MANUSCRIPT FOR AFRICAN ARCHAEOLOGICAL REVIEW

Title: Modelling Zulu ceramic traditions in the Upper and Lower uThukela Basin, KwaZulu-Natal, South Africa

Abstract

In southern Africa and elsewhere, archaeological approaches to ceramic studies largely rely on two approaches: technology and style. The relationship between technology and style suggests that critical choices taken during production are informed by cultural attributes in the same way as the range of shapes and decorative characteristics of pots. For the most part, historical and ethnoarchaeological studies of ceramic traditions are often critiqued for their lack of accuracy as markers of past ethnic identities in southern Africa. Ethnoarchaeology provides an important element to archaeological studies that allows researchers to validate social meanings, understanding the relationship between style and technology. This paper is an ethnoarchaeological study of ceramic traditions among the Nguni-speaking (Zulu) peoples between the Upper and Lower uThukela Basin, in the uMsinga, iNkandla, and Eshowe areas of KwaZulu-Natal. The study focuses on social and technical decisions for ceramic production, including the production stages. Furthermore, the Geographic Information System (GIS) is used to map out the spatial organization of pottery production. Ethnoarchaeology is used as a method to record ceramic traditions and their technological attributes such as design, style, and functional components. Moreover, the social attributes of production stages are used to understand a wide variety of techniques, processes, tools, and materials involved in ceramic production, including distribution and apprenticeship. In turn, the GIS is utilized as a tool to contextualize ethnographic data and operational sequences of pottery in the uThukela Basin. Findings from this study shows that archaeologists can move beyond typological methods to appreciate social and operational attributes of ceramic production. It also provides an example of how stylistic technological processes and choices can be evaluated in pottery making. In turn, this allows contrast of the production sequences with matching stages observed in both nearby and distant potters to yield significant regional insights than do general explanations in ceramic studies.

Keywords: Lower and Upper uThukela Basin; Zulu pottery; Ethnoarchaeology

Introduction

Over the past decades, ceramic production studies on ethnoarchaeological investigations have continued to gain meaningful contributions from research in Africa (see Buss 2018; Fredriksen and Bandama 2016; Fowler 2008; Gers and Perrill 2020; Gosselain 1995; Lindahl and Pikirayi 2010; Perrill 2008, 2014, 2019). In southern Africa archeological discourse, the context for cultural sequences has been framed within the context of typological debates when Bantu-speaking farmers and their immediate descendants journeyed into East and South of Africa. In fact, the foundations of typological debates (descriptions of shape, size, and materials), were sought to explain the origins of early iron using farming communities (Dietler and Herbich 1989; Fredriksen and Bandama 2016; Fowler 2008; Huffman 1970). Some scholars (e.g. Pikirayi 1997, 2007; Nxumalo 2019; Nyamushosho *et al*. 2021) argue that obvious limitations in Iron Age research for southern Africa still lies in the idea that ceramic attributes directly relate to individuals sharing communal encryptions or codes. Although immense efforts have been channeled to understanding aspects of ceramic traditions in Iron Age cultural sequences of southern Africa, little time and attention has been dedicated to historically recent production and use of pottery in southern Africa. This is very important to understand past peoples' behavior because traditional typological sequences tend to disregard the relevance of ceramic technology in modelling and explaining ceramic changes over time (Fredriksen and Bandama 2016; Pikirayi 1997, 2007; Lindahl and Pikirayi 2010; Sadr 2008).

This paper will show that ethnoarchaeology can be effective in providing an alternative perspective that shows how important ceramic production and technology are to societies in the uThukela Basin. The paper will also explore ethnographic data arising from Kent Fowler and Elizabeth Perrill on Zulu ceramic traditions in the Upper and Lower uThukela Basin, KwaZulu-Natal (see Fig. 1). These case studies will be used to contextualize the ways in which potters interrelate and engage as a significant component of determining their daily activities. Together with the *chaînes opératoire* approach, it will explore operational sequences and culturally meaningful technical choices by means of which the ceramics are produced. Using GIS, the spatial characteristics (clay sources, firing areas) involved in the production stages will be geographically located. The systematic presentation of technological attributes including mapping can provide the base for social attributes (organization, labor, distribution) as well as apprenticeship-knowledge transmission. These are important social variables to explore multi-scalar pottery analysis and dynamics of African pottery traditions in Gosselain (2010) and Smith (2016). In so doing, this paper will contribute to the documentation of *izinkamba*, the isiZulu word for pots, using ethnoarchaeology and the exploration of socially internalized decisions taking place in pottery production, including the modelling (GIS) of operational sequences.

Area of Study

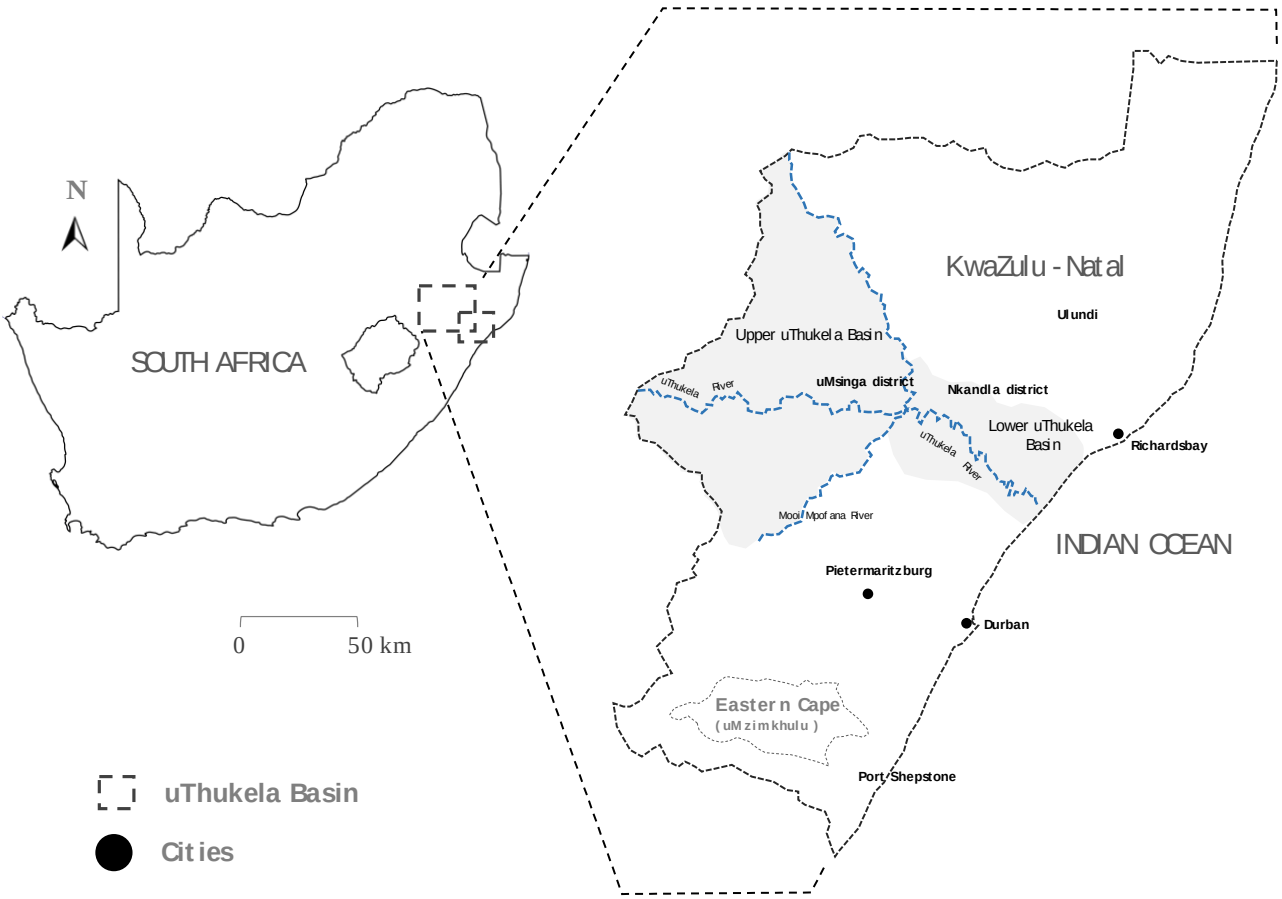

Fig. 1 Showing the Upper and Lower uThukela Basin.

Regional setting

The uThukela (meaning - something that startles) Basin, alongside climate and landcover changes, is well documented in KwaZulu-Natal, South Africa. The uThukela River collects its waters from Mont-aux-sources of the Lesotho and the uKhahlamba mountains in the Free State province. The uKhahlamba is part of the largest mountain range in southern Africa with rivers meandering through the valley bottoms of KwaZulu-Natal midlands and the eastern parts of the uThukela Falls. Through the narrow river valley systems, the eastern side of the falls open up to bioclimatic arena and temperate zones with temperatures higher (20°C) than the Natal highland (14°C) areas (Nel 2009; Roffe *et al*. 2019, 2020). The uThukela Basin catchment and drainage covers about 20,000 km^2 separated into an upper and lower river valley system. The region provides is responsible for about a third (1/3) of South Africa's water supply and is characterized by a general natural grassland cover class which support regional livestock subsistence and agricultural farming (Matthews and Catacutan 2012; Mduduma 2018; Ndoro *et al.*, 2013; Pommerieux *et al*. 2014).

The topography rises to about 3000 meters in the Drakensberg Mountains which influences high spatial and temporal climatic variability, especially yearly precipitation ratios over higher and lower altitudes (Shabalala 2018; Nsuntsha 2000; Nxumalo 2019). For instance, the highest altitude is located on the western parts of the uThukela District, receiving about 1500 millimeters per annum and the low-lying regions falling to about 600 mm of rainfall. Moreover, the higher altitudes are defined by sparse bushveld biomes and moist grasslands along with reddish brown calcareous soils (McCourt *et al.* 2006; van der Eyk *et al.* 1969). Regional geology and parent matter mainly expose Basaltic lava of the Drakensberg, Stormberg and Beaufort folds and rocky beds, as well as certain granites and gneisses and sandstone ridges, including Dwyka and Ecca supercrustal group (see Fig. 2). These mean that clay sources in the uThukela Basin, a valuable resource for the production of pottery, are confined to exposed river banks along seasonal streams and erosional processes (ibid).

