C83.1	C-2	127	64	10728	24	246	346	478	2754	361	289	221	4301

XRF Sample #	Vessel #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
C83.2	C-2	76	53	2539	57	92	420	252	1646	129	0	119	1935
C84.1	C-13	55	68	2530	44	144	378	357	1063	149	116	177	2139
C84.2	C-13	87	75	5390	16	112	437	377	1713	206	161	151	2797
C85.1	C-130	73	107	5825	74	220	393	449	1760	325	287	172	4023
C85.2	C-130	47	43	4528	66	220	389	346	1407	231	229	121	2717
C86.1	C-129	128	91	6926	187	335	439	687	1860	328	276	243	4348
C86.2	C-129	84	45	3308	19	198	467	372	979	177	130	167	2490
C87.1	C-46	65	58	2442	16	167	375	315	1388	217	191	221	2396
C87.2	C-46	73	58	5006	59	253	417	504	2474	278	210	174	3006
C88.1	C-28	85	54	3618	114	127	438	312	1241	234	159	140	2313
C88.2	C-28	110	62	5627	45	156	402	431	2047	252	153	175	2845
C89.1	C-38	77	92	4194	50	181	393	396	1375	250	203	156	2870
C89.2	C-38	61	108	7377	130	242	414	653	2453	352	296	221	4908
C90.1	C-219	106	84	10123	280	91	418	752	1756	248	198	463	2167
C90.2	C-219	229	227	36883	780	668	560	2272	5243	457	584	983	5308
C91.2	C-220	105	88	2602	14	229	473	574	1150	254	217	132	3785
C91.1	C-220	121	66	5034	62	391	522	1032	1356	425	368	184	7076
C92.1	C-316	103	63	6563	72	197	500	584	2883	201	166	191	4533
C92.2	C-316	150	152	8169	83	250	503	644	3052	336	193	198	4099
C93.1	JVP 2728	86	67	10355	282	137	478	936	1964	195	291	339	2865
C94.1	C-221	205	66	3813	75	132	403	329	2916	165	249	235	3432
C94.2	C-221	105	33	3726	36	166	358	253	1556	172	90	102	2593
C95.1	C-225	125	58	5265	61	297	361	554	2266	321	374	161	3949
C95.2	C-225	81	64	4181	33	188	333	371	1840	210	251	169	3414
C96.1	C-223	89	101	8770	82	172	333	1119	1625	302	468	241	2649
C96.2	C-223	55	51	8075	70	202	337	1143	1776	240	397	274	2711
C97.1	C-224	36	61	2241	16	130	354	472	1147	119	63	143	2103
C97.2	C-224	37	73	1706	13	120	354	288	785	76	116	128	2039
C98.1	C-34	123	617	3084	42	366	522	685	1286	305	271	643	4837
C98.1	C-34	105	108	3497	12	251	506	439	1404	322	266	147	5645

Table C.35: XRF Samples Averaged readings

Sample #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
C1	101.0	65	5420.5	28	247.5	342	323	1154.5	215.5	281.5	454.5	4689.5
C2	55.5	63.5	4410	39	140	375	428	1789	158.5	127.5	627.5	2118.5
C3	75	75	2535	52.5	188.5	365	281	1510	193.5	154.5	107.5	3012.0
C4	89.5	66.5	8364.5	63.5	206	356	720.5	2982.5	199.5	166.5	228	2638
C5	91.5	58.5	3449.5	17	196.5	393.5	389.5	2184	310.5	207.5	164	3828.5
C6	104.5	79.5	6975	76	311.5	369	470	1284.5	336.5	355	216.5	4611.5
C7	96.5	72.5	6911.5	41.5	136	347	803	1843	205.5	153.5	205.5	3032.5
C8	90	76	5786.5	134	209	393	422	1847.5	213	233	194	3343
C9	58	53	8442	112	118.5	350.5	544	3839.5	174	135	247.5	2308.5
C10	110	84	7576.5	122.5	209.5	332	546.5	1835.5	280	223.5	381.5	3097
C11	77	66.5	7021	82.5	146.5	351.5	517.5	2101.0	230.5	185.5	190	2803.5
C12	91	57.5	5644	49	142.5	363.5	473.5	2271.5	210	145	235	3283
C13	77	62	7582.5	66.5	232	351	489.5	2099.5	304.5	227.5	143	4682.5
C14	101.5	74	12741.5	78	208	346.5	827.5	2678.5	304	151.5	353	2007.5
C15	64.5	90.5	9590.5	69	136	401.5	502.5	3045	268	244.5	244.5	3235.0
C16	87	81	8252.5	175.5	178.5	384.5	655.5	4056	341.5	223.5	276	3157.5
C17	92	68	5899.5	126	222.5	389	437.5	3026.5	238	198.5	190.5	3224
C18	120	78	12372.5	47.5	216.5	360	970.5	2376.5	299	76	235	2560
C19	110	91.5	5492.5	39	320	368	355	1433	370	280.5	156.5	4538
C20	92	63	3832.5	33	199.5	398.5	452.5	1392	317.5	255.5	158.5	4774
C21	101.5	51.5	7810.5	78.5	142.5	372	684	1822.5	224.5	157.5	193.5	2610.5
C22	92	89.5	7829.5	76	262.5	341.5	474.5	3557.5	301	309.5	192.5	3978
C23	87	63	7759.5	181.5	262	343	557	2253	318	275	175	4743.5
C24	93.5	85	8683	96	286	360	733	1740	312	290.5	228.5	4627.5
C25	90.5	60	4672	65	286.5	359	297	2716	421	315.5	1024.5	5164
C26	57	62.5	7547.5	206.5	204	388.5	709.5	1978.5	291	229	190	3514.5
C27	91	61	12450	90	129.5	330	572	1571.5	179.5	151	232	1817.5
C28	74.5	80.5	6147.5	104.5	221	417.5	590	1578	295.5	263.5	210.5	4225.5
C29	85.5	56	3389.5	57	208	400	370	1582	255.5	255	211	4062
C30	74	66.5	6368.5	71	197	388	573.5	1260	273.5	204	183.5	3739
C31	79	59.5	11007.5	193	116.5	373.5	925	2817.5	226	196	501.5	2795.5

Sample #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
C32	75	52.5	7365.5	186	191	371	456	2138.5	268	237	162	3255.5
C33	109.5	92	4371	45	339.5	404	466	2866	399.5	328.5	155.5	5942
C34	77.5	66.0	6924.5	94.5	207.0	381.0	595.0	1812.5	364.0	205.5	185.5	3915.0
C35	147.0	68.5	5303.0	35.0	469.0	383.0	1338.5	1245.5	386.0	347.0	153.5	6274.5
C36	121.0	71.5	3010.0	52.0	212.5	392.0	318.5	1650.5	281.5	257.0	141.5	3919.0
C37	100.0	83.0	9762.5	115.0	137.5	410.5	891.0	3201.0	255.5	65.5	248.0	1464.5
C38	77.5	57.0	9118.5	85.0	145.0	387.0	789.5	1579.0	167.0	196.0	223.0	2505.5
C39	96.0	81.5	10282.5	60.5	132.0	388.0	810.0	1667.0	226.0	192.5	270.5	2444.0
C40	87.0	63.5	9112.5	91.0	112.0	408.5	746.5	2061.5	235.0	61.0	179.5	2603.0
C41	72.0	93.0	9886.0	40.0	157.0	367.0	676.0	1766.0	274.0	111.0	235.0	2813.0
C42	89.5	69.5	6161.0	46.5	243.0	437.5	420.0	2332.0	323.5	200.0	177.5	4098.0
C43	92.5	41.5	4617.5	52.0	168.0	418.0	383.5	655.5	295.0	195.5	127.0	3503.5
C44	65.0	59.0	5475.5	85.5	159.0	429.0	555.5	1325.0	264.5	162.0	207.0	2753.0
C45	87.0	42.5	6109.5	49.5	234.5	393.0	530.5	1956.5	276.5	270.5	166.5	4158.5
C46	78.5	82.5	7185.0	82.0	142.0	416.0	787.0	1397.5	174.5	114.0	229.0	1431.0
C47	116.0	88.0	3432.5	7.5	341.5	435.0	606.0	1920.5	348.5	353.5	131.5	5791.5
C48	95.0	117.0	8093.5	105.5	214.0	402.5	581.5	2053.0	284.5	300.5	219.5	5012.0
C49	86.0	49.5	3704.0	38.5	320.0	423.0	398.5	1099.5	293.0	337.5	96.0	4580.0
C50	75.5	56.0	4471.5	76.5	129.5	411.0	370.0	1066.5	246.0	142.5	124.5	2763.5
C51	56.0	62.0	2168.5	25.0	140.5	455.5	340.5	1644.5	205.5	150.5	123.0	3155.5
C52	51.5	83.0	5608.5	56.5	105.0	385.0	319.0	1487.0	160.5	142.5	124.0	1657.0
C53	66.0	77.5	5800.5	55.5	138.5	427.0	465.0	2452.0	262.0	178.0	151.5	2810.0
C54	60.0	53.0	4998.5	23.0	101.0	453.5	495.5	2233.5	176.0	104.0	109.5	1088.5
C55	61.0	65.0	5507.5	70.5	118.0	398.0	382.0	2543.5	191.0	112.0	154.0	2096.5
C56	57.0	70.5	4636.5	66.0	60.5	435.0	410.0	1608.0	133.5	34.0	124.0	1102.5
C57	125.0	73.0	8301.0	64.5	254.0	344.5	686.0	1845.0	298.0	203.0	202.0	4174.0
C58	92.5	65.0	3966.0	27.5	299.0	448.0	341.0	1902.0	321.0	295.0	178.0	5050.5
C59	81.5	50.0	3696.0	24.0	364.5	365.5	656.0	1779.0	357.5	388.0	119.0	6526.0
C60	90.0	78.0	5079.5	36.5	329.0	427.0	557.0	1751.5	314.0	318.0	170.5	3363.0
C61	128.0	66.5	8642.0	63.5	221.0	393.5	307.0	1506.0	321.0	313.5	207.5	4221.0
C62	107.5	67.5	10302.5	99.0	241.0	380.5	834.5	2189.0	298.0	240.0	285.0	3841.5
C63	109.0	86.5	8401.5	77.0	334.5	408.0	529.5	1488.5	362.0	428.5	196.5	5203.5
C64	91.5	76.0	11693.0	65.6	169.0	374.0	807.0	3557.0	249.0	182.5	278.5	1725.0

Sample #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
C65	134.0	83.0	9026.5	72.0	239.5	438.0	674.5	2173.5	266.5	280.0	281.0	4870.0
C66	91.0	73.0	6318.5	73.0	250.5	407.5	516.5	1650.5	266.0	229.0	197.0	4131.0
C67	104	73	5652.5	92	174	406.5	515	2331	253	193.5	227.5	3134.5
C69	49.5	55	3860	49.5	95	406.5	252.5	1144	134	63	108.5	1184
C70	109.5	40.5	5590	46.5	163.5	369.5	295.5	2131	267.5	163	226.5	3298
C71	84	67	3077.5	31.5	176.5	414	534	1059.5	197.5	172	198.5	3020.5
C72	61	59	4138	27.5	140.5	440	325.5	1170	192	98	179	2344.5
C73	78.5	114.5	4004.5	30	273	417.5	337.5	1648	261	286	212.5	5235
C74	98	70.5	4550.5	41	173.5	378.5	265.5	1756	238	278.5	169	3581.5
C75	87	97	10431.5	357.5	132.5	389.5	941.5	2552.5	187	76.5	268.5	2706.5
C76	107.5	88.5	7738	58.5	253	429.5	606.5	3346.5	377.5	274.5	202	4916
C77	91.5	75	6461.5	26.5	281	400.5	744	1382.5	338	279.5	289.5	3759.5
C78	98.5	99	3857.5	22	335	417.5	622.5	1824	368.5	357	146	5715.5
C79	59	83	5676	71	89.5	399	412.5	1360	153	123.5	147	1858
C80	67	66	7642	38.5	264	362	327.5	2983	256.5	257.5	164.5	4474
C81	92	79.5	5423.5	90	205.5	412.5	298	4109	325.5	208.5	299.5	3557.5
C82	59	75	6797	82.5	123.5	388.5	397.5	989.5	121	130.5	126	1167.5
C83	101.5	58.5	6633.5	40.5	169	383	365	2200	245	144.5	170	3118
C84	71	71.5	3960	30	128	407.5	367	1388	177.5	138.5	164	2468
C85	60	75	5176.5	70	220	391	397.5	1583.5	278	258	146.5	3370
C86	106	68	5117	103	266.5	453	529.5	1419.5	252.5	203	205	3419
C87	69	58	3724	37.5	210	396	409.5	1931	247.5	200.5	197.5	2701
C88	97.5	58	4622.5	79.5	141.5	420	371.5	1644	243	156	157.5	2579
C89	69	100	5785.5	90	211.5	403.5	524.5	1914	301	249.5	188.5	3889
C90	167.5	155.5	23503	530	379.5	489	1512	3499.5	352.5	391	723	3737.5
C91	113	77	3818	38	310	497.5	803	1253	339.5	292.5	158	5430.5
C92	126.5	107.5	7366	77.5	223.5	501.5	614	2967.5	268.5	179.5	194.5	4316
C93	86	67	10355	282	137	478	936	1964	195	291	339	2865
C94	155	49.5	3769.5	55.5	149	380.5	291	2236	168.5	169.5	168.5	3012.5
C95	103	61	4723	47	242.5	347	462.5	2053	265.5	312.5	165	3681.5
C96	72	76	8422.5	76	187	335	1131	1700.5	271	432.5	257.5	2680
C97	36.5	67	1973.5	14.5	125	354	380	966	97.5	89.5	135.5	2071
C98	114	362.5	3290.5	27	308.5	514	562	1345	313.5	268.5	395	5241

Sample #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
P1	270.5	167.0	18820.0	344.0	1058.0	700.0	1439.5	5049.5	1765.0	930.5	959.5	16413.0
P2	268.0	133.0	33872.0	276.0	839.5	636.5	1857.5	9338.5	2117.5	920.5	572.5	16997.0
P3	307.0	223.5	44021.0	331.5	522.0	639.0	2550.5	7741.5	1474.0	809.0	846.0	17744.5
P4	223.5	178.0	37047.5	376.5	273.0	623.5	2558.5	4788.5	632.0	116.0	725.5	6218.0
P5	270.0	133.0	43963.0	407.5	438.5	603.0	2129.0	9082.0	1173.5	467.5	919.0	9250.5
P6	302.5	190.5	51053.0	372.0	618.5	611.5	2210.5	7426.0	1786.5	853.5	724.5	13365.5
P7	381.5	119.5	33719.0	172.0	725.0	585.5	3181.0	4671.5	1561.0	339.5	576.0	14457.0
P8	255.0	134.0	39100.5	212.0	203.5	587.0	4141.0	6597.0	869.5	0.0	700.0	9504.5
P9	341.5	139.0	29048.0	141.5	1167.0	565.0	2138.5	10599.0	2168.5	1087.0	507.5	20611.0
P10	272.5	194.0	57308.5	80.0	467.0	593.5	4236.5	5326.0	1233.5	722.5	1083.5	12817.0
P11	255.5	146.0	59459.0	598.5	428.5	541.0	2915.0	7613.5	1078.5	537.5	1131.0	7328.5
P12	371.5	203.0	41170.5	735.0	782.0	587.0	2459.0	5800.0	1818.0	1272.5	450.0	18050.5
P13	380.0	139.5	67248.5	643.5	437.0	637.5	3448.5	9631.0	1010.0	593.5	1167.5	10278.0
P14	279.0	199.0	55645.5	379.5	412.5	540.0	3311.5	5641.5	1537.0	421.0	765.0	12476.0
P15	162.5	121.0	44995.0	499.0	245.0	658.5	3253.0	8285.0	843.0	116.5	2173.0	4831.0
P16	313.0	120.5	52816.5	442.0	819.5	596.0	2887.5	6548.5	1595.0	708.5	693.5	13638.0
P17	213.5	123.5	31548.5	273.0	675.0	655.0	2530.0	4953.0	1543.5	695.5	839.5	14684.5
P18	199.5	156.5	49337.5	167.0	501.5	608.5	2706.0	6169.0	1404.0	714.5	824.0	11378.5
P19	277.0	134.5	52718.5	315.0	699.5	546.0	2811.5	8945.0	1773.0	724.5	1156.5	12929.5
P20	401.5	155.5	55992.0	159.0	615.0	559.5	3519.0	8635.5	1245.5	453.0	902.0	14449.0
P21	350.0	125.5	34334.0	18.5	1020.0	662.0	1995.0	3610.0	2295.5	1375.5	506.5	19653.0
P22	390.5	152.5	34380.0	59	1007.5	604.5	1438.0	5262.0	2319.0	1139.0	1171.5	19388.0
P23	439.5	300.5	77242.0	1494.0	508.5	666.0	3882.5	5768.5	1285.0	381.5	1551.5	6836.5
P24	312.5	239.5	58744.5	175.0	408.5	580.5	3261.0	10172.5	1178.5	0.0	1439.5	11985.0
P25	211.0	110.0	54307.5	694.5	306.0	539.0	2574.5	7794.0	843.0	467.5	819.5	5655.5
P26	308.0	113.0	50613.0	449.5	699.0	523.5	2736.5	7428.5	1848.0	790.0	1925.5	17715.0
P27	218.0	84.5	43383.0	228.0	818.5	531.0	2092.5	3929.0	1358.0	651.0	501.0	14372.0
P28	374	131.5	59759	214.5	599.5	674.5	3950.5	5389	1557	979	479.5	9333.5
P29	232.5	152.5	43815	117	715.5	662	1570	7062	1644	732.5	435.5	12231.5
P30	313	137.5	24851	292	796	682.5	1371.5	6412.5	1614.5	962.5	718.5	15403
P31	190.5	93.5	35208.5	236.5	562	614	2563	5977.5	1215.5	468.5	1250.5	17197.5
P32	237	112	50572	252	467	565.5	2698.5	8789.5	1625	632	646.5	9388
P33	261.5	141	38629.5	246.5	750	623.5	2365	9863	2075.5	875.5	509.5	15775

