Pots and marriage:
An archaeometric analysis of sherds from Mgoduyanuka, a Late Iron Age site in KwaZulu-Natal

by

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I declare that the above dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.

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Abstract

This project tests the hypothesis, driven by Zulu ethnography, that red-coloured sherds from the Late Iron Age site of Mgoduyanuka in KwaZulu-Natal come from pots that were brought into the homestead through marriage alliances. In contrast, black-coloured and plain sherds come from pots that were locally made. To test this hypothesis, three archaeometric techniques were employed: portable XRF, conventional XRF and XRD. To understand the social origins of coloured vessels, ethnographic interviews were conducted. XRF and XRD results showed that there is no difference between the clay fabrics of the sherds. However, the results of portable XRF showed that there is a significant difference between the fabrics of the red-coloured sherds and the plain sherds. The fabric of the black-coloured sherds is spread between the red-coloured and the plain sherds, suggesting that some black pots would have been brought into the homestead.

Key words: Mgoduyanuka; Late Iron Age site, archaeometric techniques; clay fabrics; coloured pots; Zulu ethnography; ancestors; marriage alliances; colour symbolism; fertility

Opsomming

Hierdie projek het die hipotese, gebaseer op Zulu-etnografie, dat rooigekleurde potskerwe van die Laat Ystertydperkterrein Mgoduyanuka in KwaZulu-Natal afkomstig is van potte wat in die woonkompleks ingebring is deur huweliksalliansies, getoets. In teenstelling hiermee is swartgekleurde en gewone (ongekleurde) potskerwe afkomstig van plaaslik vervaardigde potte. Om hierdie hipotese te toets is drie argeometriese tegnieke gebruik: draagbare XRF, konvensionele XRF en XRD. Om die sosiale oorsprong van gekleurde potte te verstaan is etnografiese onderhoude gevoer. XRF- en XRD resultate het getoon dat daar geen verskille is tussen die materiaal van die potskerwe nie. Die resultate van die draagbare XRF het egter 'n beduidende verskil getoon tussen die materiaal van die rooigekleurde en gewone potskerwe. Die materiaal van die swartgekleurde potskerwe is versprei tussen die rooigekleurde en gewone potskerwe, wat suggereer dat sommige swart potte in die woonkompleks ingebring is.

Sleutelwoorde: Mgoduyanuka; Laat Ystertydperkterrein; argeometriese tegnieke; kleimateriaal; gekleurde potte; Zulu-etnografie; voorouers; huweliksalliansies; kleursimboliek; vrugbaarheid

Okucashuniwe

Le phrojekthi beyihlola ngenkolelomboni, ngokokulandisa kwesizwe samaZulu, ngokuthi izingcezu-zebhodwe ezinombala obomvu ezisendaweni yaseMgoduyanuka iLate Iron Age KwaZulu-Natali zaphuma ezimbizeni ezazifika ngesikhathi kuganiselwana. Umehluko ukuthi, izingcezu-zebhodwe ezinombala omnyama futhi ezingahlobile ngezalezo zimbiza noma lawo mabhodwe enziwe endaweni. Ukuze kuhlolwe le nkolelombono, kuye kwasetshenziswa izindlela ezintathu zokuhlola ubudala balezi zimbiza: nokuyiXRF ephathekayo, yiXRF ejwayelekile kanye neXRD. Ukuze siqonde imvelaphi yezitsha ezinemibala, kuye kwabanjwa izinkulumongxoxo ngokulandela incazelo yabanolwazi. Imiphumela yeXRF neXRD ibonise ukuthi awukho umehluko okhona phakathi kokwakheka kwelezi zindengezi. Kodwa-ke, imiphumela yeXRF ephathekayo ibonise umehluko omkhulu phakathi kokwakheka izingcezu-zebhodwe ezinemibala ebomvu kanye nalezo ezingahlobile. Ukwakheka izingcezu-zebhodwe ezinombala omnyama kuvela kuzo zombili izingcezu- zebhodwe ezinombala obomvu kanye nalezo ezingahlobile, okusho ukuthi ezinye izimbiza kwakungezokufika emakhaya.

Amagama amqoka: eMgoduyanuka; indawo eLate Iron Age, izindlela zokuhlola ubudala; izinto zobumba; izimbiza ezinemibala; ukulandisa kwesizwe samaZulu; amadlozi; izivumelwano zokuganiselana; uphawu lombala; ukuvunda

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Preface

AIM AND OBJECTIVES

Excavations by Tim Maggs in the 1970s at the Late Iron Age site of Mgoduyanuka in the upper Thukela basin produced an assemblage of more than 4700 potsherds. Textured decoration is rare in the assemblage, but one-third of the sherds are burnished. Most of the burnished sherds are coloured red, a few are coloured black and the rest are uncoloured. The gendered nature of colour and pot making in Zulu cosmology suggests that the red-coloured pots might originate from the natal homes of the new brides. By contrast, black-coloured pots were possibly locally made, along with plain food-processing vessels such as *izimbiza* (Armstrong et al. 2008; Whitelaw 2014). The main aim of my project is to test this hypothesis using the Mgoduyanuka ceramic assemblage.

METHODOLOGY

To test the hypothesis, I conducted archaeometric analyses using both X-Ray Fluorescence (portable and conventional XRF) and X-Ray diffraction (XRD). My analysis had two components. Firstly, I conducted an elemental analysis of selected sherds using portable X-ray fluorescence (pXRF) to determine whether the sherds cluster in a way that relates to different categories of burnish. The ceramic sample selected included a range of coloured and plain sherds from Mgoduyanuka. The XRF device was calibrated to identify and record elements likely to be present in ceramic fabrics. I anticipated that trace elements would be particularly useful for my study, given the sedimentary nature of the dominant geological body.

Secondly, on a subset of my ceramic sample, I conducted conventional XRF to provide support to the pXRF. I also conducted a mineralogical analysis of the same subset using XRD. Additionally, I conducted ethnographic fieldwork by doing interviews with contemporary Zulu potters and native Zulu speakers residing in KwaZulu-Natal. The main aim of conducting ethnographic fieldwork was to augment the sometimes limited information in the formal ethnographic literature. Very often, the ethnographic literature does not contain much specific information on beliefs about and uses of material cultures such as pots. Moreover, the interviews were done to aid in facilitating the interpretation of the elemental and mineralogical results from the XRF and XRD.

Broadly speaking, I endeavour to explore the relationship between ceramics, colour and marriage alliances. Secondly, I aim to determine whether it is possible to identify 'technical stylistic identities', that is, to determine the possible variety of potters involved in creating a single archaeological assemblage. In addition, I consider the significance of the three colours, black, red and white (plain), for late Iron Age communities in KwaZulu-Natal. The analysis of ceramic fabrics can aid in exploring and understanding such issues.

A PERSONAL REFLECTION

KwaZulu-Natal province is famously known for the rise of the Zulu Kingdom under the leadership of Shaka kaSenzangakhona (Guy 1994). Thus, the majority of the people of this province are classified as the Zulus. In 1986 a TV series, titled *Shaka Zulu*, and later in 2001, a film titled *Shaka Zulu: The Last Great Warrior*, aided in raising awareness of KwaZulu-Natal in the world at large. This history has made the province a captivating area for scholars and the rest of the world. The downside of these two TV shows is that, for the public of South Africa (non-Zulu native speakers), they have left a negative view of King Shaka and Zulu people at large. These two TV shows portrayed Shaka as an aggressive leader who did not mind spilling the blood of his people (Tomaselli 2003). To make matters worse, the Zulu focused political party known as Inkatha (full name, Inkatha Cultural Liberation Movement, now Inkatha Freedom Party (IFP)) was known for its brutality during the apartheid era (Wylie 1992; Tomaselli 2003). As an outsider, I learnt of Zulu people as ferocious people, a population that does not mind spilling blood to achieve its goals. The violent behaviour of the IFP during the apartheid and post-apartheid periods is often likened to the reign of Shaka (Tomaselli 2003). When the province experienced unrest in July 2021, it reinforced the already bad name of the Zulu. The unrest was orchestrated by supporters of Jacob Zuma, the former South African president, rallying against an order set out by the judiciary council of South Africa that Zuma should serve time in prison. His supporters wanted to use this kind of 'Zulu identity' to help their cause.

Watching these films at age 12, I would think, "This man is heartless!" However, for other people, Shaka was a great king and a great warrior, as reflected in the subtitle of the film: *The Last Great Warrior*. It was only recently, working on my project that I learnt that the TV shows on the violent portrayal of Shaka and the Zulu nation were based on stories written by travellers, missionaries and traders (e.g., Nathaniel Isaacs and Henry Fynn). For example, Nathaniel Isaacs (1836: 336) wrote,

> Chaka seems to have inherited no redeeming quality; in war he was an insatiable and exterminating savage, in peace an unrelenting and a ferocious despot, who kept his subjects in awe by his monstrous executions, and who was unrestrained in his bloody designs, because his people were ignorant and knew not that they had power. He was also a base dissembler; he could smile in the midst of the execution of his atrocious decrees, and stand unmoved while he witnessed the spilling of the blood of his innocent subjects; and, as if nothing like an act of barbarity had been committed, he would appear mild, placid, generous, and courteous to all, assuming the expression of deep sorrow for the necessity which had called him to issue his bloody decree.

Isaacs and Fynn described Shaka as a tyrant, testifying to his cruelty and barbarity (Krige 1965: 15). These descriptions paint a terrible picture of Shaka kaSenzangakhona. At least, now, some research is being done to shed light on the exaggerations made in the portrayal of Shaka kaSenzangakhona. Wylie (1992) argues that Isaacs's image of Shaka kaSenzangakhona is an exaggeration that still has an influence on how non-Zulu speakers think about Zulu people. Isaacs's first-hand encounter with Shaka has resulted in a 'mythic' version of the man (Wylie 1992, 1995, 2000) and, I think, a violent impression of Zulu people. Because of these films on Shaka and stories told about the IFP, my whole view of the Zulu people was negative.

In 2016, I was given the opportunity to become an intern in KwaZulu-Natal province. The thought of relocating to KwaZulu-Natal province was daunting. However, my perception of the region and its people soon began to shift. Upon arriving in Pietermaritzburg, I received an invitation from Mr Phumulani Madonda to come to his *umembeso* ceremony (one of the Zulu premarital ceremonies). His gesture to invite a stranger to come and celebrate with him on the most special occasion of his life was surprising to me.

It was at Mr Madonda's ceremony that I first experienced Zulu cultural ways of doing things. Following Mr Madonda's ceremony, another colleague invited me to a wedding. Both these ceremonies were astonishing to experience and made me realise that as a rule Zulu people residing in KwaZulu-Natal take great pride in their culture and tradition. Many of them still steadfastly follow their customs, from dancing to wearing traditional attire and appeasing their ancestors. They maintain customs, although certain ceremonial steps have been lost or changed along the way. For example, Krige (1965) notes five premarital procedures, namely *isicelo*/*ukucela*, *ukubaleka, lobola*, *umbondo* and the bringing of the *inqhuthu* cattle. *Inqhuthu* is a cow presented as a gift to the mother of the bride, brought by the groom to the bride's family if the bride is still a virgin. *Inqhuthu* is part of a gift given in preparation for the marriage. Today, only three steps from Krige's account of the premarital stage are still done: *isicelo*, *lobola* and *umbondo*, in this order (Phumulani Madonda pers. comm. 2016; Selina Mncube pers. comm. 2016, 2017; Magwaza potters pers. comm. 2018, 2019). Today the bringing of *inqhuthu* is no longer done as a separate ceremony but has been included as part of the *lobola* cattle, the 'eleventh cow'. Furthermore, they have introduced *umembeso* (bringing of gifts to the bride's family). *Umembeso* is done after the *lobola* has been paid and it is a highly regarded premarital ceremony in Zulu culture today.

The premarital rules have changed or been altered. Only one stage, *ukubaleka*, is no longer practised. *Ukubaleka* means 'to run away' but, in this context, it refers to a girl (the future bride) going to her lover's homestead. This was done after he had done the *isicelo* ceremony for his fiancé's family (Krige 1965).

The day I started working at the KwaZulu-Natal Museum, the staff showed me the collection storerooms, an introductory 'behind the scenes tour'. One of the storerooms contained the anthropology collection, which included pots from around South Africa. I could not help admiring the aesthetic of the black Zulu beer pots. I asked, "Are all Zulu pots black?" I had already noticed that Zulu pots are mostly, if not all, black. The first time I saw the Zulu pots was at the Iziko Museum in Cape Town. The second time was at Mr Madonda's ceremony where guests brought ceramic pots as gifts to his bride's family. At Madonda's ceremony, it was the first time that I saw ceramic pots presented or exchanged as gifts. I had learned through archaeology that people used to gift pots, but I had not seen it happen.

Mr Madonda told me that here in KwaZulu-Natal the exchange of ceramic pots as gifts during weddings or premarital ceremonies is customary. He further mentioned that Zulu pots are black. Hearing this information was intriguing because I am Tswana, and I am used to seeing traditional ceramic pots that are mostly reddish or brownish in colour. In my experience, ceramic pots are used only for brewing traditional beer for ancestral purposes. This beer is known as *bojalwa jwa setso* in Sotho-Tswana and *umqombothi* in Zulu, although the word *umqombothi* is now a universal term used for traditional beer across all ethnic groups in the urban areas of South Africa.

While doing this research project, I learned that not only has there been a shift of practices but also of language. For example, the term *umqombothi* did not always mean traditional beer, as popularly known today. Bryant (1905: 541) defines *umqombothi* as "Water dirty by the admixture of particles of husks or raw meal that has been washed therein before cooking (the word is not used of water dirtied by particles of cooked food as from dish or pot-washing)." Doke and Vilakazi (1972) define "*qombothi* (*umqombothi*) as 1). Muddy, discoloured water; water mixed with mud and debris; wastewater; slops. 2) "Bad beer". Dent and Nyembezi (1969: 469) defines umqombothi as "Bad beer."

It is interesting that a word that used to have an obnoxious meaning would now be adopted as an acceptable and mostly preferred word by Zulu-speaking people, depending on the part of the province in which they are based. However, most Zulu-speaking people in KwaZulu-Natal still prefer to call traditional beer as *utshwala besiZulu*, rather than *umqombothi*. The notion is that differentiating it from *umqombothi* gives reverence to the ancestors because it is believed that *utshwala besiZulu* is the traditional beer permitted at *umsamo* (sacred place for the ancestors) and *umqombothi* is what gets given to the visitors. What I find interesting, however, is the serving of *umqombothi* or *utshwala besiZulu* in black pots.

I thought that maybe the production of black pots is a stylistic identity of Zulu ceramic artists that distinguishes themselves from other ceramic artists in the country. However, Perrill (2012: 9) states, "Likewise, the black surface on most Zulu ceramics, added in a second firing of the pots, is a sign of respect for the ancestors and their appreciation of cool, dark spaces." Seeing Perrill's statement, I realised that black pots have a deeper meaning to the Zulu people, not only stylistically but also culturally.

I made the mistake of inferring that all Zulu pots are black, including archaeological pots of the Late Iron Age. My colleague, a chief curator and now my co-supervisor, Dr Gavin Whitelaw (pers. comm. 2016), corrected my assumption. Mainly he corrected my assumption of the Late Iron Age pots, and said, "No, not all Late Iron Age pots of KwaZulu-Natal province are black. Actually some are red and some are without any added colour". He further pointed out: "There are Late Iron Age sites here in KwaZulu-Natal that have yielded a higher abundance of red ochre burnished pots than we find nowadays in the province. Tim Maggs excavated such pots in 1975 at the site Mgoduyanuka." His comment sparked my curiosity, resulting in me pursuing this project. My research project escalated from focusing only on pots to including colour and marriage alliances. From an ethnographic perspective, by attending the two ceremonies and engaging with my colleagues who are native Zulu speakers, I learnt that there are connections between colour, marriage, and pots. My interest grew and the question arose whether Late Iron Age communities in this part of the world held similar belief systems. I consider this topic using the ceramics excavated from Mgoduyanuka.

To understand how colour symbolism affects the Zulu people, I did some research on colour. I learned that there are three key colours in Zulu cosmology: black (*mnyama*), red (*bomvu*) and white (*mhlophe*). The colour red (*bomvu*) has various symbolic meanings in the Zulu belief system. In medicine, red is an 'in-between' colour (Ngubane 1977). It is associated with heat, transformation, and female fertility (Ngubane 1977; Armstrong et al. 2008). In certain contexts (e.g., novice diviners), red pigment applied on a woman's body refers to her paternal ancestors (Berglund 1976: 160). Upon realising the significance of colour symbolism in today's Zulu homesteads and their views on marriage patterns, I felt compelled to incorporate colour symbolism to this project.

NOTES ON CHAPTERS

Chapter 1: Archaeological Background

In this chapter, I look at the Iron Age period of KwaZulu-Natal, with an emphasis on the Late Iron Age and the study site, Mgoduyanuka. I detail how Late Iron Age communities lived in this part of the world (the period AD 1300–1824), and also how their settlement layout changed through time due to environmental and social stresses that they endured.

Chapter 2: Ethnographic Background

The focus of this chapter is on anthropology and oral records of colour symbolism, pollution, 'hot versus cold' and the concept of *hlonipha* and marriage in Zulu society. The chapter unpacks the relationship between colours (red, black and white), ceramic pots and marriage alliances of Zulu people today.

Chapter 3: Archaeometry Background

This chapter reviews the literature on archaeometric studies that have been carried out in southern Africa since my entire project is based on archaeometry and the uses of X-Ray Fluorescence (XRF) and X-Ray Diffraction Spectrometry (XRD).

Chapter 4: Mgoduyanuka

This chapter focuses on the study site Mgoduyanuka and its geology and soils, with an emphasis on the upper Thukela Basin where Mgoduyanuka is situated.

Chapter 5: Description of the Sample

This chapter describes the attributes of the ceramic sample, including vessel shape and size, clay fabrics, fabric colour and sherd thickness.

Chapter 6: Method and Results

This chapter focuses on the quantitative methodology (that is, archaeometric analyses) used to analyse the ceramic assemblage of Mgoduyanuka. The chapter also highlights the limitations I faced during the process, plus the advantages and disadvantages of applying archaeometric techniques to qualify data. In addition, the results yielded by these three techniques (pXRF), XRF and XRD) are presented.

Chapter 7: Discussion and conclusion

In this chapter, I discuss my results of the archaeometry and ethnography, and then conclude my findings.

1
Archaeological Background

IRON AGE OF KWAZULU-NATAL

Archaeologists divide the Iron Age of KwaZulu-Natal into two periods: the Early Iron Age (first millennium AD) and the Late Iron Age (second millennium AD) (Maggs 1984; Maggs 1989). These two Periods are made up of phases characterised by particular ceramic styles that all belong to the Chifumbaze Complex (Phillipson 1977; Huffman 1989, 2007). Huffman (2007) defined the two TRADITIONS within the Chifumbaze Complex: one in the east known as the **UREWE TRADITION** and the other in the west known as the **KALUNDU TRADITION**. Iron Age farmers of both traditions settled in KwaZulu-Natal during the first millennium AD.

The Early Iron Age of KwaZulu-Natal

The Early Iron Age period marks the introduction of metallurgy in southern Africa by early Bantu-speaking farming communities (Phillipson 1977; Huffman 1982; Maggs 1984; Badenhorst 2010). The evidence from KwaZulu-Natal shows that these early farming communities cultivated a combination of crops such as millet, sorghum, and vegetables. The vegetables planted included legumes such as beans and African groundnuts, as well as gourds and watermelons. The grains grown included small-seeded millets and sorghum, which possibly included both grain sorghum and a variety cultivated for its sweet pith (Maggs 1989: 39). They also kept domestic animals such as sheep/goats, cattle, and even chickens (Maggs 1989: 39). In KwaZulu-Natal, the Early Iron Age period is well documented through ongoing research (see Maggs 1984; Whitelaw 1998).

Recent research has revealed that the KwaZulu-Natal Early Iron Age chronology comprises five phases (see Whitelaw & Janse van Rensburg 2020) (Fig. 1.1). Previous research had identified only four phases in the chronology of the Early Iron Age of KwaZulu-Natal (e.g.,

AD	Phase / *facies*	**TRADITION**, Branch	Period
2000			
1800			
	Nqabeni		
1600			
1400			
	Moor Park		
1200			
	Blackburn	**UREWE**, Blackburn Branch	Late Iron Age
1000			
	Ntshekane		
800	Ndondondwane		
	Msuluzi	**KALUNDU**	
600			
	Mzonjani		
400			
	Silver Leaves	**UREWE**, Kwale Branch	Early Iron Age
200			

Figure 1.1: Updated table of the Iron Age sequence of KwaZulu-Natal. Hatched lines indicate breaks in ceramic tradition and period. Table from Whitelaw (2020).

Maggs 1989; Whitelaw 1998) but, at Lake Sibaya, the earliest phase, Silver Leaves at about AD 250–450, has been identified (Whitelaw & Janse van Rensburg 2020). The Silver Leaves phase is followed by the Mzonjani phase (AD 450–600). The Mzonjani pottery style evolved out of Silver Leaves. Both of these phases belong to the **UREWE TRADITION** (Huffman 2007; Maggs 1984). This classification is based on the idea that they both have a similar structure of ceramic style. Silver Leaves and Mzonjani sites occur mostly in the coastal areas (Maggs 1980b, 1984; Whitelaw & Janse van Rensburg 2020) in the low-lying country in the coastal forest vegetation zones (Maggs 1984).

In about the mid-7th century a **KALUNDU TRADITION** ceramic style emerged, most notably in the low-lying inland bushveld vegetation zone. In KwaZulu-Natal the **KALUNDU TRADITION** begins with the Msuluzi phase (AD 650–800) (Maggs 1980b; Whitelaw 1998; Huffman 2007). The Msuluzi phase succeeds the Mzonjani phase, but does not develop out of the Mzonjani ceramic style. The Msuluzi ceramic style is sufficiently different from the

Mzonjani ceramic style to suggest that a new group of people came to settle in the inland bushveld vegetation zone of KwaZulu-Natal at ca. AD 650. The Msuluzi style gave rise to the Ndondondwane style (AD 800–950). The two ceramic styles (especially in the case of early Ndondondwane) are so similar that it is not easy to distinguish between them (Maggs 1984). Ndondondwane later gave rise to the Ntshekane ceramic style (AD 950–1050).

The Ntshekane phase marks the end of the Early Iron Age in this part of the world. A new ceramic style of the Urewe tradition emerged ca. AD 1050. These Blackburn ceramics mark the beginning of the Late Iron Age.

The Late Iron Age of KwaZulu-Natal

Enough is known to draw several contrasts between the Early Iron Age and Late Iron Age periods in KwaZulu-Natal (Maggs 1989: 35). The main features that point to contrasts between the two periods are differences in settlements and differences in pottery styles. The Late Iron Age period in KwaZulu-Natal incorporates the Blackburn phase (AD 1050–1300), Moor Park phase (AD 1300–1700) and Nqabeni phase (AD 1700–ca. 1850) (Maggs 1980a, 1989; Huffman 2004: 84). Like Silver Leaves and Mzonjani, all these phases belong to the **UREWE TRADITION** (Fig. 1.1).

Blackburn phase (AD 1050–1300)

The Blackburn phase is believed to mark the settlement of early Nguni-speaking people in KwaZulu-Natal (Davies 1971; Huffman & Herbert 1994; Huffman 2004). This notion arises from Blackburn ceramics, which are very different from the ceramics of the Ntshekane ceramic style or any other Kalundu ceramic style (Huffman 2004). The name-site Blackburn (Davies 1971) and the contemporaneous Mpambanyoni (Robey 1980) laid the foundation for our understanding of how early Nguni people structured and placed their villages. These two sites revealed a location preference and architectural details preferred by early Nguni people.

Maggs (1989) mentions that the early Nguni people farmed few domestic animals and part of their diet was shellfish. Middens of discarded shells were found at Blackburn and Mpambanyoni (Maggs 1989: 35). These dietary elements are similar to those maintained by some of the Early Iron Age communities that lived close to the coast, such as at Mzonjani (see Maggs 1980a; Maggs 1989). The stable isotope record shows that the diet of Blackburn communities included seafood, although their $\delta^{15}N$ varies (12.0 and 13.5 ‰) (Ribot et al. 2010). Their diet also included food high in C_4 such as sorghum and millet and milk and meat from animals that ate C_4 grasses (Ribot et al. 2010). At Shongweni Shelter, there is evidence that they consumed millet, sorghum, ground beans, and cowpeas. The sorghum and millet at Shongweni Shelter are dated about AD 1000 (Mazel 1992). Most recorded Blackburn sites are on hilltops in the ancient Berea Formation dune cordon in the coastal belt.

Blackburn settlement structures

Davies (1971) estimated that the Blackburn site might have had 19 to 20 beehive huts, or, if there had been a cattle-pen in the settlement, there would have been 15 huts at most (Davies 1971: 77). The settlement included a few clusters of huts, with middens of shells at the edge of each hut cluster (Maggs 1989). Davies (1971: 77) notes that the beehive huts at Blackburn had one or more central poles/posts (estimated 3.05 m high), depending on the size of the hut, the frames of the huts would have been tied to the central post(s). Hut sizes were up to 5.5 m across (Davies 1971: 77). He suggests that the walls of the huts were made of grass or matting on a light frame of *Ficus natalensis* (Natal fig), which in the Zulu language is called *umthombe*. Davies's beehive-hut description is similar to the historically recorded architecture in the region.

Towards ca. AD 1300, domestic stock was probably a staple of the meat diet (Maggs 1989: 37), meaning that people now consumed more meat than vegetables and grains, compared to Early Iron Age communities. Additionally, around the same time, southern Africa experienced drastic climatic changes. Average annual temperatures plummeted with the onset of the Little Ice Age (Tyson et al. 2002).

The impact of climate during AD 900–1800

The Medieval Warming Period (AD 900–1300) (Tyson 1986) was followed by the Little Ice Age at about AD 1300, which lasted until AD 1800 (Tyson et al. 2000). These two climactic events probably had an impact on the lifestyles of farming communities in southern Africa (see Hall 1976; Tyson 1986; Tyson et al. 2000; Tyson et al. 2002; Holmgren et al. 1999; Holmgren et al. 2001; Huffman 1996, 2007).

Studies using stable isotopes of oxygen ($\delta^{18}O$) and stalagmites show that during Medieval warming southern Africa experienced a wetter and warmer climate (Huffman 1996), with a minimum of 500 mm precipitation per annum in the summer rainfall region (Tyson 1986).

Once the Little Ice Age began, southern Africa became colder and drier than it is today (Tyson 1986; Whitelaw 2015: 162). Similarly, in the northern hemisphere, the coastal regions were blocked with glaciers (Tyson 1986). Environmental stresses caused by the Little Ice Age possibly affected the lives of Late Iron Age communities, especially during the Moor Park phase.

Moor Park phase (AD 1300–1650)

From around AD 1300, Moor Park communities moved into upland grasslands of KwaZulu-Natal (Maggs 1984; Huffman 2007; Whitelaw 2014) (Fig. 1.2). According to Whitelaw (pers. comm. 31 October 2023) it is possible that during that time there was a slight shift in location of the sweet/sourveld grasslands interface; however, it might not be significant for Late Iron Age communities of KwaZulu-Natal. It is possible that these grasslands were favoured by Late Iron Age communities for grazing (Maggs 1984).

The relationship between the Little Ice Age and the Moor Park communities moving to the grassland is not clear. It is also not clear if the purpose of moving to the grassland was to expand in agriculture, because some Moor Park sites are situated on the boundary between sweet and sour grasslands. This location suggests an interest in grazing resources for cattle (Maggs 1984: 200). However, what we do know is that, firstly, the Little Ice Age started at about AD 1300 (Holmgren et al. 1999; Tyson et al. 2000; Huffman 2008: 2046). Secondly, .Moor Park communities settled on hilltops, perhaps for defensive reasons. Lastly, the move coincided with the first use of stonewalling to demarcate spaces in settlements (Davies 1974; Whitelaw 2020).

Huffman (2007: 444) refers to Moor Park walling as defensive. Whitelaw (2015, 2020) argues that the walling was not for safety, but was for marking boundaries within settlements. The move to the hilltop on its own signals defence. Evidently, Moor Park people had to defend themselves against conflicts that took place in pursuit of resources (Huffman 1996; Whitelaw 2020). The lack of resources was possibly exacerbated by the environmental stresses that they faced during the Little Ice Age. The fact that farmers were building walls out of stone suggests that no suitable wood was available in the grasslands for palisade fences. In other words, the stone walls indicate a primarily grassy environment, not a woody environment (Maggs 1976, 1982a; Dreyer 1992). While some trees and bushes grew in patches, suitable wood for fences

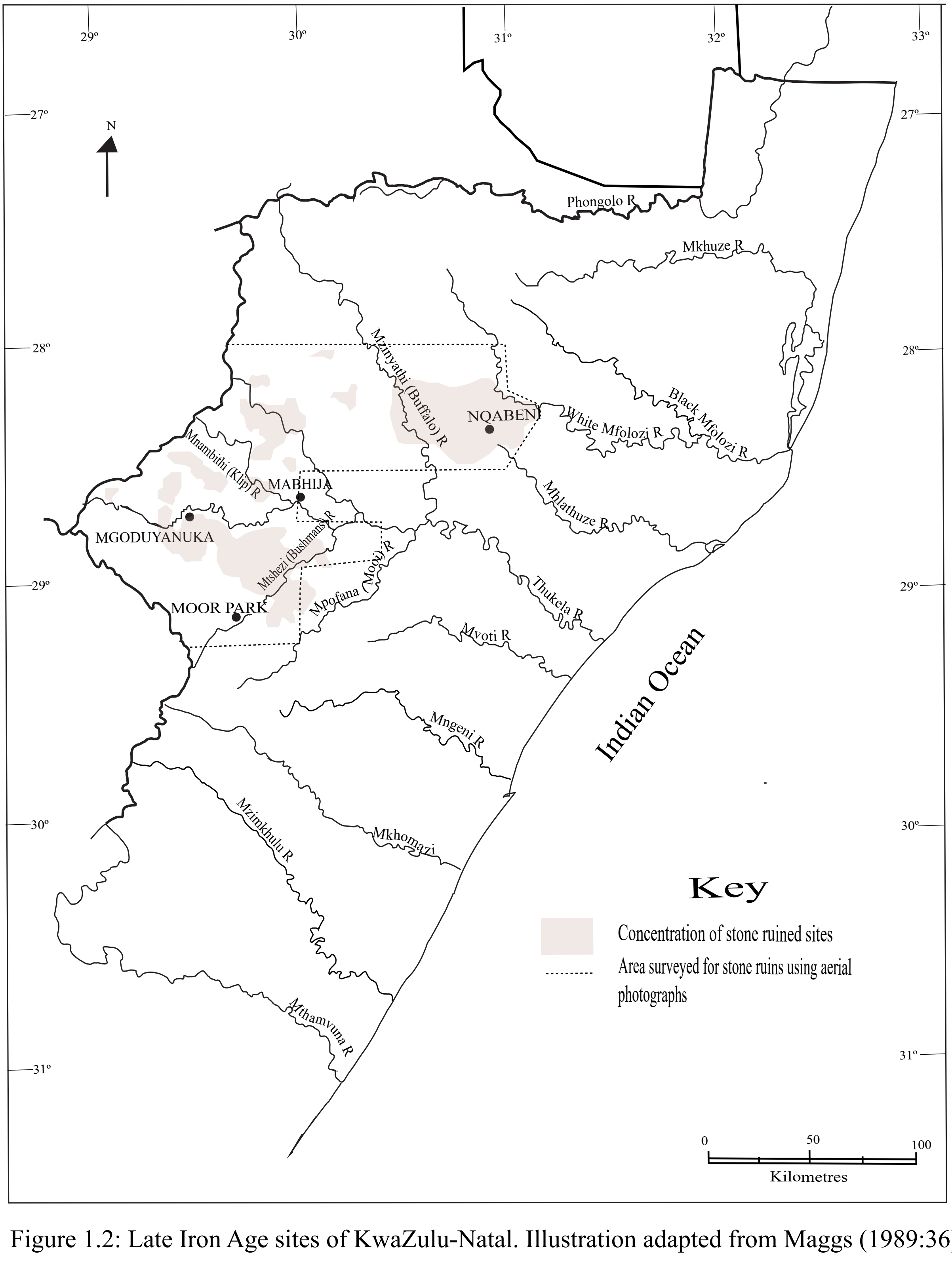

Figure 1.2: Late Iron Age sites of KwaZulu-Natal. Illustration adapted from Maggs (1989:36)

was not widespread. As is well known, Iron Age farmers in the grasslands used dung for fuel in the absence of suitable or abundant wood (Maggs 1976).

Maggs (1989: 37) suggests that the Moor Park communities occupying the KwaZulu-Natal grasslands by the 1500s are the true ancestors of the Zulu people of today. He believes that they were similar culturally, linguistically and physically. Sometime after ca. AD 1540, maize cultivation was introduced by the Portuguese while visiting Delagoa Bay (Maputo) for ivory trading (Maggs 1989, 2008). Maize is suitable for wetter, higher altitude environments and it became a staple crop for Late Iron Age communities in the 18th century in the upper Thukela Basin, and one of the reasons for the population increase in the grasslands (Maggs 1984: 204; Maggs 1989). The site Mgoduyanuka provides such evidence (Maggs 1982) (see Chapter 4).

Another type of pottery in the northeastern Free State associated with Type N sites dates from the late 1400s to 1500s. Huffman (2007) classified this style as Ntsuanatsatsi and argues that it is similar to Blackburn based on the decoration style of rim notching, stamped lines on the neck and stamped chevron patterns on the shoulder of the pot that also occurs in Blackburn pottery (Huffman 2007: 444). Furthermore, the Type N settlement pattern of Ntsuanatsatsi has beehive huts similar to Nguni (Huffman 2007: 451). Based on oral records, Huffman (2004) believes that the Nguni speakers were responsible for Type N and the beehive structures. As a result Huffman (2004, 2007) suggests that Ntsuanatsatsi marks the ‘first movement’ of Nguni people out of KwaZulu-Natal. (But see Maggs 2023 for a contrasting position.)

During the early 1600s there was an influx of new people settling in the Waterberg in the Limpopo province (de Bruyn 2014). These new communities in the Waterberg had different settlement layouts from the already existing Sotho-Tswana communities of the Waterberg region (Hall 1995: 310–311). These new communities established ‘defensive walling’ and some had beehive structures all similar to those of Nguni-speaking people. Hall (1995) classifies these new inhabitants as Nguni-Ndebele/Northern Ndebele. According to Huffman (2007: 448) these new communities in the Waterberg indicate the ‘second movement’ of Nguni-speaking people out of KwaZulu-Natal. The second movement may also have included people who settled on the Mpumalanga escarpment and later were incorporated into Bakoni (Huffman 2007: 448; Delius & Schoeman 2008: 143–145).

Climatic conditions through the 1600s during the Little Ice Age became severe, forcing Nguni-speaking farmers into 'third movements' northwards. According to Huffman (2007: 448), this 'third movement" involved uncoordinated small groups into the region from Gauteng to Limpopo.

During the early 1800s there was a 'fourth movement' of Nguni people out of KwaZulu-Natal because of conflict in the region inland of Maputo Bay. The best-known group is Mzilikazi's Khumalo, which eventually established itself as the Ndebele of southwestern Zimbabwe (Wright 2006–2007).

Nqabeni phase (AD 1650–1870)

The Nqabeni phase encompasses the sites Nqabeni, Mgoduyanuka and Mabhija (Hall & Maggs 1979; Maggs 1982a, 1982b; Huffman 2007: 465). Out of the three Nqabeni phase sites I chose Mgoduyanuka (located in the upper Thukela Basin) as the focal study site for this project (Fig. 1.2).

According to Huffman (2007: 451), "*Nqabeni* pottery cannot be directly derived from *Moor Park* and only indirectly from *Blackburn*. An intervening phase, yet to be recognised, probably links *Blackburn* to *Nqabeni*." In essence, the relationship between the Nqabeni ceramic style and earlier ceramic styles is not straightforward (Huffman 2007).

Nqabeni phase communities were located in the open savanna grasslands. Aside from maize being the most cultivated crop, it is probable that the Nqabeni phase communities cultivated sorghum as well, or at least 'sweet reed' sorghum. Mazel (1990: 126) found 'chewed wads' in Mhlwazini Cave near Mgoduyanuka which were probably sweet reed sorghum chewed for sweetness as people chew sugar cane today.

The Nqabeni phase communities are known also for their stonewalling, and this has resulted in a valuable artefact for archaeologists, because stonewalling preserves well and is conspicuous. This is the reason why the Late Iron Age (LIA) sites in the upper Thukela Basin have received relatively better archaeological attention compared to other LIA sites in KwaZulu-Natal (Maggs 1989: 43). Mgoduyanuka is thus one of the sites that has received much attention (for example, Maggs 1982a, 1988; Maggs et al. 1986) and been examined in detail (Maggs 1984: 204). I return to Mgoduyanuka in chapter 4.

CLOSING REMARKS

The archaeology has aided me to understand how past farming communities including past Nguni communities lived. Furthermore, the archaeological information has shown me that the past Nguni people in this part of the world are the direct ancestors of the current Nguni-Zulu people, whose descendants still dominate the landscapes of KwaZulu-Natal. The fact that the descendants of Nguni-Zulu people still occupy the KwaZulu-Natal landscapes gives this project momentum because it can help answer the question of why Nguni-Zulu currently prefer to use black pots rather than red pots. Understanding ethnography is also crucial to answering this question. The next chapter (Chapter 2) details ethnographic information regarding pots and marriage. I gathered the information from the descendants of past Nguni-Zulu people residing in this part of the world.

2
Ethnographic Background

INTRODUCTION

Ethnography has played a significant role in aiding archaeologists to interpret the past, although some interpretations are perceived as controversial. The gradual change of culture and tradition poses a challenge to archaeologists who draw on the present to interpret the past. It is for this reason that the field of ethnoarchaeology has been developed to research relationships that exist between people, actions and material culture.

Ethnoarchaeology concerns ethnographic work that tackles issues pertinent to archaeologists (Lane 1996; Huffman 2019). Ethnoarchaeological and, more broadly, anthropological research provides a platform for archaeological interpretation. Ethnographic data can inform on issues such as marriage exchange, colour symbolism and tangible materials, as well as their interlinkages.

Drawing mainly on interviews conducted in the Magwaza homestead complex in Nkandla, KwaZulu-Natal, this chapter focuses on three issues. Firstly, I examine the different roles that ceramic pots play in rural life today and the colours associated with those pots. Secondly, I look at the marriage exchange rules that are maintained in rural areas. Thirdly, I consider the nature of colour symbolism within Zulu culture, especially as it is expressed in rural homesteads. The main reason why I chose to focus on rural areas in KwaZulu-Natal is that people there still maintain and understand the belief system central to Zulu culture, and still make and use ceramic pots. By contrast, people in the townships are today heavily influenced by western cultures.

Not many people in South Africa today use ceramic pots as everyday utensils. This is because ceramic pots are fragile and break easily. Also, it is easier for people to buy factory-produced pots today (Fowler 2011). In Botswana (see Wilmsen et al. 2009; Thebe & Sadr 2016; Thebe 2017) and other African countries such as Somalia (*The Potters of Buur Heybe* 2006), some people still use ceramic pots as part of their everyday homeware (Gosselain 1992). In South Africa, ceramic pots are mainly used for ceremonial purposes. In this context, pots play a vital role as they are used for storing beer – traditional beer (*utshwala*) – reserved for appeasing or connecting with the ancestral world (Ndoro 1996; Jolles 2013; Thebe & Sadr 2016; Thebe 2017).

Pot-making in much of southern Africa was associated with women (Hamilton & Hall 2012); this is still largely true for KwaZulu-Natal (see Krige 1965; Lawton 1967), although today men such as Clive Sithole are showing interest in the skill as an art form. In the Magwaza homestead complex, Bonisiwe Magwaza (pers. comm. 2019) employs her son to decorate her vessels and sometimes he makes pots. This gender shift in the craft is a consequence of modern economic and artistic forces. By contrast, in some regions of southern Africa, such as in northwest Botswana (Thebe 2017), as well as regions of eastern Africa such as southern Somalia (Belkin 2006), potting is traditionally men's work.

Fieldwork at KwaMagwaza homestead

The Magwaza family complex has been popularly known as KwaMagwaza since ca. 1905 (Webb & Wright 2014: 49). It is one of the many 'homestead complexes' (*isigodi*) in Mbabalane, Nkandla, near the confluence of the Nsuze and Thukela rivers. The Nkandla area is known not only as the residential area of the former South African president, Jacob Zuma, but also for its forest (Nkandla Forest), a semi-coastal vegetation (Edwards 1967); it is also now a popular tourist attraction of the province. The Magwaza potters are well known in rural Nkandla. The Magwaza potters I interviewed are Buzephi Magwaza, Thandiwe Magwaza, Thuleleni Magwaza, Zikoti Magwaza, Bonisiwe Magwaza, and also Yeh and Daliwe Magwaza. All of them, except Yeh and Daliwe, are *omakoti*/*aboMakoti* (sing. *makoti/umakoti*), that is, women married into the Magwaza family. Yeh and Daliwe are the daughters of the Magwaza family. Their mother was a potter, but she left the practice to take care of her ill husband (he has since passed away). Each bride has her own compound, where each compound consists of a kraal and around the kraal are rondavel and four-corner structures with either flat or corrugated iron or tiled roofs (the latter a RDP structure). The great-hut (*indlunkulu*) built of concrete blocks is situated behind the kraal. The *umsamo* (a sacred place) is located inside the *indlunkulu*. When I first visited in 2019, I was told that there were no cattle, only goats. In essence, KwaMagwaza is a cluster of compounds.

I chose the Magwaza potters for my ethnographic enquiries because they are well known. Additionally, Magwaza potters have contributed to the work of several researchers (e.g., Armstrong 2008; Armstrong et al. 2008; Perrill 2012; Jolles 2006, 2013). Moreover, KwaMagwaza is easily accessible from Pietermaritzburg (it is 179 km distant). The Magwaza potters still practise and are knowledgeable about Zulu customs. There are other known potters in KwaZulu-Natal, such as the Nala potters living in the Thukela valley downstream of KwaMagwaza, and the Mabaso potters from the Msinga area.

Conducting ethnographic interviews has many challenges, perhaps the biggest of which is the language barrier. The other challenges are ethnic issues or race. My home language is Sotho or Tswana, but I can speak Zulu proficiently. Therefore, when I went to KwaMagwaza, I did not expect any communication limitations since I am almost fluent in Zulu. I thought that being able to communicate fluently with my informants would overcome any problems. However, that was not the case. I encountered the following issues:

- **Race and ethnicity**: As a Black child, there are disadvantages and advantages to conducting interviews on culture and traditional customs in rural areas of South Africa. The advantage is that the elderly people are pleased to see a child showing interest in learning about the culture. As a result, the interview turns into a conversation, because to them it provides a platform to teach, advise and guide; in other words, it provides a platform for grooming. However, sometimes informants can become annoyed with you (as a Black child) asking about things they perceive as 'basic knowledge'. For them some things are such 'basic knowledge' that they see no need to discuss them. Therefore they do not deem it necessary to teach you, unless you are a baby or a toddler, or in a 'learning phase'.

- **Behaviour**: Your behaviour as a Black researcher when conducting such interviews is mostly under scrutiny by informants. There are sometimes instances where you would be reprimanded as a Black/African child, for behaving as if you are not familiar with the culture. Then you need to demonstrate humility to show respect and clarify that, yes, you are African or Black, but not Zulu, and that you came here to learn about

Zulu culture. Some informants maintain the misconception that all black lives are similar. For instance, you are expected to know certain rules such as 'how to show respect to elders.' If you behave in a manner that they are not familiar with, and you are black and young, you will get reprimanded or even worse, leave a bitter taste on their tongues when they think of you or see you. I saw this happen with a researcher from Nigeria at the KwaMagwaza homestead. The women were not pleased with her mannerisms and demeanour. She came to Buzephi Magwaza's pottery workshop (hut) and stood by the door. When explicitly asked to come inside and sit on the benches, she refused at first. My colleague Mr Phumulani Madonda explained to her that standing at the door of the owner's hut is disrespectful behaviour, especially in the Zulu culture. He told her, "As visitors, we are not allowed to stand at the entrance of the house" (Madonda pers. comm. 2018). Only then did she sit down. The Magwaza women found her behaviour offensive, and for us who travelled with her to KwaMagwaza, it was embarrassing. The Magwaza women were so annoyed that whenever she asked a question they would give her a closed answer: a "yes or no" without elaboration. They would even tell her "we have already answered that question." It was awkward to observe, but a lesson was learnt.

- **Age factor and marital status:** Asking questions as a young person and not being married can be challenging. For instance, some of the questions I asked 'sounded difficult'. It is not that they did not understand my questions, but it was my age and my marital status. If informants regard you as a child, who is not yet married, there are certain issues, for example, sexual issues, that they feel they cannot share with you. They can only talk about sexual issues when you are beyond the stage of marriage or already married. Consequently, they would not discuss certain things in detail with me. Instead, they would talk about something else to derail the conversation and 'avoid' the questions. Sometimes they simply answered me dismissively. Because of this awkwardness, I had to do follow-up questions with my Zulu-speaking work colleagues or another Zulu person who is knowledgeable about the customs and does not mind answering such questions.

- **Monetary factor:** Pot-making is a craft and an art business. The Magwaza potters were introduced to the 'art tourism' market by Juliet Armstrong of the University

> of KwaZulu-Natal. This affected the sale price of pots. The first time I went to KwaMagwaza in 2019, all small pots were R40 and medium to large pots in the range of R80.00–R100.00. I was shocked when I visited the following year and found that prices had gone up drastically. My colleagues and I were charged triple the initial prices. I realized that they were taking advantage of my colleagues because they were white. It should be noted that the Magwaza women did not expect anything from us. They were willing to talk even if we did not buy pots. Buying pots, however, was a positive gesture that encouraged everyone to relax. In other words, buying their pots was an icebreaker.

Juliet Armstrong was a lecturer in Fine Art at the University of KwaZulu-Natal. She was a potter and ceramic sculptor interested in Zulu pottery (Bell & Clark 2014). She worked with various potters from around the province and invested time in promoting potters in the world of ceramic artistry. She took several potters overseas to participate in international exhibitions, leading to international exposure (the group included Bonisiwe Magwaza). As a result, the Magwaza potters owe part of their status as artists to her. Armstrong passed on in 2012, and her passing affected the lives of the Magwaza potters negatively, so much so that more than ten years later they are still hurt by it. During Armstrong's research days, most of the Magwaza women were motivated to continue the craft of making pots as it brought financial stability to their lives. Things declined after her death and most of the Magwaza women lost interest, especially the younger potters such as Daliwe and Yeh Magwaza (Daliwe Magwaza pers. comm 2019).

Daliwe and Yeh no longer make pots, but the older Magwaza women continue with pot-making because they find it therapeutic and they sometimes get requests from their neighbours to make pots for them. I believe the younger generation at KwaMagwaza was only interested in pot-making because of the opportunities it offered, such as travelling internationally and making money, which they saw while Armstrong was still alive.

During my visit to KwaMagwaza, I learnt about the roles pots in the homestead play in the life of contemporary Zulu people living in rural KwaZulu-Natal. Furthermore, it is through the works of Armstrong and Elizabeth Perrill (2012) that I learnt about potters in KwaZulu-Natal who still make pots in a traditional way.

POTS IN THE HOMESTEAD

Pots and the living

Potters in rural KwaZulu-Natal distinguish between pots made for tourists (outsiders) and pots made for locals (Todd 2006; Magwaza pers. comm. 2019). Pots made for tourists are commonly red and highly decorated with incisions and impressions (Fig. 2.1). They can take a variety of elaborate (though often repetitive) forms. Pots made for locals are burnished black with simple decorations such as *amasumpa* (small bumps on the outer surface of the pot) or incised patterns (Zikoti and Buzephi Magwaza pers. comm. February 2019). The Magwazas emphasised that black pots are mainly produced for doing ancestral ceremonies. However, black pots are not restricted to locals; if tourists want black pots they will make black pots. The only distinguishing factor is that the pots made for locals are treated with fat, whereas pots made for tourists are treated with polish (Todd 2006). Fat or polish is used on pots to give them a lustrous finish.

The fat applied on local pots is mostly cooking oil. Potters do not use cow fat from their homestead herd because each beast in the homestead kraal (*isibaya*) is connected to the

Figure 2.1: Buzephi Magwaza and Zikoti Magwza (sitting down) in their pot making hut. Phumulani Madonda holding and looking at the pots that the women made for tourists. Photo taken by Mudzunga Munzhedzi 2019.

ancestors of the homestead (Thandiwe Magwaza pers. comm. 2019). Either the buyer brings his or her cattle fat, or they use cooking oil.

In the past pots were used in various ways in the Zulu homestead, namely, for serving, storing, transporting, cooking and brewing, and for medicinal purposes (Krige 1965; Fowler 2006: 98). The same is true for elsewhere in southern Africa where the tradition of pot-making took place (e.g., Huffman 1972). In addition, each pot type had a specific function (Huffman 1972; Fowler 2006; Jolles 2013). For example, in the past, *uphiso* – a pot with a neck – was mainly used for the transportation of liquid. Today *uphiso* is viewed as a decorative vessel or vase and is rarely used for beer. *Izinkamba* are used for transporting or drinking beer during ceremonial gatherings. *Izinkamba* (sing. - *ukhamba*) were used as storing and drinking vessels (this term *ukhamba/izinkamba* is also used as a generic term for all pots). In the past and even today, *izimbiza* pots are mainly used for brewing and storing beer.

Lawton (1967) and Reusch et al. (1998) observed that the most widely used terms across the region are *izinkamba* and *izimbiza*. This is still true today. Interestingly, the names given to other pot types vary across KwaZulu-Natal. This variation was first recorded by Lawton (1967: 64). Subsequent researchers such as Dieter Reusch and Kent Fowler noticed similar variation (see Reusch et al. 1998; Fowler 2011). For example, in the Msinga district people refer to a small pot as *umcakulo* and to pots with a neck as *izingcazi* (Reusch et al. 1998; Fowler 2011). In Eshowe and Nkandla (KwaMagwaza) people identify the same small pot as *umancitshana*/ *umancishana*, and necked pots as *izimpiso* (Jolles 2013; Magwaza potters pers. comm. 2019), and so do the other Zulu-speaking people in KwaZulu-Natal with whom I interacted.

