

**Change and continuity in the lithic technologies from
Final to Ceramic Final Later Stone Age,
Limpopo Basin, South Africa**



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in fulfilment of the requirements for the degree of Doctor of Philosophy**

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CANDIDATE'S DECLARATION

I declare that this thesis is my own, unaided work. It is being submitted for the Degree of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree of examination at any other University

Iris Guillemard

A handwritten signature in black ink, appearing to read 'Iris Guillemard', written over a light blue horizontal line.

20th day of October 2020 at Paris

ABSTRACT

The late Holocene of southern Africa is a key period of social and economic change. From around two thousand years ago, the appearance of domesticated sheep and pottery at Later Stone Age (LSA) sites, traditionally associated with hunter-gatherers, marks the beginning of varied neolithization processes. The Limpopo River Basin is particularly important to the discussion of these processes. The area is thought to have been a major route of migration and settlement for varied populations, generally classified as ‘hunter-gatherers’, ‘herders’ and ‘farmers’. These three economic categories are often associated with specific language groups. This association leads to the creation of paradigms, that sometimes impede our understanding of social dynamics during the late Holocene.

This thesis aims to investigate phenomena of stability and change in lithic systems through the late Holocene within the socially complex middle Limpopo River Basin. It begins with a case study of the microlithic assemblage from Balerno Main Shelter (BMS), dated from 300 BC to the second millennium AD. The lithic technical system is defined using the *chaîne opératoire* and techno-functional methods and investigated to determine if change or stability can be observed throughout the sequence. Hypotheses are then formulated about the scenario observed, in relation to the potential economic and social shifts that occurred within hunter-gatherer societies. The potential trans-economical nature of lithic technologies is considered, along with phenomena of interactions in the Limpopo River Basin. Lastly, large-scale technological phenomena are discussed, and the thesis questions what techno-complexes could represent beyond the classic vision of ‘archaeological cultures’. A discussion is then opened about multi-disciplinary migration models that equate subsistence, language and genes in the context of the pastoral Khoe migration in southern Africa. Rather than correlating different ‘traits’ within ‘culture container models’, as per convention, this thesis proposes a dis-assembling of these characteristics for the investigation of the reason for change or stability within each analytical category. This dis-assembling allows us to go beyond simplistic correlations to investigate phenomena of co-dependence or independence between different proxies and factors using varied hypotheses.

RÉSUMÉ

L'Holocène récent en Afrique australe (4000 BP – 19^{ème} siècle) est une période clef voyant l'apparition de changements sociaux et économiques. A partir d'il y a environ deux mille ans, l'apparition du mouton domestiqué et de la poterie dans les sites Later Stone Age (LSA), traditionnellement associés aux chasseurs-cueilleurs, marque le commencement de divers processus de néolithisation. Le bassin de la rivière Limpopo est une région particulièrement intéressante pour l'étude de ces processus. Ce bassin est en effet une voie de migration majeure où se côtoient des populations variées, généralement qualifiées de 'chasseurs-cueilleurs', 'éleveurs' et 'agriculteurs'. Ces trois catégories économiques sont souvent associées à des groupes linguistiques particuliers. Cette association donne naissance à des paradigmes qui limitent parfois notre compréhension des dynamiques sociales au cours de l'Holocène récent.

Cette thèse a pour objectif d'analyser les phénomènes de changements et de continuité au sein des systèmes lithiques de l'Holocène récent dans le bassin du Limpopo. L'assemblage microlithique du site de Balerno Main Shelter (BMS), daté de 300 BC au second millénaire AD est analysé. Le système technique lithique est défini à partir d'une étude des chaînes opératoires, et de la méthode techno-fonctionnelle. Cette étude détermine si des changements s'opèrent au cours de l'Holocène récent, ou si au contraire le système technique s'inscrit dans la stabilité. Des hypothèses sont ensuite proposées afin d'expliquer le scénario observé, notamment en relation avec les potentiels changements économiques et sociaux prenant place au sein des sociétés de chasseurs-cueilleurs. En particulier, la nature 'trans-économique' des industries lithiques de la région est considérée, ainsi que des phénomènes d'interactions. Une discussion est également ouverte à propos des phénomènes techniques de grande échelle. Cette thèse questionne comment pourrait-on interpréter les techno-complexes lithiques au-delà de 'cultures archéologiques'. Une réflexion est enfin menée sur la pertinence des modèles de migration multidisciplinaires qui corrélerent l'économie de subsistance avec certains langages et gènes dans le cadre des migrations pastorales dites 'Khoe' en Afrique australe. Au lieu de corréler ces différents aspects au sein de 'modèles en bulles culturelles' (*culture-container models*), cette thèse propose de désassembler ces données afin de mieux interpréter les processus de changement et de continuité au sein de chaque catégorie analytique.

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INTRODUCTION

Southern Africa's long history and remarkable archaeological record and preservation make the sub-continent a creative place for research. Famous for its in-situ human evolution record in the Cradle of Humankind, it is also a central place for the study of Pleistocene and Holocene hunter-gatherer societies, up to the second millennium AD. In his inaugural speech at the Collège de France in October 2019, François-Xavier Fauvelle reminded us that African archaeology is continually contributing to the enrichment of our understanding of broad anthropological and social processes, such as human evolution and the shift to food production.

This thesis focuses on southern African's Later Stone Age (LSA), which is dated from around 40 000 years ago to the second millennium AD. The LSA has attracted many researchers, notably on its last millennia when economic diversification within hunter-gatherer societies seems to occur. Research undertaken on the LSA has revealed the diversity that existed in the social and economic organisations of southern African hunter-gatherers. Far from being an immutable entity, the LSA sees the chronological succession of different archaeological materials during the late Pleistocene and the Holocene, including varied lithic techno-complexes. Instances of regionalisation, on the one hand, and, on the other, homogenisation of these archaeological entities give a pulsed dynamic to this LSA history.

The late Holocene of southern Africa is a key period of social and economic change. From around four thousand years BP, technological shifts occur in the lithic technologies of some hunter-gatherer groups. It is also from around that time that some of them begin to exploit natural resources more intensively and that sedentary mode of occupation would appear in certain areas. From around two thousand years ago, domesticated sheep and pottery appear in LSA sites. The appearance of these new elements marks the beginning of varied economic and social shifts that take place in late Holocene hunter-gatherer societies, entering varied neolithization processes.

Sheep and herding practices are believed to have been first introduced in southern Africa by small groups of Khoe-speaking pastoralists coming from eastern Africa. This first migratory phase is referred to as the 'Early herding phase'. Many uncertainties remain about its chronology and potentially associated archaeological material. For instance,

different authors argue that ‘Khoe pastoralists’ were using stone tools, that could differ from those made by local hunter-gatherers. A few centuries later, successive migrations of agro-pastoral communities reach southern Africa. This second migratory phase is commonly referred to as the ‘Iron Age migrations’ or ‘Bantu migrations’. Diverse subsistence economies subsequently emerge during the first and second millennium AD, adapted to the environmental context in which they occur. Pastoralist economies progressively develop in the dry lands of western southern Africa. In the more irrigated lands of eastern southern Africa, economies flourish which integrate herding practices and agriculture differently. In these contexts, hunter-gatherer societies go through varied processes of social and economic changes involving different actors and following contrasted trajectories.

Lithic technologies of the last three thousand years differ across southern Africa but are broadly microlithic. The impact of different neolithization processes on the technological sphere of hunter-gatherers is still under study. In most southern Africa, it seems like each regional lithic tradition persists after the introduction of sheep and pottery. In other places, however, some authors argue that technological changes occur. Some lithic assemblages could, following these researchers, then be attributed to incoming herders. In other places, specific types of retouched artefacts become more widespread, potentially reflecting a shift in activities.

Despite the apparent technological continuity which prevails in southern Africa, many questions are still open about potential ‘herder’ or ‘Khoe’ lithics and about what could be seen from the study of lithic technologies at that time. Even though change, that could be an indicator of the arrival of new populations, is looked for, the reasons behind the stability of lithic systems have not been investigated, even though it would appear to be a widespread phenomenon. This raises questions about the different possible interpretations of broad phenomena of change or continuity within lithic systems at the site-scale, as well as at regional and supra-regional scales when considering lithic techno-complexes. How might a lithic technological unit reflect (or not) social or economic change or continuity within hunter-gatherer societies? Could it also be possible to retrace large-scale migrations through lithic studies? These questions have their importance both in the context of neolithization, and in regard to the assembling or disassembling of ‘cultural’ or ‘economic’ packages in archaeological studies.

The shift from hunting and gathering to food-producing economies, corresponding to the process of neolithization, is indeed one of the key transitions of human history. The local invention and diffusion of these new practices in southern Africa are discussed through the partial or concomitant observation of ‘markers’ such as domesticated animal remains, signs of agriculture, polished stone tools, pottery, storage practices, sedentary modes of occupation, and new symbols. Traces of violence and changes in burial practices may also be observed. In the last decades, worldwide research has revealed the existence of a great diversity of ‘Neolithics’ and ‘neolithizations’, integrating these markers differently, and following diverse chains of transmission. The joint appearance of key elements such as domestication, agriculture, and sedentarism, as a ‘Neolithic package’ may be observed, but it is not always the case. In some places of the world, the progressive development of forest management or horticulture without animal domestication exists. Storage practices and pottery-making may also occur in hunting and gathering societies, independently or not from domestication and agriculture. There is also great diversity in the ways in which domesticated animals are used. Some populations continue to rely heavily on hunting and gathering, while, in others, domesticated animals are at the centre of the economy. Domesticates may also be associated with more or less mobile ways of life, and respond to different needs, such as meat or milk consumption, or transport. All these situations reflect the diversity that may be expected when studying neolithization processes, as is the case in southern Africa. In the context of neolithization, researchers debate different diffusion models of food-producing economies, giving more or less agency to local hunter-gatherers when explaining the development of these new practices. Overall, recent research shows how chains of events and consequences exist in the process of neolithization, but also how different markers may appear independently and not necessarily rapidly lead to a complete ‘Neolithic package’.

Southern African archaeology centralises many of these debates. Diverse subsistence economies follow from the first appearance of domesticates in southern Africa. In some instances, hunter-gatherer societies may have maintained a hunting and gathering economy, or, in others, adopted ‘hunting-herding’ practices that led, in some cases, to ‘full’ pastoralism. Pastoral economies are observed in the arid and semi-arid lands of western southern Africa. In the eastern and central half of southern Africa, interactions between hunter-gatherers and agro-pastoral communities led to different scenarios of independence or progressive integration between these two economies. Like the appearance of domesticates in southern Africa, pottery also appears from around two thousand years ago

in LSA sites traditionally attributed to hunter-gatherers. Many debates concern whether pottery could have been made by hunter-gatherers themselves, following in-situ inventions or resulting from contact with populations making pottery, or was obtained through trade with agro-pastoral populations. New rock art representations and techniques also occur that according to some researchers, would have been made by incoming herders. Finally, populations with diverse subsistence economies seem to have co-existed for at least one millennium in different areas of southern Africa. In archaeological terms, it sometimes seems as if Palaeolithic, Neolithic and Iron Age ‘societies’ could have co-existed in the same spaces, while following different degrees of interactions and integrations. Taking the example of the Limpopo River Basin, in north-eastern South Africa, at least three chrono-cultural entities overlap: the LSA, traditionally associated with hunter-gatherer sites, the Iron Age corresponding to agro-pastoral sites and the Neolithic early herding phase that would correspond to an independent arrival of herders.

The Limpopo River basin is a major route of migration and settlement for different populations, including hunter-gatherers, herders and agro-pastoralists. Different authors propose that from around 2000 years ago, Khoe-speaking herders went through the region during the early herding phase, spreading their languages, practices and rock art tradition. They would be followed a few centuries later by agro-pastoral communities speaking Bantu languages, bringing with them domesticates, agriculture, pottery, iron and village life. Their arrival corresponds with the beginning of the Iron Age. The local hunter-gatherers would have interacted with both herders and agro-pastoral populations, and have progressively integrated into agro-pastoral societies during the second millennium AD. It is in this complex research context that this thesis is situated.

The aim of my thesis is to investigate phenomena of stability or change in lithic systems through the late Holocene, within the socially-complex middle Limpopo valley. In this study, I discuss shared technologies and practices, in time and space, by potentially diverse groups of people. In doing so, I challenge ‘culture-container models’, that are often used in archaeology for interpreting patterns of similarity. I also discuss the potential assembly or disassembly of different characteristics such as technology, economy of subsistence, spoken language, and biological traits. These aspects are essential for the formation of interpretative hypotheses about phenomena of change or continuity within the different archaeological analytical units that we may use. These aspects are particularly interesting

for discussing what, as prehistorians, we could be looking at when studying lithic techno-complexes or lithic systems.

In order to investigate stability or change in lithic systems and open interpretative hypotheses, I start from a case study that is the lithic assemblage from Balerno Main Shelter (BMS). This site, located in the middle Limpopo valley is a rock shelter site containing a microlithic industry typologically characterised by the presence of small scrapers and backed pieces. Previous studies by Bronwen van Doornum concluded that the lithic typology remains unchanged before and after the appearance of pottery at the site. This ‘continuity’ in the lithic typology is a scenario that is broadly represented in southern Africa. Assessing the lithic technology at this site, observing if a similar trend could or could not be observed, and investigating the reasons for change or stability are central to late Holocene lithic and archaeological research.

The assemblage from BMS allows for the consideration of a sequence spanning from 300 BC to the second millennium AD. The older layers of the site only contain ‘typical’ hunter-gatherer archaeological material, including lithics. Layers succeeding this phase contain pottery sherds, some of which are stylistically related to regional Iron Age pottery styles. This second phase corresponds to a time when hunter-gatherers potentially engaged in activities with close-by agro-pastoral societies.

In analysing the BMS lithic assemblage, I firstly define the lithic technical system at the site-scale using the *chaîne opératoire* and techno-functional methods. Following this characterisation, I investigate if change or stability of the lithic system can be observed throughout the sequence. I then formulate interpretative hypotheses on the scenario observed about the potential economic and social shifts that occurred at the time within hunter-gatherer societies. Secondly, I integrate my results within the regional context. This comparison allows me to assess if the pattern observed at BMS is similar to or different from what is observed in other sites of the Limpopo valley. I then present hypotheses about if there could be one or many lithic technical know-how in the area. I investigate the potential trans-economic nature of lithic technologies, and phenomena of interaction and creolisation occurring in the Limpopo valley. Lastly, I discuss large-scale technological phenomena, often called ‘techno-complexes’. In doing so, I question what these entities could represent. This discussion has implications for the formulation of hypotheses about whether and how large-scale migrations could be traced through southern Africa using

lithics. I also discuss the related problem of equating certain aspects, such as technologies or styles, with well-defined ‘peoples’. In the context of the specific questions of this thesis, I open a discussion about multi-disciplinary migration models that equate subsistence, language and genes in the context of the pastoral Khoe migration. Rather than correlating different ‘traits’ within ‘culture container models’, as per convention, I propose a dis-assembling of these characteristics for the investigation of the reason for change or stability within each analytical category. This initial dis-assembling allows us to go further than simplistic correlations to investigate phenomena of co-dependence or independence between different proxies and factors, using varied hypotheses.

In order to discuss the reasons for change or stability of lithic technologies through the late Holocene, and to highlight multi-disciplinary approaches, I will present, when possible, studies from different disciplines separately rather than integrating them within a broad narrative. Multi-disciplinary approaches and models will also be presented and discussed by highlighting which key proxies are chosen to answer specific sorts of questions.

I begin this thesis with a broad literature review of research concerned with late Holocene southern African past populations. The first chapter focuses on context. I describe the different ethnohistorical debates that lead to the definition of varied population types in southern African archaeology. Genetic studies are included in this section as they are greatly influenced by these ethno-historically defined analytical categories. The debates and ‘population categories’ discussed in the first half of the chapter pervade most southern African archaeological research on the late Holocene. Following these historical and ethnological debates, the second half of the chapter focuses on the archaeological data on populations, migrations, and interactions in the southern African late Holocene. Here, I synthesise current and past archaeological data on the early herding phase and the agro-pastoral migrations. I make references to genetic or linguistic studies, because so intricately linked to archaeological research on these questions but do not focus on them in this chapter. I then introduce the different lithic techno-complexes or ‘industries’ recognised from the mid-to late Holocene in southern African LSA. This overview gives us a sense of the broad similarities and regional differences that could be found in the lithic systems of this period of time. I finally present an archaeological synthesis of phenomena of change and stability in hunter-gatherer societies from the mid- to late Holocene.

The second chapter introduces and discusses the theories used in the frame of this thesis. The aim of this chapter is to highlight how different perspectives and analytical categories, associated definitions and assumptions may be used to define past populations. I discuss the relationship between different approaches to identify groups found in archaeology and the various definitions and implications attached to the concept of ‘culture’, developed in both anthropology and archaeology. I further highlight how ‘culture container models’ are increasingly deconstructed in contemporary research. This discussion is particularly relevant to the question about how lithic technologies could be interpreted at different scales, a question that is central to this thesis. The deconstruction of ‘culture container models’ is also relevant to discuss multi-disciplinary migration models as it challenges the notion of ‘cultural packages’ including ‘material culture’, economy of subsistence, spoken language and genetic traits. I end the chapter with a presentation of theories that I will use to interpret patterns in the lithic assemblages at different scales. Most of these theories move away from concepts that perceive archaeological similarity in terms of culturally consistent peoples, and from ‘tree-diagram’ representations that are often associated with these perceptions.

The third chapter of this thesis describes the methods used for studying the BMS lithic assemblage. The *chaîne opératoire* and techno-functional methods are presented, together with the associated concepts and terminologies used in this thesis. I then detail the specific kinds of data which were registered in databases for the study of BMS lithic assemblage, and outline how my statistical studies were conducted. The site of BMS site and the Shashe-Limpopo Confluence Area (SLCA) located in the middle Limpopo valley are presented in the fourth chapter, together with the sampling strategy used for studying the lithic assemblage.

In the fifth chapter, I present the results of the lithic analysis. The *chaînes opératoires* and global techno-functional analyses are presented per raw material category in order to keep track of potential techno-economic variations. Raw data concerning the cores, blanks and retouched artefacts are firstly given per raw materials, before synthesising the results and analysing the distribution of specific technological criteria within the archaeological sequence. The study of the scrapers, backed pieces and other retouched artefacts of the assemblage is presented separately in order to categorise more finely the morpho-functional attributes of these tools. I formulate hypotheses on the functioning of some of these artefacts. In the final sub-section of the results chapter, I synthetise all the data presented

in the chapter and propose a description of the different *chaînes opératoires* of BMS assemblage.

The sixth and last chapter of this thesis is a two-part discussion. The first part discusses the interpretation of late Holocene lithic systems of southern Africa. The results of the lithic analysis and observation of the sequence of BMS are interpreted in the light of theories introduced in chapter two. These theories are also used to discuss the occurrence of lithic artefacts associated with diverse site-types and subsistence economies in the Limpopo valley. I end the first part by discussing the large-scale distribution of microlithic industries through mid and late Holocene in southern Africa. The second half of the discussion critically reviews some of the migration models of the advent of herding in southern Africa, and propose new directions.

1. CONTEXT

I begin this chapter with an overview of the environmental context in southern Africa, before proceeding to a discussion of the archaeological setting. I then focus on the construction of ‘hunter-gatherer’ and ‘herder’ identities in southern Africa. I discuss the relationships and potential bridges between these two historically-defined groups as these debates permeate archaeological research interested in the adoption of domestication. Archaeological, ethnohistorical and rock art data are included to go further on these points. I also present the different and debated models for the introduction and diffusion of sheep and pottery in southern Africa before presenting an overview of the regional variation in the lithic industries from the mid- to late Holocene in southern Africa. Bearing these regional variations in mind, I will discuss which transition scenario may have existed in southern Africa while underlining the variety of situations arising at the time, involving different actors and hunter-gatherer economic backgrounds.

1.1. Southern African environmental and geographical setting

Before turning to the core archaeological context of this thesis, it is necessary to give an overview of the geographical and environmental setting of southern Africa. Southern Africa is located south of the equatorial belt of central Africa (Fig. 1.1). Different countries belong to this macro-region, including the countries most discussed in this thesis: South Africa, Namibia, Zimbabwe, Botswana and Zambia.

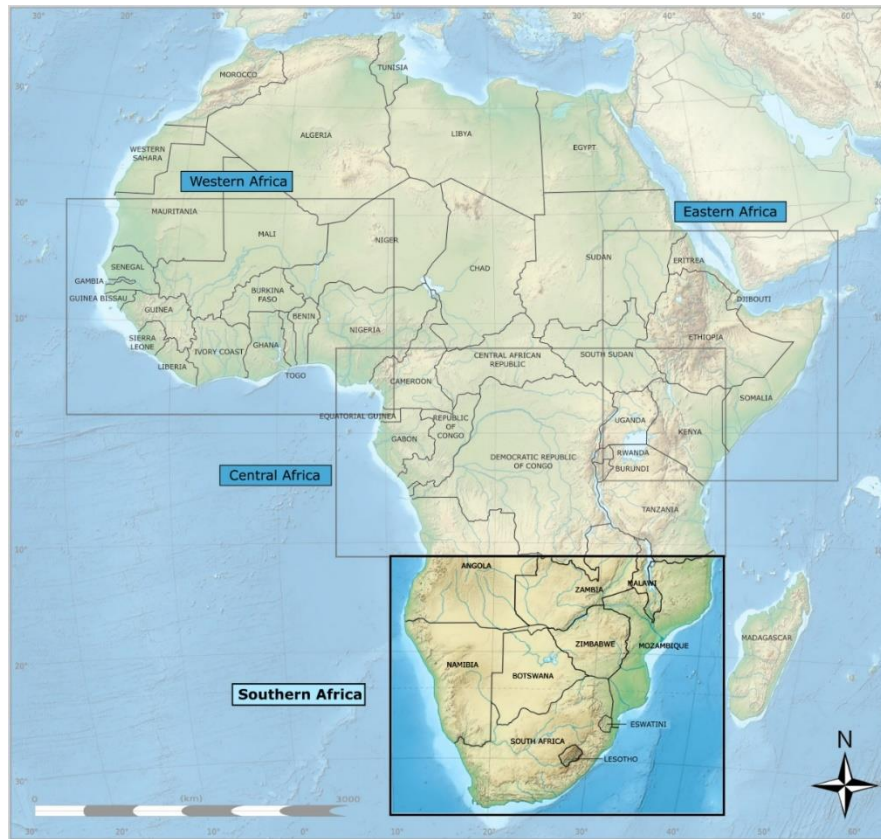


Figure 1.1. Southern Africa and macro-regions of Africa

Among the main geographical features of southern Africa are the Kalahari and Namib Deserts, the Maloti-Drakensberg mountain range, the Okavango Delta and the various rivers flowing through the sub-continent (Fig. 1.2). Key water features include the Zambezi River which crosses a large area of the sub-tropical upper margins of southern Africa and comprises the southern border of Zambia. To its north-east, lies Lake Tanganyika which, at the border between Zambia and Tanzania, reaches the Kalambo Falls. To the south, beyond Lake Nyasa (or Malawi) and the plains of Mozambique, the Limpopo River flows through eastern central southern Africa, from the eastern margins of the Kalahari Desert to the Indian Ocean. The river crosses large areas of Mopane savanna in the middle Limpopo valley where it forms the border between South Africa, Zimbabwe and Botswana at the confluence with the Shashe (or Shashi) River.

The environment to the west becomes increasingly arid until it eventually reaches the Kalahari Desert that covers a large area of Botswana and part of South Africa. The Okavango River opens a large delta in the north of Botswana, creating vast marshy plains close to the border with Namibia. Continuing westwards, the sandy margins of the Namib Desert shape arid landscapes interrupted by the Brandberg and Erongo Mountains which

act as rain-catchments and shelter a diversified vegetation and fauna. Further south, the Kuiseb River enters the Namib desert and spreads into a delta. In the southern margins of the Kalahari, in Namaqualand, the Orange River forms the border between Namibia, and South Africa and winds its way through the interior of South Africa up to the highlands of Lesotho. The long Maloti-Drakensberg mountain range extends in northeast-southwest direction. East of the Maloti-Drakensberg flows the Thukela (or Tugela) River creating a basin in a semi-tropical environment. At the southernmost end of the continent, the Cape Folded Mountains mark a separation between the dry inland and the Mediterranean coastal climate.



Figure 1.2. Southern Africa's geographical features and Limpopo River Basin.

The climatic and environmental conditions of southern Africa are very diverse. Its western regions are particularly arid, compared to its eastern regions and northern margins that are more humid (Fig. 1.3). Annual rainfall in western southern Africa is low. This aridity is similar to that in some areas of eastern and northern Africa. Eastern southern Africa is quite dry, but has climatic similarities with the southern margins of central Africa. The environmental separation between the arid west and the more humid east allowed for the

varied subsistence strategies in late Holocene hunting-and-gathering and food producing societies (e.g. Phillipson 1977; Barnard 1992).

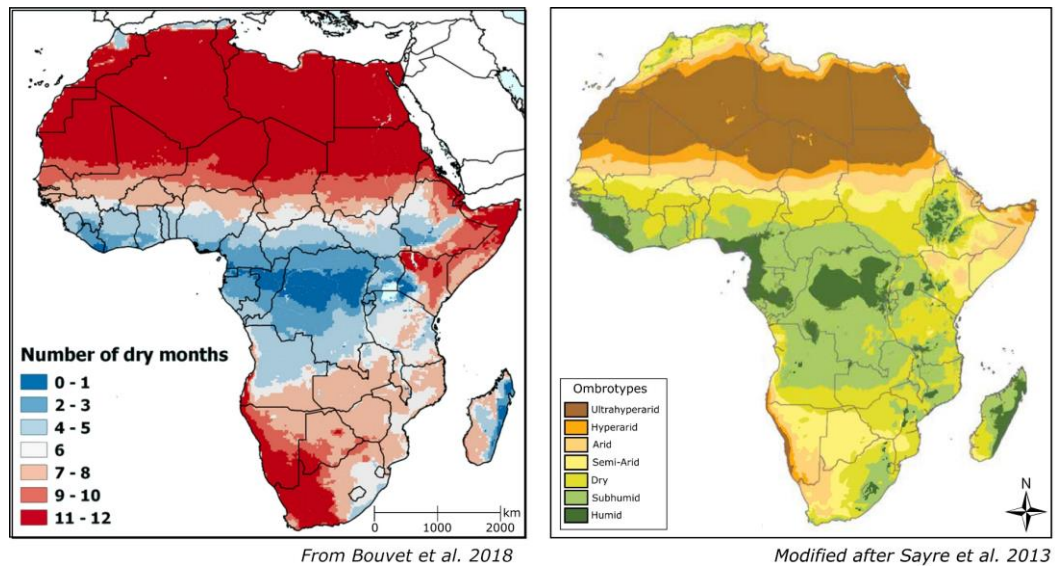


Figure 1.3. Number of dry months and ombrotypes in Africa

The differences in aridity are also reflected by the vegetation of southern Africa (Fig. 1.4). The northernmost margins are covered by tropical and sub-tropical woodlands and savannas. At the western and southern margins of the Kalahari Desert, mopane savanna covers the landscape, together with patches of dry tropical forest in and around the Limpopo River basin. In and around the Kalahari and Namib deserts, the vegetation mostly consists of dry savannas and grasslands, whereas the vegetation around the Maloti-Drakensberg range is richer in forests and mostly covered by montane grasslands. The area south of the Cape Folded Mountains is characterised by Fynbos-type vegetation, Mediterranean scrub and some forest.