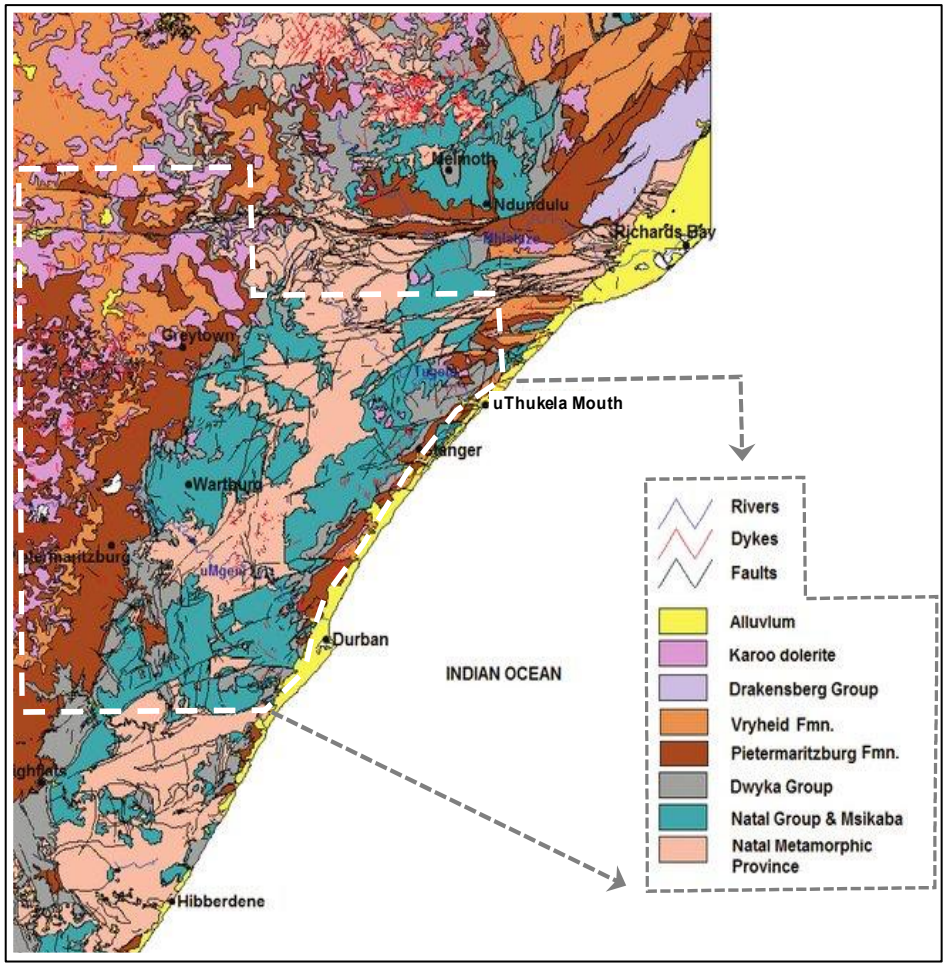

Fig. 2 Map showing the geological substrates (white polygon) in KwaZulu-Natal (Adapted from Demlie and Titus 2015).

The emphasis on underlaying geological substrates in the uThukela Basin is important because it plays an important role in the development of local soils (Ecca supercrustal group-formation), their classification types (clayey soils) and textural attributes (well drained) red and yellowish-brown soil

(Demlie and Titus 2015; McCourt *et al*. 2006; Mduduma 2018). Perhaps, this also explains the various ceramic industries in the uThukela Basin and why the catchments are areas of large commercial and small scaled farming activities thriving in rainfed maize, including irrigated wheat (Dlamini *et al*. 2011). As such, this paper evaluates the technological stages of Zulu ceramics in the uThukela Basin and contrast stages of the production sequences with matching stages observed from both nearby and distant potters through the application of ethnographic studies.

Noteworthy, in Africa and many other parts of the world (Europe), there seems to be a general trend of pottery production being a highly specialized female activity. For instance, Gosselain (1992, 1994, 2002) notes these fundamental characteristics of gender specialization in Cameroonian Bafia potters (see Herbich & Dietler's 1991 for Luo pottery producers of Kenya). Moreover, Lindahl and Pikirayi (2010) encounter a similar gender-orientated specialization in modern Venda and Zimbabwean potters. The same can be observed in the Mopani District of Limpopo Province, South Africa (see Fredriksen and Bandama 2016). This social dimension of pottery production is significant, especially in terms of how technical choices are influenced by behavioral patterns in which social interactions and networks between potters are formed (Gosselain 2010; Hodder 1980; Perrill 2008, 2014, 2019; Smith 2016; Stark 1998). In fact, relevant ethnography in the uThukela Basin may be used as supporting evidence. This paper will examine how pots derive social significance to both their manufacturers and consumers, and social significance that is commonly expressed through ornamentation (intentional communication or symbolic narration/storytelling) as suggested by Pikirayi (2007: 289).

Ethnoarchaeology Studies in Southern Africa

Ceramic studies on pottery produced in the uThukela Basin fall within Iron Age literature, a cultural context defined by farming communal groups who were metal using food producers in South Africa. In fact, ceramic assemblages have been used by scholars to categorize social interactions, using similarities in stylistic attributes, and mapping the spread of cultures on the landscape. As such, ceramic studies mainly adapted to a more defined technological method versus a more stylistic approach in South Africa (Gosselain and Smith 1995; Huffman 2001; Nxumalo 2012; Nyamushosho *et al*. 2021; Perrill 2008; Pikirayi 1999, 2007; Sadr 2008; Thebe and Sadr 2017). In fact, Huffman (1970, 1989, 2007) argues that these approaches work effectively on the basis of tracing or tracking ceramic typologies as opposed to cultures. In archaeology a common conception is that, technological operations in ceramics are culturally sensitive, determined by "environmental and functional constraints, [and] that little scope remains for stylistic expression" (Gosselain 1992: 559). This mode of thinking suggests stylistic attributes of ceramic types can be linked to and defined by the language of their producers. To support these views, Huffman (1970, 1982, 1989) refers to the multidimensional approach between BaPedi and BaVenda groups whereby ceramics are grouped into types varying from shape, decoration

layout, and decoration motifs. These ideas are also prevalent in Whitelaw (2012) wherein past societies are suggested to have used and still use material-cultural style to express identity. Whitelaw does, however, observe the problems of ceramic style and its relation to human group identities, including ethnicity. He simply supports the use of style by indicating that researchers must still infer identity from incomplete material record (ibid: 130).

The use of ceramics studies as a proxy for people across southern Africa (see Nyamushosho *et al*. 2021; Pikirayi 2007; Thebe and Sadr 2017; Sadr 2008) and the world remains a contested theme to archaeologists and linguists. Ethnoarchaeological studies have provided greater clarity in understanding boundaries between symbolic meanings in the material record and that boundaries are not always related to individuals sharing communal encryptions of ethnic or linguistic codes (Fredriksen and Bandama 2016; Gosselain 2016; Hodder 1982; Perrill 2008, 2014; Thebe and Sadr 2017). Recent studies on contemporary southeastern Botswana ceramic industries (see, Thebe and Sadr 2017) show that pottery style is inefficient to identify pots produced by societies speaking different languages. They argue that researchers should adopt a technological approach or *chaine operatories* together with the integration of style and ethnography to advance literature on ceramics. The major setback for existing ceramic approaches in archaeology is that pottery producers are always in transition and there are wide ranging changes in production industries (Herbitch and Dietler 1991; Nyamushosho *et al*. 2021; Nxumalo 2012; Pikirayi 1999, 2007; Pikirayi and Lindahl 2013; Thebe and Sadr 2017). As such, if researchers simply infer these to the past, it may always show a different meaning and significance of the object being produced. Since technological procedures may be fully stylistic, reasons for technological processes need to be analyzed and observed (Gosselain 1992). This means that the production stages could be ethnographically observed on a micro regional scale and be culturally explained or validated (ibid: 561). In fact, the ethnographic technological approach allows researchers to evaluate the cultural choices involved in pottery production sequences. This suggests that in any artefact analysis, a variety of possible stylistic technological processes and choices could be evaluated. This paper does not engage detailed debates on function, but acknowledge that functional approach is important. The relationship between style and function was shown in Yugoslavian people, ethnographically studied by Wobst to show that style aided function and communicated the available choices during pottery production (1999).

Technology

Over the past decades, the sole use of decorative style has been highly contested. This paper explores the integration of technology to offer better arguments and help advance the understanding of ceramic industries in southern African archaeology. As noted previously, southern African ceramics were largely classified into typological sequences, based on proportions of decoration, layout, and ceramic

profiles to explain past people identities. Scholars such as Gosselain (1992); Fredriksen and Bandama (2016) argue that technological aspects are important, but they need to be understood and situated within a cultural context, as these principals are related to social attributes. As such, the collation of various theoretical frameworks ranging from style, technology (*chaînes opératoires*) and ethnography enables the establishment of newer ways to evaluate the organization, social aspects, labour, distribution, and apprenticeship of ceramics. Essentially, technology in ceramic production can be described as a series of technological operations, which transform raw material into something that is functional and can be used as a product (Sillar and Tite 2000: 4). This idea demonstrates that technology plays an important role in cultural activities and choice is a common feature (Hodder 1980, 1982). For example, style coexists with choice and whenever there is a possibility of choice, there is style. Noteworthy, technological procedures (e.g. *chaînes opératoires*) can be fully stylistic and a variety of possible stylistic technological processes and choices could be evaluated through current and existing ethnography (Gosselain 2010, 2016). Ethnoarchaeology can prove to be vital in assisting scholars to understand the choices made and the context within which that happens in the production of pottery. This methodological approach is, however, not perfect. Some scholars have often criticized this method as being poorly structured. Those who view it negatively have argued that they can formulate arguments without the use of ethnoarchaeology (David and Kramer 2001; Gosselain 1992, 2010; Gosselain and Smith 1995; Hodder 1982; Nxumalo 2012; Pikirayi and Lindhal 2013). Nevertheless, the ability of researchers to conduct ethnography or field work improves validation of results and helps to avoid individual biases.