The uMzinyathi (Buffalo) River seems to mark a linguistic boundary. The uMzinyathi River was called a buffer zone/boundary of Zululand and Natal by colonials after the defeat of Cetshwayo kaMpande during the Anglo-Zulu war in 1879 (Ballard 1989; Jolles 2001; Whelan 2001). The Msinga area was always on the edge of the Zulu Kingdom (Jolles 2001), and in ca. 1848, it was included in the Natal Colony (Laband & Thompson 1989; Whitelaw pers. comm. 2021). The difference in naming items suggests variation in Zulu dialects across the region. It is possible, for instance, that the difference in naming items reflects the difference between the dialects of *Tekela Nguni* (by Lala and Mbo clan groups) and *Ntungwa Nguni* (by Zulu people (amaZulu)) (Bryant 1967: 15–16).

Are all brides/women potters?

Not every woman at KwaMagwaza can make pots. I had assumed that, typically, women learnt how to make pots in their natal homes, but most of the Magwaza women were taught by their mothers-in-law. This was also the case with Siphiwe Nala downstream of Ndondondwane (Jolles 2013), although she taught her daughter, Nesta Nala, and Nesta likewise taught her daughters. Zikoti Magwaza, on the other hand, learnt pot-making from her natal side, but was never interested in the craft until she married into the Magwaza family.

The situation of Zikoti Magwaza raises the question of how a mother-in-law, who is a specialist in pot-making, perceives a bride already skilled in pot-making. Gosselain (2000: 189) refers to 'technological style':

> ... in southern Cameroon, potters process clay in a way that makes them unmistakable members of a specific community; fashion vessels with a technique shared by a larger, but bounded, group of individuals; use the same ornamental tools and motifs as an even larger group of people; fire the pots in structures and with fuels typically associated with communal or regional traditions; and treat the pots after firing with techniques and materials distributed at still another spatial and social level.

If marriage brings different 'identities' together, does the bride change her way of making pots and adapt to new practices of pot-making taught by her mother-in-law? Is pot-making a 'fluid skill', whereby the bride adopts new techniques and combines them with her already acquired skills? If that is the case, it suggests ways in cultural practices might either stabilize or subtly shift in character.

Like potter, like pot: I am my pot

Zulu pots have been characterised as black-burnished with *amasumpa* or incised decoration (e.g., Evers & Huffman 1988; Reusch et al. 1998; Fowler 2006, 2011; Perrill 2012; Jolles 2013). According to Klopper (1991: 85–86), *amasumpa* decoration was "a symbol of royal patronage and power" in the Zulu Kingdom. Even today, Zulu potters acknowledge these characteristics as 'isiZulu'. Some potters have moved away from traditional ways of making pots. For instance, Magwaza potters sometimes give their pots character by using anthropomorphic or zoomorphic decoration. Thandiwe Magwaza decorated some of her pots as if they were wearing earrings/

Figure 2.2 (left): Pot by Thandiwe Magwaza, with *amasumpa* decoration; the design symbolises earplugs (*iziqhakaza*).
Figure 2.3 (right): Pot by Thandiwe Magwaza with amasumpa decoration; the design symbolises horns of a bull (*impondo zenkaba*).

ear-plugs) (pl. *iziqhakaza*, sing. *iqhakaza*), and some as if they had the horns of a bull (Figs 2.2 & 2.3). Giving a pot such a character shows that the potter treats her work not simply as a functional object, but that she connects with it on a deeper level, on both personal and artistic levels, and therefore gives the pots life.

A paper by David et al. (1988), "Why pots are decorated" shows how pot and potter are similar. They mention that a potter tells stories through her pots. Human beliefs are scripted into the pots and pottery decoration acts as a subtle language. Pots are not merely decorated but are decorated with meaning. In a response to David et al., Evers and Huffman (1988) note that, sometimes, zoomorphic motifs can represent the potter's animal totem. The point made by Evers and Huffman (1988) is so true. For example, Thandiwe Magwaza decorated her pot with *amasumpa* aligned, she said, as the horns of a bull (*inkabi*). Her explanation was that her pot is like *inkabi*. Perhaps the bull represents her animal totem? On the other hand, the 'bull' could represent the position she holds in the homestead, or the significance her pot holds. A bull is a leader of the herd. Does it mean that she, and the pot, are leaders of the herd? In other words, a pot is a reflection of a potter, and that the pot resembles the potter. A pot is an 'offspring' of the potter's imaginations.

Figure 2.4: Firing process at KwaMagwaza homestead. Thandiwe Magwaza (wearing blue scarf) and Thuleleni Magwaza (in a green dress), and Dr Gavin Whitelaw (sitting down) at the firing scene.

Restrictions on pot-making

At KwaMagwaza, certain recorded beliefs and restrictions about potting seem to have been relaxed. Lawton (1967: 52) and Armstrong et al. (2008: 521), for example, mention that firing is restricted to family members and no stranger is allowed at the firing. It was not the case for Dr Whitelaw and myself. We were allowed to observe the firing process closely. Moreover, the firing site was situated where anyone could see it. On enquiry, the Magwaza women said, "Anyone is welcome to see the firing." (Figs 2.4 & 2.5). Evidently, they are now used to strangers (including tourists) visiting to see their pots. They also aware that tourists are interested in every part of the process. For example, Bonisiwe Magwaza (pers. comm. August 2021) said, "they prepared this process specifically for us to see." Perhaps the taboos or restrictions on firing that Lawton and Armstrong mention only apply to pots made for locals and intended for traditional ceremonial purposes.

Figure 2.5: *Izimpiso* pots after firing processes at KwaMagwaza.

Contra Armstrong et al. (2008: 520), there also seemed to be no secret about the source of the clay and the Magwaza women offered to take me to the place. Fowler (2008) also visited the Magwaza clay sources.

Regarding the issue of restrictions on pot-making while menstruating, Armstrong et al. (2008: 520) state, "Menstruation does not prevent the Magwaza potters from working. This change is probably rooted in the modern, commercial nature of their work." I confirmed this point with the Magwaza women, who added that a menstruating woman must pay a 'fee' at the clay mine, to the gods of the clay mine (Magwaza pers. comm. 2021).

Furthermore, Armstrong et al. (2008: 520) mention, "Only family members are allowed to touch the unfired pots." I had a different experience, because Buzephi Magwaza allowed me to look and feel the 'unfired' pots she had made (Fig. 2.6). Perhaps restrictions are eased in the case of pots made for commercial purposes (i.e., pots for tourists). Possibly, restrictions are more strictly adhered to when they make pots for ancestral ceremonies.

Figure 2.6: ‘Unfired’ pots at Buzephi Magwaza’s house, made by Buzephi Magwaza. Photo taken by Mudzunga Munzhedzi 2019.

Pots, the dead and *inhlonipho* (respect)

Pots have the power to transition from an ordinary, functional object to an object that links the living to the dead. The three most important pots in this regard are *umancitshana*, *imbiza*, and a pot reserved for *amasi*.

Umancitshana and umsamo

Umancitshana (pl. - *omancitshana*), meaning the stingy one, is a small black drinking vessel (Jolles 2005; Fowler 2006) used to offer traditional beer (*utshwala*) to the ancestors. It is always left at a sacred place known as *umsamo*. The *umsamo* is situated at the back of the hut opposite the entrance and built so that it is raised a little higher than the rest of the floor. The beer left at the *umsamo* can be consumed only by older men and older women of the family; younger people are prohibited from drinking beer left at the *umsamo*. The *umancitshana* is handled by the homestead head’s mother of the family ‘homestead complex’. Once she passes on, a senior wife in the family homestead takes over. Aside from the *umancitshana* and beer, other items are also regarded as important for connecting the living with the dead. These include *impepho* (incense), which is usually burnt in an old potsherd.

Imbiza pot

Another important pot is *imbiza*, a big pot for brewing traditional beer, *utshwala*. The *imbiza* stays in the great-hut, placed on the *umsamo*. This is because *utshwala* is brewed only if there is an ancestral ceremony or ritual that needs to be performed. In addition, because fermentation of the beer, like pregnancy, is the work of the ancestors, *imbiza* stays in the place of the ancestors so they can do their work. In rural areas of KwaZulu-Natal, *utshwala* is not something consumed for pleasure. There is always a specific reason for consuming *utshwala*, such as a thanksgiving ceremony to the ancestors. People say that the reason *utshwala* is brewed is for connecting with ancestors. These conceptual associations govern the particular ways in which the *imbiza* is treated.

The *imbiza* is cleaned with dung on the outside (to show respect to the ancestors – *ukuhlonipha amadlozi*) (Armstrong 2008: 415), and on the inside with plain water. The *imbiza* symbolises a womb (fertility) because it brews beer. The reason dung is used to clean the *imbiza* is because ancestors associate dung with 'coolness' (Kuper 1982: 20), and dung provides a way for the ancestors to help prevent lightning from striking the homestead (Lawton 1967: 52; Armstrong 2008: 415). Only dung from the homestead cattle-pen (*isibaya*) can be used to clean the great-hut and *imbiza* (Bonisiwe Magwaza pers. comm. 2019).

Imbiza pot, womb, great-hut, and cattle-pen

There is a conceptual relationship between the *imbiza* and the great-hut. Looking at the structural and functional 'behaviour' of the *imbiza* and the great-hut, they both represent the womb of the homestead. We should bear in mind that the womb is a bearer of fertility. It is a sacred place where babies grow hidden from view, yet conspicuously (the only time people are certain a woman is pregnant is when the belly starts showing). The same applies to the brewing of traditional beer (*utshwala*). We can see that the *utshwala* is good for drinking only when the bubbles from fermentation start showing. No one knows how fermentation starts (it is a process that happens in secret), but we see that something is happening in the later stage of fermentation.

The great-hut is like a womb because it houses *umsamo* (a sacred place for the ancestors). People communicate with their ancestors but are never sure how successful the communications are and whether the blessings and requests were heard; one can only hope. A person is sure that the ancestors have heard only when positive manifestations in the physical world show.

The role of the cattle-pen is similar to that of the great-hut. It houses the ancestors of the homesteads and it is where the first communication with the ancestors takes place through the spilling of a beast's blood. Only men of the homestead are allowed in the cattle-pen and, ideally, no woman is allowed to be in the cattle-pen. The bride and her mother-in-law are not allowed in the kraal of the homestead except in special circumstances. The only time a woman is permitted to enter the cattle-pen is during her wedding ceremony when her in-laws – including those in the ancestral world – are welcoming her into the family (Phumulani Madonda pers. comm. 2018; Selina Mncube pers. comm. 2018; Magwaza pers. comm. 2019). A cow referred to as *umqholiso* is slaughtered by the bride's in-laws and the gall is poured over her in a ritual of incorporation into the groom's homestead (Krige 1965: 148–149).

Once the homestead ancestors note that their new 'daughter' (the bride) has been 'cleaned' with gall, it pleases them. In the ancestral world, gall plays a significant role. My colleague Nothando Shabalala (pers. comm. 2022), a practising traditional healer, notes that the ancestors regard goat gall as more important than blood because it connects directly with the groom's family and can therefore ward off any unwanted spirits surrounding the family. She further states that gall represents the umbilical cord of the family to the ancestral world, which is why the in-laws pour gall over a new bride. Another explanation put forward regarding pouring gall over a bride, is that this is the first step to welcoming the bride to enter the most important place of the homestead, namely the kraal (Krige 1967: 148–149). This, however, does not

Figure 2.7: Pot made for storing/drinking *amasi* (circumference 62.1cm). Pot made by Buzephi Magwaza.

mean that from then on she is allowed to go into the kraal. In essence, the only time a female is allowed to go into the kraal is when she has reached menopause. From these aforementioned explanations, it is clear that cattle dung and goat gall have similar roles. As the dung used to clean the *imbiza* and the great-hut, gall plays a similar role by cleaning the bride and warding off evil spirits, meaning that it connects, cleans, 'cools' and protects the bride to be acceptable to the ancestors of the homestead. It is also a way of connecting her to the homestead; so that she is not negatively affected by 'foreign' (to her) spirits/forces. At the same time, it is a way in which her in-laws (dead and living) are protecting themselves from the bride, as the bride is still an outsider.

Amasi-pot

The third important pot is the *amasi*-pot or pot reserved for *amasi*. This pot is usually plain black and burnished, or with few or no 'textured decorations' (Fig. 2.7). The Magwaza potters do not have a formal Zulu name for the pot reserved for *amasi.* They simply call it *ukhamba lwamasi* meaning *amasi*-pot. Reusch et al. (1998: 23) note that in other regions in Zululand north of Thukela River they do have a formal name for the *amasi*-pot, which is *umcakulo*. However, according to Krige (1965), *umcakulo* is a bowl from which people eat a boiled grain preparation mixed with amasi (*umcaba*). So it is unlikely that it is the same as *ukhamba lwamasi* (as popularly known).

After a groom has married his bride, he does not leave his father's homestead (*umuzi*). Instead, his father builds a house and a kraal for him and his new wife inside the family yard (homestead /'homestead complex') (Thuleleni and Bonisiwe Magwaza pers. comm. 2021). This is done so that the bride (*umakoti*) can be 'initiated' into the family, and the initiation is known as *ukukotisa* so that the bride can learn the customs of her in-laws.

In olden times, the new bride would abstain from *amasi* (sour milk) for the entire first year of her marriage (Mayr 1906: 468). *Amasi* represents the semen of the groom's ancestors (Ngubane 1977: 53; Kuper 1982: 20) and before the bride can eat any food that is known as a fertility food (e.g., eggs and *amasi*), she needs the permission of her husband's family. Consuming *amasi* as a bride or new wife without being granted permission is seen as a disrespectful act towards the husband's family. They do not simply tell the bride that she can now eat fertility foods. They notify her by performing a ritual and letting her know the reason for the ritual.

This ritual results in the bride's official acceptance by the ancestors of her in-laws, who now recognise her as a family member of her new homestead (Krige 1965: 120):

> It takes a long time before the husband's sib, including the ancestors, become used to the addition of the girl, and she must therefore *hlonipha* (avoid in respect) her relatives-in-law, a recognition of the difficult position.

Once an invitation to the ritual has been received by the bride's natal family, her mother makes an *amasi*-pot. The pot is for her daughter to store *amasi* for her husband (Reusch et al. 1998; Magwaza pers. comm. 2019; Nothando Shabalala pers. comm. 2022).

This custom of a bride bringing or making an *amasi*-pot for her husband is no longer widely maintained. *Amasi* is now made and kept in an *igula*, a calabash or gourd shaped like an hour glass (Krige 1965). Note, however, that *amasi* stored in a gourd is for the entire family, whilst *amasi* stored in the ceramic *amasi*-pot is specifically meant for a woman's husband (Buzephi Magwaza pers. comm. 2021). The new wife keeps the *amasi*-pot until she gives birth to her first child or until it breaks (Bonisiwe Magwaza pers.comm. 2021).

The 'marriage' pot, the bride and *inhlonipho*

Kinship and marriage rules of Zulu culture

In Zulu culture, there are certain kinship rules that govern affiliations and marriage alliances. According to Preston-Whyte (1974: 177), "ties of kinship traced either through blood (consanguinity) or established by marriage (affinity) are recognized and are of fundamental importance to the individual". For example, among Nguni-speaking people, marriage between kin is prohibited (Preston-Whyte 1974: 177). Nguni-speaking people typically favour exogamous marriages that exclude anyone who shares a clan name, or the clan names of parents and grandparents.

My colleague Mr Madonda (pers. comm. 2019) expresses marriage potential as follows: "In Zulu culture, a man and a woman sharing clan names either from the maternal side or paternal side cannot get married, especially those sharing clan names of the paternal side." However, if a woman happens to share the clan name of the maternal side of the man, and she is adamant about getting married, an arrangement to fix it can be made. Normally the arrangement to fix the 'damage' entails slaughtering a goat to ask for permission from the ancestors to change the woman's clan name (Phumulani Madonda, pers. comm. 2019). In contrast, Sotho-Tswana speakers allow marriage between kin. Marriage between kin is the most accepted and often preferred system (Preston-Whyte 1974). A cross-cousin marriage is the preferred arrangement (Preston-Whyte 1974).

It should be noted that kinship rules are set. Once an agreement to pay a *lobola* price for the bride to be has been reached then a wedding can take place. In Zulu culture, there are post-wedding rules that the bride needs to understand. There are, for example, certain boundaries set on the behaviour of the new wife. Normally these boundaries are set through objects and homestead features. For example, it is taboo for a bride to touch and clean the *imbiza* pot, to clean inside the great-hut and enter the cattle-pen, because these places and things are highly valued places to the ancestors.

The *imbiza*, great-hut and cattle-pen are so sacred that only certain people have permission to touch them or have access to them. For example, cleaning the *imbiza* and the great-hut is the responsibility of the mother-in-law (i.e., husband's mother) and the daughters of the homestead. The new bride is not allowed to clean them until a ritual known as *indlakudla* has been performed; indeed, she is not allowed even to touch or enter the great-hut until the *indlakudla* is performed. Moreover, after the *indlakudla* rite, she is not allowed to cross over to the male (right) side of the great-hut. This is because the ancestors of the homestead are not yet familiar with her. They need time to become familiar with her and trust her. In truth, the bride will only be fully accepted by the ancestors of her in-laws once she reaches menopause (Selina Mncube pers. comm. 2019; Huffman 2019: 223).

The bride is recognised by how she is dressed. Her new in-laws have one important requirement – that she be dressed decently. By 'decently', I mean she must wear *umhlonipho* – a cloth or scarf tied diagonally across her upper body (shoulder to the abdomen or around her neck) (Fig. 2.8). She must always cover her head with a *doek* and wear a skirt or a dress covering her knees. In the olden days, new wives would wear a pleated leather skirt, *isidwaba* (pl. *izidwaba*) (Braatvedt 1927). Today *izidwaba* are not worn frequently but are reserved for wedding days and other important occasions. The dress code of the bride shows respect not only to her in-laws but also to their ancestors. As already stated, a woman does not get married to her husband and his relatives only, but also to his ancestors.

Figure 2.8: The brides (pl: *omakoti*/*abomakoti*, sing: *umakoti*) of Magwaza. Left is Thuleleni Magwaza; on the right is Thandiwe Magwaza. The woman sitting in the middle is a friend of the Magwaza ladies. She is also a *makoti* of another homestead (family) and she does not make pots. Note the pot at the bottom left covered with an *imbenge* basket.

Pots presented to the groom

Like the bride, pots taken to the groom's family homestead must be dressed appropriately. The pots are mostly made by the bride or the bride's mother or a woman from the bride's side (if they are potters) (Magwaza pers. comm. 2019). The bride can bring many pots to the groom's family. Ideally, the bride should provide gifts to all the men in the groom's family, especially those of the paternal lineage (Magwaza pers. comm. 2019). Usually, when the bride arrives at her new home, she gifts beer to the father of the groom and the brothers of the groom. This beer was called *umbondo* in the past (Krige 1965: 132).

Today, *umbondo* refers to a post-wedding ceremony where a bride and her family take gifts to the groom's family. It is the reverse of the *umembeso* ceremony, where the groom and his family take gifts to the bride's family. The *umbondo* beer is carried in a pot covered with an *imbenge* – a shallow basket over the mouth of the pot (Buss 2018; Bonisiwe Magwaza pers. comm. 2019) (see Fig. 2.8). This practice is *inhlonipho*. Whitelaw (pers. comm. 2021) suggests that the *imbenge* covering the pot is analogous to the *umakoti*'s dress code; it demonstrates to her in-laws that she is a decent and respectful daughter-in-law and that her family has groomed her well.

The Karanga in Zimbabwe hold similar ideas of respect. With the Karanga, the pot taken to the in-laws must be a new pot that represents the bride's virginity (Aschwanden 1982: 190). The pot also represents the bride's family; it indicates how well she has been raised. In a way, this practice is like the '*inhlonipho*' concept maintained by the Nguni people. This is because the bride's virginity is not only important to her and her family, but it is also a way of showing respect to her in-laws and the ancestors of her in-laws (Herbert 1990) and, in so doing, she offers respect to the homestead of her new family.

Marriage alliances between families are not only signified by pots. Colour symbolism can also play a significant role in the negotiations between families. The next section will consider colour symbolism in marriage alliances.

COLOUR SYMBOLISM AND MARRIAGE EXCHANGES

At the KwaMagwaza homestead, I found it difficult to get comprehensive answers on why they use mostly red and black colours to decorate their pots. In addition, what role does these two colours red and black symbolise between the living and the dead? The only answer I received from the Magwaza potters regarding the use of red and black colour and their symbolism on pots was, 'the locals prefer buying black-coloured pots and the tourists prefer buying red-colours pots'. The explanation was that black-coloured pots are used for ancestral ceremonies, hence why the locals buy black-coloured pots. They further explained that the tourists love red-coloured pots because they are beautiful. The locals, including the Magwaza potters, will never use red-coloured pots to perform ancestral ceremonies. The Magwaza potters and locals regard red colour as an inappropriate colour to use when performing ancestral ceremonies, because red is for danger.

That is as far as the topic on colours and their symbolism at KwaMagwaza's went. I sensed that they were not aware of the reasons why the black pots are mostly used for ancestral ceremonies aside from the belief that red is associated with danger. For that reason, I did not want to come across as someone forcing the potters to agree on the little research I had done prior to the visit.

I wanted them to be the ones volunteering on sharing the information, especially when they have been asked, hence why further research on colours and their symbolism had to be done.

In subsequent research, I found that there are three important colours in Zulu cosmology. These colours are black (*mnyama*), red (*bomvu*) and white (*mhlophe*). In healing, the three colours can define medicines and the medicines are always taken in this order: black – red – white. Black and red things are similar because they can be either good or bad and contaminated, but white is always good and clean and pure. Although white medicine can be taken alone, black or red medicines must be followed with the cleansing of white medicine (Ngubane 1977: 113).

In November 2021, I interviewed a former Zulu traditional healer, Ms Busisiwe Mazibuko, who resides in a Pietermaritzburg township (known as Mbali unit 13), regarding these three colours and their symbolism. She also mentioned other colours besides the three colours aforementioned that are also important. Ms Busisiwe Mazibuko (pers. comm. 2021) agreed with the statement made by Ngubane (1977). She mentions that indeed, the red and black colours have powers of darkness and, at the same time, powers to protect one from the darkness. This means that they can protect a person from danger and at the same time inflict danger on other people (Busisiwe Mazibuko pers. comm. 2021). This explains why traditional healers will either wear a combination of black and white beads, or red and white beads, but rarely wear a combination of black and red beads.

Furthermore, research has shown that the topic of colour and what it can symbolise is not a new topic discussed only in ethnography. Archaeologists have also invoked colour symbolism. The Iron Age provides a good example. Daily activities that women and men participated in were channelled by colour symbolism. If the colour represents softness and the item is soft, it will be associated with women. If the colour represents hardness and the item is hard and very rigid to work with, then it will be associated with men. For example, copper and iron workings were gendered. Copper was associated with women because it is a soft metal to work with, and iron with men because it is a hard metal to work with. Copper is also a 'red' metal, and is likened to menstrual blood and female fertility (Herbert 1984; Hall et al. 2008: 82).

Colours red, black and white as 'heating and cooling' agents

The concepts of 'hot' and 'cool' interlink with colour. The colour red is associated with heat, lightning and blood (Berglund 1976; Kuper 1982). Medicinally, in the Zulu/Nguni world, red medicines are 'hot medicines' because they are prepared on fire (heat), as are black medicines. These hot medicines are used to drive sickness out of the body. They are used in the order of black medicines first, then red. White medicines, on the other hand, are cold, 'cool' and uncooked (Bryant 1966: 22). The cool medicines are used to make the body healthy again, to purify the body. Conceptually, red is an 'in between' colour associated with transition and thus with the danger (or pollution) of uncertainty (Ngubane 1977; Kuper 1982). For example, when a woman delivers a baby, the blood that comes out is seen as dangerous and hot (meaning she is 'hot' and 'dangerous'). Therefore, the woman should not be close to a man or the cattle as her blood might pollute and cause ill health (Ngubane 1977, Kuper 1982). Menstrual blood is not considered as dangerous as the blood of a woman who just delivered a baby (Ngubane 1977: 79). This leads me to the idea of pollution symbolised by colour.

Pollution and colour

Like the concept of *hlonipha*, the notion of pollution has been widely discussed (e.g., Berglund 1976; Ngubane 1977; Kuper 1982; Armstrong et al. 2008). Moreover, the concept of pollution in ethnography is complex. Ngubane (1977: Chapter 5) endeavours to explain or unpack the concept of 'pollution' in simple terms. She starts by saying "… 'pollution' is a 'mystical force' more often closely associated with women" (Ngubane 1977: 77). She further states, "Among Zulu, the source of pollution is essentially a happening associated with 'birth' on the one hand and with 'death' on the other" (Ngubane 1977: 77). Additionally, the idea or concept of pollution is more often than not linked to darkness (*ubumnyama*) and heat (Ngubane 1977: 77–78).

In ethnographic accounts, menstruating women are prohibited from approaching a smelting site and, in extreme cases; a smith whose wife is menstruating is prohibited from entering the iron-smelting site. A woman menstruating is said to be "polluting" (Herbert 1993: 85). At KwaMagwaza, I was told that a menstruating woman should not collect clay or be close to the clay mine and should not make pots until she has 'healed'. The 'polluting' concept also applies to men. A man who has just slept with his wife cannot come close to where the pot-making is taking place. It is believed that his presence will cause the pot to break because he is 'hot'. The same is true of a potter who has not yet cleansed herself from sex. Interestingly, I was surprised to see that I was allowed to the pot-making site without being questioned about whether I was ‘clean/hot’ or not (that is, if I was menstruating). I was surprised because I had expected this challenge as a young woman, not yet in menopause.

Interestingly, it is not only a menstruating woman who is considered polluted but also a woman who has recently given birth (Ngubane 1977; Magwaza pers. comm. 2020). She is dangerous to herself, her new-born, and the people surrounding her, because she is weak and vulnerable to negative influences (evil spirits) in the world, and she might ‘infect’ others with poor health (Ngubane 1977). She is both susceptible to sickness and poses a threat to other people and things. Therefore, whenever she leaves the house, she must smear red ochre on her exposed skin to protect herself from possible dangers in the wider environment (Ngubane 1977: 78). This shows that the colour red acts as a protective symbol from danger and at the same time resembles danger (hot). This shows that the colour red is ambiguous. It is the same with menstruation with its red blood. Menstruation poses a danger to other people and things, but it is also evidence of fertility and thus of potential for new life.

This is why a menstruating woman is prohibited from being around crops and cattle and around her husband if she is married (Kuper 1982: 21). Furthermore, in the ancestral world, a bride menstruating indicates that her paternal ancestors still have a hold on her, therefore she is seen as ‘hot’ and a ‘danger’ to her in-laws since she is still carrying foreign blood. The only time she is perceived clean is by conceiving and giving birth. In contrast, when the daughter of the homestead menstruates it is not seen as her bringing foreign spirits, even though she is still regarded as being polluted.

In material culture, copper provides the best-known example. Naturally, copper is red in colour, and referred to as ‘red gold’ (Herbert 1984). Because of its red colour, copper was also used to pay for bride wealth if the groom’s family did not have cattle or enough cattle (Kuper 1982; Herbert 1984). Metal implements manufactured from copper or iron were given in exchange for the wife (Kuper 1982; Moffett et al. 2017). The reason why copper was used is that its red colour is likened to “hot and female” (Kuper 1982: 22). It is reasonable to accept that the people of Mgoduyanuka held similar views about colour, which were most probably reflected in the ways in which they decorated their pots and other items of material culture.

At KwaMagwaza, a menstruating woman cannot go to procure clay because she has the powers of ‘killing’. There are, however, exceptions. If it so happens that she is at the site, she must pay a fee of R1 or any silver coin, and the silver coin is thrown at the site. The explanation for paying a fee at the clay site is thus: it is done so that the 'spirits/gods' of the site can allow her to procure clay and it is a way of asking for forgiveness from the 'spirits' of the site (Thandiwe and Thuleleni Magwaza pers. comm. 2019). Note, the 'spirits' of the clay mine are not ancestors, so no ancestral ritual is performed. The 'spirits/gods of the clay' merely protect the mine/site (Thandiwe and Thuleleni Magwaza pers. comm. 2019).

The notion behind throwing a silver coin is that silver is associated with white – purity or calmness. In essence, the payment of a silver coin is made so that the gods of the clay mine can be calm and not angry with her (a woman menstruating) for collecting and so that gods will not stiffen the potter's clay to a point where it cannot be manipulated (Thandiwe Magwaza pers. comm. 2019). Moreover, the payment is made for the purpose of making sure that the process of pot-making is successful and that the pots will not break during the process (Magwaza pers. comm. 2019).

Interestingly a breastfeeding woman is thought to be a good omen because she is carrying milk and milk is white and 'cool'. Berglund (1976: 340) mentions that one of his informants told him that a breastfeeding woman should till the fields because they know that when harvest season comes it will yield more crops. This means that milk carried by a breastfeeding woman has the potency for reproduction and bringing calmness.

CLOSING REMARKS

I close this chapter focusing on marriage alliances. Throughout the chapter, I have noticed that there is one thread that links all these social systems, and that thread is marriage. Metaphorically, marriage is a thread that connects the living to the dead or spiritual world. All these social belief systems are centred on marriage. Marriage has importance both in the physical sense and in the spiritual sense. In the physical sense, when there is a wedding taking place and an exchange of goods from both families, we automatically know that new relationships are built and alliances are formed or enhanced.

The only way one can explain the spiritual form of marriage in Zulu culture is through ethnographic interpretations. Given the relationship in sub-Saharan Africa between pots and people (e.g., David et al. 1988), Whitelaw (2014) suggests that the red ochre burnished sherds at Mgoduyanuka were brought into the homestead by young wives moving in with their husbands. The red represents their fertility, given to them by their father's ancestors. In contrast, applying black to the pots is a sign of respect and therefore an act of appeasing the ancestors, as they prefer cool and dark places (Armstrong et al. 2008; Perrill 2012). Black is the preferred colour for serving and drinking pots because it makes the ancestors comfortable at beer feasts (Armstrong 2008).

The colour black on pots provides shade and it is pleasant looking to the ancestors (Armstrong et al. 2008; Perrill 2012; Jolles 2013). Armstrong et al. (2008: 415) also mention an important point about the firing process. They observe that only the serving and drinking vessels are given a second carbonised firing (to make the pots black), and this is done as an honour to the ancestors and not to strengthen the vessel. It is another form of *inhlonipha*.

As already mentioned, there are rules and laws that a woman needs to abide by once she is married. She must learn how to present herself to her in-laws (this includes the ancestors of her in-laws). These rules imposed on the bride are solely made so that she learns ways of appeasing the ancestors of her husband's homestead. For example, the pot that she brings to the father of the groom is covered. I have come to realise that the covering of the pot does not only represent the pot being 'respectfully dressed' but also represents a shaded hut (womb). Berglund (1976: 340) elaborates on this notion by using gall bladder as an example; he says that one of his informants told him that the shades love gall or gall bladder because it has a door but no one can exit, there are no windows and it is completely shaded. I believe the pot with an *imbenge* cover functions as a form of a gall or gall bladder – *imbenge* being the doorway and the pot being a hut with no windows (fully shaded). The *umakoti* wearing a *doek* to cover her head is similar.

Unfortunately, archaeologically, marriage alliances can only be explained through the physical senses, because of the material culture found at sites. Through remnants of material culture, archaeologists can deduce whether communities interacted with one another. For example, archaeologists have shown that rare artefacts such as ceramics, crucibles, ivory, and various beads made from different materials such as copper, glass, and even ostrich eggshell found at archaeological sites could be evidence of alliances (see Esterhuysen 2008; Whitelaw 2012; Moffett et al. 2017).

Of all artefacts, ceramics have played a huge role in demonstrating alliances. Hammond-Tooke (1981) states that some ceramic interchanges could represent marriage alliances. Esterhuysen (2008) used the ceramics found at Historic Cave in Makapan Valley to show that they could be explained as alliances formed through marriage. She argues that alliances were formed by the Northern Ndebele (known as Kekana ka Mugombane) and Bakgatla ba Mmakau during times of trouble. She further shows that alliances between these groups would have been formed based on leadership strength, especially when one group seems to be highly organised and has powers of conquest.

Additionally, trade and marriage alliances work hand-in-hand (Huffman 2007:318). The notion behind 'political status' supports the idea of marriage exchanges in the form of peace offerings. This point will be expanded further in Chapter 6 to respond to the suggestion made by Whitelaw (2014) that red pots at Mgoduyanuka are the result of new wives moving into their husbands' homesteads.

3

Archaeometric Background

INTRODUCTION

Taylor (1976: 7) suggested that archaeometric studies could be divided into four categories:

1. Archaeological chronology or archaeochronometrics
2. Archaeological analytics (physical and chemical analysis of material)
3. Paleoenvironmental or paleoecological reconstructive studies
4. Archaeological remote sensing applications.

My project falls into the second category, archaeological analytics.

Today, archaeological analytic studies on ceramics and metal artefacts form an important component of archaeological research for acquiring information relating to technological and cultural choices of past communities (Tite 1999; Sillar & Tite 2000). These analytical techniques, combined with typological classification, have introduced additional data for our interpretations of pottery production and social systems of Iron Age societies. As such, these techniques in southern Africa are increasing in popularity (cf. Diskin & Ashley 2016).

Around the world, archaeological analytical techniques have been applied since the late 18th century (Mantler & Schreiner 2000). Martin H. Klaproth (1743–1817) was one of the first people to use them. He analysed Roman coins and glass objects, looking at their chemical composition (Mantler & Schreiner 2000). Archaeologists interested in ceramic analysis have employed the same category of techniques. However, in KwaZulu-Natal these techniques have not been widely used. Archaeological analytical techniques combine optical (macroscopic analysis) and compositional (chemical analysis) strategies to characterise the fabrics of clays used to make archaeological ceramics (Tite 1999; Lindahl & Pikirayi 2010). However, results/technical data yielded by these techniques only make sense when properly explained or interpreted (Janssen et al. 2000).

Using X-Ray Fluorescence (XRF) and X-Ray Diffraction (XRD) offers a standardized methodology that allows for multiple analyses on a sample (Jacobson 2005: 12). XRF operates by counting the number of photons of energy emitted from the sample (Pollard et al. 2008; Shackley 2011). It then gives the chemical composition of the sample. XRD (X-Ray Diffraction) helps in determining the mineral composition of a sample. The combination of these two approaches allows one to understand both the chemistry and mineralogy of samples (Loubser & Verryn 2008), and therefore to distinguish samples made of different source materials. This approach, provenance study, is best applied to clay samples.

WHY POTS?

Pottery is common on most southern African Iron Age sites, but the craft of pot-making begins before the Iron Age period. In southern Africa, there are three groups of early potters. The first group of pot makers were hunter-gatherers from the central plateau of South Africa (Boundary Shelter) ca. 2100 BP (Sadr & Sampson 2006). The second group consisted of pastoralists moving south in the western parts of the region from about 2100 BP, and the third group were early farmers (Iron Age communities) that settled in the low-lying country in the eastern and northern parts of southern Africa from about 1800 BP (Jacobson 2005). It has been argued that the earliest pottery of hunter-gatherers coincides with the arrival of the fat-tailed sheep 2100 BP in the Cape and KwaZulu-Natal (Klein 1986; Sadr 1998; Sadr et al. 2003; Lander & Russell 2015). However, the evidence for early (ca. 2100 BP) potting in the central Karoo (Sadr and Sampson 2006) shows that potting by hunter-gatherers was not directly connected to the presence of sheep.

In KwaZulu-Natal, the craft of pot-making begins at least ca. AD 150–300, by hunter-gatherers and possibly as early as 2100 BP (Mazel 1992). Whitelaw (1998: 4) proposes, "Hunter-gatherers wishing to add new methods of cooking and foods to their diet may have made the pots themselves". Unlike Iron Age people's pottery, the pottery made by hunter-gatherers is not easy to classify into stylistic units (Jacobson 2005). Iron Age pottery is highly formalised with defined decorations that facilitate categorisation into chronological phases (Jacobson 2005), such as the Early and Late Iron Ages.

In making pots, potters transformed a basic raw material (clay) through firing to create something new (David et al. 1988: 366). For thousands of years, people have used clay to create pots and other objects in distinctive and culturally specific styles (Delius et al. 2014; Thebe 2017). Pots can tell a story, not only as material objects but also about the potter's social and cultural context as, for example, in the case of the Magwaza pots. Their ability to tell a story is what makes pots useful artefacts to archaeologists. As Gosselain (2000:189) states: "Objects accumulate histories and have the ability to tell multiple stories about people". Pots are objects that carry histories of their own. Therefore, pots should be treated as 'social objects' (David et al. 1988; Evers & Huffman 1988; Esterhuysen 2008: 197).

Firstly, considering pots as 'social objects' helps identify lifestyle changes in past communities, such as the emergence of sedentary lifestyles and food production (Bostoen 2007). For example, Esterhuysen (2008) and Thebe (2017) show how pottery as a 'social object' can aid in understanding population movements and social discourses caused by warfare, land conflicts, and environmental stresses during the Late Iron Age and early colonial period.

Secondly, treating pottery as a social object helps in unpacking complex issues such as marriage alliances or social alliances that took place in the past. Ceramics are fundamental to this work, as they are common artefacts on archaeological sites and decorated in culturally and historically specific ways.

Lastly, through ceramic typologies, sometimes combined with technological analyses, one can generate data on how communities changed through time (Huffman 1980; Denbow 1982: 85; Thorp 2009: 208; Jacobson et al. 1991; Wilmsen et al. 2009). Provenance studies and chemical and element characterisation of ceramics have helped archaeologists tremendously in archaeological interpretation. The main aim of my project is to understand the social life of Mgoduyanuka inhabitants through their ceramic assemblage and to establish if they too, held similar views about clay pots as noted among Karanga people by Evers and Huffman (1988). According to Evers and Huffman (1988: 739):

> Clay pots are important symbols of a relationship between husband and wife. The way a husband handles his wife's pots reflects his attitude towards her.

Therefore, in order to understand the social aspect of ceramic pots, one needs to look at the technical side of ceramic pots holistically.

Objectives

This project examines the chemical characteristics of the clay fabrics from Mgoduyanuka in order to test a hypothesis that links decoration to marriage alliances. Several studies in southern Africa and internationally have used similar techniques to answer issues of provenance, and chemical characterisation of clay samples. I now consider several case studies chosen because they have used similar methods and techiniques (pXRF, XRF, XRD) to answer social questions relating to past communities. Some of these case studies look at the provenance while some are a combination of provenance and chemical characterisation, but they all focus on interactions of past communities (i.e. marraige alliances and also movement of communities).

LITERATURE REVIEW

Case studies on provenance studies

Coastal KwaZulu-Natal

One of the many reasons to look at clay is that any manipulated clay carries a unique chemical 'fingerprint' (Punyandeera et al*.* 1997: 249). With that in mind, Iron Age researchers based in KwaZulu-Natal collaborated to conduct a project in analysing sherds from various Early Iron Age (EIA) sites in KwaZulu-Natal. Their aim was to provenance the EIA sherds to see if any link between coastal and inland EIA communities could be established (Punyandeera et al. 1997: 249). Their project was instigated by Horwitz et al.'s (1991) speculation that Emberton Way and Mhlanga Lagoon may have been harvest sites for shellfish and may have served shellfish to villages of more than 20 km inland (Punyandeera et al. 1997: 250). Emberton Way and Mhlanga Lagoon are both large middens, disturbed by construction (Horwitz et al. 1991). Both yielded sherds of four Early Iron Age phases, namely, Mzonjani, Msuluzi, Ndondondwane, and Ntshekane. In Emberton Way, there is also evidence of a Late Iron Age phase, but because of disturbance and a lack of decoration, it is difficult to say which LIA phase is represented at the site (Horwitz et al. 1991). Horwitz et al. (1991: 26) found potsherd fabrics in the Emberton Way and Mhlanga Lagoon middens contained unsorted quartz pieces as a prominent feature of the ware, suggesting that these pots were made predominantly from granitic material rather than the aeolian deposits of the coastal belt.

The granitic fabric of pottery assemblages in these two shell middens most closely resembles the matrix of ceramic assemblages from the Mngeni valley approximately 20–40 km away from the coast. This observation suggests that the sherds found in these two midden sites were not locally made and led Horwitz et al. (1991) to suggest that either pottery was made inland and traded to coastal communities, or inhabitants of the inland communities carried pots down to the beach to process and carry shellfish meat back home (Horwitz et al. 1991: 26).

Given Horwitz et al.'s (1991) suggestion, Punyandeera and colleagues (1997) examined in detail sherds from four sites, three inland and one coastal. They chose sherds from Mzonjani on the Berea Formation dune sands of the coastal belt (of the Mzonjani phase) (Maggs 1980c), and Nanda (Msuluzi phase) and KwaGandaganda (Ndondondwane phase) (Whitelaw 1994) inland in the Mngeni valley. Punyandeera et al. chose not to look at sites further inland because it is highly unlikely that people from these distant communities would travel so far to collect shellfish.

For the coastal region, they selected Emberton Way (this site seems to have been used throughout the EIA, although probably sporadically) (Horwitz et al. 1991; Punyandeera et al 1997: 249). For the analysis, Punyandeera et al. selected 107 sherds from the four sites for X-Ray Fluorescence Spectrometry (XRF), focusing specifically on plain, undecorated sherds. The use of XRF aided in showing clusters and outliers, and from that, they were able to deduce the movements and interactions of different groups during the first millennium.

Punyandeera et al.'s (1997) XRF results supported the suggestion made by Horwitz's team that people travelled from inland to the sea to collect and process shellfish and take some of it back to their permanent homes inland. Secondly, they realized that the clay source used to make pottery in Nanda and KwaGandaganda was a common granitic clay source, such as occurs in the Mngeni valley (Punyandeera et al. 1997: 254). Additionally, it is possible pottery was made at Emberton Way to replace broken pots and then carried back inland (Punyandeera et al. 1997: 254). Their last finding was that occupiers of KwaGandaganda used various clay sources, one of which was unique to KwaGandaganda; and that trading between KwaGandaganda and Nanda was not possible as these two sites were occupied at different times (Punyandeera et al. 1997: 254). All these results from XRF indicated a high probability of interactions for sites situated near each other and a link between coastal and inland areas (Punyandeera et al. 1991: 254).

Soutpansberg

Jacobson et al. (1991) used Particle-Induced X-Ray Emission (PIXE) and typology to determine the chemical signatures of sherds of various facies north and south of the Soutpansberg in present-day Limpopo Province. Their analysis showed that most pots were used in the same area they were made. A few pots had been moved across the mountains. Of these, the majority were southern pots found in the north. Oral traditions suggest that one possible explanation of this pattern is marriage alliances where brides from the south were marrying into northern communities. Also, southern pots with northern decoration patterns show that ideas (represented by decoration) moved from north to south. This was probably because northern communities had higher status than the southern communities. Evidence from this study supports the hypothesis that marriage alliances contributed to the admixture of Khami and Moloko ceramics to form a new style (Tavhatshena) signifying the early emergence of Tshivenda, the Venda language. Thus, analysis of raw materials can contribute to our understanding of interactions between cultural groups (Kelloway & Birmingham 2010).

Moloko

Dana Rosenstein aimed to examine a possible correlation between technological change in ceramic production and the aggregation of Tswana-speaking farmers into mega-settlements housing several thousand people (Rosenstein 2008). Archaeometrically, she used optical petrography to analyse early and late phase Moloko ceramics. The petrography results revealed that early Moloko ceramics (now classified as of the *Olifantspoort* and *Madikwe* facies) were produced from unrefined clay, whereas late Moloko ceramics, the *Buispoort* facies especially, are characterised by temper inclusions from local rocks. The fabric of the *Buispoort* ceramics shows traces of talc inclusions, possibly from the weathered dolerite rocks. Furthermore the fabric shows that mica minerals (e.g., biotite and muscovite) and grog were used as temper (Rosenstein 2008; Tlhoaele 2014). This notion is based on the fact that the mica inclusions are angular and coarse, a typical characteristic of a purposefully crushed material to be used as temper (Rosenstein 2008; but see Tlhoaele 2014: 49 for a different interpretation). The *Buispoort* ceramics found in upper Olifantspoort and Molokwane are distinctly different from the *Uitkmst* ceramics found at the Marothodi site (Rosenstein 2008; Hall 2012). The explanation for the difference was not attributed to geographical reasons but to stylistic/technological identity (Hall 2012).

Botswana

Edwin Wilmsen, James Denbow and Phenyo Thebe collected many sherds from 28 sites in Botswana, all dating to the Iron Age. They initially used typology to analyse the sherds. The typological data revealed that each site has pots that are stylistically different or unique. These observations of the different styles encouraged Wilmsen et al. to conduct archaeometric analyses on the sherds. Wilmsen et al. (2009) hypothesized that the ceramic assemblages included pots that appear to have been transported from site to site in Botswana from as early as AD 900–1100. To test their hypothesis, they turned to optical petrography (Wilmsen et al. 2009). Petrography revealed that pottery was transported from the waterveld regions such as Okavango Delta to hardveld regions such as Tswapong Hills and Tsodilo Hills. Some of these sites are 400–600 km from each other. In addition, the results showed that four different types of clay fabrics (basalt fine fabric, granite fabric, silica fabric (quartz-feldspar), and bone temper fabric) were sought after. Wilmsen et al. (2009) conclude that interactions or intercommunications at waterveld sites started earlier than AD 900, possibly ca. AD 200. However, intercommunication between waterveld and hardveld regions started later, after ca. AD 900. Furthermore, by ca. AD 900 hardveld communities were fully involved in the East Coast trade. Their conclusion is supported by the results of the clay fabrics analysed.

Another provenance project on the Late Iron Age of Botswana was done by Diskin and Ashley (2016). They used XRD (X-Ray Diffraction) and ICP-OES (Inductively Coupled Plasma & Optical Emission Spectrometry). They analysed the clay fabric of 1342 sherds found at the site Khwebe Hills 4. Because the hills were occupied by San and Tswana people at different times, Diskin and Ashley wanted to determine the range of variation in ceramic fabrics. Of the total assemblage, 118 sherds have a clay fabric with bone as the main temper. A large proportion of ceramics have sand and sometimes quartz as the main temper (Diskin & Ashley 2016: 576), while a third large sub-set has a high concentration of quartz and feldspar. From the results, they concluded that Khwebe Hill 4 was indeed occupied by different groups of people in different archaeological periods. Their study also suggested that three groups instead of two occupied the Khwebe Hills 4 site. The three groups that occupied the hills at different times were hunter-gatherers, herders, and the early Sotho-Tswana people.

Case studies on chemical and mineral characterisation

Al-Khidr, Failaka Island (Kuwait)

One project that looks at the characterisation of elements is by Stremtan et al. (2012). They conducted pXRF analyses on ceramics from a site known as Al-Khidr in Failaka Island, Kuwait. The site was excavated in 2004–2009. The aim of the project was to fingerprint production centres, raw material sources of Dilmun ceramic style, as well as trade and exchange routes that existed between Mesopotamia and the Indus Valley during the Bronze Age (Stremtan et al. 2012).

It is believed that the Al-Khidr served as a port in the Persian Gulf ca. mid-second millennium BC. Al-Khidr ceramics have been classified as the Barbar type of the Dilmun phase, but the site itself dates to the Kuwait-Slovak phase of the Bronze Age, and Slovak comes after Dilmun in the Bronze Age. For this reason this is an interesting study site, as it has the potential to answer questions of trade and exchange.

For this project, only eight sherds were chosen. Stremtan et al. deployed pXRF to ascertain homogeneity of the ceramic fabric by using non-destructive tools, and also to characterise the elements. Characterisation of elements helps to determine the source. The Barbar type vessels are hand-made and their colours are homogenous and well fired. Stremtan et al. also chose to deploy Inductively Coupled Plasma Mass-Spectrometry (ICP-MS) to understand the chemical composition of the fabrics and to compare the results to those yielded by the pXRF study. They also applied petrography to characterise and understand the crystal matrix that composes the fabric of the ceramics. Lastly they used XRD so that they could understand the mineralogy of the ceramic fabrics of the study site. XRD and petrographic analysis and ICP-MS were the only methods that were destructive.

The results yielded by these four techniques showed that only seven of the eight sherds had a fabric that is homogenous. Furthermore the results showed that the ceramics of Al-Khidr can be clustered into two groups, one group with obsidian and the other without. Trace elements such as barium (Ba), strontium (Sr), yttrium (Y), rubidium (Rb), niobium (Nb) and zirconium (Zr) proved that seven ceramics have obsidian and gehlenite, a calcium-rich mineral formed when temperatures exceed 850°C during firing (Stremtan et al. 2012). All this was achievable through the use of pXRF, and the ICPS-MS. ICPS-MS supported the results yielded by the pXRF, and petrography. It showed obsidian within the minerals of the analysed ceramic.

Rock-art at Maqonqo Shelter, KwaZulu-Natal

Another project that looked at the characterisation of elements, is by Escott (2011). His project was not on ceramics but the aim was similar to my project in terms of characterisation of elements, hence why I chose to include it as part of the literature review.

Maqonqo Shelter in the Biggarsberg has a deep Later Stone Age sequence that dates back to nearly 8000 BP and many paintings on the rock shelter wall (Mazel 1996). Escott's (2011) project focused on the rock-art. He also looked at some of the rock-art sites near Maqonqo for comparative purposes (Escott 2011). His main interest was to characterise San rock-art paint geologically, and to determine if any changes in the excavated pigmenteceous material occurred with increasing depth (that is, through time) (Escott 2011: 4).

Escott collected more than 70 painted samples and more than ten blanks (plain rocks with no painting). He also collected 125 archaeological 'ochre' samples of different sizes. All these samples were analysed using EDX, synchrotron micro XRF (μ-XRF) and synchrotron micro XRD (μ-XRD) to ascertain the chemical and mineralogical composition of the pigments. The results were as follows: all Maqonqo paint samples, with colours ranging across red, orange, yellow, black, white, and pink, plus the blank samples, had a high calcium (Ca) content. The calcium comes from gypsum minerals and, for the painted samples, Ca oxalates such as whewellite and weddellite. The Ca oxalates probably formed from paint ingredients (Escott 2011).

The red paint samples at Maqonqo Shelter consisted mainly of whewellite, gypsum, quartz, and haematite. In addition, the red paint samples were thinner relative to paint samples of other colours. Because of its mineral composition and the thinness of its painted layer, red pigment resists erosion, which is why it generally outlasts other paint colours (Escott 2011). The red and yellow paints were probably sourced from iron (Fe) nodules found locally. Both had a combination of goethite and haematite minerals, while the aluminium (Al) content was low, and the titanium (Ti) content high (Escott 2011).