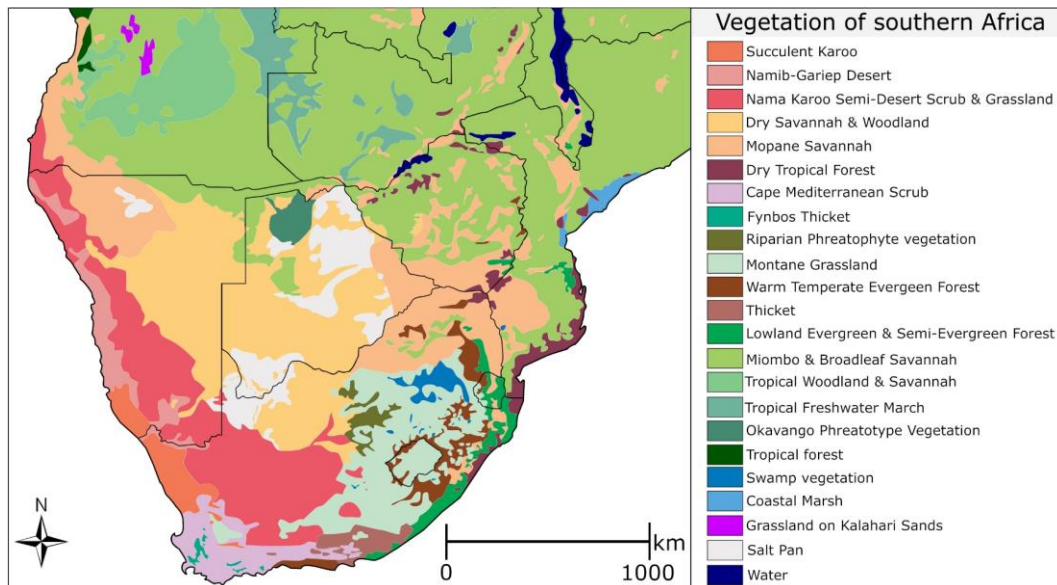


Figure 1.4. Vegetation of southern Africa, simplified after Biondi *et al.* (2015) and Sayre *et al.* (2013)

Because of the distribution of environments in southern Africa, agricultural practices are generally more adapted to the eastern part of southern Africa, whereas other subsistence strategies exist in the arid and high-mountain environments. In South Africa today, agriculture and cattle raising is mostly practiced in the north and east of the country, while fruits and vegetables are also grown in southernmost areas (Fig. 1.5, Waldner *et al.* 2017). A focus on sheep farming is found in the interior of the country and in Namaqualand at South Africa's border with Namibia. A similar situation exists for instance today in Ethiopia where pastoral systems are found in the most arid regions, and agriculture and mixed-farming systems in the more humid areas (Amede *et al.* 2017).

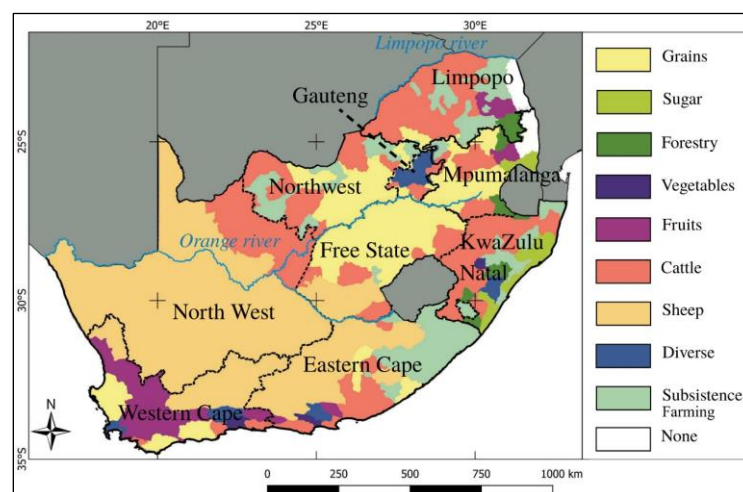


Figure 1.5. Current agricultural regions of South Africa, in Waldner *et al.* (2017)

These different environmental conditions have implications for the varied subsistence strategies practiced by peoples in the past. While the mobility of hunter-gatherers and pastoralists may be high in arid environments, it may be more sedentary in places where water is more easily accessible and where agriculture may be developed. The exploitation of marine, riparian and riverine resources for instance allows more sedentary occupation patterns. Mountain areas also offer different resources accessible at different altitudes, varying between the lowlands and the highlands.

Keeping in mind this environmental setting, I now introduce the southern African archaeological setting for the mid- and late Holocene.

1.2. Archaeological setting

The late Holocene of southern Africa sees the appearance of key social and economic transformations within hunter-and-gatherer societies. From around 2000 years ago, sheep and pottery appear in southern African LSA sites traditionally associated with hunter-gatherers, and more recently in sites attributed to agro-pastoral or pastoral populations (Mitchell & Whitelaw 2005; Sadr 2015; Kinahan 2019). The presence of caprine bones in LSA sites has fuelled debates about the shift to food-production in hunting-gathering societies (e.g. A.B. Smith 2008; Sadr 2019a), while questions about identities, interactions and transcultural practices have also been discussed (e.g. Eastwood 2003; Forssman 2017; Guillemard 2020).

Pottery and domesticated sheep bones first appear in LSA sites dated from around 2000 years ago. These LSA sites often contain prior occupation layers rich in lithics. Most of the LSA sites are located in rock shelters with open-air occupations having been investigated less. Before 2000 BP, the occupants of these sites were hunting wild game, gathering plants, making different kinds of tools on bone and stone, and in some areas were painting or engraving rock shelters and boulders (H. Deacon & J. Deacon 1999; Mitchell 2002; Lewis-Williams 2002).

Hunting techniques differed from place to place. Bow and arrow hunting is attested, as are different types of trapping techniques, such as pit-traps (Brooks & Yellen 1977). Stone structures, such as desert kites, might also have been made by LSA hunter-gatherers and have functioned as trap-structures to ambush game in arid and open landscapes (Lombard

et al. 2020). In some areas, plant storage is also indicated after 4800 BP, for instance at the sites of Pomongwe and Bambata in the Matopo Hills in Zimbabwe (Walker 1995a) where pits in the ground were made for storing marula seeds and caterpillars. A similar practice was also highlighted at Boomplaas Cave in South Africa's southern Cape around 2000 BP, preceding the appearance of sheep at the site (H. Deacon *et al.* 1978). In other areas, hunter-gatherers were exploiting aquatic resources from rivers or lakes, as is the case at sites along the Botleti (or Boteti) River in the Kalahari, between 4000 and 2000 BP (Denbow 1986). Denbow suggests that more sedentary settlement patterns might have occurred at these sites. On the coast, mega-middens have been documented, with past people mainly exploiting marine resources (e.g. D. Miller *et al.* 1995; Sealy 2006). Seasonal mobility between different ecological areas, such as in the Maloti-Drakensberg, has also been highlighted (e.g. Carter 1970; Opperman 1987).

The southern African lithics industries preceding the introduction of pottery and sheep also differ from place to place. It is possible to regroup them under two main categories: the microlithic Holocene industries, often attributed to the Wilton, and the macrolithic Holocene industries mainly found in coastal areas and the western half of southern Africa (J. Deacon 1984a). These two categories encompass a broad variety of lithic traditions and are not exclusive. Indeed, southern African assemblages exist that associate macro- and microlithic artefacts (e.g. Vogelsang & Eichhorn 2011). These different lithic traditions likely reflect varied phenomena and adaptation to local environments. It is for instance possible that bows and arrows were more useful in a savanna environment allowing for discrete tracking, than in open landscapes where they may have been less efficient.

Rock art studies in the Maloti-Drakensberg mountains and elsewhere propose the existence of a vast shared belief network among hunter-gatherer societies throughout southern Africa (Lewis-Williams 1981, 2002). Although stylistic regional differences exist in the paintings and engravings, the importance of the trance dance and ritual specialists to the rock art has been recognised both inside South Africa and outside, from northern Namibia to Zimbabwe (e.g. Huffman 1983; Lewis-Williams & Pearce 2012; Kinahan 2017). This 'pan-San' belief system is also highlighted by Alan Barnard as existing among modern southern African hunter-gatherer societies (Barnard 2007). Although few dates exist for this rock art, it is now broadly recognised that the paintings were made during the last 3000 years, if not more (Mazel 2009; Bonneau *et al.* 2017).

From this preliminary archaeological overview, it is clear that hunter-gatherers living in southern Africa before the appearance of pottery and sheep potentially shared similarities in their social organisations, economies and beliefs, but also composed a mosaic of societies, as it is reflected in the archaeology.

From around 2000 years ago, the introduction of sheep and pottery marks the beginning of varied neolithization processes. In the context of this thesis, I understand ‘neolithization’ as the adoption of herding by hunter-gatherer societies. It is a process that may involve different actors, including hunting-and-gathering, pastoral and agro-pastoral populations. In that sense, I separate the concept of ‘neolithization’, that is an economic and social process, from the concept of ‘Neolithic’, that is a period of time situated between the Palaeolithic and its hunting-and-gathering economies, and the Iron Age associated with the production of Iron. The Neolithic period broadly corresponds to when hunter-gatherers adopt food production, in situ and/or by contact with incoming populations, before the development of metallurgy.

In Europe and Near East, neolithisation processes are often associated with a ‘package’ including food production, pottery, polished stones, and a more sedentary way of life. This package, however is not applicable everywhere around the globe, and a diversity of scenarios from hunting-and-gathering to food production occurs in the world, and Africa (Clark & Brandt 1984; Kozłowski 2004; Demoule 2007, 2009). In Europe, researchers argue that incoming agriculturalists lived side by side with Mesolithic (hunter-gatherer) populations (Marchand 2000; Demoule 2007), occupied different part of the landscape (Binder & Maggi 2001), or that agriculturalists rapidly replaced hunting-gathering populations (Kotsakis 2003; Kozłowski 2004). Some authors also highlight the fact that hunting-and-gathering populations kept their lithic technologies and ways of life until the Bronze Age, only integrating pottery into their traditions (Nowak 2006, 2007). These scenarios imply different modalities of interaction, some of them emphasising a ‘Mesolithic presence’ in Neolithic contexts and interactions (e.g. Gehlen 2013, 2017). Differences in terms of archaeological materials, for instance of lithic material between early agriculturalists and hunter-gatherers are also more or less emphasized, from similar (e.g. Gehlen 2006) to different (e.g. Perlès 1990).

In contrast to Europe, there is in southern Africa, an ongoing debate concerning the use of the term ‘Neolithic’ between around 300 BC – AD 400, when pottery and domestic sheep

appear before the arrival of agro-pastoralists. While neolithization processes occur, for instance through contact between hunter-gatherers and agro-pastoralists, there is still much debate about if the Neolithic exists. How and by whom were sheep firstly introduced in southern Africa is still debated. Sheep are traditionally attributed to a herder presence, marking the arrival of Khoe people in southern Africa (e.g. A.B. Smith 2006). Models involving local hunter-gatherer populations in the adoption and diffusion process of sheep have been proposed (e.g. Sadr 2003). Authorship of the first southern African pottery is similarly debated (Huffman 1994; Sadr & Sampson 2006). Sadr (2003) argues that hunter-gatherers herded sheep themselves and therefore became producers, although not completely turned toward a pastoral economy (Sadr 2013). He therefore proposes that the use of the term Neolithic is adequate (Sadr 2003). A.B. Smith (2005b) however, does not recognise a Neolithic period in southern Africa. He argues that herding could not have been developed in hunter-gatherer societies in a sustainable way. Instead, sheep herding is for A.B. Smith linked to a migration of Khoekhoe pastoralists, which does not represent a neolithization process in situ.

The aim of this thesis is not to assess if we should use or not the term of 'Neolithic' for southern Africa. Instead, by focusing on the processes, I include varied archaeological contexts, notably the Iron Age ones associated with agro-pastoral populations. I argue that the adoption of herding by hunter-gatherers corresponds to varied trajectories, and that one main model cannot be applied to the whole of southern Africa. We will also see in this thesis that the categories 'hunter-gatherers', 'pastoralists' or 'herders' and 'agro-pastoralists' include varied subsistence economies, and that bridges linking them exist.

In the Shashe-Limpopo Confluence Area (SLCA), a multitude of interactions and social remodelling took place. Among these changes, hunter-gatherer settlement patterns shifted after AD 900 leading, progressively, to the disappearance of the hunter-gatherer 'signature' from the landscape after around AD 1300 (van Doornum 2005; Forssman 2014a). In parallel, authors also discuss the appearance of a new rock art tradition attributed to Khoe herders and relatively dated as early as 2000 BP (B. Smith & Ouzman 2004; Eastwood *et al.* 2010).

1.3. ‘Bushmen’ versus ‘Hottentots’, ‘hunter-gatherers’ versus ‘herders’: constructing identities

Southern African archaeology focused on the late Holocene is influenced by ethnohistorical categories, questions and debates. In the context of this thesis, it is a significant note that archaeological data is often discussed in the light of historical or ethnographic data. LSA lithics are generally attributed to ‘San’ hunter-gatherers, pastoralism to ‘Khoe’ herders, and agriculture to ‘Bantu’ agro-pastoral communities. The same trend is also common in rock art research where specific rock art traditions are conventionally attributed to one of these three categories. The terms ‘San’, ‘Khoe’ and ‘Bantu’, as well as the presupposed opposition between their respective economies of subsistence heavily derive from former historical categories, as well as more recent ethnography. This approach to the archaeology is potentially limiting, because it creates paradigms and may project into the past historical practices that may not have existed then, but may simultaneously be informative, especially when ethno-archaeology is used. Indeed, ethnography may be relevant to the understanding of past communities.

The debates concerning the identity of recent and past hunter-gatherers and herders of southern Africa are particularly lively (e.g. Pargeter *et al.* 2016). Difficult questions arise about how to define ethnic, economic groups or individual identities in historical and anthropological contexts, as well as in the deep archaeological past. Different proxies are used to group people under more or less permeable categories, and each discipline has its own interest. Historians are interested in the historical and political construction of identities, in relation to, for instance, interactions or political events (J. Wright 2016). Anthropologists focus amongst other things on social organisation, kinship and belief (Barnard 1992), while geneticists will be interested in defining people based on where they came from and their degree of interconnection (e.g. Soodyall *et al.* 2008). Archaeologists mainly base their models on different material proxies. How a population is defined therefore depends on the research field, its associated questions and possible answers.

I now turn to how historical and ethnographic approaches are linked to the archaeology of the late Holocene. We will see how the history of South Africa contributed to the creation of categories of populations that are currently used in archaeology, and how such categories may be problematic. I will then discuss the ethnohistorical debates concerning the adoption of herding practices by hunter-gatherers, and how this debate pervaded archaeology. I will

then give an overview of linguistic, genetic and physical anthropology studies, as they all tend to be influenced by this ethnohistorical approach. I will address questions and challenges raised in the literature relative to the identity and interconnection of hunter-gatherers and herders in southern Africa. Finally, I will discuss how innovations such as pottery and domestication could have been integrated into the hunter-gatherer way of life.

1.3.1. A model based on History

a. The colonization of South Africa

From the 15th century onwards, European travellers, missionaries and settlers explored South Africa. The first encounters with local populations occurred with Portuguese explorers in the 15th century (Raven-Hart 1967). Bartolomeu Dias sailed around the Cape in 1488, followed some years later by Vasco de Gama (Mitchell 2002). Their settlement in South Africa did not expand much further than this coastal area, whereas they expanded further in other countries such as Mozambique and Angola. Livestock was at that time traded with local populations living on the South African coast. In 1652, the Dutch East India Company (VOC) represented by Jan van Riebeeck, settled at the Cape. This settlement led to an intensification of interactions and conflicts with local populations (Elphick 1985). The Cape Colony expanded under the Dutch until British control in 1795 and 1806 (Mitchell 2002). From this colonial period, we have records written by Europeans living in the Colony, as well as travellers and missionaries exploring further areas outside. Starting from the city of Cape Town, they ventured further and further inside the country. During their travels, they wrote in their journals the different sceneries that they came across as well as their thoughts about the appearance, customs or mental abilities of the local populations that they encountered (Fig. 1.6).

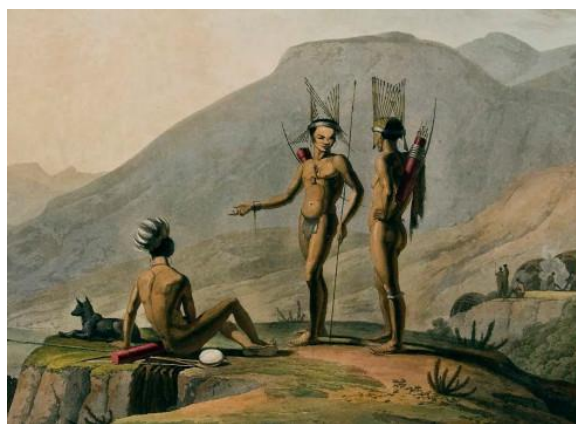


Figure 1.6. Painting of ‘San’ men by Samuel Daniell in Jolly (2014)

Influenced by the colonial state of mind, the vast majority of these narratives are very depreciative of indigenous populations, especially towards nomadic forms of societies. Of interest to historians are descriptions of different groups of people and notes on their customs and languages (e.g. Burchell 1922-24; Raper & Boucher 1988 about R.J. Gordon). Many travellers described at least three populations: ‘Bushmen’ living off wild resources, ‘Hottentots’ herding caprines and cattle (despite looking like Bushmen to the recorders); and ‘black-skinned’ populations living in villages, practicing cattle breeding, herding and agriculture.

Initially, three main terms were used by colonial Europeans to qualify the local populations they encountered: ‘Kaffir’, ‘Hottentot’ and ‘Bushmen’ (Fauvelle-Aymar 2006). All these terms were and are still extremely derogatory and the first two are no longer used by researchers. The word ‘Bushman’ is still used by academics, as is its alternative ‘San’. I present the derogatory terms here only for the sake of a discussion of historical context. The word ‘Kaffir’ derives from the Arabic and was later adopted by Portuguese. It globally refers to all sub-Saharan populations, therefore including the populations living in the Cape area (Fauvelle-Aymar 2006). The word ‘Hottentot’ became common in the Colony under the VOC. Its etymology is believed to derive from a song of this group of people, in which they were thought by Europeans to say a word similar to ‘Hottentot’ to present themselves (van der Cruysse 2010). ‘Hottentots’ were later associated with ‘Khoekhoe’ meaning ‘men of the men’ (van der Cruysse 2010). The word ‘Bushman’ literally means ‘man from the bush’ (or from the forest), associating them with animal characteristics, and came in the colonial period to characterise a group of Hottentots without cattle (Fauvelle-Aymar 2002). The word ‘San’, of Nama origin (Gordon 1992) is also used today and was globally attributed by Lee & DeVore (1976: 6) to the “*hunting and gathering people of southern Africa*”.

There is much confusion in the early records regarding the terminology used to describe indigenous populations. According to Schrire (1980), when the Dutch colonised South Africa, they were already aware of the existence of different populations, but were calling them all under the general term of “Hottentot”. It is only from 1685 that the term ‘Bushmen’ was used to describe hunting and gathering populations (or more generally people without domesticated animals). These two categories were loosely used by European travellers and missionaries depending on their own interpretations of the locals’ ways of life. This historical context makes the interpretation of these early documents very challenging and

blur to some extent the understanding of herding populations that were observed at the Cape.

b. Challenges in the interpretation of historical records

When studying the records of the early Europeans, historians and archaeologists are faced with many challenges, the first being to estimate the reliability of these early records (McGranaghan 2015). Kolbe (1731), for instance describes a population which he refers to as ‘Hottentot’. The author describes people using a great variability of tools, and techniques, including hunting with bow and arrows (some of which might have been poisonous), making pots, raising cattle and sheep and melting iron. This description may reflect a population living with a mixed economy. However, the possibility that Kolbe was describing different groups of people is also plausible.

Similar uncertainties found in historical literature led to debates concerning the degree of flexibility and interconnection between ‘Hottentots’ and Bushmen, later transcribed as Khoekhoe and San (Schrire 1980), and in archaeology, as broadly opposed herders and hunter-gatherers. Relying on historical documents, Schrire (1980) and Barnard (1988) underline the fact that the sharing of hunting practices of both hunting-and-gathering and herding societies, as well as the keeping and loosing stock by herders, would not necessarily be visible in historical documents. A similar point of view is expressed by S. Marks (1972) and Parkington (1984) who propose the idea that the separation between hunting-and-gathering and herding groups perceived by early travellers might in fact represent different circumstances of stock acquisition and loss within one group of people. S. Marks in particular talks about the difficulty of distinguishing hunter-gatherers from herders based on historical observations: *“there is little to distinguish a landless and cattleless Khoi from a Bushman, or a Bushman who had acquired cattle from a Khoi. Thus, (...) the term Khoisan appears best suited to refer to the Late Stone Age peoples of the Cape whom the Dutch encountered”* (S. Marks 1972: 57–58). Lindholm (2006) expresses the same idea when talking about historical herders practicing hunting and relying on hunter-gatherer groups.

Some authors, however, perceive the distinction between hunter-gatherers and herders in historical documents as reliable. Bollong *et al.* (1997), for instance, advocate for the accuracy of European travellers’ records differentiating Bushmen hunter-gatherers and Hottentot pastoralists in the Seacow Valley. According to them:

there was never any confusion or blurring of the labels Bushman and Hottentot as used in the Seacow valley between 1770 A.D. and the 1890s A.D. Bushmen were native to the valley and descended from those without livestock. Hottentot were from elsewhere, brought in or drawn in as labor, and descended from pastoralists. (...) Similarly, there is no sound basis for assuming that early travellers who saw potteries in use by natives were in any way confused about their ethnic identities. (Bollong et al. 1997: 271)

The interpretation of historical records, and the understanding of Bushmen populations also changed through the history of anthropology. Originally seen as savages, their status progressively raised to the one of ‘primordial’ people, living symbiotically with nature (see Gordon 1992 for discussion). Gordon (1992) insists on the close relationship between political situation –the Apartheid policy and the shift to democracy – and the disregard and rehabilitation of the Bushmen. The complexity attached to the understanding of historical documents, but also to the political contexts in which they were interpreted by scholars, makes the study of Bushmen and Khoekhoe peoples difficult and sensitive. The question about identity has become central to many areas of study, and is still at the centre of many debates in anthropology and in archaeology.

1.3.2. Khoe and San: ethnohistorical data

San and Khoe (or Khoi) peoples have been extensively studied by anthropologists (e.g. Lee & DeVore 1976; L. Marshall 1976; Tanaka 1980; Barnard 1992; Bieseke 1993; Guenther 1999). Barnard (1992) uses the term ‘Khoisan’ initially coming from physical anthropology and later used by Schapera (1930), as merged reference to both entities. He highlights the diversity in Khoisan populations in terms of language, kinship systems and customs, as well as the similarities, for instance concerning beliefs.

There are different Khoe and San languages, which are not necessarily associated with different modes of subsistence. For instance, not all Khoe-speaking groups are herders: some are also hunter-gatherers, as is the case in northern Botswana (Barnard 1988). Reconstituting language genealogy, Barnard (1988) proposes that ‘Early Khoe’ located north of South Africa came down and separated into two branches: those who moved south and became Khoekhoe, practicing herding, and those who moved west in the Kalahari and became Kalahari ‘Khoe Bushmen’ practicing hunting and gathering. Approaching similar

issues, Güldemann (2008) attempts to map language groups against ‘subsistence’ and ‘biological’ types. His map stresses the non-correspondence between human biology, spoken language and economy of subsistence (Fig. 1.7).

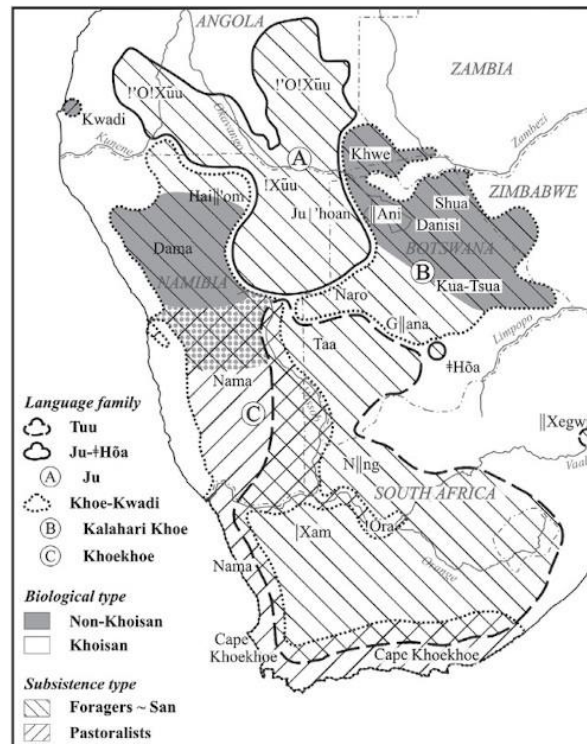


Figure 1.7. Güldemann’s (2008) map showing the non-correspondence between spoken language, biological types, and economies of subsistence.

Modern and past pastoral and hunting-and-gathering populations are often opposed in terms of their economies, ways of life and values (e.g. Ingold 1980). A common view is that the focus on keeping domestic stock in pastoral societies is structurally and culturally different from a subsistence focused on wild resources. Kinahan (1989: 15) develops this idea:

The crucial difference between hunters and pastoralists reside in the fact that pastoralists own domestic animals. But the significance of this goes beyond the herds themselves, to the social relations of their ownership. For unlike the hunter, who has no fixed claim over the game until it is brought down, the pastoralist has vested rights of ownership in living animals. (...) Each day as the herdsman leads his stock from their field, or drinks their milk, or surrenders an ewe to repay a debt, he reinforces prerogatives of

ownership which are specific to pastoral society, and generally absent from that of hunters.

According to Barnard (1988: 33), modern Khoekhoe herders, including the Nama and the Korana peoples, “*traditionally lived in circular encampments which were made up mainly of patrilineally related kinfolk. (...) each tribe had its own independent, and often powerful, chief.*” San societies on the other hand, are more generally seen as egalitarian societies, although this perception has been nuanced (see Guenther 2007 for discussion).

Ethnohistorical studies also focus on interactions between Khoe and San populations in the recent past. S. Hall (1990) lists three well-studied processes of interaction: trade and exchange, labour, and religious practice. Dowson writes that “*From various ethnohistorical accounts we know that interaction between the San and the Khoekhoen was extensive and not superficial.*” (Dowson in B. Smith & Ouzman 2004: 516). He cites a historical record by Kay (1833) narrating what he believes are San shamans performing curing rituals for Khoekhoe people.

Relationships between San and ‘others’ have also been well-studied in anthropological and ethnohistorical fields. The role of San shaman as healers or rain-makers for farmer communities is described in many ethnohistorical documents (Vinnicombe 1976; Katz 1982; Dowson 1994; Hammond-Tooke 1998, 1999). Similarly, ‘San’ hunter-gatherers herding cattle for other groups was also recorded (McGranaghan 2015). During these interactions, what is kept of the hunter-gatherer’ socio-economic background and way of life is often discussed (e.g. Guenther 1977). Yellen (1984) for instance notices changes in recent times of settlement layout, discard pattern and faunal assemblages of the hunter-gatherers living in the Dobe area of Botswana. He argues, however, that people continued to adhere to ‘Ju/’hoansi’ (Bushman) values. In later work in the Kalahari, he noticed a change in these values (Yellen 1990). Depending on the authors, interactions between hunter-gatherer and neighbouring societies may have led to different degrees of assimilation, acculturation or preservation of the hunter-gatherer traditional economy, values and way of life. Discussions around these questions led to the Kalahari debate (see Sadr 1997 and for discussion).

1.3.3. Domestication in hunter-gatherer societies from an ethnohistorical perspective

a. Domesticating in a ‘San’ society

We saw in the previous section how potential interconnections between hunting-and-gathering and herding populations, as observed by Europeans, are debated. As similarities are highlighted by some researchers, fundamental differences would also oppose San and Khoe societies, such as those regarding their social organisation and power relations. In that context, some researchers have discussed if domestication is consistent with southern African hunter-gatherer ‘ideology’ and way of life (see McGranaghan 2015 for discussion). These debates, which could have been confined to historically observed groups spilled over archaeology and, significantly for this thesis, have greatly impacted the different visions expressed by authors on the adoption or rejection of food-production by late Holocene hunter-gatherers.

The question about whether or not ‘San’ hunter-gatherers could have adopted food production joins a more global debate in anthropology and archaeology opposing the social organisation of hunting-and-gathering and food producing societies. For Barnard (2002) and Ingold (2000), the integration of domestic stock in hunter-gatherer societies would not be impossible, but would be associated with structural changes in hunter-gatherer societies leading to the development of new hierarchies. The idea that keeping stock is associated with storage, wealth accumulation, and therefore to non-egalitarian societies is also developed by Testart (1982, 2005). Food storage is linked by Testart to the creation of a new social order, through payment of marriage bonds and the performance of bride services (*“service à la fiancée”* Testart 2005). In his model, Testart makes a clear separation between hunter-gatherer groups where these bride services imply a payment or exchange of goods (which he regroups under the ‘World 2’) and hunter-gatherer groups with bride services free of payments or exchanges (which he regroups under the ‘World 1’). For him, San hunter-gatherers are part of World 1, as neither storage nor the accumulation of wealth are common San practices. Following his model, Khoe pastoralists and San hunter-gatherers would be living in different ‘worlds’, which would be an obstacle to the natural adoption of domestication by San societies.

For some authors, the sharing ethos and organisation of both past and recent San societies would have impeded the adoption of herding practices. A.B. Smith (1990, 2008) defends the idea that San societies would have had to shift to a pastoralist way of life and ideology in order to incorporate domesticated stock and cattle: *“these early domestic sheep would*

have been entering a socio-economic system where concepts of 'domestication' were unknown, and where meat was shared within the egalitarian ethic of southern African hunters" (A.B. Smith 2008: 57). The absence of storage practices would also have been an obstacle to the adoption of a herding way of life (A.B. Smith 1990).