Sample #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
P34	288.5	103.5	37938	209.5	924.5	615	1827	8507.5	1975	1195	2509.5	21942.5
P36	286.5	136	58693	828	502	530.5	3398	7318	1096	670.5	1358	13514.5
P37	361	85	35642.5	73.5	757	576	2226	5560.5	1735.5	965.6	529	15683.5
P38	295.5	95	30980.5	191	715.5	697	1268	5748	1831	834	223.5	13427
P39	382	177.5	52647	698	825.5	547	4198.5	4760	2015.5	960	559	14285.5
P40	229	127.5	56861.5	973.5	565.5	581.5	3928	8446	1182.5	859	686	9991.5
P41	262.5	148	60602	826	521	589.5	3429.5	8381.5	1090.5	488.5	1190.5	9166.5
P42	374.5	161	43357	237	774.5	557.5	2540	17262	1763	902.5	768.5	14705.5
P44	336	81.5	47233.5	447.5	890	582.5	3007	6652.5	1828.5	829.5	1948.5	19296
P45	275	117.5	39863.5	650.5	568	615	2715	4934	1342.5	856.5	625.5	13303
P46	356.5	196.5	23686	114	1070	729.5	3025.5	3578	2014	1104.5	1116	21195
P47	291.5	160.5	49609	925	788	630.5	1619	7292	1825	1049	627	13322.5
P48	206.5	110.5	54538.5	458.5	346	521	3378.5	6509.5	983	549.5	1164	11515
P49	301	132.5	30693.5	527	521	618	2155.5	7391	1103.5	628	644	11181.5
P50	203	120.5	31988.5	276	565	696	2711.5	3790.5	1249.5	711	386.5	12807.5
P51	271	119	55415	158.5	489.5	552.5	3508.5	7072	1339	766	787.5	15596.5
P52	212.5	76.5	54757	561.5	392	553.5	3233	6769	1095	560	776.5	10407
P53	331	206	26444	238	986.5	725.5	2275.5	7370	2415.5	970	427.5	17897.5
P54	324	107.5	34727	84.5	1038	647.5	1612	3728	1956	947.5	562	18582.5
P55	300.5	174.5	31119.5	111.5	1039	643.5	1910	5236	2132	999	531.5	17668
P56	344.5	87.5	55951	347	890	618.5	2465.5	11038.5	1873	998.5	870	14453.5
P57	462	139	57437.5	358	1128.5	566	2114	5172	1985.5	1443	396.5	18964.5
P60	348.5	138.5	24267.5	91	133	630	1677	8385	2265.5	1398.5	1016.5	21973
P61	278.5	185	21369.5	66.5	980.5	639	1607.5	6927	1797.5	1160	906	19107.5
P62	317.5	147.5	27448	164	1046.5	593	2191	6754	1974	1150	1096	17241
P63	302	158	46634	305	760	590	2664	6131	1270	979	666	12778
P64	257.5	131.5	44039	411.5	313.5	646	2783	8247	988.5	321.5	552.5	11252.5
P65	230	112.5	46516.5	303.5	585	515.5	2340.5	8060	1505.5	762	1034.5	12831.5
P66	319	144	57270	154	914	510	2556	8079	2179	1301	674	16482
P67	381.5	127.5	39521	577.5	841.5	571	3219	3087	2221.5	867	408.5	16744
P68	297.5	133.5	50600	494	448.5	583.5	3084.5	9566.5	1124.5	536.5	1098	12238.5
P69	221	173.5	46032.5	1002	508	625.5	2873.5	9288	1140	693	804	12431.5
P70	214	135.5	39235	599.5	338.5	535.5	2467.5	7184	888	455.5	585	9884

Sample #	As	Cu	Fe	Mn	Nb	Ni	Rb	Sr	Ti	Y	Zn	Zr
P71	301.5	147	33875	189	662	620.5	2375	9910.5	1718.5	714	636.5	13188
P72	510	219	31202.5	50	1487.5	551.5	1584	9235	2346	1274.5	425	23786.5
P73	344	252.5	28168	84	1163.5	621	2030.5	9566.5	2228.5	1299	530	20820.5
P74	347	96.5	37141	264.5	596	567	2783.5	13078.5	1621.5	765	5792	14699
P75	242.5	139	41926	766.5	631	618	2004.5	10815	1821	701	678	13598.5
P76	309	197	43643	148.5	518.5	568	3364.5	6903	1139.5	458	1259	11096.5
P77	216	141.5	52237.5	432.5	603.5	537.5	2979.5	13085	1080	653.5	2572	5763.5
P78	243	141.5	55246	221.5	662.5	529	2293	6401	1626.5	932.5	1810	13141.5
P79	315.5	116	54943.5	225.5	709	551.5	2755.5	7365.5	1683.5	728.5	686	12398.5
P80	366	151	54176	257.5	1131.5	512.5	2792.5	5143.5	1977	959.5	934.5	16020
J1	334.5	157.5	25351	76	1497.5	531.5	2637.5	3845	2489.5	907.5	568	16998.5
J2	268.5	80	64039.5	558.5	830.5	541	2430	5525	1951.5	800	3249.5	14947.5
J3	399.5	135	36357.5	133.5	657	678.5	2273.5	5576	1815.5	999.5	356.5	16310.5
J4	239.5	148	22848.5	314.5	1129	698	5166	5658	1550.5	1883.5	700.5	13809
J5	307	256.5	39300.5	186	1159	630.5	1910.5	3904.5	2089.5	1110.5	900.5	18105.5
J6	263	170.5	62238	1402	738	624	2911	7741.5	1534	958	1958.5	13496
J7	337.5	184	34561.5	580.5	1140	613	1931	7997	2428	1662.5	834	19109.5
J8	250	130.5	27283.5	69	1237.5	549	2034.5	3906.5	2460.5	1643.5	337	21468.5
J9	300.5	192.5	26483.5	70	937.5	611	4156	7139.5	2190.5	646.5	718.5	18181
J10	353	286	36865.5	1294.5	691	710.5	2303.5	6531.5	1730.5	1239	1216.5	18885.5
J11	277	146.5	30240.5	270.5	997.5	671.5	1982.5	7403	2140.5	968.5	305.5	16095.5
J12	393	106	50428.5	603	635	534	2034.5	6958.5	1925.5	675.5	657.5	14473
J13	240.5	118.5	34775.5	78.5	876.5	630	1764.5	10252	2433.5	911	648	15949.5
J14	524	171	66595.5	860	778	515	2078	10012.5	2120	857	748	13912
J15	351.5	193.5	45329.5	163	1302	575	2478	5280	2907.5	2079	560	22396
J16	315	185	37120.5	117.5	1249.5	524.5	1846.5	7638	2745.5	954.5	547.5	18927
J17	346	141.5	30642.5	54	910.5	670	1934.5	10264.5	2263.5	1076	781	15539
J18	378.5	137	59891.5	290	804.5	597.5	1924.5	9739	2260	889.5	601.5	14239
J19	254	363	53343	2622	547.5	552.5	3031.5	10455	1243.5	582	2295	10771.5

APPENDIX D

Cambria Ceramic Data

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Cambria	**C01**	Angunmod	Round	Rounded	No	Incised	Toolimp	None	None	None	None
Cambria	**C02**	Rolled	Round	Angled	Yes	None	None	None	None	D4	D
Cambria	**C03**	Angunmod	Flat	Pronounced	Yes	None	None	None	None	N1, L1	N, L
Cambria	**C04**	Angmod	Flat	Rounded	Yes	None	Toolimp	Toolimp	None	H2, Q2, Q3, Q6	H, Q
Cambria	**C05**	Angunmod	Flat	NA	No	None	None	None	None	Ind	Ind
Cambria	**C07**	Angunmod	Flat	NA	No	None	None	None	None	A2, L1	A, L
Cambria	**C08**	Angmod	Round	NA	No	Incised	Toolimp	None	None	None	None
Cambria	**C09**	Angtap	Flat	NA	No	None	Toolimp	Toolimp	Incised	Q2	Q2
Cambria	**C11**	Rolled	Round	Pronounced	No	None	None	None	None	None	None
Cambria	**C12**	Everted	Round	NA	No	None	Toolimp	None	None	B1, B5	B
Cambria	**C13**	Angmod	Round	NA	Yes	Incised	Toolimp	None	None	None	None
Cambria	**C14**	Angunmod	Flat	NA	No	Incised	None	Twistcordimp	None	M2	M
Cambria	**C15**	Angunmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C17**	Angunmod	Flat	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C18**	Angunmod	Flat	NA	No	Twistcordimp	None	None	None	A2, L1	A, L
Cambria	**C19**	Curvunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C20**	Angunmod	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C22**	Angmod	Flat	NA	No	None	None	None	None	L1	L
Cambria	**C23**	Angunmod	Bevext	NA	No	None	None	None	Incised	L1	L
Cambria	**C24**	Angunmod	Flat	NA	Yes	Incised	None	None	None	L1	L
Cambria	**C25**	Angunmod	Flat	NA	No	Incised	None	None	None	Ind	Ind
Cambria	**C26**	Angunmod	Flat	NA	No	None	Cordwrapimp	Toolimp	None	L1	L
Cambria	**C27**	Angunmod	Flat	NA	No	Incised	None	None	None	A2	A
Cambria	**C28**	Angunmod	Flat	NA	No	None	None	None	None	Ind	Ind
Cambria	**C29**	Angunmod	Round	NA	No	None	None	None	None	D2	D
Cambria	**C30**	Rolled	Round	NA	Yes	None	None	None	None	J1	J
Cambria	**C31**	Angmod	Bevext	NA	Yes	Incised	Toolimp	None	None	L1	L
Cambria	**C32**	Angmod	Flat	NA	No	Incised	None	None	Incised	M2	M
Cambria	**C33**	Angtap	Flat	NA	No	None	Toolimp	None	None	None	None
Cambria	**C34**	Curvunmod	Flat	NA	Yes	None	None	Toolimp	None	None	None
Cambria	**C35**	Angunmod	Flat	NA	No	None	Toolimp	None	None	None	None
Cambria	**C37**	Angmod	Flat	NA	Yes	None	Toolimp	None	None	L1	L
Cambria	**C38**	Angmod	Flat	NA	Yes	Dentate	None	None	None	None	None
Cambria	**C40**	Angmod	Bevext	NA	No	Crosshatch	Toolimp	None	None	None	None
Cambria	**C41**	Angmod	Bevext	NA	No	Crosshatch	Toolimp	None	None	L1	L
Cambria	**C42**	Angtap	Bevext	NA	No	Crosshatch	None	None	None	A1, L1	A, L
Cambria	**C43**	Angunmod	Bevext	NA	No	None	Toolimp	Toolimp	None	L1	L
Cambria	**C44**	Angunmod	Bevext	NA	No	None	None	None	Incised	L1	L
Cambria	**C45**	Angunmod	Flat	NA	Yes	Crosshatch	Toolimp	None	None	L1	L
Cambria	**C46**	Angunmod	Bevext	NA	Yes	Crosshatch	None	None	None	None	None
Cambria	**C47**	Angunmod	Bevext	NA	Yes	Crosshatch	Toolimp	None	None	L1	L
Cambria	**C48**	Angunmod	Flat	NA	No	None	Toolimp	Toolimp	None	None	None
Cambria	**C49**	Curvmod	Flat	NA	No	Crosshatch	None	None	None	Ind	Ind
Cambria	**C50**	Srim	Flat	NA	Yes	None	Twistcordimp	None	None	None	None
Cambria	**C51**	Everted	Round	NA	No	None	None	None	None	Ind	A
Cambria	**C52**	Angunmod	Bevext	Angled	Yes	None	None	None	None	None	None
Cambria	**C53**	Everted	Pinched	Angled	No	None	None	None	None	N1, L1	N, L

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Cambria	**C54**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C55**	Srim	Round	NA	No	Incised	None	None	None	None	None
Cambria	**C56**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C57**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C58**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C59**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C60**	Angmod	Bevext	Rounded	Yes	Incised	None	None	Incised	O3	O
Cambria	**C61**	Curvmod	Flat	NA	Yes	None	Toolimp	None	None	O3	O
Cambria	**C62**	Angunmod	Bevext	NA	No	Incised	None	Twistcordimp	None	B2	B
Cambria	**C63**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C64**	Angunmod	Bevext	NA	No	None	None	Toolimp	None	Q4	Q
Cambria	**C65**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C67**	Angunmod	Flat	NA	Yes	None	Toolimp	Toolimp	None	L1	L
Cambria	**C68**	Angunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C69**	Angunmod	Flat	NA	No	Incised	None	Twistcordimp	None	A2	A
Cambria	**C70**	Angunmod	Flat	NA	Yes	Crosshatch	None	None	None	None	None
Cambria	**C71**	Rolled	Round	NA	Yes	None	None	None	None	P2	P
Cambria	**C72**	Rolled	Round	Angled	Yes	None	None	None	None	Ind	F
Cambria	**C73**	Angunmod	Flat	NA	Yes	None	None	None	None	A2, L1	A, L
Cambria	**C74**	Curvmod	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C75**	Curvunmod	Flat	NA	Yes	None	None	None	None	F3	F
Cambria	**C76**	Angtap	Round	NA	No	None	Toolimp	Toolimp	NA	None	None
Cambria	**C77**	Angmod	Flat	NA	No	Incised	Toolimp	None	None	Ind	Ind
Cambria	**C78**	Rolled	Round	NA	Yes	None	None	None	None	F2	F
Cambria	**C80**	Srim	Flat	NA	Yes	None	None	None	Twistcordimp	None	None
Cambria	**C81**	Srim	Round	NA	No	None	None	None	None	None	None
Cambria	**C82**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C83**	Rolled	Round	NA	Yes	None	None	None	None	D1	D
Cambria	**C84**	Srim	Flat	NA	Yes	None	None	None	Twistcordimp	None	None
Cambria	**C85**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C86**	Srim	Flat	NA	Yes	None	None	None	Incised	None	None
Cambria	**C87**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C88**	Rolled	Round	NA	Yes	None	None	None	None	J3	J
Cambria	**C89**	Srim	Flat	NA	No	None	None	None	Incised	None	None
Cambria	**C90**	Angmod	Bevext	NA	No	Incised	Toolimp	None	None	L1	L
Cambria	**C91**	Angunmod	Flat	NA	No	Crosshatch	None	None	None	B2, L1	B, L
Cambria	**C92**	Rolled	Round	Angled	No	None	None	None	None	F1	F
Cambria	**C93**	Angtap	Round	NA	No	None	None	None	None	None	None
Cambria	**C94**	Rolled	Round	Angled	Yes	None	None	None	None	D3	D
Cambria	**C95**	Angunmod	Bevext	NA	Yes	None	None	None	None	L1	L
Cambria	**C96**	Angunmod	Flat	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C97**	Angunmod	Flat	NA	Yes	Crosshatch	Toolimp	None	Incised	H1, H2, L1	H, L
Cambria	**C98**	Curvunmod	Flat	Rounded	Yes	None	None	None	None	O1	O
Cambria	**C99**	Angmod	Flat	NA	Yes	None	None	None	None	L1	L
Cambria	**C100**	Srim	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C101**	Srim	Flat	NA	No	None	None	None	None	None	None
Cambria	**C102**	Rolled	Round	NA	No	None	None	None	None	None	None

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Cambria	**C103**	Everted	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C104**	Curvunmod	Flat	NA	No	None	Toolimp	Toolimp	Incised	A4, L1, Q4	A, L, Q
Cambria	**C107**	Angunmod	Flat	NA	Yes	None	Toolimp	None	Incised	None	None
Cambria	**C110**	Rolled	Round	NA	No	None	None	None	None	E1, G1	E, G
Cambria	**C111**	Rolled	Round	NA	No	None	None	None	None	D1	D
Cambria	**C112**	Angunmod	Flat	NA	Yes	Twistcordimp	None	None	Incised	L1	L
Cambria	**C113**	Angunmod	Flat	Angled	No	None	None	Incised	None	A2, F4	A, F
Cambria	**C115**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C116**	Rolled	Round	NA	Yes	None	None	None	None	F3	F
Cambria	**C117**	Curvunmod	Bevext	NA	No	Incised	None	None	None	A2, L1	A, L
Cambria	**C118**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C120**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C121**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C122**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C123**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C124**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C126**	Rolled	Round	NA	No	None	None	None	None	B2	B
Cambria	**C127**	Srim	Flat	NA	No	None	None	None	Twistcordimp	None	None
Cambria	**C128**	Srim	Flat	NA	No	None	None	None	Twistcordimp	None	None
Cambria	**C129**	Srim	Flat	NA	No	None	None	None	Twistcordimp	None	None
Cambria	**C130**	Srim	Flat	NA	Yes	None	None	None	Twistcordimp	None	None
Cambria	**C131**	Srim	Flat	NA	No	None	None	None	Twistcordimp	None	None
Cambria	**C132**	Srim	Flat	NA	No	None	Toolimp	None	Twistcordimp	None	None
Cambria	**C133**	Srim	Flat	NA	No	None	None	None	None	None	None
Cambria	**C134**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C135**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C136**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C137**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C138**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C139**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C140**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C141**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C142**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C143**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C144**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C145**	Srim	Flat	NA	No	None	None	None	Twistcordimp	None	None
Cambria	**C146**	Angunmod	Bevext	NA	No	None	Toolimp	Toolimp	Incised	Ind	Ind
Cambria	**C147**	Angtap	Flat	NA	No	None	Toolimp	Toolimp	Incised	None	None
Cambria	**C148**	Angunmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C149**	Angunmod	Flat	NA	No	None	Toolimp	Toolimp	Incised	H2, Q2	H, Q
Cambria	**C152**	Srim	Flat	Rounded	No	None	None	None	None	None	None
Cambria	**C153**	Curvunmod	Bevext	NA	Yes	None	None	None	None	L1	L
Cambria	**C155**	Rolled	Round	Angled	Yes	None	None	None	None	P2	P
Cambria	**C156**	Curvunmod	Bevext	Angled	No	Crosshatch	Twistcordimp	Twistcordimp	None	A2, L1	A, L
Cambria	**C157**	Rolled	Round	Rounded	Yes	None	None	None	None	A2	A
Cambria	**C158**	Angunmod	Bevext	NA	No	None	None	None	None	N1, L1	N, L
Cambria	**C159**	Rolled	Round	Rounded	Yes	None	None	None	None	G1	G