The white pigments consisted of gypsum, anhydrite, basanite, and whewellite. Gypsum was the dominant mineral in the white pigments, making the white paint highly susceptible to erosion (Escott 2011), because a key feature of gypsum is that it is soluble in water. Pigments containing gypsum, when exposed to water, will erode quicker than any other pigments, and eventually the pigment with gypsum will completely fade away.

Orange pigments commonly had a high Al content and gibbsite, a component of bauxite. Some of this pigment probably came from local dolerite outcrops around the site. The pink paint seems to be a combination of red and white paint. The black paints had high iron (Fe) and manganese (Mn) content compared to the other paints and low aluminium (Al). This suggests that the softer inner core of iron (Fe) nodules and a very dark rock (e.g., dolerite with dark minerals such as pyroxene, or olivine) were combined via calcination processes to yield a black colour. A calcination process involves thermal treatment of a solid chemical compound (carbonate ores), where the compound is raised to a high temperature without melting under oxidation, to remove impurities or volatile substances.

Southern Sweden

Another interesting study that drew my attention is by Papakosta et al. (2020) and it is both on provenance and characterisation of elements within ceramics. Papakosta et al. (2020) conducted analysis on Late Mesolithic Ertebølle ceramics from three sites in Scania, southern Sweden. The study sites are Soldattorpet, excavated in 1901 and 1902, Kesemölla and Vik. They selected 20 ceramics from Soldattorpet (12 from the 1901 excavation and 8 from the 1902 excavation), 6 ceramics from Kesemölla and 1 from Vik. In total 27 Ertebølle ceramics were chosen. They used Fourier-transform infrared spectroscopy (FTIR), XRD, and pXRF. According to Papakosta et al. (2020: 678) their original aim was to elucidate the origins of some unusual ranges of organic aromatic compounds identified in the material during the previously undertaken lipid residue analyses. They further extended their aims to add and update research on the clays used in the Scanian Ertebølle ceramics in order to provide a comprehensive understanding on the ceramic phases of the Scania Ertebølle. The 27 ceramics are the same samples used for the analysis of lipid residue characterisation from the previous project. The Ertebølle ceramics are separated into two categories, pointed-base vessels used for cooking and oval bowls used as lamps. These ceramics are known to be the oldest in the ceramic phases of Scania Ertebølle cultural units.

The results revealed that most of the ceramics analysed were made from kaolinite clay minerals and had coarse clay fabrics. The most common temper found in the coarse fabric was granite. Finer clay was used for some of the oval ceremonial bowls (Papakosta et al 2020: 683). The results yielded by the XRD and FTIR results showed that the ceramics had similar mineralogy across all sites. These minerals are albite (plagioclase feldspar) and microcline (K-feldspar).

Although the mineralogy of the ceramics was similar across the sites, there was a clear separation of Ertebølle ceramics between the sites Kesemölla and Soldattorpet. The ceramics found at Kesemölla have relatively high concentration of aluminium (Al), manganese (Mn), calcium (Ca), zinc (Zn), and lead (Pb) and relatively low content of iron (Fe), poatassium (K), strontium (Sr) and silicon (Si), whereas it is vis-à-vis for the ceramics found at Soldattorpet, hence the separation (Papakosta et al. 2020:.688). Papakosta et al. (2020: 690) suggest that these ceramics belonged to different groups occupying the sites and that each pottery maker produced the ceramics onsite to meet their own needs. Another interesting observation was on ceramics excavated in 1901 and 1902 from Soldattorpet; the results indicated two different chemical signatures within the clay sources suggesting that different local clays were used for ceramic production (Papakosta et al. 2020: 690).

Remarks on the case studies

From these archaeometric case studies, it is evident that archaeological analytical techniques provide empirical data that are useful in archaeological interpretation. It is for this reason that I also want to deploy an archaeometric methodology for the ceramic assemblage at Mgoduyanuka. It is worth noting that, to my knowledge, there are no archaeometric studies on Late Iron Age ceramics in KwaZulu-Natal. Studies have instead focused on Early Iron Age sites (e.g., Boulle & Peisach 1977; Peisach et al. 1982; Punyandeera et al. 1997).

CLOSING REMARKS

These case studies are evidence of the value of provenance study, that this approach has the abilty to show patterns of migration, answer questions on trade and originality of items. Some show how past communities interacted and moved across the landscape. Only one case study by Jacobson (et al. 1991) showed how the Late Iron Age communities of Soutpansberg, Limpopo, interacted through marriage alliances. The rest of the case studies, especially those focusing on Late Iron Age sites (e.g., Rosenstein 2008; Wilmsen et al. 2009; Diskin & Ashley 2016), overlooked the notion of marriage alliance as the driving force for cultural interactions. As already mentioned, this approach has not been largely employed by Iron Age researchers in the KwaZulu-Natal province especially for the Late Iron Age. My project will be one of the first to employ this kind of approach on Late Iron Age ceramics of KwaZulu-Natal, and will also be the first to emphasise that marriage alliance is one of the reasons why we get variations of pots in one site. The Mgoduyanuka site is used as an example to offer a test of the hypothesis.

4
Mgoduyanuka

INTRODUCTION

Mgoduyanuka, meaning ‘the hole that smells’, is situated around a hill on Kiaora (Kia-Ora) farm, S28 43 00 E29 23 40, overlooking the Thukela River near Bergville (Maggs 1982a: 84) (Figs 4.1 & 4.2). Excavations at the site took place in 1975, conducted by Tim Maggs. The site is a stone-built settlement (Maggs 1984) dated to 180±45 BP (Pta-1699) (Maggs 1982a: 87; Maggs 1984), which calibrates on the southern hemisphere curve (Hogg et al. 2020) with Calib rev. 8.2 (Stuiver & Reimer 1993) to AD 1669–1950 (2σ; median probability AD 1805).

As already mentioned, Mgoduyanuka is a Late Iron Age site in Bergville, KwaZulu-Natal province. It is important to describe the environmental background of the Bergville area, before I turn to details of the site. An understanding of the geology is essential for interpreting the results of the XRF and XRD analyses. Geology plays a key role in the origin of soils (e.g., through weathering, stresses and strains that the land experiences over long periods), in combination with climate and vegetation. This section therefore focuses on the regional geology, vegetation and climate.

ENVIRONMENTAL BACKGROUND

The geology

The geological basement of KwaZulu-Natal consists mainly of the Archaean Kaapvaal Craton crustal block, formed when the earth’s basaltic crust was intruded by granite ca. 3500 million years ago. It is the oldest Archaean crystalline massif on Earth (Sudan 1999: 14). Other Archaean rocks forming the foundation are ‘old granite’ and gneiss rocks (Uken et al. 1999, Van der Eyk et al. 1968), categorised as the Natal Metamorphic Suite (Uken et al. 1999) (Fig. 4.3).

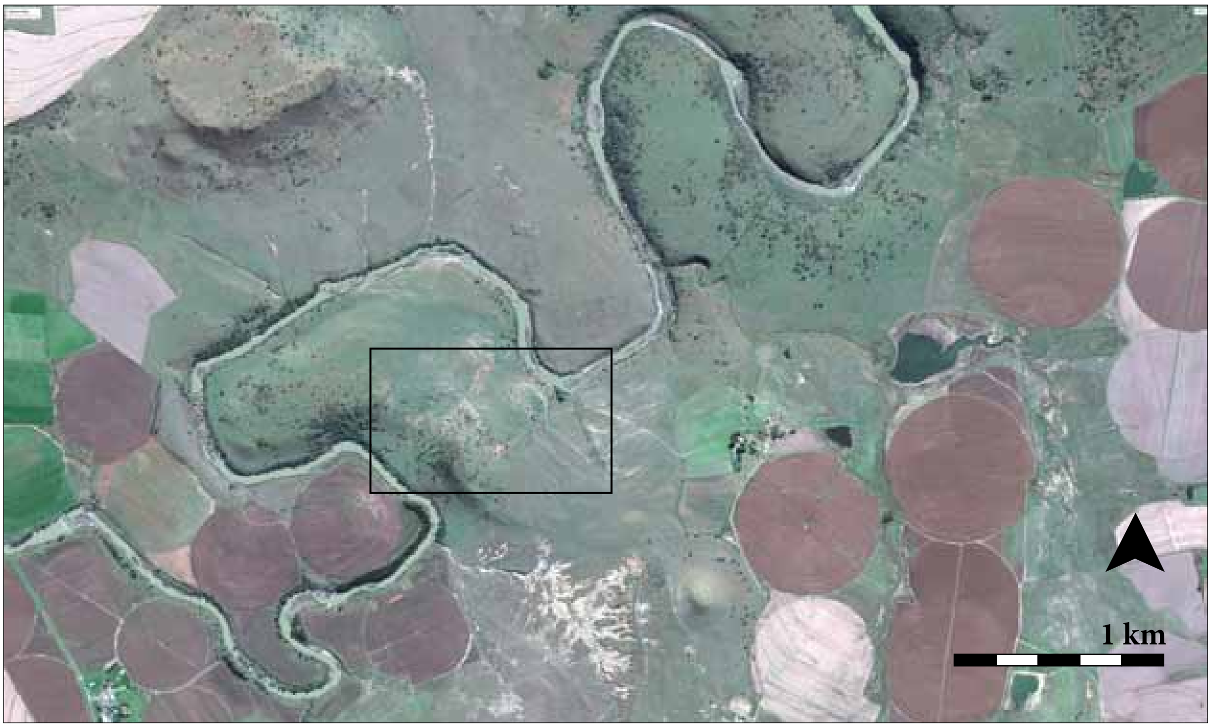

Figure 4.1: Google Earth image (1 May 2010) of Mgoduyanuka district, near Bergville, KwaZulu-Natal. The box marks Fig. 4.2.

The Archaean Kaapvaal Craton in KwaZulu-Natal comprises the Pongola Supergroup (Sudan 1999, Uken et al. 1999), the Nsuze group and the Mozaan group. They are exposed between Vryheid and Melmoth (Uken et al. 1999). They are overlain by the Natal Group (Table Mountain

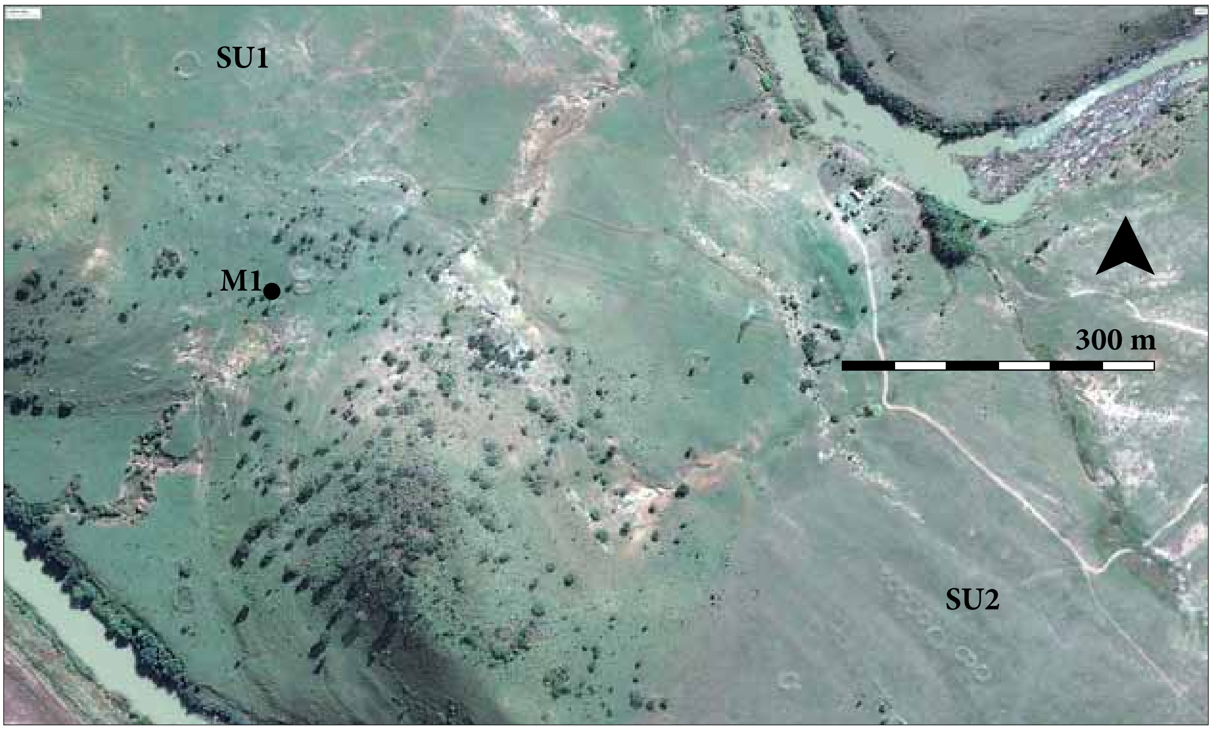

Figure 4.2: Google Earth image (1 May 2010) of Mgoduyanuka, showing key features. SU1 = Settlement Unit 1; SU2 = Settlement Unit 2; M1 = Midden 1.

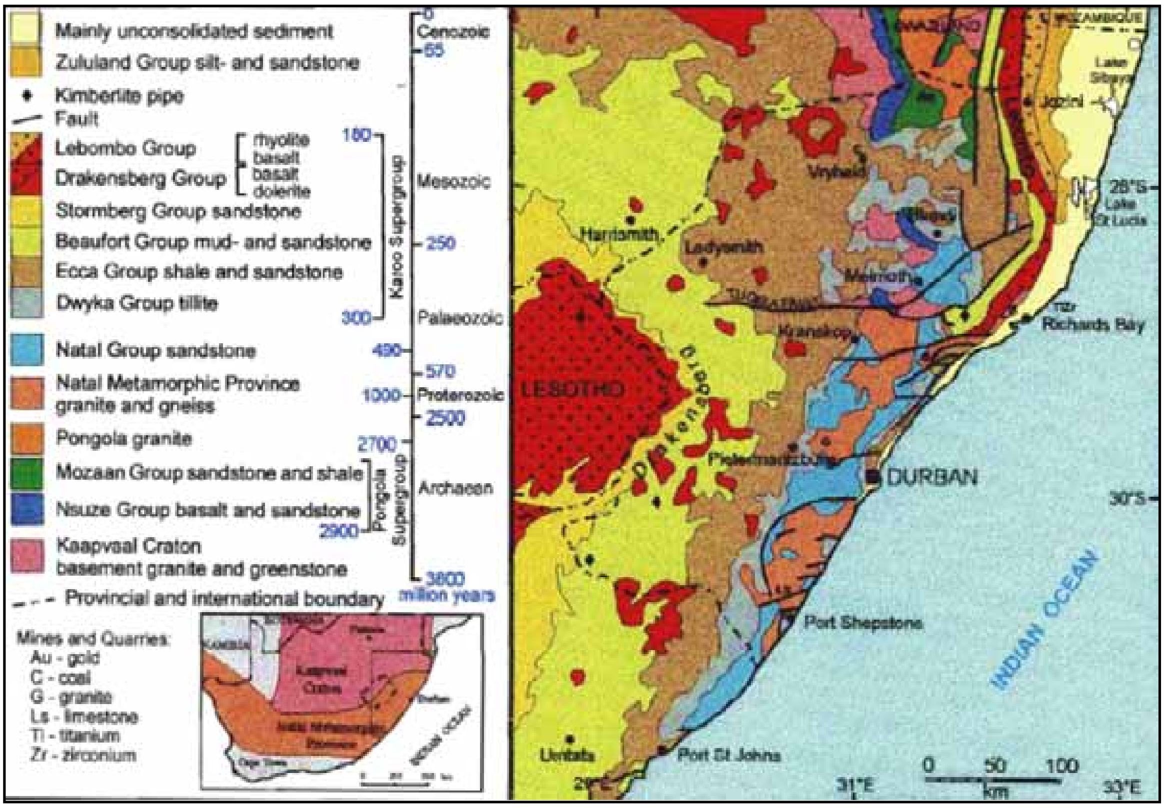

Figure 4.3: The geology of KwaZulu-Natal map (Sudan 1999: 15 Fig III.1).

Group series) formed during the late Silurian and early Devonian periods. In KwaZulu-Natal, this group is characterised by sandstone, which is pinkish in colour due to a high concentration of alkali-feldspar (K-feldspar) (Van der Eyk et al. 1969). The Natal Group is exposed in the Kranskop and Nkandla areas (Van der Eyk et al. 1969), the Valley of a Thousand Hills between Durban and Pietermaritzburg, and Oribi Gorge (Uken et al. 1999).

The Karoo Supergroup covering half of South Africa lies above the Natal Group. In KwaZulu-Natal, the Karoo Supergroup, formed during the late Carboniferous period and late Triassic, consists of the Dwyka Tillite Group, the Ecca Group, the Beaufort, and the Stormberg Group/ Series, which formed during the late Triassic period.

Additionally, at around 180 million years ago, lava erupted to form the Drakensberg and Lebombo Groups in Lesotho. Due to the fissure vent, there was an uplift of basalt magma that crystallised within the fractures, forming the dolerite dykes and sills (Van der Eyk et al. 1969). The Cretaceous period (145–65 million years ago), which famously ended with the extinction of dinosaurs and ammonites, saw the opening up of the Indian Ocean and the deposition of silts and sandstone of the Zululand Group. The most recent sand (of the Quaternary period) makes up the youngest sediments in the KwaZulu-Natal geological sequence (Uken et al. 1999).

Geology of Bergville

The geology of Bergville is relatively simple. It consists of the Beaufort Group and dolerite dykes and sills (Fig. 4.4). The sedimentary rocks of the Beaufort Group are divided into two subgroups, the Adelaide and Tarkastad Subgroups (Council of Geoscience 1998; Uken et al. 1999). The Adelaide Subgroup dominates the Bergville and Mgoduyanuka area (Fig. 4.4). Adelaide forms part of the Beaufort Series (Wilson et al. 2014; Paiva 2015) and was deposited in the middle to upper Permian era. The Adelaide subgroup is the lowermost subgroup of the series and consists of six formations situated in the eastern and western sides of the Karoo Basin. In the west, these are the Abrahamskraal and Teekloof formations (Wilson et al. 2014: 327). In the east, the formations are Middleton, Balfour, Normandien (equivalent to the Estcourt formation), and Emakwezini.

The Normandien formation is dominant in the Free State province, and extends east to the Mgoduyanuka area. The Normandien formation is made up of more than 60% mudstones. It is 400–600 m thick and is a fluvial-deltaic deposit (Johnson & Verster 1994: 2). The colour ranges from greenish-grey to blueish-grey and sometimes turns greyish-red and reddish-brown. The red-brown colours result from dry periods and the greenish-grey and other grey colours from deposition in wet periods (Escott 2011; Wilson et al. 2014).

Also prominent in the Bergville area are dolerite sills and dykes that formed 180 million years ago (see Fig. 4.3). Dolerite is an igneous rock. There are two types of igneous rocks, namely, intrusive/plutonic rocks and extrusive igneous rocks. Both are formed during magma processes. Igneous rocks are further characterised by their silica content. Those rocks with a high silica content are geologically felsic, with more than 60% of felsic minerals that are quartz, orthoclase and plagioclase feldspars. The felsic minerals are rich in silicon (Si), aluminium (Al), sodium (Na) and potassium (K). Igneous rocks with low to very low silica content (less than 60% silica minerals) are termed mafic (basic) or ultramafic (very basic). The mafic to ultramafic minerals are rich in magnesium (Mg), iron (Fe) and calcium (Ca) (Deer et al. 1992). There are also igneous rocks with average silica content, classified as intermediate (Deer et al. 1992).

Intrusive igneous rocks are formed of minerals that crystallized or cooled slowly during the eruption of magmas and are usually formed when the magma remains inside the earth's crust and therefore crystallises within pre-existing rocks. Most of them are felsic because they have

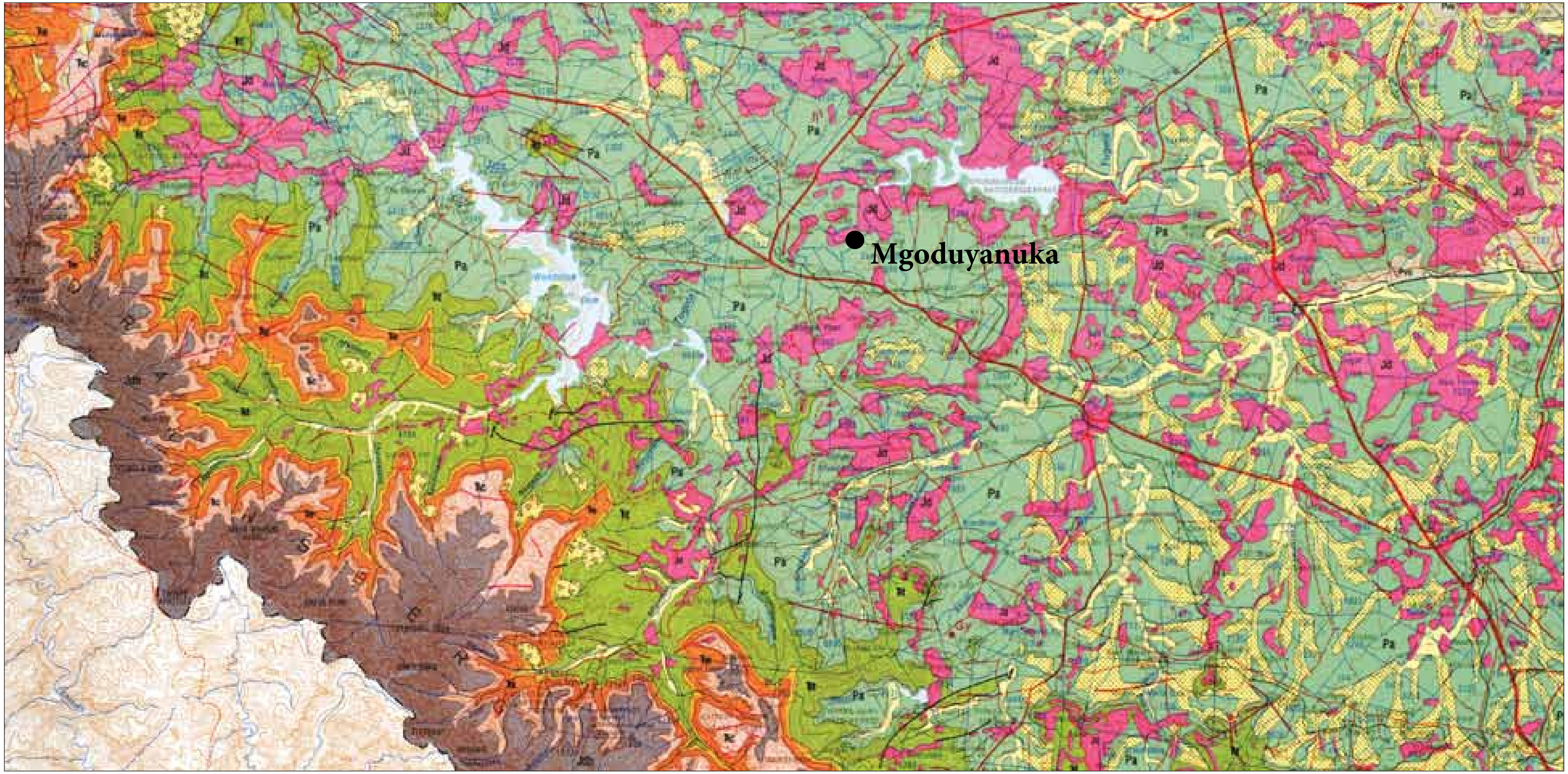

Figure 4.4: Part of the geological map Harrismith 1:250 000. Mgoduyanuka is marked with a black circle. Green (Pa) indicates Adelaide Subgroup. Lime green (TRt) indicates Tarkastad Subgroup. Magenta (Jd) indicates dolerite.

high silica content from quartz and feldspar minerals; these two minerals usually make up 60–90% of the rock. Extrusive igneous rocks are composed of minerals that have high magnesium and iron content. Extrusive igneous rocks form because of magma lava erupting outside the rock chambers onto the surface, and the minerals rapidly crystallise when exposed to cool temperatures in the atmosphere.

Dolerite is an intrusive but mafic igneous rock because it has high concentrations of magnesium (Mg) or manganese (Mn), or iron (Fe) elements (Sloane 1991; Deer et al. 1992). It is composed mainly of three mineral groups, namely, plagioclase feldspar (calcium aluminium silicate), pyroxene (silicates of calcium, magnesium and iron) and olivine (magnesium iron silicate, which gives dolerite its dark colour) and each of which could make up 60% or 80% of the rock. The rest are trace minerals such as chlorite, quartz, and orthoclase feldspar (Sloane 1991: 1; Deer et al. 1992).

Climate

Bergville and therefore Mgoduyanuka are situated in the Thukela Interior Basin. The climate of the Interior Basin is warmer and drier than the Thukela Highlands. In addition, because the Interior Basin has a relatively even topography compared to the Thukela Highlands regions and Thukela coastal regions, the temperature extremes are less vast. According to records from Bergville in the last 30 years, December and January are the warmest months with mean daily maximums of 28°C and minimums of 16°C (December) and 17°C (January). Temperatures can drop to 10–12°C at night and reach 35°C in daytime. July is the coolest month with a mean daily maximum of 19°C and minimum of 2°C. Temperatures can drop to −5°C at night and reach 25°C in daytime (https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/bergville_south-africa_1019933).

Rainfall contributes most of the precipitation that Bergville gets throughout the year. The rainy season lasts for about 9 months and the dry season for 2–3 months. In the drier months, there is snow, but very little, <1 mm, and it does not last long. The average annual rainfall in the last 30 years is 727 mm. May to July is the driest period with 10 mm or less precipitation per month. November to January have the most rainfall with more than 100 mm per month (https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/bergville_south-africa_1019933).

Soils

Soils are products of parent rocks that form during the process of weathering and natural erosion (Van der Eyk et al. 1969). As soils form through the above-mentioned processes, they also carry chemical elements (Havlin et al. 2017). Therefore, an understanding of soils and the geological landscape of the area is important, because it will aid in the interpretation of my XRF and XRD results.

Soils are formed through parent rocks in three ways. They can be formed through colluvial processes (material transported downslope by water-wash or gravity), alluvial processes (material deposited alongside watercourses) and aeolian processes (material accumulated by air movements) (Van der Eyk et al. 1969: 15; Yassoglou et al. 2017: 53). Although soils are a product of the geological substrate, these three processes mean that they usually form from multiple sources. Van der Eyk et al. (1969: 101) say that

> A second important result of landscape forming processes is the provision of mixed parent materials. It is doubtful whether any soil in the Interior Basins (or elsewhere, for that matter) has developed from a pure residuum of weathering of the underlying rock. Naturally, the degree of mixing is variable, and some soils are derived predominantly from dolerite, or shale, or from sandstone. Few soils are purely residual from underlying rock, however, and many parent materials are thorough mixtures of the local rock types.

Van der Eyk et al. (1969) produced the most important baseline source on soils of the Thukela Basin. They created a detailed 1:250 000 soils map of the basin. Several soil types in the Mgoduyanuka area would have been available to potters. Based on the information Fowler (2008: 487, 2011: 181, 2015: 91) recorded in his study of modern potters working in the lower Thukela, Msinga and Phongolo districts, I focus on the soils within a 6 km radius of Mgoduyanuka. This radius covers a maximum distance that modern potters travelled to collect clay (Fig. 4.5).

The 6 km radius includes eight possible soil forms on Van der Eyk et al.'s soils map (Fig. 4.5). The eight forms are Estcourt, Avalon, Shortlands, Hutton, Rensburg, Willowbrook, Katspruit and Dundee (Table 4.1). In addition, most of the area within the 6 km radius is Van der Eyk et al.'s M category, which consists of "stony land, steep land, and land with very shallow soils"

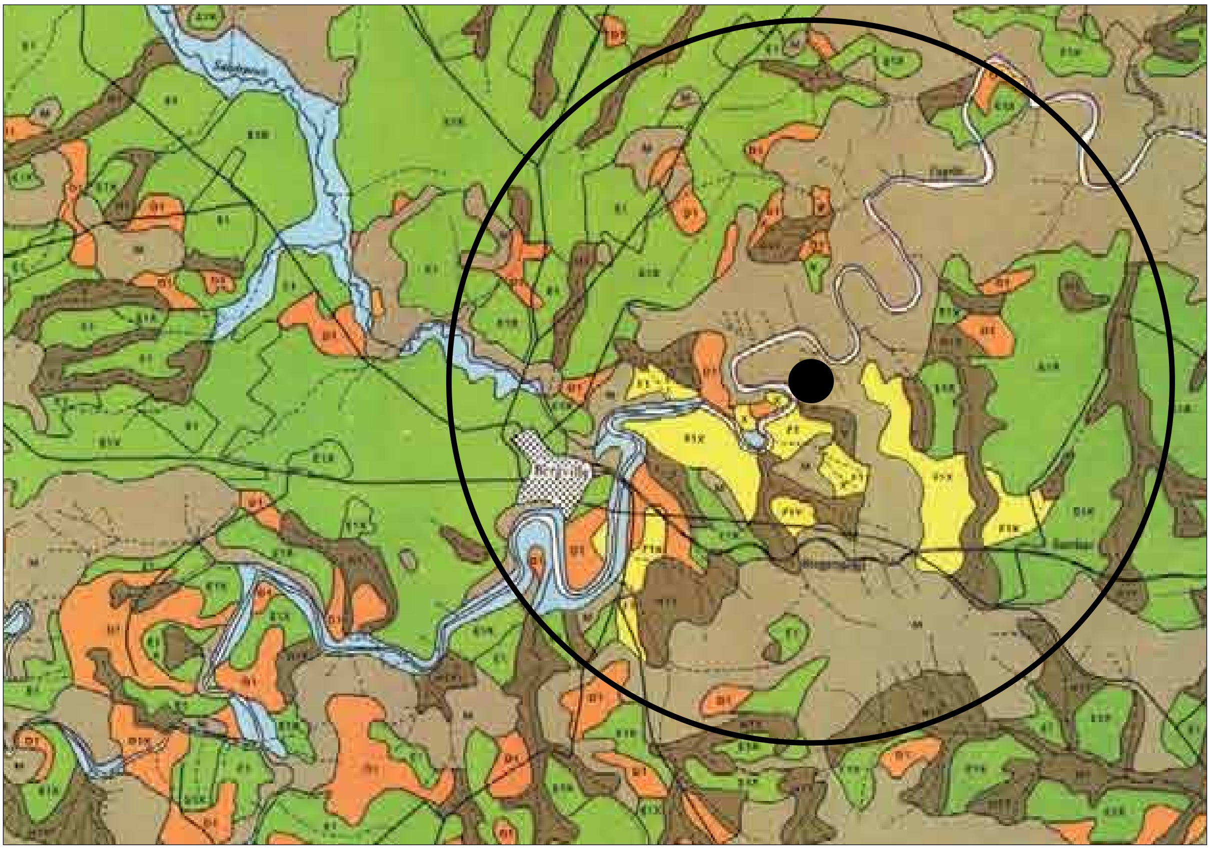

Figure 4.5: Soil map of Mgoduyanuka district (from Van der Eyk et al. 1969). Mgoduyanuka indicated with black dot. Ring around the site indicates a radius of c. 6 km. See Table 1 for soil codes; X indicates sheet erosion; Y indicates donga erosion.

(Van der Eyk et al. 1969: soils map, sheet 8; Fig. 4.5). These lands might have been covered with Shortlands (dolerite substrate) or Estcourt (Beaufort Group substrate) form soils before the Iron Age occupation at Mgoduyanuka.

These soil forms incorporate one or more soil series. The Estcourt form, for example, includes Estcourt and Uitvlugt series soils, but the Uitvlugt series is more typical north of the Thukela River. The Avalon form includes Avalon and Bergville series soils. Avalon series soils occur in drier conditions and Bergville series in wetter conditions. Both soil series were possibly accessible to Mgoduyanuka potters.

Recent studies (e.g., Fey 2010) have re-categorised South African soil types. According to Fey (2010), there are 73 types of soil in South Africa, and these types can be grouped into 14 groups (Fey 2010). Out of the 14 groups, ten are found in KwaZulu-Natal, namely, humic, vertic, melanic, calcic, duplex, plinthic, oxidic, gleyic, cumulic, and lithic (Fey 2010: 35). In Bergville (including the Mgoduyanuka study area), seven of the ten groups of soil cover the landscape. Furthermore, Fey (2010) has matched the soil forms by Van der Eyk et al. (1969) with his new

Table 4.1

From *Soils of the Tugela Basin: A Study in Subtropical Africa* by J.J. van der Eyk, C.N. Macvicar and J.M. de Villiers, Natal Town and Regional Planning Reports, vol. 15. Pietermaritzburg: Town and Regional Planning Commission, Natal, 1969.
* = six soil form/series found at Mgoduyanuka.

Soil Code	**General Type / Texture**	**Soil Form (Van der Eyk et al. 1969)**	**Soil Series (Van der Eyk et al. 1969)**	**Soil Group (Fey 2010)**	**Geological base / Landscape**
M, pale brown	Stony land, steep land, land with very shallow soil		from Shortlands (dolerite), Estcourt, Avalon (Beaufort)		Dolerite / shales and sandstone of Beaufort
F1, yellow	Duplex soils / Loamy	Estcourt	*Estcourt	Duplex	Shales, fine sandstones / slopes (dry facies)
			Uitvlugt		
E1, green	Yellow, apedal, overlying a plinthic horizon / Clayey and loamy	Avalon	*Avalon (dry subregion)	Plinthic	Shales, fine sandstones / gentle slopes (mainly moist facies)
			*Bergville (moist subregion)		
H1, brown	Margalitic and non-margalitic gley soils / Clayey and loamy	Rensburg	*Rensburg	Vertic	Shales, fine sandstones, dolerite / stream courses
		Willowbrook	Willowbrook	Melanic	
		Katspruit	Killarney	Gleyic	
L1, sky blue	Clayey, loamy and sandy soils of alluvial lands	Dundee		Cumulic	Alluvium along Thukela R.
D1, orange	Red, apedal (unstructured) and structured soils, non-calcareous / Clayey and loamy	Hutton	Msinga	Oxidic	Colluvium / alluvium
			*Doveton (rare in dry subregion of interior basin)		Shales, fine sandstones, dolerite, Tugela schist / slopes
		Shortlands	*Shortlands	Oxidic	Dolerite

groups (see Table 4.1). The seven soil groups found in Mgoduyanuka and its surroundings are plinthic, vertic, duplex, gleyic, melanic, cumulic and oxidic.

Plinthic soils are iron rich, classified as either soft plinthic or hard plinthic depending on their mottling and cementation process during the formation of plinthine (le Roux & du Preez 2006; Fey 2010). Vertic and melanic soils are formed during semi-arid to sub-humid climate (Fey 2010).Vertic soils are known as swelling soils because they are rich in smectite minerals (Fey 2010; Dlamini 2015) and also have lower infiltration rate than melanic (Fey 2010: 47). Melanic soils are dark, and have structured clays (Fey 2010: 45). Gleyic and duplex soils are soils with special subsoil characteristics relating to pedogenic processes; they have a layer of orthic topsoil (Fey 2010).

Oxidic soils are red or yellow-brown apedal soils (Van der Eyk 1965; Van der Eyk et al. 1969; Fey 2010) and are iron rich but not to the extent of plinthic soils. Furthermore, the oxidic soils are said to have residual iron enrichment, whereas plinthic soils have absolute iron enrichment (Fey 2010: 33). Cumulic and lithic soils are young soils with an orthic topsoil but a weakly developed subsoil (Fey 2010: 33). Based on Fey's (2010) classification and description, the M group on Van der Eyk et al.'s map (Fig. 4.5) could possibly be equivalent to lithic soils. Although his classification is more recent, Fey (2010) lacks the detailed information of Van der Eyk et al.'s (1969) larger scale mapping for the Thukela Basin, so I rely on Van der Eyk et al., but draw on information from both sources.

Although the clay sources cover an area of 6 km radius, it is unlikely that the potters of Mgoduyanuka collected clay across the Thukela River. Rivers often served as chiefdom or community boundaries. Therefore, their clay sources would be along the riverbanks and in the southern parts of the area or areas with hydraulic confinement, such as wetlands (Fey 2010: 14). From Van der Eyk et al.'s (1969) map (Fig. 4.5), it is highly possible that the potters of Mgoduyanuka collected most of their clay from the H1 category. These are gley soils of the Rensburg, Willowbrook and Katspruit forms, or, in Fey's (2010) classification, vertic, melanic and gleyic soils (Table 4.1). These soil types contain a high percentage (>50%) of clay. They can form in stream courses from both dolerite and from shales and fine sandstones of the Beaufort Group. If necessary, potters could have mixed these clays with material from other soil forms.

Vegetation

Broadly speaking, the vegetation of KwaZulu-Natal can be divided into three regions: a coastal/ lowlands region, a midlands/interior basin, and the highland region (Edwards 1967; Van der Eyk et al. 1969). According to Pentz (1945), cited in Van der Eyk et al. (1969), the coastal/ lowlands were covered with coastal evergreen bush and the interior/midlands had tall grass veld vegetation and temperate forests. The highlands/grasslands were covered with grass and were less arable.

Recently KwaZulu-Natal vegetation has been classified into four biomes, namely, the Indian Ocean Coastal Belt (CB); the Sub-Escarpment Grassland Bioregions (Gs); the Sub-Escarpment Savanna Bioregions (SVs) and lastly the forests (Mucina & Rutherford 2006: 33, 44–45). Mucina and Rutherford (2006) have divided the grassland vegetation of KwaZulu-Natal into twelve (12) categories from Gs 1–12, starting from northern Zululand all the way to southern KwaZulu-Natal (Mucina & Rutherford 2006: 417–425). The savanna vegetation of KwaZulu-Natal is further sub-divided into seven categories from SVs 1–7 (from Thukela valley bushveld to Bhisho thornveld) (Mucina & Rutherford 2006: 508–513).

Vegetation of the Thukela Basin including the Interior Thukela Basin

According to Edwards (1967 map; Fig. 4.6), there are 24 vegetation zones in the entire Thukela Basin. The Interior Thukela Basin vegetation includes eight of the 24, namely, *Acacia sieberiana* tree veld, interior *Acacia karroo-Acacia nilotica* thorn veld, *Acacia caffra* scrub and tree veld, *Diospyros lycioides* scrub, *Themeda-Hyparrhenia* grassland and *Tristachya-*

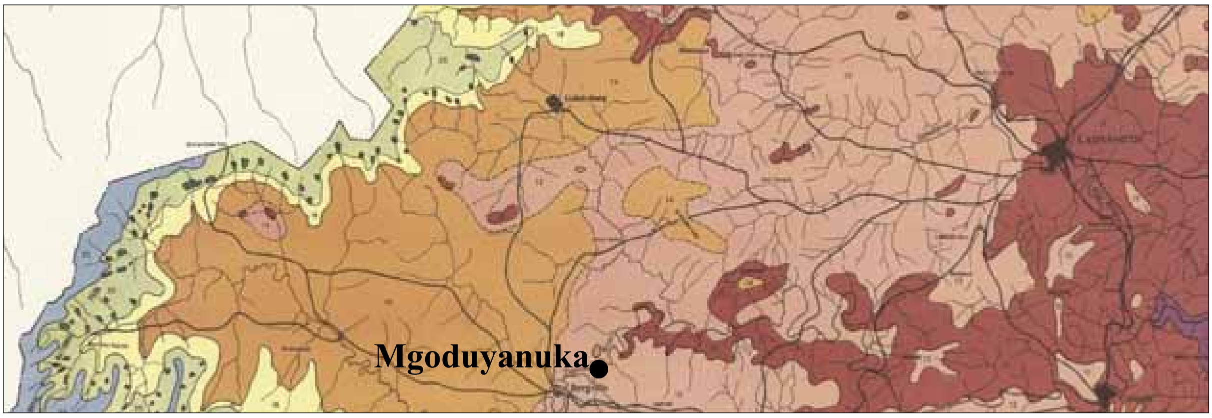

Figure 4.6: Part of vegetation map of the Thukela Basin (from Edwards 1967). From left, blue (23) = subalpine fynbos and grassland; pale green (20) = *Protea* savanna; pale yellow (18) = *Themeda-Trachypogon* highlands grassland; orange (14) = moist transitional *Themeda-Hyparrhenia* grassland; dusky pink (13) = *Themeda-Hyparrhenia* grassland; red ochre (12) = interior *Acacia karroo-Acacia nilotica* thornveld; purple (9) = semi-deciduous bush.

Figure 4.7: Vegetation at Mgoduyanuka showing *Acacia sieberiana* and *Themeda* and *Hyparrhenia* grass. (Photos: Dimakatso Tlhoaele, May 2022).

Digitaria grassland (Edwards 1967; Fig. 20). *Themeda-Hyparrhenia* grassland is the most extensive vegetation of the Thukela Basin; it covers 32% of the catchment area (Edwards 1967: 145).

Mgoduyanuka is in the interior basin of the Thukela and it is covered by *Themeda-Hyparrhenia* Grassland (Fig. 4.6). Recent studies by Mucina and Rutherford have classified the *Themeda-Hyparrhenia* Grassland as *Natal Highland Thornveld* (Gs 6) (Mucina & Rutherford 2006: 420). *Themeda triandra* and *Hyparrhenia hirta* co-dominate the landscape of Mgoduyanuka. *Themeda triandra* is a 'sweet' (nutritious) red grass, which grows up to about a metre in height. *Hyparrhenia hirta* is a taller grass that grows to 1.5 m in height (Edwards 1967 :146) (see Fig. 4.7). It is 'sourer' than *Themeda* and is most nutritious in spring, but it is a very good thatching grass. *Acacia sieberiana*, the paperbark acacia, is a common tree in the *Themeda-Hyparrhenia* Grassland. Its pods provide fodder for livestock in the dry season.

THE EXCAVATION AT MGODUYANUKA

Excavations at the site were conducted by Tim Maggs and his team in November and December 1975. The excavated material is stored in the KwaZulu-Natal Museum, accessioned as 1976/001, and linked to site record 2829CB006. Additionally, there is a published report by Maggs (1982a) about the site from which most of the baseline contextual information is extracted for this study.

Mgoduyanuka 'district'

Mgoduyanuka is one of many sites included in a mapping project that studied the distribution of stone walled settlements in the upper Thukela basin (Maggs et al. 1986; Maggs 1988). In the wider Mgoduyanuka district, the majority of the homesteads cluster into four neighbourhoods, with only a few isolated examples (Maggs et al. 1986: 466) (Fig. 4.8). The homesteads are built around the bases of hills (Maggs 1982a; Maggs et al. 1986). Maggs (1988) argues that there was a strict convention relating to settlement layout in Late Iron Age grassland communities in KwaZulu-Natal. Maggs et al. (1986) use the archaeology of the Mgoduyanuka area to show that anthropological perceptions concerning clustered (Sotho-Tswana) versus dispersed (Nguni) settlements by Sansom (1974) are incorrect, or at least not entirely correct. Sansom (1974) had argued that the clustering and dispersal of homesteads is based on access to agricultural resources. However, evidence in the Mgoduyanuka area, where there has been more than

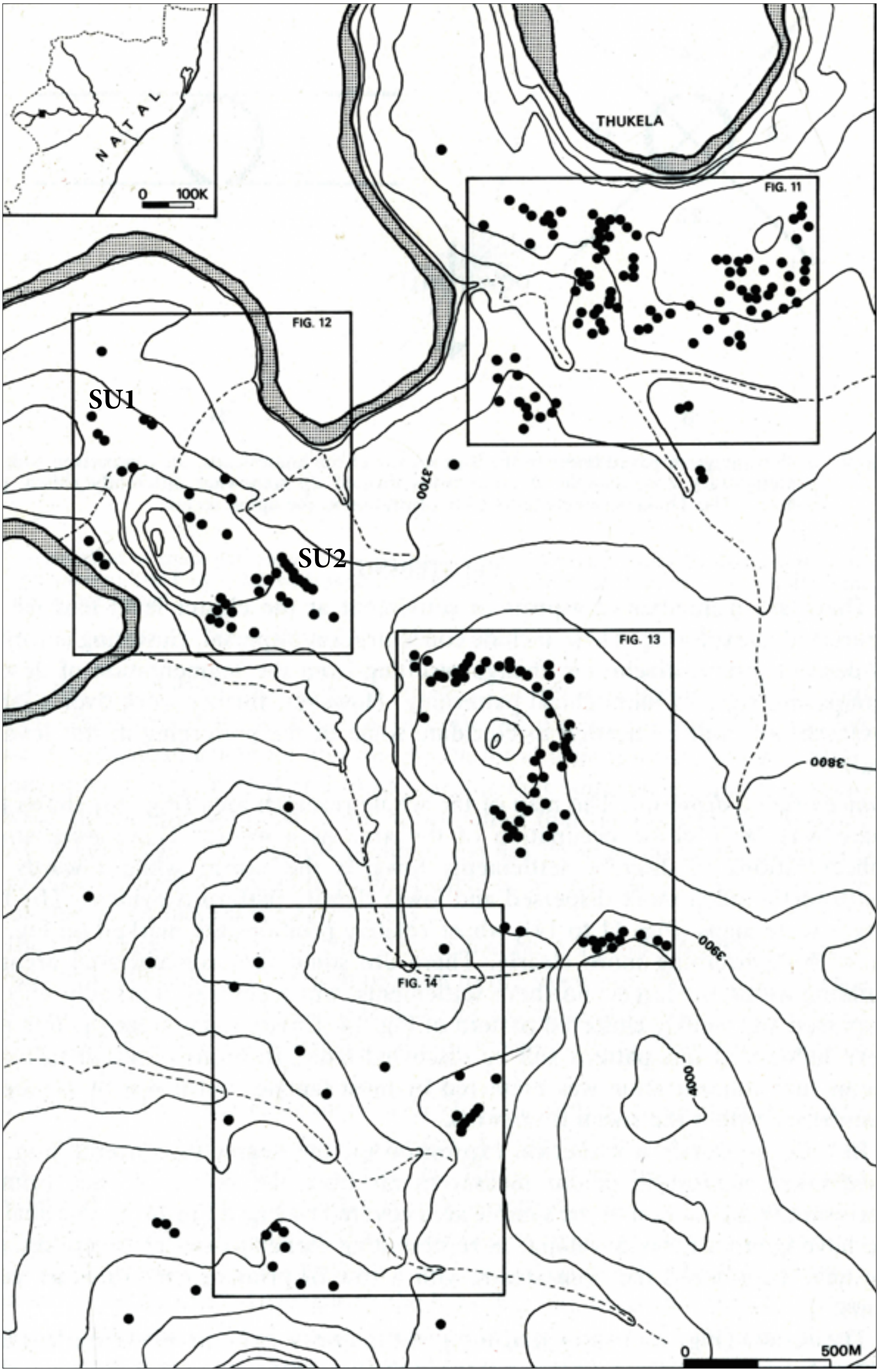

Figure 4.8: Four homestead neighbourhoods in the Mgoduyanuka district, with SU1 and SU2 in the upper left block. From Maggs et al. (1986: 466).

one episode of stone wall robbing, with at least three to four phases of rebuilding, makes interpretations of clustering vs dispersal difficult to sustain (Maggs et al. 1986: 470). What is clear is that all concentrated settlements have gone through more than one occupational phase (Maggs 1982a; Maggs et al. 1986: 470).

The inhabitants of Mgoduyanuka systematically built and positioned their cattle-pens and huts with the stock-pen entrances facing uphill, with the huts and related smaller structures forming a loose ring around the cattle-pens. The cattle-pens were arranged linearly along the slope contour in cases where a settlement had more than one cattle-pen. There is no evidence of an outer wall, or fencing that enclosed the homestead (Maggs 1988: 431). Each hut has a granary foundation behind it, and it seems like the floors of some huts were paved with stone. The paving of the floors is said to prevent moisture reaching the earth floor (Maggs et al. 1896: 457). This settlement pattern is supported by the rock-engravings found near sites in surrounding areas, depicting the settlement layout of homesteads (Maggs 1988).

Rock-engravings of settlement layouts

Ongoing research leading to the recording of rock-engravings at Strydpoort, Kopleegte and Hattingsvlakte further contributed to our understanding of the upper Thukela Late Iron Age settlements. The discovery of these rock-engravings was a breakthrough for KwaZulu-Natal Iron Age specialists, as it was the first time in KwaZulu-Natal that rock-engravings of Late Iron Age settlements were found near the type of stone-built sites they represented (Maggs 1988: 425).

These rock-engravings helped to understand and confirm the layout of Mgoduyanuka (Maggs 1988). The engraved patterns show similar settlement layouts to those revealed by the archaeology of Mgoduyanuka and related sites in the upper Thukela region. The most striking feature of the rock-engravings was that most of the engraved circles had openings facing up the slope of the rock face (Fig. 4.9). This pattern is similar to real stock pens that have been recorded at Mgoduyanuka and other upper Thukela Late Iron Age sites (Maggs 1988). The similarity demonstrated the significance of the position of stock-pen entrances in these communities (Maggs 1988: 425).

The fieldwork done on the Mgoduyanuka settlements yielded an understanding of how the Late Iron Age people in the upper Thukela structured their homesteads or villages. Diagnostic features include central primary stock pens opening uphill, usually with a cobbled entrance and a ring of rather dispersed huts (Maggs 1982a: 110). The rock-engravings offer support of this pattern even though they depict an 'idealized' homestead layout, a layout that usually does not exactly exist in real life because of the individual choices and decisions that people have to make. The engravings also include pecked lines that seem to be paths taken by cattle to grazing and water.

As already noted, Mgoduyanuka contains at least three occupation horizons, indicated by 1) foundation channels beneath middens; 2) stone walling robbed for building new walls; and 3) whole walls (Maggs 1982a: 112; Maggs et al. 1986: 470). According to ethnography, for pollution reasons people are unlikely to have built on top of sites of people they did not know (Ngubane 1977: 18–20, 24–29). The evidence for multiple phases of occupation suggests that families lived there for two or more generations, for 100 years or more.

The clustering of homesteads seems to have been the preferred system for the Late Iron Age occupants in the upper Thukela (Maggs et al. 1986) (Fig. 4.8). The explanation put forth is that the occupation was based on an agnatic system (descent relationships) (Maggs et al. 1986; Maggs 1988, 1989). An agnatic cluster comprises two or more generations living in a homestead or set of closely related homesteads under the authority of a senior man (Whitelaw 2015). Hammond-Tooke (1993: 109) defines an agnatic cluster as "consisting of homestead heads descended from a common grandfather or great grandfather who occupy a section of a sub-ward." They further suggest that this linear arrangement of cattle-pens was done solely to produce a larger order of settlement and could be an extension of households within the homestead (Maggs et al. 1986: 462; Maggs 1988: 417). It was possibly a later development than the more conventional Mgoduyanuka settlement form (Maggs et al. 1986: 460).