The idea that San societies were egalitarian is, however, contested (e.g. Dowson 1994), especially in regard to the role played by shamans and the hierarchical relationships their status implies (see Blundell 2004 for discussion on powerful shamans). Other authors also oppose the egalitarian structure of the society with everyday life practices: *"Ideologically (in the Marxists sense of masking beliefs) San society is indeed egalitarian. That is why Susan Kent wrote of the San 'façade of egalitarianism' (Kent 1993: 480). The San are egalitarian in ethos but not necessarily in practice"* (Lewis-Williams 2015: 204).

Situating this debate in the context of late Holocene southern African archaeology, it seems like diversified economic organisations may have existed in hunting and gathering societies. Storage practices are indeed recorded from LSA sites since at least 4000 BP (Mazel 1992b; Mitchell 2002; Russell & Lander 2015b). The extent of this practice is, however, still unclear. Different mid- to late Holocene LSA sites could evidence hunter-gatherer societies practicing food accumulation and practicing more sedentary ways of life. Such economies, termed 'delayed-return', in contrast with the 'immediate-return' of conventional hunting-and-gathering, were also described for hunter-gatherers exploiting honey by managing bees in Kenya (Dale *et al.* 2004) and in southern Africa (Russell & Lander 2015b). Sadr (1998) also reminds us of the diversity existing in southern African hunter-gatherer societies regarding economic structures and sharing practices. In this context, he stresses the idea that the sharing of meat, common among modern San Kalahari hunter-gatherers, did not necessarily happen in past southern African past hunter-gatherer societies (Sadr & Plug 2001). Joining a similar argument, L. Marshall (1976) points out that not all the meat is necessarily shared in modern San societies.

b. Worldviews and domestication

A recent trend in global anthropology and archaeology is relevant to the discussion of the relationship between hunter-gatherer and domestication because it problematises the opposition between 'wild' and 'domestic'. It is interested in the different types of ontological relations between humans and non-humans, and how different worldviews may correspond to different social organisations. These approaches also pervade questions

around the shift to food-production in hunter-gatherer societies. Descola (2005) is one of the pivotal authors developing research on ontologies. According to him, relationships between humans and non-humans vary from society to society, and can be categorised under four ‘worlds’ (animism, totemism, naturalism and cosmocentrism). Following his theory, in the ‘animist world’, humans and non-humans interact at the same social level in the ‘animist world’, a configuration that has been recently attributed to San societies (e.g. Guenther 2015). Descola (2005) further expresses the idea that food production is not necessarily associated with a clear separation between what could be understood as ‘wild’ and ‘domestic’. He highlights that in some contexts, ‘tamed’ animals or plants were not seen as different from their natural equivalents (Descola 2005).

The idea of domestication in San societies can be discussed from this perspective to open a discussion about whether domesticated animals could have been integrated into an animist ontological system, placing them ideologically at the same level as wild animals. Following theories based on ontologies, attempts have been made to discuss San ethnography and rock art in terms of new animism (McGranaghan 2012, 2014a; C. Low 2014; Guenther 2015). In light of archaeological, anthropological and historical literature, McGranaghan (2015) has defended the integration of sheep (and other domesticates) into a ‘San world’. For McGranaghan (2015), sheep could have been integrated within the sharing system of San society. In a study of the Bleek and Lloyd Archive (Digital Bleek and Lloyd), McGranaghan addresses questions of identity and interactions of historical /Xam San and their neighbours regarding domestication (McGranaghan 2012, 2015, 2014a, 2014b). His study focused on 19th century San, reveals that domesticates were integrated into their everyday lives, as well as in narratives and rituals, including different aspects such as raiding, herding services, and the integration of domesticates into San beliefs and customs. He discusses how hunting and herding could equally lead to encounters and interactions with non-human entities, as perceived in San societies (McGranaghan 2015). He also notes that, during initiations, similar ways of including sheep in ritual activities exist in both San and Khoekhoe societies. He concludes that “*despite differences between Bushmen and Khoekhoe populations, their shared history and overlapping territories may have rendered certain cultural practices mutually meaningful*” (McGranaghan 2015: 532).

The idea that similarities exist in the relationship to animals between hunter-gatherers and herders is also defended by other researchers (e.g. Lander & Russell 2015: 129). According to McGranaghan and Challis (2016) ‘taming magic’, comprising culturally-specific respect

behaviours and plant charms, would have been used in San contexts when hunting ‘wild’ animals, to calm and ‘tame’ the animal before killing. This ability to ‘control animals’ is also discussed by Lander (2014). The research developed by these authors implies that ‘taming’ was not a foreign idea in San societies, and that domesticated sheep could have been similarly integrated as ‘tamed’ wild animals. McGranaghan (2012: 339) insists on this aspect: “*interactions with particular (domestic) species should be situated within the wider context of relationships with non-humans*”. There is therefore room for the potential integration of domesticated animals in San societies, without a drastic changing of the ‘worlds’ discussed by Descola (2005) or Testart (2005).

c. Conclusion

To know if colonial-period San and hunter-gatherers of the late Holocene shifted at some point into pastoralists is, however, another issue. As McGranaghan (2012: 148) recalls, many authors working on southern African San societies (e.g. L. Marshall 1961; Lee 1969; Draper 1978) have highlighted that egalitarianism in San societies requires “*strongly coercive social mechanisms working (ideally) to prevent the formation of persistent hierarchies through complex distribution rules and systematic ‘belittling’ of performances that acquire desirable resources*”. However, sharing practices are not necessarily associated with the absence of sharing. As McGranaghan notes (2012: 357), “*the sharing of milk rather than the animal itself can allow for the acquisition of stock without transgressing ethical limits*”.

From these ethnographical and historical examples, we can see the possibility that domesticates could have been integrated within southern African hunter-gatherer societies, economies and beliefs. This discussion, even though restricted to historical contexts, is interesting for discussing southern African late Holocene archaeology and the adoption of herding practices by hunter-gatherers. It highlights that rather than seeing the adoption of new practices as impossible or ‘enforced’, herding could have been progressively integrated in a particular way. In that sense, and as we will see in the theory chapter of this thesis, we must bear in mind that an object or, a practice, is generally better understood in its social context. Similar archaeological remains do not necessarily represent similar practices: domesticated animal remains found at two different archaeological sites do not necessarily correspond to ‘full’ pastoralism. Pottery could also have been integrated differently by each society.

As noted above, history and anthropology are disciplines that have produced specific questions, and contributed to oppose or blur historical hunter-gatherer and pastoral societies. Many of these debates reached archaeology, and similar stances may be adopted when discussing late Holocene hunting-and-gathering and herding populations. Among the disciplines working with historically or ethnographically defined groups, rock art studies also play a role in the current understanding of late Holocene southern African populations, migrations, and the introduction of herding.

1.3.4. A rock art perspective on domestication

a. Introduction to southern African rock art

Southern African rock art is one of the archaeological fields which produces an important amount of research on LSA societies. Echoing the three southern African populations mentioned already, three broad rock art traditions are discussed in southern Africa, each attributed to specific groups of people: fine-line ‘San’ paintings, ‘Khoe’ Geometric Tradition (to which I return later in this chapter) and the white finger-paintings of the ‘Northern Sotho’ or ‘farmer’ tradition (e.g. Eastwood & Eastwood 2006). Because San, Khoe and Bantu-speaking populations are broadly related to specific economies of subsistence, fine-lines paintings are often attributed to hunter-gatherers, geometrics to herders and white finger-paintings to agro-pastoral communities. This broad breakdown is informed by ethnographic studies and historical records. Despite the ‘solid’ attribution of fine-line paintings to hunter-gatherers (to the exception of potential ‘hunter-herders’), I consider later in this chapter and in chapter six, how attributing the Geometric Tradition to ‘the Khoe’ may be more problematic.

Fine-line rock art is known to have existed for at least 3000 years in the Maloti-Drakensberg (Bonneau *et al.* 2017). A much older date of 30 000 BP from a painted slab at Apollo 11 in Namibia, suggests a long-time depth rock painting tradition (Wendt 1976; Rifkin *et al.* 2015). The authorship of these paintings is for the greater part attributed to people ancestral to the San observed historically. This San authorship was acknowledged as early as the 17th century by explorers and missionaries (e.g. Arbousset [1840]2000: 133–134), and by local populations. A major turn in southern African rock art studies appeared when fine-line rock art was interpreted using San ethnography and ethnohistorical documents (e.g. Vinnicombe 1976; Lewis-Williams 1981). Key ethnographic sources include Southern San material produced by the Bleek family (e.g. Bleek & Lloyd 1911, Digital Bleek and Lloyd 2020) and Orpen (1874), and the Northern San material largely

produced by anthropologists (e.g. Lee 1969; Lee & DeVore 1976; L. Marshall 1976; Guenther 1977, 1999; Bieseke 1993).

From the San ethnographies, different scholars have perceived connections between the details of San ethnography, particularly that related to myths and narratives, and the details of fine-line rock art. The drawing of a link between San beliefs and fine-line rock paintings has been decisive for southern African rock art research.

Lewis-Williams (e.g. 1981) has argued that fine-lined paintings are linked to the shamanistic San trance dance practice, and the different altered state of consciousness, beliefs and imagery attached to it. Trance dances were in the past widely practiced by different San groups throughout southern Africa, are still practiced in some areas today, and have been documented by many anthropologists (e.g. Guenther 1999). It is one of the reasons that, Barnard (2007) argues that San religion is far more uniform than other aspects of their society. This idea is also expressed by Lewis-Williams who uses the concept of a 'pan-San' belief system (Lewis-Williams 1981, also see Lewis-Williams & Bieseke 1978). This uniformity in beliefs at a large scale echoes the wide distribution of San rock art that is today interpreted as associated with the trance dance (e.g. Huffman 1983; Maggs & Sealy 1983; Garlake 1995; Lewis-Williams 1998; Walker 1998b; Kinahan 2001; Eastwood *et al.* 2010). The use of the ethnography to interpret rock art also led to the development of interconnected ideas about the art, such as the supernatural potency of certain animals which can be partly linked to fat (Lewis-Williams & Bieseke 1978), the relation of the art to girls and boys initiations (De Prada-Samper & Hollmann 2017; D. Morris 2010), and 'taming magic' as an ethnographic revision of sympathetic magic (McGranaghan & Challis 2016).

b. Representations of sheep in rock art and their interpretations

Although the general context of the fine-line tradition is widely accepted to be hunter-gatherer, the situation becomes more complex when we look at depictions of domestic animals. Representations of fat-tailed sheep have been seen as evidence for the presence of herders, and partly used to propose migration routes (Cooke 1965). Few studies have investigated the way in which this 'new animal' was integrated in, or isolated from, the San rock art tradition. Most of the sheep depictions are located in the eastern part of southern Africa (e.g. Robinson 1986), although some are also recorded in the Western Cape and in Namibia (see Lander 2014 for discussion, Fig. 1.8).

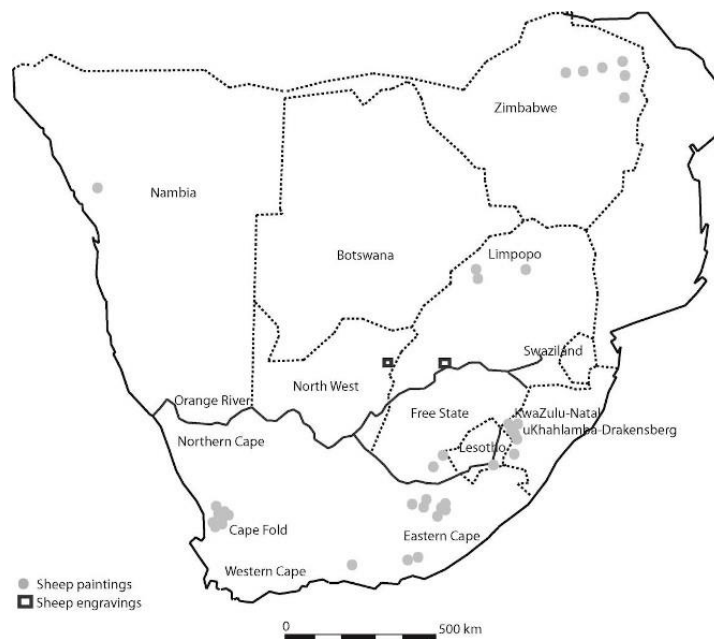


Figure 1.8. Painted and engraved sheep representations in Manhire *et al.* (1986), modified by Lander (2014)

Different authors have highlighted the scarcity of sheep depictions. Although engravings of sheep are also found in South Africa (Willcox 1965; Butzer *et al.* 1979), paintings of sheep are attributed to the fine-line tradition, which, as noted above, is conventionally labelled ‘San’, and by extension, ‘hunter-gatherers rock art’ (Mazel 1982; Van Rijssen 1984; Manhire *et al.* 1986; Yates *et al.* 1994; Eastwood 1996; Lenssen-Erz & Vogelsang 2005; Lander & Russell 2015). The association between fine-line paintings and a specific mode of subsistence could however be opened to discussion. As is the case in the northern Drakensberg, paintings of sheep are not necessarily associated with colonial motifs, suggesting their antiquity (Lander 2014). Lenssen-Erz & Vogelsang (2005: 59) interpret the presence of sheep in northern Namibian rock art as evidence of hunter-gatherer rock art testing “*the potential of incorporating a new, idiosyncratic motif into their ritual activities by depicting sheep*”. For them, these ‘tests’ did not lead to a redefinition of religious and social institutions. Huffman (1983) also associate sheep paintings of Ruchera Cave in Zimbabwe with trance-dance imagery such as dancing figures and lines coming out the head (Fig. 1.9).

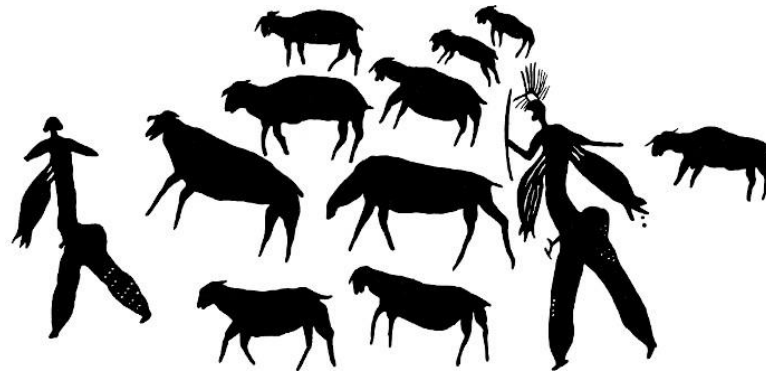


Figure 1.9. Extract from a panel of sheep paintings from Ruchera Cave in Manhire *et al.* (1986), redrawn from Goodall (1946)

Other rock paintings of sheep in the south-western Cape of South Africa are also associated with figures experiencing trance states (Manhire *et al.* 1986). Different authors insist that the incorporation of sheep in the rock art is related to the incorporation of sheep in the worldview of hunter-gatherers (Lander 2014; Lander & Russell 2015; Russell & Lander 2015b). Properties like hide colours and the fatness of sheep would have echoed San beliefs about supernatural potency (Huffman 1983; Eastwood & Fish 1996; S. Hall & B. Smith 2000; Eastwood & Eastwood 2006). Associations between the fatness of sheep and women is also discussed by Hollmann (1993), as well as the relationship between sheep fat and girls' transition rites, for instance in the rock art of the Limpopo River basin (Eastwood & Eastwood 2006). According to Lander & Russell (2015: 127), sheep represented in the rock art in a typical "*forager manner*" contrast with sheep represented during the colonial period which, in contrast, are more often represented in herds and together with other domesticates.

The association between sheep trance dance, supernatural potency and initiation ceremonies is another line of argument for proposing that these animals were viewed and 'processed' in the same way as putative 'wild' entities depicted on the rock face. This idea is highlighted by Lewis-Williams and Dowson (1989: 147) who write: "*There is also evidence that cattle and horses, and perhaps sheep as well, became symbols of potency and were used in the art of the final decades as eland or other animals had been used in earlier times*".

Following this discussion, the implication relevant to this thesis is that these ethnohistorical studies argue that sheep could have been integrated into various social structures and belief systems. This implies that rather than considering that past southern African hunter-

gatherers could not have had domesticates because of their sharing ethos, we should rather investigate how these animals have been integrated within their specific social organisation. Similarly, pottery, that is often conventionally associated with food-producing societies, could also reflect different practices and uses, as discussed below.

1.3.5. Pottery uses in historical records

Southern African historical and ethnographic records about pottery-making and use are also of interest. As mentioned already, pottery appears in southern Africa from around two thousand years ago roughly at the same time as sheep. Firstly found in LSA sites, many questions are still open about who was making these pots, and how were they used by LSA hunter-gatherers (e.g. Sadr & Sampson 2006).

Early travellers mention both San and Khoekhoe using pots, but their descriptions are somewhat limited by the personal interest in and understanding of these populations (see Stewart 2005 for discussion). Bollong *et al.* (1997) present different uses of pottery as observed by Europeans. Kolbe (1731) for instance speaks about Hottentot boiling pots, pots in which meat is served, or in which butter is placed for “*anointing their bodies or to sale to the Europeans*” (Kolbe 1731: 172). Another interesting account related in Bollong *et al.* (1997) is an observation made by Kannemeyer (1890) who encountered a Bushman collecting ‘Khoekhoe sherds’. This historical observation has been echoed by other others who propose the collecting of pottery sherd by LSA hunter-gatherers (e.g. Mitchell 2002). Additional accounts of San using pottery discussed in Bollong *et al.* (1997), include the use of a beer pot (maybe fermented honey), cooking bowls, and a vessel “*filled with eland meat*” (Burchell [1824] 1953, II: 32).

Bleek and Lloyd (1911) also recorded notes about pottery from a /Xam San man called //Kabbo and their other San interlocutors, and descriptions of how pottery was made and used. According to //Kabbo, the pots were made by women who collected the clay and mixed it with grass. A coil technique was employed, the pots then being smoothed, oiled with fat and air-dried. The pot was then “*sealed with gum and, finally, with boiled springbok blood*” (Bollong *et al.* 1997). //Kabbo also describes how the pot was used as an instrument for drumming:

They tie, putting the bag [6126' a springbok bag, they wet the skin of the springbok's thigh, then, when it is wet they tie it over the pot's mouth, and they dry the drum], over the pot's mouth, and then, they tie on the sinew. And they pull making tight the drum surface for they wish the drum to sound, when they beat the drum. (Unpublished manuscript material from one of Lloyd's /Xam notebooks. Manuscript reference: LL. BK. VIII-1: 6161', 6127-6128; Online reference: BC_151_A2_1_076.).

Although many of the preceding manuscript pages were unfortunately left untranslated by the Bleek family, it is nevertheless important to notice that the “they” used by //Kabbo in reference to the group of people making pot-drums, could actually refer not to Bushmen people but to other populations. The point is especially significant in light of the observations of several other authors. Bollong *et al.* (1997) discuss a drawing dating to 18th century which depicts a Hottentot woman playing a pot-drum: “*the caption on the pot reads: sheepskin/Earthen pot/brown. (...) This Hottentot plays with his hands on this pot-drum. It is a pastime for women*” (Bollong *et al.* 1997: 272). Kolbe in his Cape travels also describes a pot-drum:

Another instrument of music is an earthen pot, (resembling, like their common ones, a Roman urn), covered at top with a smooth dressed sheep-skin, which with sinews and sheep-guts, is tightly braced on, like the skin on a kettle-drum. This instrument is mainly used by the women (...). (Kolbe 1731: 273).

These different records are interesting, and allow us to propose that some pottery found in archaeological contexts might not have been used only been used for cooking or storage. There are accounts of hunter-gatherers using pots for cooking or keeping water in other parts of Africa (Lander & Russell 2015). These authors cite the example of ‘Angolan Bushmen’ described by D. Bleek (1927) who exchanged pots with Bantu-speaking farmers for skin and honey. A similar exchange is related in Bleek & Lloyd (1911).

These few records illustrate the diversity of pottery acquisition and use in different contexts. They problematise the simple association between the practice of domestication and pottery by highlighting the fact that the archaeological presence of pottery does not necessarily evidence the same practice in every site. Pottery could have been made,

collected, or traded. Significantly, pottery need not necessarily be equated with food storage.

1.3.6. Synthesis

The selected examples discussed in the preceding section concerning the relationship between domestication and southern African populations show that the search for the origins of the first herders in southern Africa is intimately linked to the history of colonisation. Beginning from historical observations, and further ethnographic studies, Khoe people were increasingly associated with pastoralists or herders, creating a paradigm associating one language group with one economy of subsistence, and opposed to San people associated with hunting-and-gathering and thought incapable of incorporating domestication into their society. As we have seen, however, ethnohistorical approaches highlight the fact that, if comparing historical societies, sheep may fit in both hunting-and-gathering and herding worldviews. In that sense, archaeologists can question how sheep were first adopted by late Holocene hunter-gatherers, and how they might have fit in their social organisations and belief systems. Following these ideas, the presence of sheep in hunter-gatherer sites does not necessarily imply pastoralism or the presence of Khoe peoples. These observations are also of interest for discussing the pottery found in both LSA and Iron Age sites because potsherds found in different sites do not necessarily fit within the same social structure and might correspond to different practices and uses. Equating particular objects with specific practices in different site types may, therefore, be opened to discussion and should be demonstrated archaeologically.

In the next two sections, I review aspects of the separation or integration of different populations, as discussed in the fields of linguistics and genetics. It is important to note that these two disciplines are influenced by and in turn, contribute to the creation of categories of people by the association of languages and economies of subsistence. I will point out how, in linguistics and in genetics, the interactions between different populations is demonstrated.

1.4. A linguistic perspective on southern African populations

1.4.1. The Khoisan and Bantu languages

African languages have been divided into four different language families, of which Khoisan is one (Greenberg 1963). Khoisan languages are characterised by the use of click

consonants. Different authors argue that the complexity of the click system renders difficult the comparison of Khoisan languages, and leaves some doubts about the fact that Khoisan would represent only one linguistic phylum (König 2008; Güldemann 2008). Güldemann & Voßen (2000) recognise at least 70 Khoisan languages, although only a dozen is still in use today in southern Africa (pers. comm. M. Brenzinger in König 2008). At least three broad classifications can be made in Khoisan languages: Central Bushman (also called Khoekhoe, see Greenberg 1950), Northern Bushman and Southern Bushman. South African Khoe languages are believed to derive from the language of hunter-gatherers in northern Botswana (Westphal 1963; Ehret 1982), and form a separate entity (Barnard 1988: 29):

Khoisan language groups or families include Khoe (...), !Kung, Taa or Ta'a (including !xõ), !Wi and tentatively Southwestern or Cape (/Xam). (...) In terms of the traditional classification of Khoisan languages, Khoe includes Hottentot and Central Bushman, !Kung is Northern Bushman, and the others are collectively the Southern Bushman group.

Another simplified version of language classification is proposed by Güldemann (2008: 95) who sees a major split in Khoisan languages: “the Khoe-Kwadi family and the two other families, Ju-~~H~~oan and Tuu, which can be subsumed under the convenient ‘Non-Khoe’”.

Khoe and San click languages are believed to have been spoken in a larger territory than today, before the ‘Bantu migrations’. The click-using Hadza and Sandawe languages in Tanzania have for instance been attributed to the Khoisan group. These two languages were nevertheless classified as ‘isolates’ (Güldemann & Voßen 2000), and the relationship between southern African Khoisan languages remains unclear (Blench 2013). San languages, such as /Xam have decreased, or been influenced and replaced by Khoe and Bantu languages. It is for example the case in southern Namibia where the San-affiliated Tuu languages would have been replaced by a Khoe language after the Nama migration (Güldemann 2006a). Southern African Bantu languages on the other hand are believed to ultimately derive from areas around Cameroon and eastern Nigeria (Phillipson 1984). Bantu languages can also be divided into two groups: the Western Highland group occurring in Angola and northern Namibia, and the Eastern Highland group that is widespread in the eastern part of southern Africa (Phillipson 1984).

It is important to recognise that the interconnections between Khoe, San and Bantu languages exist as a direct result of interactions between groups of people. Studying these interactions allows us to question processes of filiation, interactions and borrowings between these different languages.

1.4.2. Linguistics as a mean to study interactions

Comparative linguistic studies represent an important field for the study of interactions through the phenomena of borrowing. Links between Khoe and San affiliated languages have been discussed, for instance, in the Cape area where Güldemann (2006b) recognises a strong influence of San Tuu languages on Cape Khoe. For Blench (2009, 2013), links should also exist between Cushitic-speaking herders of east Africa and Khoe-Kwadi speakers, particularly in animal names and practices. According to him, *“there was a ‘lost’ branch of the Cushitic family whose speakers encountered the early Khoe and transferred basic herding skills as well as the animals (fat-tailed sheep and longhorn taurine cattle)”* (Blench 2013: 56). He situates the zone of interaction in modern day Zambia, inferring that *“Cushitic languages once spread as far as south-central Africa”* (Blench 2009: 33). A similar idea is expressed by Güldemann (2008) who sees links between Khoe-Kwadi and East African languages (Fig. 1.10).

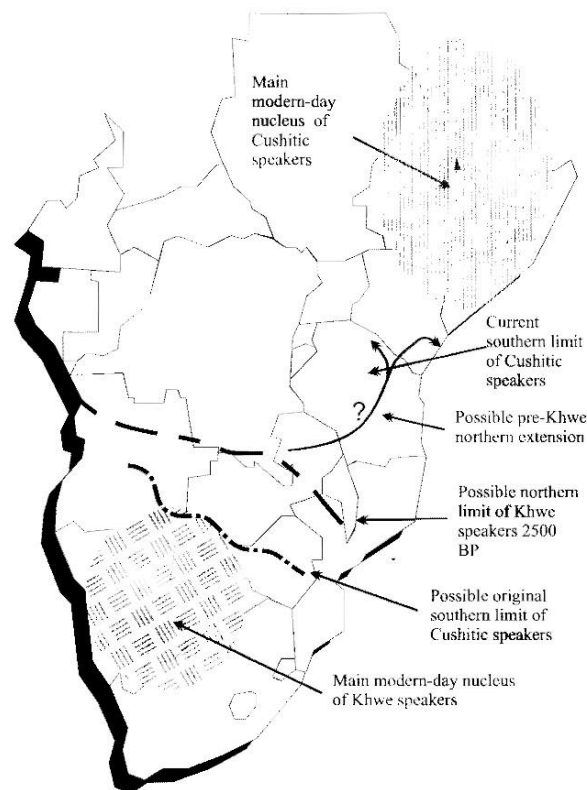


Figure 1.10. Proposed language distribution in Blench (2009)

Interactions between local click-speaking southern African peoples and Bantu speakers are also evident in some South African Bantu languages, where clicks have been incorporated (Herbert 1990; Voßen 1997; Güldemann 2008). Ehret (1998) for instance has suggested that some Bantu communities living in the south-east of the country integrated Khoe vocabulary related to herding. He bases his hypothesis on the isolation of Khoe language loanwords in Bantu languages (Ehret 1973).

These few examples highlight the fact that although language groups can be isolated, they are not completely independent from each other. They also underline the fact that interaction between group was a strong factor which partly remodelled languages.

1.4.3. Linguistic models for the origins of Khoe populations

Despite the recognition that languages are not necessarily independent from one another, the assumption that all Khoe-speakers in South Africa are herders or pastoralists is nevertheless widespread. This point is significant for this thesis because of the supposed presence of herders in the Limpopo River Basin. Linguistics has played a crucial role in the search for this connection, as it was able to discuss the evolution and potential origins of language groups (Haacke & Eiseb 2002). Different methods were used, such as palaeolinguistics, which includes comparative grammar and glottochronology (e.g. Ehret 1982). In these linguistic studies, whether Khoe-speakers and herding groups were equated, or whether the link was made by researchers from other disciplines, ‘finding the origin of Khoe languages’ became ‘finding the origin of herders or pastoralists.’ Extrapolating from the existence of similar words or structures in different Khoe languages, linguists recreated ‘proto’ languages that they located in different areas of Africa.