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Cambria	**C160**	Curvmod	Flat	NA	No	None	Toolimp	Incised	Incised	None	None
Cambria	**C161**	Angunmod	Bevext	NA	Yes	None	None	None	None	A2, L1	A, L
Cambria	**C162**	Srim	Flat	Angled	Yes	None	None	None	Twistcordimp	B2, B3, L1	B, L
Cambria	**C163**	Angmod	Bevext	NA	Yes	Incised	None	Incised	Incised	L1	L
Cambria	**C164**	Curvunmod	Flat	NA	Yes	Incised	None	None	Incised	C1	C
Cambria	**C165**	Curvunmod	Flat	NA	No	None	Toolimp	Toolimp	None	H2, Q2, Q6	H, Q
Cambria	**C166**	Angunmod	Flat	NA	Yes	None	Toolimp	None	None	None	None
Cambria	**C167**	Angtap	Bevext	Angled	No	None	Toolimp	None	None	None	None
Cambria	**C168**	Angunmod	Flat	NA	Yes	None	Toolimp	Toolimp	None	Q6	Q
Cambria	**C169**	Angunmod	Bevext	NA	No	None	Toolimp	Toolimp	None	L1	L
Cambria	**C170**	Angunmod	Bevext	NA	No	Twistcordimp	None	None	None	A2, L1	A, L
Cambria	**C171**	Angunmod	Flat	NA	Yes	None	None	None	None	A2	A
Cambria	**C172**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C173**	Angunmod	Flat	NA	Yes	None	None	None	Incised	None	None
Cambria	**C174**	Srim	Flat	NA	Yes	None	None	None	Twistcordimp	None	None
Cambria	**C175**	Angmod	Bevext	NA	Yes	Incised	Toolimp	None	None	None	None
Cambria	**C176**	Curvmod	Bevext	NA	No	Crosshatch	None	None	None	None	None
Cambria	**C177**	Angmod	Flat	NA	Yes	None	Toolimp	Toolimp	None	Q6	Q
Cambria	**C178**	Angunmod	Bevext	NA	Yes	Incised	Toolimp	None	None	None	None
Cambria	**C179**	Curvunmod	Flat	NA	No	Crosshatch	None	None	None	B5	B
Cambria	**C180**	Srim	Flat	NA	No	None	None	None	Twistcordimp	B3	B
Cambria	**C181**	Curvunmod	Bevext	NA	Yes	None	None	None	None	H2, L1, Q4, Q5	H, L, Q
Cambria	**C182**	Rolled	Round	NA	Yes	None	None	None	None	I1	I
Cambria	**C183**	Rolled	Round	NA	Yes	None	None	None	None	G1	G
Cambria	**C186**	Angunmod	Flat	NA	No	Incised	None	Twistcordimp	None	B2, C1	B, C
Cambria	**C187**	Angunmod	Bevext	NA	No	Crosshatch	None	None	None	L1	L
Cambria	**C188**	Angtap	Round	NA	No	None	None	None	Twistcordimp	None	None
Cambria	**C189**	Curvunmod	Bevext	NA	Yes	None	Toolimp	Toolimp	None	L1	L
Cambria	**C190**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C191**	Curvunmod	Round	NA	Yes	Incised	None	None	None	C1	C
Cambria	**C192**	Angmod	Bevext	NA	No	None	Incised	None	None	None	None
Cambria	**C193**	Angunmod	Bevext	NA	No	None	None	None	None	A2, L1	A, L
Cambria	**C194**	Angunmod	Round	Pronounced	No	None	None	None	None	None	None
Cambria	**C195**	Curvunmod	Bevext	Angled	Yes	None	None	None	None	D2, Q1	D, Q
Cambria	**C196**	Angunmod	Flat	NA	No	None	Toolimp	Toolimp	None	Q6	Q
Cambria	**C197**	Angmod	Bevext	NA	Yes	Incised	Toolimp	None	None	None	None
Cambria	**C198**	Curvunmod	Bevext	NA	Yes	None	Toolimp	None	Incised	Ind	Ind
Cambria	**C199**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C200**	Everted	Round	NA	Yes	None	None	None	None	A3	A
Cambria	**C201**	St	Flat	Angled	Yes	Crosshatch	None	None	None	B7, Q6	B, Q
Cambria	**C202**	Angunmod	Bevext	NA	Yes	Crosshatch	None	None	None	A2, L1	A, L
Cambria	**C203**	Angunmod	Bevext	NA	Yes	None	Incised	None	None	None	None
Cambria	**C204**	Angunmod	Bevext	NA	No	None	None	None	None	L1	L
Cambria	**C205**	Angunmod	Flat	NA	Yes	None	None	None	None	N1, L1	N, L
Cambria	**C206**	Angunmod	Flat	NA	Yes	Incised	None	None	None	None	None
Cambria	**C207**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C208**	Angunmod	Round	NA	No	None	None	None	None	None	None

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Cambria	**C209**	St	Pinched	Rounded	No	None	None	None	None	A1, L1	A, L
Cambria	**C211**	Angunmod	Bevext	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C212**	Srim	Round	NA	Yes	Crosshatch	None	None	None	None	None
Cambria	**C213**	Angtap	Bevext	NA	Yes	Crosshatch	None	None	None	A2	A
Cambria	**C214**	Angunmod	Bevext	NA	Yes	Crosshatch	None	None	None	None	None
Cambria	**C215**	Curvunmod	Bevext	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C216**	Angunmod	Flat	NA	No	Crosshatch	None	None	None	L1	L
Cambria	**C217**	Rolled	Round	NA	Yes	None	None	None	None	A2	A
Cambria	**C218**	Everted	Flat	Angled	No	Punctate	None	None	None	A2, A5, M1, Q1	A, M, Q
Cambria	**C219**	Angunmod	Flat	Angled	No	None	None	None	None	None	None
Cambria	**C220**	Rolled	Round	Pronounced	Yes	None	None	Incised	None	B6, G2	B, G
Cambria	**C221**	Srim	Round	NA	Yes	None	None	None	Twistcordimp	Ind	Ind
Cambria	**C223**	Rolled	Round	NA	Yes	None	None	None	None	B5, L1	B, L
Cambria	**C224**	Angunmod	Round	NA	No	None	Toolimp	Toolimp	None	None	None
Cambria	**C225**	Angunmod	Bevext	NA	Yes	Crosshatch	None	None	None	None	None
Cambria	**C226**	Angunmod	Flat	NA	Yes	Incised	Toolimp	None	Incised	L2, L4	L
Cambria	**C227**	Angunmod	Flat	Angled	No	None	None	None	None	N1, L1	N, L
Cambria	**C228**	Angunmod	Bevext	NA	No	Incised	None	Twistcordimp	Incised	L1	L
Cambria	**C229**	Curvunmod	Flat	Rounded	No	None	None	None	None	K1	K
Cambria	**C230**	Rolled	Round	Angled	Yes	None	None	None	None	P1	P
Cambria	**C232**	Curvunmod	Flat	NA	No	None	None	None	None	Ind	Ind
Cambria	**C233**	Curvunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C234**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C235**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C236**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C237**	Curvunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C238**	Angunmod	Bevext	NA	No	None	Toolimp	None	None	L1	L
Cambria	**C239**	Curvunmod	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C241**	Angunmod	Flat	NA	No	None	Toolimp	None	None	L1	L
Cambria	**C242**	Curvunmod	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C243**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C244**	Curvunmod	Bevext	NA	Yes	None	None	Toolimp; Twistcordimp	None	None	None
Cambria	**C245**	Angmod	Bevext	NA	Yes	Incised	Toolimp	None	None	L1	L
Cambria	**C246**	Angunmod	Bevext	NA	No	Incised	None	None	None	None	None
Cambria	**C247**	Angmod	Flat	NA	No	Crosshatch	None	None	None	None	None
Cambria	**C248**	St	Flat	NA	Yes	None	Toolimp	None	None	None	None
Cambria	**C249**	Curvunmod	Bevext	NA	No	TI	None	None	None	Ind	Ind
Cambria	**C250**	Angunmod	Bevext	NA	No	Crosshatch	None	None	None	L1	L
Cambria	**C251**	Angmod	Bevext	NA	Yes	None	Toolimp	None	None	Ind	Ind
Cambria	**C253**	Everted	Round	NA	No	None	None	None	None	None	None
Cambria	**C254**	St	Flat	NA	Yes	Crosshatch	None	None	None	Ind	Ind
Cambria	**C255**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C256**	Angmod	Flat	NA	No	None	None	None	None	Ind	Ind
Cambria	**C257**	Curvunmod	Bevext	NA	No	Incised	None	None	None	None	None
Cambria	**C258**	Curvunmod	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C259**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Cambria	**C260**	Angunmod	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C261**	Curvunmod	Flat	NA	Yes	Incised	None	Twistcordimp	None	B2	B
Cambria	**C262**	Angunmod	Flat	NA	Yes	None	None	Toolimp	None	None	None
Cambria	**C263**	Curvunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C265**	Curvunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C266**	Angunmod	Flat	NA	No	None	None	Toolimp	None	None	None
Cambria	**C267**	Angunmod	Flat	NA	No	None	None	None	None	Ind	Ind
Cambria	**C268**	Everted	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C269**	Rolled	Round	NA	No	None	None	None	None	A1, L4	A, L
Cambria	**C270**	Curvunmod	Flat	NA	Yes	Incised	None	None	None	None	None
Cambria	**C271**	Curvunmod	Round	NA	Yes	None	Toolimp	None	None	None	None
Cambria	**C272**	Angunmod	Bevext	NA	No	Crosshatch	None	None	None	Q6	Q
Cambria	**C273**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C274**	Angunmod	Flat	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C275**	Angmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C276**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C277**	Curvunmod	Round	NA	Yes	None	None	None	None	G1, J3, L3	G, J, L
Cambria	**C278**	Angunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C279**	Curvunmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C281**	Curvmod	Flat	NA	No	None	Crosshatch	None	None	None	None
Cambria	**C282**	St	Round	Angled	No	None	None	None	None	None	None
Cambria	**C283**	Angunmod	Bevext	NA	Yes	Incised	None	None	None	None	None
Cambria	**C284**	Angtap	Pinched	NA	No	None	None	None	None	None	None
Cambria	**C285**	Angunmod	Flat	NA	No	None	Toolimp	Toolimp	None	None	None
Cambria	**C286**	Curvunmod	Flat	NA	No	None	None	None	None	None	None
Cambria	**C287**	Curvunmod	Flat	NA	No	Incised	None	None	None	L1	L
Cambria	**C288**	Angtap	Flat	NA	No	None	Toolimp	None	None	None	None
Cambria	**C289**	Srim	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C290**	Angunmod	Flat	NA	No	None	Toolimp	None	None	None	None
Cambria	**C291**	Angtap	Flat	NA	No	None	Toolimp	Toolimp	None	L1	L
Cambria	**C292**	Angmod	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C293**	Ind	Flat	NA	No	Incised	None	None	None	None	None
Cambria	**C294**	Angunmod	Flat	NA	No	Crosshatch	Toolimp	None	None	None	None
Cambria	**C295**	Angunmod	Bevext	NA	Yes	Incised	Toolimp	None	None	L1	L
Cambria	**C296**	Angunmod	Flat	NA	No	Incised	None	Twistcordimp	Incised	None	None
Cambria	**C297**	Angmod	Flat	NA	No	None	None	None	None	None	None
Cambria	**C298**	Curvmod	Flat	NA	No	None	Toolimp	None	None	None	None
Cambria	**C299**	Angunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C300**	Angunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C301**	Curvunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C302**	Angunmod	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C303**	Angunmod	Bevext	NA	No	Incised	Toolimp	None	None	Ind	Ind
Cambria	**C304**	Angunmod	Flat	NA	No	Incised	Toolimp	None	None	None	None
Cambria	**C305**	Angmod	Flat	NA	Yes	Crosshatch	None	None	None	L1	L
Cambria	**C306**	Angmod	Bevext	NA	Yes	Crosshatch	None	None	None	Ind	Ind
Cambria	**C307**	Angunmod	Bevext	NA	No	Crosshatch	None	None	None	None	None
Cambria	**C308**	Angunmod	Bevext	NA	Yes	Crosshatch	None	None	None	L1	L

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Cambria	**C309**	Angunmod	Bevext	NA	No	None	Toolimp	NA	None	Ind	Ind
Cambria	**C310**	Curvtap	Bevext	NA	No	None	Toolimp	None	None	None	None
Cambria	**C311**	Angmod	Bevext	NA	No	None	Toolimp	Toolimp	None	None	None
Cambria	**C312**	Curvunmod	Bevext	NA	No	Incised	None	Twistcordimp	None	None	None
Cambria	**C313**	Angmod	Bevext	NA	No	Crosshatch	None	None	None	None	None
Cambria	**C314**	Angunmod	Flat	NA	Yes	Twistcordimp	None	None	Incised	None	None
Cambria	**C315**	Angunmod	Flat	NA	Yes	Crosshatch	Toolimp	None	None	None	None
Cambria	**C316**	Angtap	Flat	NA	Yes	Incised	None	None	None	None	None
Cambria	**C317**	Ind	Flat	NA	Yes	Incised	None	None	None	None	None
Cambria	**C318**	Curvunmod	Flat	NA	No	None	Toolimp	Toolimp	None	None	None
Cambria	**C319**	Angunmod	Flat	NA	No	Incised	Toolimp	None	None	None	None
Cambria	**C320**	Curvunmod	Flat	NA	No	Crosshatch	None	None	None	L1	L
Cambria	**C321**	Curvunmod	Flat	NA	No	Incised	None	None	None	L1	L
Cambria	**C322**	Ind	Flat	NA	No	None	Incised	None	None	None	None
Cambria	**C323**	Ind	Flat	NA	No	Twistcordimp	None	None	None	None	None
Cambria	**C324**	Angmod	Bevext	NA	No	Incised	Toolimp	None	None	None	None
Cambria	**C325**	Curvmod	Flat	NA	No	None	Twistcordimp	None	None	None	None
Cambria	**C326**	Angmod	Bevext	NA	Yes	Incised	Toolimp	None	None	None	None
Cambria	**C327**	Angunmod	Flat	NA	No	None	Toolimp	Toolimp	None	None	None
Cambria	**C328**	Angunmod	Bevext	NA	No	Crosshatch	Toolimp	None	None	None	None
Cambria	**C329**	Angunmod	Flat	NA	No	Incised	Toolimp	None	None	None	None
Cambria	**C330**	Curvunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C331**	Angunmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C332**	Angunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C333**	Angmod	Bevext	NA	No	Incised	Toolimp	None	None	None	None
Cambria	**C334**	Curvunmod	Flat	NA	No	Incised	None	None	None	None	None
Cambria	**C335**	Angunmod	Bevext	NA	No	None	Toolimp	Toolimp	Incised	None	None
Cambria	**C336**	Angmod	Bevext	NA	No	None	Toolimp	Toolimp	Incised	None	None
Cambria	**C337**	Angunmod	Bevext	NA	Yes	None	Toolimp	None	None	None	None
Cambria	**C338**	Curvunmod	Round	NA	Yes	None	Toolimp	None	None	None	None
Cambria	**C339**	Curvunmod	Flat	NA	No	Incised	None	None	None	None	None
Cambria	**C340**	Angunmod	Bevext	NA	No	None	Toolimp	None	None	Q2	Q
Cambria	**C341**	Angunmod	Bevext	NA	Yes	None	Toolimp	None	None	None	None
Cambria	**C342**	Angmod	Bevext	NA	No	None	Toolimp	None	None	None	None
Cambria	**C343**	Angunmod	Bevext	NA	No	None	None	Toolimp	None	None	None
Cambria	**C344**	Srim	Bevext	NA	No	Incised	None	None	Incised	None	None
Cambria	**C345**	Angunmod	Flat	NA	Yes	Incised	None	None	None	None	None
Cambria	**C346**	Angunmod	Flat	NA	No	None	None	None	None	None	None
Cambria	**C347**	Ind	Flat	NA	No	Incised	Toolimp	None	None	None	None
Cambria	**C348**	Angunmod	Bevext	NA	No	Crosshatch	None	None	None	None	None
Cambria	**C349**	Angunmod	Flat	NA	No	None	None	None	None	Ind	Ind
Cambria	**C350**	Angunmod	Flat	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C351**	Angunmod	Round	NA	No	None	None	None	None	Ind	Ind
Cambria	**C352**	Curvunmod	Flat	NA	No	None	None	None	None	None	None
Cambria	**C353**	Curvmod	Flat	NA	No	None	Toolimp	None	None	None	None
Cambria	**C354**	Angunmod	Bevext	NA	Yes	Crosshatch	None	None	None	None	None
Cambria	**C355**	Angunmod	Flat	NA	No	Crosshatch	Toolimp	None	None	Ind	Ind

