CERAMIC VARIABILITY OF SHANG SOCIETY AT HUANBEI IN ANYANG, CHINA

by

DENISE CATALINA FONG

B.A., The University of British Columbia, 2003

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

THE FACULTY OF GRADUATE STUDIES

(Anthropology)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

August 2008

ABSTRACT

The study of ceramic variability in Chinese archaeology is conventionally understood in the context of temporal and regional differences, where emphasis is placed on explaining variability in terms of identifying regional styles and long-term changes. In this thesis, I examine ceramic variability of Shang pottery between two contiguous daily-use contexts at Huanbei, a Middle Shang period (1400-1250 BCE) site located in the Central Plains of China. Based on the analysis of pottery sherds collected from daily-use contexts at Hanwangdu (HWD) and Huyuanzhuang (HYZ), I argue that ceramics collected within a single-site context can be highly varied and distinct due to differences in use-context. Assemblage differences and ceramic variation are evaluated according to rim sherd attributes including vessel shape, rim and lip shape, dimensional properties, and surface treatment styles. Possible interpretive models for explaining observed patterns of variability are presented.

Results of this study suggest that siginificant variability in pottery vessel design can be observed in the samples examined from the Huanbei site. Consumers from the HWD (a palace context) consumed a greater variety of pottery vessel types but with a more limited range of shapes and decorative styles. In contrast, consumers from HYZ (a non-palatial context) consumed a limited range of pottery vessel types but with a greater variability in the range of shapes and decoration. The observed patterns of variation reinforce current assumptions regarding the contextual differences between HWD and HYZ, and also provide new insight into the differential pottery consumption patterns by different social classes at Huanbei. Results of this study indicate the potential value of studying intra-site ceramic variation in Chinese archaeology and its importance in creating new knowledge on the material consumption behavior of different social classes.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

There are many individuals who I am indebted to thoughout this entire graduate student experience. First and foremost, I thank my thesis supervisor, Dr. Zhichun Jing, who gave me the opportunity to explore the archaeology of ancient China. I also thank my thesis committee member Dr. Michael Blake, who always made learning archaeology just that much more interesting throughout all these years at UBC. I express my sincere gratitude to Dr. Jigen Tang, who generously accommodated me at the Anyang field station to conduct my research on the Huanbei materials. I also would like to thank many individuals who taught me lessons about archaeology and beyond. Dr. David Pokotylo, a very good statistics teacher who helped me to get my foot in the door. Dr. Kenichi Takashima, who gave me the entry ticket into the world of oracle bone studies. Dr. Brian Chisholm, who has always been just a great friend and mentor. Professor Fang Hui from Shandong University, China, for sharing with me his profound knowledge of Chinese archaeology. Funding for my research was kindly supported by Professor Jing's Social Sciences and Humanities Research Council grant, the ACLS/Henry Luce Foundation, and the Chinese Government Scholarship Council. I also thank Patricia Omerod, who was always willing to help out during needy times.

Throughout the past few years I met numerous individuals from around the world because of our common interest in archaeology. Be it a short chat in the hallway or living together out in the field, I gained friendships, insights on life, and academic knowledge that have helped me grow tremendously as an individual and a graduate student. I thank all of you who have been a part of my graduate student experience. I especially thank the wonderful crew who helped out during the summer of 2004 at the Anyang workstation – Zhang Hua, Patty Telford, Christina Neele, Shauna Janz, and Meng Ying who offered me tremendous help in measuring, organizing, and photographing my samples. I also thank Sue Formosa, my very wonderful lab buddy, who saw me throughout the years and was always there to give support and motivation. Finally, I send my deepest gratitude to my family and friends for supporting me in this unusual venture. My biggest thanks go out to my family who has supported me in so many ways. To my dear friends who have stuck beside me throughout the years, thanks for all your encouragement. And to Meng who was always there through all the ups and downs in the past few years, my sincere gratitude to you.

INTRODUCTION

Archaeological and historical research since the 1920s have demonstrated that the Shang (1600-1040 B.C.) was a state-level society that exercised considerable cultural influence in the Central Plains region during the early Bronze Age (Bagley 1999; Chang 1980; Shaughnessy 1989; Thorp 2006; Trigger 1999; Yates 1994). Pottery vessels are among the most common material correlates of the Shang culture and have long been relied upon as an index for studying regional interaction and long term social change. By studying patterns of inter-site ceramic variability, archaeologists have gained much insight into the regional distribution of ceramic styles and their evolution over time (Yan 1997). In comparison, little is known of ceramic variability within a single site context during a single time period. Recent studies have shown that patterns of variability encode information regarding various aspects of social behavior such as strategies of production and consumption/use behavior (Masson and Rosenswig 2005; Rice 1987). The objective of this study is to examine attribute variability of pottery vessels to address questions of variability and consumption during the Shang period.

This study was conducted in the summer of 2004 during my visit to the Anyang field station located in the city of Anyang in the Henan province of China. A large collection of pottery from the Huanbei site 洹北商城 (1400-1250 BCE), by far the largest Shang-period urban settlement discovered in the central plain of China (Jing et al. 2004:6), had been recently excavated and was stored at the field station. This particular pottery collection included pottery collected from the Hanwangdu locus (hereafter HWD) during the 2001 excavation and the Huayuanzhuang locus (hereafter HYZ) during the 1999 excavation. The two loci are located one km. apart within the parameters of the Huanbei site, and offer a unique context for discussion due to their distinct use-functions: HWD was likely designated as the palace sector while the neighboring HYZ locus was a non-palatial residential sector for local elites. Comparisons drawn from pottery sherds excavated from these two distinct contexts are meant to reveal unique patterns of consumption associated with different social classes and activities. In this study, emphasis is placed on studying daily-use ceramics through the analysis of pottery rim sherds collected from a series of refuse pits associated with several large building foundations in each context. New information on the excavated pottery assemblages from Huanbei is presented here, followed by qualitative and quantitative studies of attribute variation of specific pottery vessel forms from HWD and HYZ. The analysis of attribute variation can provide insight into the kinds of pottery produced for and consumed at the two contexts. This study also aims to explore new approaches to explain variability that can improve our understanding of differences between the HWD and HYZ ceramics and provide new insight into Shang pottery consumption and variability.

The focus of this paper is to build upon current understanding of Shang ceramics in three ways: 1) identify and compare major characteristics of the HWD and HYZ pottery assemblage, 2) identify and compare patterns of variability among serving, cooking, and storage pottery vessels from HWD and HYZ, and 3) consider interpretive models to explain the observed patterns of differences and variability. This thesis begins with a brief discussion on the utility of ceramic variability analysis, and relevant approaches to examining ceramic variability in archaeological contexts. Focus is placed on the evaluation current approaches to explaining ceramic variability in Chinese archaeology. Background information on the Huanbei site is introduced, including its chronological and geographical significance. Next, research methods are presented, including a description of fieldwork, introduction to the dataset, and specific quantitative and qualitative analysis methods used. The results of my analyses, discussed in terms of vessel shape variation, rim/lip variation, dimensional variation, and decorative/stylistic variation are presented. Implications behind the observed patterns of ceramic variability in Shang society based on the Huanbei case are discussed.

CERAMIC VARIABILITY IN SHANG SOCIETY

Discussions on ceramic variability in Shang archaeology have long been undermined by the assumption that ceramics from the Shang period would have been highly standardized resulting from controlled and centralized production. As discussed by Liu Li and Chen Xingcan (2007), "ceramic utensils were produced at the major centre as well as at each regional centre, and then distributed to the entire population, including commoners in the immediate surrounding areas…It can only be generally argued that the production and distribution of ceramics utensils was carried out at regional and subregional levels" (Liu and Chen 2007:137). Underhill (2002:202) suggests that ceramic production was either controlled by political elites or independent producers. At the local level, there would be considerable division of labour for ceramic production such that artisans may have specialized in different kinds of pastes and even functional types of vessels (Underhill 2002:256). Based on oracle bone and textual data, she also points out the possibility that controlled specialized produced was practiced in such a way that "potters who belonged to one descent group made domestic pottery vessels for the late Shang royal household" (Ibid:256).

Ceramic variability has often been discussed in terms of broad-scale questions related to the culture-history of Bronze Age China. While considerable ceramic variability has been observed in Shang pottery vessels (Zhongguo 1994), observed patterns of variability are often de-emphasized in the interest of identifying typical ceramic styles for understanding cultural-historical development (Yan 1997:56-57). The method of *leixingxue* 类型学/ *biaoxingxue* 标型学 pottery seriation, grounded in principles of culture-history and stratigraphy, relies on the identification of typical vessels unique to specific temporal and spatial units to identify change over time (ibid:59). Specifically, this method assumes that certain vessel types or surface treatments that exhibit rapid change or exist for only a short period of time can be identified as representing different temporal or regional styles (Ibid:59). A common practice for classifying

Shang pottery is to sort the sherds according to so-called "typical" and "non-typical" styles, which is frequently used by local archaeologists and discussed in excavation reports (see Anyang 1994). The criteria used to differentiate between "typical" and "non-typical" styles are developed based on the following attributes, vessel shape, rim shape, lip shape, and surface treatment combinations. These are commonly associated with the local region and time period. Vessel type and surface treatment variation is generally subsumed under general forms categories to emphasize the most typical characteristics. Less is known about how to interpret patterns of ceramic variability to examine ceramic production and consumption in site-based contexts.

Research from other areas has shown that ceramic variability generally encodes information regarding an array of social processes not simply related to large-scale cultural history developments (Gosselain 1992, 1999; Lemonnier 1986; 1993; Rice 1989; van der Leeuw 2002). These include: 1) strategies of production related to the process of variety generation; and 2) consumption or use behavior involving the process of variety selection (Rice 1987:201). The general premise behind this inferential process is the idea that variability is often reduced and regularized in different production modes, and therefore its study can provide information regarding production organization and use (ibid:201). In her essay on ceramic diversity, Prudence Rice (1989:113) argues that variability examined through pottery attribute systems can reflect different aspects of production and consumption.

Following Rice (1989:113), at least four pottery attribute systems can be identified to study variability: resources, manufacturing technology, form, and decoration/ style. Variability in resources (ie. clay preparation) provides information about geological variability of the local environment and the availability of clay and temper sources. At the same time, it is also indicative of a culturally-defined 'ceramic environment' defined by potters' knowledge of and preference for the resources potentially available to them. Variability in technological attributes systems (forming and firing) are generally related to the level of technological development, and the degree of standardization and/or mass production in the manufacturing process. Variability in primary forms (vessel shapes such as jar, bowl, etc.) is significant in terms of functions and activities among the archaeological contexts being compared, while variability in secondary forms (lip or base variations, vessel dimensions, appendages) is more likely to inform on production standardization and specialization. Lastly, variability in decorative or stylistic attribute systems generally provides information regarding context of use of vessels or reflects contact between local and non-local potters (ibid:113).

The *chaîne opératoire* approach discussed by Olivier Gosselain (1992; 2000) has offered similar insight into the source and meaning of variability. It emphasizes an understanding of ceramic attribute variation in relation to production choices, and argues that variation essentially reflects the dynamics between the control of production technologies and its use in the negotiation of social identities among different categories of social group membership (Gosselain 2000:208). Resource variability pertains to geological variability of the local environment, the availability of clay and temper sources, as well as the selection of resources by potters. Based on the chaîne opératoire approach, resource and technological attributes are both easily transmissible through postlearning interactions among members involved in the pottery making process, and tends to reflect technological variations over large span of time and space.

Gosselain (2000) argues that each of the three major stages of ceramics' manufacture is shaped by various social and technical factors. The first category involves techniques that leave visible evidence on the finished products, including certain processing techniques (e.g., tempering or mixing clays to modify texture or color), "preforming", "secondary forming", decoration, certain firing techniques (e.g. smudging), and most postfiring treatments. Due to the visibility and technical malleability of these techniques, they tend to be "easily transmissible through postlearning interactions and should display a tendency to fluctuate through time and to be transmitted widely across space to reflect more superficial, situational, and temporary facets of identity" (ibid:191).

The second category involves clay selection, extraction, processing, and firing. These processes are also technically malleable, but because their effects are not as visible as the previous category of techniques potters' choices are mostly influenced by others involved in the pottery making process. Both categories are largely influenced by the transmission of ideas and techniques among members involved in the pottery production process. It is particularly useful in reflecting variation over large regional areas or changes over long periods of times (ibid:191).

The third category involves primary forming, or "roughing out". These stages are the most resistant to change due to the limited visibility and limitation through motor habits (2000:191-192). There are countless ways of shaping ceramics which are not dictated by external restrictions such as the availability of raw materials or functional morphology. Gosselain (1992:572) argues that the choice of shaping techniques is largely cultural-based since limited visibility and motor habits limitations make primary forming largely resistant to change. Among the potters interviewed by Gosselain, most were convinced that there are no possible alternatives to their shaping technique; it was rather a technological tradition whose historical background was unclear but was consistently carried on as a tradition (Gosselain 1992:572). The shaping process appears to be influenced by the potter's ethnicity defined in terms of linguistic boundaries (Ibid:582). For this reason, he argues that the shaping process is a particularly reliable index for understanding cultural diversity.

In terms of decorative attributes, potters claim that "decoration usually follows personal fancy of the maker or is produced to the requirements of the customers" (Gosselain 1992:574). It is generally acknowledged that the finished surfaces of ceramics vessels have a multitude of functions beyond pure decoration (Rice 1987:244). A conventional view highlight their technical functions which include reduction of permeability, improvement of grip during transportation, and modification of thermal properties (Ibid:232). More recently, the role of visible ceramic attributes style in communication and information transfer; research on ceramic production technology have demonstrated that attributes with high visibility best reflect superficial, situational, and temporary facets of identity (Gosselain 2000; Stark 1999). Since decoration and finishing can be easily adopted or modified by any experienced potter, they are more sensitive to innovation since the techniques can be easily copied and reproduced. Consequently, they are often vague in terms of their fashion and diffusion but are particularly effective mediums used in social identity expression (Gosselain 1992:582). In addition, other scholars have also suggested that decorative/stylistic variability is potent information regarding the expression of social identities in social interaction and in defining social boundaries (Dunnell 1978; Sackett 1977, 1985, 1986a, b; Wiessner 1983, 1984, 1985; Wobst 1977).