Two main geographical origins for proto-Khoe languages have been proposed. The first is proposed by Elphick (1985) following Ernst Westphal (1963), who argues that proto-Khoe languages were spoken in northern Botswana, where Khoe-speaking people acquired cattle from Bantu-speaking people. From there, Khoe languages, and herding, would have spread across southern Africa following a complex set of different routes. The second, is proposed by Blench (2009, 2013), who argues that proto-Khoe-speakers would have interacted with Cushitic pastoralists in central Zambia and subsequently have developed herding. The extant of languages potentially related to Khoisan languages (Sandawe and Hadza) in East Africa is one of the linguistic arguments in favour of ancient relationships between eastern and southern African populations, although it is still debated, with Hadza now generally

considered a linguistic isolate (Güldemann & Stoneking 2008; Blench 2013). Güldemann (2008), on his side, argues for a demic migration of pastoralists speaking Khoe-Kwadi languages (including Khoe languages) that may have originated from East Africa, although other points of origins for Khoe languages have been proposed (see Sadr [2008a] for discussion). Beyond language affinities, linguists have also argued that Khoe-speakers were keeping stock for a long time, and independently of Bantu-speakers. Güldemann (2008) and Ehret (2008), for instance, discuss the existence and evolutionary pattern of words related to domestication in Khoe or Khoe-Kwadi languages, such as ‘sheep’ or ‘cow’. Following their study, these words would have existed in proto-Khoe languages prior to the migration of Bantu-speakers into southern Africa.

Following these linguistic models, Khoe-speaking herders or pastoralists would be expected to have been present in different regions of southern Africa. Of special importance to this thesis is that one of these regions would be the Limpopo River Basin, where Ehret (2008) argues that the ‘Limpopo Khoe’ represented an early pastoral population, independent of agro-pastoral Bantu-speaking peoples. I return to this crucial idea throughout this thesis.

1.5. Genetic and physical anthropology approaches to southern African populations

1.5.1. Genetics

a. Methodologies and their implications

Like linguistics, genetic studies represent an important field of research concerning the origins, migrations, and interactions of southern African populations. Genetic studies are nowadays inescapable when studying past populations. Geneticists study the genomes of different populations, and may from there infer phenomenon of filiation, dispersion and interrelations. How to genetically isolate a population, reconstruct their past and ‘admixture’ with other groups are part of the research questions asked by geneticists, as are questions of identity. Constructing a current or past identity using biological proxies raises many challenges and has been criticised (Gould 1996). The idea that so-called ‘races’ and cultures can be correlated has now been proved wrong (see discussion for southern African contexts in M. Hall 1987). As Phillipson (1977) notes, genetic studies cannot reflect the reality of a cultural population in its entirety. Some individuals could, for instance, identify themselves as Nama, despite mixed genetic heritage. Phillipson,

following the work of Hiernaux (1974), highlights that: “*major socio-political, linguistic or economic re-alignments can take place with very little corresponding gene-flow.*” (Phillipson 1977: 6). Most of the authors working in the field of genetics are conscious of the difficulty, or even impossibility, of linking genes with a cultural identity or language group (see Blench 2004 for discussion). I will discuss further this issue in the sixth chapter of this thesis, especially in regard to migration models that use a combination of genetic, linguistic and archaeological data.

Two main branches of genetics exist, that are often used as strands of evidence for reconstituting these processes in the past: the paleogenetic of ancient DNA (aDNA), and modern DNA where living population are sampled and the history of the gene flow reconstructed through different methods such as mutation rates (Céline Bon pers. comm.). In southern Africa, living individuals are generally sampled for modern DNA, aDNA studies being still under-represented. While aDNA sampled from archaeological remains is most directly related to the questions in archaeology, modern DNA is sometimes less directly related to what archaeologists have access to.

The fact that modern populations are sampled, and then projected in the past, opens questions on the representativity of these individuals for talking about more ancient populations. The sampling proxies and ‘identities’ that geneticists sample vary from study to study, and may have different implications for the interpretation of their results. Beyond this thorny issue, it still appears difficult to precisely date the different events of the grouping or dispersion of sets of genes. Two examples of the large margins of errors from genetic studies may be given for the southern African context. First, Barbieri *et al.* (2014: 441) date the Khoisan: “*population expansion (...) to be 5,247 ($\pm 2,700$) years old*”. Second, Tishkoff *et al.* (2007: 2186) write that: “*The Hadza and Sandawe diverged 23 kya (CI 13–37 kya)*”. Because of these large margins of error, geneticists often rely on archaeological finds to date their results, or at least to ‘calibrate’ them. This opens further questions about how a genetic and archaeological data may then be related and associated.

Implications also arise depending on which part of the genome is studied. Looking at Y-chromosome, for instance, only gives access to the patrilineal line. Autosomal DNA, on the other hand, is not sexually determined, but filiation processes are more complicated to reconstitute than for mitochondrial DNA (mtDNA -matrilineal), or Y-chromosome (Céline Bon, pers. comm.). This has implications for what part of the history could or could not be

reconstituted. Finally, working with modern samples for retracing processes such as migrations implies having access to many individuals. However, ‘blank areas’ exist, and only a few populations are actually sampled. This is, for instance, visible in the map published by Coelho *et al.* (2009) which represents the approximative location of the populations used for their study (Fig. 1.11). Different reasons may explain why some populations are more sampled than others. It could be due to the fact that these very populations interested anthropologists more than others, that some areas are inaccessible because of political reasons, or that people themselves refused to be samples for genetic studies. Hadza and Sandawe individuals were for instance sampled because of the linguistic questions asked about their relationship with southern African Khoisan languages.

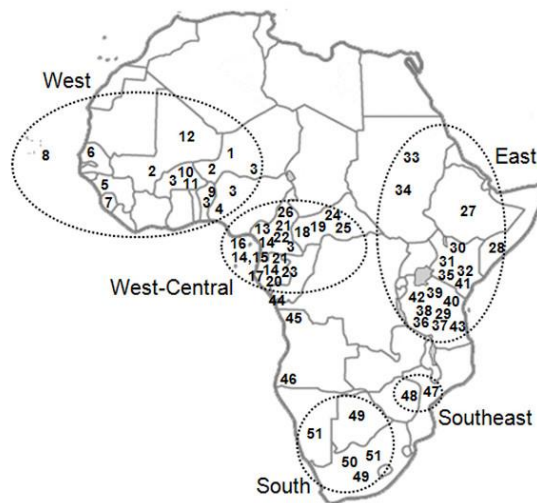


Figure 1.11. Population groups used in Coelho *et al.* (2009)

With these introductory points in mind, I now turn to the many data which are accessible through genetics and, sometimes allow us to pinpoint population movements and contacts.

b. Southern African populations and genes

In southern Africa, genetic studies have shed light on haplogroups which appear specific to southern African Khoisan populations: the L0d and L0k or L1d and L1k branches (Salas *et al.* 2002; Soodyall *et al.* 2008; Barbieri *et al.* 2014). These haplogroups are, however, also found in southern African Bantu populations, probably due to contact with Khoisan peoples (Pereira *et al.* 2001; Salas *et al.* 2002). In Mozambique, sequence types from the L1d haplogroup found in Bantu population are seen as “a probable relict of Khoisan-speaking populations that inhabited the region prior to their displacement by the Bantu-

speaking incomers.” (Pereira *et al.* 2001: 439), or due to a recent admixture. Indeed, Khoisan speaking populations may have been spread up to Ethiopia and Sudan before the Bantu migration (Greenberg 1963; Blench 1993). The haplogroups specific to Khoisan populations were not found in the genomes of other non-southern African individuals, except in the Sandawe of Tanzania (Tishkoff *et al.* 2007) and one individual in Turkana (Pereira *et al.* 2001; Salas *et al.* 2002; Černý *et al.* 2007). The study by Salas *et al.* (2002) shows particular genetic links between south and southeast Africa, with the presence of L1d haplogroups in both areas (Fig. 1.12). It seems, however, that no individuals were sampled in south-central Africa.

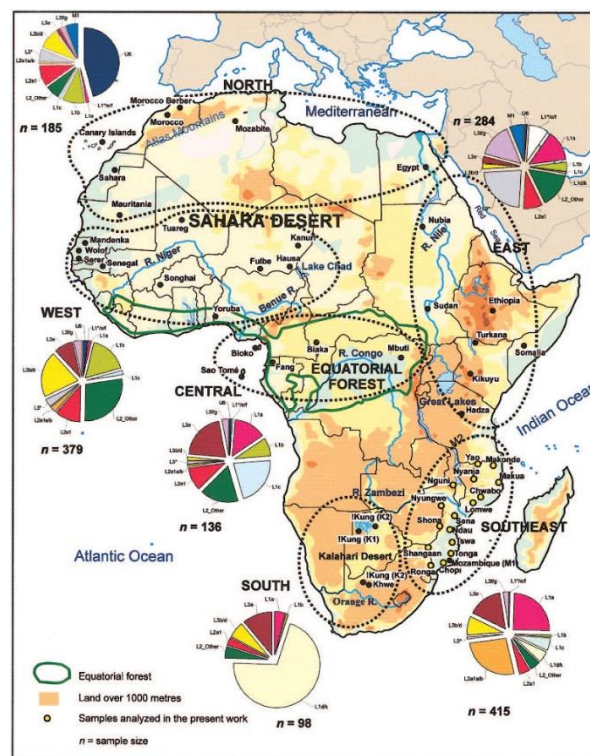


Figure 1.12. Haplogroups in Africa, in Salas *et al.* (2002)

An attempt by Soodyall *et al.* (2008) to separate San and Khoe populations in southern Africa sampled DNA from 179 living individuals. The mtDNA and Y-chromosome data they analysed allowed them to reach a time-depth of tens of thousands of years before present. They grouped the individuals based on their self-identification, rather than on the spoken language. Their study demonstrated a strong genetic connection between San and Khoe samples, supporting results from previous work (Soodyall & Jenkins 1992). The authors propose that their results are:

strongly suggestive of a common matrilineal ancestry of the San and Khoe, with differences being introduced as a result of varying degrees of gene flow from other groups over time. (...) the genetic data presented [therein] suggests an ancient common origin that predates their cultural and linguistic differences. (Sooydall et al. 2008: 37)

Güldemann and Stoneking (2008) present similar results showing a genetic proximity between ‘pastoral’ Khoekhoe and Ju-speaking San of southern Africa.

c. Genetics and pastoral migrations

Most current genetic research points to an East African location for the diffusion of herding practices into southern Africa (e.g. Henn *et al.* 2008; Pickrell *et al.* 2012; Schlebusch *et al.* 2012). The picture is, however, quite complex as, for instance, only specific genes could indicate links between East and South African populations, while other genes of the same populations do not indicate links (e.g. Barbieri *et al.* 2014). Different authors have studied the genetic links between East African and southern African populations in order to test the relationships between pastoralist populations of these two areas. Barbieri *et al.* (2014) noticed that the haplogroup L5, which is common in East Africa, is also found in two southern African groups, the Tshwa and the Shua, in Botswana. Links were also found between East African pastoralists and Nama populations thanks to autosomal DNA (Schlebusch *et al.* 2012; Pickrell *et al.* 2012). This link is not visible when looking at matrilineal data, implying for the authors that the migration may have been ‘male-mediated’ (Barbieri *et al.* 2014). In contrast, Uren *et al.* (2016) recognise only a limited eastern African genetic impact on Nama populations.

The hypothesis of a genetic similarity between southern and eastern pastoralist populations is also proposed by Henn *et al.* (2008) who studied Y-chromosome DNA from 13 populations between East and South Africa. They interpret their results as the consequence of a pastoralist migration from Tanzania to southern Africa around 2000 years ago, independent of the Bantu expansion. In their article, the authors conclude: “*Our Y-chromosomal evidence supports a demic diffusion model of pastoralism from eastern to southern Africa ≈ 2000 years ago*” (Henn *et al.* 2008: 10693). Significantly for this thesis, however, they also suggest an alternative hypothesis: “*a non-pastoralist interpretation is also possible...it would have involved, minimally, male hunter-gatherer individuals moving between the regions*” (Henn *et al.* 2008: 10697). Although it is not the hypothesis that the

authors favour, the implication is that the social interpretation of genetic data may not always be straightforward.

An interesting set of genetic articles also emphasises the presence of the lactase persistence allele C-14010 in Khoe speaking pastoral populations in southern Africa and pastoral populations in East Africa (Schlebusch *et al.* 2012, Breton *et al.* 2014; Macholdt *et al.* 2014; Ranciaro *et al.* 2014). The lactase persistence allele is linked to a genetic mutation appearing in milk-drinking populations (see Ségurel and Bon [2017] for discussion). The presence of the C-14010 lactase persistence allele in the Nama and in East African populations would support a link between the two regions, as well as the consumption of milk by these populations both today and in the past (Breton *et al.* 2014; Macholdt *et al.* 2014; Pinto *et al.* 2016). According to Breton *et al.* (2014), eastern African pastoralists would have reached southern Africa around 1300 BP, which is considerably more recent than the often-cited date of 2000 BP. These pastoralists would then have interacted with local hunter-gatherers and introduced herding to them. Interactions could also have taken place closer to eastern Africa, although this hypothesis is often not retained (Coelho *et al.* 2009). The C-14010 allele is also found in other southern African populations, such as the Bantu-speaking Xhosa, probably resulting from contacts between groups of people within southern Africa (Breton *et al.* 2014; Ranciaro *et al.* 2014). Non-East African genetic variations of the lactase persistence allele are also found in Khoisan populations in southern Africa, reflecting a complex and intricate history (Macholdt *et al.* 2014). Interestingly, some hunter-gatherer groups also have a lactase persistence trait even though they do not consume milk (Macholdt *et al.* 2014; Ranciaro *et al.* 2014). This is, for instance, the case for two Khoe-speaking hunting-and-gathering groups, the G/ana and the Tshwa (Macholdt *et al.* 2014), which may mean that this allele is found in hunting-and-gathering populations either as a result of common ancestry with a former pastoral population possessing this allele or more recent contacts.

In sum, these recent genetic studies have produced three main results: 1) Khoe and San people share similar genes; 2) Khoisan people genes entered local Bantu populations and vice-versa; and 3) links may exist between eastern Africa pastoralist populations and southern African Khoe-related populations. However, although valuable, these results are also dependant on issues regarding sampling and the definition of identity.

1.5.2. Physical anthropology

Researchers specialised in physical anthropology have, like geneticists and linguists, also aimed to address different issues regarding relationships between hunter-gatherers and herders in southern Africa. Physical anthropology is interested in the bone structures of individuals and the assignation of individual to population groups. Similar to those in genetics, problems arise when trying to culturally define peoples through biological proxies. As noted by Güldemann and Stoneking (2008), there is no necessary link between an individual's spoken language and the physical aspects.

In his book, *The Skeletons of Contact*, A. Morris (1992) makes a biological comparison of late Holocene skeletons in the Orange River valley. His work draws further attention to the fact that no clear link can be established between culture and biology. Following this idea, he writes:

A further problem has been the confusion between race and ethnicity. Much of the early work in physical anthropology assumed an exact fit between the two, with people of a given race having a specific and reified culture. It has now been shown repeatedly that race and culture are totally separate concepts and that they may vary independently (A. Morris 1994: 1).

A. Morris reiterates the fact that Khoe and San people cannot be differentiated on an osteological basis, and, therefore, he uses the term Khoisan. He also describes similarities between Khoisan and Bantu skeletons, most probably deriving from inter-marriage. Dewar and Pfeiffer (2004), who conducted research on postural habits by looking at a large sample of LSA skeletons, demonstrated that the squatting posture, which is common amongst southern African San, was widespread in the sample analysed. Variations of the posture of some individuals was also observed. According to the authors, the variation could represent different postural habits of hunter-gatherer groups living in different geographical areas. They also hypothesise that the variation might represent postural habits of different populations such as hunter-gatherers and pastoralists.

1.5.3. Synthesis: historical, linguistic, and genetic data

Specific key aspects may be highlighted from the different studies presented in the preceding sections. First, the construction of San, Khoe, and Bantu 'identities' in southern

Africa is partly dependant on categories created in a colonial context. Specific identities, or language groups got progressively correlated with specific economies of subsistence, leading to the creation of paradigms, such as ‘San hunter-gatherer’ or ‘Khoe herder’. The equivalence between specific language groups or identities and economies of subsistence led to interconnected ‘logics’. For instance: Khoe-speakers are herders, the rock art Geometric tradition is made by Khoe people, therefore the Geometric Tradition is made by herders. These reasoning also impacted migration models interested in the appearance of herding in southern Africa, by associating Khoe speakers and herders. I will discuss this aspect further in the sixth chapter of this thesis.

Even though limiting paradigms have been created, linguistics and genetics studies have also emphasised the borrowing history of languages, and the complexity of southern African populations’ genomes. Ethnohistorical studies also highlighted how domesticates and pottery could have been integrated in different ways in various populations, and that there is room to think about how could past hunter-gatherers could have adopted these new elements and practices within their social structures.

Having presented this overview, I now turn to the archaeological data about the mid- to late Holocene southern African populations.

1.6. Archaeological data: southern African late Holocene populations, migrations and interactions

We saw in the preceding sections that southern African late Holocene populations are broadly understood as belonging to three broad socio-economic categories, hunter-gatherers, herders and agro-pastoral populations, each associated with broad language groups or identities.

Before shifting to an archaeological review of late Holocene populations, migrations and interactions, it is necessary to define the terminology that I am employing in this thesis for these diverse economies of subsistence. I understand pastoralism as an economy of subsistence and a way of life organised around domesticates (e.g. Mitchell 2002). Herding is the activity of taking care or driving a group of domesticates. A herder may thus belong to a society in which hunting and gathering plays an important role. In the southern African research context, herders are generally understood as people keeping domesticates, without

having a ‘full’ pastoral economy. Depending on the authors, Khoe-speakers may be associated with either ‘herders’ or ‘pastoralists’. In contrast, ‘agropastoralists’ are people practising agriculture and animal breeding, and are generally linked to Iron Age communities. Hunting-and-gathering is also commonly practiced in diverse agro-pastoral societies.

I am also aware, however, that great internal variations exist within these categories. Anthropology has demonstrated, for instance, that pastoral populations are very varied, which is reflected in differences in meat and dairy products, the practice of hunting and gathering, but also in varied mobility patterns (e.g. Phillipson 1977). In modern pastoral society in East Africa, pastoral groups such as the Samburu and Rendille rely almost exclusively on domestic animals for their diet, whereas other groups largely consume wild fauna (F. Marshall 1990; Jones 1984). The consumption of domestic animals (milk or meat) is therefore variable within pastoral societies (see discussion in Russell & Lander 2015a). This economic diversity in pastoral societies is interesting when discussing the classic opposition between hunter-gatherers and pastoralists.

The existence of hunter-gatherers turning to pastoralism in southern Africa is now broadly accepted (Kinahan 2001; Orton 2012; Russell & Lander 2015a). However, how and when hunter-gatherers adopted this economy is still debated and is likely to reflect a variety of social processes (Kinahan 1996).

1.6.1. The Early Herding Phase

a. Domesticated caprines: first appearance and origins

Caprine bones are thought to appear in southern Africa at the end of the first millennium BC (e.g. Sadr 2003). Sheep and goats have no wild progenitors in southern Africa and must therefore have been introduced to the region from elsewhere. These species originated from Southwest Asia (the eastern Zagros, Iran, Anatolia) and were domesticated around 10 000 years ago (Zeder & Hesse 2000; Naderi *et al.* 2008). From there, they would have dispersed downwards with groups of people and through diffusion processes following different routes and waves of migrations (A.C. Smith 2013). Going through Sudan, Yemen or Kenya, sheep would have reached the Horn of Africa at the beginning of the second millennium BC (Lesur *et al.* 2013). It is generally argued that one of the main kind of pre-colonial domesticated sheep in southern Africa were fat-tailed sheep, as they are described in historical records and are depicted in rock art (Epstein 1971; Manhire *et al.* 1986).

According to Blench (2009), fat-tailed sheep are mainly distributed along the eastern part of the African continent (Fig. 1.13).

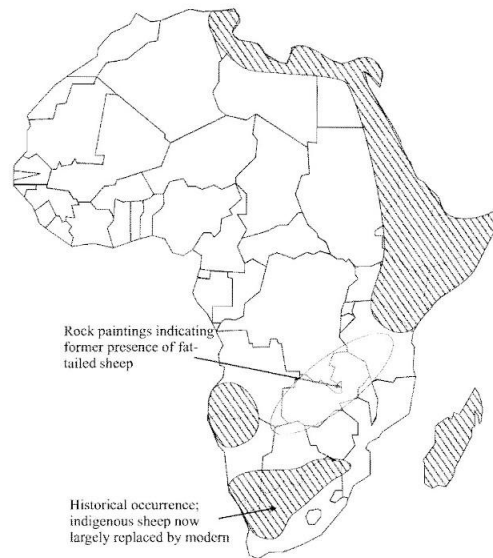


Figure 1.13. Distribution of fat-tailed sheep breed in Africa, in Blench (2009)

Importantly, however, several authors highlight the difficulty of distinguishing between goat and sheep remains. Badenhorst and Plug (2003), for instance, insist on the anatomical features that these two animals share in southern Africa, making them almost undifferentiable unless complete skulls have been preserved. According to Badenhorst (2006), only the domestic goat (*Capra hircus*) is found in southern Africa and four different breeds are recognised. It has been pointed out that goats are more resistant animals than sheep, and can adapt to harsh environments, whereas sheep require more attention depending on the breed (Badenhorst 2002; Russell & Lander 2015a). Ethnographic studies also exist and point out the advantages of the fat-tailed sheep breed, in particular the fat contained in the tail. In some pastoralists groups, as is the case with the Turkana in East Africa (Kenya), people could cut off and use the fat stored in the tail without killing the animal (Jones 1984: 55). Cutting off the sheep tail while the animal was alive was also recorded near Lesotho by Arbousset (2000: 90 [original 1840]) while travelling with Basotho.

b. Caprine remains in Later Stone Age sites

The earliest caprine bones found in southern Africa date to the BC/AD transition. In the coming sections, I make reference to the sites shown in Figure 1.14. The dates discussed in

this section have been calibrated in OxCal (v4.3.2, Bronk Ramsey 2017) using the SHCal 13 curve (Hogg *et al.* 2013) with a 95,4% probability. The original and calibrated dates are represented in Table 1.1.

In their review of the early sheep bones, Pleurdeau *et al.* (2012) present part of the evidence for early sheep remains found in LSA sites in southern Africa. They note that sheep remains are often in an uncertain stratigraphic position. This is the case at Oruwanje 95/1 (Namibia), where sheep are associated with a date of 1429–1207 cal. BC (UtC-5587) (Albrecht *et al.* 2001), while some of the remains from Bambata (Zimbabwe), in layers dated to 356 cal. BC – cal. AD 23 (Pta-3072), are attributed to sheep with caution (Walker 1983).

The earliest reliable dates for sheep remains come from Spoegrivier Cave (South Africa) at 353 cal. BC – cal. AD 70 (OxA-3862) (Sealy & Yates 1994; Vogel *et al.* 1997) and Toteng 1 (Botswana) at 61 cal. BC – cal. AD 115 (Beta-I86669) (Robbins *et al.* 2005, 2008). Toteng 1 has also produced two cow remains, dated respectively to 144 cal. BC – cal. AD 60 (Beta-I904888) and cal. AD 545– 667 (Beta-I86670). The first date is especially early in the southern African context and, for now, stands alone. Also noteworthy is the early date of 48 cal. BC – cal. AD 211 (OxA-4543) on a sheep mandible from Blombos Cave, located at the southernmost tip of South Africa (Henshilwood 1996). These ‘early’ sites pre-date the beginning of Iron Age migrations into southern Africa by at least a couple of centuries (Mitchell 2002).

Other sheep remains are dated by association with the stratigraphic unit in which they were found. Such sites include Namibian sites such as Falls Rock Shelter with remains dated between 339 cal. BC – cal. AD 55 -Pta-2929- and cal. AD 53–338 (Pta-2927) and Snake Rock Shelter (dated to between cal. AD 114–363 (Pta-2886) and cal. AD 252– 627 (Wits-1249) (Kinahan 2016); /Hei-/Khomas in the Northern Cape dated to 349 cal. BC – cal. AD 364 (Pta-5530) (Webley 2001); Geduld at AD 75–470 (Pta-4419) (A.B. Smith & Jacobson 1995); Boomplaas at cal. AD 248–525 (UW-338) (H. Deacon *et al.* 1978); and sites in the southwestern Cape such as Eland’s Bay Cave and Diepkloof Rock Shelter (Parkington *et al.* 1986; Parkington & Poggenpoel 1987). The ancient sheep remain from Leopard Cave was analysed thanks to proteomics, and newly re-attributed to a springbok (Le Meillour *et al.* 2020; Le Meillour 2017). Generally, the faunal assemblages from these early dated sites include very few sheep bones (Sadr 2013).

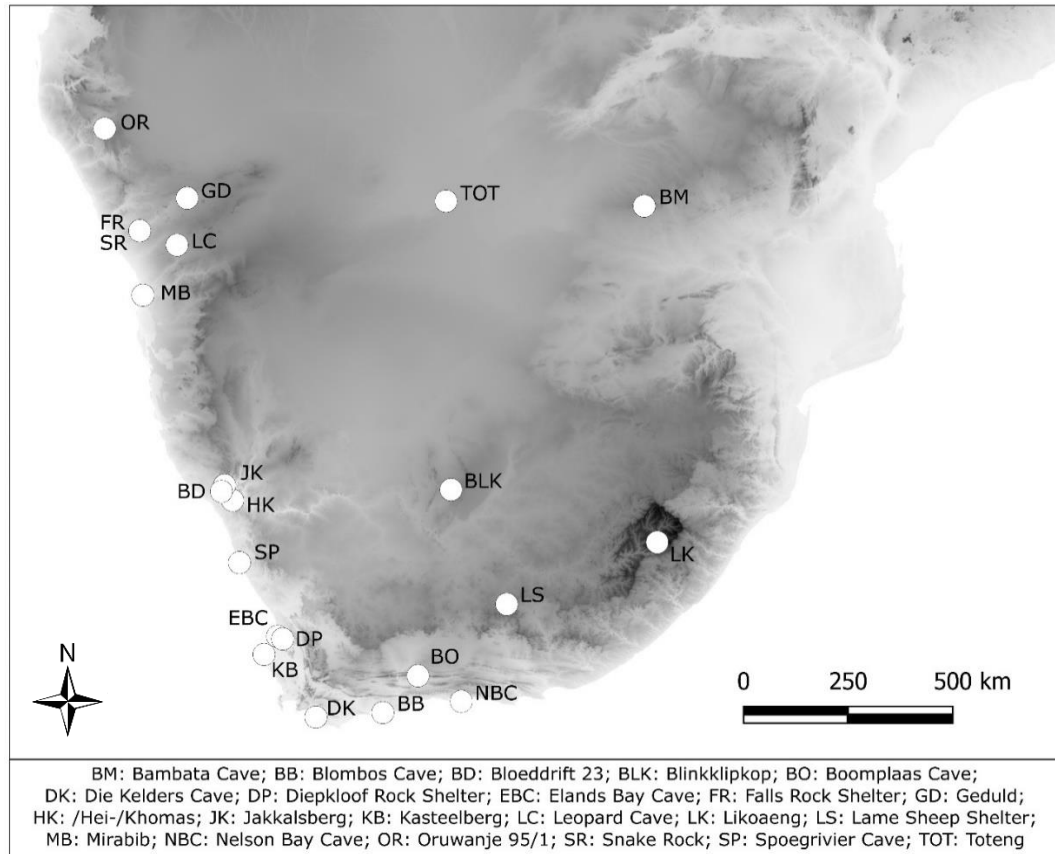


Figure 1.14. LSA sites with sheep remains cited in the text

Site	Laboratory number	Layer	Dated material	Date BP	Date cal.BP	Date cal.BC/AD	Reference
Bambata Cave	Pta-3072	3(b)	Charcoal	2140 ± 60	2305–1927	356 BC–AD 23	Walker 1983
Blinkklipkop	Pta-2840	5p	Charcoal	1160 ± 50	1173–929	AD 777–1021	Thackeray <i>et al.</i> 1983
Bloeddrift 23	Pta-7942	Hearth	Charcoal	355 ± 15	450–315	AD 1500–1635	A.B. Smith <i>et al.</i> 2001
Blombos Cave	OxA-4543	5	Sheep left mandible	1960 ± 50	1997–1740	48 BC–AD 211	Henshilwood 1996
Blombos Cave	OxA-4544	6	Sheep calcaneum	1880 ± 55	1904–1611	AD 47–340	Henshilwood 1996
Boomplaas	UW-338	BLD 2	Charcoal	1700 ± 55	1702–1425	AD 248–525	H.J. Deacon <i>et al.</i> 1978
Die Kelders	OxA-3860	7	Sheep second phalange	1325 ± 60	1299–1068	AD 651–882	Sealy and Yates 1994
Die Kelders	OxA-3861	7	Sheep maxillary fragment	1290 ± 60	1292–995	AD 658–955	Sealy and Yates 1994
Eland's Bay Cave	GaK-4335	Layer 5	Charcoal	1120 ± 85	1182–795	AD 768–1155	Klein and Cruz-Uribe 1987
Falls Rock Shelter	Pta-2929	5	Charcoal	2100 ± 50	2288–1895	339 BC–AD 55	Kinahan 2001, 2016
Falls Rock Shelter	Pta-2927	6	Charcoal	1880 ± 50	1897–1612	AD 53–338	Kinahan 2001, 2016
Geduld	Pta-4419	Square B6 level L5	Dung	1790 ± 80	1876–1481	AD 75–470	Smith and Jacobson 1995
/Hei-/Khomas	Pta-5530	Y21 LBS3 (z=18)	Bone	1980 ± 120	2298–1587	349 BC–AD 364	Webley 2001
Jakkalsberg A	Pta-5958	Hearth 1	Charcoal	1330 ± 60	1300–1070	AD 650–880	Webley 1997
Jakkalsberg A	Pta-6100	Hearth 2	Charcoal	1300 ± 25	1270–1089	AD 680–861	Webley 1997
Jakkalsberg B	Pta-6122	Hearth 1	Charcoal	1420 ± 25	1320–1194	AD 631–756	Webley 1997
Jakkalsberg B	Pta-6101	Hearth 2	Charcoal	1380 ± 50	1350–1108	AD 600–843	Webley 1997
Kasteelberg A	OxA-3864	Square A20 unit 20-30	Sheep vertebra	1630 ± 60	1610–1323	AD 340–628	Sealy and Yates 1994
Kasteelberg A	OxA-3865	Square A20 unit 20-30	Sheep distal metapodial	1430 ± 55	1399–1183	AD 551–768	Sealy and Yates 1994
Mirabib	Pta-1535	Dung floor	Dung	1550 ± 50	1515–1310	AD 435–641	Sandelowsky <i>et al.</i> 1979
Oruwanje 95/1	Urc-5587	16	Charcoal	3101 ± 39	3378–3156	1429–1207 BC	Albrecht <i>et al.</i> 2001
Snake Rock Shelter	Pta-2886	9	Charcoal	1840 ± 50	1836–1587	AD 114–363	Kinahan 2001, 2016
Snake Rock Shelter	Wits-1249	10	Charcoal	1640 ± 70	1698–1323	AD 252–627	Kinahan 2001, 2016
Spoegrivier	OxA-3862	FBS	Sheep right first phalange	2105 ± 65	2302–1881	353 BC–AD 70	Sealy and Yates 1994
Spoegrivier	GrA-9028	Lens SAS layer 10	Sheep bone	1900 ± 50	1921–1630	AD 30–321	Webley 2002
Spoegrivier	GrA-9032	Lens GAS layer 9	Sheep bone	1900 ± 50	1921–1630	AD 30–321	Webley 2002
Spoegrivier	GrA-9029	Lens GAS layer 9	Sheep bone	1890 ± 50	1907–1619	AD 43–332	Webley 2002
Spoegrivier	GrA-9030	Lens YBS layer 7	Sheep bone	1490 ± 50	1452–1272	AD 499–678	Webley 2002
Spoegrivier	GrA-9027	Lens YBS layer 7	Sheep bone	1260 ± 50	1271–987	AD 680–964	Webley 2002
Toteng 1	Beta-186669	Square K (z=75-80)	Sheep astragalus	2020 ± 40	2010–1835	61 BC–AD 115	Robbins <i>et al.</i> 2005
Toteng 1	Beta-1904888	Square L (z=70-75)	Cow carpal	2070 ± 40	2093–1890	144 BC–AD 60	Robbins <i>et al.</i> 2005
Toteng 1	Beta-186670	Square L (z=55-60)	Cow molar	1480 ± 40	1405–1284	AD 545–667	Robbins <i>et al.</i> 2005