Methodological Approach

As indicated, the focus of this paper is on the Zulu-speaking communal groups producing pottery in the uThukela Basin, extending from the uMsinga District (Upper uThukela) to the Nkandla District (Lower uThukela) in KwaZulu-Natal. It does so by examining existing Zulu pottery literature and documenting pottery industries, through interviews. It is noteworthy that, though there are some variations occurring in the Upper and Lower uThukela Basin, the pots produced in the region are nevertheless defined as 'Zulu' by both their producers and consumers. The focus of this study was on individuals or households whose production of pottery is not their sole specialization. More so, these were informants whose work has not been intensively studied in the uThukela Basin. The interviews were recorded using handheld digital Sony DCR-SR35 handy-cam. Accordingly, the potters were interviewed following seven questions (see Table 1) identified in Gosselain and Smith (1995). These questions inform researchers about the environmental context, geography, and production stages (e.g. acquiring and processing raw materials).

Table 1 Seven themes originally developed by Kramer (1985); Gosselain and Smith (1995).

Questionnaire: Name of potter, Names given to their pots and Gender		
1	Where are clays acquired and the place of production?	
2	Do they add temper in clay?	
3	What techniques are used to form their vessels and the type of vessels produced?	
4	How are their vessels decorated, styles shared among the potters and why?	
5	Where and how are their vessels fired?	
6	Do their vessels show symbolic significance?	
7	Who uses the pots and how are they distributed?	

The first question is relevant to who and how clays are identified and selected. It allows for the establishment of geography, distance between paths taken to clay sites and where production occurs. The second question explores how clays are processed and whether additives (e.g. temper), if any, are applied including the passage of knowledge when the clay do not meet production requirements. The third question addresses traditional practices of forming, tools used in production, where and the time taken by pottery during the process of drying. The fourth question deals with the decoration aspects, focusing on design and styles. This question carefully examines social and technological manifestation of these entities as well as the evaluations of technical choices. The fifth question is directed to the time taken to fire pottery, types of fuel used, as well as where the firing process takes place. It also aids the assimilation of the distance and paths taken to fire the pots. The sixth question helps contextualising answers and ideas around pottery significance especially that of identity and value. It also helps establish the follow up questions relating to the function of vessels during rituals. The seventh question tries to decipher functional aspects, consumption and the distance travelled by pots to regional markets.

These seven questions cover attributes relating to identity, modalities, and contexts for ceramic production, including knowledge and relevance. Moreover, this approach informs the choices adopted during production which may be informed by cultural norms and principles as well as the range of pottery sizes and decorative aspects, making pottery production a fully stylistic phenomenon (Fowler 2011; Gosselain 1992). The understanding of technological stages during production and their contrast between potter communities aids the isolation of motives behind the choices taken. The integration of ethnography ensures validation and connection between material culture distributions versus identity and whether changes in material culture can show ideas around reforming past social boundaries (Gosselain 2000: 187). This paper also integrates the mapping of potter production sequences, labor alignment, apprenticeship, and distribution of Zulu pots in the uThukela Basin. For example, the geographic coordinates of potter locations and associated production areas (firing pits and clay sources) were recorded using a handheld Garmin. The geographic coordinates were processed in Arc-GIS to generate spatial attributes associated with pottery production in the region. This study formed part of

an honors research at the University of Pretoria. Six pottery producing families were interviewed in both Upper and Lower uThukela Basin. This was done through travelling to clay sources, identifying their fuel mechanisms and recording production sequences.

A two-week ethnographic study was carried out in the upper and lower uThukela Basin. Noteworthy, the questions around the intersection of ethnography and art historical research have also been explored by Perrill (2008) in the same region. In fact, similar results around production (e.g. post firing [ukufusa]) can be observed in this study and offers newer ways of using archeology and art history to examine chemical reduction atmosphere vs. carbonization of ceramic surfaces which Elizabeth Perrill has been attempting to clarify. A local informant (Mr. Myzeza) was sought from Greytown, which is the nearest city to the uMsinga District who introduced the author to potters that formed part of the study presented in this paper. The selection of this region was informed by that the local informant has contacts in the region compared to anywhere else within the uThukela Basin. Three pottery producing families were interviewed, in the Upper uThukela, uMsinga District. These were the Mgaga and two Zondo families. Other informants were sourced from the Lower uThukela Basin, specifically from iNkandla and Eshowe region. The three additional families of potters from these two regions were the Nkwanyane, Xulu, and Dlamini. All of the potters from these six families were women between the ages of 35 and 40 (Fig. 3).

Fig. 3 Left image shows women extracting clay and on the right is Mrs. H. and Mrs. P. Zondo behind a dry gully stream where they mine the clay in the Upper uThukela Basin.

Results

The Upper uThukela Basin

In this initial region, I interviewed, from a region known locally as Esampofu within the Upper uThukela Basin, the Ethaweni settlement. This household is identified as Sokhele potters and their pottery making processes were documented by the author (see Figs 1 and 3). The first potter was Mrs.

L. Mgaga (Ethaweni), whose pots are used mainly for brewing beer and for storing ingredients. These pots are traded locally, forming a basic source of income for her. She uses two types of clays obtained from areas nearby a tributary stream and riverbed of the uThukela River, located about 1 km away from her settlement. The source areas are within 500 meters from each other. These two types of clays (from a nearby stream and uThukela River bed) were identified as good sources by Mrs. L. Mgaga. These clays are sieved and mixed during the production stages. At times, the finger test is carried out to check hardness and textural properties of clay. The finger test techniques involve the rubbing of clay between the forefingers and thumb to check for plasticity and grit. Without any added temper, the clays are mixed with water before fashioning.

Accordingly, a bowl is placed upside down on a flat plank surface over to form a tray, and the base of the pot. After the base is formed, and using the coiling technique, coils are blended and lodged on top of each other and placed radially to form a pot. The potters then apply several tools: (i) shoe sole (inside) and (ii) maize cob (outside) to smooth the coils together and giving texture to the pot. When it is complete, hair combs are used to incise decorations (e.g. leaf designs) that are shared between producers in the area. The pots are left to dry for 2-3 days and later taken for firing. Firing pits are excavated *ca.* 200 to 250 meters away from the settlement (see Fig. 4), and pit walls are layered with dry cow dung before pots are placed over.

Fig. 4 Mrs. L. Mgaga, from the Upper uThukela Basin, illustrating different stages of potter production: (a) blending of coils to form slab base for the vessel; (b) completed coil fashioning of the bottom third of the pot around the slab base; (c) completing the mid-section of the vessel, using the shoe sole or an alternative smoothing tool blend the coils together, and (d) using a maize cob, the exterior is scraped and the rim is shaped.

Another layer of dry dung is placed to cover the pots and fired *ca.* 2-4 hours depending on the quantity and availability of cattle dung. Due to the burning of dung, potters indicate that it gives off an awful

smell. Post-firing, white spots or patches can be observed on the pots and these likely suggest the durability or life span of a pot for potters. These spots are a physical manifestation of areas of high heat within the pit-firing. To test for durability, Sokhele potters perform the fingernail-tip knocking technique on the top and bottom of the vessel – the resulting sound that the pot produces will determine the quality of a ceramic vessel. In this case, a higher pitched, clicking of coins like echo from a pot indicates a durable vessel. The Sokhele potters' vessels are suggested to have symbolic meaning because they are frequently used by locals during ancestral ceremonies and traded for local consumption.

Following the documentation of Mrs. L. Mgaga, two potters (Mrs. H. Zondo who categorises her pots as Mazibuko and Mrs. P. Zondo who terms hers as Zondo pottery) all located in the Ekukhanyeni settlement, which is in the Enyokeni region (see Fig. 5). Both these women are married to the Zondo brothers. Like the Sokhele potters in the Enyokeni region, they source their clay from nearby riparian streams and the uThukela River. This clay is principally acquired from two sources lying about 450m away from the settlement where the potters reside. Both these sources are within 500m away from each other. Various types of tests, such as texture and hardness characteristics, are carried out by potters to identify good sources for their production.