HUANBEI

Figure 1 has been removed due to copyright restrictions. The information removed is a map indicating the location of Huanbei Shang city (from Anyang 2004b:Figure 1).

The data examined in this study were collected from the Huanbei site, situated in the Huan river valley in the northern part of Henan province in North China (Figure 1). Located in the northern suburb of modern Anyang city, Huanbei sits on flat terrain surrounded by low-relief hills to the north, the foothills of the Taihang Mountains to the west, and broad alluvial floodplains to the east and south (Anyang 2004c:6). Over two dozen pounded earth foundations have been located within the site including a large palace foundation (Thorp 2006:131). The construction of the palace-temple compound, which is by far "the largest Shang or even Bronze Age palace-temple compound ever excavated to date", implies some members of society had gained enough power to organize and direct the labour and resources of others (Jing, et al. 2004:10). It is also located immediately northeast of many late Shang period sites within an area designated as Yinxu[1], which later became the site of the first official state capital of the Shang period.

The discovery of the Huanbei site in 1999 was one of the major outcomes of the

[1] The name Yinxu corresponds to the term "the ruins of Yin" which derives from Chinese historical documents (Thorp 2006:120). The Yin people described in these texts refer to the Shang people.

interdisciplinary collaborative project between the University of Minnesota and the Institute of Archaeology of the Chinese Academy of Social Sciences (Jing, et al. 2002). Its discovery is significant for two reasons: 1) the site was occupied during the middle Shang (ca. 1400-1250 B.C.), a period which foreshadowed the rise of Yinxu, "the only major settlement that can readily claim status as a state capital" to date (Thorp 2006:214); therefore, it provides us with a better understanding of the transition process from pre-state to state-level societies in this region (Liu 2005:13); and 2) stratigraphic information indicates the Huanbei site was abandoned after a 50-year occupation, which offers a fine-scale temporal context for discussing social differentiation within a single site.

Chronology

The recent discovery of Huanbei has been an important factor in shaping current understanding of the Shang cultural chronology. Traditional definition of the Shang cultural chronology was mostly based on earlier archeological research on major Shang type-sites such as Zhengzhou (discovered in the early 1950s) and Anyang (discovered in the late 1920s) (Bagley 1999:33). The traditional view suggests that the Shang cultural chronology is composed of three periods: predynastic Shang 先商, early Shang 早商 and late Shang 晚商 periods (Zou 1980:95-182). Prior to the discovery of Huanbei, scholars had challenged this chronology system by citing evidence from art historical research by Max Loehr (1953) (discussion on Loehr's research to follow); namely, it was argued that the transition from early to late Shang was intersected by an intermediary period (Bagley 1999; Thorp 1985).

Max Loehr's seminal work on the periodization of Shang bronze decorative styles has been particularly influential in the discussion of Shang's cultural chronology because his work demonstrated a gap in the development from Zhengzhou to Anyang bronze decorative styles (see Loehr 1953). By rigorously studying unprovenanced Shang bronze vessels from various museum collections, Loehr developed a chronology charting the development of bronze decorative styles through the seriation of surface decorations on ritual bronze vessels. The development of decorative styles from the Erligang to the Yinxu period was marked by five major styles that reflected a "sustained and intensely self-conscious artistic development" (Ibid:155). Each style was characterized by a combination of changes in vessel shapes, production technique, decorative layout, image content (motifs), forms of relief/ image-ground distinction and draftsmanship (Ibid:147-154). Five styles that represented the development of bronze technology during the Shang period were defined: "Style I" and "Style II" have been associated with Erlitou/Xia and Zhengzhou/Erligang sites; "Style III" is an elaboration of "Style II", which is characterized by modulated lines, *taotie* motifs and dragon motifs. Early versions of "Style III" vessels were found at Zhengzhou while its fully developed form was later found in several other parts of China. "Style IV" and "Style V" vessels have been found in Anyang.

With the subsequent discovery of new archaeological sites, Loehr's seriation of bronze decorative styles linked the Zhengzhou and Anyang sites in a dynamic pattern of growth (Thorp 1985:7). However, vessels from Anyang appeared "exceedingly rich, varied in style, and far more advanced in every way–casting, typology, and decoration–than vessels assigned to such Early Shang sites as Zhengzhou and Panlongcheng, Hubei" (Thorp 1985:9). This influenced scholars to re-consider the Shang chronology (Bagley 1999; Tang 1999; Thorp 1985), and led some to hypothesize that there was "a so-called transition period intervening between the Zhengzhou and Anyang sites" (Bagley 1999:150) to account for the development from Early Shang styles to the mature and complicated Late Shang styles. With the discovery of the large urban settlement at Huanbei as well as about 200 small-scale Middle Shang period sites throughout different regions of China, the presence of such an intermediary period has been affirmed by archaeological evidence (Tang 1999, 2002). Due to different views regarding the definition of Shang sites, this period has been labeled in several ways: Robert Bagley (1999) refers to it as the Transition Period, Robert Thorp (1985) uses the term Transitional Period, while Chinese scholar Tang Jigen (1999; 2002) refers to it as the Middle Shang period.

Preliminary dating of Huanbei was achieved by the identification of diagnostic ceramic sherds collected from the Huanbei city wall and the modern Hanwangdu and Huayuanzhuang villages (Jing et al. 2004:25). Absolute dating of Huanbei was conducted through AMS and conventional ^{14}C dating techniques in the dating of human and animal bone samples as part of the Xia Shang Zhou chronology project (XiaShangZhou 2000:51,71). The Shang chronology of the Central Plains includes three periods: the Early Shang period (1600-1400 BCE), the Middle Shang period (1400-1250 BCE), and finally the Late Shang period (1250-1040 BCE) (Jing, et al. 2002) (Figure 2). Results of absolute dating indicate that the occupation of Huanbei (1400-1250 BCE) fits chronologically between the height of occupation at Zhengzhou during the Early Shang period and the royal occupation at Anyang during the Late Shang Period (Thorp 2006:131). Therefore, Huanbei potentially offers important evidence supporting earlier findings regarding an intermediary transition phase between Early and Late Shang.

Figure 2 has been removed due to copyright restrictions. The information removed is a diagram of the Shang chronology based on C-14 dating (from Jing 2002: Figure 8).

Hanwangdu and Huayuanzhuang

The selection of samples for diversity or standardization comparisons requires that the samples or populations being compared be linked through temporal continuity or geographical contiguity (Rice 1989:112). The reason for this standard is to control extraneous variables and to establish a 'background' or baseline range of variability against which diversity can be meaningfully interpreted (Ibid:112). In this study, HWD and HYZ provide two ideal populations for assessing variability because 1) the two loci are located in close proximity within the Huanbei site; and 2) both of the ceramic assemblages are associated with the 50-year occupation of the Huanbei site. Moreover, HWD and HYZ represent two functionally distinct contexts likely associated with different demographic features – a large palace sector at HWD and a non-palatial sector at HYZ.

Based on excavated and surveyed sections at HYZ and HWD, the two contexts represent areas of distinct layout and scale (Figure 3). At HYZ, four pounded-earth platforms of building foundations (F1-F4), wall foundation trenches, post holes and associated stone plinths, refuse pits, wells, and trenches, sacrificial pits as well as burials have been excavated (Anyang 2004c) (Figure 4). HWD is "characterized by a concentration of platforms of building foundations made of hard pounded earth, including at least two large-sized buildings with courtyards" located in the center of the Huanbei settlement (Jing, et al. 2004:14). In addition, 30 densely distributed buildings were discovered along a 600m section-cleaning ditch north of the two large building foundations (Anyang 2004b:12) (Figure 5).

Significant differences in the scale of HWD and HYZ are demonstrated by a comparison of building sizes. At the HWD locus, the largest building enclosure (F1) measures 174 m east-west by 90 m north-south, totaling 1.6 hectares (Anyang 2004b:16; 2004c:296). Situated 27 m north of it is F2, another rectangular enclosure which is about 90 m by 70m (approximately 6300 m^2) in size based on intensive coring detection. In contrast, the largest rectangular enclosure (F2) at the HYZ locus measures 30.2 m by 4.1 m (approximately 124 m^2); the second largest F1 compound measures 16.5 m by 6.25 m (approximately 103 m^2). To put this difference into perspective, the largest structure at HWD is over 150 times larger than that at HYZ.

Figure 3 has been removed due to copyright restrictions. The information removed is a map showing the proximity of HWD and HYZ at Huanbei. The rectangular area enclosed by the dotted line in zone IV is HYZ, while the area across zone V and VIII is HWD (from Anyang 2004b:Figure 2).

Figure 4 has been removed due to copyright restrictions. The information removed is a map indicating layout of features at Huayuanzhuang (from Anyang 2004c:Figure 3).

Figure 5 has been removed due to copyright restrictions. The information removed is a map indication the distribution of HWD building remains along the section-cleaning ditch (from Anyang 2004b: Figure 9).

As described in the excavation reports, the differences between construction quality of the HWD and HYZ building foundations suggests that much labour effort was devoted to the choice of building materials and the actual construction of the HWD structures (Anyang 2004b:12; 2004c). Building remains at HWD were made with high quality rammed earth showing extremely high density and uniform material composition (Jing, et al. 2002:25). In the F1 foundation at HWD, two types of pounded earth can be distinguished: very dark gray clay and silt clay in the foundation trench; and yellow silt or clay silt above the foundation trench (Anyang 2004a:27). The pounded layers were relatively thin and consistent, measuring about 8-9 cm for the former and 12-15 cm for the latter. In comparison, the HYZ F1 foundation was composed of reddish-brown clay and yellow earth with small amounts of calcium carbonate inclusions (Anyang 2004c:301). This platform was pounded in some areas only and ranged in thickness from 0.2m to 1.1m. A large portion of the F1 foundation utilized the platform of the neighbouring F2 building foundation, and the quality of the pounded earth varied within different sections of the platform (Ibid:301).

Based on the layout and size of building foundations and other features within these three zones, excavators developed preliminary interpretations about their nature: the HWD locus may have been the palatial sector of Huanbei (Anyang 2003a:16), and the HYZ locus may have been the non-palatial residential compound (Anyang 2004c:35). For these reasons, Huanbei offers a unique context for discussing ceramic variability during the Shang period: HWD appears to be the palatial sector within the Huanbei site, which suggests that the material correlates associated with HWD may have been linked to public governmental or religious activities, as well as household activities of the noble classes at the palatial context (Jing et al. 2004:15). On the contrary, the settlement patterns of HYZ suggest a small-scale residential context that was likely not associated with the royal family or any large-scale public activities (Anyang 2004c:35).

FIELDWORK, METHODOLOGY AND DATASET

For this research, I conducted fieldwork at the Anyang field station from June to July 2004 based on previously excavated ceramics collected from Huanbei during the 1999 field season at HYZ and 2001 field season at HWD. The total data set includes 1042 rim sherds (905 valid cases[2]). Rim sherds were selected for analysis to aid in classification and quantification, because rim sherds "provide the most information for assessing the size and shape of a vessel" necessary in vessel identification and size estimation (Orton, et al. 1993:168)[3]. I particularly focus on pottery excavated from refuse pits because they were closely associated with the building remains both spatially and temporally[4]. To aid data classification and organization during and after the field season, formal and surface attributes of the samples were recorded using field-notes, computer database, photography, hand drawing, and digital illustration. Fieldnotes contained detailed descriptions of the measurements and attributes of all pottery sherds examined in the field; this data was initially entered into an Excel database and later set up as an SPSS database to improve database management and aid in basic statistical analyses. Photographs of the pottery sherds were taken using a digital camera for visual reference, some of which were later used in revising the classification scheme after the field season. Hand drawings of the rim profile for selected sherds were done in the field by myself as well as a local field technician to provide a reliable reference of rim shape. These hand drawings were later scanned and traced using Adode Illustrator software in order to place the rims on the same plane of orientation to aid comparison. Selected photographs and rim profile drawings are presented in Appendix 1 and 2 in reference to rim shape and surface treatment classifications

---

[2] Based on sherds larger than 5% of estimated vessel equivalent (EVEs) in vessel diameter. Discussion of EVEs is contained in the methods section.

[3] Body sherds, while usually being the most abundant in archaeological ceramic collections, are usually harder to work with because of the difficulties in determining vessel shape and size (Orton, et al. 1993:223). Although base sherds are sometimes more accurate than rims in predicting the total number of vessels in an assemblage, they may not always provide information about the size and shape of the vessel if the sherd size is too small (Ibid:223).

[4] The site was re-occupied during much later periods, therefore I only selected those pits that were associated with the Shang period occupation.

At HWD, 371 individual rim sherds were collected from the refuse pits H2, H6, H7, H8, and H10. A substantial amount of ceramics and artifacts were excavated from these refuse pits, which include ceramics dated to Phase II of the middle Shang period (Jing, et al. 2004:17). With the exception of pit H2, which is located near the foundations of F1 and F2, all other refuse pits are located along the profile of section cleaning close to the north building cluster. The refuse pits (including H2-H10) at HWD were superimposed by level 4, a 0.2 - 0.4 m layer of brown or yellowish brown silt clay on the same strata as the platform of the HWD building foundations, which suggests that they were contemporaneous to the buildings (Anyang 2004b:17; Jing, et al. 2004:18).

At HYZ, 605 individual rim sherds were collected from the refuse pits H24, J2[5], and J4. The pits are closely associated with the HYZ F1 and F2 buildings on the west side of the excavation unit. H24 is cut into by the F2 west building foundation. J4 opens on the same level as the F1 building foundation, and J2 cuts into the platform of the F1 building foundation (Ibid:300). Both the buildings and the refuse pits are located below level 3, a Shang cultural layer; therefore, all three pits are closely associated with the HYZ building foundations.