Table 1.1. Dates associated with LSA sheep remains cited in the text

i. Caprine remains in the first half of the first millennium AD

In general, caprine remains are rare in archaeological sites dated to the first half of the first millennium AD. At Spoegrivier Cave, 108 sheep fragments were found in total, which represent only around 0,6% of all the animal remains from the site, a proportion that rises to around 2% in layers containing pottery (Vogel *et al.* 1997; Webley 2002). The faunal spectrum is otherwise dominated by wild animals, mainly seals, tortoises and small bovids. In their excavation of the site in 1994, Vogel *et al.* (1997) note a change of the floor structure around 2000 BP which is interpreted as a reorganisation of the space presumably contemporaneous with the introduction of sheep. They also argue that sheep might have preceded the introduction of pottery, as sheep fragments are found in pre-pottery layers, whereas Webley (2002) considers them as simultaneous.

The site of Toteng 1 in northern Botswana (Robbins *et al.* 2008) also contains few caprine remains compared to those of wild animals. In total, nine caprine remains, including both sheep and goats, were found out of a total of 929 faunal remains (including shells), representing just 1% of all the fauna from the site. As at Spoegrivier, remains of domestic animals predate by 300 year the first Bambata pottery sherds (which, as I discuss later in this Chapter, could have been made by hunter-gatherers or herders). At Blombos, sheep bones are both associated with pre-pottery and pottery layers (Henshilwood 1996).

Other sites such as /Hei-/Khomash (also called /Ai tomas) in the Northern Cape also have very few sheep bones (Webley 2001) and while other sites are not directly dated most of them also contain a low density of sheep bones (Pleurdeau *et al.* 2012; Sadr 2013). In some cases, however, such sites may still have been used as sheep kraals, particularly at Boomplaas, which has a calcined layer of dung and burnt sheep bones dated to cal. AD 248–525 (UW-338) (H. Deacon *et al.* 1978). The date of cal. AD 435–641 (Pta-1535) at Mirabib in Namibia was also obtained on a dung layer from which sheep hairs were extracted (Sandelowsky *et al.* 1979).

The caprine remains found in other LSA sites are mostly not directly dated. Most of them also have a low density of sheep bones (see Sadr 2013). It is for instance the case for the few sheep bones from Elands Bay Cave dated to around 1600 years ago (Klein & Cruz-Uribe 1987). For Sadr (2003), the older 1st millennium sites such as Mirabib (Sandelowsky 1977), and Geduld (A.B. Smith & Jacobson 1995; Kinahan 1995) with few potsherds and less than 10% of domestic stock cannot be associated with fully pastoral populations. It is

only later, and in specific areas of southern Africa, namely in the semi-arid and arid western lands that pastoralism develops. In Namibia, in the Brandberg and the !Khuiseb Delta, it seems that intensive pastoralism only emerged in the mid to late second millennium AD (Kinahan 2001).

ii. Caprine remains from the second half of the first millennium AD

From around the mid-first millennium AD, and especially during the second millennium AD, the number of sheep remains increases in some sites. This is so at the complex of Kasteelberg sites in the Western Cape where sheep bones are present in higher quantities between AD 600 and AD 1000. At KBDe there are 929 caprine bones (46%) out of 2016 total remains identified (Sadr 2019b). The dichotomy perceived between earlier sites with few caprine remains and later sites with greater concentrations of them was at first interpreted as an opposition between hunter-gatherers and herders sites (A.B. Smith *et al.* 1991). Later, the sheep-rich sites were understood by Sadr (2004) as indicating spatially specific activities where sheep were consumed as prestigious animals during feasts.

The site of Die Kelders in the Western Cape where two sheep bones were directly dated to cal. AD 651–882 (OxA-3860) and cal. AD 658–955 (Sealy & Yates 1994) also displays a more important concentration of sheep remains, with at least twenty-three individuals isolated, making around 6.6% of the faunal assemblage (Schweitzer 1979). However, even on this site, the author notes that there is not “*any significant change in the established hunting and gathering way of life*” (Schweitzer 1974: 8).

Jakkalsberg in the Northern Cape Province, which is dated to around cal. AD 600–880, is an example of a much larger concentration of sheep bones, which represent up to 90% of the total faunal assemblage (Brink & Webley 1996; Webley 1997). Together with the nearby site of Bloeddrift (A.B. Smith *et al.* 2001), Jakkalsberg may represent episodes of intensive herding (Sadr 2003). The site of Blinkklipkop (Thackeray *et al.* 1983) also in the Northern Cape and dated to around cal. AD 777–1021 (Pta-2840) could also be associated with similar practices (Sadr 2003), while a comparable situation may have existed at Elands Bay Cave from around cal. AD 768–1155 (GaK-4335) (Klein & Cruz-Urbe 1987).

iii. Diets associated with first and second millennium caprine remains

Generally, there is no clear evidence of an overall diet reorientation visible in the LSA sites with sheep remains dated to the first millennium AD. This is particularly clear when

comparing the density of sheep remains in LSA sites of that time with those in Iron Age sites (Sadr 2008a).

Some researchers have argued that this faunal scarcity might be due to the consumption of milk, rather than meat (Russell & Lander 2015a; Lombard & Parsons 2015). However, slaughtering is necessary even when milk is preferentially consumed. Therefore, although this argument has been proposed, together with the removal of caprine bones from livestock areas to avoid the spread of botulism (Kinahan 2001), and the keeping of livestock away from camps (Kinahan 2001), there is not a clear archaeological case supporting the scenario of an overall hunter-gatherer diet reorientation in the first millennium AD, as the faunal assemblages are almost essentially composed of wild animals. Furthermore, Russell and Lander (2015a: 8/9) argue that “*milch pastoralism might show evidence of the ritual consumption of stock (resulting in concentrated accumulations of bones at particular sites) and otherwise a very low incidence of domestic faunal remains*”. If such practice existed, it is also not visible in the archaeological landscape until the time of sites like KBDe dated between AD 600–1000. Different authors have highlighted the fact that the introduction of sheep bones in LSA sites was not correlated with a shift in the subsistence economy (Dusseldorp 2016). Based on a database of more than 300 faunal assemblages, Dusseldorp (2006) examined whether the presence of sheep would have had an effect on the consumption of other wild species, as a consequence of a change in diet. His study, based on Optimal Foraging Theory, includes the potential effects that the consumption of dairy products would have on the overall diet. He concludes that the presence of sheep did not affect the wild faunal spectrum represented, and therefore that the economic importance of livestock was limited during the LSA (excluding Iron Age settlements). Sadr (1998) also highlights the fact that given the dominance of wild animals in the diet, it is unlikely that these early sites are representative of a full ‘pastoralist’ economy. On the other hand, they could correspond to a hunter-herder economy. This, nevertheless is not necessarily indicative of either the social organisation of these early ‘hunter-herders’ or, of the power relation existing between them.

In contrast to the faunal patterns of the first millennium, a shift in sheep bone densities can be observed from around the beginning of the second millennium AD, or before in some sites such as Kasteelberg. These observations could be consistent with the hypothesis that people at the early sites were integrating only a small proportion of caprines in their economy and that a focus on pastoralism developed later on (Sadr 2008a).

1.6.2. Challenges in caprine bones identification

Complicating discussions of the chronology for the first appearance of sheep in southern Africa is the possible misidentification of some faunal remains. This possibility is not negligible given recent research in ancient DNA and proteomics that have demonstrated morphological misidentifications from Leopard Cave, Blydefontein and other sites in Namaqualand and Lesotho (Orton *et al.* 2013; Horsburgh *et al.* 2016, 2017; Le Meillour 2017).

Horsburgh *et al.* (2016) doubt the reliability of sheep identifications at Spoegrivier Cave, which currently provide the oldest sheep bone in South Africa. A similar doubt is expressed for faunal identifications from the sites of Lame Sheep Shelter, Abbot's Cave, Likoaeng and Toteng 1. Horsburgh *et al.* (2016) are particularly pessimistic about the overall early presence of sheep remains in southern Africa and therefore about the models established about how sheep first arrived: “*Given the high frequency of misidentification of domestic stock in the southern African record, we cannot regard such models as informative*” (Horsburgh *et al.* 2016: 358). Some criticisms have, however, been raised against the DNA identifications (Bousman *et al.* 2016; Scott & Plug 2016). Sadr (2008a:182) notes, however, that:

many of the post-cranial bones of livestock cannot easily be distinguished from wild animals in the same size class” and that since “most of the early AMS dates on livestock were obtained from post-cranial bones....some residual doubt remains as to their correct identification.

Nevertheless, in the consideration of when sheep first appear at individual sites, the necessity of directly dating caprine remains in order to remove possible intrusive specimens is widely understood (R. Inskeep & Vogel 1985; Sealy & Yates 1994, 1996; Henshilwood 1996). Henshilwood (1996), for instance stresses the example of the sheep remains from Nelson Bay Cave, found in a layer dated at 1930±60 BP, and later directly dated by AMS at 1100±80 BP (Gowlett *et al.* 1987, R. Inskeep & Vogel 1985). The debate about the relationship between morphological and DNA identification is still ongoing, and inclines us to consider cautiously the early date of sheep remains, especially when there are only few sheep remains.

1.6.3. Models for the arrival of herders in southern Africa

Different models of the origin and dispersal of herders in southern (and South) Africa have been proposed and debated by different authors (A.B. Smith 1990; Sadr 2015; Jerardino *et al.* 2014). The question about the herders' identity, conceptualised in terms of the linguistics, genetics, and history reviewed above, is attached to each of the different models debated. The matter is synthesised in these terms by Eastwood and Eastwood (2006: 60): "*Khoekhoen might have been a product of interaction with San and/or Bantu-speakers rather than an intact, pristine herder culture*". The way that different researchers have answered the question has led to different and debated hypotheses. One point of view is that the Khoekhoe are a result of interactions between northern hunter-gatherers and Bantu populations from whom they acquired stock and pottery (Elphick 1977, 1985; Denbow 1986). A second view is that of the other views would be that the Khoekhoe are an independent population of herders having ties with East African populations (Stow 1905; Schapera 1930; Cooke 1965). These ideas have led to different hypotheses about who the herders are and when they arrived in South Africa. As mentioned in the preceding discussion, the supposed correlation between Khoe-speakers and the diffusion of pastoralism determines part of this debate.

a. Demic migration

Following the demic migration hypothesis, Khoekhoe herders would have reached South Africa around 2000 years ago, bringing with them domesticated sheep and pottery (see discussion in Sadr 2013). The herder migration is supported by Elphick (1977, 1985) who, relying on a body of linguistic evidence, retraces the migration routes of the Khoekhoe from northern Botswana to the bottom of South Africa. According to him, Khoekhoe-speaking hunter-gatherers located in northern Botswana would have acquired stock from neighbouring Bantu-speaking populations before starting their migration. They would, therefore, be the ancestors of the 'Hottentot' population observed during colonial times in the Cape area of South Africa. This migration hypothesis is also supported by Ehret (1998) whose model and timing of dispersion is based on the recognition of loanwords in different languages and on 'glottochronology', which consists in dating language changes but has been dismissed by some as a useful way to date population movement (e.g. M. Hall 1987). Following the models of these authors, together with the older hypotheses of Stow (1905) and Cooke (1965), two to three main dispersal routes would exist: 1) a route going through the interior of southern Africa by the Kalahari and Orange River, 2) a western route along Namibian coast down to the Cape, and most significant for this thesis, 3) an incursion

through the Limpopo River Basin (Fig. 1.15). A.B. Smith is one of the researchers who adheres to the idea of a Khoekhoe migration (A.B. Smith *et al.* 1991; A.B. Smith 1990, 2005a, 2006). He constructs his argument around what he recognises as different hunter-gatherer and pastoralist archaeological sites in the southwestern Cape.

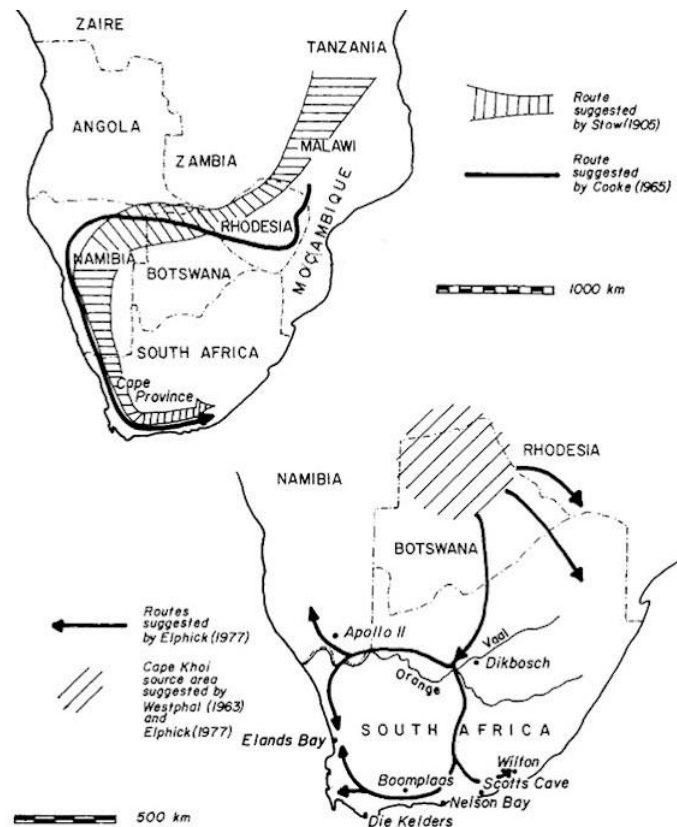


Figure 1.15. Migration routes proposed by Stow, Cooke and Elphick, in H. Deacon et al. (1978)

The demic migration hypothesis is supported by rock art studies (B. Smith & Ouzman 2004; Eastwood & B. Smith 2005; Orton 2013). As introduced above, the appearance of a ‘new’ Geometric Tradition, relatively dated to the early first millennium AD, is linked by several authors with the arrival of a Khoekhoe population. Given the high number of geometric designs and engraving techniques linked to this tradition, it is assumed that Khoekhoe must have arrived in a significant number. According to these authors, the Geometric Tradition in the central Limpopo River Basin could have been made by the people that Ehret (1998) calls the ‘Limpopo Khoikhoi’.

However, different authors criticise the demic migration model of herders, particularly its timing, and debate whether it existed at all (Sadr 1998, 2004). Orton (2012, 2013), for

instance, suggests that Khoekhoe herders may have arrived in the western part of South Africa much later, from around AD 500. Likewise, Sadr (1998) also proposes that a migration took place later than the demic migration model, reaching the Cape at the end of the first millennium AD. This later migration would be reflected in the appearance of lugged pottery (Sadr 1998). According to Sadr (2013), earlier archaeological evidence of a population turned towards a full pastoral economy does not exist (Sadr 2013).

The lack of clear archaeological evidence to support the demic migration hypothesis was decisive for its refutation, as well as the collection of new data (Fauvelle-Aymar & Sadr 2008). As Sadr (2013) points out, the migration hypothesis mostly relies on linguistic evidence which, as I have already noted in this chapter, suffers from problematic assumptions about the correlation between population identity and economies of subsistence. Yet, archaeological evidence shed light on alternative models.

The synchrony between the migration of Bantu agro-pastoralists and herders is contradicted by the dates found on sheep bones in South Africa, which predate the arrival of agro-pastoralists by at least 100 years (Sealy & Yates 1994, Henshilwood 1996, Robbins *et al.* 2005). The appearance of a large-scale migration is also not readable in the archaeological records dating to this period. Herders seem archaeologically “invisible” at the BC/AD boundary (Sadr 2008a). No structures are associated with them, nor is there a clear appearance of a new archaeological material such as a new lithic industry or settlement pattern. It is only much later that some archaeological evidence can be found (e.g. Fauvelle-Aymar *et al.* 2006; Bon *et al.* 2012). Thin-walled pottery and domesticated sheep bones stand out as the only new elements in the archaeological landscape after the BC/AD boundary. Pottery and sheep bones first appear at sites characteristic of LSA hunter-gatherers. Indeed, they are found in rock shelters and associated with lithic industries that resemble older (necessarily hunter-gatherer), showing an overall continuity of the archaeological record, at least from a typological point of view. As J. Deacon wrote in 1984, “*The overall impression is that pottery and domestic stock were added to the pre-existing Stone Age tradition and that there is continuity in the range of stone tools made in each region*” (J. Deacon 1984b: 269). I return later to this aspect to discuss further this statement in the light of past and current research. Importantly, the pottery discovered in these LSA sites is not stylistically connected to the northern margins of southern Africa in any clear way (Sadr 2008b), which is another argument against the idea of a quick and large-scale migration.

b. Small-scale infiltrations

The small-scale infiltration hypothesis assumes that diffusion and exchange should have played a role in the process of sheep diffusion, but that small groups of people entering what is today South Africa would have brought sheep with them. Sadr (2015) suggests that at least two infiltration events could be related with the first diffusion of livestock in southern Africa. He proposes that these infiltrations of people can be associated with an LSA lithic industry dominated by backed tools. Backed-tool-dominated LSA assemblages tend to mainly occur in sub-equatorial Africa (J. Deacon 1984b), such as in the Nachikufan Industry in Zambia (Clark 1950), to which I return later in this chapter. From the distribution of these assemblages after the appearance of pottery and sheep, Sadr (2015:12) concludes that:

the appearance of the earliest livestock and pottery in southern Africa can be linked to the northern backed-rich tradition on two separate infiltration fronts. On the Atlantic seaboard during the last few centuries BC, one or more small groups of northern backed-rich stone toolkit makers infiltrated livestock and thin-walled mineral tempered ceramic vessels as far as the southern tip of Africa. Farther east, a smaller infiltration of northerners initially introduced livestock and probably Bambata pottery across the Zambezi/Limpopo watershed.

In this model, diffusion based on trading and gift exchange is an important factor for the spread of sheep in hunter-gatherer groups (also see Sadr 2004, 2005). Sadr further insists that ‘real pastoralism’, as it can be observed in other areas around the world, was not represented in South Africa in the first millennium AD (Sadr 2003), and uses therefore the term “*hunter-with-sheep*” which he opposes to “*herder*” (Sadr 2003: 198).

c. Diffusion

The third model for the arrival of herders in southern Africa is favoured by different authors who suggest that the introduction of sheep and pottery would mainly rely on diffusion processes (J. Deacon 1984a; Klein 1986; Kinahan 1994; Sadr 1998; Jerardino *et al.* 2014). According to Jerardino *et al.* (2014), the neolithization in South Africa was particularly fast. Their model is built on mathematical equations estimating the average rate of diffusion of these new ‘Neolithic’ elements. The quick diffusion of pottery and sheep in southern Africa cannot for them be explained by a demic migration, as is the case in the European

Neolithic, but would have relied mainly on diffusion. In the diffusion model, the movement of people would have played a role, but would not have been the main process. Interpreting the archaeological evidence, Denbow suggests that “*the early dates for Bambata ceramics, and their strong association with LSA contexts, however, might also indicate that herding and ceramics were transmitted through LSA networks*” (Denbow 1986:8). The transmission of pottery technology and herding through hunter-gatherer networks is also expressed by Reid *et al.* (1998). Their idea is supported by the existence of regional pottery styles ‘flavours’ which imply the local adoption and development of pottery technology, rather than a unique style coming from a single source and then spreading across the whole country.

Having reviewed different models for the origins and dispersal of herders in southern Africa, I now turn to a review of the archaeological materials associated with different southern African late Holocene populations.

1.6.4. The archaeological material of hunter-gatherers, herders and pastoralists

a. Are the first appearance of pottery and caprine remains contemporaneous?

The first appearances of sheep and pottery around 2000 BP in southern Africa seem to be simultaneous, and concomitant at a large scale. Klein (1986) argues that the spread of these two elements was synchronised. However, as different authors have highlighted, the situation may not be so straightforward. Henshilwood writes that: “*If pottery and sheep were brought to the Cape at the same time, why does pottery have a higher archaeological profile than sheep?*” (Henshilwood 1996: 948). Indeed, compared to sheep bones, pottery occurs widely at LSA sites during the first millennium AD, although in small quantities. Following a similar idea, Sealy and Yates (1994) argue that the appearance of sheep and pottery are in fact “*not simultaneous and intertwined but separate events in a more complex history*” (Sealy & Yates 1994: 58). The archaeological sequence is complex and not consistent across the whole of southern Africa. Pottery and sheep do not appear at the same time in a number of sites, which may mean that these two elements, in some instances at least, diffused separately (Sadr 1998). At sites like Spoegrivier, Toteng 1 and Blombos, we see that sheep bones appear in the stratigraphy before the first pottery sherds (Henshilwood 1996; Vogel *et al.* 1997; Robbins *et al.* 2008). However, in other areas, such as in the Hungorob Ravine (Namibia), pottery seem to appear at least half a millennium before livestock (Kinahan 1995, 2001).

Furthermore, if the earliest fibre-tempered pottery was made by hunter-gatherers, and the first sheep introduced from elsewhere, it is very likely that these elements do not appear simultaneously as they correspond, in fact, to different social processes. A similar conclusion can be reached when thinking about the diffusion of pottery and sheep through hunter-gatherer networks: the diffusion rate might vary a lot depending on the local context. Furthermore, the doubts discussed above about the identification and dating of early sheep bones would suggest that it is likely that pottery appeared first. Despite these obstacles, a better comprehension and integration of archaeological stratigraphy, sequences and site formation would help to better the understanding of the chronology of these events.

As currently understood, the chronology of the appearance of pottery varies from region to region, but broadly starts around 2000 BP. According to Sadr and Sampson, first millennium pottery can be divided into thick and thin wares (Sadr & Sampson 2006, Sadr 2008b). The thin wares (5-8mm) are found in LSA contexts associated with hunter-gatherers. Their appearance in South Africa predates the thick-walled pottery by at most four centuries (Sadr & Samson 2006, Sadr 2008b), see Fig. 1.16. In contrast, the thick wares (+10mm) are associated with Iron Age contexts, and find their origins in the north of southern Africa. They have a coarse surface, and seem to have been used for plant-product processing. The relative high number of large potsherds found in Early Iron Age sites implies that pots might have been thrown away once broken (Sadr 2008b).

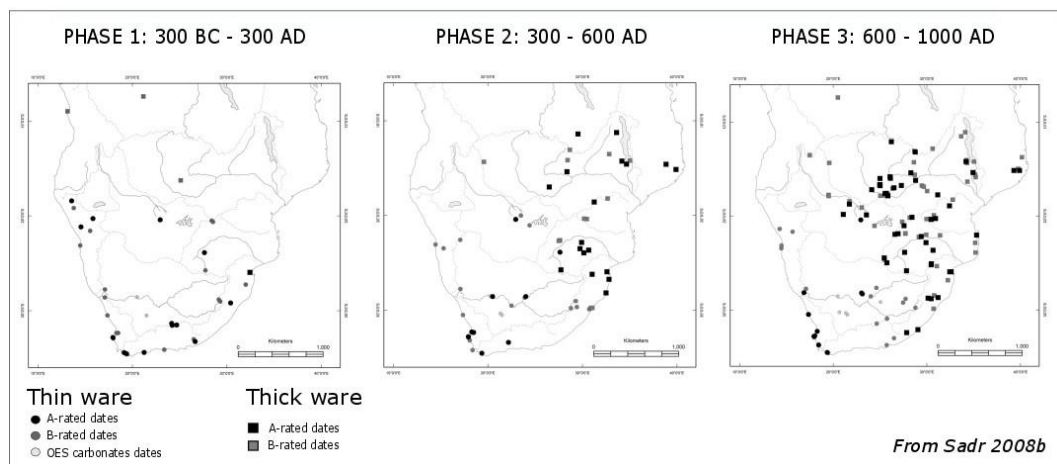


Figure 1.16. Chronological distribution of thin and thick wares in southern Africa, in Sadr (2008b)

This early pottery associated with LSA settlements has been well-documented in southern Africa (Rudner 1979; Mazel 1992a; Mitchell 1996a; Bollong *et al.* 1997; Sadr & Sampson 2006; Sadr 2008b). Thin-walled pottery have not been found north of the Zambezi, which could indicate a rather local production. Furthermore, the development of different pottery styles occurring in LSA contexts would indeed imply the local development of pottery

(Sadr 1998, 2008b). Motloun (2007: 106) gives some example of the variability one could expect from early southern African pottery: “KBA and the lowest levels of KBB (*Kasteelberg sites*) appear to be exclusively narrow-necked jars. *Die Kelders* is composed of bowls. In the interior, *Toteng* yielded jars and bowls. *Geduld in Namibia* indicated jars with low necks”. This variability in terms of style (and perhaps also function) and the absence of a clear link with Iron Age pottery are, for these authors, lines of evidence that local populations were involved in the making of at least some of this pottery.