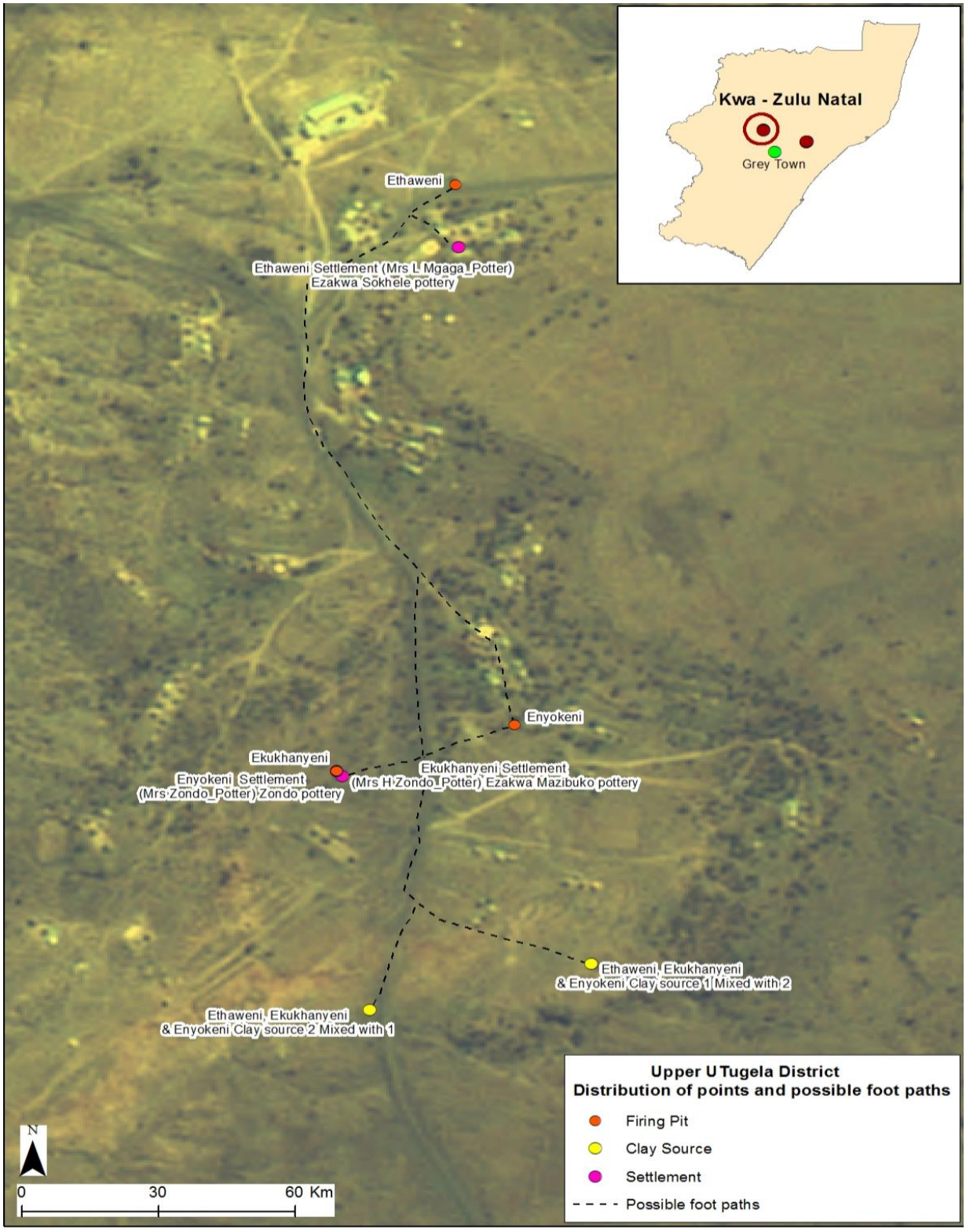

Fig. 5 A map showing the distribution of firing pits, clay sources, settlements of potters in the Upper uThukela Basin, and possible routes taken to acquire clay resources.

Although the physicality of landscapes is unnavigable by car (coarse rock fragments) and clay sources are located to nearby mosquito infested Enyokeni valley, it does not stop these potters from collecting

clays. The two sources of clay are refined to very fine, powdery components using grinding stones. Both potters of the Ekukhanyeni settlement do not add temper on their clay mix with water. In fact, Mrs. P. Zondo mixes the powdery clay with warm water to ensure that the clays have a different plasticity once mature based on the temperature of water added.

Both potters, Mrs. H. Zondo and Mrs. P. Zondo manufacture their pots indoors. This choice is informed by prevailing regional weather such as localised winds and the hot sun which tend to interfere with the drying period. Noteworthy, Perril (2008, 2014, 2015) suggests that the mixing of powdered clays indoors has health risk implications because the clay granuloma contains silica which may pose serious lung problems. Accordingly, potters let clay sit for several days before fashioning, a process that occurs on a flat wooden surface using the coiling techniques and worn-out shoe sole, including maize cob to smoothen the coils and remove marks. Across the Ekukhanyeni settlement, hair combs are used to design and decorate vessels. The Ekukhanyeni potters indicated that their pots are different from their neighbours in terms of design and sacred values associated with the design (incised zigzags). Following this, pots are left to dry for over 3-4 days and are prepared for firing thereafter. During firing, layers of dry dung are placed in a pit, under and over the pots as fuel to fire the vessels. These pits are located *ca.* 50-90m to the settlement. Like the potters from Ethaweni, the Ekukhanyeni potters indicated that dung gives off an awful smell during the firing process (see Fig. 6).

Fig. 6 Left - photo of an un-cleaned firing pit used by Mrs L. Mgaga and remnants of cattle dung from the Upper uThukela Basin. The image to the right is taken from a storage area, showing the Sokhele *Izinkamba* used for beer consumption (Alex C. Nxumalo, 2012).

Notably, very dry and loose crushed dung is suggested to give pottery a black sheen to the surface that is almost silvery, a result of the chemical reduction atmosphere. Accordingly, these vessels are then fired for an additional period, about 3-4 or more hours in the morning. The Mazibuko pottery has symbolic meaning in the performing of rituals (mostly ancestral) and marriage ceremonies. For example, Mrs. H. Zondo produces a pot known as *Dabula-ibheshu* to mark the identity of Ekukhanyeni settlement. The pot is used for serving beer to elderly members (amakhehla) in the Zondo family. According to Reusch (1998: 29), this pot *'dabula'* (meaning tear or split) and *'ibheshu'* (a skin loincloth

worn by men) is so large and heavy that when filled with beer – a man will split apart his loin-cloth if he attempts to pick it up. Moreover, Mrs. P. Zondo manufactures a vessel named *'uMaMsamo'* which sets them apart from other regional producers. This pot is used to serve elderly members of the family. It is placed in the back of a hut or house to hold offerings to the ancestors and a significant marker of identity. The pots are traded locally and with consumers from uMsinga, including regional flea markets.

The Lower uThukela Basin

After spending the first week with potters from the Upper uThukela Basin, the second week was defined by interactions with potters from the Lower uThukela Basin. The specific site of choice within this area was the Uyaya bordering kwa-Shange locality. Noteworthy, this part of the uThukela Basin encroaches towards Nkandla and Eshowe District in Zululand municipality. In fact, three pottery settlements were documented with help of local contacts for their pottery making processes (see Figs 1 and 5). These were (i) the kwa-Salaphansi settlement (producers of Nkwanyana pottery, and (ii) kwa-Budoda-abukhokhelwa settlement (producers of Xulu pottery, and kwa-Dlamini settlement (producers of Dlamini pottery).

Mrs. N Nkwanyane from the kwa-Salaphansi settlement, produces vessels for beer brewing and for the storage of sour milk. She indicates that her clays are sourced from a local site known as Sithilo, situated about 3.5 kilometers away from the homestead. Furthermore, she indicates that good sources of clays are determined using knowledge about textural tests passed on by elderly members of the family. For example, when a potter uses a pick or a spade to dig clays, it must make a 'thump' sound and exhibit a shiny texture depending on the wetness of the clay. After collecting the clays, Mrs. N. Nkwanyane head-carry (*ukuthwala*) the sediment to her homestead and sieves the clay to get rid of excess tiny rocks. Moreover, water is only added to work the clay before fashioning. The vessels are fashioned on a wooden flat surface using the blending of coils method, one by one placed over the other, smoothed using a maize cob (interior and outside) to remove marks. Following this, polished rocks are used to smooth the exterior surface enough for decorating. Finally, the blending process is followed by a small period of drying and then rubbing the exterior again with a smooth object such as stones. The next stage involves decoration using the pointy parts of thorns or glass fragments to incise lines and zigzags. Noteworthy, she indicates that her tool types are different from others because they stay far from town to purchase tools, but the stylistic designs are similar because they share the same teachers. After this, the pots are placed in cooler and drier parts of the homesteads for over three to four days before firing. During the firing process, pots are placed in a pit, located about 40-50 meters away from the settlement. Firewood and dried up aloe leaves are then used to make a big fire. This process takes place over 1-3 hours in the morning depending on wind direction. Like potters in the Upper uThukela, Mrs. N. Nkwanyane performs the knocking test to identify durable vessels. For example, well done pots create

a firm tight echo, whereas a weak or bad pot will create a hollow sound. Noteworthy, Mrs. N. Nkwanyane produces a pot she calls *'Umlobo'*. These are used by 'sangomas' (shamans or healers) to perform ancestral activities while some are sold for marriage exchanges as part of umabo ceremonies (Ngubane 1977; Reusch 1998).

The second potter the author interviewed was Mrs. T. Xulu from kwa-Budoda-abukhokhelwa settlement. The bulk of the Xulu pottery are used for activities linked to the brewing of beer as well as for the storage of sour milk and traditional medicine. By and large, Mrs. T. Xulu gets assistance from her children. Her course of clay is Sthilo, the same place where Mrs. S. Nkwanyane gets her clay in the Ovengeni region by bakkies. It is situated about 4-5 kilometers away from the kwa-Budoda-abukhokhelwa settlement (Fig. 7).

Fig. 7 An image from the Sthilo where the Lower uThukela potters source their clay (Alex C. Nxumalo, 2012).

Contrary to the Upper uThukela Basin, most potters from the Lower uThukela Basin rely on knowledge about textural tests passed on by elderly members and sometimes pilot exercises (hand touch, feel and textural properties) to identify good sources of clay. The production stages for Mrs. T. Xulu all take place within the homestead where tools and other equipment's are housed. The tools are kept in an unoccupied building that can be locked. In fact, the kwa-Budoda-abukhokhelwa settlement potters sieve clay from Sthilo, mix it with water and let it sit for several days before fashioning. During fashioning, the potters add animal fat into the clay and the only ones to do so.

Accordingly, Mrs. T. Xulu begins by creating the base of the pot by the blending of coils and then smoothing the coils to eliminate marks. In fact, she mentions that a well-done vessel must possess a flat base and a circular lip. Using polished rocks, the interior and the exterior as well is smoothed. Maize cob is particularly used on the exterior for the *iMbiza* pots. Finally, the blending process is followed

by a small period of drying and then rubbing the exterior again with a polished object such as stones. By and large, the Lower uThukela Basin potters share design and stylistic attributes. The similarity is explained by Mrs. T. Xulu indicating that most of the potters in Kwabudoda-abukhokhelwa settlements were taught by her mother. Noteworthy, pottery between the Lower uThukela Basin area can be distinguished from other potters through shape and fine neat zigzags and drawings (see Fig. 8).