Excavated features at Mgoduyanuka

Overall, Maggs and his team excavated three features: a primary enclosure, a midden 1 (M1) and hut 15 in Settlement Unit 2 (Table 4.2). Most of the excavations took place on the north-western part of the site where settlement unit 1 (SU1) and midden 1(M1) are situated (Maggs 1982a: 84).

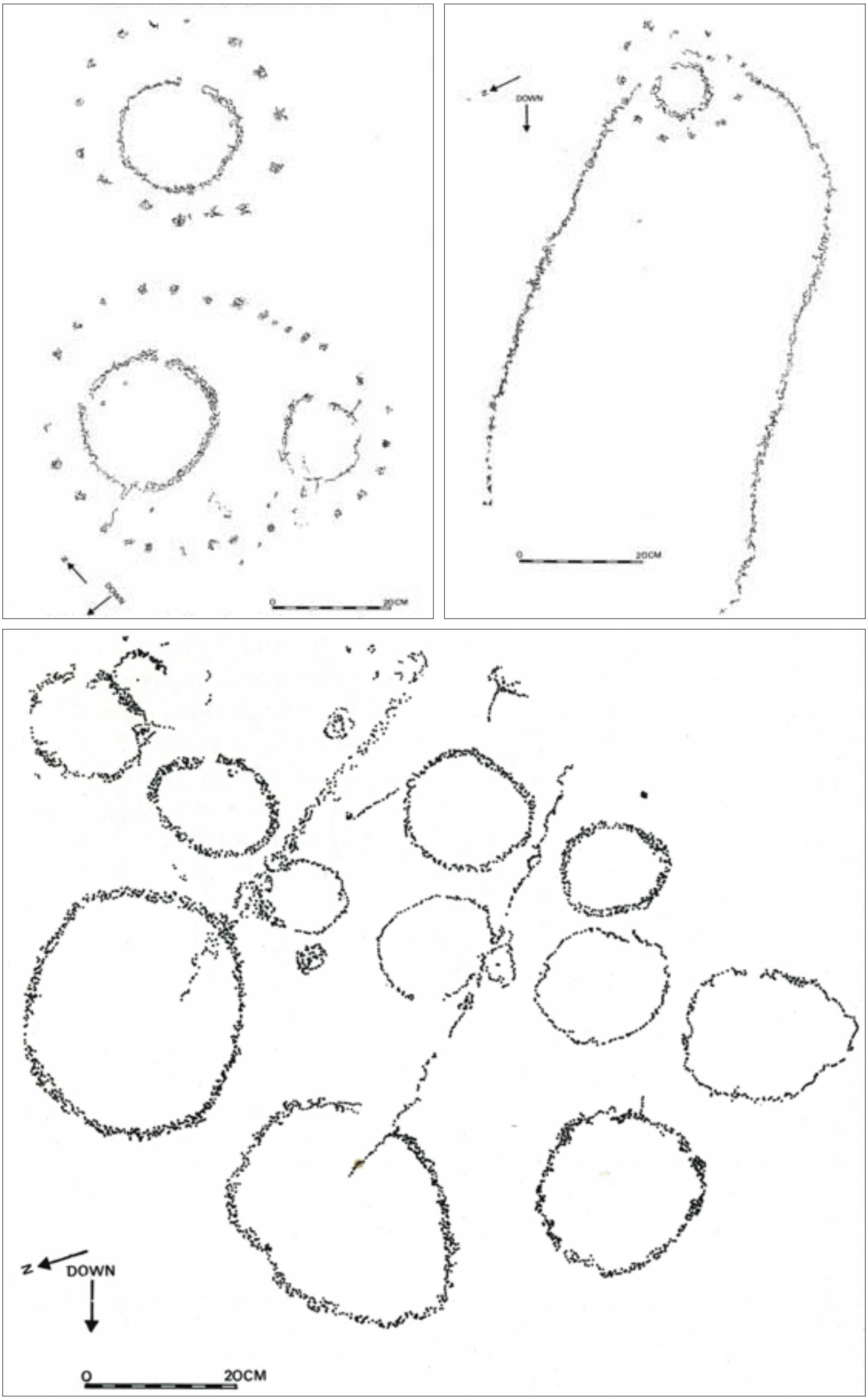

Figure 4.9: Copies of rock-engravings from Kopleegte site. ‘Down’ indicates the slope of the rock. Note the ‘upslope’ entrance of the cattle-pens. Lines might show the movement of cattle. Illustrations from Maggs (1988: 426–429).

Settlement Unit 1 (SU1)

Settlement Unit 1 (SU1) is built on a gentle north-easterly slope (Fig. 4.10) and consists of a primary enclosure built with earth and stone, with a 'serpentine' passage entrance for livestock built in stone (Maggs 1982a: 90). This entrance is on the uphill side of the cattle enclosure. The huts are 3–4 m in diameter; and have stone-paved floors, and are separated from the nearest hut by between 11 m and 20 m. They are situated 15–30 m from the primary enclosure, mainly downslope of it. Other huts were probably placed on the upslope side (Maggs 1982a: 90–1), as the engravings suggest. The primary enclosure was the focal point of excavation simply because of its size; it is relatively large compared to the other enclosures at the site. Its uniqueness, with its entrance design, signifies that it is the main enclosure of the settlement (Maggs 1982a: 89).

A trench was excavated through the primary enclosure wall (Maggs 1982a: 91) (Fig. 4.11). From Maggs' description, the natural stratigraphy revealed in the excavation is as follows: topsoil is black and crumbly with 30 cm depth, grading into dark brown soil within which yellow fragments of weathered dolerite begin to appear at about 55 cm deep (Maggs 1982a: 91).

The wall of the primary enclosure is about 90 cm tall and built on a natural surface, with a little preparation done on the foundation (only the topsoil was removed for levelling) (Maggs 1982a). The foundation of the stone facing remains *in-situ*, but higher up much of the stone has collapsed outwards and slumped (Maggs 1982a: 91). The core of the wall is approximately 1.5 m wide and approximately 60 cm high, built with pale grey-brown coloured, fine sandy soil (Maggs 1982a: 91). According to Maggs (1982a: 91) the soil used to build the core is distinct from anything in the immediate neighbourhood of the settlement unit, meaning that it was carried in from a distant source. On top of the core is a layer of weathered dolerite slabs and dark brown soil. The layer is approximately 35 cm thick (Maggs 1982a: 91).

The cobbled floor of the entrance to the enclosure is made up of large dolerite slabs, which is slightly higher in the middle than at either end (Maggs 1982a: 94). The secondary walls are located on each end of the primary enclosure wall adjoining the outside of the primary enclosure wall (Maggs 1982a: 94). These wall structures typically lie around the dolerite outcrops. They are the only earth-walled structures south of the Zambezi.

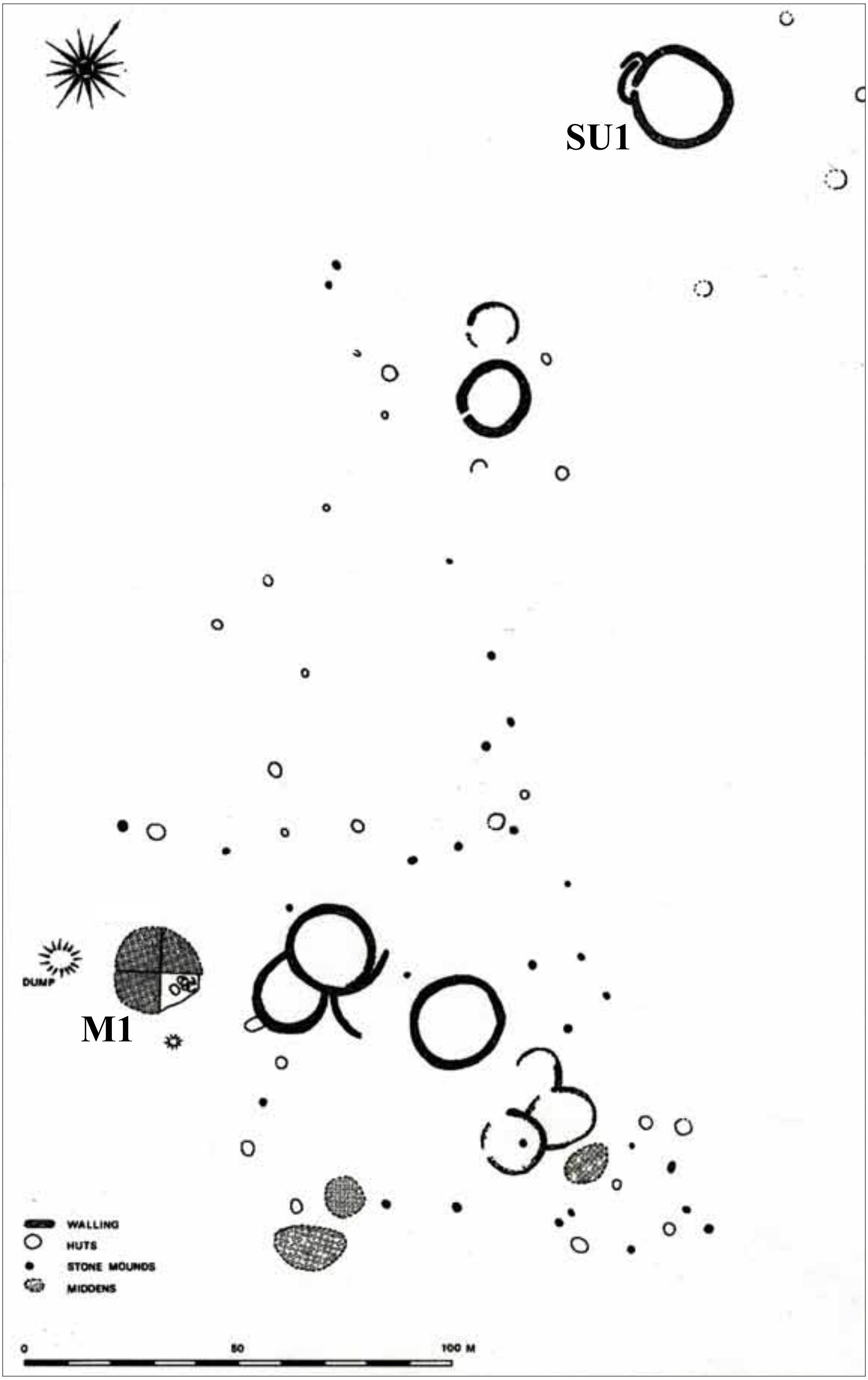

Figure 4.10: Part of Mgoduyanuka showing Settlement Unit 1 and Midden 1 (M1). Illustration from Maggs (1982a: 86).

Table 4.2

Mgoduyanuka features excavated, showing stratigraphic units.

Features	Layer	Stratigraphy units	Depth	^{14}C dates B. P
Midden 1	1	Grey-brown earthy ash	10–20 cm	-
	2	Reddish in colour and earthier. This layer contained grey material (This layer had lots of charcoal).	+ 20 cm	180 ± 45
	3	Thinner grey ash layer	50 cm	-
Trench 1 (through the wall of SU1)	1	Pale brown soil with dolerite stone-wall facing	>10 cm	
	2	Dark brown soil with weathered dolerite lumps	ca 35 cm	
	3	Pale grey-brown fine sandy soil	ca 60 cm	
Natural stratigraphy on site	1	Black crumbly soil	0–30 cm	-
	2	Dark brown soil in which the yellow weathered dolerite fragments show up at about 55 cm	30–55 cm	-
	3	Yellow fragments of weathered dolerite rubble replace the brown soil deeper down.	55–90 cm	-

According to Maggs's (1982a) description of the primary enclosure entrance, the narrow parts of the wall are designed in such a way that cattle new to the passage would have had difficulty negotiating their way through the narrow passage. The entrance passage is narrowest where it turns 180° back on itself, with a floor width of just 41 cm (Maggs 1982a: 95). Elsewhere, it is +50 cm extending to 1 m by the entrance (Maggs 1982a: 95) (Fig. 4.11).

Maggs (1982a) argues that the primary enclosure (5–20 m in diameter) was used for cattle, and he supports his claim with the large quantity of cattle bones found in Midden 1, as opposed to the small amount of small stock remains. Other finds retrieved at SU1 are a lower grindstone (split in half), well-preserved sherds of a large pot, a few other sherds, pieces of charcoal, and possibly burnt grass (Maggs 1982a: 91). The lower grindstone found at the site might represent another hut because its size suggests it was a permanent fixture and would have been positioned close to a house (Maggs 1982a: 91).

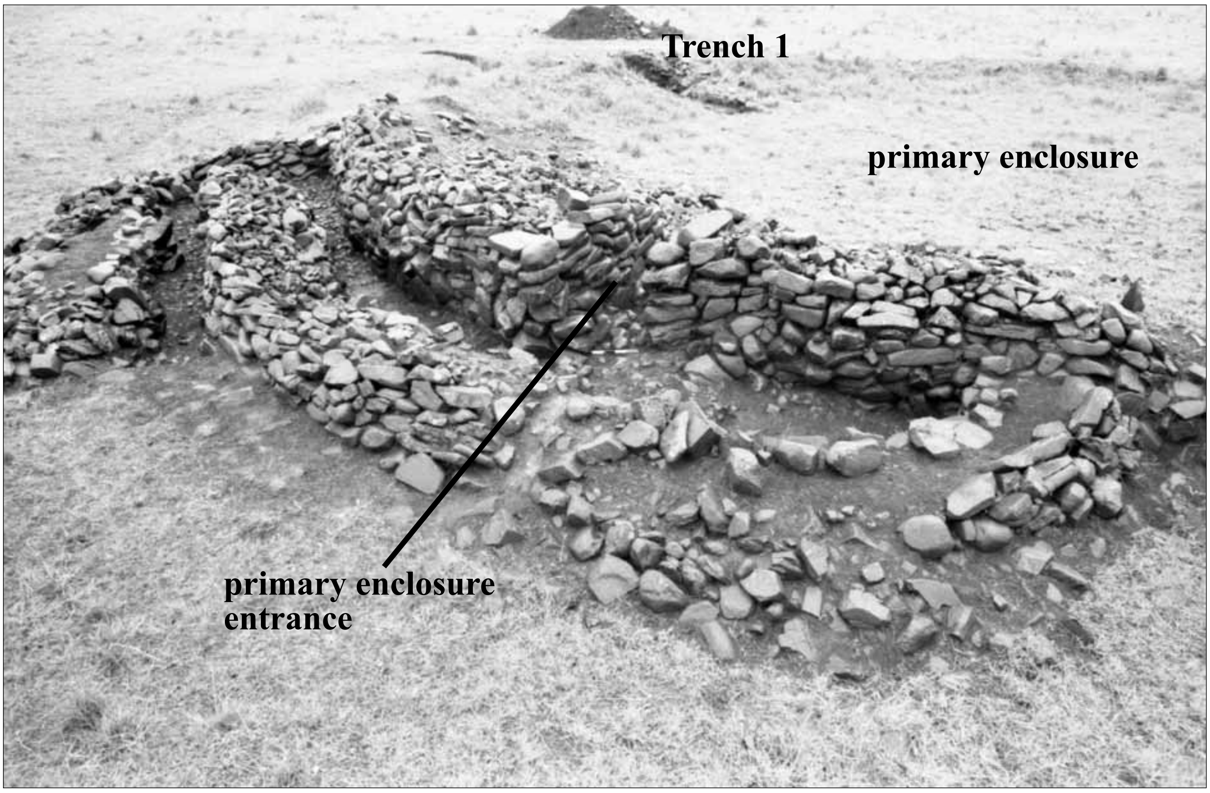

Figure 4.11: Entrance passage after excavations, looking northward. Entrance to primary enclosure in centre. Trench 1 in background (Maggs 1982a: 95). Photo: Tim Maggs; acc. no. N1976/2/16.

Midden 1 (M1)

Midden 1 is located to the south and upslope of SU1, close to another set of primary and secondary enclosures (Maggs 1982a: 87). Midden 1 was chosen for excavation because it was the largest midden on site (Maggs 1982a: 87). Most of the ceramics discussed in my project were retrieved from M1 (Maggs 1982a: 100). The midden was sectioned into four quadrants (see Fig. 4.8), one of which was excavated. The excavated quadrant covered an area of 61 m^2 (Maggs 1982a: 87). The excavation at M1 revealed multiple circles beneath the midden (Fig. 4.12) representing older structures of huts indicative of multiple phases of occupation. This residential space later became a midden (Maggs 1982a: 87–88).

One of the distinctive features of stone walled Late Iron Age sites on the southern Highveld in the Free State is the numerous middens found at the sites (Maggs 1976). However, this was not the case at Mgoduyanuka where only four middens were found (Maggs 1982a: 85). Maggs suggests that the rarity of middens at Mgoduyanuka signifies two things: firstly, it suggests different norms of disposal from the Free State sites. Secondly, the four middens must reflect a

Figure 4.12: Midden 1 (M1) and other features beneath M1. At least four building episodes are represented by overlapping circular channels (Maggs 1982a: 89). Photo: Tim Maggs; acc. no. N1976/1/29.

relatively intense and prolonged occupation of one part of Mgoduyanuka (Maggs 1982a: 85). This conclusion is supported by the structural remains found beneath M1.

Settlement Unit 2, Hut 15

At SU2, only Hut 15 and its ‘stand’, a stone platform for grain baskets, were excavated (Maggs 1982a: 84) (Fig. 4.13). SU2 includes nine primary enclosures in a row along the contour. SU2 is the largest site in the Mgoduyanuka neighbourhood, where most sites with more than one enclosure have two to three (Maggs 1982a; Maggs et al. 1986).

Hut 15 was chosen in SU2 because it seems to be the best-preserved hut floor at the settlement (Maggs 1982a: 97). Hut 15 was approximately 4 m in diameter. The floor had not been burnt, meaning that any plaster placed on the stone foundation would have disintegrated and disappeared. Many broken pottery fragments were found on the central and western sides of the hut (Maggs 1982a: 97–9). Based on Zulu ethnography this suggests that the fragments of pots were located by the hearth in the centre of the hut, and on the left side allocated to

Figure 4.13: Hut 15 and its 'stand', three spherical stones where the hearth is. Photo: Tim Maggs; acc. no. N1976/2/31.

females (western part of the hut) (Maggs 1982a). These broken fragments were reconstructed to form nine big vessels (Maggs 1982a: 97). The superstructure of the hut was probably made of poles and grass shaped into a beehive form (Maggs 1982a). Mgoduyanuka revealed a solid foundation of the hut (Maggs 1982a), whereas at Blackburn the foundation was compacted earth (Davies 1971).

Finds

Aside from pottery, the finds retrieved from the site include metalwork, faunal remains, botanical remains, stone tools, and artefacts made from bone and ivory. The stone artefacts recovered are large and deeply hollowed lower grindstones and large, oval upper grindstones

(Maggs 1982a: 102). The raw material of the lower grindstones and of the upper grindstones is dolerite. The other stone artefacts recovered from the site are one used hammerstone and five polished pebbles used for burnishing pots, also of dolerite.

Three iron blades were retrieved from the site, two from Midden 1 and one from Hut 15 (Maggs 1982a: 102). Bone and ivory artefacts came from Midden 1. These include two spoon bowls and a fragment of a spoon bowl. They are probably broken snuff spoons (Maggs 1982a: 107). Usually the handles of snuff spoons have engravings on them, but unfortunately, no handles were preserved (Maggs 1982a: 107). Maize cobs were recovered from all levels in Midden 1 (Maggs 1982a: 110). The finding of carbonized maize cobs in buried features predating the midden shows that maize cultivation was practised well before the end of the occupation (Maggs 1982a: 110), perhaps from around 1700 at least.

THE INHABITANTS OF MGODUYANUKA

Maggs (1982a) suggests that Zizi people were the original inhabitants of Mgoduyanuka and similar sites in the area. Their descendants are still there, for example, in the Ebusingatha area near Bergville. Maggs's suggestion is based on information that Bryant (1929) recorded. Van Warmelo (1974: 63) and Maggs (1989: 41) mention that the Zizi were recognised as one of the larger groups in the Drakensberg foothills. However, the Zizi, Bhele and the Dlamini apparently possessed less political cohesion than groups such as the Hlubi (Maggs 1989: 41).

Lye (1967) and Maggs (1982b: 140) note that the Zizi were one of the groups that were driven southwards out of the Thukela Basin during the *Mfecane* (troubled times) and subsequently dispersed. This was in response to the attacks by the Ngwane in early 19th century. Ngwane descendants still live in the area. Van Warmelo (1974) also mentions that the Zizi were incorporated into the Fingos/Mfengu of the Xhosa group during their dispersal, and that they were classified as Mpondo of Mpondoland. Bryant (1929: 25, 345) links the Zizi to the Dlamini clans of Swaziland and the Mbo.

Interestingly, Huffman (2007: 451) grouped the Mgoduyanuka settlement layout with what he calls the Langa pattern. According to Bryant (1929), Langa was regarded as the main chief or the 'Moses' of the Zizi who would take them to the 'promised land'. Bryant (1929) adds that Langa's name is mentioned in the Zizi-Sotho speakers' totem praise poems but hardly mentioned by the Zizi-Nguni (Zulu) speakers.

CLOSING REMARKS

The foundation for understanding how communities in grassland areas operated has been laid (see Hall & Maggs 1979; Maggs 1982a, b; Maggs 1984; Maggs 1988 and Maggs et al. 1986). Mgoduyanuka was chosen because it is one of the Late Iron Age grassland communities and has been studied in detail. Mgoduyanuka offers many possibilities to understand how communities in the upper Thukela interacted through marriage alliances and to see how the inhabitants used their resources. For example, as mentioned, the core of the wall was built with different soils. The reason the builders went to the effort of bringing in different soils for the core of the wall is that the local dolerite soils are clayey and they shrink when dry (Maggs 1982a: 91). If the wall were built only of local dolerite soil, then the shrinkage would cause the stone facing on the wall to break up. This shows that the Mgoduyanuka community understood the properties of the various soil types in the area, which is also important for the making of pots.

5
Description of the Sample

MGODUYANUKA CERAMICS

This chapter focuses on the archaeometric analysis of a selection of the Mgoduyanuka sherds and the interpretation of the results. Mgoduyanuka yielded 4761 sherds (not 4736 as recorded by Maggs (1982a)) (Table 5.1). Most sherds were retrieved from Midden 1 (M1) (Maggs 1982a: 100). From 4761 sherds, 66 sufficiently complete vessels were reconstructed and included in the analysis of shape. Of these 66 vessels, 1 pot came from Settlement Unit 1 (SU1), 48 pots and 8 bowls came from M1, and 9 pots from Hut 15 in Settlement Unit 2 (SU2) (Maggs 1982a: 100). Huffman (2004, 2007) places the ceramics into the Nqabeni facies (Huffman 2007: 465).

There is a relatively high incidence of burnished red-coloured sherds, accounting for 27% (n=1312) of the sherd assemblage, and a low incidence of burnished black-coloured 3.5% (n=167) and burnished plain sherds 1.6% (n=75). The balance of the assemblage consists of unburnished plain sherds (Maggs 1982a). Only a small portion of sherds have ‘textured decoration’, and these account for approximately 0.5% (n=25) (Maggs 1982a) (Table 5.1).

Attributes of vessels

The sherds with rims helped in determining the shape of the vessels. Four different shapes were identified by Maggs (1982a: 100): bag-shaped, u-shaped, globular and open-mouth shaped (Fig. 5.1). From Maggs’s (1982a) report, 59% were bag-shaped pots, 27% u-shaped pots, 7% open-mouthed bowls, 3% globular pots, and 4% u-shaped bowls. The shape of vessels in an assemblage is important, because it can help us assign functions to the vessels.

Based on the vessels that Maggs (1982a) illustrated, it seems that vessel shape does not correlate strongly with vessel size, if we use vessel mouth diameter as a rough proxy for vessel size. Globular pots are probably the exception as the two examples in the assemblage are at the small

Table 5.1

Table showing rim sherds recovered from Midden 1 at Mgoduyanuka with the new calculations; table adapted from Maggs (1982a:101) report.

Rim sherds	Decorated (texture) sherds				Undecorated sherds				TOTAL
	Matt	Burnish			Matt	Burnish			
		Plain	Red	Black		Plain	Red	Black	
Lip Rounded	-	-	-	-	143	3	69	2	**217**
Lip Flattened	-	-	-	-	13	1	10	-	**24**
Lip Pointed	-	-	1	-	33	-	9	2	**45**
Lip Misc	-	-	-	-	14	1	8		**23**
Body sherds	5	-	16	3	2999	70	1199	160	**4452**
Total	**5**	**0**	**17**	**3**	**3202**	**75**	**1295**	**164**	**4761**

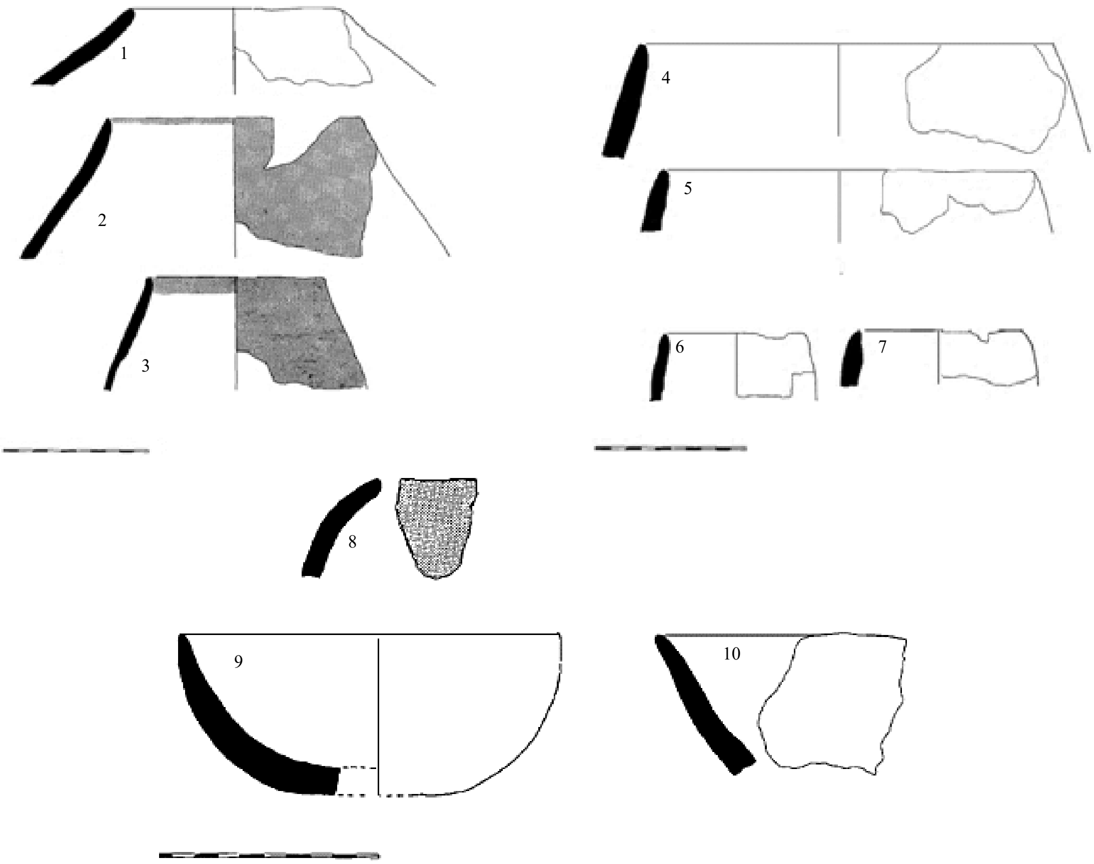

Figure 5.1: Bag-shaped pots (1–3), U-shaped pots (4–7), globular pot (8), and open mouth-pots (9–10) from midden 1 (M1). From Maggs (1982a: 104).

end of the diameter range. The globular pots possibly had a special function (Maggs 1982a: 100), perhaps medicinal.

In Maggs's illustrated selection of vessels, red burnish is applied to globular, bag-shaped and u-shaped pots. The colour was applied on the exterior of the pots and on some pots extended over the lip and a little way down the interior surface as well (Maggs 1982a: 102). The red-coloured vessels are of sizes that are easy to carry (see Table 5.2). The bag-shaped profile probably helped avoid spillage while carrying. According to ethnographic accounts, different sizes of pots had different functions. For example, larger pots are used for storing and brewing beer and for cooking. Then there are medium sized pots that are easy to carry. These pots are used for serving liquids, transporting liquids and some are used for cooking. Then there are small vessels designed as bowls used for serving food such as relish or mealie meal (pap), then some small vessels would be used for medicinal purposes (preparing medicine such as *intelezi*) (Krige 1965; Fowler 2006, 2008; Armstrong 2008).

Table 5.2

Characteristics of pots illustrated in Maggs 1982a; e = estimate.

Figure #	**Shape**	**Context**	**Mouth diameter (mm)**	**Height (mm)**	**Decoration**
15.8	Globular		90		Red burnish
14.7	U-shaped	Midden 1	92		
14.6	U-shaped	Midden 1	100		
15.12	Open bowls	Midden 1	100		
16.4	Bag-shaped	Hut 15	113	150	
15.13	Open bowls	Midden 1	120		
14.5	Bag-shaped	Midden 1	123		
14.2	Bag-shaped	Midden 1	126		Red burnish
15.8	Globular		140		Red burnish
16.5	Bag-shaped	Hut 15	143	287	
16.1	Bag-shaped	Hut 15	150 e	264 e	Red burnish
16.3	Bag-shaped	Hut 15	160		
15.10	Open bowls	Midden 1	180	86	
14.1	Bag-shaped	Midden 1	183		Red burnish
15.8	U-shaped	Midden 1	192		Red burnish
17.4	Bag-shaped	Hut 15	200	387	Red burnish
17.3	Bag-shaped	Hut 15	267	540	
14.4	U-shaped	Midden 1	280		
14.3	U-shaped	Midden 1	315		
17.2	Bag-shaped	Hut 15	367		
17.5	U-shaped	SU1	414	634	
17.1	Bag-shaped	Hut 15	434		

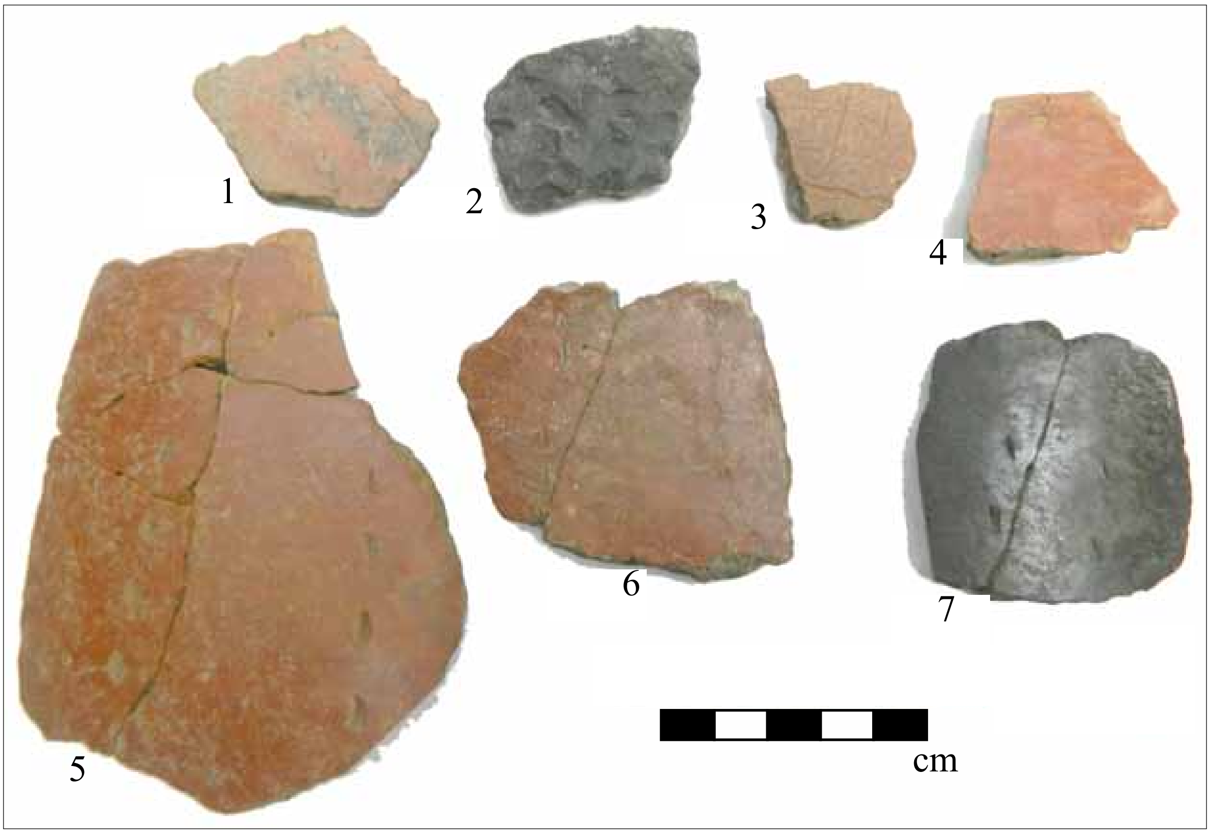

Figure 5.2: Textured decorated sherds all from M1. 1) Stamp arcades decorations; 2) Finger-pinching decoration; 3) Cross-hatching; 4) plain; 5–7 Fingernail impression.

There are four different types of textured decoration techniques found on Mgoduyanuka ceramics: fingernail impressions, stamped arcades, finger pinching and cross-hatching (Fig. 5.2) (Maggs 1982a: 100; 104). Only 25 out of 4761 sherds were found to have textured decorations on them (see Table 5.1) (Maggs 1982a: 101). The Mgoduyanuka ceramic assemblage does not include '*amasumpa* bosses' in contrast to the contemporaneous assemblage from the Late Iron Age site of Nqabeni (Hall & Maggs 1979; Maggs 1982a).

Colours of the analysed sherds

- **Plain sherds:** Plain sherds are sherds with no colour. Generally, their walls are very thick.
- **Red-coloured sherds:** The colour red has been deliberately applied rather than resulting from the fired clay. Their walls are very thin to medium in thickness; very few have very thick walls.

  I refrain from assuming that 'ochre' was applied on the ceramic assemblage of the Mgoduyanuka site. Researchers frequently use the term ochre indiscriminately for red colourant. According to Hodgskiss (2012: 99), "Ochre is a term that encompasses a range of iron-rich rocks with a red, yellow, orange or purple streak". However, Escott (2011: viii) cites Gary et al.'s (1973) description of ochre as "an earthy, usually impure, pulverulent, red, yellow, or brown oxide that is extensively usually used as a pigment". Given these two definitions, Escott (2011: viii) suggests it is highly probable that most ochre excavated, or material classified as 'ochre', is in fact material that consists of hard iron-enriched shale, weathered sandstone, or iron-ore. In other words, the material is not pulverulent nor is it an impure iron oxide (Escott 2011: viii). However, Coetzee (1976: 391) states, "highly coloured natural mineral earths are of common occurrence in South Africa, and numerous localities … have received attention as possible sources." He further states, "The pigments [ochre] exploited, in order of importance, are yellow and red" (Coetzee 1976: 391). To avoid this confusion, I simply refer to the colour of the sherds and pots (i.e., 'red-coloured').

- **Black-coloured sherds:** Some black-coloured vessels were burnished and others were without burnish. Some seem to have been blackened with soot during a 'smoke' firing or post-firing treatment (which is today termed *ukufuza*). The colour of others seems to come from the fabric; these were possibly reduction fired to produce a dark colour. The walls of the black-coloured sherds are medium to thick, but not as thick as the plain sherds.

Thickness of the analysed sherds

The Mgoduyanuka sherds vary in thickness (Fig. 5.3). The total number of sherds analysed using pXRF was 133, of which 54 were red-coloured, 26 black-coloured and 52 plain. One sherd had both red and black colour. The red-coloured sherds range in thickness from 6.9 mm to 18.2 mm, with an average of 11.16 mm. The black-coloured sherds range in thickness from 7.3 mm to 17.4 mm, with an average of 12.31 mm. The plain sherds range in thickness from 8.8 mm to 19.2 mm, with an average of 15.85 mm (Fig. 5.3). The plain sherds typically had a rough texture on the outer surface. Red and black-coloured sherd overlapped in thickness, though red-coloured leaned towards the lower quartile range (the thinner end of the range). Sherds of both colours were generally thinner than the plain sherds, but there was considerable overlap of the categories. In addition, burnishing made the pots smooth, and this was especially true in the

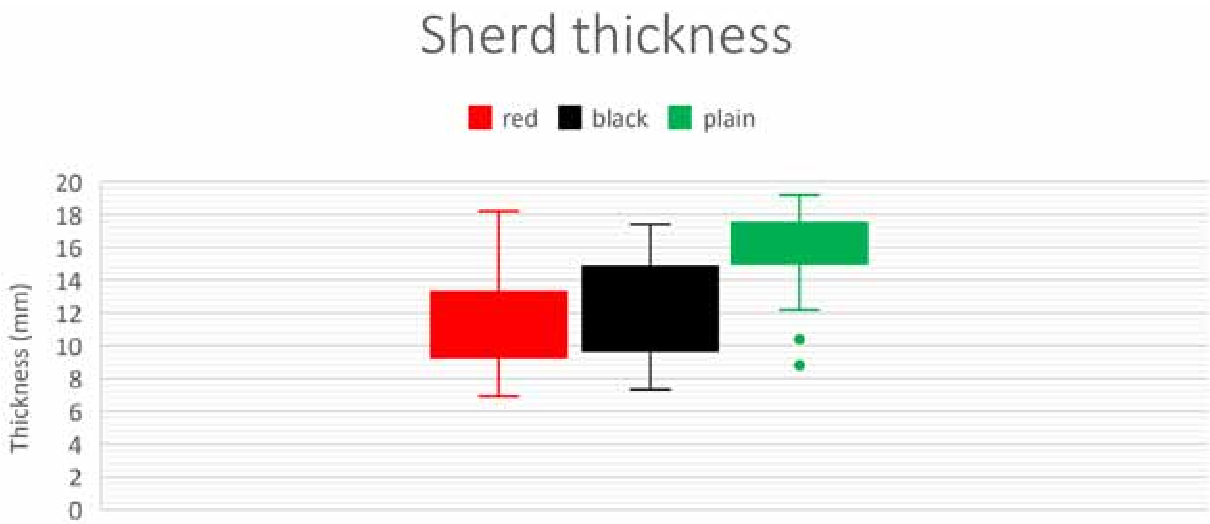

Figure 5.3: Box plots of sherd thickness in each colour category. Red = 54 sherds, black = 26 sherds, plain = 50 sherds.

case of the red-coloured sherds. In the sherd sample analysed, there were no 'very thin' (sherds <5 mm thick) sherds such as those from modern Zulu pots.

Clay fabric of the analysed sherds

The fabric of the ceramics varies from coarse-grained to fine-grained, and some sherds show voids in the clay fabric. The voids are due to the elasticity of the clay. Some of the ceramics have grog (crushed pottery that has been re-used) as temper and angular quartz inclusions in the fabric (Fig. 5.4), and Maggs (1982a: 100) in describing the fabric states that some have stone inclusions. There seem to be quartz inclusions (Fig. 5.4). I agree with Maggs's (1982a: 100) description that thin ceramics seem to lack coarser or larger inclusions compared to thick ceramics; the clay was apparently more finely processed.

Visual and microscopic analyses of the analysed sherds revealed that most of the red-coloured sherds (n=40, 74%) have a very fine-grained fabric and the colour of the fabric is reddish to buff-brown. Only 11 (15%) of the red-coloured sherds have a dark (black) coloured fabric that is coarse-grained with a sandy texture. A sandy soil texture within a clay fabric is a texture that has sand grain inclusions, whereas a very fine fabric has a silt-like texture. The majority of the plain sherds (n=46, 88%) have a very coarse fabric that is dark coloured. The coarse fabric has large inclusions such as stones and grog. Only 9 (17%) plain sherds showed to have a sandy soil texture. Similarly, 19 (73%) black-coloured sherds have a coarse fabric, that is dark in colour, and 7 (27%) black-coloured sherds have a fine fabric that is reddish to buff-brown in colour.

Figure 5.4: Zoomed image showing the fabric of ceramics found at Mgoduyanuka. A (RimP032, plain), B (BB016, black): Grog inclusions within the fabric. C (BB035, plain), D (PP014, plain): Larger angular quartzite inclusions. E (RimP040, plain), F (RB152, red): Coarse to fine grained fabrics (red and black fabric) with small quartz inclusions.

The black and red-coloured sherd had a coarse fabric that is dark in colour. The difference in the clay fabric textures indicates that these various vessels were utilised for a variety of specific purposes, such as cooking, transporting, serving and drinking. For example, the pots with very coarse-grained fabric were most likely used for cooking and storage (Bryant 1949: 398–399; Lawton 1967: part IV; Armstrong et al. 2008: 521). Pots with a coarser fabric are normally very large in magnitude, and therefore they are rarely moved or carried around a lot. Pots made with medium-grain to fine-grained clay fabric were used for the transportation of water, serving beer, and serving food (Armstrong 2008). Pots with medium-grain fabric are the type of pots that require lots of carrying around; therefore, they should be portable (Armstrong 2008).

What contributes to the colour of the ceramic fabric?

Fabric colour can vary across the surface of pots and through the walls of pots. Regarding the latter, internal colour variation, two things could affect the colour of the fabric. Firstly, the colour of the fabric could result from variation in the oxidation-reduction process during firing. For example, the colour of the entire ceramic changes to a dark colour because of reduction when dung is used to omit oxygen during firing (see Maggs 1976, 1982a; Whitelaw 2021). At 1830s uMgungundlovu, the black and dark coloured sherds seem to have been reduction fired, meaning that the black (dark) colour comes from the ceramic itself rather than a post-firing treatment such as *fuza* (Whitelaw 2021: 144). The same technique has been recorded in the Msinga and Nongoma districts in the 20th century and, in Msinga at least, potters still use reduction firing to create serving and drinking vessels (Lawton 1967; Reusch et al. 1998; Fowler 2006, 2008). There is a possibility that this was true for the ceramics of Mgoduyanuka.

The second possibility is that the clay fabric is naturally dark in colour. In chapter 4, one of the stratigraphic layers mentioned was the Normandien formation of the Adelaide Subgroup of the Beaufort Group. The Adelaide is characterised by interbedded green-grey, reddish-brown and purple-red shales and mudstones (Paiva 2015). The colour variation in these sedimentary deposits was caused by shifts in the water table that contributed to various degrees of oxidation of iron-based minerals (Paiva 2015: 74). These variously coloured sedimentary rocks could contribute to different coloured clays. Additionally, alluvial sediments that are rich in organic matter can form dark clays, for example, clay deposits in the lower Thukela Basin (Fowler 2008: 486).

I visually inspected the colour variation through the walls of the sample of black-coloured sherds from Mgoduyanuka. I distinguished two categories. The first includes sherds on which the black surface colour is different from the fabric colour. The vessel fabric is paler than the surface colour, usually ranging from shades of pale to reddish brown, suggesting oxidation during firing. I suggest this group represents pots that were oxidised during firing. The surface colour seems to have been applied after firing of the vessel. Several sherds in this category are burnished (1A) (Table 5.3).

The second category consists of sherds on which black surface colour seems to derive from the fabric colour, though it was possibly augmented or enhanced with a post-firing application. The vessel fabric is generally dark with varying shades of grey, suggesting reduction during firing. Several sherds in this category are burnished (2A) (Table 5.3).

CLOSING REMARKS

The description of the sample shows that the ceramic assemblage of Mgoduyanuka varies in thickness, whereby the plain vessels are very large in size, indicative of cooking, and brewing. As serving vessels, the red-coloured vessels vary in size from small to medium-large. The medium-large vessels would most probably be too heavy to pass around or lift up when full with liquid (water or beer). Possibly gourd ladles were used to transfer the contents to smaller vessels, or people even drank directly from the ladle. The black-coloured vessels are mostly medium-large in size, and also difficult to carry around.

Additionally, the pattern of oxidation and reduction on the black-coloured sherds suggests that there were two different firing processes used. Some of the black-coloured vessels were oxidised during firing and some seem to have gone through a reduction firing.

Table 5.3

Table representing the analysed black-coloured sherds showing oxidation-reduction firing processes.

Group	**Sherd ID**	**Oxidised**		**Possible reduction firing**	
		With burnish	Without burnish	With burnish	Without burnish
1A	BB003	X			
	BB017	X			
	BB023	X			
	BB024	X			
	BB026	X			
	RimP009	X			
1B	BB018		X		
	RimP002		X		
	RimP004		X		
	RimP030		X		
	RimP039		X		
	RimP040		X		
2A	BB007			X	
	BB016			X	
	BB020			X	
	BB021			X	
	BB025			X	
	BB029			X	
	BB035			X	
2B	BB019				X
	BB022				X
	BB028				X
	RimP022				X
	RimP028				X
	RimP041				X
	RimP034				X

6
Method and Results

ELEMENTAL AND MINERALOGICAL ANALYSES: METHOD

For the elemental and mineralogical analyses, I used portable XRF (pXRF), and conventional XRF and XRD techniques, all of which were destructive of ceramic material and required proper sampling preparation. Although one of the advantages of pXRF is that it is not necessarily destructive (Tiley-Nel 2014), I chose to do a minimally destructive pXRF analysis because it gave a better reading of the ceramic fabric and avoided possible complications presented by uneven surfaces and surface residues and treatments on pots. Sample preparation for pXRF is different from XRF and XRD. XRF and XRD have similar criteria for sampling preparation.

One may ask, why not use only pXRF to analyse samples, since it is less destructive? Using pXRF alone has disadvantages, and the method has been criticized for producing possibly misleading data when, for example, using it on unprepared samples of coarse-ware and/or tempered ceramics which have heterogeneous fabric or surface irregularities (Papakosta et al. 2020). Proper preparation can help to eliminate these irregularities. This is why I chose to do a minimally destructive pXRF analysis on the Mgoduyanuka samples.

A limiting factor in conducting destructive analyses is trying to avoid destroying the object. As a result, you can become too careful, so as to not overly trim (cut a huge sample ending up destroying the entire sample, and the trimmed-off sample is too big to fit in the machine case) or trim too little (whereby you cut a very small piece, too small, to be analysed). With XRD and XRF, one needs to choose samples that are big enough to be trimmed for analyses to avoid crushing the entire sample.

The XRD and XRF process allows for predetermination of the minerals that constitute the clay before the actual analyses take place. This predetermination happens during the heat treatment of the samples when some clay minerals react to the heat. When heat through X-ray radiation is detected, the powdered clay sample will either swell or not swell. According to Dlamini (2015), this is another way of categorizing clay sources, by grouping them into swelling or non-swelling clays.

The detection of swelling and non-swelling clays aids in understanding the clay composition, because clays with smectite minerals swell when subjected to X-ray heat, while clays without smectite do not swell (Deer et al. 1992; Dlamini 2015). Without the heat treatment, it is difficult to identify the presence of smectites in clay fabrics using optical methods only (Deer et al. 1992: 375). Most swelling minerals are smectites (Deer et al. 1992; Dlamini 2015: 31). Halloysite is another common swelling clay mineral (Deer et al. 1992: 371). In essence, if the clay soils do not swell during the XRD heating treatment, then the soils do not contain smectite minerals.

Analysis process for pXRF

Selection of sherds

Before the analyses, the sherds were selected and categorised according to colour: red burnish (RB), black burnish (BB), plain pots (PP). Sherds with rims were labelled RimP. My selection was based on the sherd size and sample size. I wanted a minimum of 30 sherds per colour category. I also wanted a sample of body sherds and rim sherds. The sherds had to be sufficiently large to allow for trimming and possibly take a sample for XRD analysis.

Initially, the selection was as follows: 39 sherds were RB, 35 sherds BB, 41 sherds RimP (the rim sherds ranged across all three colours) and 17 sherds PP. The sherds were individually assigned an ID number by colour and a numerical number; for example, plain sherd (PP001), black-coloured sherd (BB001), red-coloured sherd (RB001) and all sherds with rims (RimP001–041), including the coloured ones. Only one sherd (RimP005) had both red and black colours. It should be noted that upon further thorough inspection of the outside colour of the selected sherds some of the sherds which were initially thought to be black were actually plain. I decided to not change the sherd ID, but just assign it a proper colour. For example, sherd ID BB022 was initially classified as black only to find out it is actually plain, therefore it will be BB022 plain. In the end the total number of red-coloured sherds was 51, black-coloured sherds 26 and plain sherds 55.

Each selected sherd was trimmed using a diamond cutter, polished, and washed to get a clean, flat surface for the pXRF reading. After washing, the sherds were dried in an oven at 150ºC for 10–15 minutes. Once dry, the sherds were left to cool.

Challenges faced in preparation for pXRF

Midden 1 from SU1 yielded most of the rim sherds. They are generally small sherds, which posed a challenge in trimming.

- **Trimming**. I aimed to make sure that I did not destroy the rim section and to trim as thinly as possible to preserve the sherd.

- **Polishing**. It was easy to over-polish, which made the already uneven sherd more uneven.

- **Positioning:** It was difficult to position some of the sherds so that they could stand on their own without external support. When introducing extra support to balance the sherd inside the pXRF machine, I had to make sure that the support was positioned so that it could not be detected as part of the analysed sample, resulting in contamination of the reading. A contributing factor to this challenge was unevenness from over-polishing.

- **Closing the machine lid properly:** It was difficult to close the lid of the machine because of: (a) the size of the sherd and (b) the shape of the sherd, because some sherds have a convex shape or their body part is thick.

pXRF analysis

With the supervision and the help of Professor Anders Lindahl from the University of Pretoria, the first part of the analysis was done using a desk-mounted Thermo Scientific Niton XL3 pXRF device at the University of Pretoria Ceramic Laboratory. The process I followed is similar to the process described by Simandl et al. (2014: 162). The machine was on Mining Cu/Zn setting. The Cu/Zn setting/mode is the only mode suitable for detecting lighter elements such as Si and Al within clay fabrics. Firstly, before I could analyse any sample, I analysed two standard samples, NIST 2709a, a commerical soil standard, and SARM 69 (Jacobson 2002), a South African archaeological ceramic reference sample. There were minor differences from how Simandl et al. (2014) conducted their analysis. For example, I did not set the machine for

45 seconds per reading as they did (e.g., Simandl et al. 2014: 162), but I set the machine for 380 seconds per analysis, as recommended by Professor Lindahl, so that the pXRF device could detect as many elements as possible (i.e. to lower the balance in the pXRF data). Three readings per sherd meant that the pXRF data capture took at least 19 minutes per sherd. For each sherd, I calculated the geomean average of the three readings. In total 132 sherds were analysed.