Sadr and Sampson (2006) make the argument that pottery produced by hunter-gatherers is generally fibre-tempered, as is the case for the early pottery found in the South African Gariep Basin (Sampson 1988; Sampson & Sadr 1999; Sadr & Sampson 2006). The Gariep Basin examples, the earliest of which are undecorated, are one of the oldest occurrences of pottery in southern Africa and might have been created by hunter-gatherers (Sadr & Sampson 2006). Using fibre temper rather than mineral temper allows the making of lighter pottery, which is seen as an advantage for mobile hunter-gatherers. Some researchers disagree that such pottery is necessarily associated with hunter-gatherers. Lander and Russell (2015: 124), for example, argue that pottery in the northern Drakensberg appears rapidly in a “*highly finished form*” which is for them “*more suggestive of the intrusion of the technology of a migrant group than local experiment and development*”. They suggest that this type of pottery would have been made by pastoralists.

A particularly important thin-walled pottery types is called Bambata ware and is associated with early evidence of domesticated sheep in Botswana and Zimbabwe (Reid *et al.* 1998). Significantly for this thesis, it is the main identified type of thin-walled pottery in the Limpopo River Basin. Its decoration is characterised by “*fine-toothed comb-stamp decoration*” (Sadr 2008a:107) and “*broad line incisions*” (Sadr 2008a: 107; also see Schofield 1941 and Walker 1983). The dates for Bambata pottery are in some areas problematic due to poor archaeological contexts (Sadr 2008a). Furthermore, Bambata pottery is often found fragmented and in small amounts (Reid *et al.* 1998). For Sadr, as with the other thin-walled pottery, the Bambata pottery are not linked to farmers, because it appears in South Africa before their arrival, and is not stylistically consistent with Iron Age pottery. Huffman (1989, 1994), however, argues that similarities exist between Bambata ware and the pottery of the Kalundu Tradition which belong to the Western stream of the Iron Age migration. Other authors also argue that Bambata ware was produced by farmers (Cooke 1963; Robinson 1966; Walker 1983), or by either hunter-gatherers or

herders (e.g. S. Hall & B. Smith 2000). In the Brandberg (Namibia), Kinahan (1989) suggests in a similar vein that rather crude pottery could have been locally made by hunter-gatherers after the introduction of fine-wares by other people in the area.

Another and later type of pottery is important to consider. It is amphora-shaped with lugs and a pointy base (Fig. 1.17). It has been linked to Khoekhoe populations and called Khoe (or Khoi) pottery (Jacobson & Vogel 1979; Sadr & A.B. Smith 1991; Bollong *et al.* 1997; Sadr & Sampson 1999). This attribution partly relies on the cross between these finds and historical drawings in which similar pots are represented in association with 'Hottentots' (e.g. Rudner 1979). For Reid *et al.* (1998), in contrast to the earlier fibre-tempered pottery, this lugged pottery could be the sign of a Khoe migration into South Africa. However, in more recent work, Sadr (2013) points out the diversity existing in these pots, and the fact that there is not necessarily a correlation between language-group (in this case Khoe) and pottery style. The first 'Khoe' pottery found in the Western Cape and in the Upper Seacow Valley appeared from around AD 450 onwards, until recent times, suggesting several phases of 'herders' infiltrations (Sadr & A.B. Smith 1991; Sadr & Sampson 1999).

b. Pottery in Later Stone Age sites

Thin-walled potsherds are found in LSA sites in much smaller quantities than in Iron Age sites and, interestingly, do not generally refit with the exception of some sites (for example: Die Kelders, Schweitzer 1979). According to Sadr (2008b), it is at this stage clear that there is a marked differentiation in the degree of social integration of pottery by the inhabitants of Iron Age sites, on the one hand, and the inhabitants of LSA sites on the other hand. This distinction opens questions about how and for what pots were used at LSA sites, most likely by hunter-gatherers, and about their potential symbolic values.

Studies have demonstrated that thin-walled pots were used to process animal products. At Kasteelberg, in the Western Cape, Patrick *et al.* (1985) analysed residues found in the interior surface of a thin-walled sherd. The chemical results were compared to experimental material and showed that the substance was a fat from a marine animal, supposedly a seal. The fact that many seal remains were found on the site (min 33 individuals) is aligned with their hypothesis. Later analysis on the same site also demonstrated that pottery, in this case spouted, was used for the processing of marine animals-derived products, most likely also from seals (Copley *et al.* 2004). Parkinson and Poggenpoel (1971) at De Hangen (South Western Cape) also identified fat from different terrestrial animals. In the Seacow Valley,

Bollong *et al.* (1993) found similar evidence while investigating which temper was used in the form of fat and/or blood use in a ceramic vessel. Other authors propose further that pottery might also have been used for storage in LSA sites when associated with sedentary patterns of occupation (Lander & Russell 2015).

Regarding the state into which pottery may have been used and acquired, Musonda (1987) argues that in the Zambian LSA, potsherds were collected by hunter-gatherers from abandoned Iron Age village sites. Mitchell *et al.* (2008) propose that least some sherds from Likoaeng (Lesotho) could “*have been retained – or introduced to the site – after breakage, for use as scoops, plates or scrapers*” (Mitchell *et al.* 2008: 10). A similar idea is expressed by Kinahan (1989) who thinks that broken thin-walled pots may have been redistributed. The same author also sees evidence for the local fabrication of pottery by hunter-gatherers in the Namibian site of Falls Rock.

Overall, very few residue analyses have so far been done on this early pottery, which is not enough to sufficiently discuss their overall use. Recent analysis of seventh century AD pottery sherds from the LSA site of Likoaeng (Lesotho) are, however, very encouraging, and chemically demonstrate evidence for dairying (Fewlass *et al.* 2020). This recent study confirms that people in LSA sites, initially hunter-gatherers could have turned to herding practices and have consumed milk. In most LSA sites, however, it is still difficult to assess if pottery were made in situ, obtained, or collected as broken sherds. Future studies looking more closely at the pottery technology and chemical composition of the clay would be necessary to go further on these issues.

c. Different hunter-gatherer and herder material traditions?

San and Khoe populations are generally understood as two independent groups, the first living essentially by hunting-and-gathering, and the second by herding domestic sheep and/or cattle. This vision of two clearly separated economies is still held by contemporary authors, and is one based on historical observations (e.g. Van der Cruysse 2010: 27). As we have seen in preceding sections of this chapter, historical, ethnographic and archaeological researches nevertheless highlight that the situation is far more complex. For the present section, it is helpful to recall that Sadr (2003) proposes the term of ‘*hunters-with-sheep*’ to describe populations of typical LSA sites where few caprine bones are found, and that hunting and gathering is, in fact, an important part of the pastoral way of life (F. Marshall 1990). Adding to the complexity of the archaeological picture is that wild

game is also found in Iron Age sites typically associated with agro-pastoral communities (e.g. Maggs 1989).

Archaeology has demonstrated the great ancestry of hunting-and-gathering populations in southern Africa. Nevertheless, the origins of the herding populations observed during the colonial period are blurrier. One of the major aspects of this problem is poor archaeological visibility of early herders in South Africa (Sadr 2008a). Some authors argue that this lack of visibility is due to the very nature of nomadic pastoralists, and the few remains they left behind them (Robertshaw 1978; Parkington *et al.* 1986; Kinahan 1986). This argument was countered by Sadr (2003: 201) who points out that we do, in fact, find the sites of mobile hunter-gatherers, and that we should therefore find the ones of mobile pastoral populations. Significantly, in attempting to explain this lack of visibility, other researchers argue that southern African pastoral and hunter-gatherer populations may have shared similar technologies, styles and practices, which explains why we cannot differentiate them from hunter-gatherers (Orton 2012; Lander & Russell 2015).

Attempts have however been made to find clearly separated hunter-gatherer and herder 'material cultures', based on archaeological excavations and descriptions given by the first travellers. In 1991, A.B. Smith *et al.* presented their research on the South-western Cape. They analysed the archaeological material of several sites located in the Saldanha Bay, and noticed differences between two sets of sites, which they interpreted as characteristics of herders and hunter-gatherers. According to them, hunter-gatherer occupations contain a cultural package comprising microlithic stone tools, small ostrich eggshell beads, scrapers, and wild fauna remains with few domesticated fauna and pottery. On the other hand, herder occupations display very few retouched artefacts (the lithic industry being mostly informal), larger ostrich eggshell beads, and higher numbers of domesticated fauna and pottery. From this perspective, the site of Witklip is understood as a hunter-gatherer site, whereas the site of Kasteelberg with its accumulation of sheep bones, is understood as a herder site.

This neat archaeological model of two sets of sites has, however, been criticised. In contrast to the differences emphasised by A.B. Smith *et al.* (1991), Schrire (1992) highlights instead the strong similarities between the sites. She also questions the absence of interstratified sites that shift from hunter-gatherer to herder occupations. According to A.B. Smith *et al.*'s model, the absence of such sites would mean that hunter-gatherers and herders were living

in different territories, which is unlikely for Schrire. Furthermore, she raises two points on the potential economic and cultural bridges between hunter-gatherers and herders. She insists on the relationship between hunter-gatherers and the roots of herding in South Africa:

“What if, when herding came into the Cape 2000 years ago, it was adopted by local hunters, as must have happened in the spread of farming world-wide? Might not the herders have kept some of their traditions when hunting, and adopted new ones when they were more fully engaged in herding?” (Schrire 1992: 63).

Schrire here implies that hunting traditions, and potentially technological ‘traditions’, must have survived when hunter-gatherers firstly acquired sheep, and then gradually changed towards a more complete integration of herding practices. This argument advocates for an overlapping between hunter-gatherer and herder ways of life and material traditions, at least during the early contact period. The second aspect raised by Schrire concerns hunting practices: *“Where are the shelters that herders used when they were out hunting?”* (ibid). She insists on the economical bridges between hunting-and-gathering and herding societies, but also on the different types of herder sites that one should find. Relying on historical documents, Schrire (1980) further insists on the shared practice of hunting in both hunting-and-gathering and herding societies (as well as ‘Bushmen’ keeping and losing stock).

In addition to the economies of subsistence, lithic industries have also been involved in the debate about the archaeological ‘signature’ of hunter-gatherers and herders in the Northern Cape. The Swartkop and Doornfontein industries were used to describe different hunter-gatherer and herder assemblages (Beaumont *et al.* 1995; Beaumont & Vogel 1984; Parsons 2007). The Swartkop industry, related to hunter-gatherers, is principally made on hornfels with a blade production and backed blades. The Doornfontein industry, related to herders, is made on quartz, and is informal with a flake production and few retouched artefacts. It is associated with amphora-like pottery attributed to Khoekhoe populations (Beaumont *et al.* 1995). Parsons (2007) has highlighted the overlaps existing between these two industries, and noted that the economical separation between these two sets of sites is not straightforward. This separation is further criticised by other authors, and the distinction has not yet been accepted (Sadr 2003; Orton 2002/2003, 2012).

As we have seen, different types of pottery are attributed to either hunter-gatherers or herders (Sadr and Sampson 2006). Thin-walled, fibre-tempered pottery is associated with hunter-gatherers, while late first millennium AD pierced lug pottery in the western part of southern Africa has been attributed to a Khoekhoe herder population (see Sadr 1998 for discussion, Fig. 1.17).

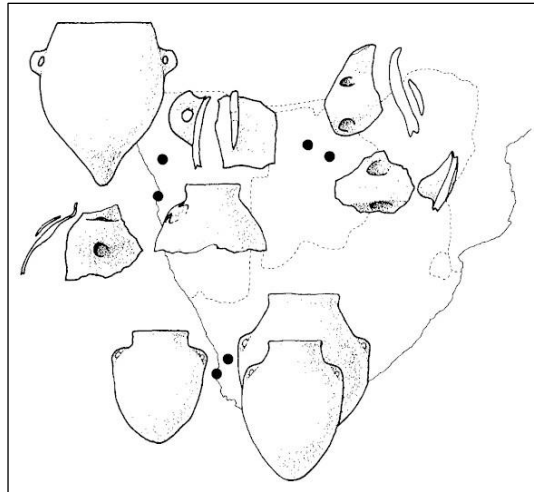


Figure 1.17. Lugs and lugged vessels in Sadr (1998)

Overall, it seems that the attempts to clearly separate hunting-and-gathering and herding societies during the first millennium AD have failed. On the other hand, there seem to be many similarities between LSA sites both with and without ceramics, to such an extent that the term ‘herder-with-sheep’ was proposed for some sites instead of the term herder (Sadr 2003). At this point, we can ask if this therefore means that the hunter-gatherers and hunters-with-sheep were the ‘same people’, speaking the same languages and having similar cultural habits? And further, does it imply that later herding people are ‘different people’?

Archaeologically, it seems that economic ties existed between all three of these modes of subsistence in southern Africa. However, we know that a great diversity of languages and cultures existed as highlighted by ethnographers in modern (or sub-modern) southern Africa hunter-gatherer groups (Barnard 1992). This diversity necessarily implies, yet again, that one archaeological signature, especially when found at a large scale, does not correspond to one people, or population group, but rather to an economy of subsistence or, significantly for this thesis, to underlying technical attributes cross-crossing cultural frontiers, however blurry they may be. The idea of a non-correspondence between archaeological materials and language is highlighted by Sadr (2013: 187): “*Languages*

leave no archaeological traces except in writing, and there is no simple, universal, static, predictable link between linguistic groups and artefact styles (Hodder 1982; Lemonnier 1986; David *et al.* 1991; MacEachern 1994)”. In the same way, beliefs and symbols can be shared by different cultures, and also be used, for instance, in the identity construction of creolised groups (e.g. Eastwood 2003; Challis 2012).

Following this train of thought, different authors have asked if there could be different and distinct hunter-gatherer and herder rock arts. B. Smith and Ouzman (2004), for instance, argue that the Khoekhoe migration could be visible through rock art. They propose that a specific rock art tradition, composed of rough-pecked or finger-painted geometric imagery (the Geometric Tradition introduced above, see Fig. 1.18 left) could have been made by Khoe people, as it differs from the fine-line painted tradition associated with San hunter-gatherers. Although this tradition is found in different areas of South Africa, it is particularly widespread in the Limpopo River Basin and the Shashe-Limpopo Confluence Area (SLCA) where it appears together with other rock art traditions including rock engravings and fine-line paintings (Eastwood *et al.* 2010, see Fig. 1.18 right).

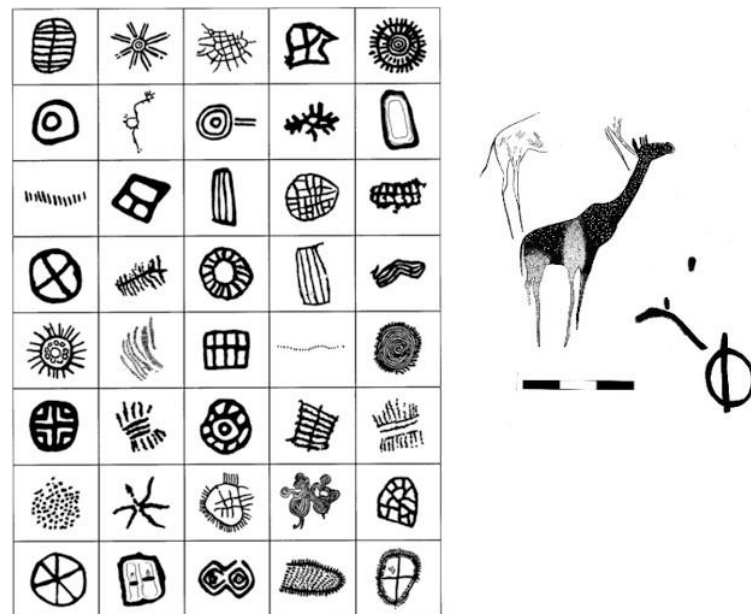


Figure 1.18. Left: Geometric representations in B. Smith & Ouzman (2004); Right: co-occurrence of ‘traditions’ in Eastwood *et al.* (2010)

B. Smith and Ouzman’s (2004)’ argument relies on the correlation they make between South African and Central African geometric rock arts. They also notice an overlap between the distribution of Central San languages (which incorporate proto-Khoe elements) and the distribution of this geometric rock art. Eastwood and B. Smith (2005)

include handprints in the ‘Geometric Tradition’, which they also attribute to Khoe and to Central African rock art, and assign a date of the early first millennium AD. S. Hall & B. Smith (2000) and Butzer *et al.* (1973), give a similar date for the appearance of the Geometric Tradition, suggesting that it became more frequent during the first millennium AD. Handprints were also attributed to herders in the Western Cape (van Rijssen 1984; Anderson 1997; Manhire 1998). In Namibia and Namaqualand (Northern Cape), finger-painted figures and geometrics are also attributed to herders (e.g. Lenssen-Erz & Vogelsang 2005; Orton 2013). Lenssen-Erz & Vogelsang believe that these paintings progressively replaced fine-line paintings, which disappeared soon after the introduction of sheep. In some sites of the Limpopo River Basin, sequential relationships between the Geometric Tradition and fine-line ‘San’ rock art imply a coexistence of the two traditions. This is, for example, the case in the shelter UB40 located in the Makgabeng Plateau, where Eastwood and Eastwood (2006) believe that San paintings are intercalated with at least three Khoe episodes.

It has also been proposed that specific techniques of rock engravings such as scraping and pecking the rock surface, appeared around 2000 BP, with the appearance of pottery (Beaumont & Vogel 1989). The engravings are not directly dated but inferred from direct dates obtained from the presumably associated archaeological material. States of patination on the engravings and on the lithics are also used for integrating the two components. The authors imply an association between some pecked engravings and sites attributed to herders. In the same way, Mazel (2013) proposes that some finger-paintings may have been made by pastoralists, and so supports B. Smith and Ouzman’s (2004) hypothesis.

The attribution of specific styles, and therefore ‘Traditions’, to either hunter-gatherers or herders is nevertheless, criticised, because of the lack of robust dates (comments in B. Smith and Ouzman 2004; Parkington *et al.* 2008; Nankela 2015). Some authors have also highlighted the fact that geometrics may not be specific to one group but could instead be the result of “*a widely shared set of Khoisan beliefs and imagery*” (Mitchell’s comments in B. Smith & Ouzman 2004: 517). D. Morris (2002) proposes that it is the case at the engraving-rich site of Driekopseiland in the Northern Cape (Fig. 1.19). Other authors note the existence of shared social attributes, including beliefs, between groups (Barnard 1992; Prins & Rousseau 1992). Prins and Rousseau (1992), for instance, stress the shared beliefs between Khoe and San people resulting from interactions. About the site of Driekopseiland, they write: “*Such engravings could also have been an expression of ritual and religion*

especially as Bushman beliefs were incorporated and transformed into those of the Khoi” (Prins & Rousseau 1992: 38). The link established between Khoe language group and this geometric rock art tradition is, therefore, still a subject of much debate (e.g. Sadr 2013).



Figure 1.19. Driekopseiland (Northern Cape) source: netwerk24.com

Recent research on geometric engravings has also proposed that part of the Geometric Tradition motifs may be depictions of Khoisan clothing items (aprons and loincloths) and tattoo marks (Eastwood & Eastwood 2006; Hollmann 2017) (Fig. 1.20). This interpretation was recently reinforced by the discovery and publication of a manuscript dated to 1875 from the Bleek and Lloyd Archive in which a |Xam San comments on tracings of engravings (De Prada-Samper & Hollmann 2017). Once again, questions of authorship are challenging, especially if accepting a level of cultural overlap between San and Khoe. It furthermore seems that the symbolic associated with loincloths or aprons was as relevant to both San and Khoekhoe (Eastwood 2003, Eastwood *et al.* 2010). Eastwood & B. Smith (2005: 74) further refer to these motifs as a “*cross-cultural image class*”, which they suggest would be typical of Central San rock art. Depictions of aprons are found in both fine-line ‘San’ paintings and engraved or finger-painted in more recent contexts (Eastwood 2003, 2008). For this reason, Eastwood *et al.* (2010) consider the apron motif as “*one that spans the divide between fine-line forager and herder rock arts. It provides definite evidence that borrowing occurred between these traditions*” (Eastwood *et al.* 2010: 90). The authors also underline that the apron motif was relevant, too, for the Bantu-speaking Northern Sotho populations (Eastwood 2003; Namono & Eastwood 2005).

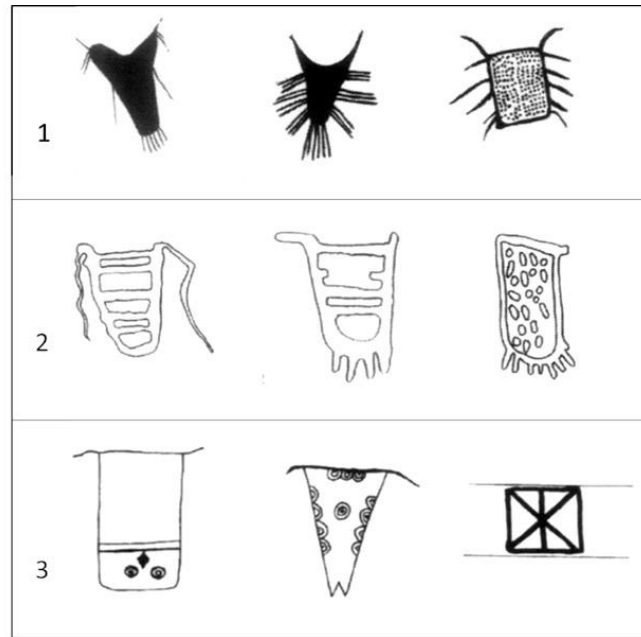


Figure 1.20. Apron motifs from Eastwood (2003). 1: fine-line painting (‘San’), 2: finger-painting (‘Khoe’), 3: Northern Sotho female aprons and wall decorations

The recent creation of motifs and paintings linked to beliefs meaningful to different communities is also emphasized by Challis (2012, 2013, 2014). He was able to place colonial-period paintings of men and horses located in the Maloti-Drakensberg into a specific historical context of ‘ethnogenesis’. He emphasises the fact that new identities are created around cattle raiding practices during colonial period interactions and political pressures. Challis (2012: 268) writes: “*the raiders did not necessarily have to be either San, ‘Hottentot’ or Bantu-speakers, but they could have been all these things at once*”. Rather than being different groups of people interacting, these raider groups were one group of culturally ‘creolised’ people. The AmaTola raiders, grouped together individuals coming from different backgrounds, gathering around common practices and beliefs. In this process of creolisation, the baboon took a central place as a “*powerful and ‘biding symbol’*” (Challis 2012: 270; 2014). As Challis highlights, the baboon is linked to the use of medicinal plants believed to give protective advantages in war-like situations, and sits at the cross-over of both San and other communities’ beliefs. The symbolic protection and power associated with it may have resulted in: “*a potent symbolic cocktail in which the baboon stood for the raiders’ ability to confound their neighbours, take their livestock, and escape unharmed*” (Challis 2012: 277). Challis’ work is important, because it underlines the fact that ‘interaction’, on the one hand, is a process happening between two or more separate and individualised groups. On the other hand, the process of creolisation is the integration of two or more groups that gives birth to a ‘new’ group. He stresses the

importance of common beliefs and practices in this process and, significantly for this thesis, Challis' case study has implications for how the so-called 'Khoe' (or 'Khoekhoe') art in the SLCA during a period of interaction could be perceived. Could apron motifs have been the 'powerful and binding symbols' of the SLCA people at that time? This question is worth further consideration, but must remain open for the moment.

1.6.5. The agro-pastoral migrations

a. Modelling the 'Bantu' migrations through southern Africa

I now turn to the arrival of agro-pastoral populations in southern Africa which corresponds to the beginning of the Iron Age in that part of the world. As stated earlier in this chapter, the current model holds that Iron Age agro-pastoralists are Bantu-speaking populations originally coming from central Africa, and who migrated southward to reach South Africa from around AD 300 (Huffman 2007). For Phillipson (1977), 'Bantu farmers' actually integrate a broad variety of cultures, languages, beliefs and economies. The cultural coherence accorded to the entity 'Bantu' is heavily criticised by others (Fauvelle-Aymar 2006; Chrétien 1985; M. Hall 1987). Regarding the association of the 'Bantu migration' and an Iron Age package M. Hall writes: "*there is no longer any unequivocal case for associating this spread with a particular 'people' (in either the racial or cultural sense) or, indeed, with a specific economy*" (M. Hall 1987: 24). He relies on the work of Vansina (1980) who stresses the multiple explanations for language expansion, and the potential lack of correlation between the spread of language and archaeological material. Furthermore, he also insists on the varied economic organisations of Iron Age societies through the last 2000 years.

The origins of Bantu-speaking populations as well as the routes they went through during their migrations are still debated. According to his linguistic study, Newman (1995) places the origin of Bantu-speaking peoples around the Cross-River valley along the border between Nigeria and Cameroon. A western African point of origin is also proposed by Huffman (1982), Phillipson (1993) and Vogel (1994), and more recently by genetic studies (e.g. Salas *et al.* 2002). Bantu migrations would have started at least 5000 years ago and expanded following at least two major routes through central and eastern Africa (Blench 2013).

As for the spread of 'Khoe-speaking herders' or pastoralists, genetic population studies are used to infer potential points of origin and routes. Pereira *et al.* (2001) for instance, argue

that DNA affinities between Mozambican Bantu and northern Bantu populations are evidence for a Bantu migration that would have started from western Africa, went through eastern Africa, to finally reach southern Africa. Salas *et al.* (2002), on their side, situate the beginning of the Bantu migration quite recently, between around 3000 and 4000 years ago. In their view, the migration would have reached the equatorial rain forest around 3500 years ago and Uganda around 3000 years ago. From there, the Bantu migration would have reached South Africa following two routes: the Indian Ocean coast (eastern), and the Malawi–eastern Zimbabwe road (central).

Three ‘streams’ linked to different ‘traditions’ or ‘branches’ were also proposed by Huffman (1982, 2007) based on ceramic typology: the Western, Central and Eastern streams. His model states that the Western Stream (Kalundu Tradition) is the first to reach South Africa, evidenced, as we have noted, by Bambata pottery (AD 150 – 650). The attribution of Bambata pottery to the Iron Age is, as we have seen, contested because of suggestions that it is instead associated with hunter-gatherers and/or early herders (e.g. Sadr 2008b). The Eastern stream (Urewe Tradition) came later, with the introduction of Silver Leaves pottery found between AD 280 to AD 450. Each of these ceramic styles further develop and are joined by other pottery styles created by diverse Iron Age populations (Huffman 2007). Huffman’s classification and model, especially his earliest evidence, have been later criticised by different authors. These authors have argued that some of the different ‘traditions’ proposed by Huffman (1982, 2007) could, in fact, be related, and that certain pottery types should not necessarily be attributed to agro-pastoral or Iron Age populations, but could also have been made and or used by hunter-gatherers and herders (see M. Hall 1987 for discussion).

In the SLCA, the first Iron Age ceramic facies is the Happy Rest, belonging to the Kalundu Tradition of the Western stream (Huffman 2007). It could have appeared as early as AD 350 (van Doornum 2005) to AD 500 and would last until AD 750 (Huffman 2007; Forssman 2014a). EIA settlements are difficult to discern, but might be related with a few rain-control sites (Huffman 2007; Forssman 2014a). Bambata ceramics occur, as early as AD 150, but may be associated with LSA rather than Iron Age contexts (Sadr 2008b).

The Happy Rest period is followed by the Zhizo period (AD 900-1050). At that time, farmer settlements become more visible in the landscape. During the second millennium AD, Leopard’s Kopje ceramic style emerge (AD 1010 – 1300), and state-level societies

develop in the SLCA, notably around Mapungubwe (Huffman 2000; Schoeman *et al.* 2015). Calabrese (2007) argues that Zhizo and Leopard's Kopje ceramics reflect two separated but interacting groups, eventually leading to the emergence of social and political complexity. In the SLCA, other ceramic types exist which spread from AD 1000 to AD 1840 (Forssman 2014a, Table 1.2).

Ceramic facie	Period (calibrated)
Bambata	AD 150 - 650
Happy Rest	AD 350/500 - 750
Zhizo	AD 750 - 1050
K2	AD 1000 - 1200
Leokwe	AD 1050 - 1220
Toutswe	AD 1050 - 1300
TK2	AD 1200 - 1250
Mapungubwe	AD 1250 - 1300
Icon	AD 1300 - 1500
Khami	AD 1400 - 1820
Venda	AD 1600 - 1840

Table 1.2. Pottery style succession in the SLCA, in Forssman (2014a) after Huffman (2007)

b. Diverse Iron Age economies

Agro-pastoral populations arrived in South Africa in the second or third centuries AD. They first settled in the eastern half of southern Africa (the Limpopo, Mpumalanga, KwaZulu-Natal provinces of South Africa and also Eswatini, most probably because of the adequacy of the environment for agriculture and livestock breeding (M. Hall 1987). This distribution of farmer communities on the eastern side of southern Africa has been noticed by historians and anthropologists for a long time (Fauvelle-Aymar 2006). Indeed, the western part of southern Africa is much drier, mostly covered by the Namib and Kalahari deserts and their semi-arid surroundings, and appears to have been well-suited to the development of pastoral economies, which were more adapted to these kinds of conditions.