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Cambria	**C356**	Angunmod	Bevext	NA	No	Crosshatch	None	None	None	None	None
Cambria	**C357**	Angunmod	Bevext	NA	Yes	None	Toolimp	None	None	Ind	Ind
Cambria	**C358**	Curvunmod	Round	NA	No	Incised	None	None	None	None	None
Cambria	**C359**	Ind	Bevext	NA	No	Crosshatch	None	None	None	None	None
Cambria	**C360**	Angunmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C361**	Angmod	Bevext	NA	No	None	None	None	None	Ind	Ind
Cambria	**C362**	Angunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C363**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C364**	Curvunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C365**	Angunmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C366**	Angunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C367**	Angmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C368**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C369**	Angunmod	Flat	NA	No	None	None	None	None	None	None
Cambria	**C370**	Angunmod	Bevext	NA	Yes	Incised	Toolimp	None	None	None	None
Cambria	**C371**	Angunmod	Flat	NA	Yes	None	Toolimp	Toolimp	Incised	None	None
Cambria	**C372**	Angunmod	Bevext	NA	No	Incised	None	None	None	None	None
Cambria	**C373**	Angunmod	Bevext	NA	Yes	Incised	Toolimp	None	None	None	None
Cambria	**C374**	Angunmod	Round	NA	No	None	Toolimp	None	None	None	None
Cambria	**C375**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C376**	Curvunmod	Flat	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C377**	Curvunmod	Bevext	NA	Yes	Incised	None	None	None	None	None
Cambria	**C378**	Curvunmod	Flat	NA	No	None	None	None	None	Ind	Ind
Cambria	**C379**	Angunmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C380**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C381**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C382**	Angunmod	Flat	NA	No	None	None	Toolimp	None	L1	L
Cambria	**C383**	Angunmod	Bevext	NA	No	Crosshatch	None	None	None	None	None
Cambria	**C385**	Srim	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C386**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C387**	Angunmod	Bevext	NA	No	None	None	None	None	None	None
Cambria	**C388**	Curvunmod	Bevext	NA	Yes	Incised	None	None	None	L1	L
Cambria	**C389**	Angunmod	Bevext	NA	Yes	Crosshatch	None	None	None	None	None
Cambria	**C390**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C391**	Angmod	Flat	NA	Yes	Crosshatch	Toolimp	Toolimp	Incised	None	None
Cambria	**C392**	Angmod	Flat	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C393**	St	Flat	NA	No	None	None	None	None	None	None
Cambria	**C394**	Angunmod	Bevext	NA	No	None	None	None	Incised	Ind	Ind
Cambria	**C395**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C396**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C397**	Ind	Bevext	NA	Yes	Incised	Toolimp	None	None	None	None
Cambria	**C398**	Angunmod	Round	NA	No	None	None	None	None	None	None
Cambria	**C399**	Curvunmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C400**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C401**	Angunmod	Bevext	NA	No	None	None	None	None	Ind	Ind
Cambria	**C402**	Curvmod	Bevext	NA	No	None	Toolimp	Toolimp	None	A2	A
Cambria	**C403**	Angmod	Flat	NA	Yes	None	Toolimp	None	None	None	None

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Cambria	**C404**	Angunmod	Bevext	NA	No	Twistcordimp	Toolimp	None	None	Ind	Ind
Cambria	**C405**	Angmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C406**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C407**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C408**	St	Round	NA	No	None	None	None	None	None	None
Cambria	**C409**	Curvunmod	NA	NA	No	None	NA	None	NA	Ind	Ind
Cambria	**C410**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C411**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C412**	Curvunmod	Flat	NA	Yes	None	None	None	None	L1	L
Cambria	**C413**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C414**	Curvunmod	Bevext	NA	Yes	Crosshatch	None	None	None	L1	L
Cambria	**C415**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None
Cambria	**C416**	Angunmod	Flat	NA	No	None	None	Toolimp	Incised	L1	L
Cambria	**C417**	Curvunmod	Flat	NA	Yes	None	Toolimp	None	None	None	None
Cambria	**C418**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C419**	Angmod	Bevext	NA	Yes	Incised	Toolimp	None	None	Ind	Ind
Cambria	**C420**	Srim	Flat	NA	No	None	None	None	Twistcordimp	None	None
Cambria	**C421**	Srim	Round	NA	Yes	None	None	None	Twistcordimp	None	None
Cambria	**C422**	Curvmod	Flat	NA	Yes	None	Toolimp	Toolimp	Incised	L1	L
Cambria	**C423**	Angunmod	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C424**	Curvunmod	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C425**	Angunmod	Bevext	NA	No	None	Toolimp	Toolimp	Incised	L1	L
Cambria	**C426**	Angunmod	Pinched	NA	No	None	Toolimp	None	None	Ind	Ind
Cambria	**C427**	Curvunmod	Bevext	NA	No	Incised	None	None	None	None	None
Cambria	**C428**	Angmod	Bevext	NA	No	Crosshatch	None	None	None	None	None
Cambria	**C429**	Angunmod	Bevext	NA	No	Crosshatch	None	None	None	L1	L
Cambria	**C430**	Angunmod	Flat	NA	Yes	Crosshatch	None	None	None	None	None
Cambria	**C431**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C432**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C433**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C434**	Angmod	Flat	NA	Yes	None	Toolimp	Toolimp	None	L1	L
Cambria	**C435**	Curvunmod	Flat	NA	No	None	None	Toolimp	Incised	L1	L
Cambria	**C436**	Curvunmod	Flat	NA	No	Crosshatch	None	Incised	None	None	None
Cambria	**C437**	Angunmod	Flat	NA	Yes	Crosshatch	Toolimp	None	None	L1	L
Cambria	**C438**	Angtap	Bevext	NA	Yes	Crosshatch	None	None	None	None	None
Cambria	**C440**	Angmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C441**	Angunmod	Flat	NA	Yes	Incised	Toolimp	None	None	L1	L
Cambria	**C442**	Curvunmod	Flat	NA	Yes	None	None	None	None	None	None
Cambria	**C443**	Angunmod	Flat	NA	Yes	None	Toolimp	None	None	None	None
Cambria	**C444**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C445**	Ind	Flat	NA	Yes	None	None	None	None	Ind	Ind
Cambria	**C446**	Angunmod	Bevext	NA	No	None	None	None	None	Ind	Ind
Cambria	**C447**	Angunmod	Flat	NA	No	None	None	Toolimp	None	None	None
Cambria	**C448**	Rolled	Round	NA	No	None	None	None	None	None	None
Cambria	**C449**	Angunmod	Flat	NA	Yes	None	Toolimp	None	Incised	None	None
Cambria	**C450**	Angmod	Flat	NA	No	None	Toolimp	Toolimp	Incised	None	None
Cambria	**C451**	Curvunmod	Flat	NA	Yes	None	None	None	None	None	None

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Cambria	**C452**	Angunmod	Flat	NA	No	None	None	None	None	Ind	Ind
Cambria	**C453**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C454**	Curvunmod	Flat	NA	Yes	Incised	Toolimp	None	None	None	None
Cambria	**C455**	Angunmod	Bevext	NA	No	None	None	None	None	Ind	Ind
Cambria	**C456**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C457**	Angunmod	Flat	NA	Yes	Crosshatch	None	None	None	L1	L
Cambria	**C458**	Angunmod	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C459**	Angunmod	Flat	NA	Yes	None	Toolimp	Toolimp	None	Q5	Q
Cambria	**C460**	Curvunmod	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C461**	St	Flat	NA	No	None	None	None	None	None	None
Cambria	**C462**	Rolled	Round	NA	Yes	None	None	None	None	None	None
Cambria	**C463**	St	Flat	NA	No	None	None	None	None	None	None
Cambria	**C464**	St	Round	NA	Yes	None	None	None	None	Q6	Q
Price	**P01**	Curvtap	Flat	NA	No	None	Toolimp	Toolimp	Incised	None	None
Price	**P02**	Angunmod	Flat	NA	Yes	Incised	None	None	Incised	Ind	Ind
Price	**P03**	Curvtap	Flat	NA	No	None	Toolimp	Toolimp	Incised	None	None
Price	**P04**	Curvunmod	Flat	NA	Yes	None	None	None	None	L1	L
Price	**P05**	Angunmod	Flat	NA	Yes	None	Toolimp	Toolimp	None	Q2, Q6	Q
Price	**P06**	Rolled	Round	NA	Yes	None	None	None	None	D1	D
Price	**P07**	Rolled	Round	NA	No	None	None	None	None	J2	J
Price	**P08**	Everted	Round	NA	Yes	None	None	None	None	Ind	Ind
Price	**P09**	Srim	Flat	NA	No	None	Twistcordimp	None	None	None	None
Price	**P10**	Angunmod	Bevext	Angled	Yes	None	None	None	None	None	None
Price	**P11**	Angmod	Flat	Rounded	Yes	Incised	None	None	None	None	None
Price	**P12**	Angunmod	Bevext	NA	No	None	None	None	None	L1	L
Price	**P13**	Angunmod	Flat	NA	No	None	None	None	None	A2, L1	A, L
Price	**P14**	Angunmod	Flat	NA	No	None	None	None	None	A2, L1	A, L
Price	**P15**	Angunmod	Flat	NA	No	None	None	None	None	Ind	Ind
Price	**P16**	Angunmod	Bevext	NA	Yes	Crosshatch	Toolimp	None	None	L1	L
Price	**P17**	Angtap	Bevext	NA	No	None	Toolimp	None	None	L1	L
Price	**P18**	Angunmod	Bevext	NA	No	None	Toolimp	None	None	Ind	Ind
Price	**P19**	Angunmod	Flat	NA	No	Incised	Toolimp	None	None	None	None
Price	**P20**	Angunmod	Bevext	NA	No	Crosshatch	Toolimp	None	None	Ind	Ind
Price	**P21**	Angunmod	Flat	NA	No	None	Toolimp	None	None	Ind	Ind
Price	**P22**	Curvunmod	Flat	NA	Yes	None	Toolimp	None	None	Ind	Ind
Price	**P23**	Curvunmod	Bevext	NA	No	None	None	None	None	None	None
Price	**P24**	Angmod	Bevext	NA	No	None	None	None	None	Ind	Ind
Price	**P25**	Angunmod	Round	NA	No	None	None	None	None	None	None
Price	**P26**	Angunmod	Round	NA	No	None	None	None	None	Ind	Ind
Price	**P27**	Rolled	Round	Angled	No	None	None	None	None	None	None
Price	**P28**	Everted	Round	Angled	No	None	None	None	None	Q1	Q
Price	**P29**	Rolled	Round	Angled	Yes	None	None	None	None	F6	F
Price	**P30**	Curvmod	Round	NA	Yes	None	Toolimp; Twistcordimp	None	None	None	None
Price	**P32**	Angmod	Flat	NA	Yes	None	None	None	None	L1	L
Price	**P33**	Angunmod	Bevext	NA	Yes	None	Toolimp	Toolimp	None	None	None
Price	**P34**	Srim	Bevext	NA	No	None	None	None	None	None	None

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Price	**P35**	Angunmod	Bevint	NA	Yes	None	None	None	None	None	None
Price	**P36**	Rolled	Round	Angled	No	None	None	None	None	A2, J2	A, J
Price	**P37**	Rolled	Round	NA	Yes	None	None	None	None	H1	H
Price	**P38**	Angunmod	Flat	NA	Yes	None	Toolimp	None	None	None	None
Price	**P39**	Curvunmod	Flat	NA	No	None	Toolimp	None	None	Ind	Ind
Price	**P40**	Angmod	Flat	NA	Yes	None	Toolimp	None	None	Q2, Q6	Q
Price	**P41**	Angtap	Bevext	NA	Yes	None	None	None	None	L1	L
Price	**P42**	Angunmod	Flat	NA	No	None	Toolimp	None	None	H2, Q2	H, Q
Price	**P43**	Angunmod	Flat	NA	Yes	None	None	None	None	A1, L1	A, L
Price	**P44**	Angunmod	Bevext	NA	Yes	Crosshatch	Toolimp	None	None	None	None
Price	**P45**	Angmod	Flat	NA	Yes	None	None	None	None	None	None
Price	**P46**	Angunmod	Flat	NA	No	Incised	Toolimp	None	None	L1	L
Price	**P47**	Angtap	Flat	NA	Yes	None	Toolimp	Toolimp	Incised	None	None
Price	**P48**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Price	**P49**	Rolled	Round	NA	Yes	None	None	None	None	D1	D
Price	**P50**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Price	**P51**	Angunmod	Round	NA	No	None	None	Toolimp	None	L1	L
Price	**P53**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Price	**P55**	Rolled	Round	NA	Yes	None	None	None	None	D1	D
Price	**P56**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Price	**P57**	Angtap	Flat	NA	Yes	None	None	None	None	C1	C
Price	**P59**	Angunmod	Bevext	NA	Yes	None	None	None	None	L1	L
Price	**P60**	Angunmod	Round	NA	No	None	Knottedcord	None	None	None	None
Price	**P61**	Angunmod	Flat	NA	No	None	None	None	None	None	None
Price	**P62**	Angunmod	Flat	NA	No	Incised	Toolimp	None	None	None	None
Price	**P63**	Angunmod	Flat	NA	No	Incised	Toolimp	None	None	None	None
Price	**P69**	Curvmod	Round	NA	Yes	None	None	None	None	None	None
Price	**P71**	Curvunmod	Flat	NA	Yes	None	Toolimp	Toolimp	None	None	None
Price	**P73**	Curvunmod	Flat	NA	Yes	None	Toolimp	Toolimp	None	None	None
Price	**P74**	Curvunmod	Bevext	NA	Yes	Incised	None	None	None	None	None
Price	**P75**	Curvunmod	Round	NA	Yes	None	None	None	None	Ind	Ind
Price	**P76**	Angunmod	Pinched	NA	No	None	None	None	None	None	None
Price	**P78**	Angmod	Bevext	Rounded	Yes	None	None	None	None	None	None
Price	**P79**	Angunmod	Bevext	Rounded	Yes	None	None	None	None	B4	B
Price	**P80**	Angmod	Bevext	Rounded	Yes	None	Toolimp	None	None	O2	O
Price	**P81**	Rolled	Round	Angled	Yes	None	None	None	None	F5, F6	F
Price	**P82**	Rolled	Round	Angled	Yes	None	None	None	None	F5, F6	F
Price	**P83**	Angunmod	Round	Angled	Yes	None	None	None	None	H2, Q1, Q2, Q6	H, Q
Price	**P84**	Angunmod	Bevext	Pronounced	Yes	Punctate	None	None	None	A2, L1	A, L
Price	**P85**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Price	**P86**	Angunmod	Bevext	NA	Yes	None	None	None	None	Ind	Ind
Price	**P87**	Curvmod	Flat	NA	No	Incised	None	None	None	None	None
Price	**P88**	Rolled	Round	NA	No	None	None	None	None	None	None
Price	**P89**	Rolled	Round	NA	Yes	None	None	None	None	Ind	Ind
Price	**P90**	Curvunmod	Round	NA	No	None	None	None	None	None	None
Price	**P91**	Curvunmod	Bevext	NA	Yes	Crosshatch	Toolimp	None	None	None	None
Price	**P92**	Curvmod	Bevext	NA	No	None	Toolimp	None	None	None	None

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Price	**P93**	Angunmod	Flat	NA	Yes	None	None	None	None	None	None
Price	**P94**	Angunmod	Bevext	NA	No	None	None	None	None	None	None
Price	**P95**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None
Price	**P96**	Curvunmod	Bevext	NA	No	None	None	None	None	None	None
Price	**P97**	Curvunmod	Flat	NA	Yes	None	None	None	None	None	None
Price	**P98**	Angunmod	Flat	NA	No	Incised	Toolimp	None	None	None	None
Price	**P99**	Angunmod	Bevext	NA	No	Incised	Toolimp	None	None	None	None
Price	**P100**	Angunmod	Flat	NA	Yes	None	None	None	None	None	None
Price	**P101**	Curvunmod	Bevext	NA	Yes	None	None	None	None	None	None
Price	**P102**	Angunmod	Round	NA	No	None	None	None	None	None	None
Price	**P103**	Angunmod	Bevext	NA	No	None	None	None	None	None	None
Price	**P104**	Curvunmod	Flat	NA	No	None	Toolimp	None	None	None	None
Price	**P105**	Srim	Flat	NA	No	Crosshatch	None	None	None	Ind	Ind
Price	**P106**	Angunmod	Flat	NA	Yes	None	None	None	None	None	None
Price	**P107**	Angunmod	Flat	NA	No	None	Toolimp	None	None	None	None
Price	**P108**	Angtap	Flat	NA	No	None	Toolimp	Toolimp	None	None	None
Price	**P109**	Rolled	Round	Rounded	Yes	None	None	None	None	None	None
Price	**P110**	Everted	Round	NA	No	None	None	None	None	None	None
Price	**P111**	Rolled	Round	NA	No	None	None	None	None	Ind	Ind
Price	**P113**	Angunmod	Flat	NA	Yes	None	Toolimp	None	None	Ind	Ind
Price	**P114**	Angunmod	Bevext	NA	No	Incised	Toolimp	None	None	None	None
Price	**P115**	Curvunmod	Round	NA	Yes	None	None	None	None	None	None
Price	**P116**	Angunmod	Bevext	NA	No	Crosshatch	Toolimp	None	None	None	None
Price	**P117**	Angunmod	Bevext	NA	Yes	None	None	None	None	None	None
Jones	**J100**	Angunmod	Bevext	NA	No	Crosshatch	None	None	None	Ind	Ind
Jones	**J101**	Angunmod	Bevext	NA	No	None	Crosshatch	Crosshatch	None	None	None
Jones	**J102**	Curvunmod	Flat	NA	No	None	None	Toolimp	None	None	None
Jones	**J104**	Angunmod	Flat	NA	No	None	None	None	None	None	None
Jones	**J107**	Angunmod	Flat	NA	No	None	Toolimp	None	None	None	None
Jones	**J110**	Angunmod	Round	Rounded	No	None	Toolimp	Toolimp	None	None	None
Jones	**J28**	Angunmod	Flat	NA	Yes	Crosshatch	Toolimp	None	None	None	None
Jones	**J29**	Angunmod	Round	NA	Yes	None	Toolimp	None	None	None	None
Jones	**J31**	Angunmod	Flat	NA	No	Crosshatch	Toolimp	None	None	None	None
Jones	**J32**	Curvtap	Flat	NA	No	None	Toolimp	Toolimp	Incised	H2, Q1	H, Q
Jones	**J33**	Curvtap	Flat	NA	No	None	Toolimp	Toolimp	Incised	None	None
Jones	**J34**	Angmod	Bevext	Rounded	No	Incised	None	None	None	M1	M
Jones	**J35**	Angunmod	Bevext	NA	No	None	None	None	None	A2	A
Jones	**J36**	Angunmod	Flat	NA	No	None	None	None	None	A2	A
Jones	**J38**	Curvunmod	Flat	NA	No	None	Toolimp	None	None	None	None
Jones	**J39**	Angunmod	Flat	Angled	No	None	None	None	None	None	None
Jones	**J42**	Curvunmod	Flat	NA	No	None	Toolimp	None	None	Ind	Ind
Jones	**J44**	Curvunmod	Flat	NA	No	None	Toolimp	None	None	Ind	Ind
Jones	**J45**	Angmod	Bevext	NA	Yes	None	None	None	None	None	None
Jones	**J46**	Angunmod	Flat	NA	No	Crosshatch	Toolimp	None	None	Q6	Q
Jones	**J55**	Srim	Bevext	NA	No	Incised	Toolimp	None	None	L1	L
Jones	**J56**	Angtap	Flat	NA	No	None	Toolimp	Toolimp	Incised	Q2	Q
Jones	**J57**	Angunmod	Bevext	NA	Yes	None	None	None	None	L1	L