Conventional X-Ray Fluorescence (XRF) and X-Ray Diffraction Spectroscopy (XRD) analysis

XRD and conventional XRF are size-specific in that they require not less than 0.7–1 gram of powdered samples. Uncertainties of measurements are allowed by 0.01 gram, meaning that the sample can be above 1 gram by 0.001/0.002 grams. I did not have enough funding to analyse all 133 sherds, therefore I selected only 12 sherds for XRD and the conventional XRF analyses. Another reason for choosing a limited sample size was because of the destructive nature of these two techniques. Since these sherds are a heritage sample, I had to select sherds that were large enough to meet the 0.7–1 gram range for the XRD and XRF analyses, but would not involve complete destruction of the entire sherd.

The 12 sherds were analysed at the Geology Laboratory of the University of Pretoria. My sampling preparation was similar to that of Punyandeera et al. (1997) and Simandl et al. (2014). The samples were crushed using a geological rock crusher, then milled to <75μm size using a tungsten carbide milling pot. Before I did finer grinding or milling for each sherd, I first ground cleaning quartz (this was done for every sherd) to eliminate contamination across sherds, as described by Punyandeera et al (1997).

The sample was then put in pellets (three scoops per pellet) and homogenised with Mounting Media Microscopy and Imaging Core (MOWIOL) and Polyvinyl Alcohol (PVA) (12 drops per sample). Homogenisation distributes the chemical composition evenly within the sample, although it sometimes favours a predominant element or chemical compound and thus skews the compositional data (Humphris et al. 2009).

For the XRF analysis, Mrs Jeanette Dykstra of the Geology Laboratory at the University of Pretoria used a Thermo Fisher ARL Perform'X Sequential XRF instrument with Uniquant software. "The software analyses for all elements in the periodic table between fluorine (F) and uranium (U) …. The results were normalised to include LOI for the sample and to indicate crystal water and/or oxidation state changes" (J. Dykstra pers. comm. December 2019).

For the XRD analysis, Mrs Wiebke Grote used a "PANalytical X'Pert Pro powder diffractometer in θ–θ configuration with an X'Celerator detector and variable divergence- and fixed receiving slits with Fe filtered Co-Kα radiation (λ = 1.789 Å). The mineralogy was determined by selecting the best-fitting pattern from the ICSD database to the measured diffraction pattern, using X'Pert Highscore Plus software. The relative phase amounts (weight% of crystalline portion) were estimated using the Rietveld method (Autoquant software)" (W. Grote pers. comm. December 2019).

The benefit of doing the XRD and conventional XRF concurrently is that the same sample can be analysed with both machines, meaning that the preparation steps for each sample are shared. I did not encounter any difficulties when preparing for these two techniques as I did with the pXRF

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RESULTS

pXRF results

The four major elements of clay sources are silicon (Si), aluminium (Al), iron (Fe), and magnesium (Mg). The proportion of the major elements depends on the source of clay. The Mgoduyanuka ceramic assemblage includes all these four major elements in addition to many trace elements. The following bivariate scatterplots present useful data. Scatterplots that do not show a clear pattern are in Appendix 4.

Figure 6.1: Silicon (Si) vs Aluminium (Al)

There is no strong separation of sherd cluster in the Si-Al ratio. There is a hint of separation of plain and red-coloured sherds on the Si axis, with plain sherds giving slightly lower results than red sherds. Although, there is no strong separation between all the sherds, the red-coloured sherds seem to have slightly higher Si content than plain. Note the outlier sherds RB133, BB030 and BB026.

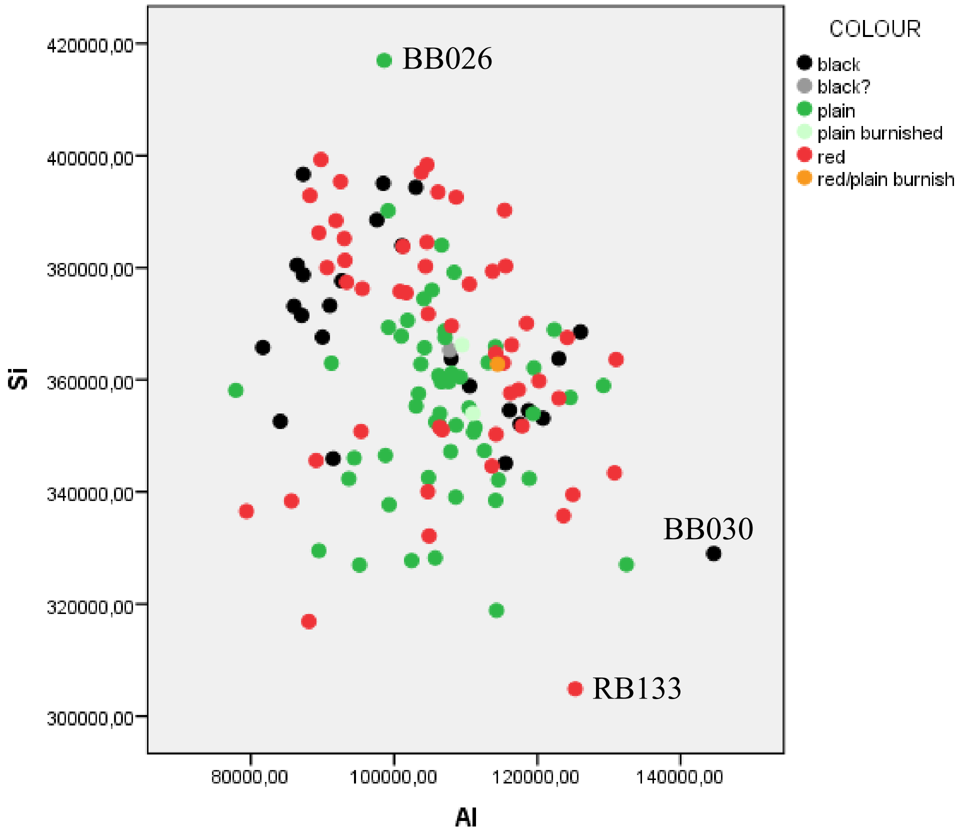


Figure 6.1: Scatterplot of silicon (Si) vs aluminium (Al). Measurements are in ppm.

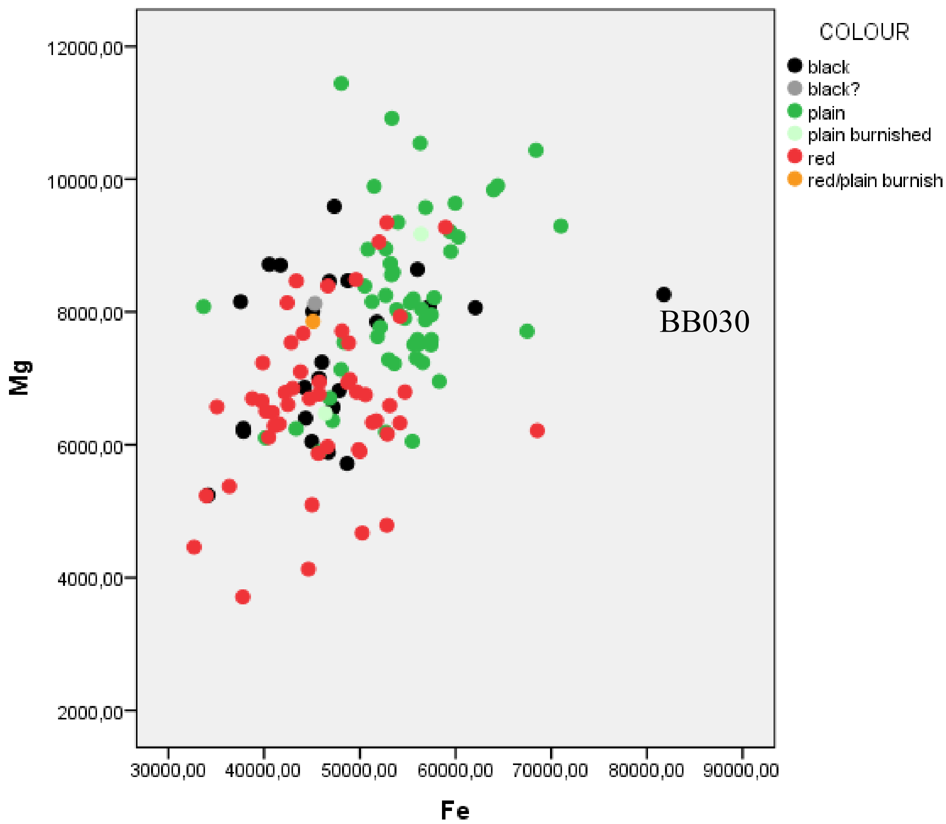


Figure 6.2: Scatterplot of magnesium (Mg) vs iron (Fe). Measurements are in ppm.

Figure 6.2: Magnesium (Mg) vs Iron (Fe)

There is a separation of red-coloured sherds and plain sherds, with plain sherds tending to be higher in Mg and Fe, and red-coloured sherds lower in both elements. Black-coloured sherds, which are fewer in number, occur mainly in the area of overlap of red and plain sherds. Note the outlier sherd BB030.

Figure 6.3: Iron (Fe) vs Titanium (Ti, trace element)

The red-coloured sherds and black-coloured sherds have low Fe and Ti compared to the plain sherds. There is a positive correlation between Fe and Ti, so their presence in the clay source is related, that is, they co-occur. Therefore, a mineral like ilmenite ($FeTiO_3$) with both Fe and Ti is a likely source. Alternatively, clay derived from dolerite with a haematite mineral (Fe_2O_3) and anatase (TiO_2) minerals might yield this result. The plain sherds have a relatively higher Fe content than red and black-coloured sherds. Note the outlier sherd BB030.

Figure 6.4: Magnesium (Mg) vs Manganese (Mn, trace element)

The graph for Mg vs Mn shows that there is a separation on the Mg axis of the red-coloured sherds and plain sherds. The few black-coloured sherds cluster more with plain sherds than with the red-coloured sherds, though they occur in the area of overlap between red-coloured and plain sherds. The red-coloured sherds have relatively low to medium Mg content compared to the plain and the black-coloured sherds. Plain sherds have a higher concentration of Mg than red and black-coloured sherds. Of interest, all the sherds have very low traces of manganese relative to magnesium. Note the outlier sherds RimP024 and BB029.

Figure 6.5: Vanadium (V) vs Chromium (Cr)

In this graph, there is a positive correlation between V and Cr along which the red-coloured and plain sherds are separated again, with plain sherds higher in V and Cr than red-coloured sherds. The black-coloured sherds cluster mainly with the red-coloured sherds. Both elements occur widely as trace elements, but in igneous rocks especially. They are "not uncommon … in heavy ferric silicate minerals, such as some pyroxenes, amphiboles, and dark mica (biotite)" (Watson 1912: 432), suggesting that the clay source is from dolerite. They also occur in rutiles, ilmenites and titaniferous magnetites (Watson 1912). Note the outlier sherds RB131 and BB030.

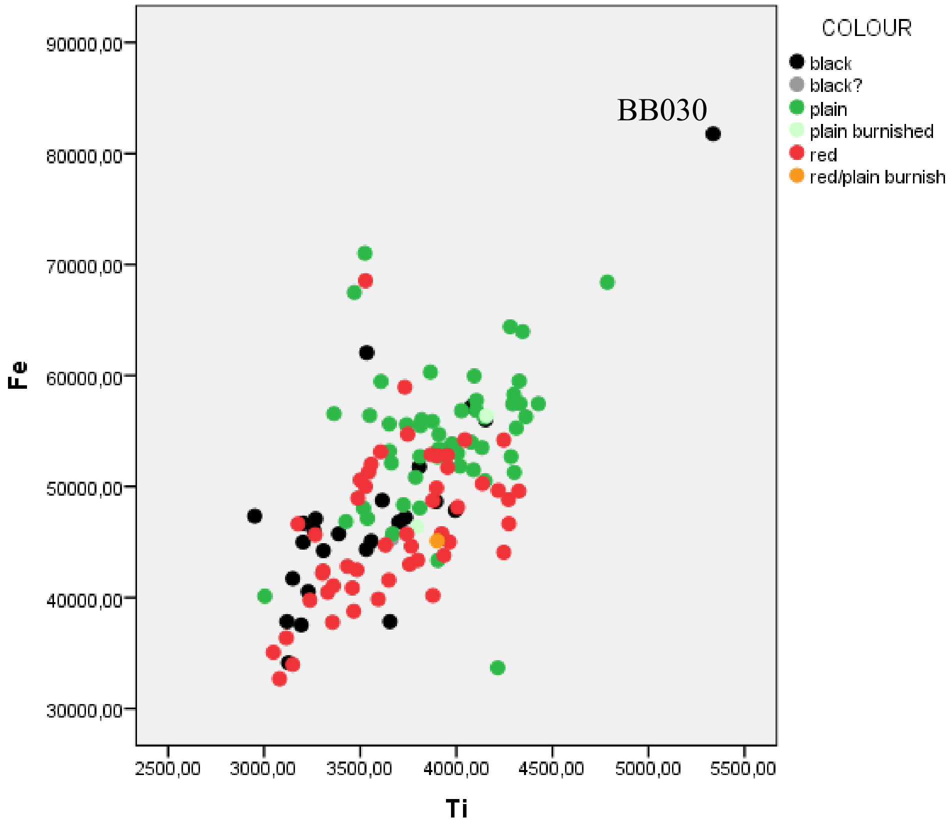


Figure 6.3: Scatterplot of iron (Fe) vs titanium (Ti). Measurements are in ppm.

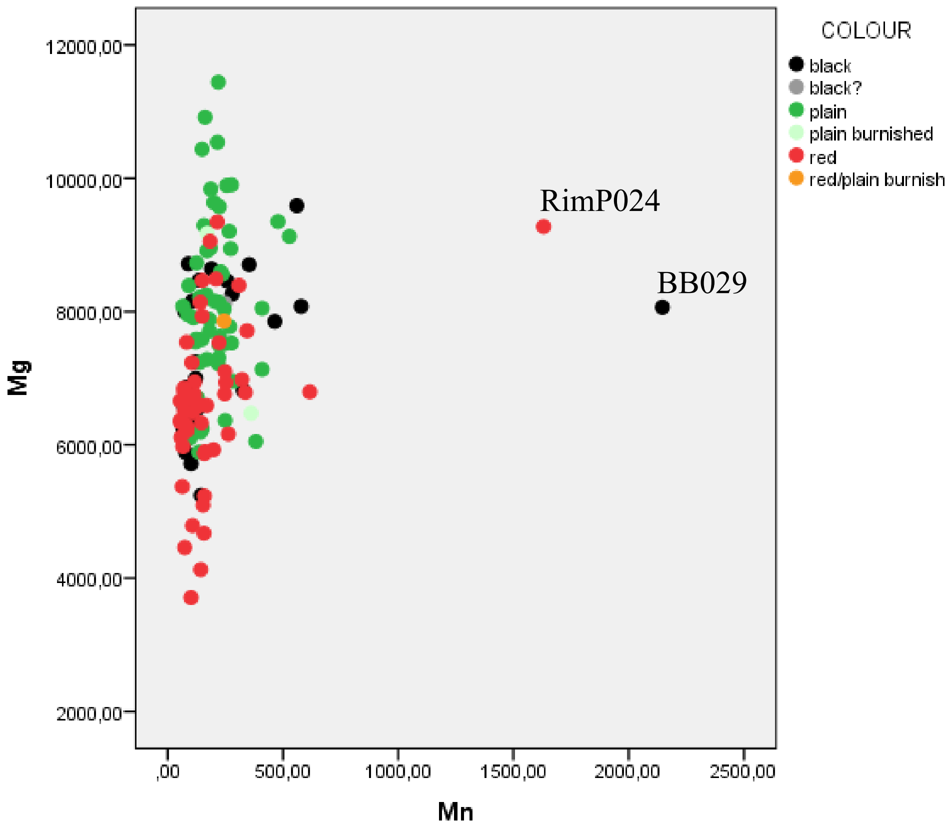


Figure 6.4: Scatterplot of magnesium (Mg) vs Manganese (Mn). Measurements are in ppm.

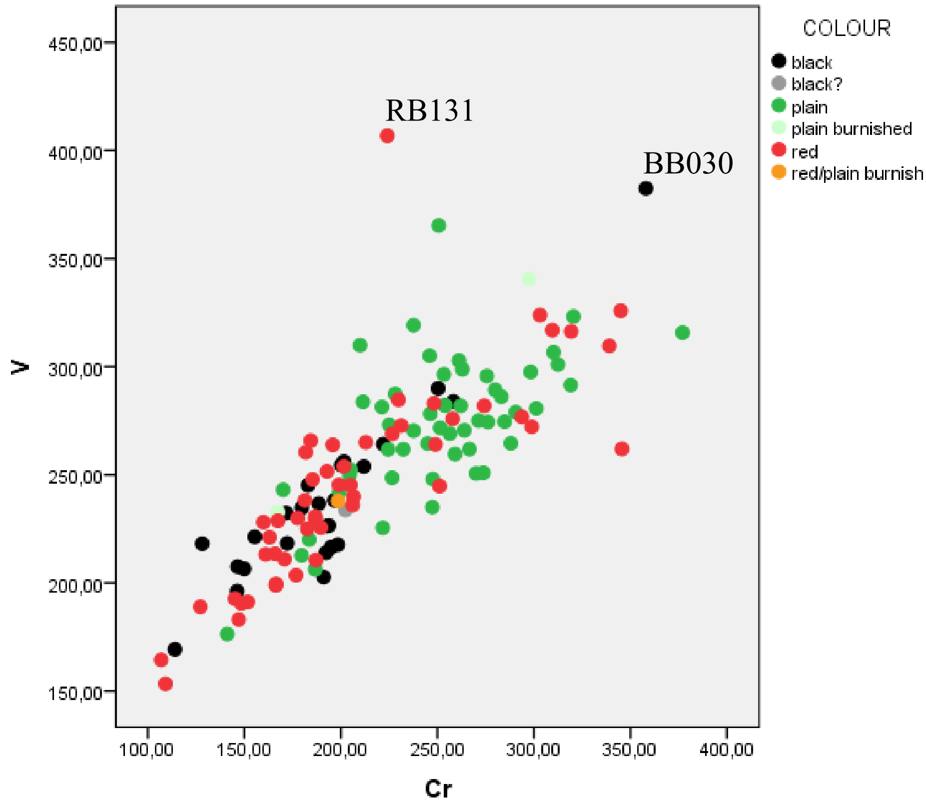


Figure 6.5: Scatterplot of vanadium (V) vs chromium (Cr). Measurements are in ppm.

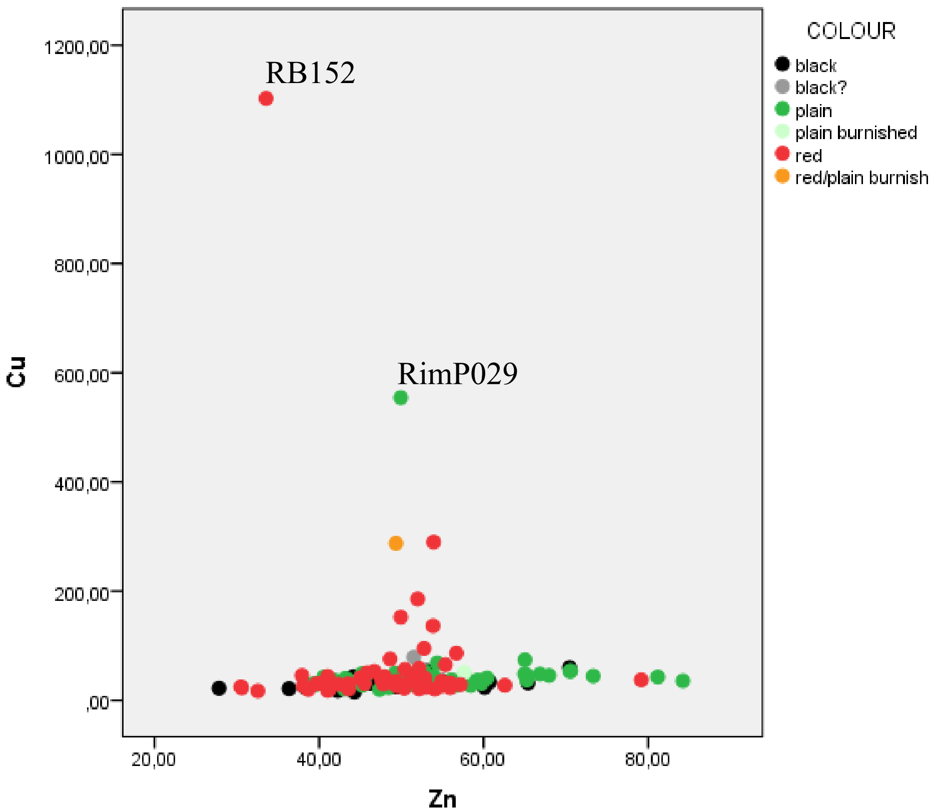


Figure 6.6: Scatterplot of copper (Cu) vs zinc (Zn). Measurements are in ppm.

Figure 6.6: Copper (Cu) vs Zinc (Zn)

There is hardly any separation of the sherd categories on the Cu axis. Almost all are low in Cu, except for two outliers. One is a red-coloured sherd very much higher than the rest of the samples and the other a plain sherd. There is limited separation of the sherds on the Zn axis, except for few outliers comprising mainly plain sherds with higher Zn than the rest of the samples. Note the outlier sherds RB152 and RimP029.

Figure 6.7: Iron(Fe) vs Strontium (Sr)

The Fe and Sr data are significant for distinguishing colour groups. There is noticeable clustering of plain sherds, showing a high concentration of Fe relative to the red-coloured and the black-coloured sherds. Note the outlier sherds BB030 and BB025.

Figure 6.8 Potassium (K) vs Rubidium (Rb)

The K and Rb data are not significant for distinguishing colour groups. There is no noticeable clustering of sherds, but the two elements show a positive correlation, which indicates that

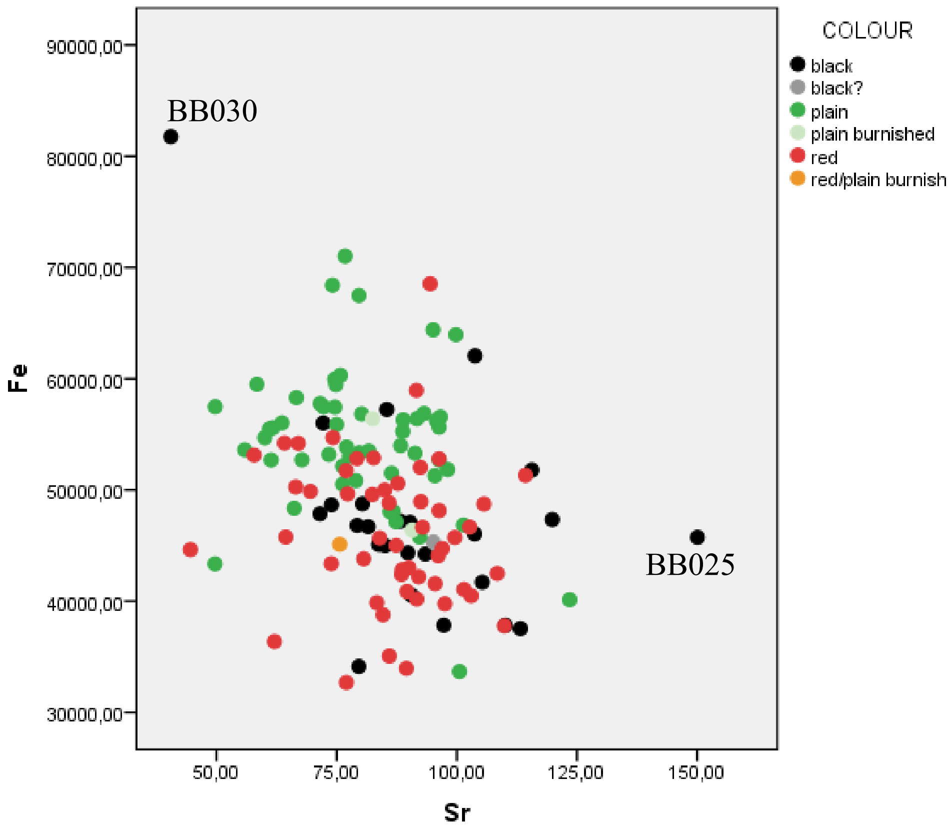


Figure 6.7: Scatterplot of iron (Fe) vs strontium (Sr). Measurements are in ppm.

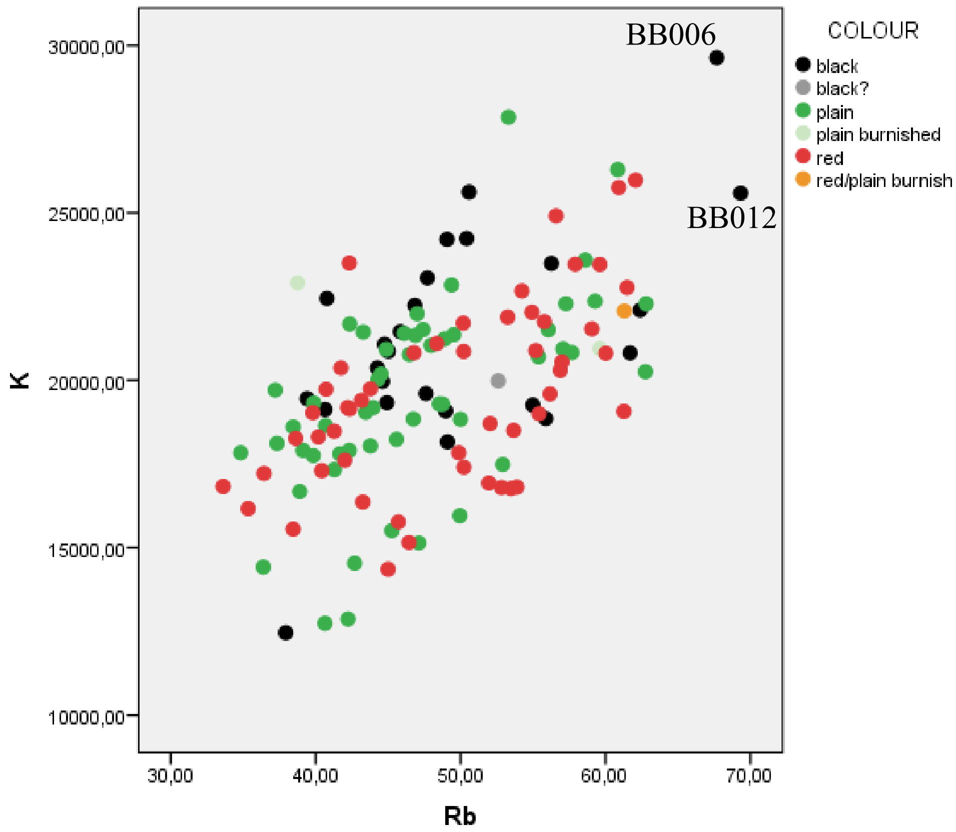


Figure 6.8:Scatterplot of potassium (K) vs rubidium (Rb). Measurements are in ppm.

the pXRF measurements reflect their relationship in the real world. Potassium and rubidium are both in the alkali metal group. Rubidium replaces potassium in the sheet silicates and the potassium feldspar (K-feldspar). Note the outlier sherds BB006 and BB012.

Hierarchical Clustering

Anders Lindahl performed the hierarchical clustering (Fig.6.9) using the Ward Linkage method. According to him, the "data for the analysis is based on a PCA [Principal Component Analysis] of the variables Mg, Al, Si, P, S, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Rb, Sr, Y, Zr, Nb, Sn, Ba, Pb and Th and we used the 6 first factors of the PCA for the dendrogram". He generated statistics using the IBM Statistical Package for the Social Sciences v. 27 (Lindahl pers. comm. Sept. 2024).

The hierarchical analysis divides 132 sherds into two main (Level 1) clusters (Table 6.1). (One red-coloured sherd (Lab. No. 51; RB029) was inadvertently omitted from the hierachical clustering.) Level 1 Cluster A has 50 sherds and 56% of them are plain. Only 30% are red-coloured sherds. In Cluster B, 45% of the 82 sherds are red-coloured and 33% are plain.

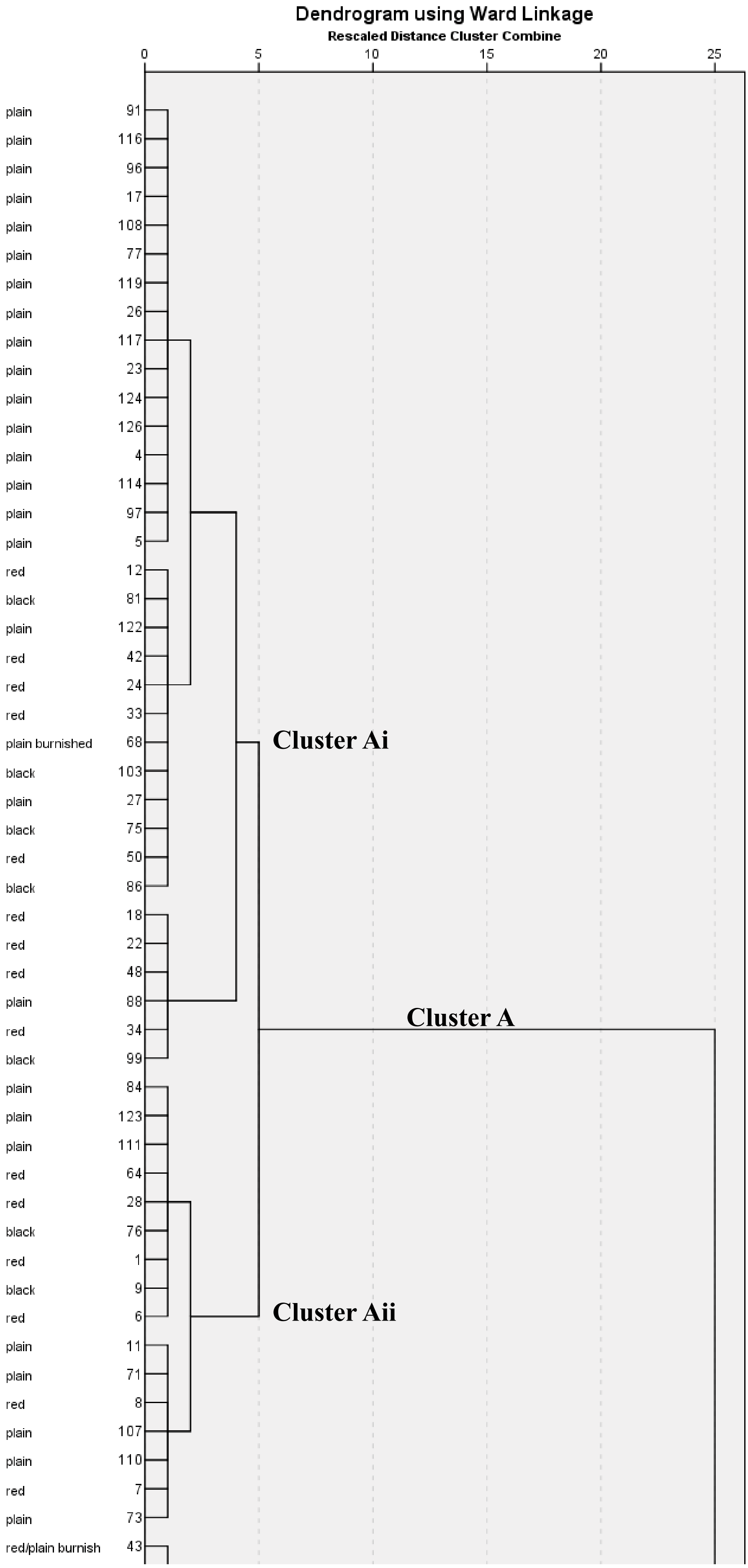


Figure. 6.9: Dendrogram. See p. 92 for full caption.

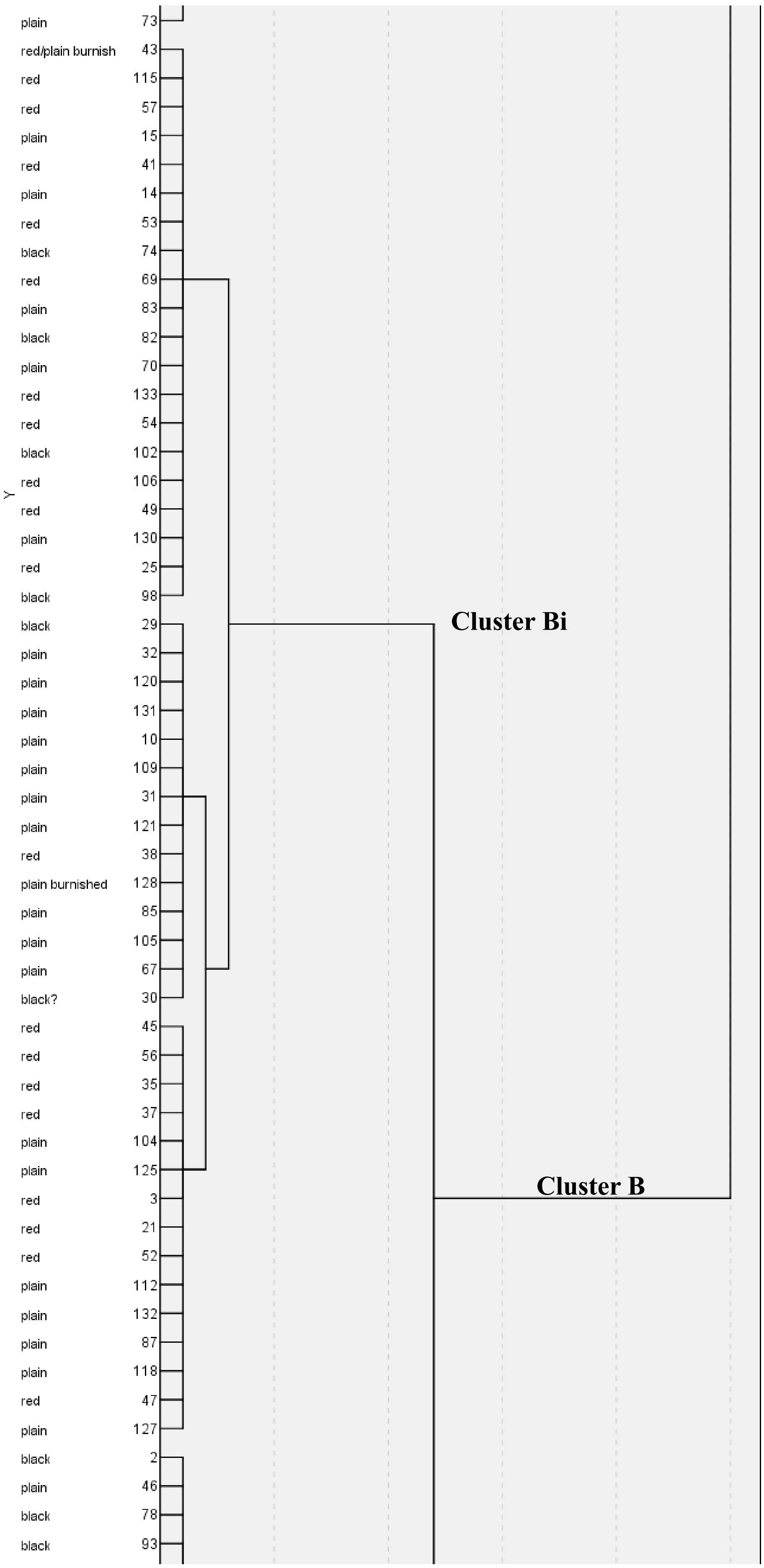


Figure. 6.9 Dendrogram. See p. 92 for full caption.

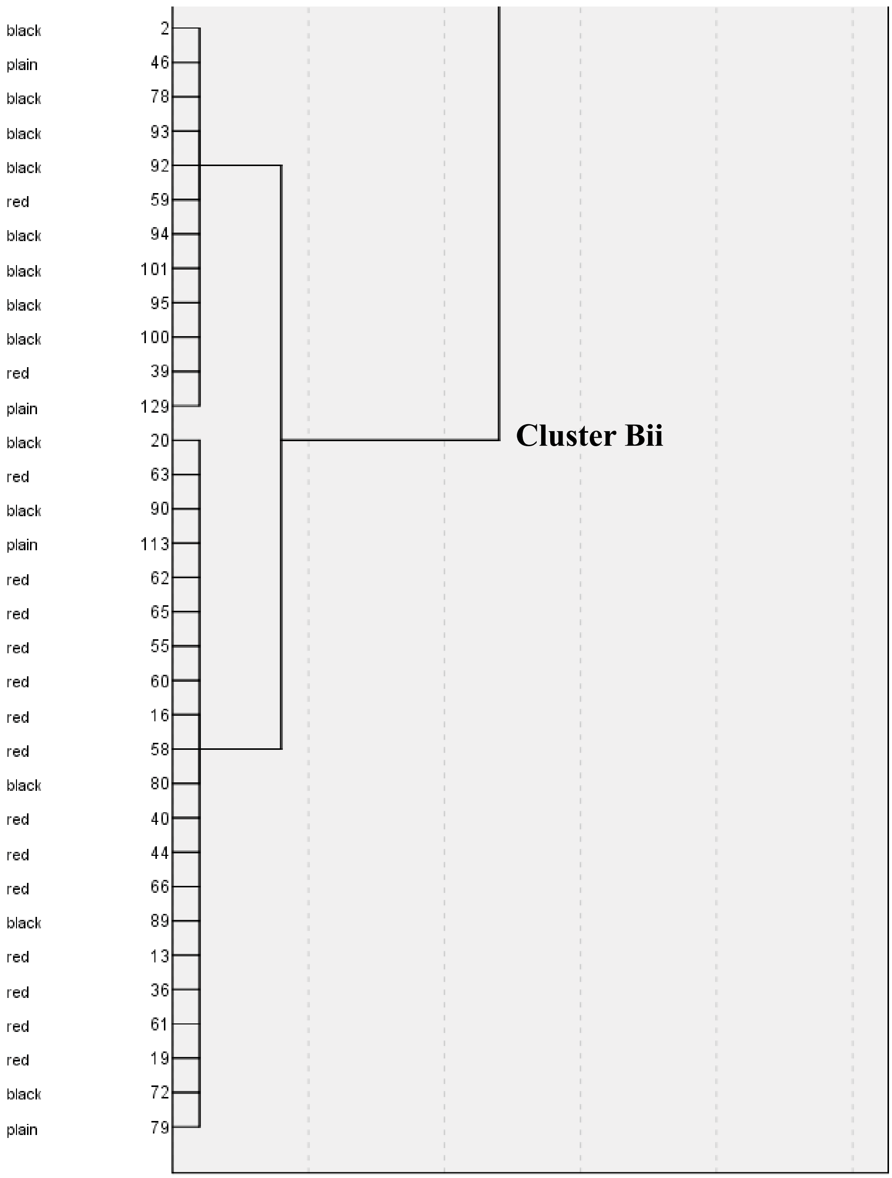


Figure. 6.9: Dendrogram in sections with short overlap at the bottom and top of each page. Sherd colours and Laboratory Numbers are on the Y axis. See Appendix 1 for correspondence with Sherd ID Numbers. There are two major (Level 1) clusters, one (Cluster A) ending at Laboratory Number 73 (Sherd ID BB4) on page 90 and the other (Cluster B) larger cluster on pages 91–92. Each Level 1 cluster has two Level 2 clusters (Ai, Aii, Bi, Bii) (see Table 5.4). There are several lower level clusters. (Note that sherd Laboratory Number 51 was inadvertently excluded from the dendrogram.)

Table 6.1:

Results of hierarchical clustering showing the two level clusters. Lab. nos groupings in brackets refer to the Y axis on Fig. 5.14.

Level 1 Cluster (Lab. nos)	**Colour**	**Number**	**%**
A (91–73)	Red	15	30
	Black	7	14
	Plain	28	56
B (43–79)	Red	36	44
	Black	19	23
	Plain	27	33

Level 2 Cluster (Lab. nos)	**Colour**	**Number**	**%**
Ai (91–99)	Red	9	26
	Black	5	15
	Plain	20	59
Aii (84–73)	Red	6	38
	Black	2	13
	Plain	8	50
Bi (43–127)	Red	20	45
	Black	6	12
	Plain	23	43
Bii (2–79)	Red	16	48
	Black	13	39
	Plain	4	12

The small sample size of the black-coloured sherds makes it difficult to see a pattern in the bivariate scatterplots. However, the histograms based on the figures in Table 6.1 show that the distributions of the black-coloured and the red-coloured sherds are very similar (Table 6.1, Figs 6.10–6.12).

In Table 6.1 (see also Figs 6.11 & 6.12) the Level 2 clusters show that the separation of red-coloured and plain sherds is driven mainly by clusters Ai (34 sherds) and Bii (33 sherds). In

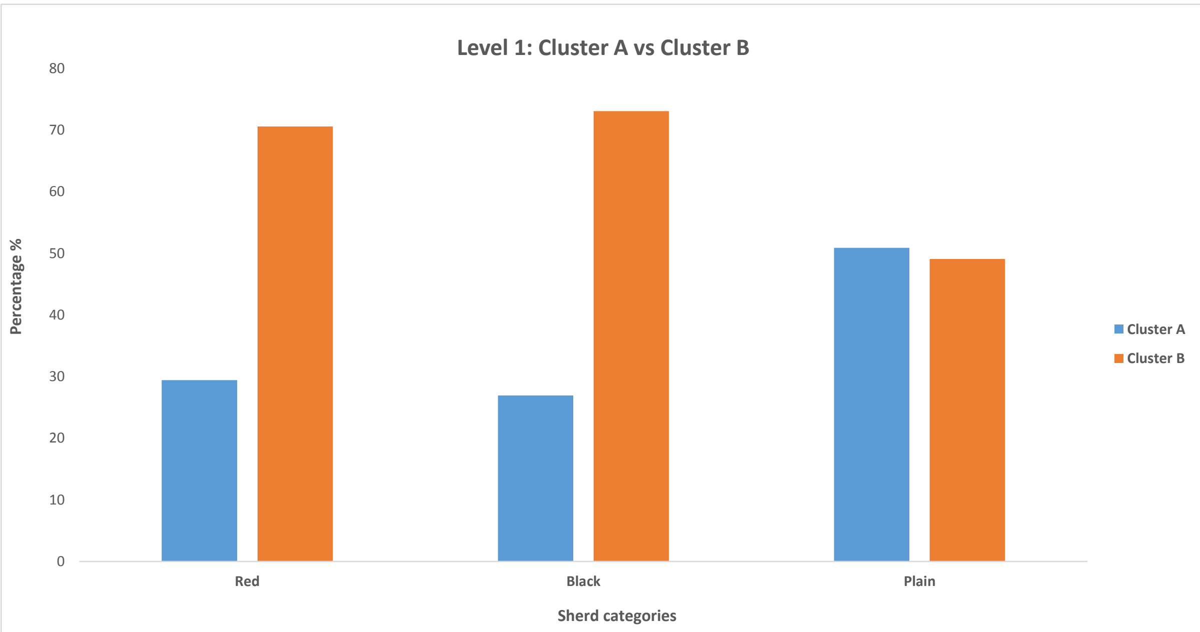


Figure 6.10: Proportion of sherds in the three colour categories across Clusters A and B.

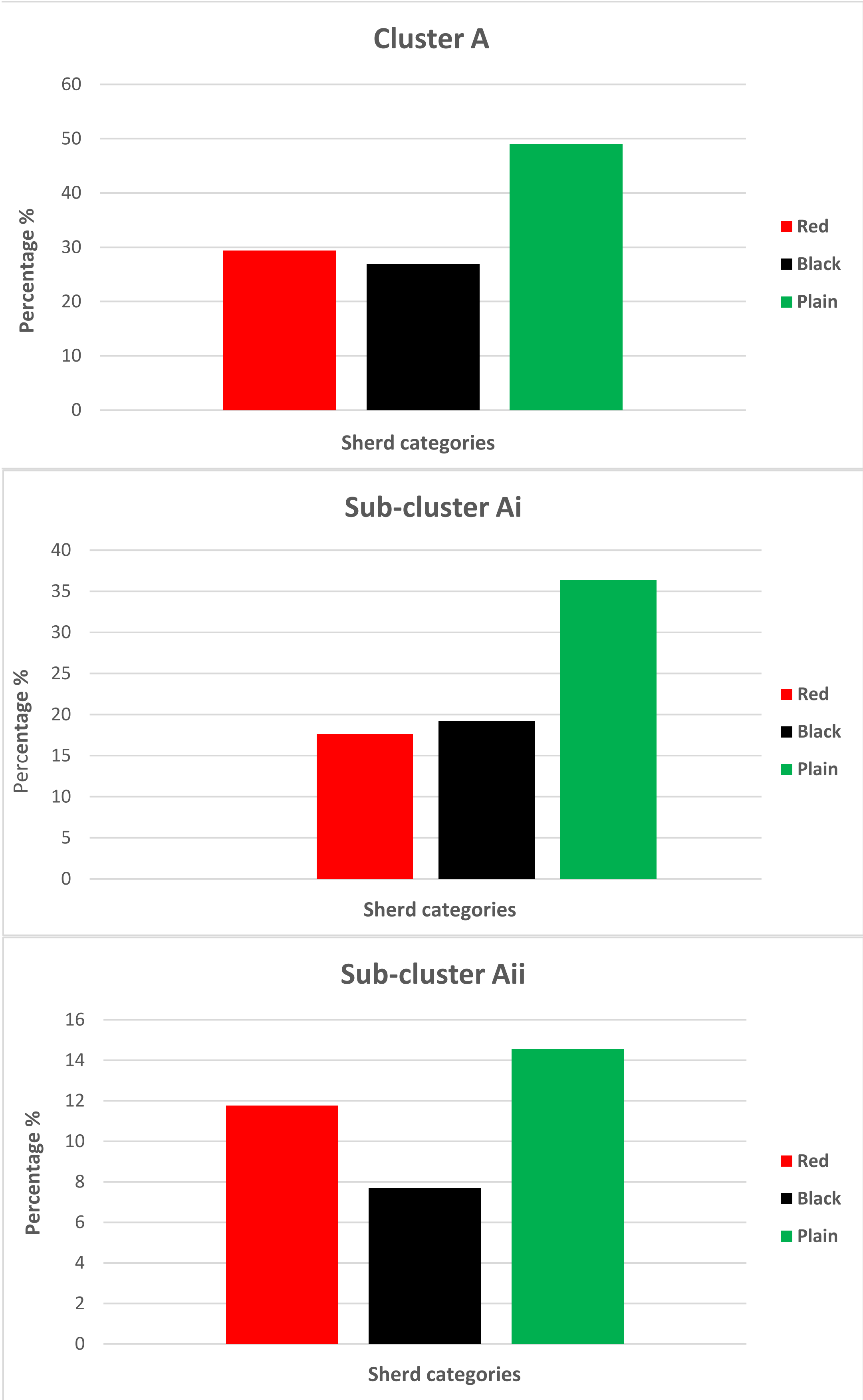


Figure 6.11: Proportion of sherds in three colour categories across Level 1: Cluster A and Level 2: Sub-clusters Ai & Aii.

Figure 6.12: Proportion of sherds in three colour categories across Level 1: Cluster B and Level 2: Sub-clusters Bi & Bii.

Cluster Ai, there is a relatively high percentage of plain sherds (59%) and a low percentage of red-coloured sherds (26%). In contrast, there is a very low percentage of plain sherds (12%) in Cluster Bii with a relatively high percentage of red-coloured sherds (48%). The black-coloured sherds are also high in the Bii subgroup, accounting for 39%. Black-coloured sherds have low percentages in the other three Level 2 clusters. Cluster Aii also shows some separation of the plain sherds and the red-coloured sherds, but there are only 16 sherds in this cluster so the pattern is weak. The dendrogram shows several lower level cluster but the sherds counts are too low for any useful analysis.

Testing with conventional XRF and XRD

XRF

Table 6.2 shows the conventional XRF results for the 12 sherds analysed. The XRF sample includes three of the outlier sherds identified on the scatterplots (Figs 6.1 to 6.8). These are BB030, RB131 and RB133. BB030 (black-coloured) is the strongest outlier from the pXRF analysis. It is high in aluminium (Al), iron (Fe) and vanadium (V), and low in strontium (Sr) in both the pXRF and XRF results. RB133 has low silicon (Si) content in both the pXRF and XRF results. RB131 has the highest vanadium (V) content in both the pXRF and XRF results. This correlation in the pXRF and XRF results suggests that the pXRF analysis adequately captures the chemistry of the sherds.

XRD

Table 6.3 shows the XRD results for 11 of the 12 sherds analysed (sherd BB032 was left out of the results). The same four minerals are present in all the sherds and they are all fairly similar. Sherd BB030 has the second highest weight percentage of quartz (SiO), but it had low Si results from the pXRF and XRF analyses. It is difficult to say more without testing of clays at Mgoduyanuka.

Using the Mann-Whitney U test for the conventional XRF and XRD results

Both the XRD and XRF results showed no significant differences between the red-coloured pots and the black-coloured pots (Table 6.2). For statistic results, I used the Mann-Whitney U test to see if indeed there is no significant difference between these two groups of sherds (meaning that all the sherds are derived from the same clay source). I tested the confidence interval at 95%:

Table 6.2:

XRF data for all detected elements between flourine (F) and uranium (U) expressed as percentages of their oxides. LOI equals Loss on Ignition and represents the organic content in the sherds.