To evaluate the differences between the pottery assemblages from HWD and HYZ, I classify the sherd samples according to their respective vessel forms and calculate the ratios of vessel types based on the number of individual sherds. Classification is guided by the Huanbei site survey and excavation reports (see Anyang 2003a, b; Anyang 2004c) with the assistance of Professor Tang Jigen, director of the Anyang field station. The assistance of Professor Tang in pottery rim classification was particularly crucial in this study because I had no prior experience in ceramic analysis. To gain familiarity with the characteristics of Middle Shang pottery, I studied the illustrations and descriptions of pottery excavated from HWD and HYZ as described in the excavation reports. In the field, Professor Tang assisted me in identifying various ceramic

[5] Pits labeled as 'H' and 'J' both represent refuse pits in general, but 'J' specifically refers to water wells.

attributes by sorting the pottery sherds based on type with me and describing to me the typical pottery attributes for each vessel type. These attributes included general paste types, inclusion types, overall vessel size, rim shape, lip shape, surface color, and strategies of differentiating among various vessel types. Complete and refitted vessels were also studied for general reference to help me understand the overall shape and possible functions for various vessel type. After sorting the sherds according to general vessel type, Professor Tang guided me in the detailed classification of various styles for each type for pottery sample from HWD H2 and HYZ H24. These two samples were selected by Professor Tang and Professor Jing to be most representative of the pottery assemblages from the HWD and HYZ contexts. Detailed classification was conducted on these two samples based on Professor Tang's assessment of significant attribute differences in rim shape and vessel size, lip shape features, as well as variations in surface color and inclusions, which is used to guide the following analysis.

In addition to individual sherd count, the EVE (estimated vessel equivalent) measure is applied as a supplementary method of sherd quantification, because sherds which are too fragmented may create a large sample compared to a small collection of large sherds (Gosselain 2000:191-192). The term estimated-vessel equivalent (EVE) was originally coined by Clive Orton in 1975, based on the assumption that "all sherds in an assemblage that come from the same vessel type a certain proportion of that vessel, that is they are *equivalent* to a certain fraction of it" (Orton 1993:179). The EVE method is determined by measuring a specific part of a vessel such as the rim that is calculable as a fraction of a complete vessel (Ibid:173). Specifically, EVEs are calculated "from the lengths (or percentages) of rims of a particular type of pot, which then may be divided by the mean rim diameter" (Orton 1993:173). The fraction of the orifice represented by the sherd is then read on the radius of a rim diameter template which comes closest to the opposite end of the rim sherd (Ibid:352). The EVEs method produces an estimate of the number of complete vessels based on the curvature and completeness of the sherd as a percentage of the total orifice circumference as well as an estimate of the rim diameter of the complete vessel (Egloff 1973:352). The EVE method will aid in the evaluation of the comparability of the two datasets.

Form variability is explored in more detail through the identification of vessel form, and secondary form characteristics, which include rim shape, lip shape, and vessel dimensions (Rice 1989:113). As discussed earlier, variability in terms of resources, technology, form, and decorative/stylistic attributes can all be identified to investigate the structure of variability in pottery (Rice 1989:113). Variability in form attributes is measured by studying the primary forms (shapes) of pottery vessels (Ibid:113). This requires a basic sorting of pottery sherds according to vessel form using classification terminology specifically relevant to Shang pottery from the local region (see Anyang 2004c). Form variability is further explored in terms of rim/lip combinations, which involves producing a list of rim shapes and lip shape combinations observed for each pottery vessel type evaluated (Masson and Rosenswig 2005:369). Following Marilyn Masson and Robert Rosenswig (2005:369), various combinations of rim shape and lip shape attributes are identified and are then labeled according to terminology used in the excavation report of the HYZ locus (Anyang 2004c). All possible rim and lip shapes combinations observed in the two contexts are identified and tabulated. Variability is evaluated based on the absolute and relative numbers of combinations for different subtypes of *pen* basins, *guan* jars, and *li* tripods from HWD H2 and HYZ H24 refuse pits, which contain large samples representative of each context.

Figure 6 has been removed due to copyright restrictions. The information removed is a diagram of a diameter template (from Egloff 1973:Figure 1).

Metric variability is evaluated based on rim diameter and rim thickness measurements (Figure 6). Rim diameter is measured using a diameter chart by measuring a vessel's orifice against a graded series of concentric arcs separated at 5% intervals (Rice 1987:292). The sherd is aligned on the arc of best fit with one edge of the rim at the 0% radius and measurements were taken along the interior edge of the rim sherd (Ibid:352). Two rim charts with 1cm. intervals were used in this study, one that had a maximum diameter of 25 cm applicable to most sherds and another with a maximum diameter of 40cm for sherds with larger diameters. Sherds that had less than 5% of the circumference intact had to be ignored in the final tabulation as well since it was too difficult to obtain an accurate size estimate from them. Sherds that were warped or damaged were also omitted from the measurements but were noted in the field records. Rim thickness is measured by using electronic calipers, and is consistently measured at the widest part of the rim for each rim sherd.

Variability is evaluated using coefficients of variation (hereafter CV), which can provide additional insight regarding standardization (Masson and Rosenswig 2005:373). CV is defined as the ratio of the standard deviation to the mean, and is reported as a percentage by multiplying the above ratio by 100 (Ibid:357). Calculating coefficients of variation is a useful measure of standardization by comparing metric variability between two sets of data; higher coefficients imply less standardization, likely due to the involvement of greater numbers of specialists in pottery making, while lower coefficients suggest less dimensional variability and imply greater standardization (Masson and Rosenswig 2005:377).

To assess decorative/stylistic variation, surface treatment attributes are observed and recorded for comparison. Variability in surface treatment attributes is evaluated by comparing surface treatment combinations for different subtypes of *pen* basins, *guan* jars, and *li* tripods. Surface treatment attributes include decoration found on the body, neck, rim, lip, as well as any attributes observed on the inner surface of the sherd. The description of attributes follows terminology used in the excavation report of the HYZ locus and includes more detailed explanation of the decorative attributes observed in the study sample (Anyang 2004c).

DATA ANALYSIS

Pottery Vessel Types at HWD and HYZ

The following types of pottery vessels are observed at HWD and HYZ: *dou*-stemmed dish, *gui*-pedestal bowl, *jia*-tripod, *pen*-basin, *guan*-jar, *weng*-jar, *zun*-vase, *li*-tripod and *jiangjunkui*-vat (Table 1). *Pen* basins, *li* tripods, *guan* jar, *zun* vases, *gui* bowls, *dou* stemmed dishes are found in both contexts; the *jiangjunkui* vat only appears at HWD, and the *jia* tripod only appears at HYZ. *Pen* basins, *li* tripods, *guan* jars are the most common vessel forms in both contexts according to both the number of rim sherds and the EVE calculation. Percentages of vessel types per context calculated by individual sherds and EVE both show similar patterns of distribution.

Based on individual sherd counts, the HWD assemblage (H2, H6, H7, H8, H10) consists of 36% *pen* basins, 20% *li* tripods and 18% *guan* jars. The remaining 26% of the assemblage consists of five vessel forms, including: *dou*-stemmed dishes, *gui*-pedestal bowls, *weng*-jars, *zun*-vases, and *jiangjunkui*-vats. The HYZ assemblage (H24, J2, J4) is characterized by *li* tripods at 37%, *guan* jars at 29%, and *pen* basins at 32%, which account for 98% of the total assemblage. The remaining 2% of the assemblage consists of five vessel forms, including low percentages (≤1%) of *dou*-stemmed dishes, *gui*-pedestal bowls, *jia* tripods, *weng*-jars, and *zun*-vases.

Table 1. Vessel types at HWD and HYZ

TYPE	HWD				HYZ			
	N	%	EVE	%	N	%	EVE	%
Dou cup	3	0.9%	0.28	0.6%	3	0.5%	0.54	0.9%
Guan jar	62	18.4%	9.94	22.2%	163	28.7%	18.8	31.6%
Gui bowl	7	2.1%	0.95	2.1%	2	0.4%	0.21	0.4%
Jia tripod	0	0.0%	0	0.0%	1	0.2%	0.06	0.1%
Jiangjunkui vat	17	5.0%	2.1	4.7%	0	0.0%	0	0.0%
Li tripod	68	20.2%	10.7	23.9%	210	37.0%	24.3	41.0%
Pen basin	120	35.6%	14.9	33.3%	179	31.5%	14.1	23.8%
Weng jar	8	2.4%	0.97	2.2%	4	0.7%	0.85	1.4%
Zun vase	52	15.4%	4.91	11.0%	6	1.1%	0.44	0.7%
Total	337	100.0%	44.8	100.0%	568	100.0%	59.3	100.0%

Table 2. Complete dataset

	TYPE	N					TOTAL		EVE					TOTAL	
HWD		H2	H6	H7	H8	H10	N	%	H2	H6	H7	H8	H10	EVE	%
	Dou cup	1	-	1	-	1	3	0.9%	0.09	-	0.08	-	0.11	0.28	0.6%
	Guan jar	29	5	16	1	11	62	18.4%	4.01	0.97	2.99	0.1	1.87	9.94	22.2%
	Gui bowl	3	1	2	-	1	7	2.1%	0.39	0.17	0.34	-	0.05	0.95	2.1%
	Jia tripod	-	-	-	-	-	0	0.0%	-	-	-	-	-	0	0.0%
	Jiangjunkui vat	17	-	-	-	-	17	5.0%	2.1	-	-	-	-	2.1	4.7%
	Li tripod	51	4	7	2	4	68	20.2%	8.4	0.52	1.23	0.19	0.35	10.7	23.9%
	Pen basin	64	5	35	7	9	120	35.6%	7.2	0.78	5.22	1	0.72	14.9	33.3%
	Weng jar	5	3	-	-	-	8	2.4%	0.62	0.35	-	-	-	0.97	2.2%
	Zun vase	51	-	1	-	-	52	15.4%	4.83	-	0.08	-	-	4.91	11.0%
	TOTAL	221	18	62	10	26	337	100.0%	27.6	2.79	9.94	1.29	3.1	44.8	100.0%
HYZ		H24	J2	J4			N	%	H24	J2	J4			EVE	%
	Dou cup	3	-	-			3	0.5%	0.54	-	-			0.54	0.9%
	Guan jar	125	14	24			163	28.7%	14.4	1.75	2.64			18.8	31.6%
	Gui bowl	2	-	-			2	0.4%	0.21	-	-			0.21	0.4%
	Jia tripod	-	-	1			1	0.2%	-	-	0.06			0.06	0.1%
	Jiangjunkui vat	-	-	-			0	0.0%	-	-	-			0	0.0%
	Li tripod	155	21	34			210	37.0%	18.2	2.69	3.4			24.3	41.0%
	Pen basin	130	6	43			179	31.5%	10.3	0.55	3.3			14.1	23.8%
	Weng jar	2	-	2			4	0.7%	0.35	-	0.5			0.85	1.4%
	Zun vase	6	-	-			6	1.1%	0.44	-	-			0.44	0.7%
	TOTAL	423	41	104			568	100.0%	44.4	4.99	9.9			59.3	100.0%

Calculations based on EVE estimation reveal similar patterns of distribution, suggesting that the effects of sherd breakage did not have dramatic impact on the relative percentages of vessel types (Table 2). The HWD assemblage (H2, H6, H7, H8, H10) is characterized by 34% *pen* basins, 23% *li* tripods and 21% *guan* jars, which altogether account for 79% of the entire assemblage. The remaining 21% of the assemblage consists of five vessel forms, including: *dou* stemmed dishes, *gui* pedestal bowls, *weng* jars, *zun* vases, and *jiangjunkui* vats. The HYZ assemblage (H24, J2, J4) is characterized by *li* tripods at 40%, *guan* jars at 31%, and *pen* basins at 26%, which account for 96% of the total assemblage. The remaining 4% of the assemblage consists of five vessel forms, including: *dou* stemmed dishes, *gui* pedestal bowls and *jia* tripods, *weng* jars, and *zun* vases.

Based on the relative percentages of vessel types from HWD and HYZ, the former is characterized by a more evenly distributed range of different pottery vessel types relative to the latter. The major difference between the two contexts is reflected in high percentages of *jiangjunkui* vat and *zun* vase at HWD relative to the typical *pen* basin, *guan* jar, and *li* tripod combination. At HWD, there are relatively low percentages of other vessel types relative to *pen* basins, *guan* jars, and *li* tripods. Second, at HWD, *pen* basins are the most popular, followed by *li* tripods and *guan* jars. At HYZ, *li* tripods are the most popular, followed by *guan* jars and *pen* basins. Differences in the relative percentages of these three most typical vessel types suggest two different sets of consumption requirements were demanded by the consumers at HWD and HYZ. Both patterns reflect distinct differences in the consumption demands and preferences of the consumers from HWD and HYZ. The significance of these observed patterns will be further elaborated in the discussion section.

Form Variability

As often described in excavation reports (see example in Anyang 2004c), conventional ceramic typology in China addresses pottery vessel types in gross functional terms; labels such as *guan* jars are often used when referring to groups of pottery vessels interpreted as having similar functions though distinct in shape. Appendix 1 shows illustrations of typical vessel shapes per vessel type. In this study, variations in vessel shape are observed for two vessel types in the HWD and HYZ samples: *pen* basin and *guan* jar rim sherds (Table 2). Among them, *guan* jars exhibit the most variability in the number of vessel shapes (n=3).

The same number of vessel shape variations in *guan* jars is observed in both HWD and HYZ rim sherd samples. Three forms of *guan* jars, include: 1) large jar with incurved sides, vertical neck, and a flat base; 2) different forms of a small jar with recurved sides, outcurved neck, and a flat base; and 3) small jar with outcurved neck, globular shape, and round base. While the number of varieties is the same, the percentages of these subtypes are different. Globular *guan* jars are the most popular at HWD, while large-sized *guan* jars are the most popular at HYZ. In terms of *guan* jars, the distribution of each of the three forms is fairly equal in terms of their relative percentages at both contexts. At HWD, the globular form presents a slightly higher percentage compared to the other types, while the large-size forms are most popular at HYZ.