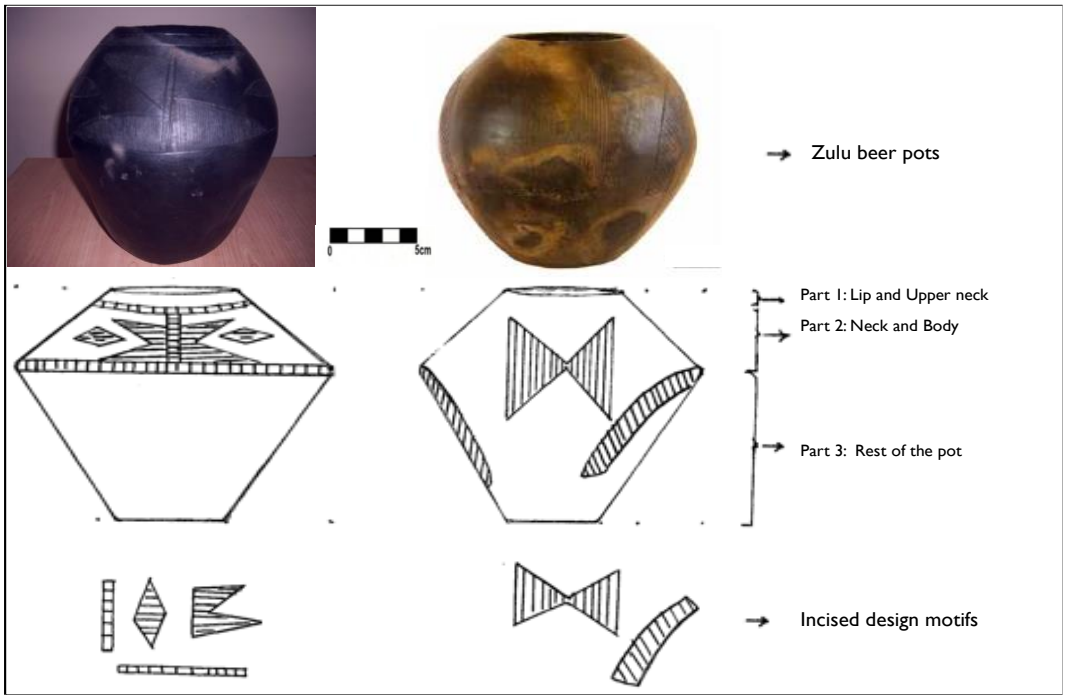

Fig. 8 Beer pots (*izinkamba*; known as *dabula-ibheshu*), labeled sketches of pots, and incised design motifs. The black pot to the left was produced by Mrs. L. Mgaga (Bongumenzi Nxumalo, 2012) while the brown one to the right is a Mabaso pot discussed by Fowler (2011b: 193).

Finally, pots are left to dry over several days and then prepared for the firing process. Across this part of the uThukela Basin, pots are fired for about 1-3 hours, in a pit located approximately 30-40m away from the settlement. They use firewood that is carefully placed on the ground and dried up aloe leaves or plants covering the pots. Firewood and dried aloe leaves are preferred over cattle dung due to accessibility. A complete firing process results in a smooth, terra cotta or buff look textured black colour. at this point. Like the Upper uThukela Basin potters, a fingernail-tip knocking technique on the top and bottom of the vessel is used to test for the durability. A good pot must produce an echo like a compact box and it must not sound dead. When water is poured inside, it must not leak. Mrs. T Xulu pots are sold for marriage exchanges and are often used by Sangomas, who are the practitioners of traditional African medicine, during their rituals. In addition, these pots can be used for the storage of traditional medicine.

Ten kilometers away from the Ovengeni, in kwa-Shange area within the Eshowe district, the author met Mrs. T. Z. Dlamini. She produces the Dlamini pottery which are used for the brewing activities, cooking, and for the storage of sour milk. Like other potters in the Lower uThukela Basin, she sources her clay from Sthilo (see Figs 7 and 9).

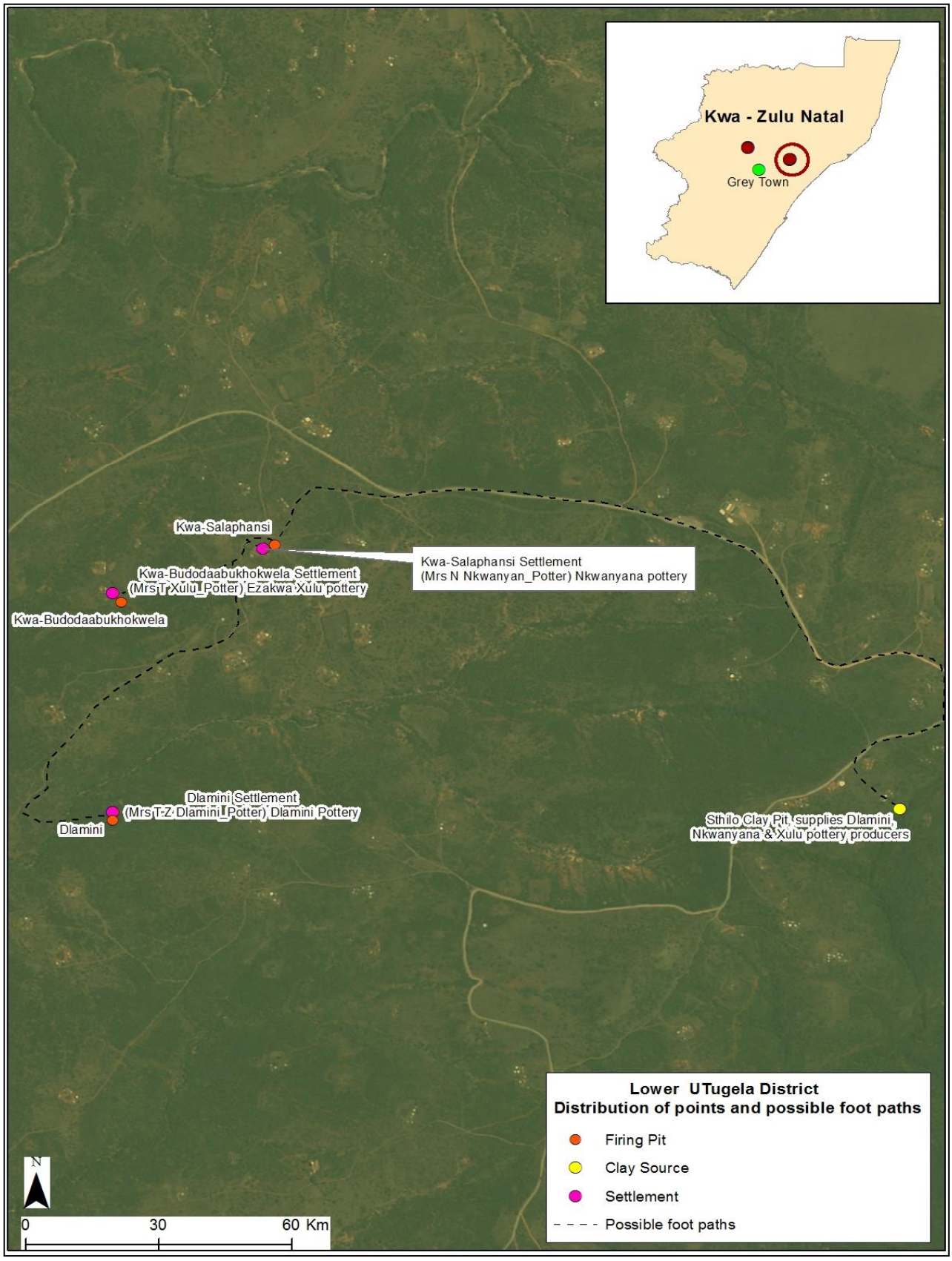

Fig. 9 Production areas and possible routes used by potters to acquire clay from the Lower uThukela Basin.

Mrs. T. Z. Dlamini determines good sources of clay using knowledge passed from teachers in the form of texture testing. For example, when the pick is on the clay pit, it must leave a shiny texture on the pit wall giving an indication of good source and hard clay. These clays are gathered, and are sieved or hand sorted to remove excess micro-rock fragments and then water. Although temper is not added to the clay, the clay is left for several days before fashioning. She fashions her pots by blending the coils to form the base of the vessel placed on a flat surface (piece of wooden plank). One by one, coils are then placed over the other and then smoothed to eliminate marks. This fashioning strategy is used across the uThukela Basin. The interior of the pots is sometimes smoothed using polished stones and the exterior using cobs. Following this, the pots are then decorated using thorns and glass, before being placed in a safe storage for about 3-4 days to dry efficiently prior to the firing process. As with other potters in the region, Mrs T. Z. Dlamini indicates that local potters share similar stylistic designs. She further confirmed the assertion made by Mrs T. Xulu that her mother is responsible for teaching the majority of potters in the area (see Fig. 9). Contrary to the popular pit firing technique used by many potters across the Upper and Lower uThukela Basin, some pots (Mrs. T. Xulu) are fired in a shallow depression. This firing area is normally located about 50-60 m away from the settlement and is defined by a bonfire made using aloe leaves and firewood. The process takes about 1-2 hours in the morning depending on weather conditions. The knocking and sound technique on the base of the pot is also used to determine its strength. The echo within the pot must not be a hollow sound which is indicative of a weak vessel.

Interpretative Frameworks and Discussion

Production Technique

A number of scholars, such as Sillar and Tite (2000) and Stark (1998) argue that the production sequences of pottery require potters to access a number of standardized choices such as raw material procurement and various production techniques. As such, pots within the same locality become a unique product due to these sets of choices (ibid). In this study, the application of ethnoarchaeology and key components of the *chaîne opératoire* was used to understand aspects around technical choices involved in formulating non-plastic materials for fashioning pottery and choices associated with firing industries in the uThukela Basin.