	STANDARD		**BB027**	**BB030**	**BB031**	**BB032**	**PP002**	**PP011**	**RB007**	**RB028**	**RB029**	**RB131**	**RB133**	**RB134**
	BHVO-1 STD	**BHVO-1 Analysed**	plain	black	black	black	plain	plain	red	red	red	red	red	red
SiO_2	**49.94**	48.17	62.53	59.56	68.41	66.45	59.95	65.52	67.67	63.25	61.11	67.05	55.17	67.62
Al_2O_3	**13.8**	17.33	15.97	21.58	12.89	12.98	16.36	15.16	15.56	16.68	17.45	15.35	20.53	14.94
MgO	**7.23**	5.96	1.12	1.07	0.90	0.98	1.40	1.07	1.01	0.97	0.73	1.14	1.08	0.78
Na_2O	**2.26**	2.94	1.11	0.32	1.06	0.92	0.87	0.81	0.95	0.77	0.42	1.03	0.36	0.57
P_2O_5	**0.273**	0.31	0.23	0.23	0.17	0.35	0.19	0.23	0.18	0.57	0.70	0.26	0.31	0.27
Fe_2O_3	**12.23**	10.98	6.41	10.72	5.54	5.01	7.66	7.34	6.73	6.06	6.51	6.05	9.58	5.57
K_2O	**0.52**	0.57	2.67	1.46	2.59	2.58	2.48	2.22	2.28	2.34	1.94	2.15	2.32	2.66
CaO	**11.4**	10.82	0.88	0.89	0.80	0.95	0.99	0.95	0.88	1.14	1.16	1.14	1.27	0.84
TiO_2	**2.71**	2.50	0.66	1.11	0.63	0.62	0.80	0.73	0.72	0.76	0.81	0.70	0.73	0.71
V_2O_5	**0.0566**	0.06	0.02	0.04	0.01	0.02	0.03	0.03	0.02	0.02	0.03	0.04	0.03	0.02
Cr_2O_3	**0.0422**	0.04	0.04	0.04	0.07	0.08	0.04	0.10	0.04	0.05	0.04	0.03	0.06	0.02
MnO	**0.168**	0.17	0.07	0.08	0.03	0.03	0.05	0.03	0.04	0.06	0.02	0.03	0.04	0.04
NiO	**0.0154**	0.01	0.01	0.01	0.02	0.03	0.01	0.05	0.01	0.02	0.01	0.01	0.02	0.01
CuO	**0.017**	0.02	0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01
ZrO_2	**0.0242**	0.02	0.09	0.08	0.10	0.11	0.08	0.10	0.11	0.12	0.10	0.12	0.07	0.13
Co_3O_4	**-**	0.02	0.01	0.02	0.02	0.05	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01
WO_3	**-**	-	0.03	0.06	0.07	0.24	<0.01	0.03	0.06	0.03	0.02	0.05	0.01	0.05
SrO	**-**	0.04	0.03	0.01	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.02	0.02
Rb_2O	**-**	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Nb_2O_5	**-**	-	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02
BaO	**-**	-	0.42	0.28	0.31	0.40	0.30	0.26	0.37	0.36	0.32	0.33	0.39	0.41
Cs_2O			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.13	0.14
LOI	**-**	-	7.59	2.35	6.30	8.07	8.68	5.24	3.23	6.70	8.54	4.37	7.78	5.08
TOTAL	**100.69**	**99.96**	**99.94**	**99.95**	**99.97**	**99.93**	**99.94**	**99.93**	**99.93**	**99.95**	**99.96**	**99.92**	**99.95**	**99.92**

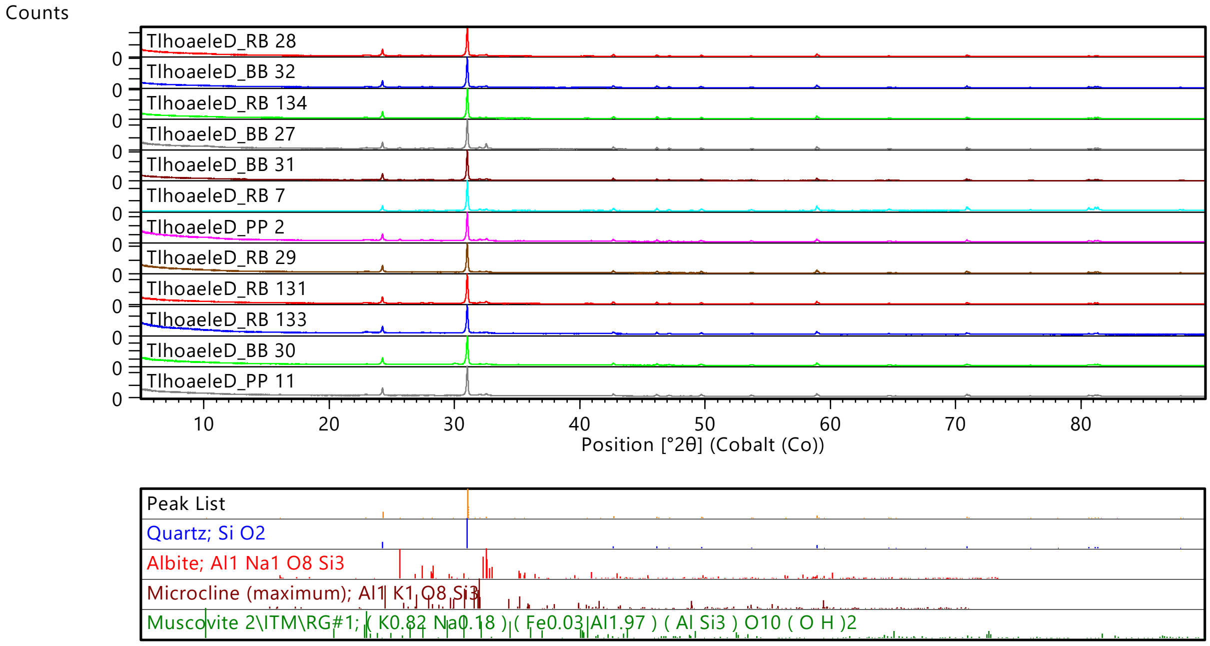


Figure 6.13: XRD diffractogram of all 12 sherds analysed using XRD and XRF machines.

Table 6.3:
Quantitative XRD results. Note: BB032 was inadvertently left out of the analyses.

	BB027	**BB030**	**BB031**	**PP002**	**PP011**	**RB007**	**RB028**	**RB029**	**RB131**	**RB133**	**RB134**
Colour	plain	black	black	plain	plain	red	red	red	red	red	red
	wt%	wt%	wt%	wt%	wt%	wt%	wt%	wt%	wt%	wt%	wt%
Microcline	9.35	11.55	10.86	13.12	12.35	13.53	11.92	11.92	10.95	10.58	8.68
Muscovite	11.06	5.69	3.31	9.71	5.26	2.72	9.02	9.02	5.46	9.42	5.92
Plagioclase	21.91	9.08	16.85	21.4	16.6	17.3	16.32	16.32	20.37	13.35	9.28
Quartz	57.68	73.68	68.99	55.77	65.79	66.45	62.73	62.73	63.22	66.65	76.11

$$U = NM + \frac{N(N+1)}{2} - \sum_{x_i}^{a} xaRank(b)$$

Equation 1: Mann-Whitney U test equation

The test was a two-tailed test with a significance level of 0.05. The results from the Mann-Whitney U test accepted the null hypothesis that there is no significant difference between the red-coloured sherds and the black-coloured sherds (Fig. 6.14, Table 6.2). All the samples resulted in a Z score = −0.18222 and a p-value = 0.86, meaning that the p-value is >0.05. Statistically, this means there was no difference observed between the sherds analysed.

CLOSING REMARKS

The visual representations of the pXRF results (Figs 6.1–6.8) show an overlap of the three sherd categories, although some separation of the red-coloured sherds and the plain sherds is obvious. The hierarchical clustering (Fig. 6.9) shows two main clusters, each with two sub-clusters. Each cluster and sub-cluster contains sherds of all three sherd categories (Table 6.1), indicating significant overlap across three sherd categories. Nevertheless, the distribution of red, black and plain sherds across the clusters shows some separation between the coloured sherds and the plain sherds (Figs 6.10–6.12).

The results of the XRF analysis seems to match the results of the pXRF analysis (Table 6.2). Lastly, the XRD results are not conclusive enough to draw anything from them, but not limiting, which I discuss in Chapter 7.

7
Discussion and Conclusion

DISCUSSION

In this final chapter, I draw on information gathered from ethnographic accounts and my interviews with the Magwaza potters and other Zulu native speakers in KwaZulu-Natal province. I also draw on the archaeometric analyses conducted to interpret the high incidence of red-coloured sherds found at Mgoduyanuka. I use the information gathered to add to discussions on the social lifeways of Mgoduyanuka and its residents through their ceramic assemblage. Though the results yielded by XRD showed no significant mineral variation in the clay fabrics of the Mgoduyanuka assemblages, the pXRF results show that there was certainly elemental variation across the clay fabrics. The conventional XRF results show some support for the reliability of the pXRF results. Therefore, my discussion focuses largely on the results yielded by pXRF.

My initial hypothesis proposed that the black-coloured pots and the plain pots would be made from clay soils found at or close to the homestead because (1) black pots are preferred by homestead ancestors and (2) plain pots are probably all cooking or brewing vessels. Therefore, the pots should be made with material that is within the ambit of the homestead. In the Mgoduyanuka context, the consequence of this hypothesis is that the clay sources are derived from the weathered dolerite rocks found at the site.

By contrast, I hypothesized that the red-coloured pots were brought in by young wives marrying into their new family. As Ngubane (1977: 66) states, the bride and her mother-in-law are the two people who have ‘travelled a long journey’. From the ethnographic account, outlined in Chapter 2, I draw on the main ideas that will aid me in the discussions of this chapter of archaeological data and the archaeometric results.

- Firstly, the red-coloured pots are the least favoured pots by the homestead ancestors because of the ambiguity of the colour red. The colour red is of importance regarding fertility, growth and protection; at the same time it has the ability to be dangerous, and destroy (attract lightning) and affect fertility (i.e., affects the growth of the family lineage). Therefore, 'red-coloured things', including outsiders such as brides, are treated with caution by the ancestors of the homestead. This is why a wife is not allowed to enter the cattle-pen of the homeastead until she reaches menopause.
- Secondly, the ethnography tells us that the black-coloured pots are highly favoured by the homestead's ancestors, because the colour black is 'cool' and shaded.

Red is a colour of transition and ambiguity. In the daily cycle, red sky marks the transition from the darkness of night to the lightness of day, but also the reverse, from day to night. In medicine, treatment with red medicines is commonly preceded by treatment with black medicines and always followed by treatment with white medicines. Black medicines tackle the worst causes of ill health and encourage their expulsion from the patient. Red medicines continue and complete the task. Like black medicines, red medicines are cooked and hot. White medicines are never cooked and are cool. They return the patient to health (Ngubane 1977).

In people, red is associated with female fertility and menstruation. A woman's fertility comes from her father's ancestors and menstruation represents their work. For this reason, menstruation in a wife is regarded as dangerous (polluting) to her husband and her husband's things. However, at the same time, the husband's ancestors work with the wife's blood to form the child in her womb (Berglund 1976; Ngubane 1977). Therefore, red (blood) is ambiguous in this context too: it presents the threat of outsiders/strangers within the intimacy of the *umuzi* but is at the same time essential for the production of children.

The only reason a foreign colour would be accepted is when it is brought in by someone outside of the family, being formally introduced to the family. If the hypothesis is valid and clay sources vary sufficiently across the marriage catchment area, then the red-coloured pots should separate from the plain and the black-coloured pots in my analysis. However, the results from the pXRF do not show the expected pattern.

Archaeological analytics: through the analysis of pXRF and XRD

pXRF results on Mgoduyanuka sherds

pXRF detects the elemental composition of the clay fabrics. Elementally, Mg and Fe are significant in separating the sherds into clusters. Mg levels in 66 sherds are less than the average of the Mg results (i.e., less than the average of the Mg geomeans; Appendix 3). Forty (61%) of the 66 sherds are red-coloured sherds, 13 (20%) are black-coloured and 12 (18%) are plain sherds. One sherd (<2%) has both red and black colouring. In terms of the colour categories in the whole sample, 74% of the red-coloured sherds have below average Mg, 50% of the black-coloured sherds have below average Mg and only 23% of the plain sherds have below average Mg.

Fe levels in 67 sherds are less than the average of the Fe results (i.e., less than the average of the Fe geomeans; Appendix 3). Thirty-eight (57%) of the 67 sherds are red-coloured sherds, 21 (31%) are black-coloured and 8 (12%) are plain sherds. In terms of the colour categories in the whole sample, 70% of the red-coloured sherds have below average Fe, 81% of the black-coloured sherds have below average Fe and only 15% of the plain sherds have below average Fe. The Fe result for the single sherd with red and black colouring is slightly above average.

For the trace elements V, Cr, and Ti, the pattern is similar with larger portion of red- and black-coloured sherds below average. The one sherd with the red and black colouring is above average with all three trace elements.

How do the pXRF results relate to the fabric and vessel wall thickness?

Red-coloured sherds have low levels of Mg and Fe. As mentioned in Chapter 5, 74% of the red-coloured sherds have a reddish- to buff-brown, fine-grained fabric with small quartz inclusions. Only 11% of red-coloured sherds have a dark (black) fabric that is coarse-grained and has a sandy texture (Fig. 5.4). Maggs (1976: 87) observed that sherds made from clays of the Beaufort Group are sandy in texture. The Beaufort Group covers a large portion of the Karoo Basin regions east and northeast of the Drakensberg escarpment.

According to the potters that Kent Fowler interviewed, red clays are not as strong compared to the dark clays (Fowler 2008). The red clays have low plasticity and break easily after being fired. For that reason, modern potters usually use temper (sandy soils) or mix the red clays with the black (dark) clays (Fowler 2008: 486). Dark clays are organic rich, giving them a high plasticity and strong clay material (Fowler 2008). However, the Loss on Ignition figures from the conventional XRF analysis are low (Table 6.2), which suggest that either the clay did not contain a lot of organic material, or some organic material got burnt out during the firing process.

The fabric of 88% of the plain sherds is coarse-grained and the colour is pale greyish. The pXRF results show that the majority of plain sherds have a high levels (above average) of Mg (77% of plain sherds) and Fe (85% of plain sherds). On the other hand, black-coloured sherds have a mixed profile as 73% have a coarse fabric and an even distribution for Mg levels, but most have low levels of Fe.

Sherd thicknesses group red- and black-coloured more closely relative to plain sherds. The plain sherds are generally thicker (Fig. 5.3). This difference suggests that the plain sherds come from larger vessels. Their generally coarser fabric mixed for strength points to the same conclusion.

XRD results on Mgoduyanuka sherds

The analysed samples did not swell when treated with heat, showing that they do not have smectite minerals in them. Smectite minerals expand by taking up water or organic molecules between their structural layers (Deer et al. 1992: 369). Therefore, soils composed of smectites, such as vertisols, will only swell or expand because of their composition of smectite minerals (Dlamini 2015).

In contrast, soils composed of illite minerals also do not swell or expand. Both illite and smectite minerals are clay minerals structurally related to micas (Deer et al. 1992: 363). These two minerals both contain potassium (K). The distinguishing factors are their expansion or swelling potential and concentration of K. According to Deer et al. (1992: 363), illites contain high concentrations of Si and low concentrations of K. They further mention that if K is not lost, then illite rather than kaolinite is likely to form (Deer et al. 1992: 362). All the samples I analysed with pXRF had K (see Appendix 3). The K detected in the assemblage was possibly formed during alteration of illite minerals, i.e., alteration of micas, feldspars (Deer et al. 1992: 355, 361). The K detected in the Mgoduyanuka ceramics might come from either of the two feldspar minerals, potassium feldspar or microcline ($KAlS_3O_8$). Alternatively, K could come from the mica group of minerals, particularly muscovite

($KAl_2(AlSi_3O_{10})(F,OH)_2$. The XRD results (Fig. 6.13, Table 6.3) show that microcline and muscovite were sources of K.

The XRD analysis also detected plagioclase which is a feldspar mineral high in aluminium (Al) found mostly in mafic igneous rocks. Geologically, igneous rocks can be grouped either by their Mg-Fe content or by their silica and feldspar content. Igneous rocks with a higher silica and feldspar content are referred to as felsic. Felsic rocks are rich in elements that form quartz and feldspar. Igneous rocks with higher Mg-Fe content are known as mafic or ultramafic. Felsic rocks are pale in colour because of the high concentration of feldspar and silica (quartz), and are rich in Si and Al. It should be noted that, elementally, all clay artefacts contain Si and Al; what is of significance is the concentration of these components within the clay sample. Mafic or ultramafic rocks are dark in colour because of the high concentration of olivine or pyroxene minerals. Both these minerals are rich in Mg and Fe. Based on the results yielded of my pXRF analysis, I suggest that the clay used for the majority of plain sherds in my sample were made from dolerite-derived clay soils.

The geological landscape of Mgoduyanuka has many dolerite outcrops, so much so that the cattle-pens are built using these rocks. Dolerite is a mafic igneous rock. Its essential minerals are pyroxene and plagioclase-feldspar, comprising more than 60% of the rock. Other minerals are quartz, magnetite, orthoclase-feldspar and chlorite (Sloane 1991).

According to Deer et al. (1992:143, 432), plagioclase-feldspar and pyroxene groups occur as stable phases in almost every igneous rock and most metamorphic rocks. Both these minerals are highly susceptible to weathering, especially the pyroxene due to the presence of iron (which is susceptible to weathering processes) (Deer et al. 1992). There are three major subgroups of pyroxene:

1. orthopyroxene (magnesium-iron pyroxenes, $(Mg,Fe)SiO_3$) also known as enstatite-ferrosilite (Coetzee 1976; Deer et al. 1992: 143)
2. calcium-pyroxene clinopyroxene (monoclinic) ($CaMgSi_2O_6$–$CaFeSi_2O_6$–$Mg_2Si_2O_6$–$Fe_2Si_2O_6$)
3. sodium pyroxenes ($NaAlSi_2O_6$) (Deer et al. 1992: 143).

The chemical compositions of these three pyroxene subgroups suggest that it is possible that the pyroxene minerals within the dolerite contribute to the high levels of Mg and Fe in the plain sherds. As noted by Maggs (1982a: 91):

> The natural stratigraphy consists of a black crumbly topsoil, about 30 cm deep, grading into the dark brown soil within which the yellow fragments of weathered dolerite begin to appear. The black and brown soils are both produced from the weathering of dolerite and are very plastic when wet.

Maggs's observation and the results yielded from the pXRF support the notion that the plain sherds were largely made with clays derived from dolerite. The red-coloured sherds, with predominantly low levels of Mg and Fe, and the black-coloured sherds, with predominantly low levels of Fe and an even distribution for Mg, were possibly made with clays not derived from dolerite.

Interpreting the archaeological data of Mgoduyanuka ceramic assemblage

The archaeometric results do not support the initial hypothesis. Firstly, the three colour categories of sherds overlap to some extent, suggesting that they possibly shared the same clay sources. Secondly, the black-coloured sherds differ to some extent from the plain sherds and have some overlap with the red-coloured sherds. Elementally, they cluster more closely with the red-coloured sherds although they are not exactly the same. In sherd thickness, the red- and black-coloured also cluster and separate from the plain sherds. In fabric, the black-coloured and plain sherds cluster more closely than to the red-coloured sherds.

How can the results be explained? There are three possibilities. Firstly, the Mgoduyanuka potters might have made all the pots from local clay, deliberately adding extra dolerite-derived materials in clays for larger cooking and brewing vessels. Secondly, some of the coloured vessels, both red- and black-coloured, were brought into Mgoduyanuka through marital exchanges and gifting ceremonies. This possibility is a less specific variation of my initial hypothesis. Thirdly, a combination of both hypotheses could apply. Further work on clay samples in the Mgoduyanuka area might supply data to help decide between these hypotheses.

Some points about the three categories of vessels are worth thinking about. Zulu ethnography shows that plain pots are usually vessels used for cooking, storing and brewing. Plain pots differ in size: some are medium sized, and some are large. The large pots such as *imbiza* were possibly used for storing and brewing beer, which today are still used for storing and brewing beer (Krige 1965; Armstrong 2008). The medium sized pots were possibly used for cooking, transporting and serving food. Ethnography tells us that the plain pots are usually used only in the main hut and rarely seen by visitors (Lawton 1967; Armstrong 2008). Based on ethnography, regarding the plain pots, it might have been a similar case with Mgoduyanuka inhabitants.

Abundance of red-coloured pots vs black-coloured pots

The question is why are there so many red-coloured pots at Mgoduyanuka compared to the black-coloured pots, if black-coloured pots are preferred by the ancestors of the homestead? Given the information in Chapter 2, it is possible that the coloured pots (red and black) at Mgoduyanuka were mostly used for serving, eating, drinking and medicinal purposes. However, I believe that there is a deeper symbolic meaning of the red-coloured pots and their significance to the ancestral world, and this has to do with the fertility of women. I believe that in order to support the potential of a woman's fertility prior to giving birth, some red-coloured vessels (but not necessarily all) were given by her natal family to their in-laws. In principle, these red-coloured vessels symbolise the potential of the bride to enhance her husband's *umuzi*. Therefore, red-coloured pots at the site could possibly be indicative of marriage alliances by the Zizi and their neighbours.

Zulu ethnography indicates that the ancestors of the homestead favour the black beer vessels because they provide shade and coolness (Armstrong et al. 2008; Perrill 2012; Magwaza pers. comm. 2019; 2021). The world of the ancestors is the reverse of the living, so what is dark here is light there.

The reasons as to why there are fewer black-coloured pots at the site might be due to several factors. One of the factors would be a change of 'kitchen' culture whereby women used basketry and gourds as their everyday utensils. In the past women might have used gourds and basketry the way black-coloured pots are used today. Records show that in the early nineteenth century, Zulu people preferred to use baskets and gourds vessels as their everyday utensils (Jolles 2005). Gourd vessels served a similar purpose to black-coloured pots today. They were used as drinking vessels and for the transportation of water. The information, provided by Jolles (2005), possibly gives us a hint as to why there are relatively few black-coloured pots and a high abundance of red-coloured pots at Mgoduyanuka. Unfortunately, basketry and gourds preserve poorly in archaeological sites and, therefore, it becomes difficult to gather evidence to support statements made by Jolles (2005).

In summary, the cluster of red-coloured sherds and some of the black-coloured sherds represents the interactions that Mgoduyanuka inhabitants made with their surrounding neighbours. The cluster of the plain sherds and some of the fewer black-coloured sherds represents activities performed daily by the inhabitants of Mgoduyanuka. These vessels (plain pots) account for 67% of the assemblage.

CONCLUSION

The initial hypothesis was rejected. It failed probably because it was too specific about meaning of red-coloured pots. Although, the initial hypothesis was rejected, I offered alternative hypotheses. One way to test these new hypotheses is testing clay samples from the study site and surrounding areas.

This project has taught me that, if you are doing archaeometric analysis, in order to understand the social interactions that took place in the past and answer questions holistically and see the patterns fully, the sample size should be large. Analysing a larger sample size aids in getting comprehensive and conclusive information. This was evident from the pXRF data. Had the same the sample size analysed with pXRF, also been analysed with XRD and conventional XRF the results from these two techniques could have yielded results as interesting as those of pXRF. However, due to financial constraints, it was not possible and only 12 samples were chosen for the XRD and XRF. Furthermore, other viable archaeometric techniques, such as petrographic studies, Scanning Electron Microscope (SEM) and the Fourier-transform Infrared Spectroscopy (FTIR), could not be deployed.

Nonetheless, I am satisfied with the results yielded by these three techniques. They allowed me to obtain a glimpse of how past communities along the upper Thukela lived their lives. I believe this research will add to the discussions and understanding of the lifeways of the Late Iron Age communities in KwaZulu-Natal.

References and Sources

REFERENCES

Armstrong, J. 2008. Ceremonial beer pots and their uses. In B. Carton, J. Laband & J. Sithole (eds), *Zulu Identities: Being Zulu, past and present*. Pietermaritzburg: University of KwaZulu-Natal Press.

Armstrong, J., Whitelaw, G. & Reusch, D. 2008. Pots that talk: *izikhamba ezikhulumayo*. *Southern African Humanities* **20**: 513–48.

Aschwanden, H. 1982. *Symbols of life: an analysis of the consciousness of the Karanga*. Gweru: Mambo Press.

Bandama, F. 2013. *The archaeology and technology of metal production in the Late Iron Age of the Southern Waterberg, Limpopo Province, South Africa*. Doctoral thesis. Cape Town: University of Cape Town.

Badenhorst, S. 2010. Descent of Iron Age farmers in southern Africa during the last 2000 years. *African Archaeological Review* **27**(2): 87–106.

Ballard, C. 1989. Traders, trekkers and colonists. In A. Duminy & B. Guest (eds), *Natal and Zululand from earliest times to 1910: a new history.* Pietermaritzburg: University of Natal Press and Shuter & Shooter, pp. 116–45.

Bell, B. & Clark, B. (eds). 2014. *For Juliet: ceramic sculptor 1950–2012*. Pietermaritzburg: Tatham Art Gallery.

Berglund, A.-I. 1976. *Zulu thought-patterns and symbolism*. Uppsala: Swedish Institute of Missionary Research.

Bostoen, K. 2007. Pots, words and the Bantu problem: on lexical reconstruction and early African history. *Journal of African History* **48**(2): 173–99.

Boulle, G.J. & Peisach, M. 1977. Characterisation of South West African potsherds by neutron activation analysis of trace elements. *Journal of Radioanalytical Chemistry* **39**: 33–44.

Braatvedt, H.P. 1927. Zulu marriage customs and ceremonies. *South African Journal of Science* **24**: 553–65.

Bryant, A.T. 1905. *A Zulu-English dictionary, with notes on pronunciation a revised orthography.* Pinetown: Marian Hill Mission Press.

Bryant, A.T. 1929. *Olden times in Zululand and Natal*. London: Longmans, Green & Co.

Bryant, A.T. 1966. *Zulu medicine and medicine-men*. Cape Town: C. Struik.

Bryant, A.T. 1967. *Zulu people as they were before the white man came*. Pietermaritzburg: Shuter & Shooter.

Buss, J. 2018. *From homestead to roadside to gallery: the social life of late twentieth century and early twenty-first century Zulu ceramics*. Master's dissertation. Cape Town: University of Western Cape.

Coetzee, C.B. (ed.). 1976. *Mineral resources of the Republic of South Africa*. Handbook 7. Fifth edition. Pretoria: Department of Mines, Geological Survey.

David, N., Sterner, J. & Gavua, K. 1988. Why are pots decorated. *Current Anthropology* **29**(3): 365–89.

Davies, O. 1971. Excavations at Blackburn. *South African Archaeological Bulletin* **26**(103/104): 165–78.

Deer, W.A., Howie, R.A. & Zussman, J. 1992. *An introduction to the rock-forming minerals*. 2nd edition. Harlow: Pearson Education Ltd.

Delius, P. & Schoeman, M.H. 2008. Revisiting Bokoni: populating the stone ruins of the Mpumalanga escarpment. In N. Swanepoel, A. Esterhuysen & P. Bonner (eds), *Five hundred years rediscovered: southern African precedents and prospects*. 500 Year Initiative 2007 conference proceedings. Johannesburg: Wits University Press, pp. 135–67.

Denbow, J.R. 1982. *The Toutswe Tradition: a study in socio-economic change*. In R.R. Hitchcock & M.R. Smith (eds), *Settlement in Botswana: the historical development of a human landscape.* Johannesburg: Heinemann Educational Books and the Botswana Society, pp. 73–86.

Diskin, S. & Ashley, C. 2016. Characterisation of archaeological ceramics from the Khwebe Hills of northern Botswana. *Journal of Archaeological Science: Reports* **6**: 574–583.

Dlamini, N.J. 2015. *Detection of expansive soils using remote sensing in Brits, North-West Province, South Africa.* Master's dissertation. Pretoria: University of Pretoria.

De Bruyn, C. 2014. An archaeological investigation in the Masebe Nature Reserve, Limpopo Province. *Digging Stick* **31**(1): 9–11.

Dent, G.R. & Nyembezi, C.L.S. 1969. *Scholar's Zulu dictionary: English-Zulu: Zulu-English*. Pietermaritzburg: Shuter & Shooter

Doke, C.M. & Vilakazi, B.W. 1972. *Zulu-English dictionary*. Johannesburg: Witwatersrand University Press.

Dreyer, J.J.B. 1992. The Iron Age archaeology of Doornpoort, Winburg, Orange Free State. *Navorsinge van die Nasionale Museum, Bloemfontein* **8**(7): 263–389.

Edwards, D. 1967. *A plant ecological survey of the Tugela River Basin*. Natal Town and Regional Planning Reports, Volume 10. Pietermatrizburg: Town and Regional Planning Commission.

Escott, J.B. 2011. *An investigation, using synchrotron radiation and other techniques, of the composition of San Rock-Art paints and excavated pigments from Maqonqo Shelter, and comparative paint data from three other sites in KwaZulu-Natal, South Africa*. Doctoral thesis. Pietermaritzburg: University of KwaZulu-Natal.

Esterhuysen, A. 2008. Ceramic alliances: pottery and the history of the Kekana Ndebele in the old Transvaal. In N. Swanepoel, A. Esterhuysen & P. Bonner (eds), *Five hundred years rediscovered: southern African precedents and prospects*. 500 Year Initiative 2007 conference proceedings. Johannesburg: Wits University Press, pp. 175–92.

Evers, T.M. & Huffman, T.N. 1988. On why pots are decorated the way they are. *Current Anthropology* **29**(5): 739–41.

Fey, M.V. 2010. *Soils of South Africa: their distribution, properties, classification, genesis, use and environmental significance*. Cape Town: Cambridge University Press.

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. 2011. The Zulu ceramic tradition in Msinga, South Africa. *Southern African Humanities* **23**: 173–202.

Fowler, K.D. 2015. Zulu pottery technology and group identity in the Phongolo Basin, South Africa. *Southern African Humanities* **27**: 81–111.

Gary, M., McAfee, R. & Wolf, C.L. (eds). 1973. *Glossary of Geology*. Washington, D.C.: American Geological Institute.

Gosselain, O.P. 1992. Technology and style: potters and pottery among Bafia of Cameroon. *Man* (N.S.) **27**(3): 556–586.

Gosselain, O.P. 2000. Materializing identities: an African perspective. *Journal of Archaeological Method and Theory* **7**(3): 187–217.

Guy, J. 1994. *The destruction of the Zulu Kingdom: the civil war in Zululand 1987–1884*. Pietermaritzburg: University of Natal Press.

Hall, M. 1976. Dendroclimatology, rainfall and human adaptation in the Later Iron Age of Natal and Zululand. *Annals of Natal Museum* **22**(3): 692–703.

Hall, M. & Maggs, T. 1979. Nqabeni, a Later Iron Age site in Zululand. *South African Archaeological Society Goodwin Series* **3**: 159–76.

Hall, S. 1995. Archaeological indicators for stress in the Western Transvaal Region between the seventeenth and nineteenth centuries. In C. Hamilton (ed.), *The Mfecane aftermath: reconstructive debates in southern African history*. Johannesburg: Wits University Press and Pietermarizburg: University of Natal Press, pp. 307–321.

Hall, S., Anderson. M., Boeyens, J. & Coetzee, F. 2008. Towards an outline of the oral geography, historical identity and political economy of the late precolonial Tswana in the Rustenburg region. In N. Swanepoel, A. Esterhuysen & P. Bonner (eds), *Five hundred years rediscovered: southern African precedents and prospects*. 500 Year Initiative 2007 conference proceedings. Johannesburg: Wits University Press, pp. 55–85.

Hall, S. 2012. Identity and political centralisation in the western regions of highveld: c.1770–c.1830: an archaeological perspective. *Journal of Southern African Studies* **38**(2): 301–18.

Hamilton, C. & Hall, S. 2012. Reading across the divides: commentary on the political co-presence of disparate identities in two regions of South Africa in the late eighteenth and early nineteenth centuries. *Journal of Southern African Studies* **38**(2): 281–90.

Hammond-Tooke, W.D. 1981. *Boundaries and belief: the structure of a Sotho worldview*. Johannesburg: Wits University Press.

Hammond-Tooke, W.D. 1993. *The roots of black South Africa: an introduction to the traditional culture of the black people of South Africa*. Johannesburg: Jonathan Ball Publishers.

Havlin, L.J., Tisdale, L.S., Nelson, L.W. & Beaton, D.J. 2017. *Soil fertility and fertilizers: an introduction to nutrient management*. 8th edition. India: Pearsons Education.

Herbert, R.K. 1990. Hlonipha and the ambiguous woman. *Anthropos* **85**: 455–73.

Herbert, E.W. 1984. *Red gold of Africa: copper in precolonial history and culture*. London: The University of Wisconsin Press.

Herbert, E.W. 1993. *Iron, gender and power: rituals of transformation in African societies*. Bloomington: Indiana University Press.

Hodgskiss, T. 2012. An investigation into the properties of the ochre from Sibudu, KwaZulu-Natal, South Africa. *Southern African Humanities* **24**: 99–120.

Hogg, A.G., Heaton, T.J., Hua, Q., Palmer, J.G., Turney, C.S.M., Southon, J., Bayliss, A., Blackwell, P.G., Boswijk, G., Ramsey, C.B., Pearson, C., Petchey, F., Reimer, P., Reimer, R. & Wacker, L. 2020. SHCal20 Southern Hemisphere calibration 0–55,000 years CAL BP. *Radiocarbon* **62**(4): 759–778.

Holmgren, K., Karlén, W., Lauritzen, S.E., Lee-Thorp, J.A., Partridge, T.C., Piketh, S., Repinski, P., Stevenson, C., Svanered, O. & Tyson, P.D. 1999. A 3000-year high-resolution stalagmite-based record of palaeoclimate for northeastern South Africa. *The Holocene* **9**(3): 295–309.

Holmgren, K., Tyson, P.D., Moberg, A. & Svanered, O. 2001. A preliminary 3000-year regional temperature reconstruction for South Africa. *South African Journal of Science* **97**: 49–51.

Horwitz, L., Maggs, T. & Ward, V. 1991. Two shell middens as indicators of shellfish exploitation patterns during the first millennium AD on the Natal north coast. *Natal Museum Journal of Humanities* **3**: 1–28.

Huffman, T.N. 1972. Shona pottery from Pumula Township, Bulawayo, Rhodesia. *South African Archaeological Society* **27**(105/106): 66–81.

Huffman, T.N. 1980. Ceramics, classification and Iron Age entities. *African Studies* **39**(2): 123–74.

Huffman, T.N. 1982. Archaeology and ethnohistory of the African Iron Age. *Annual Reviews of Anthropology* **11**: 133–150.

Huffman, T.N. 1989. Ceramics, settlements and Late Iron Age migrations. *African Archaeological Review* **7**: 155–82.

Huffman, T.N. & Herbert, R.K. 1994. New perspectives on Eastern Bantu. *Azania* **29–30**: 27–36.

Huffman, T.N. 1996. Archaeological evidence for climatic change during the last 2000 years in southern Africa. *Quaternary International* **33**: 55–60.

Huffman, T.N. 2004. The archaeology of the Nguni past. *Southern African Humanities* **16**: 79–111.

Huffman, T.N. 2007. *Handbook to the Iron Age: the archaeology of pre-colonial farming societies in southern Africa*. Scottsville, Pietermaritzburg: University of KwaZulu-Natal Press.

Huffman, T.N. 2008. Climate change during the Iron Age in the Shashe-Limpopo Basin, southern Africa. *Journal of Archaeological Sciences* **35**: 2032–2047.

Huffman, T.N. 2019. Ethnoarchaeological fieldwork in Zimbabwe: people, pots, structures and scientific mementoes. *Southern African Humanities* **32**: 217–274.

Humphris., J. Martinon-Torres, M., Rehren, T. & Reid, A. 2009. Variability in single smelting episodes: a pilot study using iron slag from Uganda. *Journal of Archaeological Science* **36**: 359–69.

Isaacs, N. 1836. *Travels and adventures in Eastern Africa*, *descriptive of the Zoolus their manners, customs, etc., etc. with a sketch of Natal*. Volume 1. London: Edward Churton.

Jacobson, L., Loubser, J.H.N., Peisach, M., Pineda, C.A. & Van der Westhuizen, W. 1991. PIXE analysis of pre-European pottery from the northern Transvaal and its relevance to the distribution of ceramic styles, social interactions and change. *South African Archaeological Bulletin* **46**(153): 19–24.

Jacobson, L. 2005. *The application of compositional analysis to provenance studies of archaeological pottery in southern Africa: a geochemical perspective using XRF spectroscopy*. Doctoral thesis. Free State: University of the Free State.

Janssen, K., Vittiglio, G., Deraedt, I., Aerts, A., Vekemans, B., Vincze, L., Wei, F., Deryck, I., Schalm, O., Adams, F., Rindby, A., Knochel, A., Simionovici, A. & Snigirev, A. 2000. Use of microscopic XRF for non-destructive analysis in arts and archaeometry. *X-Ray Spectrom* **29**: 73–91.

Johnson, M.R. & Verster, P.S. J. 1994. *Die geologie van die gebied Harrismith*. Harrismith: Departement van Minerale en Energiesake.

Jolles, F. 2001. Tradition and innovation: woodcavers at the confluence of the Umzinyathi and Umngeni rivers, KwaZulu-Natal, South Africa. *Southern African Humanities* **13**(1): 97–124.

Jolles, F. 2005. The origins of the twentieth century Zulu beer vessel styles. *Southern African Humanities* **17**: 101–151.

Jolles, F. 2006. Negotiating relationships: village to city, beadwork to SMS. *Southern African Humanities* **18** (2): 119–138.

Jolles, F. 2013. Zulu ceramics in transition: Siphiwe MaS'Khakhane Nala and her daughter Nesta Nala Landeleni Nala. *South African Humanities* **25**: 1–24.

Kelloway, S. & Birmingham, J. 2010. Profiling nineteenth-century Australian potteries: approaches provenancing ceramics and identifying potting practices. *Australian Society for Historical Archaeology* **28**: 35–42.

Klein, R.G. 1986. The prehistory of Stone Age herders in the Cape province of South Africa. *South African Archaeological Society Goodwin Series* **5**: 5–12.

Klopper, S. 1991. 'Zulu' headrests and figurative carvings: the Brenthurst Collection and the art of south-east Africa. In *Art and Ambiguity: Perspectives on the Brenthurst Collection of Southern African Art*. Johannesburg: Johannesburg Art Gallery: 80–98.

Krige, J.E. 1965. *The social system of the Zulus*. Third edition. Pietermaritzburg: Shuter & Shooter.

Kuper, A. 1982. *Cattle for wives: bridewealth and marriage in southern Africa.* Routledge and Kegan Paul (Ltd).

Laband, J. & Thompson, P. 1989. The reduction of Zululand, 1878–1904. In A. Duminy and B. Guest (eds), *Natal and Zululand from earliest times to 1910: a new history.* Pietermaritzburg. University of Natal Press, pp. 193–232.

Lander, F. & Russell, T. 2015. Fat-tailed sheep and thin-walled pots: contextualising rock art and pre-agriculturist pottery within the last 3000 years in KwaZulu-Natal, South Africa. *Southern African Humanities* **27**: 113–63.

Lane, P.J. 1996. Rethinking ethnoarchaeology. In G. Pwiti & R. Soper (eds), *Aspects of African archaeology: papers from the 10th congress of the PanAfrican Association for Prehistory and Related Studies.* Harare: University of Zimbabwe Publications, pp. 727–32.

Lawton, A.G. 1967. Bantu pottery of southern Africa. *Annals of the South African Museum* **49**(1): 1–440.

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): 133–49.

Le Roux, P.A.L. & Du Preez, C.C. 2006. Nature and distribution of South African plinthic soils: conditions for occurrence of soft and hard plinthic soils. *South African Journal of Plant and Soil* **23**(2): 120–125.

Loubser, M. & Verryn, S. 2008. Combining XRF and XRD analyses and sample preparation to solve mineralogical problems. *South African Journal of Geology* **111**: 229–238.

Lye, W.F. 1967. The *Difaqane*: The *Mfecane* in the southern Sotho area, 1822–24. *Journal of African History* **8**(1): 107–13.

Maggs, T. 1976. *Iron Age communities of the southern Highveld*. Occasional Publications of the Natal Museum No.2. Pietermaritzburg: Natal Museum .

Maggs, T. 1980a. The Iron Age sequence south of Vaal and Pongolo rivers: some historical implications. *Journal of African History* **21**(1): 1–15.

Maggs, T. 1980b. Mzonjani and the beginning of the Iron Age in Natal. *Annals of the Natal Museum* **24**(1): 71–96.

Maggs, T. 1980c. Msuluzi Confluence: a seventh century Iron Age site on the Tugela. *Annals of the Natal Museum* **24**(1): 111–45.

Maggs, T. 1982a. Mgoduyanuka: terminal Iron Age settlement in the Natal grasslands. *Annals of the Natal Museum* **25**(1): 83–11.

Maggs, T. 1982b. Mabhija: pre-colonial industrial development in the Tugela Basin. *Annals of the Natal Museum* **25**(1): 123–14.

Maggs, T. 1984. Iron Age settlement and subsistence patterns in the Tugela River Basin, Natal. In M. Hall, G. Avery, D.M. Avery, M.L. Wilson & A.J.B. Humphreys (eds), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10. Oxford: BAR International Series **207**, pp.194–206.

Maggs, T. 1988. Patterns and perceptions of stone-built settlements from the Thukela Valley Late Iron Age. *Annals of the Natal Museum* **29**(2): 417–432.

Maggs, T. 1989. The Iron Age farming communities. In A, Duminy and B, Guest (eds), *Natal and Zululand from earliest times to 1910. A new history.* Pietermaritzburg: University of Natal Press, pp. 28–48.

Maggs, T. 2008. The Mpumalanga escarpment settlements: some answers, many questions. In N. Swanepoel, A. Esterhuysen & P. Bonner (eds), *Five hundred years rediscovered: southern African precedents and prospects*. 500 Year Initiative 2007 conference proceedings. Johannesburg: Wits University Press, pp. 169–180.

Maggs, T. & Widgren, M. 2023. Moxomatsi: the organisation of space in a major Bokoni settlement. *Southern African Humanities* **36**: 66–88.

Maggs, T. & Miller, D. 1995. Sandstone crucibles from Mhlopeni, KwaZulu-Natal: evidence of precolonial brassworking. *Natal Museum Journal of Humanities* **7**:1–16.

Maggs, T., Oswald, D., Hall, M. & Ruther, H. 1986. Spatial parameters of Late Iron Age settlements in upper Thukela Valley. *Annals of the Natal Museum* **27**(2): 455–79.

Mantler, M. & Schreiner, M. 2000. X-ray fluorescence spectrometry in art and archaeology. *X-Ray Spectrum* **29**: 3–17.

Mayr, F. 1906. The Zulu Kaffirs of Natal. *Anthropos* **1**(3): 453–71.

Mazel, A. 1990. Mhlwazini Cave: the excavation of Late Holocene deposits in the northern Natal Drakensberg, Natal, South Africa. *Natal Museum Journal of Humanities* **2**: 95–133

Mazel, A. 1992. Early pottery from eastern part of southern Africa. *Southern African Archaeological Bulletin* **47**(155): 3–7.

Mazel, A. 1996. Maqonqo Shelter: the excavation of Holocene deposits in the eastern Biggarsberg, Thukela Basin, South Africa. *Southern African Humanities* **8**(12): 1–39.

Moffett, A.J., Maggs, T. & Van Schalkwyk, J. 2017. Breaking ground: hoes in precolonial South Africa: typology, medium of exchange and symbolic value. *African Archaeological Review* **34**: 1–20.

Mucina, L. & Rutherford, M.C. (eds). 2006. *The vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. Pretoria: South African National Biodiversity Institute.

Ndoro, W. 1996. Towards the meaning and symbolism of archaeological pottery assemblages. In G. Pwiti & R. Soper (eds), *Aspects of African archaeology: papers from the 10th congress of the PanAfrican Association for Prehistory and Related Studies.* Harare: University of Zimbabwe Publications, pp. 773–80.

Ngubane, H. 1977. *Body and mind in Zulu medicine*. London: Academic Press (Ltd).

Paiva, F. 2015. *Fluvial facies architecture and provenance history of the Abrahamskraal-Teekloof Formation transition (Lower Beaufort Group) in the main Karoo Group*. Master's dissertation. Cape Town: University of Cape Town.

Papakosta, L., Lopez-Costas, O. & Isaksson, S. 2020. Multi-method (FTIR, XRF, PXF) analysis of Ertebølle pottery ceramics from Scania, South Sweden. *Archaeometry* **62**(4): 677–93.

Parkington, J. & Cronin M. 1979. The size and layout of Mgungundlovu 1829–1838. *Goodwin Series* **3**: 133–148.

Peisach, M., Jacobson, L., Boulle, G.L., Gihwala, D. & Underhill, L.G. 1982. PIXE analysis of archaeological material and the use of multivariate analysis for characterisation. *Nuclear Instruments and Methods in Physics Research*. **193**(1–2): 337–341.

Pentz, J.A. 1945. *An agro-ecological survey of Natal*. Department of Agriculture, Bulletin 250. Pretoria: Government Printer.

Perrill, E. 2012. *Zulu pottery*. Noordhoek: Publishing Print Matters.

Phillipson, D.W. 1977. *The later prehistory of eastern and southern Africa.* 2nd edition. London: Heinemann Educational Books Ltd.

Pollard, M., Batt, C., Stern, B. & Young, S.M.M. (eds). 2008. *Analytical chemistry in archaeology*. Cambridge: Cambridge University Press.

Preston-Whyte, E. 1974. Kinship and marriage. In W.D. Hammond-Tooke (ed.). *The Bantu-speaking peoples of southern Africa*. London: Routledge & Kegan Paul (Ltd), pp 177–210.

Punyadeera, C., Pillay, A.E., Jacobson, L. & Whitelaw, G. 1997. Application of XRF and correspondence analysis to provenance studies of coastal and inland archaeological pottery from Mngeni River area. South Africa. *X-Ray Spectrometry* **26**: 249–56.

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

Ribot, I., Morris, A.G., Sealy, J. & Maggs, T. 2010. Population history and economic change in the last 2000 years in KwaZulu-Natal, RSA. *Southern African Humanities* **22**(1): 89–112.

Robey, T. 1980. Mpambanyoni: a Late Iron Age site on the Natal south coast. *Annals of Natal Museum* **24**(1): 147–164.

Roodt, F. 1993. *'n Rekonstruksie van geelkoperbewerking by Mgungundlovu*. Unpublished Master's dissertation. Pretoria: University of Pretoria.

Rosenstein, D.D. 2008. *Sorting out ceramics: correlating change in the technology of ceramic production with the chronology of 18th and early 19th century western Batswana towns*. Master's dissertation. Cape Town: University of Cape Town.

Sadr, K. 1998. The first herders at the Cape of Good Hope. *African Archaeological Review* **15**(2): 101–132.

Sadr, K., Smith, A., Plug, I., Orton, J. & Mütti, B. 2003. Herders and foragers in Kasteelberg: interim report of excavations, 1999–2002. *South African Archaeological Bulletin* **58**(177): 27–32.

Sadr, K., Smith, A. & Sampson, C.G. 2006. Through thick and thin: early pottery in southern Africa. *Journal of African Archaeology* **4**(2): 235–252.

Sansom, B. 1974. Traditional economic systems. In W.D. Hammond-Tooke (ed.). *The Bantu-speaking peoples of southern Africa*. London: Routledge & Kegan Paul (Ltd), pp 246–283.

Shackley, M.S. 2011. An introduction to X-Ray Fluorescence (XRF) analysis in archaeology. In M.S. Shackley (ed). *X-Ray Fluorescence Spectrometry (XRF) in GeoArchaeology*. New York: Springer International Publishing, pp: 7–44.

Sillar, B. & Tite, M.S. 2000. The challenge of technological choice for material science approached in archaeology. *Archaeometry* **42**(1): 2–20.

Simandl, G.J., Fajber, R. & Paradis, S. 2014. Portable X-ray fluorescence in the assessment of rare earth element enriched sedimentary phosphate deposits. *Geometry: Exploration, Environment, Analysis* **14**: 161–169.

Sloane, D.J. 1991. Some physical properties of dolerite: Division of Mines and Mineral Resources, Report. *Tasmania Department of Resources and Energy* **22**: 1–5.

Stuiver, M. & Reimer, P.J. 1993. Extended ^{14}C database and revised CALIB 3.0 ^{14}C age calibration program. *Radiocarbon* **35** (1): 215–230.

Stremtan, C., Ashkanani, H., Tykot, R.H. & Puscas, M. 2012. Constructing a database for pXRF, XRD, ICP-MS and petrographic analyses of Bronze Age ceramics and raw materials from Failaka Island (Kuwait). *Proceedings of the 39th International Symposium for Archaeometry, Leuven*: 274–279.

Sudan, P. 1999. *Sedimentology, stratigraphy and geological history of part of the northern KwaZulu-Natal coastal dune cordon, South Africa*. Master's dissertation. Durban: University of Natal.

Taylor, R.E. 1976. Science in contemporary archaeology. In R.E. Taylor & N.J. Park Ridge (eds), *Advances in obsidian glass studies*. England: Noyes Press, pp. 1–2.

Taylor, R.E. & Payen, L.A. 1979. The role of archaeometry in American Archaeology: approaches to the evaluation of the antiquity of *Homo sapiens* in California. *Advances in Archaeological Method and Theory* **2**: 239–83.

Thebe, P.C. & Sadr, K. 2016. Forming and shaping pottery boundaries in contemporary south-eastern Botswana. *Journal of African Archaeology* **2017**(34): 75–92.

Thebe, P.C. 2017. *Ethnoarchaeology of pottery: style and technology boundaries in southeast Botswana*. PhD thesis. Johannesburg: University of Witwatersrand.

The Potters of Buur Heybe, Somalia. 2006. [DVD]. Produced by T. Belkin. Walnut Creek, CA: Left Coast Press Inc.

Thorp, C. 2009. Excavations at Hlamba Mlonga Hill, Malilangwe Trust, south-eastern Zimbabwe. *Journal of African Archaeology* **7**(2): 191–218.

Tiley-Nel, S. 2014. *A technological study and manufacture of ceramic vessels from K2 and Mapungubwe Hill, South Africa*. Master's dissertation. Pretoria: University of Pretoria.

Tite, M.S. 1999. Pottery production, distribution, and consumption: the contribution of the physical sciences. *Journal of Archaeology methods and theory* **6**(3). 181–233.

Tlhoaele, D.R. 2014. *Technological studies of ceramics from Marothodi, North West province*. Honours project. Cape Town: University of Cape Town.

Todd, J. 2006. *A documentary film on the Magwaza potters' production of Zulu beer ceramics.* Master's dissertation. Pietermaritzburg: University of KwaZulu-Natal.

Tomaselli, K.G. 2003. Shaka Zulu, visual history and television. *Southern African Humanities* **15**: 91–107.