Table 3. Percentages of pottery subtypes for *guan* jars and p*en* basins.

TYPE	SUBTYPES	HWD H2		HYZ H24	
		n	%	n	%
Guan jar	Large-size (diameter 14-40 cm)	9	31.0%	49	39.2%
	Small-size (diameter 12-28 cm)	9	31.0%	39	31.2%
	Globular (diameter 10-18 cm)	11	37.9%	37	29.6%
Total		29	100.0%	125	100.0%
Pen basin	Flat-base (diameter 20-28 cm)	44	68.8%	108	83.1%
	Round-base (diameter 26-42 cm)	20	31.3%	22	16.9%
Total		64	100.0%	130	100.0%

Two general forms of *pen* basin are observed in both contexts, including: 1) basin with incurved sides, outflared neck and flat base; and 2) basin with flared sides and slightly rounded base. Both varieties appear in the HWD and HYZ pottery sherd samples, and in both cases flat-based *pen* basins are more popular than round-based *pen* basins. In fact, based on the relative percentages of *pen* basins at HWD, the ratio of flat-based *pen* basins is significantly higher than round-based basins. The same pattern is observed in the HYZ, where a large majority of samples are flat-based basin sherds.

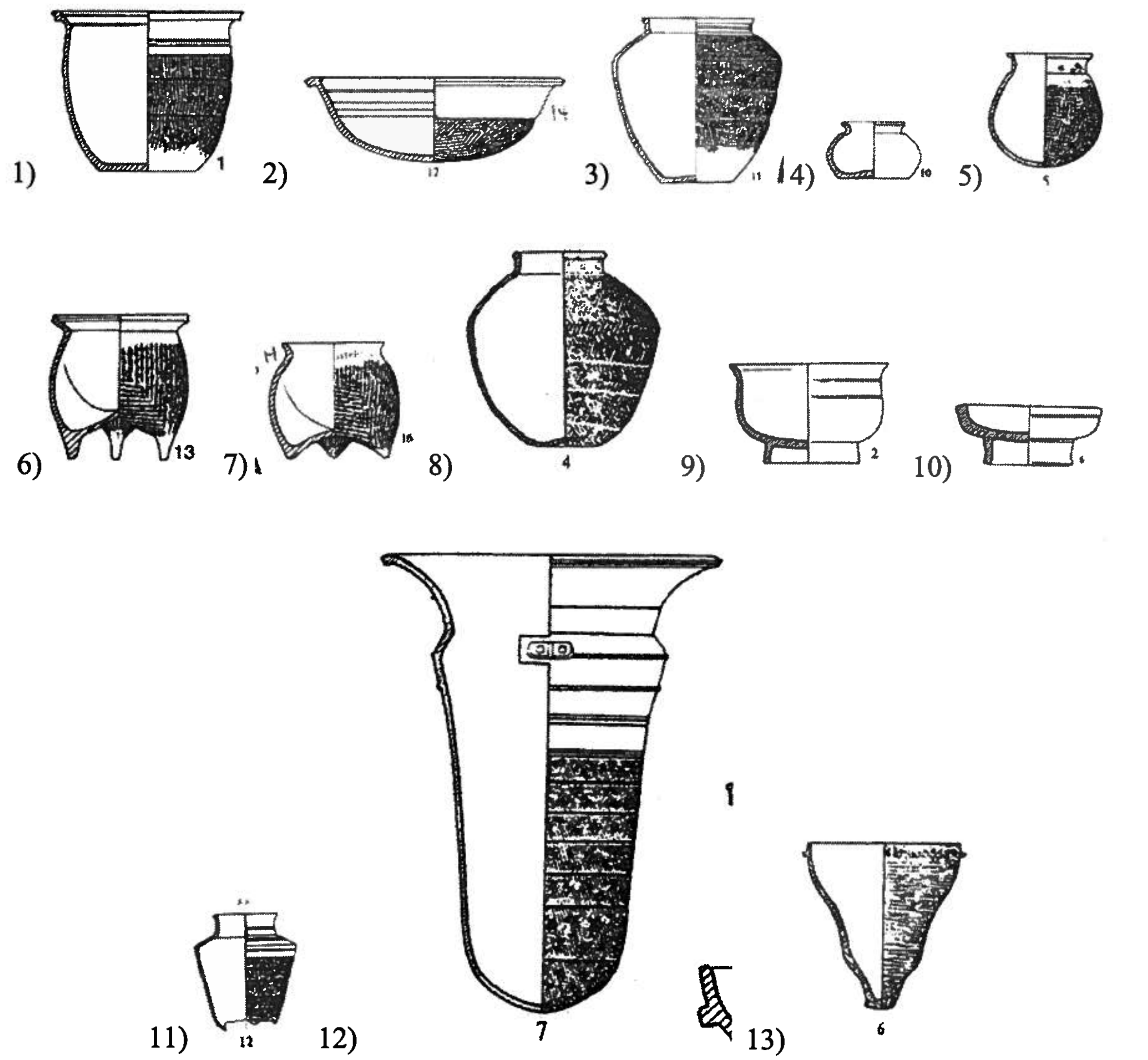


Figure 7. Vessel types identified at HWD and HYZ

1)*Pen* (Deep belly) (Underhill 2002:291-297,308); 2) *Pen* (Shallow belly) (Anyang 2004c:Figure 18); 3) *Guan* (Anyang 2004c:Figure 18); 4) *Guan* (Anyang 2004c:Figure 19); 5) *Guan* (Globular) (Anyang 2004c:Figure 19); 6) *Li* (Tang 1999:Figure 3); 7) *Li* (from Anyang 2004c:Figure 14); 8) *Weng* (from Anyang 2004c:Figure 14); 9) *Gui* (from Tang 1999:Figure 10); 10)*Dou* (from Anyang 2004c:Figure 17); 11) *Zun* (from Anyang 2004c:Figure 20); 12) large-mouthed *Zun* (Tang 1999:Figure 2); 13) *Jiangjunkui* Vat (Anyang 2003a:Figure 12).

Variation is also observed in *zun* vases at HWD and HYZ. Two forms of *zun* vase, including: 1) large-mouthed vase with wide outcurving rim, deep body, and round base; and 2) small vase with outcurving rim, recurved sides, and a round base. However, the large-mouthed style is observed only in the HWD sample, while the small vase is observed only in the HYZ sample.

Form variability is also examined in terms of the number of rim/lip combinations for *pen* basin, *guan* jar, and *li* tripod sherd samples from HWD H2 and HYZ H24 refuse pits (Table 4). At HWD, there are four rim/lip combinations for flat-based *pen* basins and three for round-based *pen* basins. At HYZ, there are five rim/lip combinations for flat-based *pen* basins and four for round-based *pen* basins. In both contexts, flat-based *pen* basins display more variability than round-base basins.

Flat-based *pen* basins in both contexts are associated with double outflaring rim, which is characterized by the outflaring rim and wide rim edge which gives the rim the appearance of two eversion points. Four rim/lip combinations are shared by HWD and HYZ, the most popular combination being the double outflaring rim and thick square lip combination. Based on the number of rim/lip combinations observed at HWD (n=4) and HYZ (n=5), flat-based basins show relatively greater variation at HYZ. One combination that is found exclusively at HYZ context is the double outflaring rim and round lip style.

Relative to flat-base *pen* basins, less variability is observed in round-base *pen* basins in both contexts. At HWD, there are three rim/lip combinations, and at HYZ there are four rim/lip combinations, which suggests greater variability in rim/lip combinations is observed in the HYZ context. The most popular style at HWD H2 is the direct rim and square lip with groove combination, while at HYZ H24 the direct rim/square lip combination is most popular. The wide outflaring rim/square lip with groove combination is unique to HYZ H24.

Table 4. Rim/lip combinations by vessel type and form

			HWD	HYZ
Guan (Large)	Outflaring rim	Round lip	0	1
	Outflaring rim	Thick squared lip	2	0
	Straight rim	Squared lip	2	5
	Straight rim	Thick squared lip	5	43
	Total		N=3	N=3
Guan (Small)	Outcurving rim	Pointed lip	0	2
	Outcurving rim	Pointed lip w/ exterior thickened	0	9
	Outcurving rim	Round lip	0	12
	Outcurving rim	Square lip	0	7
	Outcurving rim	Square lip w/ groove	0	1
	Outcurving rim	Thick round lip	0	3
	Outflaring rim	Square lip	6	4
	Outflaring rim	Square lip w/ groove	0	1
	Straight rim	Square lip	3	0
	Total		N=2	N=8
Guan (Globular)	Outcurving rim	Pointed lip	6	2
	Outcurving rim	Round lip	0	28
	Outcurving rim	Square lip	5	9
	Total		N=2	N=3
Pen (Flat-base)	Double outflaring rim	Pointed lip	5	4
	Double outflaring rim	Round lip	0	8
	Double outflaring rim	Square lip	6	6
	Double outflaring rim	Square lip w/ groove	12	13
	Double outflaring rim	Thick square lip	21	77
	Total		N=4	N=5
Pen (Round-base)	Direct rim	Pointed lip	1	1
	Direct rim	Square lip w/ groove	14	2
	Direct rim	Squared lip	5	16
	Wide outflaring rim	Square lip w/ groove	0	10
	Total		N=3	N=4
Li	Outflaring rim	Pointed lip	0	1
	Outflaring rim	Round lip	2	3
	Outflaring rim	Square lip	3	30
	Outflaring rim	Square lip w/ double groove	0	1
	Outflaring rim	Square lip w/ groove	9	26
	Outflaring rim	Thick square lip	3	6
	Outflaring rim	Thick square lip w/ groove	0	6
	Outflaring rim	Thin square lip	7	4
	Outflaring rim	Thin square lip w/ groove	0	9
	Pan-shaped rim	Square lip	19	8
	Pan-shaped rim	Square lip w/ groove	8	61
	Total		N=7	N=11

Large *guan* jar rim/lip combinations are equal in number at both HWD and HYZ. There are three rim/lip combinations for the large *guan* jar sherds in both contexts, which reflect the same degree of variability. Two combinations are common in both contexts: the straight rim and squared lip, and straight rim and thick squared lip combinations. The most popular combination is the short straight rim with thick squared lip, followed by the straight rim/squared lip combination, where there is no thickening of the lip. Two combinations of outflaring rim are unique to each context, including 1) outflaring rim shape, round lip found only in HWD, or 2) outflaring rim, thick squared lip found only in HYZ.

Nine rim/lip combinations are observed for small-size *guan* jars, which makes it the most varied among the three *guan* jar forms identified here. Two rim/lip combinations are observed at HWD while eight combinations are observed in HYZ; therefore, small-sized *guan* jars are siginificantly more varied at HYZ than at HWD. Only one combination (outflaring rim, square lip) is shared by both contexts, while the other seven combinations are exclusive to HYZ. These include various outcurving rim combinations associated with a variety of lip shape; no outcurving rim combinations are observed in HWD. The most popular rim/lip combination found at HWD is the outflaring rim and square lip, which appears to be a smaller version of the large-size *guan* variety. The most popular rim/lip combination found at HYZ is the outcurving rim and round lip combination. The outflaring rim and square lip with groove combination is only found in HYZ.

Globular *guan* jars have the lowest number of rim/lip combinations among the three *guan* jar subtypes. At HWD, two combinations are observed, while at HYZ three combinations are observed. Globular *guan* jars are by far the only form of *guan* that show more variation at HWD than at HYZ. Rim shape is highly consistent for this vessel type as globular *guan* jars are only associated with the outcurving rim. Variations in the lip shape are observed, and based on the samples examined the outcurving rim and pointed lip combination is most popular at HWD while the outcurving rim and round lip combination is most popular at HYZ. Two combinations (outcurving rim and pointed lip, and outcurving rim and square lip) are common in both contexts. The outcurving rim and round lip combination is found exclusively at HYZ H24.

At HWD, large size *guan* jars show more variability indicated by the highest number of rim/lip combinations among all three *guan* jar types in that context (n=3). Both small size and globular *guan* jars have the same pattern of variability (n=2). At HYZ, small size *guan* jars display the most variability in terms of rim/lip combinations (n=8), while large size and globular jars both display relatively less variability (n=3). High variability is observed for large *guan* jars at HWD and small *guan* jars at HYZ. Consistent low variability in globular *guan* jars in both contexts suggests relatively greater standardization for this particular vessel subtype compared to other *guan* jar forms.

Li tripods exhibit significant variability in terms of the number of rim/lip combinations. A total of eleven combinations were present in both contexts combined, seven are present in HWD and eleven in HYZ. At HWD, the most popular combination is the *pan*-shaped rim/ square lip. The *pan*-shaped rim is a style unique to *li* tripod and is characterized by an outflaring rim with slightly incurving edges. At HWD, the total number of *pan*-shape rim sherds (n=27) is greater than the number of outflaring rim sherds (n=24), which suggests the *pan*-shaped rim shape is more popular at HWD. The number of *pan*-shaped rim/lip combinations (n=2) is lower than outflaring rim/lip combinations (n=5), which indicates higher variability in outflaring rims. At HYZ, the opposite is true; the number of *pan*-shaped rim sherds (n=69) is lesser than outflaring rim sherds (n=86), which suggests that *li* tripods with outflaring rims are generally more popular. The number of *pan*-shaped rim combinations (n=2) is significantly lower than outflaring rim combinations (n=9), which indicates that outflaring rim styles are more varied in terms of the number of rim/lip combinations. However, the single most popular rim/lip combination at HYZ is the *pan*-shaped rim/ square lip with groove (n=61).