This study shows that the selection and procurement of raw material involves potters making a wide range of choices in terms of which tempering materials and sources of fuel would be used to fire the designed clay (as shown in Figs 3-10). For instance, the selection of the area where they source clay is based on several plasticity characteristics, whether it is colour, textural exploitation, and workability. These choices are available irrespective of the vessel being produced, what its function would be, and treatment procedures. In fact, the nature of the decision is based on individual's capacity to identify the

pots suitability as seen in Perrill (2008) and Gosselain and Smith's (1995: 148) laboratory results from the Ceramics and Society Project.

Potters in the uThukela Basin show that several clays are selectively qualified based on their ability to be worked and produce durable pottery. For example, three families of potters in the Upper uThukela Basin were recorded mixing two types of clay: the fine (dark reddish coloured) and the coarser grained (black coloured). The dark reddish clays have high levels of iron oxide substances which then create a reddish colour stained clays (Fowler 2008; Nxumalo 2019, 2020). In contrast, the black course grained clays have higher organic features, and encompasses a well sorted arrangement of mineral components, characteristic of alluvial (ibid). Like the Luo potters of Western Kenya, potters in the uThukela Basin are unevenly dispersed, some are sparsely distributed, while the majority are clustered in homesteads forming potter communities (Herbich and Dietler 1991). Although procurement of raw materials may seem totally communal, this is a nuanced procedure that is influenced by human agency and socio-political complexity. For example, clays are carried in sandbags by bakkies to individual settlements where they are processed and preserved in buckets, drums, and in old pots until its required for use (Fig. 10). Noteworthy, the collected clays are controlled at an individual level.

Fig. 10 One of the areas where the Upper uThukela Basin potters source their clay. Such clay is then carried back home using old maize bags. These clays are processed on the floor of a broken down house. The image to the right shows sieved clay stored in buckets and metal containers. In front of the containers are trenches dug for a building soon to be constructed.

The processing stage across the Upper and Lower uThukela Basin includes the grounding of clays to very fine, micro-granular components of sheet silicates that are left for several days to produce a homogenous paste. Water is then added to the prepared clay. General expectation would be that cold water is used by the potters. However, the Zondo potters indicate that they prefer the use of warm water instead. Their reasoning is that warm water better enhances the binding of materials, speeding up the plasticity of the clay which further ensures that pots are able to perspire when stored in a cool area, vaporizes and sweats. As illustrated above, pots are fashioned using a standardized method of blending coils, beginning with the base and lumping clay onto a disk, and then placed in a wooden plate (as shown in Fig. 4)

By and large, hair combs, broken glass, thorns, and rocks are used to design pots before the firing process. In the uThukela Basin, various types of decorations can be observed. For instance, potters from the Upper uThukela Basin potters produce leaf shaped and line motif incisions running from the lip to the mid portion of the pot, with lines running across. In contrast, potters from the Lower uThukela Basin use parallel lines, zigzag, and triangle motifs as decoration on the pot. As shown in Fig. 8, there is no specific area of the pot that is preferred for the decoration purposes. As such, decoration can be anywhere on the pot. Noteworthy, potters from the Upper and Lower uThukela Basin seldom refer to the significance of stylistic attributes, design, and decoration. This is because such attributes are shared across various pottery communities (Perril 2008, 2012, 2015). This contrasts with the findings by Fowler (2011a, 2011b) who discovered that potters often make links to stylistic motifs found on clothing as an expression of statuses in the uThukela Basin.

The firing process stages in Lower and Upper uThukela are conducted in fire pits over several hours. This process can take anything between one and two hours. Generally, the firing pits are located *ca.* 50-100 meters away from the settlements of potters due to the type of fuel used to fire the pots (see Figs 5, 6, 9). Previous studies on Zulu pottery by scholars such as Fowler (2008), Ngubane (1977) and Rice (1987) recognize several firing stages, first beginning with the bisque and then the post firing, also known as carbonization (see Perrill 2008). The ethnographic approach from this study also reveals that Zulu potters apply animal fat as post firing concoction to give their pots a distinct texture and white patches showing a well-prepared pot (see Fig. 6). As noted by Perril (2012, 2015), some potters in the uThukela Basin substitute the use of animal fat with shoe polish and wax. Moreover, Mrs. H. Zondo, also reaffirms the post firing approach *ukufusa*, through which she indicates when pots are red hot out from the fire, cow dung and powder is crushed over the pots to give them a black sheen that is almost silvery because of the chemical reduction (see also Perrill 2008). To complete the pottery production, all potters in the uThukela Basin carry out the durability test using the knocking technique on the top of the vessel near the lip. Most of the potters indicate that a well fired pot produces a high-pitched ring and clicking of coins like sound. Meanwhile, poorly made pots create a distorted unpleasant buzzing and dull like sound which likely shows cracking on the pottery structure. This technique to test the durability of the pots is also common among the Luo potters in Kenya (see Herbich and Dietler 1991).

Discussing the *chaine operatoires* for pottery industries in the uThukela Basin

The table below summarizes the *chaine operatoires* of ceramic production, and methods used in the processing and manufacture of pottery in the uThukela Basin (Table 2). Furthermore, the table formulates a discussion on the interpretive implications, particularly considering how archaeological pottery assemblages have been understood and analyzed in South Africa.

Table 2 Evaluation of fabrication approaches and techniques in both Upper and Lower uThukela Basin based on Fowler (2011a, 2011b). The phases and sub-phases, including techniques are tabled below across the uThukela Basin, as described in Gosselain (2008).

PHASES	SUB-PHASES & TOOLS	UPPER UTHUKELA BASIN POTTERS			LOWER UTHUKELA BASIN POTTERS		
		Sokhele	**Mazibuko**	**Zondo**	**Nkwanyane**	**Xulu**	**Dlamini**
Extraction	***Extraction Technique***	Surface collection using picks	Surface collection using picks	Surface collection using picks	Surface collection	Surface collection	Surface collection
Processing	***Pre-treatment***	Dried up in buckets	Dried up in buckets	Dried up, in buckets or metal containers	Drying	Drying	Drying
	Removal of non-plastics	Sieved/hand sorted	Sieved/hand sorted	Sieved/hand sorted	Sieved/hand sorted	Sieved/hand sorted	Sieved/hand sorted
	Addition to non-plastics	Mix coarse & fine clay	Mix coarse & fine clay	Mix coarse & fine clay	Sthilo-clay, coarse or fine	Sthilo-clay, coarse or fine	Sthilo-clay, coarse/fine
Shaping	***Roughing out***	Coiling from the base	Coiling from the base	Coiling from the base	Coiling from the base	Coiling from the base	Coiling from the base
	Performing	Scraping, smoothing and blending with shoe soles	Scraping, smoothing and blending using shoe soles	Scraping, smoothing and blending using shoe soles	Scraping, blending and smoothing using rocks	Scraping, blending and smoothing using rocks	Scraping, blending and smoothing using rocks
Design & **technology**	***Design technique***	Incise using hair combs and thorns	Incise using combs	Incise using hair combs	Incise using thorns, bottles and stones	Incise using thorns, bottles and stones	Incise using thorns, bottles and stones
	Extra	_	_	_	_	Animal fat	_
Drying	***Period***	Days	Days	Days	Days	Days	Days
	Location/ storage	Inside settlement	Inside settlement	Inside settlement	Inside settlement	Inside settlement	Inside settlement
Firing	***Fuel***	Cattle dung	Cattle dung	Cattle dung	Aloe leaves or firewood	Aloe leaves or firewood	Aloe leaves or firewood
	Structure	Pit	Pit	Pit	Pit	Pit	Pit
	Type	Pit firing	Pit firing	Pit firing	Pit firing	Pit firing	Shallow depression
	Location	200-250 m	50-90 m	100-150 m	40-50 m	30-40 m	50-60 m
	Time taken	±2 hours	± 3 hours	±1 hour	±1 hour	± 1 hour	±1 hour
Post firing	***Fuel***	_	_	Crushed/dry cattle dung	_	_	_
	Structure	_	_	Pit	_	_	_

Table 2 shows many similarities, especially in the stages highlighted by Fowler (2008). In fact, six out of seven phases in this paper are highlighted in Fowler (2008, 2011a) and Gosselain (2008). These are (a) raw material procurement, (b) clay processing, (c) fashioning, (d) decoration, (e) drying, (f) firing. It was only one potter who indicated that the significance of the seventh phase associated with post firing is important. All these phases and sub-phases also show that potters in the uThukela Basin share similar processes behind the production of pots. Evident in this paper is that production sequences and shaping approaches can endure or span a lengthy time. In fact, the Lower uThukela Basin potters reveal that these processes have not changed since they were taught by their teachers. What has changed, however, are the tools used by potters. It is possible that some potters in the uThukela Basin have altered surface treatments such as the substitute the use of animal fat with shoe polish, including wax as captured in Perril (2008, 2015). In this respect, there are some minor differences which can be observed between the Upper and Lower uThukela Basin, especially in the tempering of clay and fuel material used in the firing stage (see Table 3). In fact, the firewood is preferred in the Lower uThukela and cow dung in the Upper uThukela.

Table 3 Estimated time it takes to reach the sources of raw material at a standard average of 13 min/km as a result of practicality, used by Fowler (2011b).