Tyson, P.D. 1986. *Climatic change and variability in southern Africa.* Cape Town: Oxford University Press.

Tyson, P.D., Karlén, W., Holmgren, K. & Heiss, G.A. 2000. The Little Ice Age and medieval warming in South Africa. *South African Journal of Science* **96**: 121–26.

Tyson, P.D., Lee-Thorp, J., Holmgren, K. & Thackeray, J.F. 2002. Changing gradients of climate change in southern Africa during the past millennium: implications for population movements. *Climatic Change* **52**: 129–35.

Uken R., Whitmore, G. & Meth, D. 1999. KwaZulu-Natal – 3500 million years of geological history. University of KwaZulu-Natal Educational Resources Poster. <https://stec.ukzn.ac.za/educational-resources/>; site visited 2021.

Van der Eyk, J.J., MacVicar, C.N. & De Villers, J.M. 1969. *Soils of the Tugela Basin*. Volume 15. Pietermaritzburg: Town and Regional Planning Commission.

Van Warmelo, N.J. 1974. The classification of cultural groups. In W.D. Hammond-Tooke (ed.). *The Bantu-Speaking Peoples of Southern Africa*. London: Routledge & Kegan Paul (Ltd), pp. 56–84.

Watson, T.L. 1912. Vanadium and chromium in rutile and the possible effect of vanadium on color. *Journal of the Washington Academy of Sciences* **2** (18): 431–434.

Webb, C.B. &. Wright, J.B. 2014. *The James Stuart Archive of recorded oral evidence relating to the history of the Zulu and neighbouring people*. Volume 6. Pietermaritzburg. University of KwaZulu-Natal Press.

Wilmsen, E.D., Killick, D., Rosenstein, D.D., Thebe, P. & Denbow, J.R. 2009. The social geography in Botswana as reconstructed by optical petrography. *Journal of African Archaeology* **7**(1): 3–39.

Wilson, A., Flint, S., Payenberg, T., Tohver, E. & Lanci, L. 2014. Architectural styles and sedimentology of the fluvial Lower Beaufort Group, Karoo Basin, South Africa. *Journal of Sedimentary Research* **84**: 326–48.

Whelan, D. 2001. *The recent transmutation of the indigenous vernacular architecture of the people at KwaMthembu and KwaMchunu, Msinga District, KwaZulu-Natal, South Africa*. Master's dissertation. Durban: University of Natal.

Whitelaw, G. 1994. *Village settlement organisation in the Natal Early Iron Age*. Master's dissertation. Johannesburg: University of the Witwatersrand.

Whitelaw, G. 1998. Twenty-one centuries of ceramics in KwaZulu-Natal. In B. Bell & I. Calder (eds). *Ubumba: aspects of indigenous ceramics in KwaZulu-Natal.* Pietermaritzburg: Tatham Art Gallery, pp. 3–12.

Whitelaw, G. 2014. Juliet Armstrong: archaeology, anthropology and art. In B. Bell & B. Clark (eds). *For Juliet: ceramic sculptor 1950–2012*. Pietermaritzburg: Tatham Art Gallery, pp. 9–15.

Whitelaw, G. 2015. *Economy and cosmology in the Iron Age of KwaZulu-Natal*. PhD thesis. Johannesburg: University of Witwatersrand.

Whitelaw, G. 2020. Homesteads, pots and marriage in southeast southern Africa. In D.S. Whitley, J.H.N. Loubser & G. Whitelaw (eds), *Cognitive archaeology: mind, ethnography, and the past in South Africa and beyond*. Routledge Studies in Archaeology, pp. 152–83.

Whitelaw, G. & Janse van Rensburg, S. 2020. Lake Sibaya and the beginning of the Iron Age in KwaZulu-Natal. *Digging Stick* **37**(2): 1–4.

Wright, J. 2006–2007. Beyond the "Zulu Aftermath": migrations, identities, histories. *Journal of Natal and Zulu History* **24&25**: 1–36.

Wylie, D. 1992. Textual incest: Nathaniel Isaacs and the development of the Shaka Myth. *History in Africa* **19**:411–33.

Wylie, D. 1995. Language and assassination: cultural negations in white writer's portrayal of Shaka and the Zulu. In C. Hamilton. (ed.), *The Mfecane aftermath: reconstructive debates in southern African history*. Johannesburg: Witwatersrand University Press, pp. 71–103.

Wylie, D. 2000. *Savage delight: white myths of Shaka*. Pietermaritzburg: University of KwaZulu-Natal Press.

Yassoglou, N., Tsadilas, C. & Kosman, C. 2017. *The soils of Greece*. New York: Springer International Publishing.

OTHER SOURCES: INTERVIEWS/PERSONAL COMMUNICATIONS

Gavin Whitelaw, 2016–2023

Selina Mncube, 2018–2023

Phumulani Madonda, 2018–2023

Buzephi Magwaza, 2019 February 2022

Daliwe Magwaza. 2019 February 22

Yeh Magwaza, 2019 February 22

Zikoti Magwaza, 2019 February 22

Bonisiwe Magwaza, 2021 August 28

Thandiwe Magwaza. 2021 August 28

Thuleleni Magwaza 2021 August 28

Busisiwe Mazibuko. 2021, November 16

Appendix 1

Description of sherd samples for pXRF analysis.

Lab No.	**Sherd ID**	**Outer Colour**	**Thick**	**Thin**	**Medium**	**Thickness (mm)**	**Surface texture of the sherd**	Burnish	Description
70	BB001	plain	X			15.2	Rough	X	The sherd is not that smooth on the exterior (hence rough) it is rough on the interior and very thick. The burnish has faded away.
71	BB002	plain	X			12.1	Rough	X	The sherd is super black and, on the exterior, and the burnish on the exterior is fading away. There are large red inclusions on the interior, and it is rough.
72	BB003	black		X		8.0	Smooth	X	The interior of the sherd is dark brown and rough, the exterior is black and smooth the black colour on the exterior is fading away exposing the dark brown colour.
73	BB004	plain	X			15.7	Rough	X	The interior is worn out the black colour has chipped exposing the dark brown colour. The burnish has faded away on the exterior. There are horizontal striations on the exterior.
80	BB005	black	X			16.5	Smooth	X	The exterior and the interior are smooth. The burnish is almost fading away on the exterior, the interior is dark brown.
81	BB006	black		X		7.6	Smooth	X	Both the exterior and the interior are smooth. The burnish is fading away on the exterior.
74	BB007	black		X		7.7	Smooth	X	The exterior is smooth and the interior is rough. The interior is brown exposing small red inclusions.
82	BB008	black	X			16.5	Rough	No	The exterior is rough, and the interior is reddish brown and rough.
83	BB009	plain	X			17.4	Rough	No	Both the exterior and interior are rough. The interior is dark brown.
84	BB010	plain	X			15.2	Rough	No	The sherd is very thick; this could have been a very big pot. The exterior and the interior are worn out. The interior is dark brown and chipped.

Lab No.	**Sherd ID**	**Outer Colour**	**Thick**	**Thin**	**Medium**	**Thickness (mm)**	**Surface texture of the sherd**	Burnish	Description
85	BB011	plain	X			14.7	Rough	X	The interior is reddish brown and the exterior black and the burnish on the exterior has faded away.
86	BB012	black			X	12.4	Smooth	?	Both the interior and the exterior are black.
87	BB013	plain			X	11.6	Smooth	X	The interior is dark brown. The burnish on the exterior has faded away, and the black colour is fading away exposing the dark brown colour.
88	BB014	plain	X			11.0	Rough	?	The black colour both on the exterior and interior is fading away exposing a dark brown colour.
89	BB015	black	X			14.6	Smooth	No	The interior is light brown and rough.
75	BB016	black			X	14.2	Smooth	X	The interior is dark red.
90	BB017	black			X	12.4	Smooth	?	The black colour on the exterior is fading away exposing the dark brown. It is rough on the interior and black.
76	BB018	black		X		8.1	Smooth	?	It is red on the interior and little worn out.
91	BB019	plain	X			16.2	Rough	X	The exterior burnish is worn out and fading away. The interior is rough with red inclusions.
92	BB020	black		X		9.3	Smooth	X	It is black both on the interior, burnished on the exterior, the interior is rough.
93	BB021	black			X	12.0	Smooth	X	The sherd is curved. The burnish is fading away, it is black both on the exterior and interior.
77	BB022	plain		X		9.5	Rough	X	The exterior is worn out the burnish is chipped of. The interior is dark brown
78	BB023	black		X		11.8	Smooth	X	The exterior is smooth but the black burnish is fading exposing a dark brown colour. The interior is black.

Lab No.	**Sherd ID**	**Outer Colour**	**Thick**	**Thin**	**Medium**	**Thickness (mm)**	**Surface texture of the sherd**	Burnish	Description
94	BB024	black		X		10.3	Smooth	X	The burnish is fading away exposing the dark brown colour on the surface. The interior is rough.
95	BB025	black		X		10.4	Smooth	?	The interior is rough and dark brown the black colour is worn out on the interior.
79	BB026	plain		X		9.6	Rough	X	The interior is light brown and has horizontal striations. The black burnish on the exterior is fading away, exposing the light brown colour.
96	BB027	plain	X			16.4	Rough	X	The exterior has a little bit of a grey colour and the burnish is fading away. The interior is black-dark brown.
97	BB028	plain			X	13.8	Rough	X	The exterior is worn out the burnish is chipped of. The interior is dark brown with horizontal striations.
98	BB029	black		X		9.7	Smooth	X	The exterior is relatively smooth. The sherd is black on both sides. The black colour on the exterior is fading away exposing a patch of dark brown/red colour.
99	BB030	black	X			10.5	Smooth	X	The interior shows some horizontal striations. The sherd is black on both sides and burnished.
100	BB031	black		X		16.9	Smooth	X	The black burnish on the exterior is fading away, exposing a dark brown/red colour. The interior is dark brown.
101	BB032	black			X	13.6	Smooth	X	The sherd is super black on the interior. The black burnish on the exterior is fading away exposing a dark brown/red colour.
102	BB033	black		X		8.1	Smooth	X	The sherd is burnished on both sides and it is black on both sides.
103	BB034	black			X	13.9	Smooth	X	The sherd is dark red on the interior. The black burnish on the exterior is fading away exposing a dark red colour.

Lab No.	**Sherd ID**	**Outer Colour**	**Thick**	**Thin**	**Medium**	**Thickness (mm)**	**Surface texture of the sherd**	Burnish	Description
104	BB035	plain			X	12.5	Smooth	X	The black burnish on the exterior has severely faded away exposing a brown colour. The black burnish in the interior is has faded away exposing a dark brown colour.
116	PP001	plain	X			18.3	Rough	No	The interior is black
117	PP002	plain	X			18.7	Rough	No	The sherd is dark brown on the exterior, and light brown/reddish on the interior
118	PP003	plain	X			15.9	Rough	No	The sherd is dark brown on both the exterior and interior.
119	PP004	plain	X			17.8	Rough	No	The sherd is dark brown on the interior.
120	PP005	plain	X			16.7	Rough	No	The sherd is reddish brown on both the exterior and interior
121	PP006	plain	X			15.5	Rough	No	The sherd is brown on both the exterior and interior.
122	PP007	plain	X			18.4	Rough (relatively smooth)	No	The sherd is black on the interior possibly soot? It is severely weathered on the exterior.
123	PP008	plain	X			17.0	Rough	No	The sherd is light brown on both sides.
124	PP009	plain	X			15.9	Relatively smooth	No	The sherd is brown on both the exterior and interior.
125	PP010	plain	X			19.2	Rough	No	The sherd is brown on the interior, and weathered on the exterior.
126	PP011	plain	X			15.7	Rough	No	The sherd is reddish brown on both the exterior and interior
127	PP012	plain	X			18.0	Relatively smooth	No	The sherd is brown on both sides.
128	PP013	plain	X			16.4	Relatively smooth	x	The sherd is brown and rough on the interior.
129	PP014	plain	X			17.6	Smooth	No	The sherd is brow/orange on both sides
130	PP015	plain	X			16.7	Smooth	No	The sherd is orange red on the exterior and interior
131	PP016	plain	X			15.8	Rough	No	The sherd is brown on both sides.
132	PP017	plain	X			15.0	Rough	No	The sherd is covered with soot on both the exterior and interior.

Lab No.	**Sherd ID**	**Outer Colour**	**Thick**	**Thin**	**Medium**	**Thickness (mm)**	**Surface texture of the sherd**	Burnish	Description
1	RB002	red			X	13.0	Rough	X	Red burnish with a patch of black burnish. The red burnish is fading. The exterior is rough.
52	RB004	red		X		10.0	Smooth	X	The burnish shine is fading, however the sherd is still red. The texture on the interior is relatively smooth.
47	RB007	red	X			15.4	Smooth	X	It has a shine on the exterior, it is red. The exterior is smooth.
49	RB009	red		X		10.4	Smooth	X	Red burnish fading away exposing the black surface. The interior is rough.
50	RB019	red	X			12.7	rough	X	Red on the exterior and interior. The burnish is fading away. The interior is rough.
53	RB028	red	X			10.3	Smooth	X	Covered with red ochre. It is dark reddish to brown on the interior and smooth.
51	RB029	red			X	8.3	smooth	X	Red ochre has faded. The pot was poorly made. The interior is rough
56	RB085	red		X		9.5	Smooth	X	Red ochre burnish. Interior is brown and smooth with a patch of soot.
48	RB094	red		X		7.2	Smooth	X	Dark red ochre burnish. The interior is dark red and burnished, and weathered, rough.
54	RB095	red	X			9.8	Smooth	X	Red ochre burnish. The interior is dark brown and smooth.
62	RB112	red		X		9.5	Rough	X	Weathered, the red ochre is fading/has faded away. The interior is orange light brown and rough.
37	RB122	red		X		9.8	Smooth	X	Red ochre burnish. The interior is weathered orange and rough.
55	RB124	red		X		7.4	Smooth	X	Red covered with black colour (possibly soot?). The interior is brown orange and smooth.

Lab No.	**Sherd ID**	**Outer Colour**	**Thick**	**Thin**	**Medium**	**Thickness (mm)**	**Surface texture of the sherd**	Burnish	Description
57	RB126	red	X			18.2	Smooth	X	Red ochre burnish. The interior is brown and smooth, with coiling.
60	RB128	red	X			14.9	Smooth	X	Red ochre burnish. TH interior is dark brown and smooth, with coiling patterns.
33	RB129	red			X	14.5	Smooth	X	Red ochre burnish cracked. The interior is dark red and smooth
63	RB131	red			X	12.5	Smooth	X	Red and black (possibly soot?) burnish. The exterior is worn off. The interior is matt brown and smooth showing coiling striations.
64	RB132	red			X	13.0	Rough	?	The exterior is worn off showing the coiling striations. It has a patch of soot. The interior is brown and rough showing the clay inclusions.
34	RB133	red	X			16.5	Smooth	X	Red ochre burnish is fading away. The interior is red and rough with large inclusions.
35	RB134	red		X		9.6	Smooth	X	Red ochre, with black (possibly soot?). Coiling striations showing on the surface. The interior is orange, coiling striations on the interior.
36	RB137	red		X		9.1	Smooth	X	Red ochre burnish, and black colour (possibly soot?). The interior is brown orange and smooth.
38	RB138	red		X		8.8	Smooth	X	Red ochre fading away. The interior is dark brown colour is worn out exposing some inclusions.
39	RB139	red		X		8.9	Smooth	X	Red ochre burnish. The interior is fading away and there is a patch of soot. Coiling on the interior.
65	RB140	red			X	10.7	Smooth	X	Red ochre burnish is fading away, exposing some black colour. The interior is light brown orange and it is worn out exposing inclusions.

Lab No.	**Sherd ID**	**Outer Colour**	**Thick**	**Thin**	**Medium**	**Thickness (mm)**	**Surface texture of the sherd**	Burnish	Description
40	RB141	red		X		7.1	Smooth	X	Red ochre burnish both sides (interior and exterior). The interior has coiling striations.
41	RB142	red			X	11.6	Smooth	X	Red and black (possibly soot?). The burnish is fading away. The interior is brown and rough exposing inclusions.
42	RB144	red			X	12.4	Smooth	X	Red ochre burnish is fading away. The interior is very light brown and smooth.
58	RB145	red			X	13.6	Smooth	X	Red ochre burnish is fading away. The interior is brown and smooth and there is a little bit of coiling.
43	RB146	red			X	13.4	Smooth	X	Reconstructed. Maroon/ dark red/ dark brown burnish on the exterior and maroon/ dark red/ dark brown on the interior and smooth.
66	RB148	red			X	10.7	Smooth	X	Red ochre the burnish is fading away. The interior red/ orange is severely weathered but smooth.
61	RB149	red			X	11.1	Smooth	X	Red and black, the interior is brown orange and smooth.
67	RB150	plain	X			14.8	Rough	?	Poorly done, the exterior is worn out exposing striations (possibly coiling?). The interior is red brown and rough. Possibly *imbiza*.
59	RB151	red		X		10.0	Smooth	X	Red ochre burnish and black burnish? (Possibly soot?). The interior is brown and smooth.
44	RB152	red			X	13.7	Rough	X	Red ochre has faded away. It is *imbiza* weathered on the exterior. The interior is brown and rough.
68	RB153	plain			X	13.7	Smooth	X	Dark red ochre / dark brown burnish. The interior is dark red and burnished, and weathered, rough. The interior is dark red and smooth.
45	RB154	red		X		10.0	Smooth	X	Red ochre burnish. The interior is orange, no colour, and it is smooth.

Lab No.	**Sherd ID**	**Outer Colour**	**Thick**	**Thin**	**Medium**	**Thickness (mm)**	**Surface texture of the sherd**	Burnish	Description
46	RB155	plain		X		7.5	Smooth	X	Red ochre, the burnish is fading away. The interior is brown. No colour, but smooth.
69	RB156	red		X		10.3	Smooth	X	Red ochre burnish both exterior and interior. The interior is smooth.
133	RB160	Red			X	13.3	Smooth	X	The red ochre burnish on the exterior is fading away. The sherd is dark brown on the interior.
6	RimP001	red		X		9.3	Smooth	X	It is red burnish (shiny) and has thick fingernail decoration vertical along the body
2	RimP002	black		X		8.6	Smooth	X	It is black burnished (shiny) with thin fingernail decoration fairly spread apart from the rim to the body vertically.
3	RimP003	red			X	13.5	Smooth	X	Sherd is brown and burnished both the interior and exterior. The sherd is thick.
4	RimP004	plain		X		12.1	Rough	No	The sherd is black both the interior and the exterior. The sherd could be an imbiza, because it is huge.
8	RimP005	red & black	X			14.9	Rough	X	The lip/rim of the pot is broken. The red ochre burnish is fading away covered with soot on the exterior. The interior of the pot is red and rough.
7	RimP006	red	X			15.2	Smooth	X	The sherd is red but the burnish is fading. There is coiling on the exterior. On the interior is red with striation lines showing, and rough on the interior with large inclusions.
13	RimP007	red			X	11.1	Smooth	X	The sherd is covered with red ochre burnish both the interior and exterior.
5	RimP008	plain	X			18.7	Rough	No	The sherd is plain with no burnish and black/grey (? possibly soot). The rim is chipped. (Possibly *imbiza*)
9	RimP009	black		X		7.3	Smooth	X	The sherd is black burnished both on the interior and exterior. The interior is rough with large inclusions.

Lab No.	Sherd ID	Outer Colour	Thick	Thin	Medium	Thickness (mm)	Surface texture of the sherd	Burnish	Description
12	RimP010	red			X	11.0	Smooth	No	The sherd is red/ brown both the interior and exterior with no burnish (? possibly the burnish faded away).
10	RimP011	plain	X			16.8	Rough	No	The sherd is plain no burnish. It is rough both the interior and exterior. (Possibly *imbiza*).
11	RimP012	plain	X			15.0	Rough	No	The sherd is plain with no burnish, covered in soot. (Possibly *imbiza*).
18	RimP013	red		X		6.9	Smooth	X	The sherd has red ochre burnish both on the exterior and interior and it is smooth also on the interior.
16	RimP014	red		X		8.8	Smooth	X	The sherd has red ochre burnish on the exterior and on the interior is brown with ochre that has faded.
15	RimP015	plain	X			14.4	Rough	No	The sherd is plain but not an imbiza it is a normal pot.
14	RimP016	plain	X			13.0	Rough / coarse	X	The sherd is black both on the exterior and interior and the burnish has faded away.
17	RimP017	plain	X			16.8	Rough / coarse	No	The sherd has a little bit of soot by the rim on the interior. It is brown/plain both on the exterior and interior. Normal pot.
19	RimP018	red		X		9.2	Smooth	X	The lip of the sherd is convex (lip comes out), and it is chipped.
22	RimP019	red		X		9.4	Smooth	X	It has red ochre burnish on the exterior and interior.
21	RimP020	red		X		10.1	Smooth	X	It has red ochre burnish both on the exterior and interior. However, on the interior the burnish has faded away.
23	RimP021	plain			X	12.1	Rough	No	It is plain (brown) covered with soot on the exterior and worn out on the interior. There are patterns of coiling on the interior
20	RimP022	black	X			15.8	Rough	No	It is black on the exterior and brownish reddish on the interior
24	RimP023	red	X			14.9	Smooth	X	Dark red- brownish ochre burnish on both the exterior and interior. The rim/ lip is thick.

Lab No.	**Sherd ID**	**Outer Colour**	**Thick**	**Thin**	**Medium**	**Thickness (mm)**	**Surface texture of the sherd**	Burnish	Description
25	RimP024	red		X		9.0	Smooth	X	Red ochre burnishes fading away exposing the black colour (possible it is covered with soot). It is rough on the interior.
26	RimP025	plain	X			16.6	Rough	No	Plain on both sides (possible *imbiza*).
27	RimP026	plain	X			16.0	Rough	No	Plain brown orangey on both the exterior and interior. It is covered with soot on the exterior. (Possible *imbiza*).
28	RimP027	red			X	11.2	Smooth	X	It is having red ochre burnish on the exterior and on the interior the ochre burnish has faded away. The lip is flat
29	RimP028	black	X			13.2	Rough/ coarse	X	It black both on the exterior and interior there is little burnish on the exterior, it seems as though they wanted to burnish the pot then decided against it.
31	RimP029	plain			X	13.7	Rough	X	The fabric is coarse and the sherd is dark brownish-red, and worn out on the interior.
30	RimP030	black			X	11.6	Rough/ coarse	No	The sherd is black on the exterior possibly covered with soot, and on the interior, it is dark brown showing patterns of coiling.
32	RimP031	plain	X			16.8	Rough	No	The sherd is plain with rough texture not properly fired and has large inclusions on both the exterior and interior. It is possibly, an *imbiza*.
108	RimP032	plain	X			16.0	Rough	No	The sherd is orange reddish brown on the exterior possibly due to weathering. It is brown on the interior. This could have been a big pot.
109	RimP033	plain		X		10.4	Rough	No	The sherd has no burnish nor ochre. It is brownish orange on both sides.
110	RimP034	plain			X	14.0	Smooth	No	The black on the exterior has faded away exposing a grey colour. It is black on the interior.
111	RimP035	plain	X			15.6	Rough	No	The sherd is rough and brown showing a pattern of horizontal coiling.

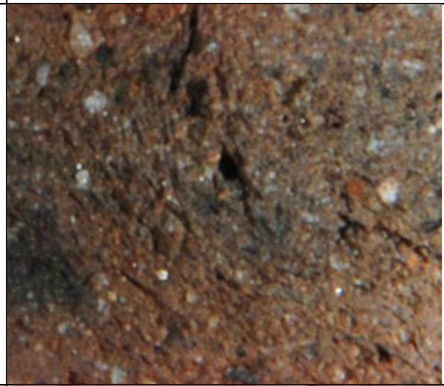
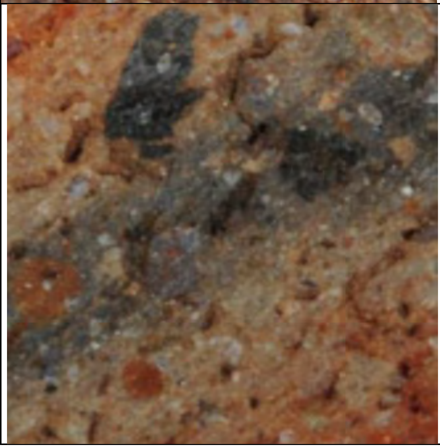
Lab No.	Sherd ID	Outer Colour	Thick	Thin	Medium	Thickness (mm)	Surface texture of the sherd	Burnish	Description
105	RimP036	plain		X		8.8	Rough	?	The sherd is orange reddish on the exterior. It has no ochre on the interior, it is dark brown on the interior.
106	RimP037	red		X		7.8	Smooth	No	The sherd is red on both sides with ochre on the exterior and has no burnish. The interior is reddish brown. It has a globular shape.
107	RimP038	plain			X	13.1	Rough	X	The sherd is black and burnished on the exterior showing patterns of coiling on both sides. It is dark brown on the interior.
112	RimP039	plain			X	12.2	Smooth	X	The sherd is black and burnished on both sides (interior and exterior). It is thin by the rim and becomes thick on the body. It has a U shape.
113	RimP040	plain			X	13.9	Rough	X	The sherd is black and thin by the rim then becomes thick on the body. It is brown on the interior. It has a U shape.
114	RimP041	plain	X			17.5	Smooth	X	The sherd is black and burnished thin by the rim with horizontal striation showing the coiling pattern.
115	RimP042	red			X	11.3	Smooth	X	The sherd has a red ochre burnish on both sides (exterior and interior). The burnish is fading away.

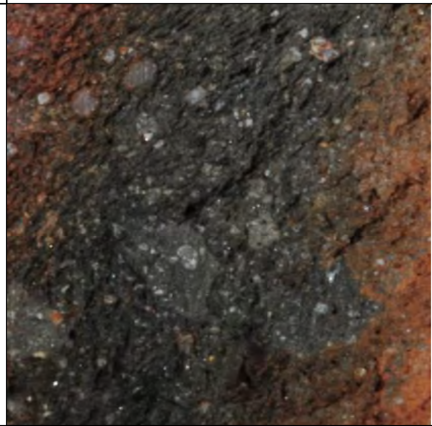
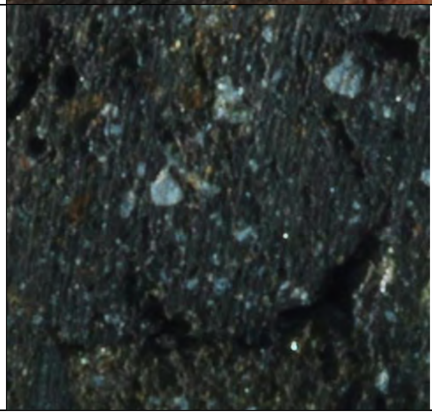
Appendix 2

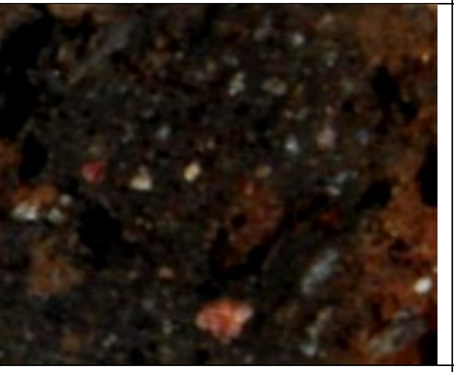
Fabric of a selection of the Mgoduyanuka sherd sample.

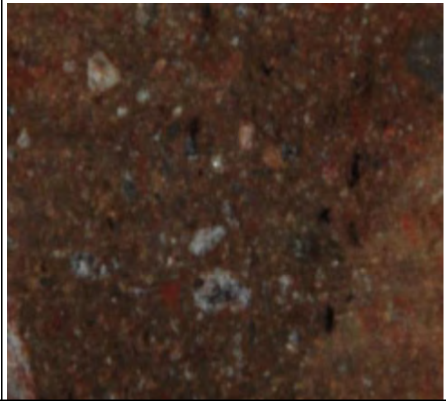
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
3	RimP003	red		Coarse	Smooth	X	Sherd is brown and burnished both the interior and exterior. The sherd is thick.
10	RimP011	plain		Coarse	Rough	No	The sherd is plain no burnish. It is rough both the interior and exterior. (Possibly *imbiza*).

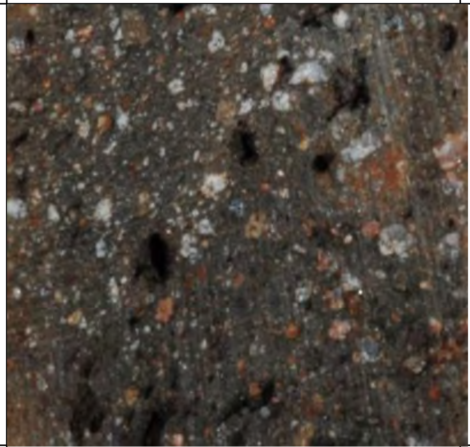
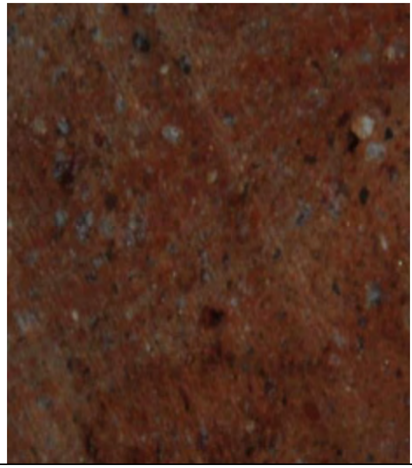
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
11	RimP012	plain		Coarse	Rough	No	The sherd is plain with no burnish, covered in soot. (Possibly *imbiza*).
14	RimP016	plain		Fine	Rough/ coarse	X	The sherd is black both on the exterior and interior and the burnish has faded away.

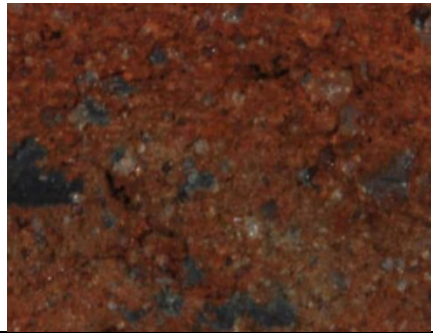
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
16	RimP014	red		Fine	Smooth	X	The sherd has red ochre burnish on the exterior and on the interior is brown with ochre that has faded.
22	RimP019	red		Coarse with pieces of grog	Smooth	X	It has red ochre burnish on the exterior and interior.

Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
23	RimP021	plain		Coarse with pieces of grog	Rough	No	It is plain (brown) covered with soot on the exterior and worn out on the interior. There are patterns of coiling on the interior
25	RimP024	red		Coarse	Smooth	X	Red ochre burnish fading away exposing the black colour (possible it is covered with soot). It is rough on the interior.

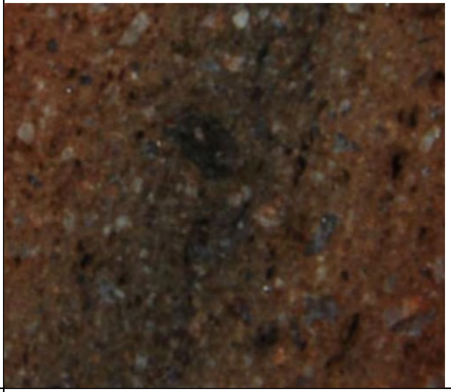
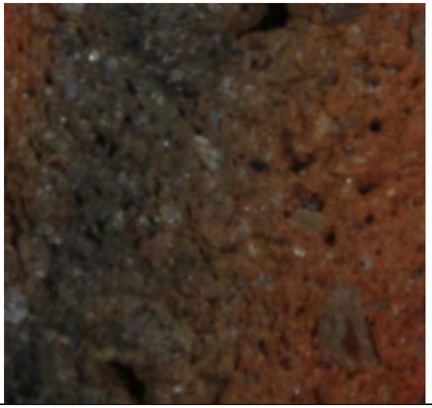
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
31	RimP029	plain		Coarse	Rough	X	The fabric is coarse and the sherd is dark brownish-red, and worn out on the interior.
38	RB138	red		Coarse	smooth	X	Red ochre fading away. The interior is dark brown colour is worn out exposing some inclusions.

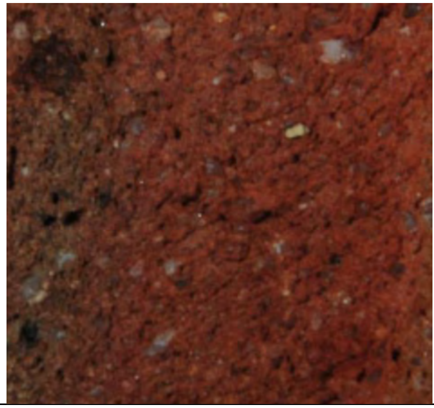
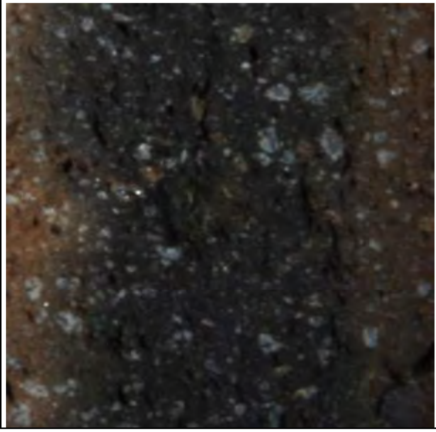
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
40	RB141	red		Fine	smooth	X	Red ochre burnish both sides (interior and exterior). The interior has coiling striations.
41	RB142	red		Very fine grained	smooth	X	Red and black (possibly soot?). The burnish is fading away. The interior is brown and rough exposing inclusions.

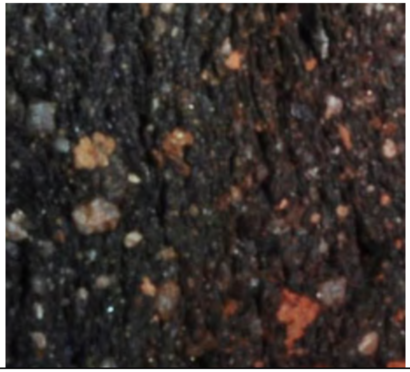
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
41	RimP042	red		Fine	Smooth	X	The sherd has a red ochre burnish on both sides (exterior and interior). The burnish is fading away.
44	RB152	red		Very fine	rough	X	Red ochre has faded away. It is very weathered on the exterior. The interior is brown and rough.

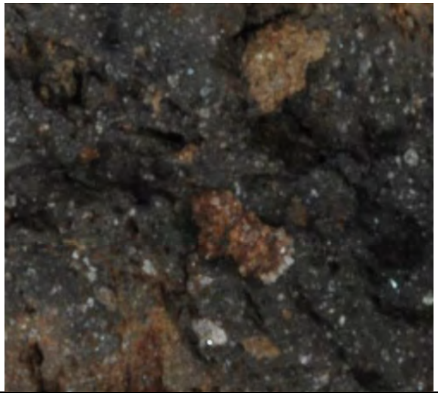
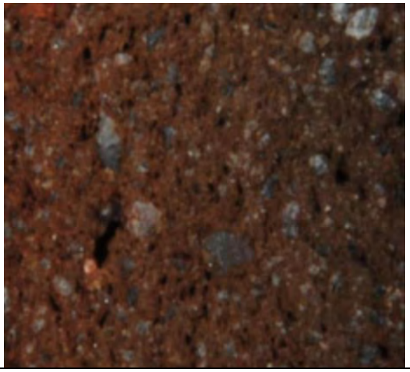
Lab No.	**Sherd ID**	**Outer colour**	**Clay fabric Image**	**Clay fabric**	**Surface texture**	**Burnish**	**Description**
46	RB155	plain		Coarser to fine	smooth	X	Red ochre, the burnish is fading away. The interior is brown. No colour, but smooth.
49	RB009	red		Coarser to fine	smooth	X	Red burnish fading away exposing the black surface. The interior is rough.

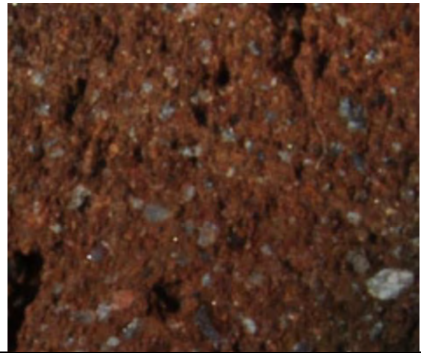
Lab No.	**Sherd ID**	**Outer colour**	**Clay fabric Image**	**Clay fabric**	**Surface texture**	**Burnish**	**Description**
50	RB019	red		Coarser- fine	rough	X	Red on the exterior and interior. The burnish is fading away. The interior is rough.
60	RB128	red		Fine	smooth	X	Red ochre burnish. TH interior is dark brown and smooth, with coiling patterns.

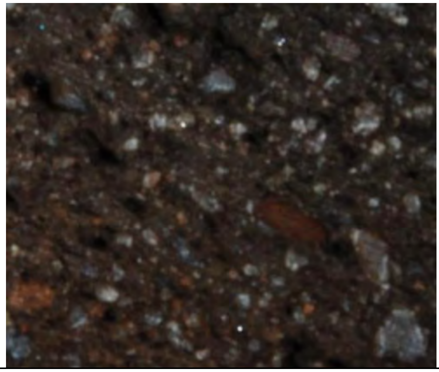
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
61	RB149	red		Fine	smooth	X	Red and black, the interior is brown orange and smooth.
62	RB112	red		Coarser	rough	X	Weathered, the red ochre is fading/has faded away. The interior is orange light brown and rough.

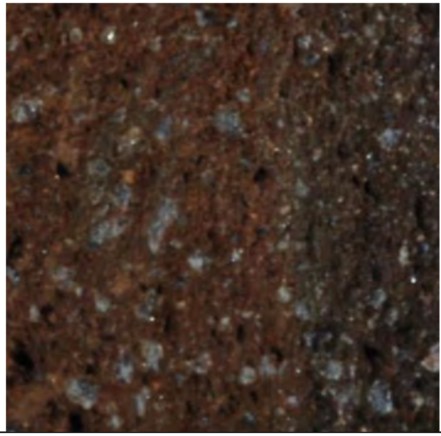
Lab No.	**Sherd ID**	**Outer colour**	**Clay fabric Image**	**Clay fabric**	**Surface texture**	**Burnish**	**Description**
65	RB140	red		Coarser to fine	smooth	X	Red ochre burnish is fading away, exposing some black colour. The interior is light brown orange and it is worn out exposing inclusions.
69	RB156	red		Fine	smooth	X	Red ochre burnish both exterior and interior. The interior is smooth.

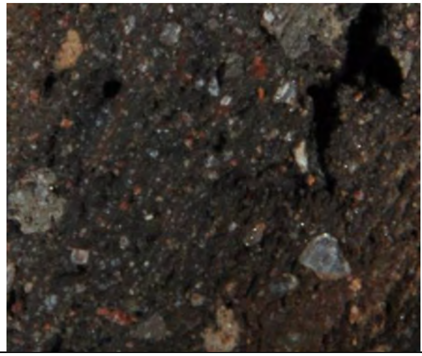
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
75	BB016	black		Coarser to fine	Smooth	X	The interior is dark red.
76	BB018	black		Coarse	Smooth	?	It is red on the interior and little worn out.

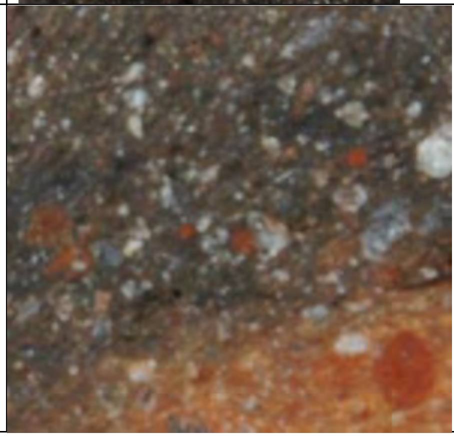
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
77	BB022	black		Medium coarse to fine	Rough	X	The exterior is worn out the burnish is chipped of. The interior is dark brown.
78	BB023	black		Fine	Smooth	X	The exterior is smooth but the black burnish is fading exposing a dark brown colour. The interior is black.

Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
79	BB026	plain		Very fine	Rough	X	The interior is light brown and has horizontal striations. The black burnish on the exterior is fading away, exposing the light brown colour.
90	BB017	black		Medium coarse	Smooth	?	The black colour on the exterior is fading away exposing the dark brown. It is rough on the interior and black.

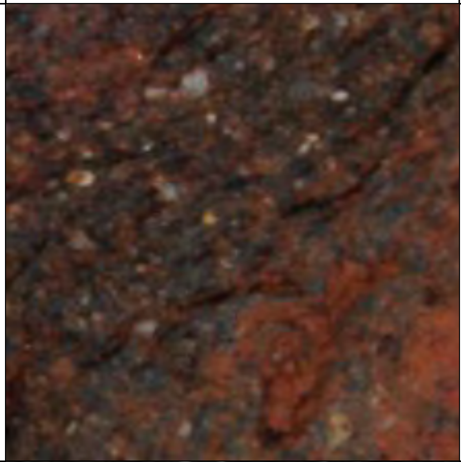
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
91	BB019	plain		Medium coarse	Rough	X	The exterior burnish is worn out and fading away. The interior is rough with red inclusions.
92	BB020	black		Medium coarse	Smooth	X	It is black both on the interior, burnished on the exterior, the interior is rough.

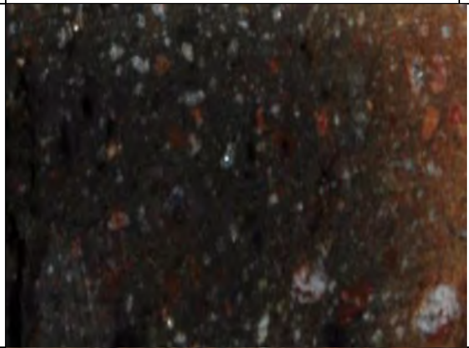
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
94	BB024	black		Fine	Smooth	X	The burnish is fading away exposing the dark brown colour on the surface. The interior is rough.
95	BB025	black		Fine	Smooth	?	The interior is rough and dark brown the black colour is worn out on the interior.

Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
97	BB028	plain		Fine (sandy grains)	Rough	X	The exterior is worn out the burnish is chipped of. The interior is dark brown with horizontal striations.
98	BB029	black		Coarse	Smooth	X	The exterior is relatively smooth. The sherd is black on both sides. The black colour on the exterior is fading away exposing a patch of dark brown/red colour.
103	BB034	black		Fine with quartz and grog inclusions	Smooth	X	The sherd is dark red on the interior. The black burnish on the exterior is fading away exposing a dark red colour.

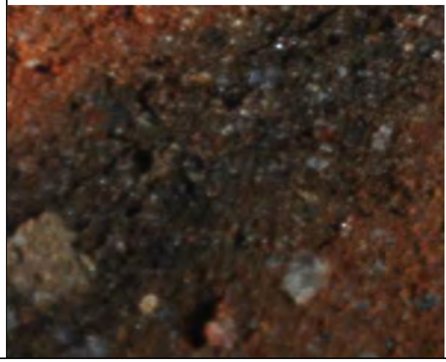
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
104	BB035	plain		Medium coarse with	Smooth	X	The red burnish on the exterior has severely faded away exposing a brown colour. the interior has faded away exposing a dark brown colour.
106	RimP037	red		Fine	Smooth	No	The sherd is red on both sides with ochre on the exterior and has no burnish. The interior is reddish brown. It has a globular shape.

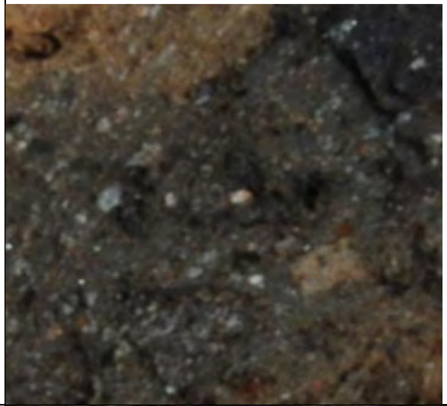
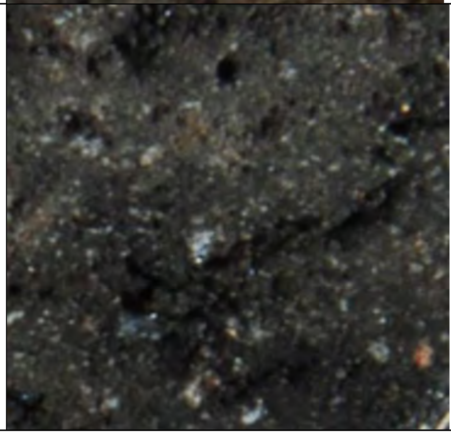
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
107	RimP038	plain		Coarse	Rough	X	The sherd is black and burnished on the exterior showing patterns of coiling on both sides. It is dark brown on the interior.
108	RimP032	plain		Coarse	Rough	No	The sherd is orange reddish brown on the exterior possibly due to weathering. It is brown on the interior. This could have been a big pot.

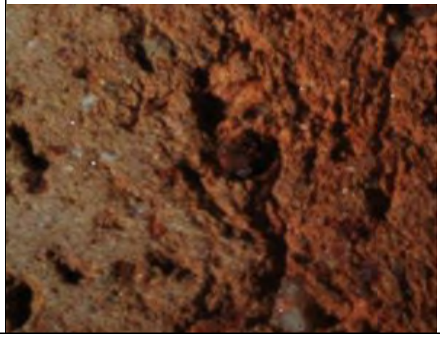
Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
109	RimP033	plain		Coarse	Rough	No	The sherd has no burnish nor ochre. It is brown orange on both sides.
110	RimP034	plain		Fine	Smooth	No	The black on the exterior has faded away exposing a grey colour. It is black on the interior.

Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
111	RimP035	plain		Very fine	Rough	No	The sherd is rough and brown showing a pattern of horizontal coiling.
112	RimP039	plain		Fine	Smooth	X	The sherd is black and burnished on both sides (interior and exterior). It is thin by the rim and becomes thick on the body. It has a U shape.

Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
113	RimP040	plain		Fine (angular quartz)	Rough	X	The sherd is black and thin by the rim then becomes thick on the body. It is brown on the interior. It has a U shape.
114	RimP041	plain		Coarse	Smooth	X	The sherd is black and burnished thin by the rim with horizontal striation showing the coiling pattern.

Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
119	PP004	plain		Fine with large quartzite inclusions	Rough	No	The sherd is dark brown on the interior.
120	PP005	plain		Fine with large inclusions (stones?)	Rough	No	The sherd is reddish brown on both the exterior and interior.

Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
121	PP006	plain		Coarse to fine	Rough	No	The sherd is brown on both the exterior and interior.
122	PP007	plain		Fine	Rough (relatively smooth)	No	The sherd is black on the interior possibly soot? It is severely weathered on the exterior.

Lab No.	Sherd ID	Outer colour	Clay fabric Image	Clay fabric	Surface texture	Burnish	Description
130	PP015	plain		Coarse	Smooth	No	The sherd is orange red on the exterior and interior.

Appendix 3

pXRF data, three results per sherd.