In examining patterns of variability in *pen*, *guan*, and *li* pottery sherds from HWD and HYZ, *guan* jars exhibit the most variability in terms of the number of rim/lip combinations. Among the three types of vessels examined, *pen* basins are the least varied in terms of the number of rim/lip combinations. These patterns suggest significant differences in the degrees of variability in rim/shape combinations between the two contexts. Though the reported patterns may be affected by sampling vagaries, the observed variability demonstrates that variability is more significant than expected both within the *guan* jar, *pen* basin, and *li* tripod vessel subtypes.

Metric Variability

Metric variability is assessed based on rim diameter and rim thickness measurements for *pen* basins (flat-based and round-based), *guan* jars (large, small, and globular), and *li* jars to evaluate the relative degree of metric variability within single vessel types[6]. Table 6 show the metric values calculated for these forms based on sherd samples from HWD H2 and HYZ H24. Coefficients of variation (CV) values across all three categories were generally high, which suggests that ceramics at HWD and HYZ generally display high variability in both contexts.

Rim diameter measurements for flat-base *pen* basins display higher CV values relative to round-base *pen* basins in both the HWD and HYZ samples, suggesting greater rim diameter variability in the former vessel type. Round base basins provide a particular useful measure of relative variability due to relatively equal sample sizes in both contexts. CV values for rim diameter suggest that round base *pen* basins are more standardized in HWD than in the HYZ sample. Rim thickness measurements show similar patterns, such that flat-base *pen* basins possess higher CV values in relation to round base *pen* basins in both samples. Again, rim thickness measurements indicate that round base *pen* basins from HWD are more standardized

[6] Low sample size made it difficult to measure standardization in other vessel types. For example, although there is a sufficient sample of *zun* vases at HWD, the sample from HYZ is too small to produce a reliable index for comparison.

than those from HYZ.

The table of metric values for rim diameter shows that small size *guan* jars from the HWD H2 sample have the lowest CV value among all types of *guan* in both contexts. These results may be influenced by the classification procedure, such that this particular vessel subtype is defined by *guan* jars possessing small vessel size. Results contrast with the high degree of variability observed in rim/lip combinations and surface treatment combinations observed for small *guan* jars in both contexts. In the HWD sample, globular *guan* jars have the second lowest CV value for rim diameter measurements, followed by large size *guan* jars. This suggests that the rim diameter of large size *guan* jars is most varied in the HWD sample. In the HYZ sample, large size *guan* jars have the second lowest CV value, followed by globular size *guan* jars. This indicates that rim diameter measurements of HYZ globular *guan* jars display the highest variability.

Table 5. Metric values for rim sherds at HWD and HYZ based on vessel type

CONTEXT	TYPE	SUBTYPES	Rim Diameter (cm)				Rim Thickness (mm)			
			N	Mean	SD	CV	N	Mean	SD	CV
HWD H2	Guan jar	Large-sized	9	29.5	5.2	17.6	9	8.4	0.7	8.5
		Small-sized	9	15.0	1.4	9.3	9	8.3	1.7	20.8
		Globular	11	15.0	2.1	14.0	11	8.4	0.8	9.5
	Li jar		51	17.2	4.7	27.3	51	6.3	1.4	22.2
	Pen basin	Flat-based	44	33.0	7.2	21.8	44	8.4	2.0	23.8
		Round-based	20	37.0	5.0	13.5	20	9.6	1.5	15.6
CONTEXT	TYPE	SUBTYPES	Rim Diameter (cm)				Rim Thickness (mm)			
			N	Mean	SD	CV	N	Mean	SD	CV
HYZ H24	Guan jar	Large-sized	49	23.7	4.7	19.8	49	8.7	2.1	24.1
		Small-sized	39	14.4	1.5	10.4	39	7.2	1.3	18.4
		Globular	37	16.5	3.3	20.0	37	7.2	1.1	15.3
	Li jar		155	18.9	5.7	30.2	155	6.2	1.3	21.0
	Pen basin	Flat-based	108	33.6	7.6	22.6	108	8.3	1.6	19.3
		Round-based	22	34.0	5.9	17.4	22	7.8	1.4	17.9

In terms of rim thickness measurements, CV values for HWD *guan* jars show low CV values for large-size and globular jars relative to small-size *guan* jars. This pattern indicates that rim thickness for large size *guan* is the least varied, while globular *guan* jars are the most varied in the HWD sample. In the HYZ H24 sample, rim thickness measurements of globular *guan* jar have the lowest CV value, followed by small size *guan* jars and finally large size *guan* jars. The observed pattern contrasts with the HWD values in that globular *guan* jars are the least varied in term of rim thickness while large *guan* jars are most varied. Small size *guan* jars have a higher CV value for rim thickness measurements even when the HWD sample size is significantly smaller than the HYZ sample, which suggests that the HYZ sample is relatively standardized compared to HWD.

Based on rim diameter measurements of *li* tripods, high variability is observed in both HWD and HYZ contexts. Rim thickness measurements produce similar patterns of variability as suggested by high CV values. Interestingly, while the *li* jar sample size from each context is very different, CV values for both rim diameter and rim thickness are similar between HWD and HYZ. In fact, rim thickness measurements indicate a slightly higher CV value (greater variability) for HWD *li* tripods despite having only a third of the HYZ sample size. This suggests that the rim thickness of *li* tripods from HYZ is more standardized than those from HWD.

Decorative/ Stylistic Variability

Variation observed in decorative characteristics is evaluated for *pen* basins, *guan* jars, and *li* tripods. Appendix 2 shows photographs of general surface treatment types according to vessel type. This includes an evaluation of surface treatment attributes observed on the body, neck, rim, lip, and the sherd inner surface. Combinations are defined differently depending on surface treatment styles, but are generally determined by the style and placement of surface treatment on the outer body, and surface treatment along the rim or inner surface of the sherd (Appendix 3).

Surface treatments associated for flat base basins in the samples from HWD H2 and HYZ H24 samples include cordmark, line, line and appliqué, line and appliqué and cordmark, and plain. A total of twenty surface treatment combinations are observed in the two samples. Six combinations are shared in both contexts, three are exclusive to HWD H2, and eleven are exclusive to HYZ H24. The most popular combination in both contexts is the incised line and cordmark with one pair of incised lines on the vessel body, 1 single incised line along the neck circumference, and a wide groove along the inner rim surface. Common surface treatments for round base *pen* basins observed at HWD and HYZ include various cordmark, line and plain surface treatment, represented by a total of eight surface treatment combinations. Three combinations are exclusive to HWD, while five combinations are exclusive to HYZ. At HWD, the most popular combination (n=11) is the cordmark surface treatment that begins approximately 5 cm. below the rim. At HYZ, plain surface treatment with a wide groove along the rim inner surface (n=15). There are no common surface treatment styles between the two contexts, suggesting that the consumers from HWD and HYZ preferred completely distinct types of round base *pen* basins. This is only observed in this particular vessel subtype.

More variability is observed in the decorative attributes of flat-based *pen* basins (n=9) from HWD relative to round base *pen* basins (n=3). At HYZ, greater variability is observed in flat-based *pen* basin (n=17) compared to round-base *pen* basins (n=5). Surface treatment variation for *pen* basins is most visible in terms of the numbers/ combinations of incised lines on the outer surface as well as the presence or absence of grooves along the inside of the rim. This is demonstrated by the large number of surface treatment combinations observed for incised line and cordmark style (n=14), which is the largest number of combinations for a single surface treatment style observed in both HWD and HYZ.

DISCUSSION AND CONCLUSION

This study of Shang pottery from HWD and HYZ provides information on ceramic variability of Shang society based on ceramic evidence collected recently from Huanbei. New information regarding the general character of the Huanbei pottery assemblage is presented, particularly since no detailed reports have yet been published for pottery collected from the HWD context. Three primary objectives of this study include: 1) identifying and comparing major characteristics of the HWD and HYZ pottery assemblages, 2) identifying and comparing patterns of variability among serving, cooking, and storage pottery vessels from HWD and HYZ, and 3) considering interpretive models to explain the observed patterns of differences and variability. Findings of this study demonstrate that pottery sherds collected from HWD and HYZ demonstrate distinct differences in terms of form and stylistic attributes. Moreover, significant attribute variability is observed in the pottery sherds examined from both contexts. Results of my study suggest that significant ceramic variability is evident in the pottery produced for and consumed by the settlers at Huanbei such that a model of controlled and centralized production may not offer adequate explanation for the observed patterns. Here I present some possible interpretations for the observed patterns of ceramic variability.

As suggested by Prudence Rice (1989:113), vessel form can reflect functions and activities among the archaeological contexts being compared. I identified significant differences between the pottery assemblages from HWD and HYZ based on the ratios of pottery vessel types. The high ratios of *pen* basins, *li* tripods and *guan* jars suggest that these vessels were important in both HWD and HYZ contexts. In particular, globular *guan* jars are the most common among all three *guan* jars subtypes at HWD, while large size *guan* jars are most common at HYZ. If *guan* jars are generally associated with storage functions, this suggests that the most preferred type of storage vessel in the two contexts is different. The exclusive presence of large-mouth *zun* vases and *jiangjunkui* vats at HWD indicates that their use may have been associated exclusively with palatial activities. Anne Underhill (2002:206) has suggested that the large-mouth *zun* vase was used in alcohol fermentation, while others have suggested a role in alcohol serving (Anyang 2004a). The exclusive presence of large mouthed *zun* vases at HWD has the following implications: 1) alcohol consumption was more important at HWD than at HYZ; and 2) the large percentage of large sized *zun* vases at HWD suggests that they demanded fermentation vessels with large capacity possibly to support large group consumption.

By way of contextual association, the exclusive presence of the *jiangjunkui* vat at HWD suggests that its function is closely related to activities that would take place in a palace context. Current interpretations of its use include alcohol fermentation vessel, bronze smelting, and salt production (boiling sea water to extract salt) (Underhill 2002; Zhongguo 1987). Future research using chemical analyses methods may allow us to identify its specific use and therefore identify the association of certain activities with a palace context. *Gui* pedestal bowls and *dou* stemmed cups have appeared in more labor-intensive styles during the late Shang period: white kaolin clay *dou* stemmed cups and jade *gui* pedestal bowls appeared in Anyang associated with elite burials (Orton, et al. 1993:169-171, 330). The generally low quantities of these vessels at both HWD and HYZ suggest they were not popular in both contexts. However, the relatively higher ratio of both vessels at HWD suggest that these vessels were more popular but not exclusively used in the palace context.

Form variation offers clues to the degree of standardization in the manufacturing process (Rice 1989:113). Examination of forming techniques used to produce *pen* basin, *guan* jar, and *li* tripod pottery vessels display low variability. The vessel shape forms of flat-base *pen* basins, round-base *pen* basins, large *guan* jars, globular *guan* jars, and *li* tripods show a high level of consistency in terms of overall form. The only vessel type that displays high variability in shape is the small *guan* jar. It appears that the production/consumption of *guan* jars may have been governed by a different set of standards. One possible explanation is that due to the small-size of these *guan* jars, the exchange of these vessels among different groups of people would have been popular due to their transportability. Because forming is most resistant to change due to limited visibility and motor habits, variations in vessel shape tend to reflect distinct cultural traditions governed by linguistic or other social boundaries (Gosselain 2000:191-192; 1992:572). Since Huanbei was one of the largest settlements in the regions at that time, it is likely that foreign-styled pottery would have been imported and exchanged in the local markets as travelers visited the area.

Metric variation provides specific information regarding the volume of food prepared and served, group size of the consumers, and the variety of food processing tasks practiced (Blitz 1993:85), but can also establish a measure of relative standardization. In a similar case study, it has been suggested that elite/religious/public contexts have a more restricted vessel size range and disproportionately larger vessels to support the limited set of large-group food consumption and storage needs (Blitz 1993:87). Greater size variability is associated with village/household contexts to reflect the greater variety in domestic activities practiced (Blitz 1993:90). In this study, the observed patterns suggest that vessels used in the palace context were not always more standardized than vessels from residential context. In fact, it is observed that small size-*guan* jars and flat-base *pen* basins from HWD were more varied in rim thickness measurements according to the calculated CV values. This reflects that these vessels may have been associated with domestic activities, and that domestic activities practiced at HWD were relatively diverse. Mean rim diameter comparisons for *pen* basin, *guan* jar, and *li* tripod vessels do not indicate significant differences in the average vessel size across similar categories. However, as mentioned earlier, there are additional large sized vessels that were associated exclusively with the HWD context which may have been dedicated to activities practiced exclusively in the palace sector.

Comparisons of secondary form variation (rim form, lip variation, vessel size) best represent the observed ceramic attribute variability in the samples from Huanbei. Like vessel shape, this aspect of form variation would have been largely influenced by cultural traditions following Gosselain's argument (1992:572). Unlike vessel shape attributes, rim/lip combinations indicate that pottery from both HWD and HYZ display high variability. Based on the number of rim/lip combinations, round-base basins display greater standardization than flat-base basins in both contexts. Also, globular *guan* jars display greater standardization than large size and small size *guan* jars. It appears that these two subtypes were more standardized compared to other subtypes of *pen* basins and *guan* jars. A possible explanation for this pattern is that the producers of these two vessel subtypes are potters shared similar cultural backgrounds and may have been employed as specialized producers of these pottery vessels. In comparison, high variability in small size *guan* jars and *li* tripods suggest these vessels were obtained from a more diversified set of sources, the sources of which may have involved a multitude of potters from diverse cultural backgrounds and pottery traditions.