Iron Age farming communities introduced, amongst other things, new economies of subsistence and iron technology in South Africa. Their economy is generally said to be based on agriculture (for instance sorghum and millet) as well as breeding cattle and caprines (Russell & Lander 2015a). According to Huffman, most Iron Age societies are spatially organised around cattle following what he calls the 'Central Cattle Pattern' (e.g. Huffman 2010). The central place of cattle in Iron Age spatial, social and economic organisation is, however, challenged by others for the first phases of the Iron Age (e.g. Badenhorst 2009), and the debate is still ongoing. Nevertheless, the Iron Age is associated with a variety of ceramic types grouped in stylistic 'traditions' (Huffman 2007). And,

although hunting was practiced at least by some farmer communities (Maggs 1989, Reid *et al.* 1998), but the proportion of domestic animals makes up to 40% or more of the faunal assemblage at most Iron Age sites (Sadr 2008a, 2013).

Additional diverse economies of subsistence and social organisations exist in plus to this broad model. The ‘Iron Age package’, including agriculture, livestock breeding, village life, pottery and iron, is not always found as such archaeologically. This is especially true for the Early Iron Age (EIA), which dates from around AD 300–700/900 (e.g. Lander & Russell 2018). According to M. Hall (1987), the early phase of the Iron Age would be characteristic of the first stages of a migration driven by small groups of people settling into ‘new’ territories, and adopting part of the local hunter-gatherer way of life. This may find echoes in the models proposing small-scale infiltrations of herders during the early herding phase. On this point, it is significant that different authors have argued that EIA settlements are indeed not necessarily associated with cattle, especially in the eastern coastal areas of southern Africa (Phillipson 1984; M. Hall 1987). According to M. Hall (1987), this could be due to either poor faunal preservation, or a focus by this early migratory group on the consumption on shellfish. M. Hall concludes that “*there seem to be many similarities between the agricultural communities of the south-eastern coastlands and the gatherer-hunter bands who had lived in these and other parts of southern Africa for millennia*” (M. Hall 1987: 38).

More permanent settlements progressively develop through the EIA phase, leading to organisations in which cattle and agriculture become more central, especially from the Middle Iron Age (MIA) dated around between AD 900–1300 (M. Hall 1987). Different economies, more or less focused on cattle and/or caprines and wild resources still exist in the MIA. The Broederstroom sites in the Magaliesberg (South Africa) dated between AD 350 and AD 600, for instance, are an example of an EIA pastoral economy focused on caprines, with cattle being only present on the margins (Mason 1981). At the site of Mzonjani in KwaZulu-Natal, dated to the third century AD, the inhabitants’ diet was rather broad, including shellfish and wild game (Maggs 1980).

From around 800–900 AD, an economic shift occurs in some areas, leading to the creation of state-level society (Calabrese 2007). Fraser and Badenhorst (2014) argue that a transition also occurs in the SLCA from a diet based on caprines during the EIA and MIA to a focus on cattle during the Late Iron Age (LIA) starting from around AD 1300. In the SLCA,

Mapungubwe becomes one of the major trade centres of southern Africa from around AD 1000 until AD 1300 (Schoeman *et al.* 2015). Iron Age settlements of that time may, however, still be quite varied. At the site of Qogana (Botswana) for instance, dated to the end of the first millennium AD, Iron Age ceramics and settlement structures were found, whereas the faunal assemblage constitutes only wild game (Turner 1987b; Denbow 1990).

From this overview of different Iron Age economies of subsistence, we can understand the important diversity that exists in the settlement patterns and other aspects of Iron Age communities, especially during the EIA. The focus of some Iron Age societies on breeding sheep is of particular interest for this thesis, as it stresses the fact that sheep herding is not only associated with pastoral societies, but may also be quite intensively developed in other economic settings.

1.6.6. Iron Age herding in the SLCA

Because herding is also vastly practiced in Iron Age contexts, and does not, therefore, only correspond to pastoralism-type economies it is necessary to further discuss the fact that herding may be practiced by varied groups of people with varied subsistence economies. The fact that herding practices are not exclusive to population groups highlights potential continuities and additional common practices between ‘hunting-and-gathering’, ‘pastoralist’ and ‘agro-pastoralist’ economies. In that sense, the term “*mixed farming economies*” used by Phillipson (1977: 13) is relevant when talking about Iron Age economies.

From around the 4th century AD, caprines are found associated with Iron Age settlements such as at Happy Rest in the Limpopo Province, and are part of the sequence up to historical times (Plug & Badenhorst 2001; Badenhorst & Plug 2003; Lander & Russell 2018). In general, caprine and cattle remains are far more visible in Iron Age sites than in LSA sites (Sadr 2013). About this phenomenon, Sadr writes:

Southern African Iron Age pastoralists (...) have left behind kitchen middens where livestock bones rarely account for less than half the mammalian faunal remains. (...) the discrepancy between the faunal composition in Iron Age and LSA middens must point to a significant difference in the people’s relations with livestock. (Sadr 2013: 172–178).

As suggested already, caprine remains in Iron Age contexts may be associated with different economies, involving, for instance more or less agriculture. In Botswana, there is evidence of intensive caprine herding from the 6th century AD onwards associated with Iron Age occupations (Reid *et al.* 1998). In some cases, it also seems that there was an emphasis on caprine herding rather than on cattle. It is the case at the site of Divuyu in the Tsodilo Hills dated to the end of the first millennium AD, where caprines form more than 60% of the faunal assemblage, with only 3% cattle and the rest being wild game (Turner 1987a; Denbow 1990).

The EIA Happy Rest settlements of the SLCA (Table 1.2) are difficult to discern archaeologically, and there is still debate about whether the economy of the people at that time was completely agropastoral (e.g. J. Smith 2005). Evidence of sheep, cattle and storage pits are nevertheless found in the environs. The eponymous site of Happy Rest in the Soutpansberg of South Africa, dated to the 4th century AD, contains at least twenty caprine individuals and seven cattle (Voigt & Plug 1984; Fraser & Badenhorst 2014). The site of Diamant, located further south, dated around AD 570–710 also contains at least 93 caprines relative to 24 cattle (Plug 2000). During the subsequent Zhizo phase starting from around AD 900 to AD 1010 (Huffman 2007), Iron Age settlements became more visible in the landscape. Overall, caprines tend to dominate the faunal assemblages of the EIA sites (Voigt & Plug 1984; M. Hall 1987; Badenhorst 2009, 2011).

During the second millennium AD, state-level societies developed in the SLCA (Schoeman *et al.* 2015). Herding strategies are also documented for this period (J. Smith *et al.* 2010), and caprines continue to be part of the archaeological assemblages of the area (Gautier & van Waarden 1981; Plug 2000). For Fraser and Badenhorst (2014), the focus on cattle would only appear during the LIA in the Limpopo Valley. Further away, in south-eastern Botswana, Iron Age pastoral sites, also involving agriculture, emerge from the 9th to the 13th century as part of the so-called ‘Toutswe Culture’ (Denbow 1979, 1984; M. Hall 1987). According to M. Hall (1987), the development of this herding economy, focused on cattle but also sheep, would be linked to the parallel expansion of Mapungubwe.

In sum, at these different Iron Age contexts of the SLCA, sheep are visible in terms of bone remains, but also dung patches and built structures. The archaeological visibility of the Iron Age sites contrasts with the relative absence of similar evidence for independent pastoral sites around the BC/AD boundary that could be attributed to the early herding phase.

However, it is important to note that because agro-pastoral populations are sedentary, their occupations are easier to find for archaeologists than the ones of mobile herders.

1.6.7. Interactions between agro-pastoral and hunting-and-gathering societies

As I have emphasised before, the study of interactions between hunter-gatherers and agro-pastoralists is a central question in the Limpopo valley and surroundings (Forssman 2014a, 2014b, 2017). In archaeology, interactions are often discussed through the identification of 'exotic' objects within a framework in which categories of objects are attributed to certain populations.

Despite the existence of thin-walled and fibre-tempered wares noted above, pottery on the whole is most often attributed to Iron Age contexts, and therefore to the agro-pastoral economies (e.g. Huffman 2007). As we have seen, however, some specific pottery styles (e.g. Bambata) or techniques of pottery making, are associated with LSA contexts (e.g. Sadr 2008b), but it is still difficult to assess if such pottery were local inventions, or if small groups of people passed down these techniques in hunter-gatherer societies who would then have developed them independently. In the Limpopo valley, to the exception of the Bambata style that is still debated, pottery is attributed to Iron Age population as it is primarily found in Iron Age contexts (Huffman 2007). When Iron Age-style pottery sherds are found in LSA sites, they are, therefore, interpreted as having been traded, or collected from near Iron Age homesteads. The same interpretation applies to iron, and to a certain extent for domesticated animal remains.

In contrast, stone tools, especially microlithic assemblages, are classically attributed to hunter-gatherers. Microlithic assemblages are indeed found in LSA sites prior to the arrival and development of agro-pastoral and pastoral populations in southern Africa (e.g. Sampson 1974; J. Deacon 1984a). This chronological relation of filiation therefore implies that microlithic industries are correctly attributed to LSA contexts and therefore to hunter-gatherers. The presence of stone tools in Iron Age sites is, then, consequently and generally interpreted as evidence for exchange between agro-pastoralists and hunter-gatherers (e.g. Wadley 1996), the presence of hunter-gatherers in Iron Age sites, or as archaeological palimpsests (Forssman 2014a).

Mention is, however, also made by some authors of farmers using stone tools, for instance when metal was scarce (Weedman 1993; Walker 1998a, 1994; Calabrese 2000). Clark

(1958a: 64) notes ‘Bantu groups’ around northern Zambia who used stone scrapers to pare-down and smooth bow-staves until recently. Closer to the SLCA, evidence for stone tool production has been found in Iron Age contexts, often mentioned as the presence of ‘flakes’ (Manyanga 2006; Nyamushosho 2016). For instance, a lithic assemblage was recovered from Mananzve Hill in Zimbabwe (80km away from BMS) and appears quite different from late Holocene LSA lithic assemblages of the SLCA.

Overall, it is to this day difficult to assess to what extent agro-pastoral populations made and used stone tools in southern Africa. More detailed lithic analyses of lithic assemblages from different types of sites would be necessary to go further on these questions, and to discuss potential interactions. On this point, it is significant to note that Iron Age communities had relationships to stone materials. One example among others is that local quartz crystals were collected by Iron Age communities, such as at Bosutswe in Botswana (Denbow *et al.* 2008). In this site, a cache containing more than 100 of them was discovered associated with hyena canines (Plug 1996). Quartz lithic material found on hilltops of the SLCA have also been attributed to Iron Age rain-control sites (Schoeman 2006a, 2006b).

In addition to lithics, other elements have also been taken in account for investigating SLCA interactions. Spatial shifts in settlements patterns have for instance been noticed by Forssman (2014a, 2017), with LSA occupations progressively getting closer to Iron Age homesteads. Varied ethnographic, historical, linguistic and genetic studies also point out to varied degrees of shared practices, languages or genetic profiles showing that many interactions took place through the late Holocene (e.g. Hammond-Tooke 1998; S.J. Marks *et al.* 2014; Pakendorf *et al.* 2017).

New economies and identities may have arisen as a result of these interactions. A more integrated and less separated view of populations could also be possible, especially in the Limpopo valley (Forssman 2014b). In particular, archaeological data must also be carefully questioned when assessing interactions. These aspects will have to be thoroughly taken in account in the future, and the impact of archaeological palimpsest will also have to be clarified.

1.7. Final and Ceramic Later Stone Age lithic industries of southern Africa

Having discussed the archaeology associated with herders, pastoralists, and agro-pastoralists, I now turn to a contextual overview of southern African lithic industries. Southern African Stone Age archaeology represents a long research tradition. Briefly, in 1929 Goodwin and van Riet Lowe established the ‘African classification’ dividing the southern African Stone Age into three stages: the Early Stone Age (ESA), the Middle Stone Age (MSA) and the Later Stone Age (LSA). At the time of the establishment of this classification, connections existed between French and South African researchers which played a role in the construction of archaeological knowledge in both places, especially between 1920 and 1940 (Schlanger 2005). The African sequence established by Goodwin and van Riet Lowe (1929) was well received by French scholars, as it was seen as: “*fully compatible with their own modes of archaeological designation and reasoning*” (Schlanger 2005:11–12). These connections may be seen through the use of terminologies made by foreign researchers working in South Africa (e.g. Péringuey 1911). Indeed, Goodwin and van Riet Lowe’s (1929:7) classification includes parallels with the European sequence:

The Fauresmith is of great interest (...). It is basically of a Lower Palaeolithic origin with possible Mousterian additions. (...) The Middle Stone Age shows a number of industries, not yet sorted fully, showing a common origin with the Mousterian of North Africa. (...) The Later Stone Age is Neo-anthropic in character and is basically an offshoot of a late Mesolithic or Early Neolithic stock of North African origin

The analogies between European and southern African archaeological sequences lasted some time, such as seen in Alimen (1955: 333): “*Prehistoric industries from southern Africa have been designated by local names for a long time. We should therefore mention those names even though analogies with European industries are clear*”. Although today it is acknowledged that the ESA, MSA and LSA do not, in fact, match the European Lower, Middle and Late Palaeolithic or Mesolithic, the tripartite division and the comparison with European industries still echoes the classification system used in Europe. The new African classification nevertheless permitted southern African archaeology to progressively gain independence from European schemes, using local terminologies.

Goodwin and van Riet Lowe’s division between the LSA and MSA is based on the characteristics observed in the prehistoric lithic industries and in the supposed origin of their creators. At first, Goodwin and van Riet Lowe only divided southern African prehistory in two periods of time: the ESA and LSA. It is only later that they decided to divide the initial LSA into MSA and LSA. They thought that the ‘Eastern Culture’, comprising the Still Bay industry and other related groups (as defined at that time) which they reclassified as MSA were made by non-modern humans. In contrast, they divided the divided into the Wilton and Smithfield industries which were understood to have been made by modern humans of ‘San’ or ‘Bush-Hottentot’ ancestry. Even today, LSA industries, and especially Wilton-like assemblages, are broadly associated with ‘San’ populations, even though, as we have seen, the picture could be more complex.

1.7.1. Current Later Stone Age classification and history of the Wilton Complex

The current LSA classification in South Africa mainly relies on research led by J. Deacon (1984a) and Sampson (1974). Other important researchers who also played a role in the constitution of the LSA sequence include Wadley (1987, 1989), H. Deacon (1976), Mazel (1989b), Parkington (2016; Parkington *et al.* 1980) among many others (e.g. Kinahan 1989; Mitchell 2000; van Doornum 2005; Forssman 2014a). Relying on these previous works, Lombard *et al.* (2012) have proposed a new synthesis of old and new lithic classification in South Africa and Lesotho (Table 1.3).

Period	SAL technocomplex	Also known as (including regional variants)	Broadly associated MISs
Later Stone Age <40 ka	<i>ceramic final Later Stone Age</i> <2 ka	ceramic post-classic Wilton, Late Holocene with pottery (Doornfontein, Swartkop)	MIS 1
	<i>final Later Stone Age</i> 0.1–4 ka	post-classic Wilton, Holocene microlithic (Smithfield, Kabeljous, Wilton)	MIS 1
	<i>Wilton</i> 4–8 ka	Holocene microlithic (Springbokooog)	MIS 1
	<i>Oakhurst</i> 7–12 ka	Terminal Pleistocene/early Holocene non-microlithic (Albany, Lockshoek, Kuruman)	MIS 1
	<i>Robberg</i> 12–18 ka	Late Pleistocene microlithic	MIS 2
	<i>early Later Stone Age</i> 18–40 ka	(informal designation); Late Pleistocene microlithic	MIS 2 to MIS 3

Table 1.3. Later Stone Age classification proposed in Lombard *et al.* (2012)

As seen in Table 1.3, they discuss six main techno-complexes. The first four are the Early Later Stone Age, the Robberg, the Oakhurst and the Wilton. Following the Wilton, they add two techno-complexes: the Final Later Stone Age and the Ceramic Later Stone Age. The Final LSA replaces the former term ‘Post-Classic Wilton’ (J. Deacon 1972, 1984a), and the Ceramic Final LSA replaces the ‘Ceramic Wilton’, or ‘Ceramic Post-Classic Wilton’ (ibid). The Final LSA is isolated by the authors because of the development of

regionalisation in the lithic industries from around 4000 BP, and the Ceramic Final LSA because of the appearance of pottery in LSA sites around 2000 BP (Lombard *et al.* 2012).

The term of Wilton was firstly used at a large scale by Goodwin and van Riet Lowe (1929), after Wilton Cave situated near to Grahamstown (Eastern Cape) and studied by Hewitt (1921). The Wilton is defined by the authors as of “*Capsien origin with Neolithic additions. It is a cave culture primarily, though open sites do appear*” (Goodwin & van Riet Lowe 1929: 7). It is said to be broadly dispersed from the Cape to the Zambezi.

Although this first classification has been deeply modified, the term Wilton is still in use to describe specific southern African lithic assemblages. Following a model elaborated by Clarke (1968), J. Deacon originally divided the Wilton Complex into three phases (J. Deacon 1972): the Early, Classic, and Post-Classic Wilton. These phases correspond to what she described as the first appearance, development and disappearance of the Wilton industry, and can be identified through variations in formal tools frequency. She specified that the dates of the different phases of the Wilton could vary from region to region (J. Deacon 1972). Some assemblages dating after the BC/AD transition have been attributed to the Classic Wilton (van der Ryst 2007), which is recent compared to that of the Southern Cape contexts studied by J. Deacon.

Building on these previous works, Lombard *et al.* (2012) proposed a new classification of the LSA. They introduced two new terminologies: the Final Later Stone Age and the Ceramic Final Later Stone Age. Both of them are said to be related to Wilton, ‘Holocene microlithic’, or ‘Late Holocene with pottery’. Although the Wilton itself is isolated in a single techno-complex, it appears to be closely linked to the following techno-complexes, giving an impression of no clear boundaries between them. The Ceramic Final LSA is based on an external element: the presence/absence of pottery, and not on any major change within lithics industries, reflecting in that sense the terms of Ceramic Post-Classic Wilton. The overall absence of a different techno-complex entity during the late Holocene is an indication that no major change occurred within the Wilton at that time. It also indicates that, generally, no new widespread techno-complex appeared from around 2000 BP, that could be clearly associated with the arrival of incoming populations.

In the next sections, I will further discuss the Wilton techno-complex, as well as the regional variations occurring. In most of southern Africa, no clear change contemporaneous

with the appearance of sheep and pottery was noted. However, interesting shifts appear in the lithic technologies of some areas. A later section is dedicated to the regional transition scenarios existing in southern Africa, which might reflect different social and economic scenarios. The main sites and locations mentioned in the next section are represented in Figure 1.21. The key to the site codes and site dates are provided in Table 1.4.

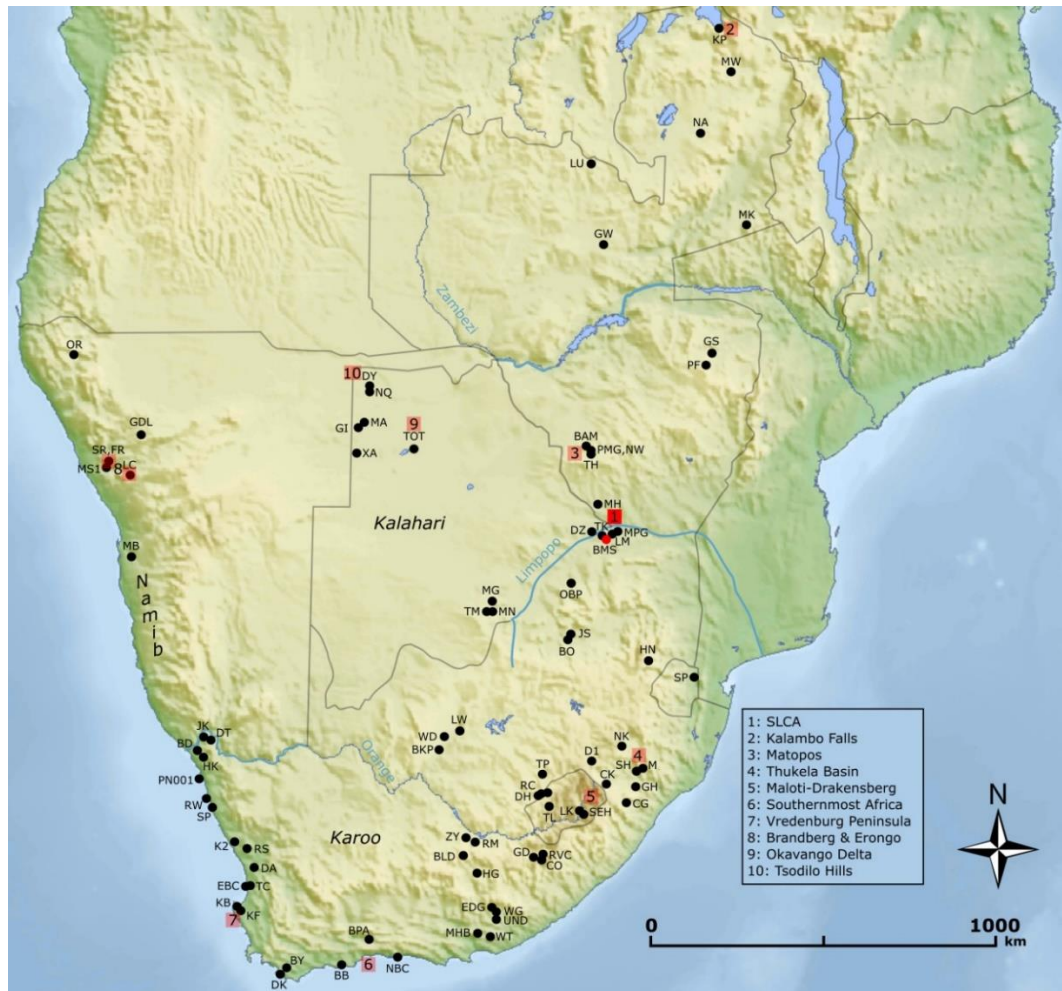


Figure 1.21. Main sites and areas cited in the text

Site code	Site name	Dates	Main references
BAM	Bambata Cave	3960±60 BP to 2140±60 BP	Walker 1995a
BB	Blombos Cave	1940±50 BP to 1840±50 BP	Henshilwood 1996
BD	Bloeddrift 23	355±15BP	Smith et al. 2001
BLD	Blydefontein	4286±149 BP to 844±119 BP	Bousman 2005
BMS	Balerno Main Shelter	2180±50 BP to 240±35 BP	Van Doornum 2005, 2008
BPA	Boomploas Cave	6400±75 BP to 1630±50 BP	Deacon 1984a
BK	Bethelsklip	800±50BP and 360±40BP	Webley 2007
BKP	Blinkklipkop	1150±40 BP to 80±35 BP	Thackeray et al. 1983
BO	Broederstroom	AD 350 to AD 600	Mason 1981; Wadley 1996
BY	Byneskranskop	3900±60BP to 255±50 BP	Schweitzer 1988
CG	Collingham Shelter	1800 BP to 700 BP	Mazel 1992b
CO	Colwinton Rock Shelter	1890±45 BP to 70±40 BP	Opperman 1987
CK	Clarke's Shelter	2300 BP to 1500 BP	Mazel 1984a
DA	De Hangen	1850±50 BP to 90±50 BP	Parkington & Poggenpoel 1971
DH	De Hoop Cave	3620±60 BP to 2850±60 BP	Klatzow 2010
DK	Die Kelders	1960±85 BP to 1465±100 BP	Swcheitzer 1979; Avery et al. 1997
DT	Die Toon	3840±60 BP to 3110±60 BP	Webley et al. 1993
DY	Divuyu	1400±70 BP to 1190±70 BP	Denbow 2011
DZ	Dzombo Shelter	2165±30 to 40±30 BP	Forssman 2014
D1	Diamond 1 Shelter	5000 BP to 3000 BP	Mazel 1984a
EB	Elands Bay Cave	4370±60 to 320±50 BP	Parkington 2016
EDG	Edgehill	5430±70 BP to 1830±60 BP	Hall 1990
FR	Falls Rock Shelter	4380±60 BP to 730±70 BP	Kinahan 1989
GD	Grassridge	6090±80 BP	Opperman 1987
GDL	Geduld	2300±50 BP to 800±50 BP	Smith et al. 1995
GH	Gehle Shelter	5700 BP to 750 BP	Mazel 1984b
GI	≠ gi	110±50 BP	Brooks & Yellen 1977
GS	Gosho 1 Shelter	x	Burrett 2003
GW	Gwisho A	4700±100 BP to 4290±125 BP	Derricourt 1976
GW	Gwisho B	4785±70 BP to 3660±70 BP	Derricourt 1976
HG	Highlands Rock Shelter	4500±60 BP to 3570±50 BP	Deacon 1976
HN	Honingklip I and IV	4870±70 BP and 210±45 BP	Korsman & Plug 1994
HK	/Hei-/Khomas	1980±20BP to 330±45 BP	Webley 2001b
JK	Jakkalsberg N	4960±40 BP to 4860±40BP	Orton & Halkett 2010
JK	Jakkalsberg L	3330 ±70 BP	Orton & Halkett 2010
JK	Jakkalsberg A	1330±60 BP and 1300±25 BP	Webley 1997
JK	Jakkalsberg B	1420±25 BP	Webley 1997
KB	Kasteelberg	AD 70 to AD 1400	Smith 2006
KF	KFS 5	1600±60 BP to 210±40 BP	Fauvelle-Aymar et al. 2006
KP	Kaposwa sites	3920±40 BP and 3850±40 BP	Derricourt 1976; Clark 1974
JS	Jubilee Shelter	4090±80 BP to 1350±120 BP	Wadley 1986, 1987
JO	João Shelter	201±28 to 139±27 BP	Forssman 2014
K2	KK002	1462±24 BP to 175±23 BP	Orton 2012
LC	Leopard Cave	3250±40 BP to 2190±40 BP	Pleurdeau et al. 2012
LK	Likoaeng	2060±45 to 1285±40 BP	Mitchell et al. 2008; Mitchell 2009
LM	Little Muck Shelter	mid-Holocene to AD 600	Hall & Smith 2000; Forssman et al. 2018
LU	Luano Shelter	x	Bisson 1990
LW	Little Witkrans	7470±70 BP to 1490±40 BP	Humphreys & Thackeray 1983
M	Mbabane Shelter	1500 BP to 470 BP	Mazel 1986
MA	Mahopa	3270 BP to present	Yellen & Brooks 1989
MB	Mirabib	1550±50 BP to 6470±80 BP	Sandelowsky 1977
MF	Mafunyane Shelter	1120±30 BP to 900±30 BP	Forssman 2014; Walker 1994
MG	Magagarape	x	Walker 1994
MH	Mananzve Hill	850±30 to 120±30 BP	Nyamushosho 2016
MHB	Melkhoutboom	5900±90 BP to 2870±90BP	Deacon 1976
MK	Makwe	5790±40 BP to AD 970±70	Derricourt 1976; Phillipson 1984
MN	Manyana	x	Robbins 1985
MPG	Mapungubwe	AD 1000-1300	Schoeman et al. 2015
MS1	Mesum 1	2820±55 BP to 860±55 BP	Richter 1984
MW	Mwela Rocks	11700 ±280 BP to 7200±200 BP	Clark 1974; Derricourt 1976
MZN	Mzonjani	third to fourth century AD	Maggs 1980
NA	Nachifuku	9720±550 BP to AD 200±100	Clark 1950; Derricourt 1976
NBC	Nelson Bay Cave	5890±70 BP to 455±30 BP	Deacon 1984a; Inskeep & Vogel 1985
NK	Nkupe Shelter	6600 BP to 2400 BP	Mazel 1988
NQ	Nqoma	1290±60 BP to 860±60 BP	Denbow 2011
NW	Nswatugi Cave	9790±90 BP to 6490±70 BP	Walker 1995a
OBP	Olieboomsport	2810±15 BP to 150±45 BP	Van der Ryst 2007
OR	Oruwanje 95/1	3100±37 BP to 530±37 BP	Albrecht et al. 2001

PF	Pfupi Cave	x	Robinson 1952
PMG	Pomongwe	4810±80 BP and 4090±70 BP	Walker 1995a
PN001	Shell midden PN2009/001	2600 BP	Webley & Orton 2013; Orton 2012
RC	Rose Cottage Cave	5970±70 BP to 500±50	Wadley 2000
RM	Riversmead	2285±115 BP	Sampson & Sampson 1967
RS	Reception Shelter	2560±49 BP to 474±22 BP	Orton 2012
RST	Roosfontein Shelter	1920±60 BP to 1290±50 BP	Klatzow 1994
RVC	Ravenscraig	3045±50 BP to 460±45 BP	Opperman 1987
RW	Rooiwal Hollow & Midden	Hollow: 2360±60 BP; Midden: 1110±50 BP	Orton et al. 2005
SH	eSinhlonhweni Shelter	AD 450-700	Mazel 1986
SP	Siphiso Shelter	5710±280 BP to 350±60 BP	Barham 1989
SPC	Spoegrivier Cave	3520±50 BP to 1890±50 BP	Webley 2007
SR	Snake Rock Shelter	4510±70 BP to 1640±70 BP	Kinahan 1989
TC	Tortoise Cave	7700±70 BP to 760±50BP	Jerardino 1995
TK	Tshisiku Shelter	5440±60 BP to 2380±50 BP	Van Doornum 2005, 2007
TL	Tloutle Rock Shelter	5080±80 BP to 375±65 BP	Mitchell 1993
TM	Thamaga	1190±90 BP	Robbins 1986
TOT	Toteng	5000±80 BP to 600±10 BP	Robbins et al. 2008
TP	Twyfelpoort Shelter	3210±50 BP to 1880±50 BP	Backwell et al. 1996
TS	Tshangula	2150±100 BP	Walker 1995a
UND	Uniondale Rock Shelter	4520±60 BP to 2125±55BP	Brooker 1989
WD	Wonderwerk Cave	7430±60 BP to 1210±50 BP	Humphreys & Thackeray 1983
WG	Welgeluk	4560±70 BP to 510±50 BP	Hall 1990
WT	Wilton Large Rock Shelter	4860±115 BP to 2270±100 BP	Deacon 1972
XA	/xai/xai	3645 BP to 635 BP	Yellen 1971, Yellen & Brooks 1989
ZY	Zaayfontein	730±75 BP	Sampson 1972, 1974; Sampson & Sampson 1967

Table 1.4. Site code keys, dates and main references

1.7.2. The Wilton: chronology and geographical distribution

J. Deacon (1972, 1974, 1984a) dates the LSA Wilton industry from 8000 BP through the late Holocene. The Wilton has been recognised in many parts of southern Africa and appears as a consistent archaeological entity at a large geographical scale (Mitchell 2002). It is typologically characterized by small scrapers and backed tools, in particular segments. In more recent works, J. Deacon moves away from the term Wilton in order to integrate regional variations under more generalised descriptive headings. She differentiates two main phases: Holocene microlithic assemblages (8000–2500 B.P.) and Late Holocene assemblages associated with pottery from around 2500 BP (J. Deacon 1984a, 1984b). The Holocene microlithic assemblages are characterised by a fully developed microlithic tradition with numerous formal tools (J. Deacon 1984a: 308). The Late Holocene assemblages with pottery are also characterised by microlithic industries, but are further characterised by the appearance in the northern Cape, the Magaliesberg and KwaZulu-Natal of long end scrapers associated with few backed microliths. Coastal midden assemblages with few formal tools are also mentioned for this period of time.