Site	Vessel No.	Modal Type	Lip Form	Shoulder	Polished	Lip Dec	Ext Rim Dec	Int Rim Dec	Ext Neck Dec	Motif Type	Motif Category
Jones	**J58**	Curvmod	Bevext	NA	Yes	None	Toolimp	None	None	None	None
Jones	**J59**	Curvunmod	Flat	NA	No	None	Toolimp	None	None	None	None
Jones	**J60**	Angunmod	Flat	NA	No	None	Toolimp	Toolimp	None	H2	H
Jones	**J61**	Everted	Round	NA	Yes	None	None	None	None	None	None
Jones	**J62**	Angtap	Bevext	NA	No	None	Toolimp	Toolimp	None	Ind	Ind
Jones	**J63**	Rolled	Round	NA	No	None	None	None	None	None	None

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Cambria	**C01**	Absent	15	20.9	8.3	3	NA	NA	7.2	0.36	Yes
Cambria	**C02**	Strong	10	7.6	8.3	3.8	3.3	1.1	13.2	0.46	Yes
Cambria	**C03**	Strong	27	30.7	9.5	6.6	7	1.5	8.8	0.69	Yes
Cambria	**C04**	Strong	22	39.9	8.9	5.7	1.7	0.8	5.5	0.64	Yes
Cambria	**C05**	Weak	14	11.7	4.6	5.9	4	0.8	12.0	1.28	No
Cambria	**C07**	Strong	32	32.8	8.7	6	6.1	1	9.8	0.69	No
Cambria	**C08**	Absent	28	38.3	10.8	NA	NA	NA	7.3	NA	No
Cambria	**C09**	Absent	NA	21.5	6.4	6.1	3.7	1	NA	0.95	No
Cambria	**C11**	Absent	8	7	7.5	5.7	NA	NA	11.4	0.76	No
Cambria	**C12**	Absent	7	10.5	4.8	9	1	0.5	6.7	1.88	No
Cambria	**C13**	Absent	NA	28.2	9.7	7.1	NA	NA	NA	0.73	Yes
Cambria	**C14**	Absent	16	20.8	8.5	4.6	1.8	0.4	7.7	0.54	Yes
Cambria	**C15**	Absent	12	15.5	5.1	4.8	NA	NA	7.7	0.94	No
Cambria	**C17**	Weak	16	23	8.1	4	3.1	0.7	7.0	0.49	No
Cambria	**C18**	Strong	22	30.5	7.8	6.5	3.9	1.2	7.2	0.83	Yes
Cambria	**C19**	Absent	20	24.4	7.7	4.9	NA	NA	8.2	0.64	Yes
Cambria	**C20**	Absent	20	10.7	6.2	5.3	NA	NA	18.7	0.85	Yes
Cambria	**C22**	Weak	NA	31.2	7.3	8	4.1	1.1	NA	1.10	Yes
Cambria	**C23**	Absent	20	19.3	6.2	6.4	3	1	10.4	1.03	No
Cambria	**C24**	Absent	18	28.5	6.1	7.5	1.5	0.8	6.3	1.23	No
Cambria	**C25**	Absent	18	15.9	5	5.8	3.2	1.2	11.3	1.16	No
Cambria	**C26**	Absent	18	32.5	6.8	7.9	4.4	1.1	5.5	1.16	Yes
Cambria	**C27**	Absent	16	25.4	5.6	7.4	3.3	0.9	6.3	1.32	Yes
Cambria	**C28**	Weak	16	14.1	6.7	8	6.1	1.1	11.3	1.19	Yes
Cambria	**C29**	Absent	NA	14.6	4.9	6.1	3.8	0.7	NA	1.24	Yes
Cambria	**C30**	Weak	16	10.2	11.1	6.1	5.5	1.2	15.7	0.55	Yes
Cambria	**C31**	Absent	18	31.2	9.3	5.5	4.6	0.4	5.8	0.59	No
Cambria	**C32**	Absent	17	25	8.5	6.7	1.9	0.3	6.8	0.79	Yes
Cambria	**C33**	Absent	10	15.1	7.1	5.1	NA	NA	6.6	0.72	No
Cambria	**C34**	Absent	NA	26.9	5.8	4.7	NA	NA	NA	0.81	Yes
Cambria	**C35**	Absent	20	36.1	7.7	6.6	NA	NA	5.5	0.86	No
Cambria	**C37**	Absent	16	17.7	5.6	7	2.8	0.7	9.0	1.25	No
Cambria	**C38**	Absent	12	17.5	5.3	4.7	NA	NA	6.9	0.89	Yes
Cambria	**C40**	Absent	16	18.6	6.9	5.6	NA	NA	8.6	0.81	No
Cambria	**C41**	Absent	12	17.7	6.8	4.5	0.9	0.5	6.8	0.66	No
Cambria	**C42**	Absent	18	20.2	7.1	9.9	5.4	1	8.9	1.39	No
Cambria	**C43**	Absent	NA	23.5	7.7	5	1	0.9	NA	0.65	No
Cambria	**C44**	Absent	14	19.5	6.1	5.5	2.9	1	7.2	0.90	No
Cambria	**C45**	Absent	14	33	7.5	8	1.2	0.8	4.2	1.07	No
Cambria	**C46**	Absent	22	32.4	8.9	5.4	NA	NA	6.8	0.61	Yes
Cambria	**C47**	Absent	NA	31	7.4	NA	0.7	1	NA	NA	No
Cambria	**C48**	Absent	22	31.2	6.6	7.7	NA	NA	7.1	1.17	Yes
Cambria	**C49**	Absent	NA	36.7	5.4	5.3	5.3	1.2	NA	0.98	No
Cambria	**C50**	Absent	14	5.7	8.6	5.6	NA	NA	24.6	0.65	Yes
Cambria	**C51**	Absent	9	6.8	5.4	4.9	2.4	1	13.2	0.91	No
Cambria	**C52**	Absent	7	11	4.4	4.9	NA	NA	6.4	1.11	No
Cambria	**C53**	Absent	11	8.5	4.5	8.3	0.8	0.7	12.9	1.84	No

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Cambria	**C54**	Absent	NA	9.2	9.6	4.6	3.2	0.8	NA	0.48	No
Cambria	**C55**	Absent	NA	17.3	4.8	NA	NA	NA	NA	NA	No
Cambria	**C56**	Absent	6	7	6.7	5	2.3	0.5	8.6	0.75	No
Cambria	**C57**	Absent	8	11.9	8	4.8	2.8	0.4	6.7	0.60	No
Cambria	**C58**	Absent	8	8	7.4	4.7	NA	NA	10.0	0.64	No
Cambria	**C59**	Absent	9	5.2	5.6	2.7	NA	NA	17.3	0.48	No
Cambria	**C60**	Strong	11	15.2	5.3	4.1	2.3	0.9	7.2	0.77	Yes
Cambria	**C61**	Weak	12	12	5.8	4.7	1.7	0.8	10.0	0.81	Yes
Cambria	**C62**	Absent	14	17.5	8.8	7.5	1.8	0.8	8.0	0.85	Yes
Cambria	**C63**	Absent	14	22.2	6.9	6.7	NA	NA	6.3	0.97	No
Cambria	**C64**	Strong	20	8.3	6.5	4.9	3.1	1.1	24.1	0.75	Yes
Cambria	**C65**	Absent	10	15.1	5.1	4.6	NA	NA	6.6	0.90	No
Cambria	**C67**	Absent	16	25.6	6.3	8.6	4.3	0.6	6.3	1.37	Yes
Cambria	**C68**	Absent	18	34.3	7.2	NA	NA	NA	5.2	NA	No
Cambria	**C69**	Absent	12	22.2	8.1	11.1	2.9	0.7	5.4	1.37	No
Cambria	**C70**	Absent	25	23.5	8.2	7.9	NA	NA	10.6	0.96	Yes
Cambria	**C71**	Absent	12	6.9	9.4	7.2	0.9	0.3	17.4	0.77	No
Cambria	**C72**	Strong	15	13.2	10	4	6	0.8	11.4	0.40	Yes
Cambria	**C73**	Weak	26	32.8	8	5.8	5.6	1.2	7.9	0.73	Yes
Cambria	**C74**	Absent	13	12.8	5.5	3.8	NA	NA	10.2	0.69	No
Cambria	**C75**	Absent	9	21.3	5.5	6.8	2.3	0.4	4.2	1.24	No
Cambria	**C76**	Absent	NA	44.4	7.4	7.1	NA	NA	NA	0.96	No
Cambria	**C77**	Absent	28	39.3	9	9.9	7.3	0.5	7.1	1.10	Yes
Cambria	**C78**	Strong	22	16	13.2	6.8	5.5	1.4	13.8	0.52	Yes
Cambria	**C80**	Absent	NA	36.6	4.6	NA	NA	NA	NA	NA	Yes
Cambria	**C81**	Absent	10	51.3	6.4	NA	NA	NA	1.9	NA	Yes
Cambria	**C82**	Absent	24	13	13.4	5.2	4.6	0.6	18.5	0.39	No
Cambria	**C83**	Strong	18	8.6	9.1	3.6	6.1	1.4	20.9	0.40	Yes
Cambria	**C84**	Absent	16	22.6	5.7	6.4	NA	NA	7.1	1.12	Yes
Cambria	**C85**	Absent	10	8.1	8.5	5.3	NA	NA	12.3	0.62	No
Cambria	**C86**	Absent	10	24.6	3.8	NA	NA	NA	4.1	NA	Yes
Cambria	**C87**	Absent	6	7.8	6	2.7	NA	NA	7.7	0.45	No
Cambria	**C88**	Weak	10	6.4	5.6	4	2.8	0.9	15.6	0.71	No
Cambria	**C89**	Absent	14	20.9	4.8	NA	NA	NA	6.7	NA	Yes
Cambria	**C90**	Absent	16	24.1	7.3	6.4	1.1	1.1	6.6	0.88	Yes
Cambria	**C91**	Absent	16	32.2	6.1	6	3.9	0.8	5.0	0.98	Yes
Cambria	**C92**	Weak	6	5.9	5.4	3.1	3.1	1.3	10.2	0.57	No
Cambria	**C93**	Absent	14	18.2	5.1	6.9	NA	NA	7.7	1.35	Yes
Cambria	**C94**	Strong	16	10.5	8	5.7	5.1	2.8	15.2	0.71	Yes
Cambria	**C95**	Absent	16	21.9	5.6	4.5	2.1	1	7.3	0.80	No
Cambria	**C96**	Absent	14	19.3	6.7	4.8	4.4	1.2	7.3	0.72	No
Cambria	**C97**	Absent	20	37.8	7.8	9.5	0.7	1	5.3	1.22	Yes
Cambria	**C98**	Weak	18	23.4	5.2	4.1	3.4	1	7.7	0.79	Yes
Cambria	**C99**	Absent	23	36.9	8.2	8.6	3.4	0.6	6.2	1.05	No
Cambria	**C100**	Absent	12	24.4	5.1	NA	NA	NA	4.9	NA	No
Cambria	**C101**	Absent	18	32.1	7	NA	NA	NA	5.6	NA	No
Cambria	**C102**	Absent	10	7.8	8	4.3	NA	NA	12.8	0.54	No

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Cambria	**C103**	Weak	12	6.2	6.4	3.5	3.7	1.5	19.4	0.55	No
Cambria	**C104**	Absent	26	41.7	5.1	6.2	1.5	0.8	6.2	1.22	Yes
Cambria	**C107**	Absent	16	43.9	7.4	5.6	NA	NA	3.6	0.76	Yes
Cambria	**C110**	Strong	13	10.1	8.6	5.4	4.9	1.5	12.9	0.63	Yes
Cambria	**C111**	Strong	32	12.8	13	5.2	3.4	1.9	25.0	0.40	Yes
Cambria	**C112**	Absent	24	34.1	7.6	5	1.1	0.8	7.0	0.66	Yes
Cambria	**C113**	Weak	14	16.8	7	7.3	5.4	1.1	8.3	1.04	Yes
Cambria	**C115**	Absent	16	10.8	11.6	5.3	NA	NA	14.8	0.46	No
Cambria	**C116**	Absent	18	10.5	10.8	6.5	3.6	1.9	17.1	0.60	Yes
Cambria	**C117**	Weak	8	16.7	5	7.1	3.4; 0.8	1.5; 1.1	4.8	1.42	Yes
Cambria	**C118**	Absent	12	9.7	11.2	5.1	NA	NA	12.4	0.46	No
Cambria	**C120**	NA	26	13.5	12.3	5	NA	NA	19.3	0.41	No
Cambria	**C121**	Absent	19	11.3	11.8	4.9	NA	NA	16.8	0.42	No
Cambria	**C122**	Absent	12	13.6	10.5	6.1	NA	NA	8.8	0.58	No
Cambria	**C123**	Strong	12	9	8.8	5.3	4	1.5	13.3	0.60	Yes
Cambria	**C124**	Absent	22	9.6	11.9	6.3	4.3	1	22.9	0.53	No
Cambria	**C126**	Strong	18	14	12.4	6.5	4.4	0.8	12.9	0.52	No
Cambria	**C127**	Absent	18	21.8	4	NA	NA	NA	8.3	NA	Yes
Cambria	**C128**	Absent	14	30	4.6	3	NA	NA	4.7	0.65	No
Cambria	**C129**	Absent	14	24.8	3.4	5.8	NA	NA	5.6	1.71	Yes
Cambria	**C130**	Absent	18	35.2	7.4	NA	NA	NA	5.1	NA	Yes
Cambria	**C131**	Absent	18	31.4	5	3.2	NA	NA	5.7	0.64	No
Cambria	**C132**	Absent	22	21.5	4.4	NA	NA	NA	10.2	NA	No
Cambria	**C133**	Absent	NA	37.5	6	6.4	NA	NA	NA	1.07	Yes
Cambria	**C134**	Absent	20	13.2	9.2	4.4	NA	NA	15.2	0.48	No
Cambria	**C135**	Absent	22	16.2	11	7.3	3.7	0.7	13.6	0.66	No
Cambria	**C136**	Weak	20	12.8	9.8	5.6	4.7	0.8	15.6	0.57	No
Cambria	**C137**	Absent	18	14.8	13.8	6.5	4.7	1.3	12.2	0.47	No
Cambria	**C138**	Absent	18	10.3	7.6	5.5	4.4	1	17.5	0.72	No
Cambria	**C139**	Absent	6	9.6	8.4	5.2	2	0.4	6.3	0.62	No
Cambria	**C140**	Absent	18	9.5	8.3	5.4	3.4	1.2	18.9	0.65	No
Cambria	**C141**	Absent	9	10.3	9.6	5.9	3.4	0.9	8.7	0.61	No
Cambria	**C142**	Absent	18	11	8.6	6.1	1.9	0.2	16.4	0.71	No
Cambria	**C143**	Weak	10	8.7	8.8	5.4	4	1.4	11.5	0.61	No
Cambria	**C144**	Absent	12	11.6	10	5.4	4.5	1.5	10.3	0.54	No
Cambria	**C145**	Absent	NA	47.9	6.6	NA	NA	NA	NA	NA	No
Cambria	**C146**	Absent	27	31.9	8.7	NA	1.3	0.6	8.5	NA	No
Cambria	**C147**	Absent	30	22.3	5.8	NA	NA	NA	13.5	NA	No
Cambria	**C148**	Absent	10	26	4.7	NA	NA	NA	3.8	NA	No
Cambria	**C149**	Absent	18	38.2	7	9.2	1.8	1.2	4.7	1.31	Yes
Cambria	**C152**	Absent	20	27	4.7	4.9	NA	NA	7.4	1.04	Yes
Cambria	**C153**	Absent	18	39.4	7.9	6.6	1.7	0.9	4.6	0.84	Yes
Cambria	**C155**	Strong	20	11.2	11.2	6	4.9	1.1	17.9	0.54	Yes
Cambria	**C156**	Absent	8	8.7	3.8	5.6	2	0.8	9.2	1.47	No
Cambria	**C157**	Strong	12	7.3	8	4.5	3.6	1.9	16.4	0.56	Yes
Cambria	**C158**	Absent	10	12.7	3.8	4.1	1.1	0.4	7.9	1.08	No
Cambria	**C159**	Strong	10	8.2	8.8	4.5	4.4	1.7	12.2	0.51	Yes