Evidence from decorative/stylistic attributes corroborate with these findings. Decorative/ stylistic attributes are generally useful in providing information about the context of use or outside contacts of the makers (Rice 1989:113), and is particularly potent with information regarding the expression of social identities in social interaction and social boundaries. Results of this comparison are particularly telling of the differences between the HWD and HYZ round-base *pen* basins. Based on the types of surface treatment combinations observed, the round-base *pen* basins used in the two contexts are completely distinct in style. Vessels from HWD generally exhibit some variability, except for globular *guan* jars where only one surface treatment combination is observed. In comparison, vessels from HYZ display high variability for all *pen* basin, *guan* jar, and *li* tripod vessels. Due to the lack of information regarding resource variability, it is difficult to determine whether the observed variations are the results of active cultural interaction between foreign and local potters, or if foreign pottery vessels were frequently imported and consumed by the local people. The observed patterns, however, strongly suggest that the pottery vessels produced for and consumed at Huanbei do not demonstrate characteristics of a highly standardized pottery production system. Some vessels exhibit more standardized attributes, which indicate that these particular types may have been more involved in socially visible contexts. Variability in forming and decorative attributes suggest 1) consumers from the HWD context demanded a greater variety of pottery vessel types for palatial activities but often a more limited range of shapes and decorative styles; and 2) consumers from the HYZ used a limited range of pottery vessel types likely dedicated to domestic activities but greater variability in the range of shapes and decoration.

This study has attempted to demonstrate the potential value of investigating intra-site ceramic variation. Traditional ceramic research in China often attributes ceramic variation to culture-historic differences resulting from cultural, regional and temporal differences (Zhongguo 2003:253). Results of my analysis suggest form and surface treatment variability are particularly effective in illustrating patterns of variability for *pen*, *guan*, and *li* vessels from Huanbei. Metric variability in terms of rim diameter and rim thickness has also revealed interesting patterns. Future research may benefit from the consideration of additional attributes in the study of complete or refitted vessels. To better understand the expressions of variability in Shang pottery, methods in experimental archaeology may offer new insights on sources of production variability. Resource variability and technological variability should be explored to better understand the organization of pottery production, particularly since firing technology has revealed significant variability. It will also provide more information for assessing whether the source of variability observed in this study is due to variation in local production or high volume import of foreign pottery vessels.

An additional perspective yet to be considered in future research is the role of bronze vessels in daily contexts. Cooking, storage, and serving vessels fabricated in bronze were a common part of the Shang elite's lifestyle as suggested by mortuary evidence (Underhill 2002:238-239). Since HWD was a palatial compound where governmental/religious activities took place and the royal family resided, many more bronze vessels would have been consumed compared to HYZ. To what degree would this have affected the observed ceramic patterning at Huanbei? Were bronze vessels frequently consumed in daily contexts, and if so, what role would they have played in different activities? Future research should consider the significance of pottery vessel use and variability in relation to other craft industries.

BIBLIOGRAPHY

Anyang

2003a Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo Anyang Gongzuodui, 中国社会科学院考古研究所安阳工作队. Henan Anyang shi Huanbei Shang cheng de kancha yu shijue 河南安阳市洹北商城的勘查与试掘 (Survey and Test Excavation of the Huanbei Shang city in Anyang). *Kaogu 考古* 428(5):3-16.

2003b Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo Anyang Gongzuodui, 中国社会科学院考古研究所安阳工作队. Henan Anyang shi Huanbei Shang cheng gongdianqu yi hao jizhi fajue jianbao 河南安阳市洹北商城宫殿区一号遗址发掘简报 (A Brief Report on the Excavation of Palatial Compound F1 at the Huanbei Shang city in Anyang, Henan). *Kaogu 考古* 428(5):17-23.

2004a Anyang Work Team of the Institute of Archaeology, CASS. A Brief Report on the Excavation of Palatial Compound F1 at the Huanbei Shang City in Anyang, Henan. *Chinese Archaeology* 4:21-28.

2004b Anyang Work Team of the Institute of Archaeology, CASS. Survey and Test Excavation of the Huanbei Shang City in Anyang. *Chinese Archaeology* 4:1-20.

2004c Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo Anyang Gongzuodui, 中国社会科学院考古研究所安阳工作队. 1998-1999 Anyang Huanbei Shang cheng Huayuanzhuang dong di fajue baogao 1998-1999 安阳洹北商城花园庄东地发掘报告 (Excavation Report on the Locus East of Huayuanzhuang of the Shang Period City at Huanbei in Anyang in 1998-1999). *Kaoguxue Jikan 考古学集刊* 15:296-358.

Bagley, R.

1999 Shang Archaeology. In *Cambridge History of Ancient China: From the Origins of Civilization to 221 B.C.*, edited by M. Loewe and E. L. Shaughnessy, pp. 124-231. Cambridge University Press, Cambridge.

Blitz, J. H.

1993 Big Pots for Big Shots: Feasting and Storage in a Mississippian Community. *American Antiquity* 58(1):80-96.

Chang, K. C.

1980 *Shang Civilization*. Yale University Press, New Haven.

Dunnell, R. C.

1978 Style and Function - Fundamental Dichotomy. *American Antiquity* 43(2):192-202.

Egloff, B. J.

1973 A Method for Counting Ceramic Rim Sherds. *American Antiquity* 38(3):351-353.

Gosselain, O. P.

1992 Technology and Style - Potters and Pottery among Bafia of Cameroon. *Man* 27(3):559-586.

1999 In Pots We Trust The Processing of Clay and Symbols in Sub-Saharan Africa. *Journal of Material Culture* 4(2):205-230.

2000 Materializing Identities: An African Perspective. *Journal of Archaeological Method and Theory* 7(3):187-217.

Jing, Z., G. R. Rapp, J. Tang and J. Stoltman
2004 *Coevolution of Human Societies and Lanscapes in the Core Territory of Late Shang State - An Interdisciplinary Regional Archaeological Investigation in Anyang, China, 2001-2004.* Institute of Archaeology, Chinese Academy of Social Sciences, and University of Minnesota.

Jing, Z., J. Tang, G. R. Rapp and J. Stoltman
2002 *Co-Evolution of Human Societies and Landscapes in the Core Territory of Late Shang State - An Interdisciplinary Regional Archaeological Investigation in Anyang, China, 2000-2001.* Institute of Archaeology, Chinese Acadamy of Social Sciences, and University of Minnesota.

Lemonnier, P.
1986 The study of material culture today: towards an anthropology of technical systems. *Journal of Anthropological Archaeology* 5(2):147-186.

1993 Introduction. In *Technological Choices - Transformation in Material Cultures since the Neolithic*, edited by P. Lemonnier, pp. 1-35. Routledge, London.

Liu, L. and X. Chen
2007 *State Formation in Early China* Duckworth Publishers, London.

Loehr, M.
1953 The Bronze Styles of the Anyang Period (1300-1028 B.C.). *Archives of the Chinese Art Society of America* 7:42-53.

Masson, M. A. and R. M. Rosenswig
2005 Production Characteristics of Postclassic Maya Pottery from Caye Coco, Northern Belize. *Latin American Antiquity* 16(4):355-384.

Orton, C.
1993 How many pots make five? — an historical review of pottery quantification. *Archaeometry* 35(2):169-184.

Orton, C., P. Tyers and A. Vince
1993 *Pottery in Archaeology.* Cambridge University Press, Cambridge.

Rice, P. M.
1987 *Pottery Analysis - A Sourcebook.* University of Chicago Press, Chicago.

1989 Ceramic Diversity, Production, and Use. In *Quantifying Diversity in Archaeology*, edited by R. Leonard and G. Jones, pp. 109-117. Cambridge University Press, Cambridge.

Sackett, J. R.

1977 Meaning of Style in Archaeology - General Model. *American Antiquity* 42(3):369-380.

1985 Style and Ethnicity in the Kalahari - A Reply to Wiessner. *American Antiquity* 50(1):154-159.

1986a Isochrestism and Style - A Clarification. *Journal of Anthropological Archaeology* 5(3):266-277.

1986b Style, Function, and Assemblage Variability - A Reply to Binford. *American Antiquity* 51(3):628-634.

Shaughnessy, E. L.

1989 Historical Geography and the Extent of the Earliest Chinese Kingdoms. *Asia Major* 2(2):1-22.

Stark, M. T.

1999 Social Dimensions of Technical Choice in Kalinga Ceramic Traditions. In *Material Meanings - Critical Approaches to the Interpretation of Material Culture*, edited by E. Chilton, pp. 24-43. University of Utah Press, Salt Lake City.

Tang, J.

1999 Zhong Shang Wenhua Yanjiu 中商文化研究 (A Study of the Mid Shang Culture). *Kaogu Xuebao* 4:393-420.

2002 Shang wang chao kao gu xue bian nian de jian li 商王朝考古学编年的建立. *Zhong yuan wen wu 中原文物* 6:50-59.

Thorp, R.

1985 The Growth of Early Civilization, New Data from Ritual Vessels. *Harvard Journal of Asiatic Studies* 45(1):5-75.

2006 *China in the Early Bronze Age - Shang Civilization*. University of Pennsylvania Press, Philadelphia.

Trigger, B.

1999 Shang Political Organization: A Comparative Approach. *Journal of East Asian Archaeology* 1(1):43-62.

Underhill, A. P.

2002 *Craft Production and Social Change in Northern China*. Kluwer Academic/ Plenum Publishers, New York.

van der Leeuw, S.

2002 Giving the Potter a Choice - Conceptual aspects of pottery techniques. In *Technological Choices - Transformation in Material Cultures since the Neolithic*, edited by P. Lemonnier, pp. 238-288. Routledge, London.

Wiessner, P.

1983 Style and Social Information in Kalahari-San Projectile Points. *American Antiquity* 48(2):253-276.

1984 Reconsidering the Behavioral Basis for Style - A Case Study among the Kalahari San. *Journal of Anthropological Archaeology* 3(3):190-234.

1985 Style or Isochrestic Variation - A Reply to Sackett. *American Antiquity* 50(1):160-166.

Wobst, H. M.

1977 Stylistic Behavior and Information Exchange. In *For the Director: Research Essays in Honor of James B. Griffin*, edited by C. E. Cleland, pp. 317-342. vol. 61. Museum of Anthropology, University of Michigan, Ann Arbor, Michigan.

XiaShangZhou

2000 *Xia Shang Zhou duan dai gong cheng zhuan jia zu: Xia Shang Zhou duan dai gong cheng 1996-2000 nian jie duan cheng guo bao gao: jian ben 夏商周断代工程 1996-2000 年阶段成果报告：简本 (Xia Shang Zhou Chronology Project)*. Shi jie tu shu chu ban gong si, Beijing.

Yan, W.

1997 *Zou xiang shiji de kaoguxue 走向世纪的考古学*. Sanqin Chubanshe, Xi'an.

Yates, R.

1994 The-City State in Ancient China. In *The Archaeology of City-States : Cross-cultural Approaches*, edited by D. L. N. a. T. H. Charlton. vol. 71-90. Smithsonian Institution Press, Washington, D. C.

Zhongguo

1987 *Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo, 中国社会科学院考古研究所. Yinxu Fajue Baogao 殷墟发掘报告 (Excavation of Yinxu 1958-1961)*. Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo 中国社会科学院考古研究所.

1994 *Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo, 中国社会科学院考古研究所. Yinxu de Faxian Yu Yanjiu 殷墟的发现与研究 (Archaeology Excavation and Researches in the Yin Ruins)*. Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo 中国社会科学院考古研究所.

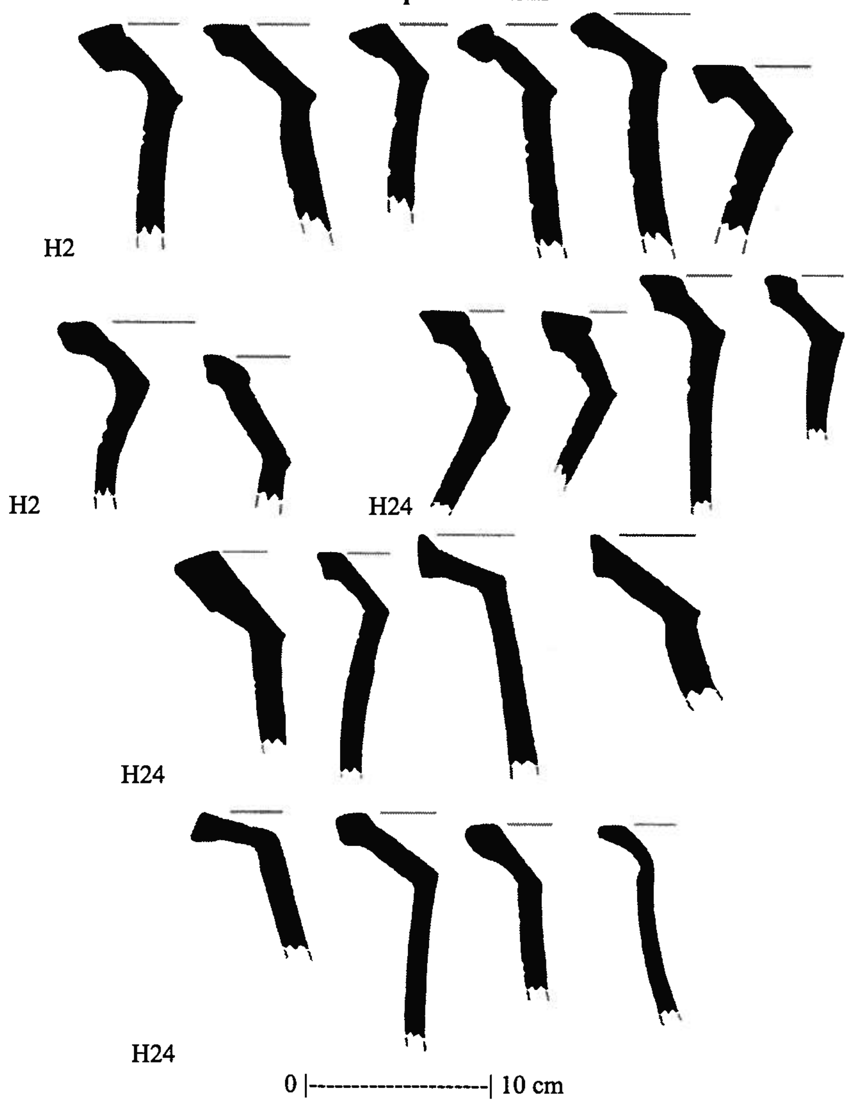
2003 *Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo, 中国社会科学院考古研究所. Zhongguo Kaoguxue Xia Shang Juan 中国考古学夏商卷 (Chinese Archaeology Xia and Shang)*. Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo 中国社会科学院考古研究所.