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
RB002	5898.781	85665.67	338380	1888.88	678.1958	18307.44	7911.538	3526.169	244.7488	251.1242	161.4129	49994.04	32.91552	95.05279	52.74028	18.08877	40.18551	85.01816	22.26037	243.2645	6.944803	34.53459	587.614	5.52	12.08415	-
RimP002	6244.004	81673.93	365741.1	2231.787	287.1774	21450.8	7751.781	3118.607	218.3398	172.1732	67.32677	37823.15	#NUM!	15.26784	44.28193	9.94395	45.83296	110.0781	25.50426	194.6956	6.390921	23.89438	559.2164	8.255331	9.957346	-
RimP003	4127.743	101688.4	375503.6	927.1299	302.4327	16768.21	4438.804	3765.168	213.2065	161	143.0887	44623.73	45.55588	29.73554	47.80711	11.15647	53.45893	44.57476	25.65028	298.6864	9.364293	24.18691	577.9022	9.389266	13.77459	2.007331
RimP004	7773.13	114164.4	338504.3	1155.914	287.2907	20934.54	5739.147	3661.128	235.01	247.3198	268.7364	52122.24	42.19286	36.5319	59.21887	13.55311	57.06746	76.24532	23.90334	239.3188	7.359851	29.00822	634.8128	10.23469	10.51096	-
RimP008	10435.26	118874.3	342378.4	998.3	319.3972	15954.95	8994.805	4786.015	323.169	320.5033	149.3268	68404.96	104.391	42.74076	81.14575	19.14395	49.94913	74.11634	34.58069	216.8747	7.831202	26.87599	467.3038	-	11.4445	-
RimP001	3708.126	79368.25	336537.1	4512.836	360.8169	17613.37	5892.362	3355.49	198.8859	166.2499	101.3891	37773.49	103.2834	20.28867	41.20847	11.6258	42.01513	109.8867	25.37113	217.1488	7.053348	21.26291	623.4665	8.676595	12.13151	-

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
RimP006	4788.556	104904.3	332148.6	3435.039	608.112	16168.12	8689.141	3898.87	272.1569	298.8558	107.8977	52806.14	132.6019	40.64425	51.51586	14.61474	35.34043	96.28753	26.909	207.3217	6.622189	35.32	494.5949	6.5	10.56892	1.58
RimP005	4671.871	88101.07	316865.5	1561.153	751.8818	15155.11	5868.715	4134.821	264.085	248.947	157.4486	50255.08	102.3805	26.0932	54.87282	18.21615	46.44091	66.48357	28.94058	224.4216	9.072988	20.65	529.5372	6.49	12.40186	1.895996
RimP009	6400.838	84104.75	352580.2	1047.754	464.8396	19084.45	6325.858	3531.183	232.3909	171.5976	102.846	44333.98	98.43926	27.32653	44.4373	11.12981	48.97624	89.83411	27.01982	229.8964	6.9876	24.17351	525.3753	9.054954	11.21071	-
RimP011	8910.679	106594.9	359606.2	1235.312	315.0207	14535.16	6084.038	4327.216	305.0443	245.938	170.503	59492.17	127.6764	37.56673	56.10363	16.55917	42.69196	58.42763	31.96155	244.1157	8.331027	27.68646	510.2037	7.124058	11.8902	2.12
RimP012	6051.128	89498.83	329509.7	1154.53	205.6293	12741.56	6023.709	3812.86	275.0429	271.3888	382.7101	55474.48	98.88838	40.93817	51.59837	13.13521	40.6367	61.02217	28.47634	260.6691	7.340583	23.0984	501.4463	7.22	14.73225	1.99
RimP010	6697.139	113667.8	344588.3	2714.829	612.6219	23496.51	10093.08	3630.812	316.883	309.5632	79.96	44722.79	419.9824	38.33403	47.54536	22.70317	42.31673	96.98988	31.1505	192.9954	6.376748	28.60994	550.7268	4.83	12.73468	1.6

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
RimP007	5373.039	104571.8	384531.6	986.6982	424.0261	24908.36	3719.44	3114.474	183.1029	147.0429	63.35164	36364.38	125.24	22.72044	30.58856	13.96134	56.57932	62.06749	25.94899	184.513	7.371648	28.42	561.9182	6.321408	12.37491	-
RimP016	8942.495	119514.1	362142.8	985.7877	345.8029	22285.38	5462.06	3786.913	249.8653	204.4759	272.8611	50830.17	204.5472	27.21497	58.42877	16.37496	57.26427	79.00844	24.67326	202.9391	8.086808	25.17259	645.9459	5.82807	12.43143	-
RimP015	7281.545	114125.5	365911.1	1224.666	379.6971	20698.6	5258.355	4007.149	261.7429	224.4323	170.3019	52999.6	169.095	35.67137	84.19357	16.24229	55.37298	77.6635	26.98255	206.817	8.631682	21.99543	624.6765	7.533696	13.4733	1.679583
RimP014	6311.387	93052.9	385206.4	799.8979	354.958	16810.34	6147.082	3647.942	190.4787	148.5094	68.73141	41567.39	148.4623	24.01161	53.01172	12.13928	53.88293	95.47779	30.41131	216.0789	8.308703	26.2894	483.659	8.738046	13.66305	-
RimP017	7509.637	105790.3	352484.4	3123.454	335.9845	18842.79	7779.628	3650.897	278.2187	246.3458	241.7455	55634.9	218.8062	30.81816	49.41903	15.29851	46.74122	96.32724	25.64319	254.1943	6.956926	28.26984	623.0445	5.278901	11.21768	1.62
RimP013	6363.454	124959.4	339503.5	2468.66	339.1553	17217.04	7993.333	3953.52	325.8504	344.945	53.89	51722.5	182.3907	43.5817	47.92732	21.45071	36.43822	76.95601	37.78165	197.8261	6.331157	21.01313	465.3089	-	9.652707	-

RimP023	RimP021	RimP019	RimP020	RimP022	RimP018	Sample
6944.264	9636.83	6796.044	6603.971	5717.636	6658.905	**Mg**
106359.5	108648.1	130781	100812.2	101088.7	88255.42	**Al**
351563.3	351908.4	343376.6	375748.6	383933.4	392874.9	**Si**
1330.385	967.0668	1887.408	2648.853	2062.14	1619.243	**P**
381.707	460.5263	593.2389	460.19	378	232.9459	**S**
20543.91	15509.33	18263.97	19590.16	19449.76	19185.89	**K**
6503.263	6275.613	6169.144	7152.285	7275.413	6577.177	**Ca**
3923.526	4092.724	3746.723	3482.002	3894.184	3237.267	**Ti**
235.9717	289.2649	261.9588	225.0516	253.8704	213.475	**V**
206.0656	279.8774	345.6108	182.5147	211.8329	165.9336	**Cr**
116.9443	200.3542	70.42	134.2565	100.7974	53.87136	**Mn**
45758.49	59962.73	54697.19	42478.45	48657.64	39753.75	**Fe**
51.18128	35.95	53.8899	68.7	206.135	210.5536	**Ni**
25.92582	40.7108	39.95259	20.74244	30.84908	19.90665	**Cu**
49.43227	60.40063	52.88091	54.04968	46.17806	38.67217	**Zn**
10.82011	15.94435	12.8799	20.54624	15.36367	11.63958	**As**
56.99594	45.25533	38.62658	56.16816	39.40832	42.19684	**Rb**
64.41131	74.60823	74.21295	108.3883	73.89408	97.51981	**Sr**
28.20224	27.94252	31.50353	33.37177	27.02035	25.02559	**Y**
247.2827	238.74	188.7662	254.3618	218.6144	220.2802	**Zr**
8.405977	7.347429	6.783026	8.55953	8.01802	6.543005	**Nb**
26.97577	22.8	23.30642	18.26	20.73378	26.00046	**Sn**
549.4983	491.7021	488.7297	564.7274	539.3019	476.6445	**Ba**
7.403702	6.96	6.84	8.935534	5.998208	8.000153	**Pb**
11.02817	11.71702	9.493234	14.82724	10.2114	11.21913	**Th**
-	1.789749	-	-	1.74	-	**U**

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn
RimP024	9275.978	120240.1	359811.1	1959.848	427.6181	21092.51	7386.18	3731.661	275.8967	257.8456	1630.829
RimP025	9837.095	110470.1	354977.5	1563.488	360.1272	21436.87	7416.888	4344.941	279.014	290.5556	186.5805
RimP026	6703.945	119397.2	353951.7	1327.293	291.7304	22284.08	6031.207	3424.733	220.0988	183.5869	130.0188
RimP027	5869.097	89105.89	345599.1	1048.282	439.8158	15769.65	5302.379	3265.341	210.6297	187.0936	159.1919
RimP028	8641.179	107962.4	363759.6	1186.607	317.8987	19967.65	6496.568	4151.526	283.8951	258.3112	190.1133
RimP030	8126.658	107765.6	365300.5	2287.347	593.1713	19981.35	7608.749	3662.69	233.7494	202.2938	248.1828

Sample	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
RimP024	58948.52	269.8649	58.32485	52.13146	18.55837	48.35677	91.59257	32.31676	232.1976	8.144194	27.44732	874.8831	8.70086	13.46096	2.24
RimP025	63955.78	187.9998	45.39497	67.93139	21.05214	43.27958	99.78395	32.146	192.1486	7.048832	32.64466	585.742	-	10.49642	-
RimP026	46842.97	58.75212	35.88941	59.65718	13.89807	62.79979	101.3955	26.52403	203.3634	7.556327	26.62857	651.3016	8.382808	11.87191	2.050415
RimP027	45653.35	52.10108	27.4835	62.56771	12.61975	45.71085	83.94789	25.87452	185.4216	7.302537	33.25648	513.4517	9.043865	9.435948	2.1
RimP028	56004.46	103.8118	53.85787	53.11065	18.08214	44.60138	72.18908	28.39687	271.9125	6.89548	49.77326	546.2243	5.03	10.12223	1.783816
RimP030	45307.38	44.77	79.14249	51.50249	10.63093	52.5958	95.09602	26.5177	219.2879	7.947802	37.15702	658.6625	7.754012	13.52822	1.544604

RB137	RB134	RB133	RB129	RimP031	RimP029	Sample
6286.545	8466.205	6214.619	6763.052	10539.68	8953.549	**Mg**
92521.15	113744.8	125302.2	106712.2	108039.3	107064.7	**Al**
395339.1	379361.9	304838.8	351059.2	361143.1	368739.3	**Si**
1767.631	2575.1	2458.295	3795.881	1483.572	1131.146	**P**
351.6304	471.8181	464.1833	590.836	432.3576	430.7234	**S**
19746.94	21702.76	20365.1	21746.44	20921.9	21341.07	**K**
6473.684	6363.164	10583.23	9301.417	7814.002	6082.4	**Ca**
3359.45	3798.861	3526.882	3741.478	4361.133	3810.431	**Ti**
221.0996	229.9824	309.5811	230.708	274.5524	281.4027	**V**
163.0419	177.6252	339.0881	186.6904	284.7724	221.1991	**Cr**
82.24775	149.7297	83.87681	246.9429	216.3084	184.7567	**Mn**
41045.77	43362.26	68534.87	45713.26	56295.1	52707.34	**Fe**
-	64.56081	36.6466	#NUM!	66.15926	146.5315	**Ni**
26.20818	75.66055	289.8076	86.34484	73.99774	554.5953	**Cu**
38.077	48.61043	53.92366	56.67272	65.00187	49.92311	**Zn**
12.16324	20.9255	20.13128	15.78708	15.87875	16.9286	**As**
43.77858	50.17701	41.73954	55.77132	44.87258	46.886	**Rb**
101.4524	73.85321	94.43603	99.56085	88.85743	67.75719	**Sr**
26.21375	30.08054	28.17314	31.44112	31.23747	29.985	**Y**
243.6789	260.2034	170.6889	243.0703	189.6957	191.4025	**Zr**
7.28401	8.661634	6.656792	8.788889	6.83627	8.459635	**Nb**
22.01172	21.3627	33.38011	43.79808	29.35708	36.95649	**Sn**
505.8379	677.5614	565.4284	610.1128	502.5743	570.8002	**Ba**
9.814274	6.072191	10.91	6.33454	5.16	8.09656	**Pb**
12.13427	11.77292	14.14234	14.34198	13.86524	11.67133	**Th**
1.61	1.59	1.5	1.559872	2.53	-	**U**

RB144	RB142	RB141	RB139	RB138	RB122	Sample
5096.443	9053.622	4458.868	6980.516	7930.883	7535.051	**Mg**
104713.6	114178.8	104601.9	93371.47	108023.1	115413.6	**Al**
340046.4	364732	398381.4	377388.6	369618.5	390232.7	**Si**
3141.418	2275.83	1663.596	1702.225	1059.683	2727.129	**P**
432.0725	366.9761	525.0929	462.7922	406.5448	424.4058	**S**
25754.96	20883.65	22665	16363.9	16930.36	18708.36	**K**
6842.468	6415.982	4749.022	10791.87	5710.281	5674.534	**Ca**
3964.18	3556.03	3079.673	3487.498	4043.994	4271.291	**Ti**
251.5424	253.9076	153.3715	245.2823	268.9356	272.7206	**V**
192.77	201.5362	109.1178	204.9333	226.5781	231.2571	**Cr**
153.0578	183.4989	73.19872	321.6326	149.5807	222.7953	**Mn**
44998.92	52012.37	32678.03	48942.82	54202.6	48829.43	**Fe**
-	-	-	28.96192	39.54	-	**Ni**
53.10754	152.327	24.65818	30.38711	35.90207	34.93105	**Cu**
46.7	49.91769	30.49717	45.48668	51.01375	54.89215	**Zn**
18.40415	17.21102	11.31496	17.80471	15.34715	17.15534	**As**
60.91223	55.19502	54.22514	43.25237	51.95029	52.04216	**Rb**
87.3665	92.40017	77.00702	92.50407	64.16755	85.93376	**Sr**
27.4863	24.57269	24.92413	27.74202	31.33326	29.18047	**Y**
211.9729	224.1627	187.2476	203.6073	239.2852	249.553	**Zr**
9.124139	7.523563	7.257108	7.487836	8.584487	8.123783	**Nb**
27.28268	23.2976	27.43024	21.50555	21.56	22.44823	**Sn**
607.5746	608.7618	648.8009	577.0748	500.8389	602.8509	**Ba**
7.080973	7.255846	6.571449	6.164984	5.893876	10.2962	**Pb**
15.07351	13.27426	10.45866	11.95669	12.58892	13.78871	**Th**
1.878297	-	1.91	-	1.67	1.633468	**U**

RB094	RB007	RB155	RB154	RB152	RB146	Sample
5973.323	6162.455	6104.482	8488.586	6572.005	7857.381	**Mg**
123667.3	104761.5	77871.31	110516.3	108666.1	114449.3	**Al**
335758.3	371754.8	358112.6	377072.9	392566	362770.4	**Si**
3833.333	1839.113	3704.687	2093.131	1805.459	2229.306	**P**
495.1116	419.007	375.2234	403.894	222.3981	324.6273	**S**
21883.25	19400.47	18832.52	18503	21529.51	22068.09	**K**
8100.683	6532.019	6174.145	5163.695	3806.39	7111.601	**Ca**
3175.682	3868.027	3003.849	4324.964	3047.782	3899.795	**Ti**
245.378	283.0589	176.3365	265.0044	164.4413	237.8818	**V**
199.0105	248.2163	141.0793	212.8604	106.8991	198.6017	**Cr**
66.3012	263.0493	97.06323	209.6012	127.6024	244.5052	**Mn**
46629.58	52881.5	40121.83	49583.63	35063.76	45100.35	**Fe**
-	37.82863	89.48035	-	-	-	**Ni**
56.47852	136.4937	30.51882	185.616	1102.632	287.6249	**Cu**
50.42663	53.83589	39.35732	51.97843	33.54916	49.33619	**Zn**
26.16416	14.60971	10.65457	20.08812	16.42735	12.40976	**As**
53.24266	43.16263	49.98764	53.65112	59.06179	61.29368	**Rb**
92.8494	82.68312	123.4675	82.44381	85.96987	75.64954	**Sr**
27.15503	26.53651	27.29157	28.5347	25.90644	33.16726	**Y**
194.9194	229.9683	199.3633	225.9823	208.1015	194.0092	**Zr**
6.751681	6.404802	6.262585	9.234255	6.841982	8.753988	**Nb**
24.96868	29.94635	34.75448	28.31522	26.73464	22.01448	**Sn**
537.8119	596.2794	583.6466	593.9241	726.3566	602.1817	**Ba**
4.963195	4.65	9.327365	8.791963	7.41755	6.592071	**Pb**
11.5851	11.11591	10.90081	12.14543	12.84067	12.73254	**Th**
-	-	-	-	1.783704	1.74	**U**

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
RB009	6328.971	116232.8	357634.5	2256.323	531.3738	15558.02	5941.279	4246.141	316.2736	319.3257	145.8683	54183.34	45.54621	65.19231	55.35045	17.25275	38.4417	67.00153	30.04561	238.1101	7.441415	22.35789	502.5706	6.06	11.34773	1.69
RB019	6934.06	117872.6	351757.3	2417.002	536.325	19031.56	10637.53	3876.924	281.9494	274.2345	252.0453	48725.91	32.84599	40.04478	45.08283	11.95853	39.80388	105.6198	21.95725	219.3255	6.247857	28.58244	494.8555	7.117626	10.98949	1.53987
RB029	7676.848	114234.2	350279.4	4347.035	556.4085	16829.18	11775.98	4246.903	323.8316	303.1495	#NUM!	44064.69	31.51748	45.42829	37.91766	22.36232	33.62347	96.1366	18.75013	212.2789	6.294829	#NUM!	410.0741	-	11.70907	-
RB004	6850.461	104386.2	380211.7	1482.208	333.6306	17403.03	5748.722	3756.009	225.6056	189.5858	70.1799	42992.11	-	32.20086	48.80537	11.05518	50.22285	90.04873	28.0261	222.4742	7.963097	23.79125	507.8517	9.913051	12.48652	1.824171
RB028	8392.491	124161.2	367509.1	3846.173	707.0621	20807.48	7338.726	4273.123	260.4543	181.7806	309.1354	46647.92	-	31.52018	55.92935	17.66975	60.02106	102.6539	35.79559	251.0065	9.28234	27.33205	677.0539	8.06889	15.41651	2.119999
RB095	6794.071	130983	363603.9	1833.331	491.1756	23456.46	7795.952	4217.631	263.8691	195.7514	616.7978	49649.11	26.59498	21.05906	52.15145	18.5417	59.60616	77.26463	32.99176	285.1282	10.05061	24.90911	701.9353	9.664376	16.72897	2.139065

RB128	RB151	RB145	RB126	RB085	RB124	Sample
6786.84	7539.839	5233.903	6487.64	5926.76	8138.548	**Mg**
89485.64	95565.98	106113.1	115284.1	115587.7	91870.45	**Al**
386223.8	376263.2	393466	362995.1	380284.4	388395.2	**Si**
1118.708	1501.875	1796.046	4731.961	979.6003	1294.672	**P**
369.5607	310.1701	433.7778	375.9429	320.9688	311.4032	**S**
20860.83	20819.54	23462	20294.75	19000.46	19145.15	**K**
6770.883	5666.172	5146.775	6654.085	4483.555	7622.469	**Ca**
3302.938	3432.787	3147.878	3458.168	3896.262	3305.813	**Ti**
199.5031	247.8577	188.9674	228.0689	238.1629	211.0393	**V**
166.3296	185.3383	127.1364	159.7969	181.2822	170.7869	**Cr**
336.5369	82.05346	158.8446	108.0748	198.4357	141.3665	**Mn**
42178.17	42819.49	33954.74	40860.09	49863.49	42399.8	**Fe**
-	-	-	-	32.27	-	**Ni**
25.76394	30.88143	17.16481	41.07098	28.74338	17.94542	**Cu**
43.27321	40.19918	32.53091	45.02869	57.20083	41.03842	**Zn**
12.60311	11.68615	17.25324	12.88625	14.29348	10.16965	**As**
50.21399	46.78137	57.90536	56.88277	55.40956	42.3459	**Rb**
92.05149	88.63036	89.51299	89.63653	69.51977	88.50376	**Sr**
26.43264	25.47537	26.29662	29.46374	25.23784	26.5438	**Y**
186.5597	203.6182	193.7436	186.6808	268.4326	201.2369	**Zr**
7.118733	7.0994	7.631073	7.389169	7.992558	6.625634	**Nb**
22.82081	23.09981	23.83601	25.58	25.73107	29.82389	**Sn**
560.0379	505.0542	760.2588	550.132	630.0915	478.2503	**Ba**
7.51669	10.60181	6.130663	7.029016	5.830129	7.560006	**Pb**
12.59188	11.29658	12.95685	12.85492	11.58539	11.30702	**Th**
1.87	-	1.65	1.648909	1.64	-	**U**

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
RB149	6112.617	89783.93	399271.4	1958.186	360.1484	18478.22	6928.111	3330.011	228.7849	167.344	57.6302	40478.94	-	30.15145	39.63723	13.88885	41.27293	102.9728	27.43414	210.1527	7.051222	22.45978	489.8711	6.720098	11.98277	-
RB112	6505.799	93135.38	381298.6	1152.82	451.4743	17835.89	5710.656	3877.344	203.5586	176.7735	71.30753	40171.79	-	30.22567	43.54137	11.93322	49.87756	91.65228	26.34514	223.6523	8.089999	20.56084	498.6774	9.515086	10.75837	-
RB131	6753.651	101245.5	383764.5	1638.262	563.8704	17300.74	8107.504	3499.733	406.7992	224.051	115.866	50576.24	-	29.55117	42.30619	9.864685	40.41894	87.71693	27.46467	223.9153	7.205948	26.17695	526.9803	5.982625	10.83536	1.51
RB132	6590.931	95388.67	350783.8	830.7328	352.6715	14356.28	5761.057	3605.393	284.7193	229.8298	169.4814	53125.41	27.25	43.9181	41.02954	17.11915	44.99682	57.85657	23.95841	240.7484	6.762052	28.40055	550.6736	6.12	8.997512	1.62
RB140	6698.208	90631.15	380004.2	760.4727	254.3709	16796.35	4947.12	3465.455	192.6749	145.1304	91.02645	38767.46	-	20.7741	43.58484	9.562178	52.82065	84.64848	28.09924	222.9027	8.087656	26.73486	486.7463	10.93289	11.84041	-
RB148	7233.729	103790.1	396996.4	1089.384	278.2898	19070.58	4247.71	3593.141	191.2464	151.7121	104.4822	39846.73	-	35.01179	49.36497	13.24796	61.26868	83.37105	28.76933	244.6128	8.736106	31.02	557.5633	13.34379	14.72308	2.07976

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
RB150	7627.905	106209	360742.4	4826.792	780.1565	19046.83	9210.785	4019.675	270.344	237.6177	226.2965	51829.66	24.7	37.10823	49.81959	14.94387	43.44737	98.06065	28.98577	205.7785	8.12617	25.55313	557.2109	8.138243	11.88073	1.559712
RB153	6473.827	111000	354011	3262.44	577.0834	20945.04	7741.186	3794.535	232.769	167.1997	361.5699	46377.27	-	32.74178	52.23034	16.50756	59.59913	90.67841	36.85317	256.882	8.534548	23.43522	622.8185	6.166399	14.17062	1.957141
RB156	7711.237	118503.8	370057.2	4018.087	691.026	22027.51	7060.404	4007.278	239.9344	206.4476	343.7583	48137.73	-	23.08463	55.92764	12.98337	54.91797	96.32797	32.20338	234.6445	8.080206	23.76304	709.9781	7.951154	13.64621	1.837628
BB001	8250.923	129221.8	358942.8	1346.472	386.5303	26289.23	4813.41	4283.644	273.1349	225.0463	167.7002	52691.41	23.7	31.33979	53.32575	18.78025	60.84194	61.37838	32.47489	211.422	9.265347	28.4281	622.7183	7.378156	12.55672	2.651933
BB002	6953.41	95164.84	326963.8	747.1069	345.5316	15139.64	7573.411	4299.322	259.6226	259.0913	284.1489	58286.82	34.70506	44.45472	73.31421	15.22326	47.11662	66.61599	32.70442	186.5748	7.324233	23.34941	511.7982	4.71	9.187608	-
BB003	8155.764	87304.45	396645.4	2118.82	302.0823	24232.27	6262.124	3192.146	207.5685	146.4687	106.8459	37523.19	-	17.65358	42.24648	14.40601	50.42459	113.2213	26.80998	214.0713	7.908761	33.64134	554.5995	8.611045	10.81145	-

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
BB004	7222.467	114295.1	318846.8	977.0541	351.032	20256.05	6199.124	3987.398	261.8415	266.5794	219.1465	53606.78	-	23.19443	48.4408	15.61839	62.7515	55.87652	37.60382	204.7974	7.973635	30.04789	573.5634	6.051182	12.3212	1.814663
BB007	6569.021	122988.8	363763.9	2155.765	414.1153	19126.08	6979.423	3735.391	289.9895	250.3671	71.74479	47174.49	26.77113	43.61944	44.18093	18.37293	40.63631	88.21113	33.72074	191.6268	6.299665	25.43	542.1287	6.023687	11.19469	1.91
BB016	6816.656	116126.1	354561.5	1647.873	701.5695	20815.99	6864.742	3993.855	238.2523	196.6609	327.7156	47849.97	-	29.43699	50.88147	17.12411	61.69959	71.51739	35.0633	235.5332	8.912302	24.259	617.3364	7.123728	14.9824	2.053876
BB018	8470.772	91497.09	345926.3	1145.781	456.5394	18853.92	6398.678	3614.108	217.6974	198.3921	136.699	48750.3	-	37.6229	51.99904	16.14822	55.87298	80.3536	27.71479	215.8621	7.573285	21.08913	479.2038	7.934101	11.77305	-
BB022	8137.918	103072.9	355292.7	1064.904	571.4395	21399.14	8415.009	4312.03	248.0565	247.5407	222.0527	55255.74	-	47.91295	66.83987	15.23282	46.10976	88.7632	30.9861	201.2595	7.901415	37.05355	511.9629	5.918005	10.31574	-
BB023	6047.418	86027.34	373137.2	911.2076	422.2978	20368.51	5850.19	3202.153	226.3041	192.8313	74.19061	44979.71	-	27.69869	38.51306	9.149016	44.25404	85.10562	26.37644	218.3069	7.35428	22.12415	510.8071	8.444063	9.364252	-

Sample	BB026	BB005	BB006	BB008	BB009	BB010
Mg	8082.299	5242.435	9588.051	8077.724	9890.544	10916.5
Al	98619.3	103043.5	115542.6	126023.6	122369.3	94421.33
Si	416951.8	394314.8	345108.3	368544.2	368936.6	346037
P	1832.337	982.4402	2416.177	1544.734	745.6618	1153.083
S	424.9105	411.5395	408.2291	454.3869	336.6094	642.0772
K	18607.27	23488.34	29626.48	19260.82	20823.92	19292.79
Ca	6381.114	4371.836	7030.972	7058.053	5920.374	10465.24
Ti	4215.157	3126.343	2950.45	4081.204	4088.754	3906.699
V	243.0951	169.3094	196.2007	254.5046	242.1441	250.6266
Cr	170.0545	114.052	146.2363	200.1512	199.1641	270.0361
Mn	65.72074	144.2687	559.8271	578.68	255.5998	161.9037
Fe	33672.56	34122.28	47332.43	57226.27	51493.25	53345.78
Ni	-	-	-	-	41.51	-
Cu	19.84853	22.1121	23.63056	31.4923	27.02051	48.22962
Zn	47.32685	27.83346	60.09471	65.37594	56.60826	64.95868
As	12.2042	15.81074	17.83492	19.58109	18.04688	11.77794
Rb	38.45203	56.26242	67.67543	54.98732	57.67625	48.53748
Sr	100.553	79.62671	119.8409	85.42975	86.42658	79.69831
Y	33.0839	25.67505	24.33304	34.45488	28.06986	29.64285
Zr	218.9493	190.0981	180.4437	265.1832	253.3869	191.0668
Nb	9.375057	7.167865	8.22321	10.21809	9.312722	6.714622
Sn	29.74675	20.27178	27.72136	30.91977	28.71806	23.26
Ba	464.4533	636.303	723.9981	706.61	612.4193	501.5348
Pb	6.408611	7.381749	9.07859	8.132257	6.143675	5.18
Th	13.54585	11.36153	13.80919	17.04913	13.79127	10.42942
U	-	-	-	2.219189	2.046485	#NUM!

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
BB011	8155.825	104225.6	365704.6	1725.801	450.9393	20770.42	8289.006	4302.326	270.5577	263.9969	203.8212	51271.33	25.50093	45.88358	65.24381	18.82932	46.46581	95.41967	30.88794	196.6913	7.574913	25.78463	519.4083	6.17	11.62453	#NUM!
BB012	8705.656	120777.5	353104.8	1483.645	564.283	25587.46	6587.592	3148.462	206.55	149.8532	353.4086	41694.83	-	32.09117	58.33545	13.43822	69.32806	105.2612	25.15156	179.4312	7.972086	29.98	686.1697	8.064657	12.67035	1.85127
BB013	7583.589	105292.7	375997.1	892.3419	385.1397	17903.14	6388.264	3818.769	298.8041	262.9224	123.2981	56014.57	85.72	36.58779	41.86277	14.00126	42.31952	63.63296	27.85666	229.03	7.664831	24.89	521.1695	5.257684	11.23656	1.7
BB014	7957.444	132438.8	327046	1239.155	695.7415	19708.07	10337.7	4426.628	315.7436	377.0034	85.75371	57460.09	79.3086	68.36159	54.35056	12.55135	37.20467	72.29778	33.51522	199.7857	6.031658	22.80187	456.1802	#NUM!	9.094381	-
BB015	6200.004	98478.53	395061.5	2967.33	387.2597	19327.46	7961.143	3653.675	218.1684	128.1011	113.5053	37833.86	-	24.54549	43.84064	15.68538	44.90967	97.2722	24.17899	233.1403	8.675569	22.00161	531.6892	6.035445	11.60486	1.55
BB017	8005.099	97599.45	388532.7	845.2223	346.8184	23056.42	5556.369	3556.387	226.5459	193.7207	73.59147	45075.4	24.04	34.28088	42.76894	12.53249	47.7059	83.74955	23.29389	211.1129	7.219694	27.4135	497.6421	6.382091	10.37604	1.83

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
BB019	8038.047	111333	351457.8	1471.297	403.503	21235.79	6758.175	3977.229	269.06	256.4222	245.4646	53855.09	27.26	50.99502	51.89686	15.14424	48.89871	77.03733	27.37304	225.9095	7.090924	27.61628	554.4939	6.54	9.816213	1.76
BB020	7244.408	90007.61	367604.6	2417.564	405.2711	20861.58	8210.177	3258.827	202.6661	191.0417	121.0924	46034.91	29.59381	23.36536	44.16298	11.0833	45.01818	103.6766	23.87231	207.8967	6.564063	31.59	532.7392	7.184525	9.70529	-
BB021	6544.278	87101.16	371490.5	1621.251	379.8123	21071.12	6796.696	3267.636	236.7165	188.4882	129.0888	47087.57	22.58	28.54155	40.91452	11.282	44.75432	90.262	26.17986	205.9743	6.88141	27.22248	498.8181	8.341808	9.233675	-
BB024	6862.814	92676.37	377621.3	1323.402	582.6814	24204.38	7650.434	3307.695	213.972	192.2262	80.3886	44219.58	-	21.33315	36.34394	9.361357	49.06152	93.44298	23.27368	199.8344	6.715352	23.39122	518.5529	8.140816	9.118852	-
BB025	6997.795	86460.07	380464.9	7479.687	569.5385	22441.84	8457.686	3387.537	216.5104	194.949	121.4061	45724.17	-	23.90376	38.30007	25.04184	40.77239	150.0566	22.12079	194.8763	6.66054	31.32524	578.8578	6.417335	12.39902	-
BB027	8050.55	112586.9	347340.4	1666.515	667.3529	22361.24	5845.425	3549.098	309.9148	209.8799	409.0345	56402.83	-	30.8859	59.73008	23.1233	59.27361	91.71161	26.9841	181.0872	8.140027	30.94497	678.8436	12.11709	11.74798	1.63

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
BB028	9126.696	108608.8	339068.9	2119.532	542.741	19282.69	6515.506	3864.918	264.4376	244.9318	528.2452	60295.82	33.91283	34.89799	51.04558	15.81076	48.75128	75.78379	27.88331	230.4598	8.099968	29.10817	606.6457	8.5	13.05227	-
BB029	8064.062	117569.5	352076.8	3082.482	564.2007	18160.77	7087.203	3533.396	264.1987	221.889	2145.73	62053.84	65.76047	33.69806	60.72119	20.86387	49.09965	103.773	28.11016	221.6961	8.181497	37.87117	875.1473	12.03433	12.97181	-
BB030	8263.596	144639.1	328979.6	1307.027	415.734	12461.99	4934.586	5336.194	382.4744	358.013	279.2798	81768.25	69.89032	59.96308	70.43333	24.99112	37.93423	40.50008	38.16356	217.8813	9.576298	34.47375	440.551	-	12.57998	-
BB031	5886.263	87290.53	378757.7	1223.622	377.3679	22234.69	5242.793	3202.631	245.2097	182.9497	77.98064	46684.95	-	28.88346	43.00892	13.81315	46.83896	81.56281	26.46505	217.3452	6.708635	24.56167	546.1084	6.553168	10.93529	-
BB032	8718.073	91021.33	373227.9	2115.453	789.427	25618.63	6733.435	3228.475	221.3064	155.3211	89.26352	40521.45	-	29.03942	43.70311	11.90786	50.58693	90.59384	24.81125	189.9419	6.976165	25.03172	473.554	8.577667	11.08419	2.06
BB033	7850.9	118776.9	354529.2	4459.209	499.9833	19601.38	8165.789	3806.959	256.1602	201.5315	464.2374	51777.38	32.10322	35.11645	55.06179	16.095	47.61214	115.5925	26.12922	223.5973	7.448995	33.51425	631.7229	6.04822	12.07612	2.233383

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
BB034	8460.776	110542.8	358893.8	2677.507	566.2776	22095.2	6888.136	3701.684	234.7659	179.707	257.0419	46807.88	-	24.62986	49.32897	14.7901	62.39451	79.24149	35.10345	203.5655	8.627655	28.57587	619.5992	7.735904	12.03412	2.385707
BB035	7133.216	101016.2	367781	2267.818	456.1945	21511.52	6865.404	3516.698	248.6009	226.4892	409.1431	48041.38	24.5	27.4455	45.2505	14.55788	47.40812	86.08318	28.46922	263.0161	6.557259	26.21633	651.8625	5.789404	12.4709	1.66
RimP036	8597.594	103740.9	362797.6	1974.635	440.3711	18116.08	7856.23	4132.545	286.1403	283.0895	229.6093	53501.69	31.43851	44.07721	45.574	11.42878	37.33261	81.70681	28.39681	246.9865	7.088946	26.85343	546.056	6.88465	9.738857	-
RimP037	6338.449	117357.6	358234.9	2707.869	596.4275	19732.49	9096.477	3542.943	276.7964	293.7122	56.14898	51303.64	29.65138	50.39665	45.83822	18.38952	40.72269	114.2624	30.45839	193.4956	6.122856	23.84598	593.1527	5.29966	8.731639	-
RimP038	6240.485	105724.5	328223.8	1175.302	264.5095	17485.73	4476.255	3902.69	206.3251	186.6807	149.7132	43338.34	-	20.45395	43.06697	12.74089	52.91267	49.69506	25.71468	277.3489	8.491242	25.45316	576.4976	7.21	13.5263	-
RimP032	8731.31	106357	351853.2	1609.288	414.8722	20183.6	6565.342	3651.25	271.6942	251.4747	124.8941	53180.73	48.95488	36.5981	43.62544	12.08608	44.51705	73.37425	25.58239	257.3241	6.739626	25.02294	516.7491	8.52	9.21989	-

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
RimP033	7584.107	113127.2	363091.8	1180.181	398.1136	12871.6	6278.44	4331.16	281.9826	254.0974	149.2759	57475.74	37.96	49.8139	52.46948	14.04789	42.22968	49.74899	31.93525	237.2661	8.547553	28.08044	490.8275	5.899458	11.14674	-
RimP034	6364.493	102436.6	327769.5	3395.347	451.4135	21507.91	7123.596	3536.867	212.7291	179.6215	249.4221	47129.49	-	27.08784	52.28606	16.4379	56.05932	87.37813	29.25095	217.087	7.549097	20.83707	632.0505	5.923614	10.7216	2.15
RimP035	7880.374	93674.15	342354.8	1608.846	417.5027	17751.37	8373.069	4027.079	280.7287	301.1831	180.8604	56830.49	-	44.54003	53.89801	13.54456	39.83675	80.17418	26.55694	186.383	6.634492	23	489.2338	-	11.26073	-
RimP039	7526.175	106641.3	384013.2	3687.038	549.1661	14420.8	5272.444	4146.844	302.8376	261.1309	277.0591	56230.26	24.46021	28.17483	51.4624	22.42719	36.38471	95.74866	26.24654	241.3144	7.490501	30.21853	636.3579	-	12.8565	-
RimP040	7544.347	99142.07	390177.8	1945.457	322.4927	16679.17	6583.953	3724.162	261.8364	232.3249	120.0544	48347.16	-	28.7431	39.58736	11.14191	38.91019	66.16383	27.61125	235.7542	7.669243	26.05913	499.7587	5.152495	11.99634	-
RimP041	6192.362	114564.5	342174.9	2716.125	578.4524	17801.7	6447.849	3901.251	264.5341	288.0048	142.8509	52690.87	30.83	53.22881	52.78373	17.50799	41.67416	96.37102	31.81892	203.8257	7.129756	22.04	590.9136	8.17	11.07192	-

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
RimP042	7100.461	116418.7	366209.4	2915.372	402.9649	22764.01	7292.817	3935.163	229.677	186.6766	248.1155	43794.72	25.9	22.29579	50.33831	14.27724	61.48382	80.61714	33.81691	217.87	9.047778	30.04581	586.1112	6.864708	12.90291	-
PP001	9350.407	111084.3	350672.4	1861.217	564.1018	23584.95	6618.635	4076.965	252.3133	204.9557	478.7141	53987.11	-	37.06832	65.23449	18.4742	58.60735	88.30085	28.90343	220.4643	9.672637	21.82582	601.5645	7.041945	13.81102	-
PP002	9902.247	106394.1	353972.4	1693.89	436.2707	21042.71	7545.953	4280.006	306.6943	310.142	276.9074	64394.26	36.03132	53.89396	70.56384	21.0431	47.95283	95.083	29.45338	183.3711	7.307354	30.28746	548.757	-	9.693898	-
PP003	8695.281	111223.8	356889.3	2094.718	462.8713	22438.57	7141.552	4094.945	260.9683	228.0885	320.3968	53397.35	--	35.44775	61.42135	17.70543	55.69836	87.80078	30.64828	206.5169	8.615536	27.08149	578.3811	-	11.99879	-
PP004	9302.849	109544.2	353835.6	1876.158	484.7576	22331.12	7091.831	4149.634	272.319	243.8417	348.8989	57045.18	-	41.37238	65.63361	19.0222	53.89348	90.33486	29.65948	202.8655	8.476095	26.15985	575.8271	-	11.71172	-
PP005	9287.05	109035.6	354896.3	1881.164	460.872	21928.17	7256.965	4174.144	279.334	258.3791	313.984	58102.56	-	42.91539	65.76719	19.20845	52.40801	91.02322	29.91587	197.3172	8.111094	27.78797	567.4951	-	11.08542	-

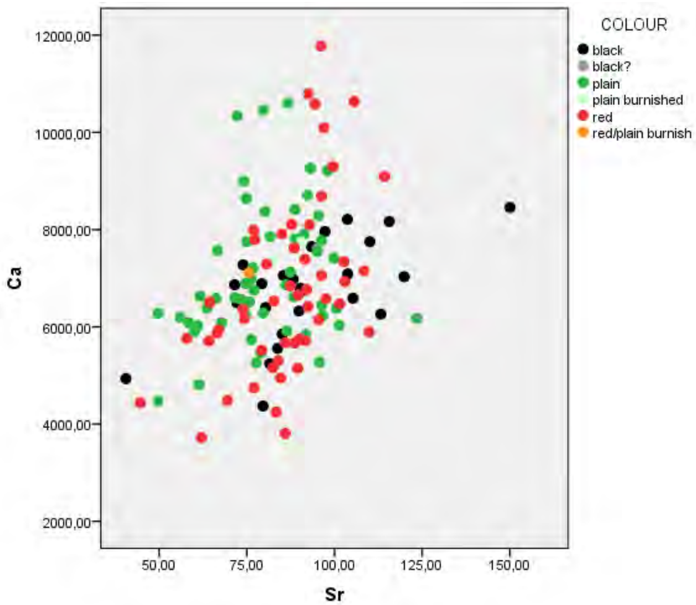
PP011	PP010	PP009	PP008	PP007	PP006	Sample
9191.081	9199.879	9172.436	9200.956	9226.324	9090.598	**Mg**
109557.9	109544.1	109640.6	109489	109502.8	109930.6	**Al**
354888.1	354827.3	354921.6	354915.3	354645.1	355204.8	**Si**
1913.416	1910.435	1919.778	1910.051	1901.521	1948.082	**P**
468.6795	469.3994	469.3938	467.2487	471.5657	469.3769	**S**
22140.01	22145.74	22167.16	22107.17	22162.94	22231.53	**K**
7184.855	7181.218	7176.688	7196.674	7170.319	7163.116	**Ca**
4153.102	4153.422	4149.922	4155.965	4154.381	4139.442	**Ti**
273.9719	274.0077	273.194	274.7162	274.1149	270.7675	**V**
248.465	248.436	247.0966	249.8701	248.3492	243.1213	**Cr**
325.7902	326.7851	326.9425	323.6535	329.7883	327.4149	**Mn**
56959.93	56992.92	56779.75	57107.6	57091.99	56145.03	**Fe**
-	-	-	-	-	-	**Ni**
41.09337	41.1537	40.80525	41.32285	41.33523	39.77749	**Cu**
64.98309	65.03988	64.83946	65.07016	65.21057	64.24189	**Zn**
18.89175	18.90707	18.83821	18.9301	18.95308	18.63316	**As**
53.41337	53.41586	53.55714	53.26751	53.42332	53.98322	**Rb**
90.26196	90.28498	90.1406	90.36045	90.35405	89.70886	**Sr**
29.95405	29.93598	29.96984	29.95634	29.88185	30.07164	**Y**
200.5776	200.6277	201.0191	200.0871	200.7781	202.1977	**Zr**
8.308302	8.312965	8.334191	8.277848	8.32697	8.398193	**Nb**
27.14286	27.10078	27.07593	27.25221	26.97492	27.00152	**Sn**
571.9344	572.0484	572.5063	571.2493	572.3904	573.8822	**Ba**
-	-	-	-	-	-	**Pb**
11.43024	11.43765	11.47612	11.37717	11.4599	11.59231	**Th**
-	-	-	-	-	-	**U**

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
PP012	9187.792	109580.9	354879	1914.539	469.1574	22150.96	7180.92	4152.149	273.7243	247.9984	326.5055	56910.79	-	41.01715	64.95409	18.87899	53.46208	90.22916	29.95329	200.7414	8.318478	27.10651	572.163	-	11.44798	-
PP013	9192.916	109561	354864.8	1912.796	469.0787	22145.57	7182.331	4152.891	273.9013	248.2997	326.36	56954.53	-	41.08803	64.99234	18.8926	53.43043	90.2587	29.94777	200.6489	8.313247	27.11671	572.0486	-	11.43862	-
PP014	9190.596	109566.6	354877.3	1913.584	468.9718	22145.51	7182.702	4152.714	273.8658	248.2543	326.2184	56941.75	-	41.06617	64.9765	18.88778	53.43529	90.24994	29.9517	200.656	8.313342	27.12202	572.0487	-	11.43895	-
PP015	9190.435	109569.5	354873.7	1913.64	469.0693	22147.35	7181.984	4152.584	273.8304	248.1841	326.3613	56935.69	-	41.05711	64.97431	18.88645	53.4426	90.24593	29.95092	200.6821	8.315022	27.11508	572.0867	-	11.44185	-
PP016	9191.316	109565.7	354871.9	1913.34	469.0399	22146.14	7182.339	4152.73	273.8658	248.246	326.3132	56943.99	-	41.07044	64.98105	18.88894	53.43611	90.25152	29.95013	200.6623	8.31387	27.11794	572.0613	-	11.43981	-
PP017	9190.782	109567.3	354874.3	1913.521	469.027	22146.33	7182.342	4152.676	273.854	248.2281	326.2977	56940.47	-	41.06457	64.97729	18.88773	53.438	90.24913	29.95092	200.6668	8.314078	27.11835	572.0656	-	11.4402	-

Sample	Mg	Al	Si	P	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Pb	Th	U
RB160	9190.844	109567.5	354873.3	1913.5	469.0454	22146.61	7182.221	4152.663	273.8501	248.2194	326.3241	56940.05	-	41.06404	64.97755	18.88771	53.4389	90.24886	29.95066	200.6704	8.314323	27.11712	572.0712	-	11.44062	-

Appendix 4

The rest of the pXRF bivariate scatterplots not presented in Chapter 6, three results per sherd.


COLOUR
black
black?
plain
plain burnished
red
red/plain burnish
Ca
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4000,00
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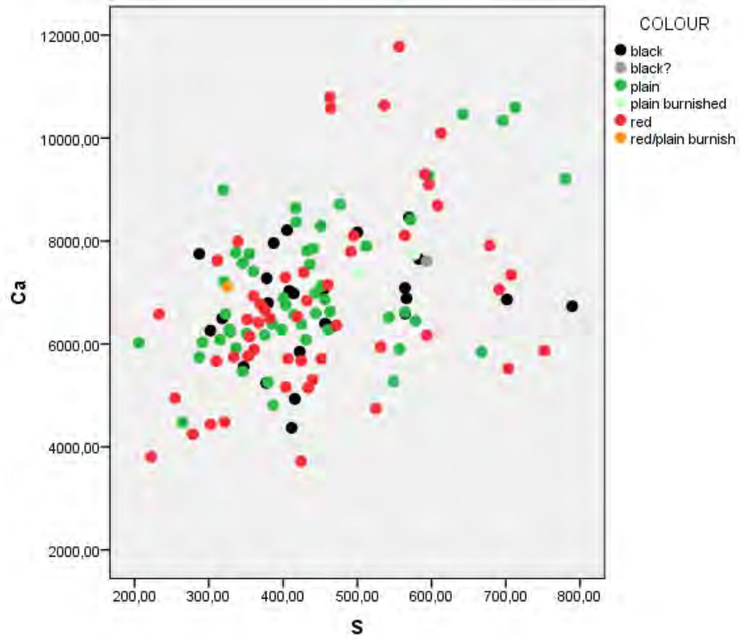
125,00
150,00
Sr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black?
plain
plain burnished
red
red/plain burnish
Ca
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10000,00
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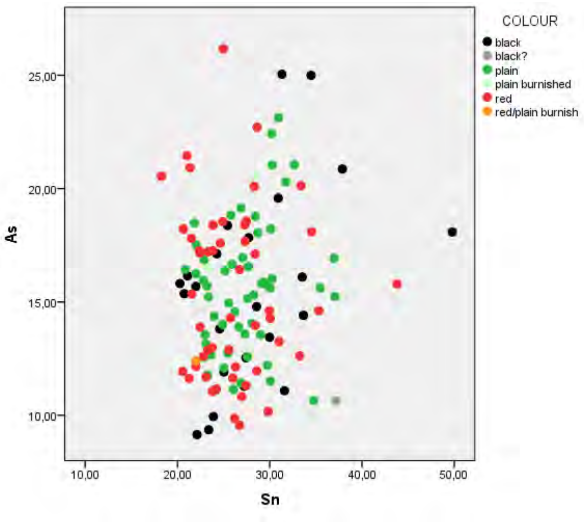
700,00
800,00
S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black?
plain
plain burnished
red
red/plain burnish
As
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10,00
10,00
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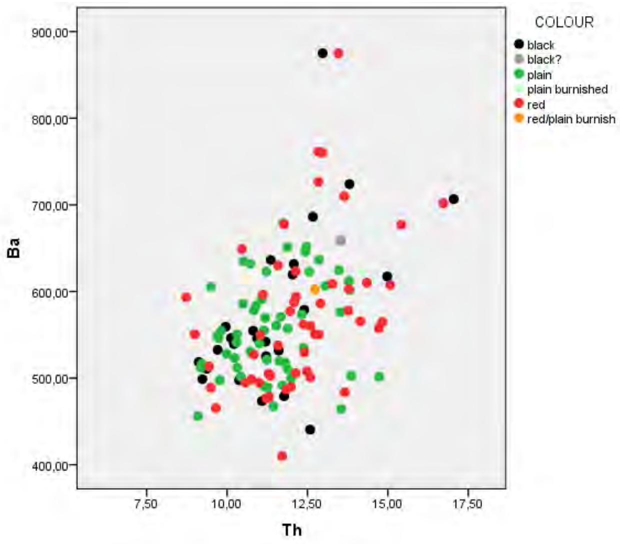
40,00
50,00
Sn


COLOUR
black
black?
plain
plain burnished
red
red/plain burnish
Ba
900,00
800,00
700,00
600,00
500,00
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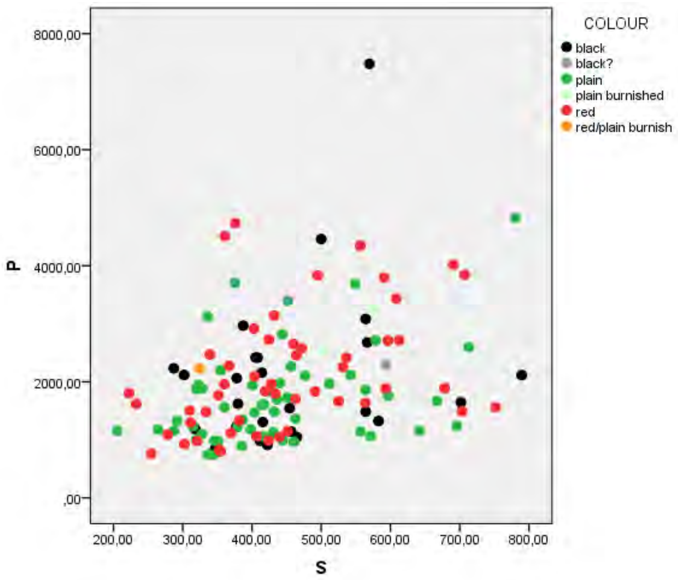
15,00
17,50
Th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black?
plain
plain burnished
red
red/plain burnish
P
8000,00
6000,00
4000,00
2000,00
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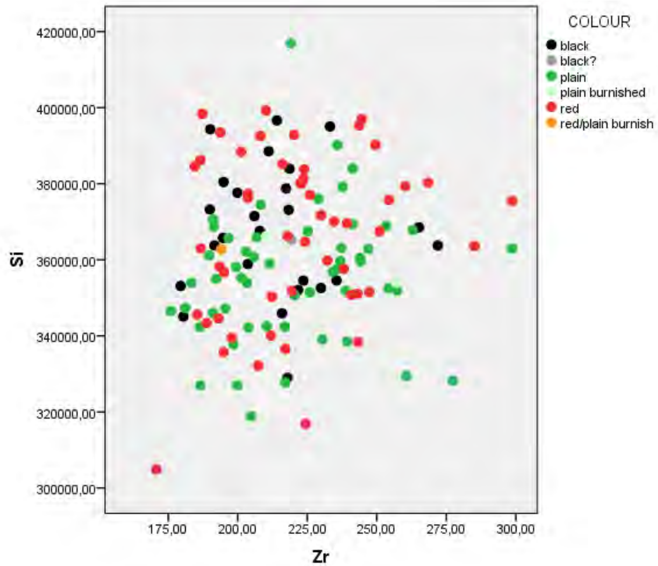
600,00
700,00
800,00


COLOUR
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black?
plain
plain burnished
red
red/plain burnish
Si
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400000,00
380000,00
360000,00
340000,00
320000,00
300000,00
Zr
175,00
200,00
225,00
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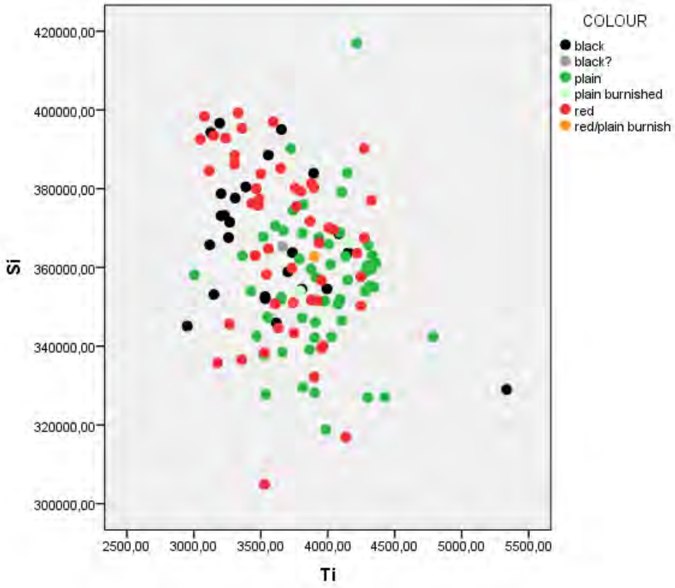
300,00


COLOUR
black
black?
plain
plain burnished
red
red/plain burnish
Si
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400000,00
380000,00
360000,00
340000,00
320000,00
300000,00
Ti
2500,00
3000,00
3500,00
4000,00
4500,00
5000,00
5500,00