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Cambria	**C160**	Absent	28	44.6	6.7	7.6	NA	NA	6.3	1.13	Yes
Cambria	**C161**	Strong	20	34	6.5	6.3	4.8	2.3	5.9	0.97	Yes
Cambria	**C162**	Strong	17	25.1	4.1	6.2	4.9	1.6	6.8	1.51	Yes
Cambria	**C163**	Absent	18	23.9	6.8	6.6	1.2	0.9	7.5	0.97	Yes
Cambria	**C164**	Absent	14	25.7	8.5	6.4	2.7	0.5	5.4	0.75	No
Cambria	**C165**	Absent	11	13.1	5.5	3	0.9	0.5	8.4	0.55	No
Cambria	**C166**	Absent	42	27.3	7.7	3.5	NA	NA	15.4	0.45	No
Cambria	**C167**	Absent	10	15.7	3.7	4.4	NA	NA	6.4	1.19	Yes
Cambria	**C168**	Absent	30	44.5	9.4	7.9	1.3	0.5	6.7	0.84	No
Cambria	**C169**	Absent	16	31.3	6.1	7.4	1	0.6	5.1	1.21	No
Cambria	**C170**	Absent	16	17	6.6	8.1	3.2	0.6	9.4	1.23	Yes
Cambria	**C171**	Weak	22	23.4	6.9	6.3	3.2	0.8	9.4	0.91	Yes
Cambria	**C172**	Absent	20	23.1	6.9	5.6	NA	NA	8.7	0.81	Yes
Cambria	**C173**	Absent	30	39.2	6	NA	1.4	0.7	7.7	NA	Yes
Cambria	**C174**	Absent	18	37.8	6.3	NA	NA	NA	4.8	NA	No
Cambria	**C175**	Absent	23	28.6	10	4.8	NA	NA	8.0	0.48	Yes
Cambria	**C176**	Absent	10	16.8	5.5	4	NA	NA	6.0	0.73	No
Cambria	**C177**	Absent	26	42.5	9	7.1	1	0.8	6.1	0.79	No
Cambria	**C178**	Absent	14	26.3	6.4	NA	NA	NA	5.3	NA	No
Cambria	**C179**	Absent	14	29.2	4.7	5.6	4.1	1.1	4.8	1.19	No
Cambria	**C180**	Absent	20	26.3	5.2	5.4	2.2	1.3	7.6	1.04	No
Cambria	**C181**	Absent	20	31.8	4.9	6.2	1.9	0.9	6.3	1.27	Yes
Cambria	**C182**	Weak	NA	10	7.9	4.6	3.8	1	NA	0.58	Yes
Cambria	**C183**	Strong	12	8.1	6.5	4.1	5.3	2	14.8	0.63	Yes
Cambria	**C186**	Absent	12	17.5	8.4	6.1	1	0.6	6.9	0.73	Yes
Cambria	**C187**	Absent	18	25.9	9.3	6.7	0.5	0.6	6.9	0.72	No
Cambria	**C188**	Absent	14	29.4	8	10.7	NA	NA	4.8	1.34	Yes
Cambria	**C189**	Absent	10	27	6.4	5.1	1	0.7	3.7	0.80	No
Cambria	**C190**	Strong	12	10.4	7.9	3.4	4.4	1	11.5	0.43	No
Cambria	**C191**	Absent	12	26.8	8.6	8.4	2.2	0.4	4.5	0.98	No
Cambria	**C192**	Absent	12	17.3	6.6	6	NA	NA	6.9	0.91	No
Cambria	**C193**	Weak	13	23.9	6.1	4.6	3.8; 1.1	1.3; 0.8	5.4	0.75	Yes
Cambria	**C194**	Absent	8	13.3	3.8	4	NA	NA	6.0	1.05	Yes
Cambria	**C195**	Strong	18	22.2	6.3	7.3	6.8	1.5	8.1	1.16	Yes
Cambria	**C196**	Absent	22	28.2	6.7	6.1	1.6	0.8	7.8	0.91	No
Cambria	**C197**	Absent	22	30.7	10.2	5.8	NA	NA	7.2	0.57	Yes
Cambria	**C198**	Weak	12	16	5.7	3.5	4.2	1	7.5	0.61	No
Cambria	**C199**	Absent	16	6.5	6.9	3	NA	NA	24.6	0.43	No
Cambria	**C200**	Absent	14	10.1	9.4	4.8	5.1	0.6	13.9	0.51	No
Cambria	**C201**	Absent	5	7.6	3.6	3.6	0.5	0.6	6.6	1.00	No
Cambria	**C202**	Absent	16	21.2	7.2	10.2	5	1	7.5	1.42	Yes
Cambria	**C203**	Absent	14	9.1	3.2	4.5	NA	NA	15.4	1.41	No
Cambria	**C204**	Absent	18	17.4	7.3	7.5	1.5	0.7	10.3	1.03	No
Cambria	**C205**	Absent	NA	14.8	2.8	4.3	0.6	0.5	NA	1.54	No
Cambria	**C206**	Absent	18	19.4	7.8	5.5	NA	NA	9.3	0.71	No
Cambria	**C207**	Absent	18	6.2	6.7	5	3.4	1.4	29.0	0.75	No
Cambria	**C208**	Absent	12	13.3	4.7	3.3	NA	NA	9.0	0.70	No

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Cambria	**C209**	Absent	5	7.6	3.9	5.8	0.8	0.5	6.6	1.49	No
Cambria	**C211**	Absent	24	24.9	7.6	4.6	5.8	0.9	9.6	0.61	No
Cambria	**C212**	Absent	16	20.3	7	6.5	NA	NA	7.9	0.93	No
Cambria	**C213**	Weak	14	25.1	6.6	5.7	3.9	0.5	5.6	0.86	Yes
Cambria	**C214**	Absent	14	27.3	5.7	NA	NA	NA	5.1	NA	No
Cambria	**C215**	Absent	20	22.1	6.3	4	4	0.6	9.0	0.63	No
Cambria	**C216**	Absent	12	22.2	6.2	4.9	0.4	0.4	5.4	0.79	No
Cambria	**C217**	Weak	12	10.7	10.5	5.8	3.2	1	11.2	0.55	No
Cambria	**C218**	Absent	8	9	4.6	5.8	1.2	0.9	8.9	1.26	Yes
Cambria	**C219**	Absent	22	32.4	8.2	6.9	NA	NA	6.8	0.84	Yes
Cambria	**C220**	Strong	16	10.2	7.9	4.8	3.9	1.5	15.7	0.61	Yes
Cambria	**C221**	Absent	10	17.4	5	6.1	NA	NA	5.7	1.22	Yes
Cambria	**C223**	Weak	22	10.4	9.5	5.8	3.3	0.9	21.2	0.61	Yes
Cambria	**C224**	Absent	18	52	6.7	NA	NA	NA	3.5	NA	Yes
Cambria	**C225**	Absent	25	30.3	9.1	5	NA	NA	8.3	0.55	Yes
Cambria	**C226**	Absent	24	41.4	8.8	9.5	2.1	0.9	5.8	1.08	No
Cambria	**C227**	Strong	20	27.3	8.7	6.1	5.8	1.4	7.3	0.70	No
Cambria	**C228**	Absent	22	37.8	7.4	6.4	1.6	1.3	5.8	0.86	No
Cambria	**C229**	Absent	8	15.4	7.6	6.5	1	0.5	5.2	0.86	No
Cambria	**C230**	Strong	16	12.3	10.8	6.2	5.7	1.4	13.0	0.57	No
Cambria	**C232**	Absent	12	14.1	5.1	5.7	NA	NA	8.5	1.12	No
Cambria	**C233**	Absent	20	21.8	8.5	6.2	NA	NA	9.2	0.73	No
Cambria	**C234**	NA	5	8.6	5.5	4.9	2.7	1.1	5.8	0.89	No
Cambria	**C235**	NA	12	6.2	7.6	3.9	4.7	0.8	19.4	0.51	No
Cambria	**C236**	Absent	14	7.5	6.1	4.7	NA	NA	18.7	0.77	No
Cambria	**C237**	Absent	11	14.5	6.7	4	NA	NA	7.6	0.60	No
Cambria	**C238**	NA	NA	28.5	8.6	6.3	2.4	0.5	NA	0.73	No
Cambria	**C239**	Absent	20	32.5	4.9	NA	NA	NA	6.2	NA	No
Cambria	**C241**	NA	16	24.9	8.6	5.4	1.7	1.1	6.4	0.63	No
Cambria	**C242**	Absent	12	16.1	7.4	6.8	3.2	0.4	7.5	0.92	No
Cambria	**C243**	NA	NA	7.4	5.8	2.3	NA	NA	NA	0.40	No
Cambria	**C244**	Absent	NA	22.5	6.5	NA	NA	NA	NA	NA	No
Cambria	**C245**	NA	12	14.3	7	3.9	1.5	1.1	8.4	0.56	No
Cambria	**C246**	Absent	NA	24.3	8.6	5	NA	NA	NA	0.58	No
Cambria	**C247**	Absent	12	24.3	8.8	8.4	NA	NA	4.9	0.95	No
Cambria	**C248**	NA	18	15.7	10.8	5.7	NA	NA	11.5	0.53	No
Cambria	**C249**	NA	NA	15.2	7.1	7.1	2.3	0.5	NA	1.00	No
Cambria	**C250**	NA	10	10.4	4.7	4.7	1.2	1	9.6	1.00	No
Cambria	**C251**	NA	28	40.2	7.6	5.5	3.2	0.5	7.0	0.72	No
Cambria	**C253**	NA	10	9.7	9.2	6.9	NA	NA	10.3	0.75	No
Cambria	**C254**	NA	8	NA	6	2.4	NA	NA	NA	0.40	No
Cambria	**C255**	NA	12	7.6	6.1	2.9	NA	NA	15.8	0.48	No
Cambria	**C256**	NA	8	13.6	6.3	3.1	NA	NA	5.9	0.49	No
Cambria	**C257**	NA	20	13.5	5.4	4.2	NA	NA	14.8	0.78	No
Cambria	**C258**	NA	10	10.2	5.1	5.7	NA	NA	9.8	1.12	No
Cambria	**C259**	Absent	8	11.9	4.2	5.2	NA	NA	6.7	1.24	No

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Cambria	**C260**	Absent	18	16.6	5.4	4.6	NA	NA	10.8	0.85	No
Cambria	**C261**	Absent	14	21.6	8.6	7.1	1.2	0.4	6.5	0.83	No
Cambria	**C262**	Absent	NA	29.7	7.8	6.3	NA	NA	NA	0.81	No
Cambria	**C263**	Absent	10	15.5	4.7	4.1	NA	NA	6.5	0.87	No
Cambria	**C265**	Absent	8	18.8	5.5	5.6	NA	NA	4.3	1.02	No
Cambria	**C266**	NA	NA	30.7	7.6	NA	NA	NA	NA	NA	No
Cambria	**C267**	NA	14	16.4	5.9	4.9	2.6	0.7	8.5	0.83	No
Cambria	**C268**	NA	12	9.3	5	5.2	NA	NA	12.9	1.04	No
Cambria	**C269**	NA	5	10.2	8	7.3	0.2	0.2	4.9	0.91	No
Cambria	**C270**	NA	6	11.3	4.5	5.7	NA	NA	5.3	1.27	No
Cambria	**C271**	NA	10	12	6.1	5.7	NA	NA	8.3	0.93	No
Cambria	**C272**	NA	16	31.8	7.6	NA	0.9	0.3	5.0	NA	No
Cambria	**C273**	NA	10	21.6	6.1	4.6	NA	NA	4.6	0.75	No
Cambria	**C274**	NA	12	19.6	6.2	NA	2.1	0.4	6.1	NA	No
Cambria	**C275**	NA	18	16.6	7.5	6.6	NA	NA	10.8	0.88	No
Cambria	**C276**	NA	12	9	7.1	5.6	NA	NA	13.3	0.79	No
Cambria	**C277**	NA	6	8	5.6	7.1	2	1.1	7.5	1.27	No
Cambria	**C278**	NA	16	37.8	5.7	3.2	NA	NA	4.2	0.56	No
Cambria	**C279**	NA	16	17.8	6.1	3.6	NA	NA	9.0	0.59	No
Cambria	**C281**	Absent	14	16.7	8	6.6	NA	NA	8.4	0.83	No
Cambria	**C282**	Absent	8	13	6	6.3	NA	NA	6.2	1.05	No
Cambria	**C283**	Absent	NA	22.7	NA	4.5	NA	NA	NA	NA	No
Cambria	**C284**	NA	16	14.4	5.1	NA	NA	NA	11.1	NA	No
Cambria	**C285**	NA	10	22.9	7.5	NA	NA	NA	4.4	NA	No
Cambria	**C286**	NA	20	29.3	6.2	7.4	NA	NA	6.8	1.19	No
Cambria	**C287**	NA	20	30.6	6	NA	NA	NA	6.5	NA	No
Cambria	**C288**	NA	22	34.7	6.7	NA	NA	NA	6.3	NA	No
Cambria	**C289**	NA	NA	37.9	8.5	NA	NA	NA	NA	NA	No
Cambria	**C290**	NA	22	36.3	9.3	NA	NA	NA	6.1	NA	No
Cambria	**C291**	NA	21	34.9	6.7	NA	NA	1.3	6.0	NA	No
Cambria	**C292**	NA	26	36.4	8.2	NA	NA	NA	7.1	NA	No
Cambria	**C293**	NA	20	24.9	6	NA	NA	NA	8.0	NA	No
Cambria	**C294**	Absent	28	36.3	7.4	NA	NA	NA	7.7	NA	No
Cambria	**C295**	NA	11	19.3	7.9	7	0.9	0.6	5.7	0.89	No
Cambria	**C296**	Absent	16	35.4	7.7	NA	1.9	1	4.5	NA	No
Cambria	**C297**	NA	20	29	8.4	NA	NA	NA	6.9	NA	No
Cambria	**C298**	NA	14	17.4	8.6	NA	NA	NA	8.0	NA	No
Cambria	**C299**	NA	18	27.3	6.4	NA	NA	NA	6.6	NA	No
Cambria	**C300**	NA	20	28.5	7	NA	NA	NA	7.0	NA	No
Cambria	**C301**	NA	14	16.5	5.7	NA	NA	NA	8.5	NA	No
Cambria	**C302**	NA	16	18.2	7	NA	NA	NA	8.8	NA	No
Cambria	**C303**	Absent	NA	21.7	8.3	NA	0.5	0.3	NA	NA	No
Cambria	**C304**	NA	NA	34.2	8.6	NA	NA	NA	NA	NA	No
Cambria	**C305**	Absent	16	20.4	7.4	NA	0.7	0.7	7.8	NA	No
Cambria	**C306**	Absent	14	19.1	6.8	NA	1.1	0.7	7.3	NA	No
Cambria	**C307**	NA	18	32.6	8.2	NA	NA	NA	5.5	NA	No
Cambria	**C308**	NA	24	29.7	6.2	5.9	NA	NA	8.1	0.95	No