Zou, H.

1980 Shi Lun Xia Wenhua 试论夏文化. In *Xia Shang Zhou Kaoguxue Lunwenji 夏商周考古学论文集*, pp. 95-182. Wenwu Chubanshe 文物出版社, Beijing.

APPENDICES

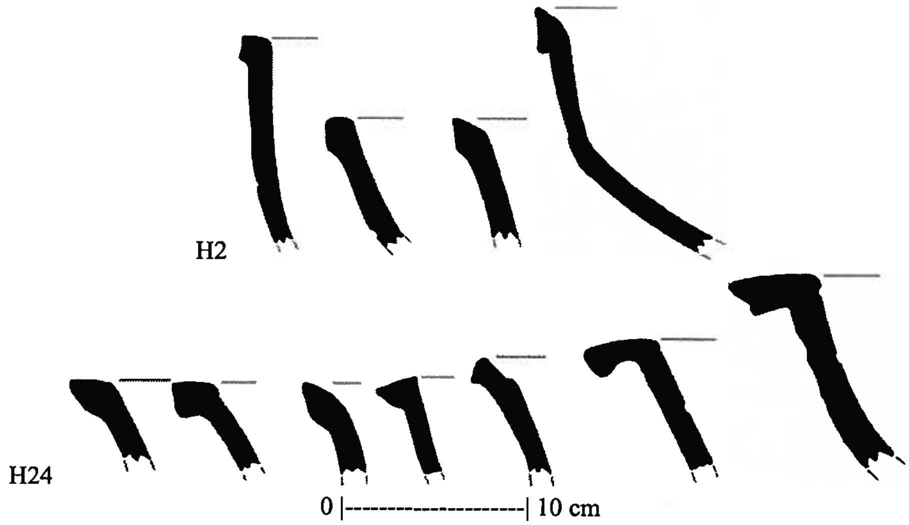
Appendix A. Rim Shape Variations

Pottery Subtype	**Rim Shape Variations**
Pen (Flat-based)	

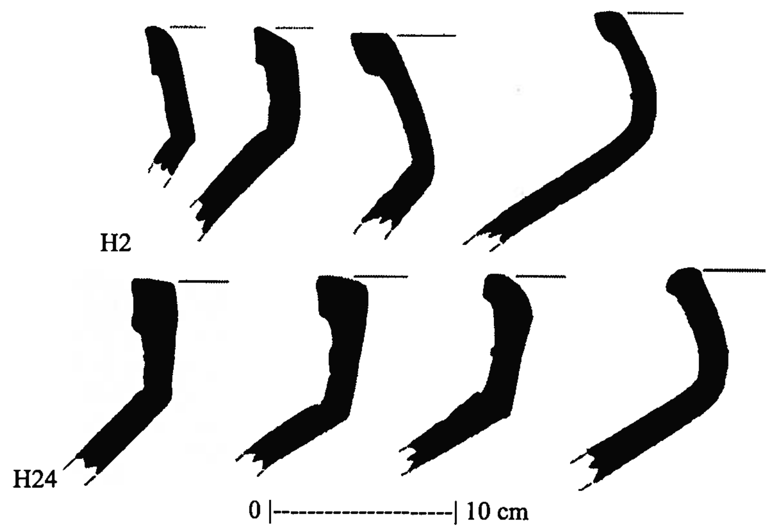
Appendix A. Rim Shape Variations (Cont'd)

Pottery Subtype | **Rim Shape Variations**

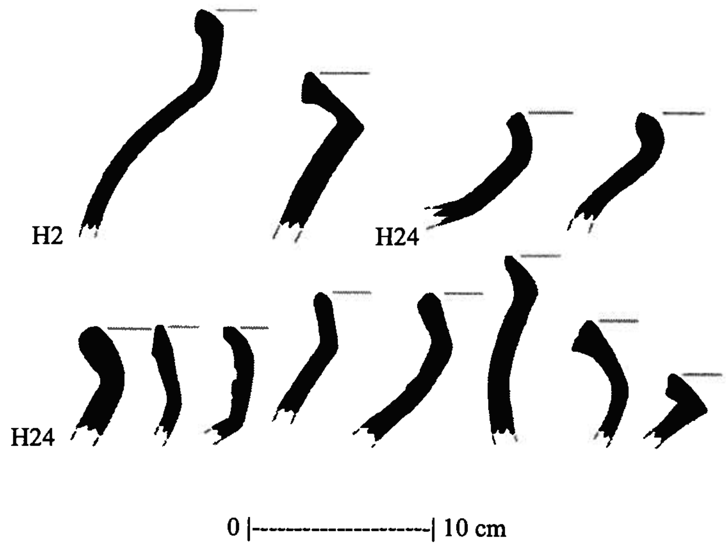
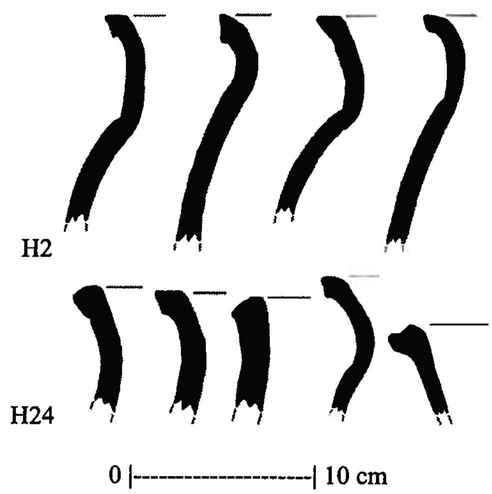
Pen
(Round-based)



Guan (Large-sized)

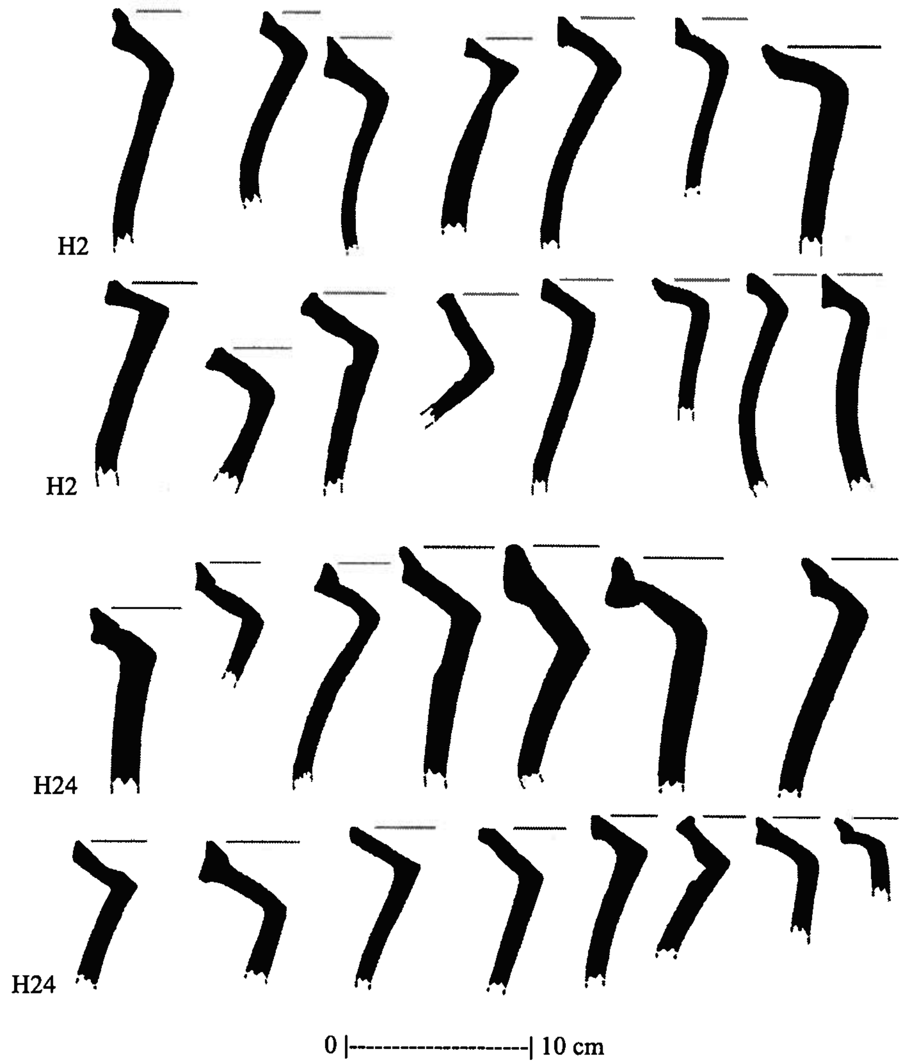


Appendix A. Rim Shape Variations (Cont'd)

Pottery Subtype	**Rim Shape Variations**
Guan (Small-sized)	
Guan (Globular)	

Appendix A. Rim Shape Variations (Cont'd)

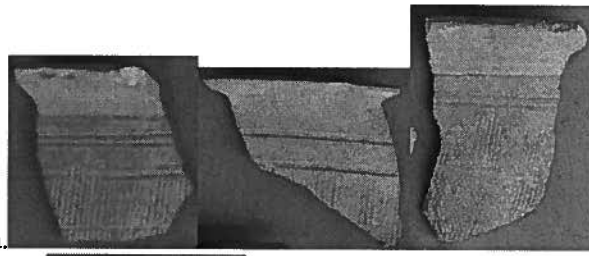
Pottery Subtype	**Rim Shape Variations**
Li	

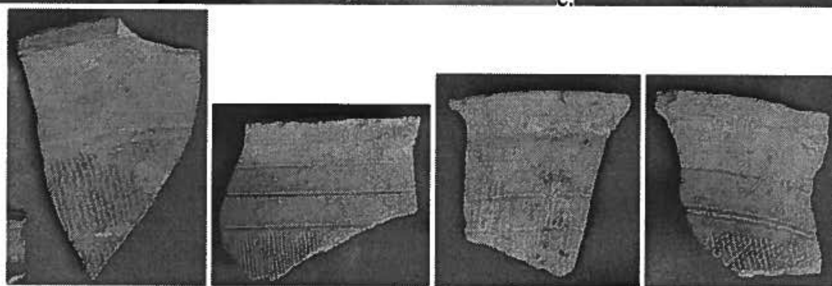


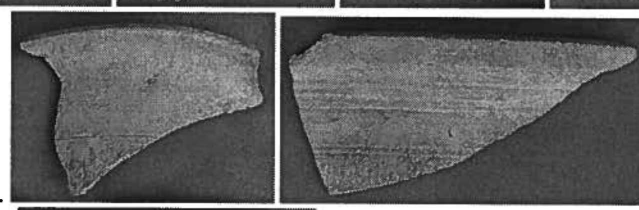
Appendix B. Surface Treatment Variations

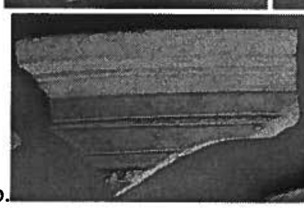
Pottery Subtype	**Surface Treatment Variations**

Pen
(Flat-based)
a. "Line & Cordmark"
b. "Line & Applique"
c. "Line"

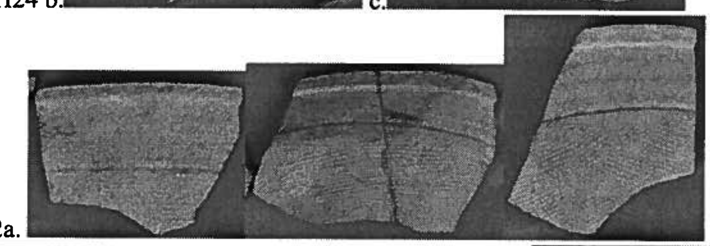
H2a.

c.


H24a.


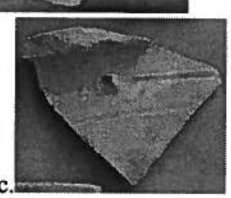
H24a.


H24 b.

c.


Pen
(Round-based)
a."Cordmark"
b."Plain"
c. "Line"

H2a.


H24b.

c.