Clay Source	***Upper UThukela basin Potters***			***Clay Source***	***Lower UThukela basin Potters***		
	Sokhele	*Mazibuko*	*Zondo*		*Nkwanyane*	*Xulu*	*Dlamini*
Black-clay source 1	✓	✓	✓	Sthilo (black)	✓	✓	✓
Red-Clay source 2	✓	✓	✓		-	-	-
Distance	Less than 1 km	±500 m: 0. 5 km	± 520m: 0.52 km	Distance	3-5 km	4-5 km	8-9 km
Estimated Time Taken	13 min	6 min	5 min	Estimated Time Taken	39 minutes	52 minutes	1 hour: 44 minutes

The implication of the results (see Tables 2 and 3) suggest that the Upper uThukela Basin potters prefer two types of clays. These serve as tempering inputs to achieve favorable clay properties before pots are designed. Gosselain (1996) argues that mixing various types of clays with differing physical properties clay ensures the potential for maintaining clay granulometric composition lumps and to avoid breakage during the firing stages, including the use of the pot. It is possible that the mixing of two types of clays by potters in the Upper uThukela Basin improves the clay granulometric composition and to avoid breakage during the firing process as well as using the pot. In turn, pottery producers from the Lower uThukela Basin add no temper to their clays.

Functional Repertoire of Zulu Pots and their Social Context

Pottery in the uThukela Basin is separated into six different functional categories. These vary from (a) beer storage (*izimbiza*), (b) pots used for serving food and medicinal preparation (*izinkamba*), (c, d and f) for preparing meat - *izinkhanzi* (see Fig. 11).

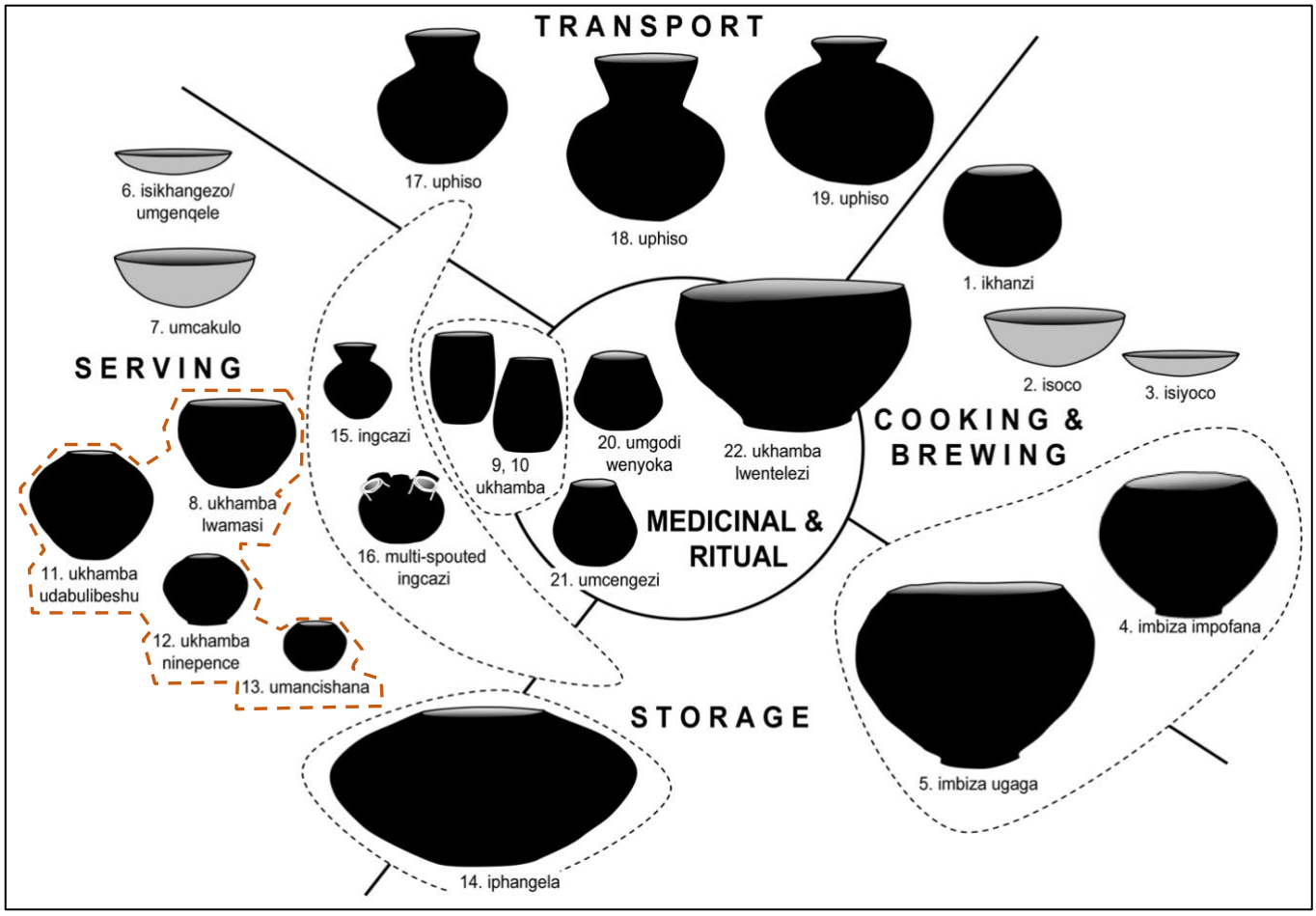

Fig. 11 Showing functional aspects of Zulu pottery, orange dotted polygon highlights serving pots - *izinkambha* (after Fowler 2006: 98).

Arthur (2003) argues that form, function, and shape are useful theoretical approaches which have symbolic meaning to social status, wealth, and political aspects. This paper notes that beer pots are largely produced in greater numbers and procured by local consumers. In several studies (see Fowler 2006; Ngubane 1977; Perrill 2008, 2012, 2014, 2015), these pots and their functional aspects exhibits minimal social visibility in the uThukela Basin. As a result, pottery production and their consumption in the uThukela Basin is not linked to technical attributes as a proxy for function, but rather shape and size is emphasized (also noted in Fowler 2006). Noteworthy, serving pots (see Fig. 11) are desirable for lavish food that socially bring people together and helps maintain or reinforce group cohesiveness, including social norms of generosity. By and large, the learning, labour, and apprenticeship of pottery

production in the uThukela Basin shows that women make pots. The same can be observed elsewhere in Africa among BaVenda and Zimbabwean potters (see Lindahl and Pikirayi 2010), Cameroonian Bafia potters (Herbich and Dietler's 1991), and the Luo potters in Kenya (Gosselain 1992). All these studies demonstrate that pottery production has a social significance. For example, social information about good sources of clay is transmitted through teaching and potter network which are dominated by female interactions in the uThukela Basin. Accordingly, the range of distribution for the uThukela Basin pots and other ornaments are as far as ca. 250 km in the Mona market in Nongoma. However, the bulk of pottery are traded with the local and regional clientele (Greytown in the Msinga area).

Zulu pottery production: a model for olfactory studies

As indicated by the potters, smell has direct proportional relationships to the fuel types applied during the firing process and the inverse of that is true regarding the location of firing pits in their settlements. In both Upper and Lower uThukela Basin, potters indicate that the type of fuel used to fire the pottery indirectly enhances smell. For instance, in the Upper uThukela Basin, potters have access to cattle and thus cattle dung is preferred as the fuel source for the firing process. These potters indicate that cattle dung emits an awful smell. As a result, the location of their firing pits is not less than 100 meters (m) away from their settlements (see Table 3). In contrast, potters from the Lower uThukela Basin indicated their preference to use aloe leafs and firewood during the firing of pots. These emits a tolerable smell and may explain why firing pits are located ca. 40 m away from their settlements (as shown in Table 3). It is from this aspect that smell exhibits proportional inferences which can be observed in the GIS and approximating the location of firing pits round the settlements.

Conclusion

Ceramic studies in archaeology are very important because they can be used to situate past people's history. This study confirms what scholars, especially the work of Kent Fowler (2006, 2008, 2011a, b) and Perrill (2008, 2011, 2012, 2014) elsewhere in the study area, indicating that the production process is the same across a wide/large geographical region like the uThukela Basin. This paper is relevant to South African archaeologist that study Iron Age research in that it warns against the casual usage of ethnographic studies to map out the present onto the past. It does so by showing that the social boundaries among pottery producers in the uThukela Basin are not uniform or static, but they are always changing which could render inferences made from the present onto the past problematic. This is crucial for the development of new approaches in South Africa to understand Iron Age ceramic studies as well as the need for archaeologist to pay careful attention to the *chaine operatoire*. For instance, this work

has shown the reliability and implications of ethnoarchaeological approaches in evaluating the *chaine operatoires* and modelling technological, including operational attributes. As such, the paper recommends that ethnographers should take on a dual approach which fuses technological and the functional aspects to understand the social attributes in pottery production. Potters and consumers in the uThukela Basin emphasize the functional categories, size, and shape of the pots in order to draw distinctions between ceramic types as they are directly linked to capacity, transport and availability of contents. However, varying issues and problems bound the literature, suggesting the need for newer studies and alternative approaches to understand prehistoric practices of this shared and widespread tradition. David and Kramer (2001) argue that the production of pottery can be linked to stylistic attributes, which mark aspects that are linked to socio-cultural boundaries and the culmination of class, including group cohesiveness. Despite the subtle changes on stylistic and functional attributes between pottery types in the uThukela Basin, all potters who were interviewed define their pottery as Zulu pottery. Moreover, potters in the uThukela Basin produce pots as a means of generating capital, thus making a living for themselves and their families. Similar to other scholars working in the uThukela Basin, this paper shows that archaeologists need to look at culturally significant variables such as functional categories, sizes and shapes in understanding past ceramic industries. All these aspects show the dangers of uncritically adopting and applying ethnographies to examine the present onto the past.

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Declarations

Conflict of Interest Disclosure

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REFERENCES

Arthur. J, W. (2003). Brewing Beer: Status, Wealth and Ceramic Use Alteration among the Gamo of South-Western Ethiopia. *World Archaeology, 34*(3), 516–528.

Buss, J. (2018). From Homestead to Roadside to Gallery: The Social Life of Late Twentieth Century and Early Twenty-First Century Zulu Ceramics. Published Master's dissertation: University of the Western Cape, South Africa.

David, N., & Kramer, C. 2001. *Ethnoarchaeology in Action*. Cambridge University Press: United Kingdom.