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Cambria	**C309**	NA	NA	20.3	NA	NA	2.3	1.3	NA	NA	No
Cambria	**C310**	NA	14	20	4.9	NA	NA	NA	7.0	NA	No
Cambria	**C311**	NA	NA	27	7	NA	NA	NA	NA	NA	No
Cambria	**C312**	NA	NA	26.4	6.4	NA	NA	NA	NA	NA	No
Cambria	**C313**	NA	25	24.7	7.3	6.1	NA	NA	10.1	0.84	No
Cambria	**C314**	Absent	NA	31.5	6.9	NA	1.8	0.6	NA	NA	No
Cambria	**C315**	NA	24	33.5	8.6	NA	NA	NA	7.2	NA	No
Cambria	**C316**	NA	20	31	6	NA	NA	NA	6.5	NA	Yes
Cambria	**C317**	NA	14	23.5	5.9	4.3	NA	NA	6.0	0.73	No
Cambria	**C318**	NA	22	23.7	6.6	3.9	NA	NA	9.3	0.59	No
Cambria	**C319**	NA	15	34.7	8.7	NA	NA	NA	4.3	NA	No
Cambria	**C320**	Absent	16	22.1	7	NA	0.8	0.5	7.2	NA	No
Cambria	**C321**	NA	NA	33.1	6.6	NA	NA	NA	NA	NA	No
Cambria	**C322**	NA	10	15	5.9	NA	NA	NA	6.7	NA	No
Cambria	**C323**	NA	18	24.9	5.6	NA	NA	NA	7.2	NA	No
Cambria	**C324**	NA	26	34.4	8.6	NA	NA	NA	7.6	NA	No
Cambria	**C325**	NA	NA	24.1	4.3	NA	NA	NA	NA	NA	No
Cambria	**C326**	NA	13	22.3	8.3	6.5	NA	NA	5.8	0.78	No
Cambria	**C327**	NA	28	35.7	9.9	NA	NA	NA	7.8	NA	No
Cambria	**C328**	NA	NA	21.9	9.1	NA	NA	NA	NA	NA	No
Cambria	**C329**	NA	NA	32.1	7.3	NA	NA	NA	NA	NA	No
Cambria	**C330**	NA	NA	20.4	5.8	NA	NA	NA	NA	NA	No
Cambria	**C331**	NA	16	28.4	5.1	NA	NA	NA	5.6	NA	No
Cambria	**C332**	NA	12	20.8	6.9	NA	NA	NA	5.8	NA	No
Cambria	**C333**	NA	22	28.9	9.7	NA	NA	NA	7.6	NA	No
Cambria	**C334**	NA	12	20	5.9	NA	NA	NA	6.0	NA	No
Cambria	**C335**	Absent	NA	41	10.3	NA	NA	NA	NA	NA	No
Cambria	**C336**	NA	NA	37.3	9.4	NA	NA	NA	NA	NA	No
Cambria	**C337**	NA	NA	23.7	6.6	NA	NA	NA	NA	NA	No
Cambria	**C338**	NA	12	20.4	7.3	NA	NA	NA	5.9	NA	No
Cambria	**C339**	NA	15	28.6	6.9	NA	NA	NA	5.2	NA	No
Cambria	**C340**	Absent	16	22	7.3	NA	1.1	0.5	7.3	NA	No
Cambria	**C341**	NA	22	33.3	7.3	NA	NA	NA	6.6	NA	No
Cambria	**C342**	NA	22	31.7	8.5	NA	NA	NA	6.9	NA	No
Cambria	**C343**	NA	14	23	4.8	NA	NA	NA	6.1	NA	No
Cambria	**C344**	Absent	14	22.6	4.4	3.4	1	0.4	6.2	0.77	No
Cambria	**C345**	Absent	NA	22.8	5.5	6.6	NA	NA	NA	1.20	No
Cambria	**C346**	NA	14	15.4	6.2	NA	NA	NA	9.1	NA	No
Cambria	**C347**	NA	NA	25.1	9.9	9.1	NA	NA	NA	0.92	No
Cambria	**C348**	NA	17	23.1	6.2	NA	NA	NA	7.4	NA	No
Cambria	**C349**	NA	NA	39.9	7.8	NA	2.7	0.5	NA	NA	No
Cambria	**C350**	Absent	22	23.1	8.7	NA	2.8	0.3	9.5	NA	No
Cambria	**C351**	NA	9	21.8	6.1	NA	NA	NA	4.1	NA	No
Cambria	**C352**	NA	8	NA	6.8	NA	NA	NA	NA	NA	No
Cambria	**C353**	NA	10	15	5.7	4.4	NA	NA	6.7	0.77	No
Cambria	**C354**	NA	16	22.4	7.3	NA	NA	NA	7.1	NA	No
Cambria	**C355**	NA	24	29.6	8.3	NA	NA	NA	8.1	NA	No

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Cambria	**C356**	NA	NA	19.9	7.2	NA	NA	NA	NA	NA	No
Cambria	**C357**	NA	NA	28.6	8.1	NA	1.1	0.5	NA	NA	No
Cambria	**C358**	NA	12	13.2	6.6	NA	NA	NA	9.1	NA	No
Cambria	**C359**	NA	10	14.4	6.9	NA	NA	NA	6.9	NA	No
Cambria	**C360**	NA	18	23.5	6.5	NA	NA	NA	7.7	NA	No
Cambria	**C361**	Absent	18	33.2	9.3	NA	3.5	0.6	5.4	NA	No
Cambria	**C362**	NA	10	21.5	5.9	NA	NA	NA	4.7	NA	No
Cambria	**C363**	Absent	8	8.4	7.9	4.4	NA	NA	9.5	0.56	No
Cambria	**C364**	NA	18	20.8	5.3	NA	NA	NA	8.7	NA	No
Cambria	**C365**	NA	18	24.9	7.9	NA	NA	NA	7.2	NA	No
Cambria	**C366**	NA	18	23.5	6.5	NA	NA	NA	7.7	NA	No
Cambria	**C367**	NA	24	22.1	4.9	NA	NA	NA	10.9	NA	No
Cambria	**C368**	NA	26	9.3	12.2	6.4	NA	NA	28.0	0.52	No
Cambria	**C369**	NA	18	29.5	5.1	NA	NA	NA	6.1	NA	No
Cambria	**C370**	NA	20	31.8	8.6	7.1	NA	NA	6.3	0.83	No
Cambria	**C371**	NA	20	40.1	5.7	NA	NA	NA	5.0	NA	No
Cambria	**C372**	NA	20	23.2	6.4	NA	NA	NA	8.6	NA	No
Cambria	**C373**	NA	24	35.7	6.2	NA	NA	NA	6.7	NA	No
Cambria	**C374**	NA	26	28.5	7	NA	NA	NA	9.1	NA	No
Cambria	**C375**	NA	10	15.1	4.8	NA	NA	NA	6.6	NA	No
Cambria	**C376**	Absent	14	23.4	7	5.1	NA	NA	6.0	0.73	No
Cambria	**C377**	Absent	28	18.6	5.9	NA	NA	NA	15.1	NA	No
Cambria	**C378**	Absent	14	12.9	4	NA	1.4	0.6	10.9	NA	No
Cambria	**C379**	NA	10	19.6	7.3	5.8	NA	NA	5.1	0.79	No
Cambria	**C380**	NA	8	8.6	8	4.7	NA	NA	9.3	0.59	No
Cambria	**C381**	Absent	8	6.7	6.8	3.8	NA	NA	11.9	0.56	No
Cambria	**C382**	Absent	22	36.9	6.7	NA	0.8	1.3	6.0	NA	No
Cambria	**C383**	NA	14	22.3	7.5	NA	NA	NA	6.3	NA	No
Cambria	**C385**	NA	18	20.8	9	NA	NA	NA	8.7	NA	No
Cambria	**C386**	Absent	10	11.8	6.2	2.9	3.3	0.5	8.5	0.47	No
Cambria	**C387**	NA	20	26.5	5.4	NA	NA	NA	7.5	NA	No
Cambria	**C388**	NA	8	NA	5.1	6	NA	NA	NA	1.18	No
Cambria	**C389**	NA	9	14.7	5.8	NA	NA	NA	6.1	NA	No
Cambria	**C390**	NA	14	22.4	5.5	NA	NA	NA	6.3	NA	No
Cambria	**C391**	Absent	28	42.3	9.5	NA	0.3	0.3	6.6	NA	No
Cambria	**C392**	Absent	20	26.8	8.6	7.7	3.4	0.4	7.5	0.90	No
Cambria	**C393**	Absent	5	NA	7.2	7.6	NA	NA	NA	1.06	No
Cambria	**C394**	Absent	16	28.5	5.2	NA	NA	NA	5.6	NA	No
Cambria	**C395**	NA	14	7.7	6.1	3.1	NA	NA	18.2	0.51	No
Cambria	**C396**	NA	31	26.3	7.3	NA	NA	NA	11.8	NA	No
Cambria	**C397**	NA	22	31.9	9.2	NA	NA	NA	6.9	NA	No
Cambria	**C398**	Absent	16	17.8	7.6	5.2	NA	NA	9.0	0.68	No
Cambria	**C399**	NA	13	12	4.7	NA	NA	NA	10.8	NA	No
Cambria	**C400**	NA	11	19.2	5.9	NA	NA	NA	5.7	NA	No
Cambria	**C401**	Absent	26	17	7.3	6.9	NA	NA	15.3	0.95	No
Cambria	**C402**	Absent	12	10.6	5.5	5.8	1	0.3	11.3	1.05	No
Cambria	**C403**	NA	16	29.5	7.5	5.1	NA	NA	5.4	0.68	No

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Cambria	**C404**	Absent	10	16.3	4.8	NA	NA	NA	6.1	NA	No
Cambria	**C405**	NA	22	21.4	7.8	NA	NA	NA	10.3	NA	No
Cambria	**C406**	Absent	18	10	9.9	5.2	2.8	0.5	18.0	0.53	No
Cambria	**C407**	Absent	NA	9.6	9.3	5.4	5	1.5	NA	0.58	No
Cambria	**C408**	NA	10	NA	4.3	6.4	NA	NA	NA	1.49	No
Cambria	**C409**	Absent	18	11.9	5.3	5.7	4.3	0.9	15.1	1.08	No
Cambria	**C410**	NA	10	5.6	5.9	2.7	NA	NA	17.9	0.46	No
Cambria	**C411**	NA	20	NA	10.9	5.5	NA	NA	NA	0.50	No
Cambria	**C412**	Absent	16	22	5.9	NA	0.8	1.1	7.3	NA	No
Cambria	**C413**	NA	22	NA	7.7	4.2	NA	NA	NA	0.55	No
Cambria	**C414**	Absent	24	17.8	6.7	6	1	0.5	13.5	0.90	No
Cambria	**C415**	NA	16	23.9	6.6	NA	NA	NA	6.7	NA	No
Cambria	**C416**	Absent	20	40	8.1	8.7	1.5	0.5	5.0	1.07	No
Cambria	**C417**	NA	NA	25.2	7.2	4.3	NA	NA	NA	0.60	No
Cambria	**C418**	NA	24	NA	13.1	7.2	NA	NA	NA	0.55	No
Cambria	**C419**	Absent	NA	32.2	10.8	7.3	3.2	0.7	NA	0.68	No
Cambria	**C420**	NA	10	29.1	7.1	NA	NA	NA	3.4	NA	No
Cambria	**C421**	NA	NA	24.9	4.4	4.2	NA	NA	NA	0.95	No
Cambria	**C422**	Absent	36	35.2	7.5	NA	1.5	1	10.2	NA	No
Cambria	**C423**	NA	14	36.3	8.6	NA	NA	NA	3.9	NA	No
Cambria	**C424**	NA	16	16	5.5	NA	NA	NA	10.0	NA	No
Cambria	**C425**	Absent	22	33.2	5.1	NA	2.6	0.8	6.6	NA	No
Cambria	**C426**	Absent	10	16.5	4.3	6.6	1.7	1	6.1	1.53	No
Cambria	**C427**	NA	18	18.9	7.3	5.9	NA	NA	9.5	0.81	No
Cambria	**C428**	NA	20	23.4	8.8	4.9	NA	NA	8.5	0.56	No
Cambria	**C429**	Absent	22	19.3	8.5	NA	0.8	0.5	11.4	NA	No
Cambria	**C430**	NA	12	16.8	3.9	NA	NA	NA	7.1	NA	No
Cambria	**C431**	Absent	18	NA	7.5	5.8	6.6	0.7	NA	0.77	No
Cambria	**C432**	NA	14	NA	13.8	6.8	5.6	1.3	NA	0.49	No
Cambria	**C433**	NA	18	NA	9.1	4.6	4.9	1.4	NA	0.51	No
Cambria	**C434**	Absent	28	33.9	7.5	5.4	0.9	0.4	8.3	0.72	No
Cambria	**C435**	Absent	NA	38.1	5.6	NA	3.4	0.7	NA	NA	No
Cambria	**C436**	NA	24	24.2	7.9	NA	NA	NA	9.9	NA	No
Cambria	**C437**	Absent	24	33.9	7.8	7.4	1.5	0.7	7.1	0.95	No
Cambria	**C438**	NA	NA	28.8	5.9	7.7	NA	NA	NA	1.31	No
Cambria	**C440**	NA	22	28.6	8.4	6.6	NA	NA	7.7	0.79	No
Cambria	**C441**	NA	14	13.7	7.8	5.7	1.1	0.6	10.2	0.73	No
Cambria	**C442**	NA	16	12.6	6.6	NA	NA	NA	12.7	NA	No
Cambria	**C443**	NA	14	17.4	6.8	3.8	NA	NA	8.0	0.56	No
Cambria	**C444**	NA	22	NA	11.1	5	2.8	1.1	NA	0.45	No
Cambria	**C445**	NA	24	20.4	6.3	5.5	4.9	1.1	11.8	0.87	No
Cambria	**C446**	NA	NA	37.4	6.6	NA	3.7	1.3	NA	NA	No
Cambria	**C447**	NA	28	35	6.1	NA	NA	NA	8.0	NA	No
Cambria	**C448**	NA	12	NA	5.7	2.6	NA	NA	NA	0.46	No
Cambria	**C449**	Absent	16	23.6	7	NA	1.3	1	6.8	NA	No
Cambria	**C450**	Absent	16	29.5	9.8	NA	0.9	0.9	5.4	NA	No
Cambria	**C451**	NA	20	21.5	6.6	5.2	NA	NA	9.3	0.79	No

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Cambria	**C452**	NA	28	30.6	9.3	NA	NA	NA	9.2	NA	No
Cambria	**C453**	NA	12	11.1	6.4	2.8	NA	NA	10.8	0.44	No
Cambria	**C454**	NA	14	18.2	5.3	NA	NA	NA	7.7	NA	No
Cambria	**C455**	NA	16	17.5	6.6	NA	3.1	0.8	9.1	NA	No
Cambria	**C456**	NA	18	NA	9.2	3.9	NA	NA	NA	0.42	No
Cambria	**C457**	Absent	NA	20	6.1	7.3	2.7	0.8	NA	1.20	No
Cambria	**C458**	NA	18	16.6	7.6	4.5	NA	NA	10.8	0.59	No
Cambria	**C459**	NA	20	34.5	7.1	5.5	1.5	1.3	5.8	0.77	No
Cambria	**C460**	NA	18	13.9	7.8	5.9	NA	NA	12.9	0.76	No
Cambria	**C461**	NA	8	NA	5.8	6.3	NA	NA	NA	1.09	No
Cambria	**C462**	NA	18	NA	10.6	6.4	NA	NA	NA	0.60	No
Cambria	**C463**	NA	6	NA	4.2	4.1	NA	NA	NA	0.98	No
Cambria	**C464**	Absent	10	NA	5.9	4.1	1.1	0.3	NA	0.69	No
Price	**P01**	NA	24	23.6	6.6	7.1	NA	NA	10.2	1.08	Yes
Price	**P02**	Absent	18	26.7	8.7	NA	0.8	0.4	6.7	NA	Yes
Price	**P03**	NA	24	26.7	6.5	NA	NA	NA	9.0	NA	Yes
Price	**P04**	Absent	20	32	7.8	5.3	3.1	0.9	6.3	0.68	Yes
Price	**P05**	Absent	22	31.5	6	4.6	1.2	1	7.0	0.77	Yes
Price	**P06**	Strong	17	8.4	8.6	4.3	4.4	2	20.2	0.50	Yes
Price	**P07**	Strong	15	7.2	7.9	4.5	6.1	1.8	20.8	0.57	Yes
Price	**P08**	Absent	14	9.3	10.9	7.3	4.1	1.2	15.1	0.67	Yes
Price	**P09**	NA	16	28.1	4.8	NA	NA	NA	5.7	NA	Yes
Price	**P10**	NA	13	15.8	7.1	5.4	NA	NA	8.2	0.76	Yes
Price	**P11**	NA	9	12.7	5.7	5	NA	NA	7.1	0.88	Yes
Price	**P12**	Absent	22	23.7	7.6	5	3.6	1	9.3	0.66	Yes
Price	**P13**	Weak	15	14.8	5.8	5.6	4.9	1	10.1	0.97	Yes
Price	**P14**	Weak	20	30.9	8.6	8	6.1	0.8	6.5	0.93	Yes
Price	**P15**	Absent	10	13.8	5.5	5	1.2	0.7	7.2	0.91	No
Price	**P16**	Absent	22	35.8	7.8	4.3	3.1	0.5	6.1	0.55	Yes
Price	**P17**	Absent	21	33.4	8.2	4.1	2.2	0.8	6.3	0.50	Yes
Price	**P18**	Absent	26	40.9	11.2	6.9	3.4	0.7	6.4	0.62	Yes
Price	**P19**	NA	14	24.6	9.8	6.4	NA	NA	5.7	0.65	Yes
Price	**P20**	Absent	NA	32.1	8.4	NA	0.6	0.5	NA	NA	Yes
Price	**P21**	Absent	9	14.6	5.5	4.6	6.2	1.1	6.2	0.84	No
Price	**P22**	Absent	12	18.5	6	5.1	2.3	1.9	6.5	0.85	Yes
Price	**P23**	NA	14	40	8.7	NA	NA	NA	3.5	NA	Yes
Price	**P24**	Absent	20	24.4	7.2	7	1.4	0.5	8.2	0.97	Yes
Price	**P25**	NA	21	28.3	6.7	NA	NA	NA	7.4	NA	Yes
Price	**P26**	Absent	22	26.9	6.6	5.2	3.5	0.4	8.2	0.79	Yes
Price	**P27**	NA	9	9.9	5.8	5.7	NA	NA	9.1	0.98	No
Price	**P28**	Absent	5	8.2	5	6	NA	NA	6.1	1.20	No
Price	**P29**	Strong	14	7.8	7.1	3.7	5.2	1.7	17.9	0.52	Yes
Price	**P30**	NA	12	25.8	8.7	11.5	NA	NA	4.7	1.32	Yes
Price	**P32**	Absent	NA	28.6	8.6	6.1	1.4	0.4	NA	0.71	No
Price	**P33**	Absent	18	11.9	6.1	5	NA	NA	15.1	0.82	Yes
Price	**P34**	NA	12	NA	9.3	NA	NA	NA	NA	NA	Yes