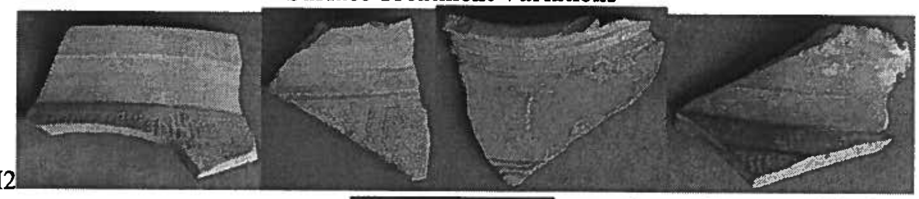
Appendix B. Surface Treatment Variations (Cont'd)

Pottery Subtype

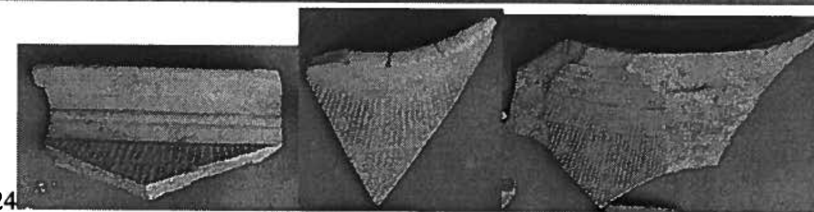
Surface Treatment Variations

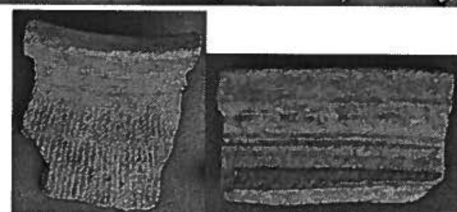
Guan (Large-sized)
"Line & Cordmark"
only

H2



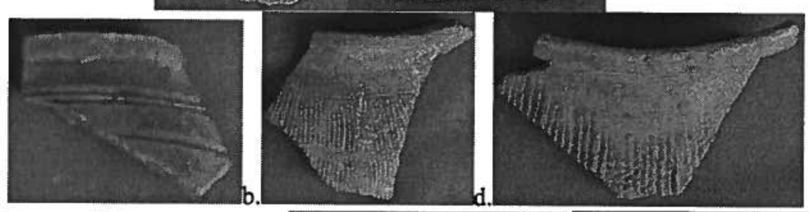
H24



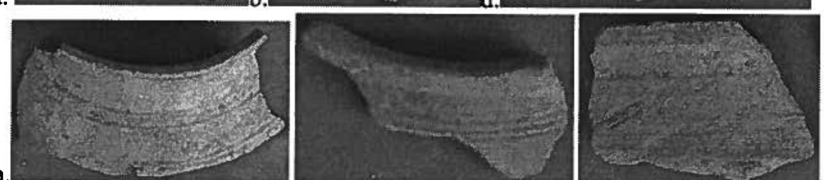


Guan (Small-sized)
a. "Line"
b. "Line & Cordmark"
c."Burnished"
d."Cordmark"

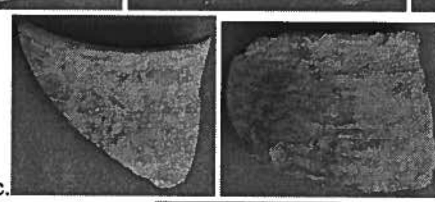
H2a. b. d.



H24a.



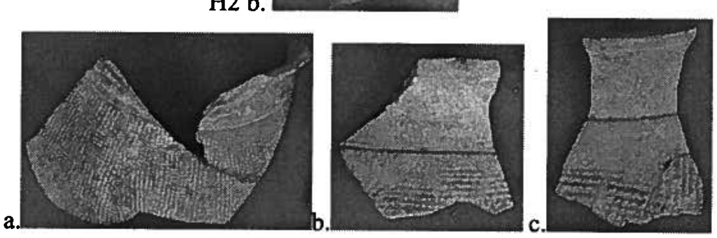
c.



Guan (Globular)
"Outcurving"
a. "Fine square stamp"
b. "Medium square stamp"
c. "Coarse square stamp"

H2 b.

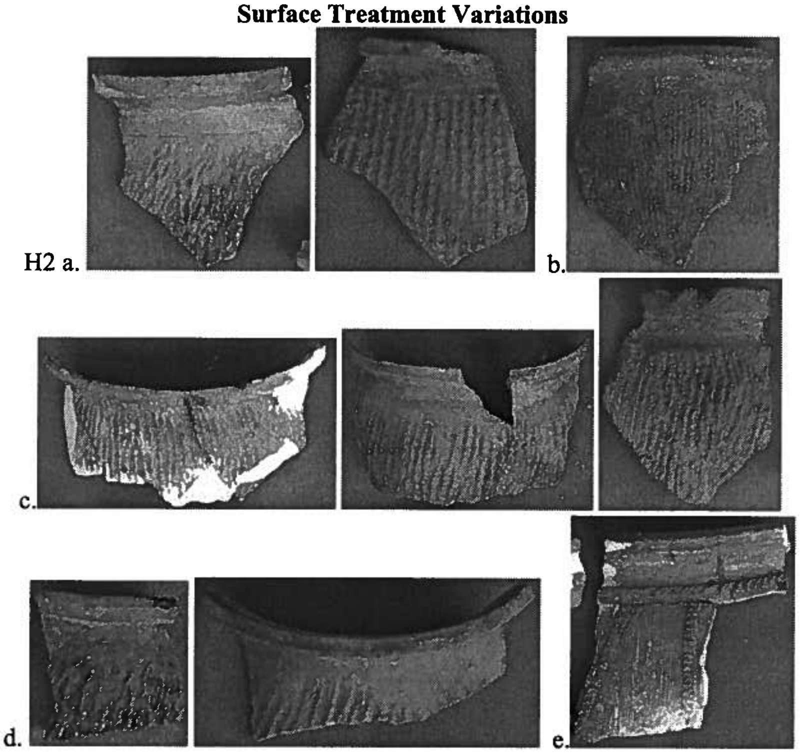
H24 a. b. c.

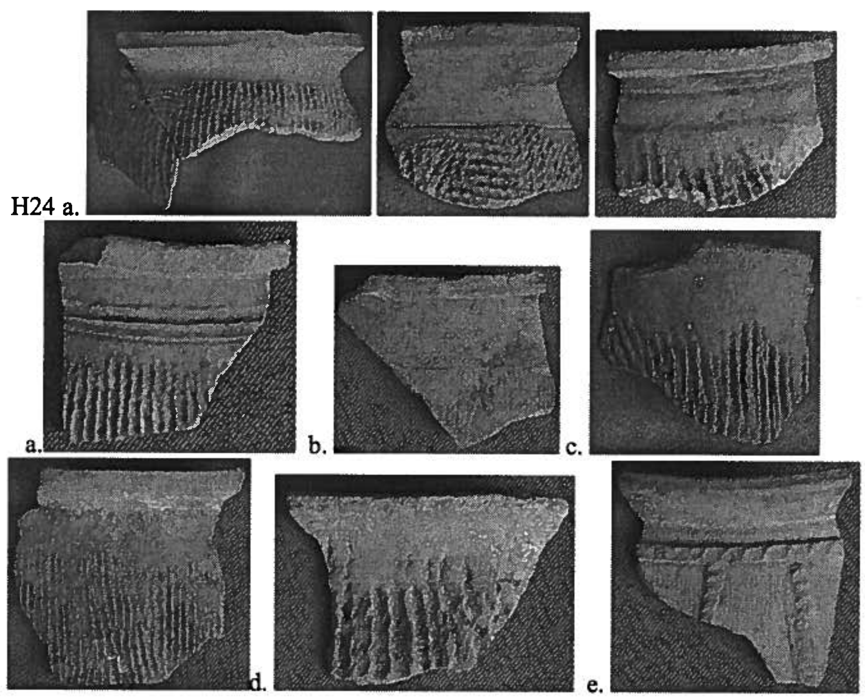


Appendix B. Surface Treatment Variations (Cont'd)

Pottery Subtype
Li
a. "Line & Cordmark"
b. "Fine Cordmark"
c. "Medium Cordmark"
d. "Coarse Cordmark"
e. "Cordmark & Applique"

Surface Treatment Variations





Appendix C. Surface Treatment Combinations by Vessel Type and Form

				HWD	HYZ
Guan (Large)	Appliqué	Appliqué band 1cm below neck	Plain rim surface	1	0
	Line & Cordmark	Cordmark begins 3cm below neck	Plain rim surface	1	2
	Line & Cordmark	Cordmark begins 5cm below neck	Raised line along neck outer surface	1	2
	Line & Cordmark	Cordmark begins at neck	Plain rim surface	2	11
	Line & Cordmark	Cordmark begins at neck	Raised line along neck outer surface	3	9
	Total			N=5	N=4
Guan (Small)	Burnished	Fine, smooth surface	Plain rim surface	0	4
	Burnished	Fine, uneven surface	Plain rim surface	0	1
	Burnished	w/ 1 pair of Incised line	1 set of Double incised line along neck outer surface	0	2
	Burnished	w/ 1 pair of Incised line	2 set of Double incised line along neck outer surface	0	1
	Line	1 pair & 1 single incised line on body	Plain rim surface	1	0
	Line	Double incised line on body	Incised line along neck outer surface	0	1
	Line	Single incised line on body	Incised line along neck outer surface	0	2
	Line	Triple incised line on body	Plain rim surface	0	1
	Cordmark	Cordmark begins 3 cm below neck	Plain rim surface	1	0
	Cordmark	Cordmark begins at neck	Plain rim surface	1	1
	Total			N=3	N=8
Guan (Globular)	Square Stamp	Coarse	Cordmark begins at neck	0	2
	Square Stamp	Fine	Cordmark begins at neck	0	3
	Square Stamp	Medium	Cordmark begins 3cm below neck	0	2
	Square Stamp	Medium	Cordmark begins at neck	12	6
	Total			N=1	N=4

Appendix C. Surface Treatment Combinations by Vessel Type and Form (Cont'd)

				HWD	HYZ
Pen (Flat-base)	Cordmark	Fine Cordmark	Plain rim surface	0	5
	Line	1 pair of Incised line on neck	Fine line	1	0
	Line	1 single incised line on neck	Fine line	1	4
	Line	2 pair of Incised line on body & 1 single Incised line on neck	Raised line along neck outer surface	0	1
	Line & Appliqué & Cordmark	1 pair of Incised line on body & 1 single Incised line on neck	Raised line along neck outer surface	0	1
	Line & Cordmark	1 pair of Incised line on body	Plain rim surface	2	2
	Line & Cordmark	1 pair of Incised line on body & 1 single Incised line on neck	Plain rim surface	0	2
	Line & Cordmark	1 pair of Incised line on body & 1 single Incised line on neck	Wide groove along rim inner surface	7	8
	Line & Cordmark	1 pair of Incised line on body & 3 single Incised line on neck	Plain rim surface	0	2
	Line & Cordmark	1 single Incised line on body	2 groove along rim inner surface	0	2
	Line & Cordmark	1 single Incised line on body & 1 pair Incised line on neck	Wide groove along rim inner surface	1	0
	Line & Cordmark	1 single Incised line on body & 1 single Incised line on neck	Wide groove along rim inner surface	1	3
	Line & Cordmark	2 pairs of Incised line on body	Wide groove along rim inner surface	0	4
	Line & Cordmark	2 pairs of Incised line on body & 1 single Incised line on neck	Plain rim surface	1	6
	Line & Cordmark	2 pairs of Incised line on body & 1 single Incised line on neck	Wide groove along rim inner surface	0	7
	Line & Cordmark	2 single Incised line on body	2 groove along rim inner surface	1	0
	Line & Cordmark	2 single Incised line on body	2 incised line along rim inner surface	0	1
	Line & Cordmark	2 single Incised line on body	Plain rim surface	2	2
	Line & Cordmark	3 single Incised line on body & 3 single Incised line on neck	Wide groove along rim inner surface	0	1
	Plain	Undecorated body	Wide groove along rim inner surface	0	6
	Total			N=9	N=17
Pen (Round-base)	Cordmark	Cordmark begins 4cm below orifice	2 groove along rim inner surface	4	0
	Cordmark	Cordmark begins 4cm below orifice	Wide groove along rim inner surface	6	0
	Cordmark	Cordmark begins 5cm below orifice	Plain rim surface	11	0
	Line	2 pair of Incised line on body	Plain rim surface	0	1
	Plain	Undecorated body	2 groove along rim inner surface	0	1
	Plain	Undecorated body	1 Fine groove along rim inner surface	0	3
	Plain	Undecorated body	Plain rim surface	0	10
	Plain	Undecorated body	1 Wide groove along rim inner surface	0	15
	Total			N=3	N=5

Table 4. Surface Treatment Combinations by Vessel Type and Form (Cont'd)

				HWD	HYZ
Li	Coarse Cordmark	Cordmark begins 1cm below neck	Plain rim surface	1	1
	Coarse Cordmark	Cordmark begins 1cm below neck	Wide groove along rim inner surface	0	2
	Coarse Cordmark	Cordmark begins at neck	Wide groove along rim inner surface	2	0
	Cordmark & Appliqué	Fine Cordmark with appliqué	Fine groove along rim inner surface	3	1
	Cordmark & Double Incised line	Cordmark begins 3 cm below neck	Fine groove along rim inner surface	0	1
	Cordmark & Incised line	Cordmark begins 1cm below neck	Wide groove along rim inner surface	1	1
	Cordmark & Incised line	Cordmark begins 3 cm below neck	Extra-Wide groove along rim inner surface	0	7
	Cordmark & Incised line	Cordmark begins 3 cm below neck	Fine groove along rim inner surface	6	1
	Cordmark & Incised line	Cordmark begins 3 cm below neck	Wide groove along rim inner surface	1	7
	Cordmark & Incised line	Cordmark begins at neck	Plain rim surface	1	0
	Cordmark & Triple Incised line	Cordmark begins 3 cm below neck	Plain rim surface	0	1
	Fine Cordmark	Cordmark begins 1cm below neck	Wide groove along rim inner surface	3	0
	Fine Cordmark	Cordmark begins 3 cm below neck	Fine groove along rim inner surface	0	1
	Fine Cordmark	Cordmark begins 3 cm below neck	Plain rim surface	0	1
	Fine Cordmark	Cordmark begins at neck	Plain rim surface	1	0
	Medium Cordmark	Cordmark begins 1cm below neck	Extra-Wide groove along rim inner surface	0	8
	Medium Cordmark	Cordmark begins 1cm below neck	Fine groove along rim inner surface	0	1
	Medium Cordmark	Cordmark begins 1cm below neck	Plain rim surface	2	4
	Medium Cordmark	Cordmark begins 1cm below neck	Wide groove along rim inner surface	0	18
	Medium Cordmark	Cordmark begins 3 cm below neck	Extra-Wide groove along rim inner surface	0	9
	Medium Cordmark	Cordmark begins 3 cm below neck	Fine groove along rim inner surface	4	0
	Medium Cordmark	Cordmark begins 3 cm below neck	Plain rim surface	0	1
	Medium Cordmark	Cordmark begins 3 cm below neck	Wide groove along rim inner surface	4	0
	Medium Cordmark	Cordmark begins at neck	Extra-Wide groove along rim inner surface	0	2
	Medium Cordmark	Cordmark begins at neck	Plain rim surface	1	2
	Medium Cordmark	Cordmark begins at neck	Wide groove along rim inner surface	2	0
	Total			N=14	N=19