Demlie, M., & Titus, R. (2015). Hydrogeological and hydrogeochemical characteristics of the Natal Group Sandstone, South Africa. *South African Journal of Geology, 118*(1), 33–44.

Dietler, M., & Herbich , I. (1991). *Aspects of ceramic system of the Luo of Kenya.* 105–135.

Dlamini, P., Chivenge, P., Manson, A., & Chaplot, V. (2014). Land degradation impact on soil organic carbon and nitrogen stocks of sub-tropical humid grasslands in South Africa. *Geoderma, 235*, 372–381.

Fowler, K. D. (2006). Classification and collapse: the ethnohistory of Zulu ceramic use. *Southern African Humanities, 18*(2), 93–117.

Fowler, K. D. (2008). Zulu pottery production in the Lower Thukela Basin, KwaZulu-Natal, South Africa. *Southern African Humanities, 20*, 477–511.

Fowler, K. D. (2011a). The Zulu ceramic tradition in Msinga, South Africa. *Southern African Humanities, 23*, 1–44.

Fowler, K. D. (2011b). The Zulu ceramic tradition in Msinga, South Africa. *Southern African Humanities, 23*, 173–202.

Fredriksen, P. D., & Bandama, F. (2016). The mobility of memory: space/knowledge dynamics in rural potting workshops in Limpopo Province, South Africa. *Azania Archaeological Research in Africa, 51*(4), 1–18.

Gers, W & Perrill, E. (2020). Introduction. *de arte*, *55*(2), 1–3

Gosselain, O. P. (1992). Technology and Style: Potters and Pottery Among Bafia of Cameroon. *Man, New Series*, *27*(3), 559–586.

Gosselain, O. P., & Smith, A, L. (1995). The Ceramics and Society Project: An Ethnographic and Experimental Approach to Technological Choices. *KVHHAA Konferenser, 34*, 147–160.

Gosselain, O. P., Smith, L. A., Wallaert, H., Ewe, G. W., & Linden, M. V. (1996). Preliminary results of fieldwork done by the "Ceramic and Society Project" in Cameroon, December 1995-March 1996. *46*, 13–17.

Gosselain, O. P. (2002). *Poteries du Cameroun méridional. Styles techniques et rapports à l'identité*. Paris: CNRS Edition.

Gosselain, O. (2010). Exploring the dynamics of African pottery cultures. *The Archaeology of Regional Technologies: Case Studies from the Palaeolithic to the Age of the Vikings*, 193–224.

Gosselain, O. (2016). To Hell with Ethnoarchaeology. *Archaeological Dialogues*, *23*(2), 215–228.

Huffman, T. N. 1970. The Early Iron Age and the Spread of the Bantu. *The South African Archaeological Bulletin*, *25*(97), 3–21.

Huffman, T. N. 1980. Ceramics Classifications and Iron Age Entities. *African Studies*, *3*(1), 121–174.

Huffman, T. N. (1982). Archaeology and Ethnohistory of the African Iron Age. *Annual Review of Anthropology*, *11*, 133–150.

Huffman, T. N. (1989). Ceramics, settlements and Late Iron Age migrations. *African Archaeological Review*, *7*, 155–182.

Hodder, I. (1982). *Symbols in action.* Cambridge, UK: Cambridge University Press.

Kramer, C. 1985. Ceramic Ethno-archaeology. *Annual Review of Anthropology*, *14*, 77–102.

Lindahl, A., & Pikirayi, I. **(**2010). Ceramics and change: an overview of pottery production techniques in northern South Africa and eastern Zimbabwe during the first and second millennium AD. *Archaeological and Anthropological Sciences*, *2*(3), 133–149.

Matthews, L., & Catacutan, D. C. (2012). *Context of uThukela watershed, KwaZulu Natal, South Africa.* Institute of Natural Resources, Pietermaritzburg, South Africa.

McCourt, S., Armstrong, R. A., Grantham, G. H., Thomas, R. J. (2006). Geology and evolution of the Natal belt, South Africa. *Journal of African Earth Sciences*, *46*(1-2), 71–92. https://doi.org/10.1016/j.jafrearsci.2006.01.013.

Mduduma, H. (2018). Hydrochemical characterisation of northern KwaZulu-Natal historic coal mining districts, northeastern South Africa. Published Master's dissertation: School of Agricultural, Earth and Environmental Sciences, University of KwaZulu-Natal, South Africa.

Ndoro, J. T., Hitayezu, P., Mudhara, M., & Chimonyo, M. (2013). September. Livelihood factors influencing market participation and supply volumes decisions among smallholder cattle farmers in the Okhahlamba Local Municipality, South Africa: Implications for agricultural extension programming. In 4th International Conference of the African Association of Agricultural Economists, 22-25 September 2013, African Association of Agricultural Economists, Hammamet, Tunisia.

Nsuntsha, A, N. M. (2000). *Change and continuity in government institutional arrangements: implications for environmental management in the Upper Tugela area of KwaZulu- Natal.* Unpublished Doctoral dissertation, University of KwaZulu-Natal, South Africa.

Nxumalo, B. S. (2012). *An ethnoarchaeological study of Zulu pots in the uThukela basin.* Unpublished Honours dissertation: University of Pretoria, South Africa.

Nxumalo, B. S. (2013). The ethnoarchaeological Study of Zulu pots in the Uthukela Basin: http://antiquity.ac.uk/projgall/518.

Nxumalo B. S. (2019). Integrating geoarchaeological approaches and rainfall modelling as a proxy for hydrological changes in the Shashe–Limpopo basin, South Africa. *South African Archaeological Bulletin, 74*(211), 67–77.

Perrill, E. (2008). Contemporary Zulu ceramics, 1960s – present. Published Doctoral dissertation: Indiana University, United States of America.

Perrill, E. (2011). In Surface and Form – 25 Years of Zulu Ceramic Innovation. *Ceramics: Art and Perception*, *85*, 55–59.

Perrill, E. (2012). South African Rubber and Clay. *Third Text, 26*(5), 585–597.

Perrill, E. (2014). An Illustrative Legacy: Art Education and Zulu 'Crafts'. *Critical Interventions: Journal of African Art History and Visual Culture, 8*(1), 10–30.

Perrill, E. (2015). Burnishing History: The Legacies of Maria Martinez and Nesta Nala in Dialogue: Part I: An Historian's Conversation. *The Journal of Modern Craft, 8*(3), 263–286.

Pikirayi, I. (1997). Pots, people and Culture: an overview of ceramic studies in Zimbabwe. In Pwiti, G. (ed.), *Caves, monuments and texts: Zimbabwean archaeology today.* Uppsala: Department of Archaeology and Ancient History, 68–87.

Pikirayi, I. (1999). Taking Southern African ceramic studies into the twenty-first century: a Zimbabwean perspective. *African Archaeological Research, 16*(3), 185–189.

Pikirayi, I. (2007). Ceramics and group identities: towards a social archaeology in southern African Iron Age ceramic studies. *Journal of Social Archaeology, 7*(3), 286–301.

Pikirayi, I., & Lindahl, A. (2013). Ceramics, ethnohistory, and ethnography: locating meaning in southern African iron Age ceramic assemblages. *African Archaeological Review, 30*, 455–473.

Pommerieux, M., Bourblanc, M., & Ducrot, R. (2014). *Monitoring and evaluation of a participative planning process for the integrated management of natural resources in the uThukela District Municipality (South Africa).* Working paper No. 2014/1, University of Pretoria, South Africa.

Reusch, D. (1998). Imbiza kayibil' ingenambheki: the social life of pots. *In*: Bell, B & Calder, I., eds, *Ubumba: aspects of indigenous ceramics in Kwa-Zulu–Natal*. Pietermaritzburg: Tatham Art Gallery, 19–40.

Roffe, S. J., Fitchett, J. M., & Curtis C. J. (2019). Classifying and mapping rainfall seasonality in South Africa: a review. *South African Geography Journal, 101*(2), 158–174.

Roffe, S.J., Fitchett, J. M., & Curtis, C. J. (2020). Investigating changes in rainfall seasonality across South Africa: 1987–2016. *International Journal Climatology*, *41*(1), E2031–E2050. https://doi.org/10.1002/joc.6830.

Sadr, K. (2008). An ageless view of first Millennium AD southern African ceramics. *Journal of African Archaeology*, *6*(1), 103–129.

Sillar, B., & Tite, M. S. (2000). The Challenge of Technological Choices for Materials Science Approaches in Archaeology. *Archaeometry*, *42*(1), 2–20.

Shabalala, M. M. (2018). Modelling the impacts of changes in agricultural management practices on water resources with declining hydrometeorological data in the uThukela catchment. Unpublished Master's Thesis. Centre for Water Resources Research School of Agricultural, Earth and Environmental Sciences College of Agriculture, Engineering and Science. University of KwaZulu-Natal.

Nyamushosho, R. T., Chipangura, N., Pasipanodya, T., Bandama, F., Chirikure, S., & Munyaradzi, M. (2021). Nyanga pottery and the Manyika ethnohistory: towards a decolonised archaeology of the Nyanga agricultural complex. *Heliyon*, 7, 1–15.

Smith, A. (2016). Pottery and Politics: Making Sense of Pottery Traditions in Central Africa. *Cambridge Archaeological Journal*, *1*, 1–21.

Stark, M. T. (1998). Technical choices and social boundaries in material culture patterning: An introduction. In Stark, M. T. (ed.), *The Archaeology of Social Boundaries*, Smithsonian Institution Press, Washington, DC, 1–11.

Thebe, P. C., & Sadr, K. (2017). Pottery decoration in contemporary southeastern Botswana, *Azania: Archaeological Research in Africa*, *52*(3), 305–323.

van der Eyk, J. J., MacVicar, C. N., & de Villiers, J. M. (1969). *Soils of the Tugela Basin*, Pietermaritzburg: Natal Town and Regional Planning Commission.

Whitelaw, G. (2012). Anthropology and History in the Southern African Iron Age. *African Studies*, *71*(1), 127–144.