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Price	**P35**	NA	14	30.6	6.4	5.9	NA	NA	4.6	0.92	Yes
Price	**P36**	Weak	9	9.8	5.7	5.2	3.5	1	9.2	0.91	Yes
Price	**P37**	Weak	8	7.6	6.6	3.4	3.1	1.2	10.5	0.52	Yes
Price	**P38**	NA	9	11.1	6.1	6.6	NA	NA	8.1	1.08	Yes
Price	**P39**	Absent	NA	17.4	6.5	5.8	2.5	0.5	NA	0.89	No
Price	**P40**	Absent	22	41.1	8.7	8.2	1.5	1	5.4	0.94	Yes
Price	**P41**	Absent	16	23.9	6.5	NA	1.8	0.9	6.7	NA	Yes
Price	**P42**	Absent	22	44.3	8.5	7.9	1	0.8	5.0	0.93	Yes
Price	**P43**	Absent	24	31	7.8	7.7	5.3	1.2	7.7	0.99	Yes
Price	**P44**	NA	20	25.2	7.6	6.9	NA	NA	7.9	0.91	Yes
Price	**P45**	NA	18	21.8	9.9	7.4	NA	NA	8.3	0.75	Yes
Price	**P46**	Absent	18	28	8.2	4.4	1.6	0.5	6.4	0.54	Yes
Price	**P47**	Absent	22	23.2	4.7	4.6	NA	NA	9.5	0.98	Yes
Price	**P48**	Strong	18	11.6	10.2	4.3	4.4	1.6	15.5	0.42	Yes
Price	**P49**	Strong	20	10.8	10.3	5.1	4.3	2.4	18.5	0.50	Yes
Price	**P50**	Absent	14	9.1	10.3	3.9	3.7	0.9	15.4	0.38	Yes
Price	**P51**	Absent	NA	24.7	8.6	4.5	2.6	1	NA	0.52	No
Price	**P53**	Strong	30	13.5	13.8	5.7	5.6	2.8	22.2	0.41	Yes
Price	**P55**	Strong	11	9.4	7.7	4.2	4.2	2.2	11.7	0.55	Yes
Price	**P56**	Weak	14	11.6	9.6	5.1	4.6	2	12.1	0.53	Yes
Price	**P57**	Absent	14	21.7	6.6	4.7	3.6	1.2	6.5	0.71	Yes
Price	**P59**	Weak	14	18.1	5.3	6	3.5	1.7	7.7	1.13	No
Price	**P60**	NA	11	12.5	3.2	6.5	NA	NA	8.8	2.03	Yes
Price	**P61**	NA	20	27.1	9	7.6	NA	NA	7.4	0.84	Yes
Price	**P62**	NA	20	34.7	8.3	NA	NA	NA	5.8	NA	Yes
Price	**P63**	NA	NA	25.5	10.1	6.5	NA	NA	NA	0.64	Yes
Price	**P69**	NA	10	11.2	6.2	7.3	NA	NA	8.9	1.18	No
Price	**P71**	NA	20	29.4	7.8	NA	NA	NA	6.8	NA	Yes
Price	**P73**	NA	31	12.7	6.9	5.7	NA	NA	24.4	0.83	No
Price	**P74**	NA	12	19.9	5.8	6	NA	NA	6.0	1.03	Yes
Price	**P75**	Absent	7	14.8	5.1	4.8	NA	NA	4.7	0.94	Yes
Price	**P76**	NA	5	7.2	2.7	3.7	NA	NA	6.9	1.37	No
Price	**P78**	NA	26	31.7	10.6	5.4	NA	NA	8.2	0.51	No
Price	**P79**	Weak	16	24.5	6.6	7.4	4.3	1	6.5	1.12	No
Price	**P80**	Absent	24	25.2	9	6.3	0.9	0.9	9.5	0.70	No
Price	**P81**	Strong	13	9.6	7.5	3.5	3.9	1.2	13.5	0.47	No
Price	**P82**	Strong	15	9.9	7.4	5.1	4.2	1.2	15.2	0.69	No
Price	**P83**	Absent	23	36.2	5.8	6	2.1	0.7	6.4	1.03	No
Price	**P84**	Strong	11	12.8	5.4	5.3	4.9	1.4	8.6	0.98	No
Price	**P85**	Strong	18	11.9	10.5	6.1	5.4	1.3	15.1	0.58	No
Price	**P86**	Absent	12	13.4	5.7	5.8	3.6	1.1	9.0	1.02	No
Price	**P87**	NA	12	17	4.9	5.2	NA	NA	7.1	1.06	Yes
Price	**P88**	NA	16	16.2	10.6	4.8	4.9	2.5	9.9	0.45	No
Price	**P89**	Weak	12	12.9	13.2	5.8	3.6	1.3	9.3	0.44	No
Price	**P90**	NA	12	10.1	5.7	4.8	NA	NA	11.9	0.84	No
Price	**P91**	NA	12	16.4	6.4	NA	NA	NA	7.3	NA	No
Price	**P92**	NA	15	18.8	8	6.6	NA	NA	8.0	0.83	No

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Price	**P93**	NA	NA	38.4	9.7	NA	NA	NA	NA	NA	No
Price	**P94**	NA	18	16.3	5	5	NA	NA	11.0	1.00	No
Price	**P95**	NA	16	24	7	NA	NA	NA	6.7	NA	No
Price	**P96**	NA	18	25.7	7.6	6.9	NA	NA	7.0	0.91	No
Price	**P97**	NA	22	25	6.2	NA	NA	NA	8.8	NA	No
Price	**P98**	NA	28	26.6	7.9	NA	NA	NA	10.5	NA	No
Price	**P99**	NA	NA	26.5	8.4	NA	NA	NA	NA	NA	Yes
Price	**P100**	NA	22	24.1	5.9	NA	NA	NA	9.1	NA	Yes
Price	**P101**	NA	9	12.9	5.1	4.9	NA	NA	7.0	0.96	Yes
Price	**P102**	NA	20	22.9	6.3	NA	NA	NA	8.7	NA	Yes
Price	**P103**	NA	NA	19.4	6.2	7.4	NA	NA	NA	1.19	No
Price	**P104**	NA	16	16.3	6.9	5.9	NA	NA	9.8	0.86	No
Price	**P105**	Absent	9	20.4	7.3	NA	0.7	0.3	4.4	NA	No
Price	**P106**	NA	12	20.1	5.3	NA	NA	NA	6.0	NA	Yes
Price	**P107**	NA	NA	32.4	7.8	NA	NA	NA	NA	NA	Yes
Price	**P108**	NA	20	26	8.7	NA	NA	NA	7.7	NA	Yes
Price	**P109**	NA	14	12	11.3	4.8	NA	NA	11.7	0.42	Yes
Price	**P110**	NA	6	9.1	10.2	5.8	NA	NA	6.6	0.57	No
Price	**P111**	Absent	10	7.3	6.8	4.1	4.1	1.2	13.7	0.60	No
Price	**P113**	Absent	12	15.1	6.1	5.3	NA	NA	7.9	0.87	No
Price	**P114**	NA	16	26	6.3	5.3	NA	NA	6.2	0.84	No
Price	**P115**	NA	16	27.7	6.4	NA	NA	NA	5.8	NA	No
Price	**P116**	NA	NA	34.3	7.9	NA	NA	NA	NA	NA	No
Price	**P117**	NA	10	13.2	5.6	5.3	NA	NA	7.6	0.95	No
Jones	**J100**	Absent	10	11.8	6.8	5.3	0.6	0.9	8.5	0.78	No
Jones	**J101**	NA	NA	40.5	9.3	NA	NA	NA	NA	NA	No
Jones	**J102**	NA	18	11.6	7.4	6.5	NA	NA	15.5	0.88	No
Jones	**J104**	NA	NA	17.2	6.1	NA	NA	NA	NA	NA	No
Jones	**J107**	NA	12	23.3	5.8	6.4	NA	NA	5.2	1.10	No
Jones	**J110**	NA	30	44.9	8.8	7.4	NA	NA	6.7	0.84	No
Jones	**J28**	NA	24	29.6	7.6	7	NA	NA	8.1	0.92	Yes
Jones	**J29**	NA	14	23.6	7.4	5.5	NA	NA	5.9	0.74	Yes
Jones	**J31**	NA	26	29.5	7.5	6	NA	NA	8.8	0.80	Yes
Jones	**J32**	Absent	11	20.2	3.3	6.4	1.4	0.7	5.4	1.94	Yes
Jones	**J33**	NA	30	28.4	6.4	6.8	NA	NA	10.6	1.06	Yes
Jones	**J34**	Absent	12	24.4	8.6	5.6	3.9	1.9	4.9	0.65	Yes
Jones	**J35**	Absent	9	15.3	5.7	4.2	2.4	0.9	5.9	0.74	Yes
Jones	**J36**	Weak	16	12.4	5.6	6.3	4.1	1.1	12.9	1.13	Yes
Jones	**J38**	NA	16	21.4	6.6	5.4	NA	NA	7.5	0.82	Yes
Jones	**J39**	NA	14	21.7	5	4.8	NA	NA	6.5	0.96	Yes
Jones	**J42**	Absent	NA	23.8	6.4	4.2	1.8	0.9	NA	0.66	Yes
Jones	**J44**	Absent	16	24	6	5.9	3	1	6.7	0.98	Yes
Jones	**J45**	NA	18	28.1	10.3	6.3	NA	NA	6.4	0.61	Yes
Jones	**J46**	Absent	28	29.9	7.4	4.9	1.3	0.8	9.4	0.66	Yes
Jones	**J55**	Absent	10	20.2	5.8	5.4	0.7	0.5	5.0	0.93	Yes
Jones	**J56**	Absent	24	19.6	4.5	5.6	3	1.3	12.2	1.24	Yes
Jones	**J57**	Absent	16	28.5	7.6	4.7	2.9	1.1	5.6	0.62	Yes

Site	Vessel No.	Cameo	Orifice Diam. (cm)	NeckLength (mm)	Rim Width (mm)	Wall Thick (mm)	Inc Width (mm)	Inc Depth (mm)	OD/NL	RPR	XRF Sample
Jones	**J58**	NA	NA	18.7	9.6	7.1	NA	NA	NA	0.74	No
Jones	**J59**	NA	22	12	7.7	6	NA	NA	18.3	0.78	No
Jones	**J60**	Absent	14	10.6	2	3.7	1	1.3	13.2	1.85	Yes
Jones	**J61**	NA	10	7.6	1.9	3.8	NA	NA	13.2	2.00	No
Jones	**J62**	Absent	14	29.7	6.5	NA	0.7	0.9	4.7	NA	No
Jones	**J63**	NA	7	7.2	7.5	3.4	NA	NA	9.7	0.45	No

Curriculum Vitae

Katy J. Mollerud

EDUCATION

2005-Present Ph.D. Candidate (ABD) in Anthropology (Archaeology), University of Wisconsin-Milwaukee.
Dissertation Title: The Cambria Connection: Identifying Ceramic Production and Community Interaction in Late Prehistoric Minnesota, AD 1050-1300

2001-2005 M.S. in Anthropology, University of Wisconsin-Milwaukee
Thesis Title: Messages, Meanings and Motifs: An Analysis of Ramey Incised Ceramics at the Aztalan Site

1994-1998 B.A. in Anthropology and Spanish, Minnesota State University Moorhead

RESEARCH INTERESTS

Archaeology of the Eastern Woodlands and Upper Midwest with an emphasis on Cahokia and its hinterlands, large-scale societies, tribalization, ceramic analysis, compositional analysis with an emphasis on x-ray fluorescence (XRF).

TEACHING AND MUSEUM EXPERIENCE

2014-Present ***NAGPRA Regional Coordinator***, Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge, MA

2009-2010 ***Adjunct***, Department of Anthropology and Earth Sciences, Minnesota State University Moorhead, Moorhead, MN
ANTH 115 Introduction to Archaeology

2009-2012 ***Adjunct***, Department of Health and Physical Education, Minnesota State University Moorhead, Moorhead, MN
HLTH 122 Alcohol and College Life

2003-2004 ***Teaching Assistant***, Department of Anthropology, University of Wisconsin-Milwaukee, Milwaukee, WI
ANTHRO 103 Digging Up the Past: Approaches to Archaeology
ANTHRO 281 Dead Men Do Tell Tales: An Introduction to Forensic Science
ANTHRO 481 Criminalistics

PROFESSIONAL PAPERS

2012 *A Comparative Analysis of Ceramics from Three Sites in the Cambria Locality, Minnesota.* Paper presented at the 58th Midwest Archaeological Conference, East Lansing, MI.

2012 *Keeping up with the Joneses: A Comparison of Cambria Phase Pottery from the Owen D. Jones and Price Sites.* Paper presented at the 77TH Annual Meeting of the Society for American Archaeology, Memphis, TN.

2011 *Compositional Analysis of Cambria Phase Pottery Using X-Ray Fluorescence.* Paper presented at the 57th Midwest Archaeological Conference, La Crosse, WI.

2008 *"X" Marks the Spot: Sourcing Effigy Mound Ceramics from the Horicon Site using X-Ray Fluorescence*. Paper presented at the 73rd Annual Meeting of the Society for American Archaeology, Vancouver, BC, Canada.

2006 *Ring Around the Ramey: A Comparison of Ramey Incised Pottery from the Sites of Cahokia, Aztalan, and the Apple River Region*. Paper presented at the 52nd Midwest Archaeological Conference, Urbana, IL.

2004 *Up North II: Ramey Incised Ceramics at the Aztalan Site*. Paper presented at the 69th Annual Meeting of the Society for American Archaeology, Montreal, QC, Canada.

2003 *Up North: Ramey Incised Ceramics at the Aztalan Site*. Paper presented at the 49th Midwest Archaeological Conference, Milwaukee, WI.

PUBLICATIONS, REPORTS, AND VIDEOS

Hampton, R.A. and K.J. Mollerud

2005 *Historic American Engineering Record Documentation of the North Street Bridge, Sidney, Shelby County, Ohio*. Hardlines Design Company, Columbus, OH. Report on file at the Ohio Historic Preservation Office, Columbus.

Lee, A.B. and K.J. Mollerud

2003 *Report of Phase I Archaeological Investigations of Two Agricultural Fields Selected as Potential Sites for Mitigating Wetlands Associated with FRA/LIC-161-23.15/0.00 (PID 12139), Licking and Granville Townships, Licking County, Ohio*. Hardlines Design Company, Columbus, OH. Report on file at the Ohio Historical Preservation Office, Columbus.

Marasinghe, P.A.B., K.J. Mollerud, and B.D. Carlson

1996 Pseudo Derivative Curves for the Determination of Titration End Points. *Microchemical Journal* 53(2): 225-229

Mollerud, K.J. (writer/producer)

1998 *Forgotten Things: Archaeology at Historic Moorhead*. Video exhibit produced for the Clay County Historical Museum, Moorhead, MN.

GRANTS, ACADEMIC SCHOLARSHIPS AND AWARDS

2012, 2008 Travel Grant, University of Wisconsin-Milwaukee

2011 Riaz Malik Student Research Grant, Council for Minnesota Archaeology

2008-2009 Dissertation Fellowship, University of Wisconsin-Milwaukee

2004 *Above and Beyond Award*, given by the Student Accessibility Center, University of Wisconsin-Milwaukee

1994 Academic Scholarship, Minnesota State University Moorhead

1993 *Certificate of Achievement for Outstanding Scientific Research*, United States Army Junior Science and Humanities Symposia Program

FIELD EXPERIENCE

2010 ***Field Director***, Minnesota State University Moorhead, MN
Responsible for coordinating fieldwork and supervising crews conducting pedestrian survey and shovel testing. Also responsible for artifact processing and analysis, and the completion of state site forms.

2007-2008 ***Field Director***, Commonwealth Cultural Resources Group, Inc. (CCRG), Jackson, MI
Responsible for supervising Phase II and III excavations, monitoring excavation of deep test trenches, mapping, and report writing.

2003-2006 ***Archaeologist***, Hardlines Design Company, Columbus, OH
Performed archaeological survey and excavation. Also responsible for artifact processing and analysis, cataloging and curation, and report writing.

2001-2002 ***Archaeological Technician***, Historic Resources Management Services (HRMS), Milwaukee, WI
Performed archaeological survey and excavation. Also responsible for flotation and artifact processing.

2000-2001 ***Field Technician***, Archaeological Studies Group, University of Tennessee, Knoxville, TN
Excavation of multi-component sites at the Townsend Archaeological Project, Blount County, TN. Cultural and temporal periods represented include Late Archaic, Early and Middle Woodland, Mississippian, Historic Cherokee, and 19th and early 20th century farmsteads. Also responsible for flotation, artifact processing and cataloging.

1999-2000 ***Field Technician***, Indiana State University, Terra Haute, IN
Excavation of stratified Archaic sites at the Caesars Archaeological Project, Harrison County, IN. Also responsible for artifact processing.

1999 ***Field Technician***, Illinois State Museum Society, Springfield, IL
Responsible for unit and feature excavation and artifact processing.

1997 ***Project Assistant***, Minnesota State University Moorhead, MN
Responsible for background research for assessment survey of archaeological sites impacted by the 1997 Red River Flood.

LABORATORY TRAINING

X-ray fluorescence (XRF): Received training on two different handheld XRF analyzers (Niton and Bruker) in order to collect elemental data. Training included sample preparation techniques, equipment and procedural protocols, and radiation safety certification.

ACADEMIC SERVICE AND PUBLIC OUTREACH

2012 *Ceramic Analysis*, visiting classroom lecture for undergraduate archaeology class (instructor Michael Michlovic), Minnesota State University Moorhead.

2009 *An Attribute Analysis of Ramey Incised Pottery from the Sites of Aztalan, Cahokia, and the Apple River Region,* visiting classroom lecture for undergraduate archaeology class (instructor George Holley), Minnesota State University Moorhead.

2007 *Motifs in the Middle: A Comparison of Ramey Incised Pottery from the Sites of Aztalan, Cahokia, and the Apple River Region*. Lecture sponsored by the Wisconsin Archaeological Society, Milwaukee, WI.

2006 *Cahokia and Aztalan: An Archaeological Overview*. Lecture presented at the Milwaukee Public Museum, Milwaukee, WI.

2002-2003 ***Faculty Representative***, Anthropology Student Union, University of Wisconsin-Milwaukee

PROFESSIONAL MEMBERSHIPS

- Society for American Archaeology (SAA)
- Midwest Archaeological Conference (MAC)
- Minnesota Archaeological Society (MAS)
- Wisconsin Archeological Society (WAS)
- American Alliance of Museums (AAM)
- New England Museum Association (NEMA)