Thus, for Final LSA assemblages, regional diversity and a broader range of retouched artefacts is underlined (Lombard *et al.* 2012). A specific type of scraper, the backed scraper, previously called double segments, for example, occurs in Botswana and Namibia, but not in Zimbabwe and in the SLCA (Walker 1995b, 1998a). According to Walker, this could reflect different hunter-gatherer populations. Sampson proposes a similar argument to

discuss the appearance of recent Smithfield industries in the Orange River Valley (Mason 1962; Sampson 1972, 1974). For more recent periods, microlithic industries with Wilton elements such as segments are found even during the colonial period (e.g. Close & Sampson 1998). New raw material such as glass and porcelain are also used after the arrival of Europeans for the making of tools including arrowheads (Schapera 1930; Goodwin 1945; J. Deacon 1992; Valentin 1994).

In South Africa, the Wilton appears around 8000 years ago and is geographically widespread in the whole country (Sampson 1974; Phillipson 1977; J. Deacon 1984a). It was also recognised in Eswatini (Barham 1989) and in Lesotho (e.g. Mitchell 1992). In the coastal Northern Cape and in Namibia, macrolithic and microlithic industries with different retouched artefacts, and with flake debitage also exist (Breunig 2003; Dewar 2008; Vogelsang & Eichhorn 2011; Orton 2012). Some of these industries are still associated with small scrapers and or segments. It is at this stage difficult to know if they could constitute isolated techno-complexes, or if they are regional variations of the Wilton.

The term ‘Wilton’ has been applied in other areas of southern Africa. In Zimbabwe (especially in the Matopos) and Botswana (Walker 1995a; Robbins *et al.* 2008, 2005), most of the lithic industries discussed are microlithic, associated with small scrapers and/or backed artefacts, and so are rather consistent with the Wilton. However, other types of retouched artefacts such as trapezes, said to be extremely rare in South Africa, are quite common in the Matopos (Walker 1995a) and in the Pfupi industries in northern Zimbabwe (Robinson 1952; Burrett 2003). Few lithic studies were made in Malawi and Mozambique, and it is difficult to get a sense of the lithic industries of the last 3000 years in these areas. The scraper-segment duo was found in Mozambique, but information on more precise typology and technology are rare (Morais 1984; Muianga 2013; Ekblom *et al.* 2015). In southern Zambia, the Wilton was recognised in Mumbwa caves (Clark 1942; Savage 1983) and in the Gwisho area (Gabel 1965; Fagan & van Noten 1971). It was called ‘Zambian Wilton’ in order to specify the typological variants observed in this area. In the north and east of Zambia and surrounding areas, the Nachikufan was individualised (Clark 1950), although its resemblance to Wilton industries was highlighted (Phillipson 1977).

The term Wilton is also used to refer to other microlithic assemblages in South Africa and further north, up to Central and East Africa (Phillipson 1977). The regional variations of the Wilton complex are still under study, and relationships with other industries such as the

Nachikufan remain unclear. This is partly due to the use of varied typologies, and to the unequal amount of research led in different southern African countries. Indeed, the couple backed microliths / thumbnail scrapers is widely spread in Africa for similar periods of times, but associated with different forms of retouched artefacts and / or technologies. Phenomena of increased regionalisation from around 4000 BP also tend to complexify this picture.

1.7.3. The Classic Wilton in southernmost Africa

The Wilton industries were primarily described in the Western and Eastern Cape Provinces (J. Deacon 1972, 1984a; Klein 1974; H. Deacon 1976; Parkington *et al.* 1980). The sites such as Wilton Large Rock Shelter - (J. Deacon 1972), Melkhoutboom (H. Deacon 1976), Nelson Bay Cave (J. Deacon 1984a; R. Inskeep & Vogel 1985) and Boomplaas (J. Deacon 1984a) serve as a typological reference when defining the Wilton industries. Sampson, parallel to the work of J. Deacon divides the Coastal Wilton into four phases: Early, Classic, Developed and Ceramic (Sampson 1974). The main dates associated with the sites mentioned below are in Table 1.4. Importantly, sites in Table 1.4 are not representative of whole sites, but only in the periods of time we are interested in. Sites in the table also represent only those with dated layers.

As noted above, the Wilton techno-complex is broadly characterised by the scraper-segment duo. Scrapers are generally the most common retouched artefacts in the Wilton assemblages of the Cape area. J. Deacon particularly draws attention to scrapers in the LSA as a useful means of classification for the lithic industries. She recognises a cultural value in the size variation of the scrapers through time: “*changes in the style or norms of scraper manufacture reflect cultural change*” (J. Deacon 1972: 36). She proposes a classification of three scraper types: small (<20mm), medium (20–30mm), large (30mm) (J. Deacon 1972, 1984a). This classification system reflects the shift from the macrolithic Oakhurst complex, to the microlithic Wilton complex occurring around 8000 BP. She further notices scraper size variations in the Wilton sequence. Scrapers are more variable in size at the base and top of the sequence (J. Deacon 1984a). In Wilton assemblages, scrapers are generally small (<20 mm) or medium (20–30 mm) (Fig. 1.22). Large scrapers (>30 mm) may also occur in coarse raw materials.

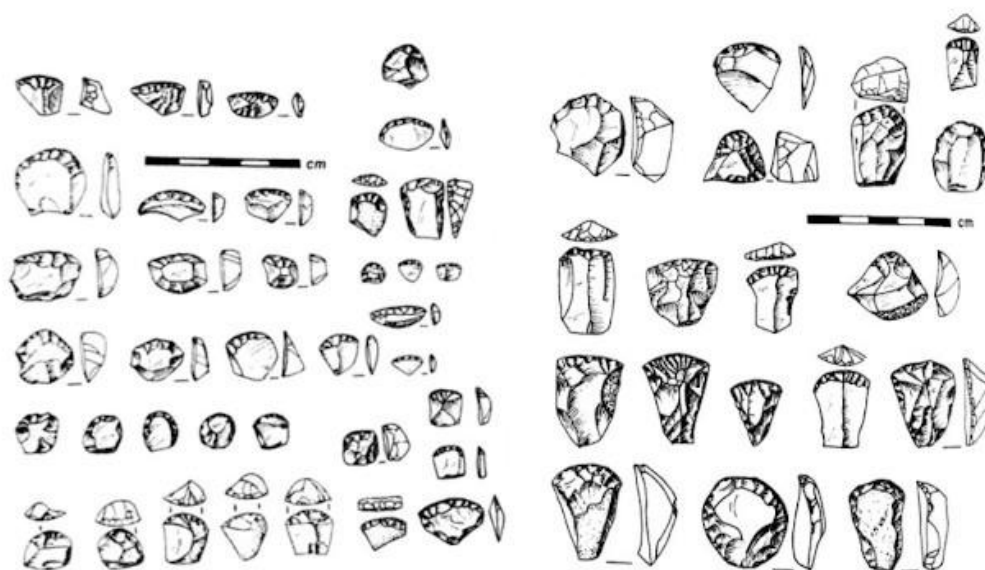


Figure 1.22. Small (left) and medium (right) Wilton scrapers in J. Deacon (1984a)

Segments usually are the second most represented retouched artefact in the Wilton. Together with the scrapers, they are seen as ‘*fossiles directeurs*’ of the Wilton (Parkington *et al.* 1980). Segments are defined by J. Deacon (1984a: 389) as a: “*portion of circle with a curved arc backed with abrupt retouch and a straight, sharp chord*”. She also includes in this category segment-like artefacts with only a portion of the arc retouched (Fig. 1.23). As seen in her drawings, she also includes triangles in this definition, which others have considered as another microlith type (e.g. Walker 1995a; Clark 1974). Segments are generally understood as arrowhead barbs, hafted on the side of the arrow or at the tip (Clark 1959; Phillipson 1976; Clarke 1979). Rare use-wear studies in southern Africa have suggested a broader use of these artefacts, including a combination of different uses as knives to work vegetal material (e.g. Schweitzer 1988; Wadley & Binneman 1995).

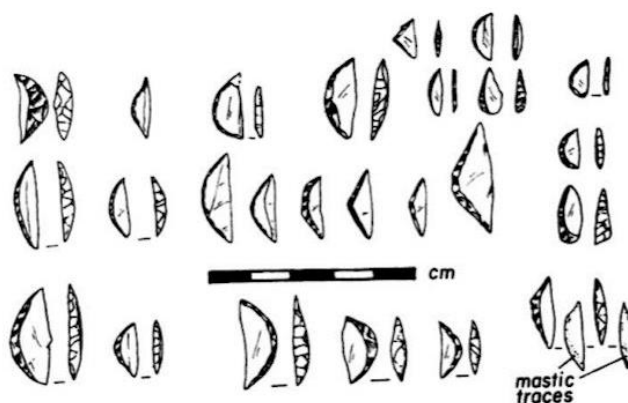


Figure 1.23. Segments in J. Deacon (1984a)

In addition to scrapers and segments, backed bladelets are also commonly found in Wilton assemblages of this area, and form a rather variate tool type class (Fig. 1.24). By J. Deacon's typological definition:

backed bladelets have two or more straight margins of which one more is blunted with abrupt retouch and one is a straight cutting edge. Sub-classes are seen as deliberate end-products or discards made at various stages of a reduction sequence. (J. Deacon 1984a: 390)

In her definition, a backed bladelet may have one or two abrupt retouched edges, and, as seen in Figure 1.24, the definition seems to group together varied morphologies.



Figure 1.24. Backed bladelets in J. Deacon (1984a)

Borers are also found in Wilton assemblages of the Cape area, and elsewhere (Fig 1.25). They are blades or bladelets with a point formed by an abrupt retouch on one or two sides. It is assumed that these artefacts were useful for the making of beads (J. Deacon 1984a).

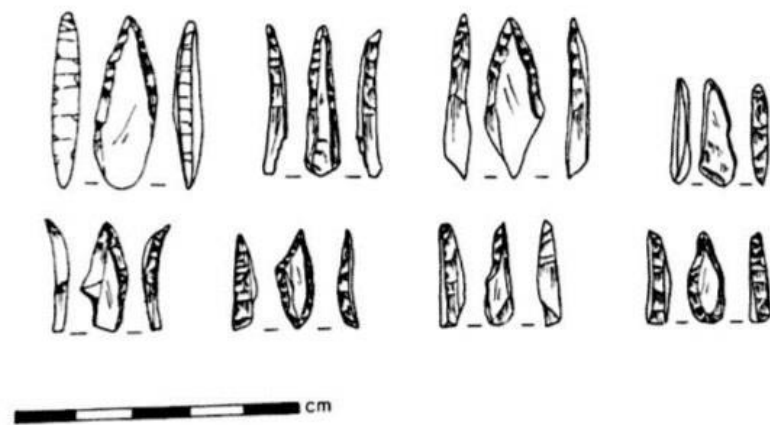


Figure 1.25. Borers in J. Deacon (1984a)

A further component of Wilton lithic assemblages are adzes which are common in Eastern and Western Cape assemblages, and occur less frequently in other areas such as in the coastal Northern Cape (Orton 2012). According to J. Deacon adzes:

have one or more straight or slightly convex working edges which have been shaped by one set of flake scars and also show secondary step-flaking resulting from use at a steep angle and in a chopping motion. They are generally larger than scrapers, the mean for southern Cape samples being between 25 and 40mm. (J. Deacon 1984a: 391)

The overall shape and blanks of these adzes seem variable (Fig. 1.26). Evidence of mastic adhering to some artefacts at Melkhoutboom (H. Deacon 1976) indicates that they may have been hafted. Adzes are associated with wood-work in most of the literature (J. Deacon 1984a). Part of this interpretation may derive from early research by Clark (1958a) on stone tool implements from the Kalambo Falls area, but also by analogy from similar tools found in Australian contexts used to work wood (Clark 1958b; Parkington *et al.* 1980). One use-wear study on adzes from the site of Boomplaas Cave confirms this hypothesis (Binneman & J. Deacon 1986). Mitchell (2002: 161) also writes that adzes could have been used for making and sharpening digging sticks.

Spokeshaves comprise a further component of the Wilton typology. They are characterised by a concave retouch delineation, often forming two or more notches (J. Deacon 1984a, Fig. 1.26). The nature of the retouch is, however, similar to that found on the adzes.

Consequently, J. Deacon states that spokeshaves “*appear to be a geographical variation of adzes in that they are more common in the eastern half of southern Africa including parts of Zambia, Zimbabwe, the eastern Transvaal [including modern Mpumalanga and Limpopo Provinces] and Natal [KwaZulu-Natal]*” (J. Deacon 1984a: 392).



Figure 1.26. Adzes (top) and spokeshaves (bottom) in J. Deacon (1984a)

Scraper-adzes are also mentioned in the literature on the Wilton of the Western and Eastern Cape. The term ‘scraper-adze’ is applied to scrapers laterally shaped on one or both sides. This lateral retouch is often associated with ‘adze-retouch’, or ‘adzing’ (e.g. Thorp 1997: 240; Wadley 2001: 169; Klatzow 2010: 59).

Lastly, backed scrapers, previously called ‘double crescents’ or ‘double segments’, also occur. They comprise pieces with a rather elongated retouched edge opposed to a backed edge (Schweitzer 1988; van Doornum 2005). Their function is still unclear. It has been proposed that these pieces are backed flakes, the backing being used as a prehensile part and the raw edge as the active part (Sampson 1974; Schweitzer 1988). The intra-typological variability of backed scrapers, such as observed at Byneskranskop 1 in the Western Cape, could be the result of different stages of discard after the utilisation of the edge of the backed flake (Schweitzer 1988: 53).

In sum, the Classic Wilton typology comprises the following types: scrapers, segments, backed bladelets, borers, adzes, spokeshaves, scrapers-adzes, and backed scrapers. An important point within the frame of this thesis is that despite the typological emphasis of this widely-used classification system, different technological information is accessible from the work produced by J. Deacon (1984a) and other researchers. For example, bladelet debitage seems to be widespread in the Wilton, even though its modalities are often not precisely described (e.g. J. Deacon 1984a). Similarly, bipolar debitage is also widespread in the Wilton, but not specific to this period of time (Barham 1987).

1.7.4. Wilton in the interior and coastal areas of southern Africa

Most of the assemblages from the southern and western Cape coast up to the Maloti-Drakensberg range have similar typological attributes, and have therefore been referred to as ‘Wilton’. This is the case of sites such as Byneskranskop (Schweitzer 1988), Uniondale Rock Shelter (Brooker 1989) and Melkhoutboom (H. Deacon 1976). The sites of Edgehill and Welgeluk in the Eastern Cape also contain a similar lithic industry (S. Hall 1990), although the raw materials used are not fine-grained, such as chert or chalcedony, but consist mainly in hornfels and silcrete. Scrapers measure less than 30mm on both sites, and are complemented by segments, backed bladelets and adzes (Fig. 1.27). Overall, the visible variations in the stone artefact frequency of the Western Cape are interpreted by Parkington *et al.* (1980) as a reflection of different activities.

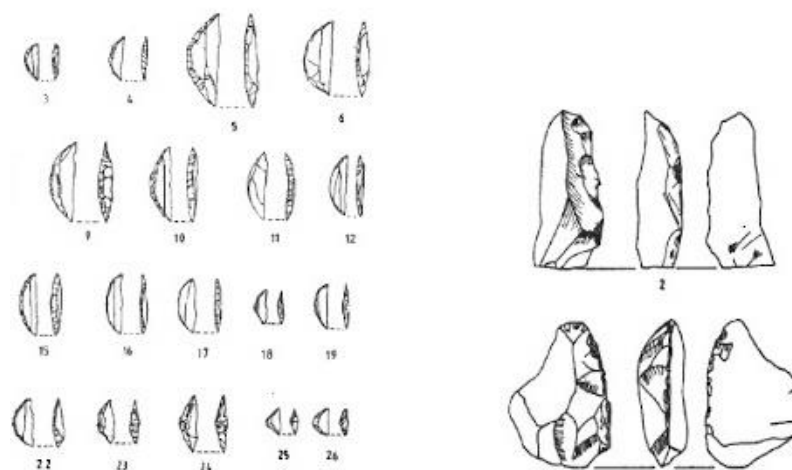


Figure 1.27. Backed pieces and adzes from Edgehill in S. Hall (1990)

At the site of De Hangen located in the Western Cape, Parkington and Poggenpoel (1971) note the presence of small bipolar bladelet cores. They hypothesise that a punch technique

may have been used to detach at least some of the bladelets. They also note the presence of flakes secondarily trimmed on an anvil. Scrapers are also recorded on the site, but they are not as small and regular as the ‘typical’ Wilton small scrapers. Other assemblages also have different typological lithic attributes, such as the site of Die Kelders (Swcheitzer 1979; Avery *et al.* 1997). There, the lithic assemblage made on quartzite and quartz is overall not microlithic in nature, and is without a bladelet production. Flakes are extracted from cobbles, and macro-tools similar to choppers are made. However, Wilton retouched artefacts are present on finer raw materials in very small quantities, such as small scrapers, segments, triangles and borers.

Wilton industries were also described on a typological basis in the interior of South Africa. Sampson mints a sequence in the Orange River Valley, composed of six phases that he later attributes to the Interior Wilton in opposition to the Coastal Wilton (Sampson 1970, 1972, 1974). Both of them however belong to the same ‘Wilton Complex’ (Sampson 1972, 1974). Assemblages of the ‘Interior Wilton’ were excavated in the Orange River Valley such as at the rock shelters of Zaayfontein and Riversmead (Sampson & Sampson 1967; Sampson 1972, 1974). It is also the case for close-by sites like Highlands (H. Deacon 1976), Blydefontein (Bousman 2005), Ravenscraig, Colwinton and Grassridge south of Lesotho (Opperman 1987).

Further assemblages dated between 4000 BP and AD 1000 are also typologically attributed to the Wilton. It is the case along the western border of Lesotho at sites like Twyfelpoort Shelter (Backwell *et al.* 1996), Rose Cottage Cave (Beaumont 1978; Wadley 1991, 1992, 2000), Roosfontein shelter and De Hoop Cave (Klatzow 1994, 2000, 2010). Lithic industries were also attributed to the Wilton in Lesotho at sites such as Tloutle Rock Shelter (Mitchell 1990, 1993), Likoaeng (Mitchell 2009) and elsewhere (Carter & Vogel 1974), even though they display specific typological variations. In some sites of the interior of South Africa, an absence or rarity of segments is noted from around the mid-Holocene (Parkington *et al.* 1980; J. Deacon 1984a).

In the Thukela Basin (KwaZulu-Natal), many sites dated from the mid- to late Holocene have been excavated by Mazel (1989b). Among them, Diamond 1 and Clarke’s shelters (Mazel 1984a); Mbabane and eSinhlonhlweni shelters (Mazel 1986); Collingham Shelter (Mazel 1992b); Gehle Shelter (Mazel 1984b) and Nkupe Shelter (Mazel 1988). The retouched artefact category on most of these sites is dominated by scrapers, followed by

backed pieces and adzes. These assemblages might represent a regional variation of the Wilton such as defined in the Cape. Scrapers appear quite varied, with overall bigger scrapers than in Wilton assemblages, and displaying different morphologies (Fig. 1.28). The backed pieces (including segments and backed bladelets), on the other hand, are similar to what is expected in a typical Wilton assemblage, although they may also be bigger on average. The Thukela Basin adzes and spokeshaves are similar or bigger than the ones in the Southern/Western Cape sites. Both the bigger scrapers and adzes seem to be made in hornfels, such as at Mbabane and eSinhlonhlweni shelters (Mazel 1986). It is therefore possible that the morphological differences observed echo the raw material used, which is unlike most Wilton sites where silica rocks (cherts, chalcedonies, agates, also called ‘CCS’ [cryptocrystalline silicates] and opalines in the literature) are often employed. In comparison to typology, very little information is available on lithic technology. However, it seems that some at least of these assemblages may not be classifiable as microlithic.

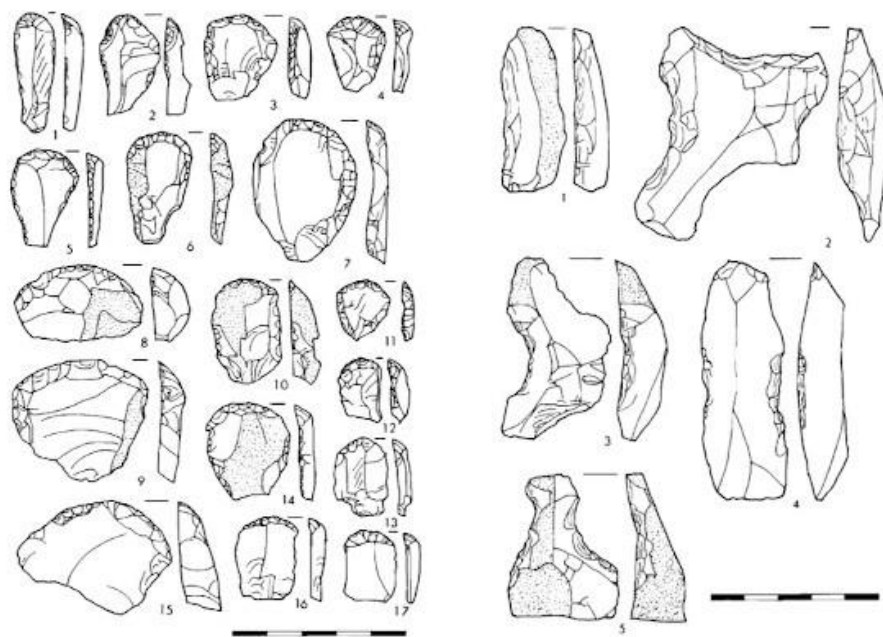


Figure 1.28. Scrapers and adzes from eSinhlonhlweni Shelter, in Mazel (1986)

In the Northern Cape, several LSA sites were excavated by Humphreys and Thackeray (1983). At Wonderwerk Cave and Little Witkrans, mention is made of bladelet and flake debitage, as well as small scrapers, backed artefacts (including backed blades and segments), and adzes. The cores of both sites are pyramidal with the longest face exploited for the extraction of bladelets and elongated flakes. At Wonderwerk, different techniques

of debitage seem to exist depending on the raw material: bipolar percussion is used for quartz, free-hand direct percussion for dolerite and potential indirect (punch technique) percussion for chert (Humphreys & Thackeray 1983: 49-50). The hypothesis that a punch might have been used for detaching bladelets is also proposed by Bousman (2005) at Blydefontein.

Further north in the Magaliesberg, Wadley excavated several sites including Jubilee Shelter (Wadley 1986, 1987, 1989, 1996). Here, the reduction process seems to be oriented towards the production of bladelets. Pyramidal bladelet cores, single and multiplatform cores as well as bipolar cores are noted when core-typology information is available. Small scrapers and segments are the most represented retouched artefacts. In Mpumalanga, the sites of Honingklip I and IV also carry a microlithic assemblage dominated by small end scrapers, followed by backed tools, as well as adzes (Korsman & Plug 1994). In Eswatini, the site of Siphiso Shelter is also attributed to the Wilton (Barham 1989).

1.7.5. In and above the Limpopo River Basin

a. Limpopo River Basin assemblages

I now come to assemblages from sites of special regional importance to the subject of this thesis. In the Limpopo River Basin and in the Shashe-Limpopo Confluence Area (SLCA), several LSA sites dated to the last 3000 years have been excavated and studied (Mason 1962; Wadley 1987, 1995; Walker 1994; S. Hall & B. Smith 2000; van Doornum 2005; van der Ryst 2007; Bradfield *et al.* 2009; Forssman 2014a). Most of the SLCA assemblages dated from 3000 BP to AD 1000 seem to be typologically related to the Wilton, as they contain scrapers and backed tools. It is the case for the sites of Balerno Main Shelter, Balerno 2, Tshisiku shelter studied by van Doornum (2005, 2008), Dzombo Shelter, João Shelter, Mafunyane Shelter (previously called Tuli Lodge, Walker 1994), and Little Muck (S. Hall & B. Smith 2000; Forssman *et al.* 2018) (Fig. 1.29).

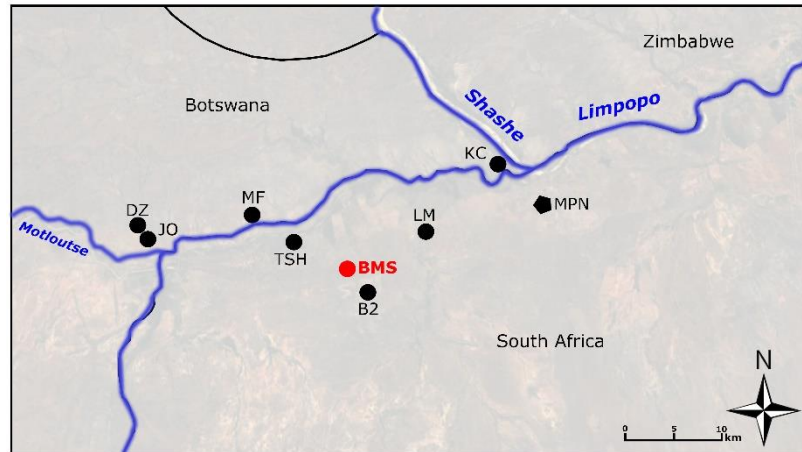


Figure 1.29. SLCA sites. BMS: Balerno Main Shelter, B2: Balerno 2, DZ: Dzombo Shelter, JO: Joao Shelter, KC: Kambaku Camp, LM: Little Muck, MF: Mafunyane, MPN: Mapungubwe

In the SLCA, scrapers are almost always the most common retouched artefact (van Doornum 2005; Forssman 2014a, Fig. 1.30). The other common retouched artefacts are segments and backed bladelets, as well as adzes, awls (similar to borers) and backed scrapers. All of them can be qualified as microlithic. Macro-tools such as ‘planes’ also occur on coarse raw material such as dolerite. Most of the lithic assemblages are made on local fine-grained CCS material such as chert and agate.

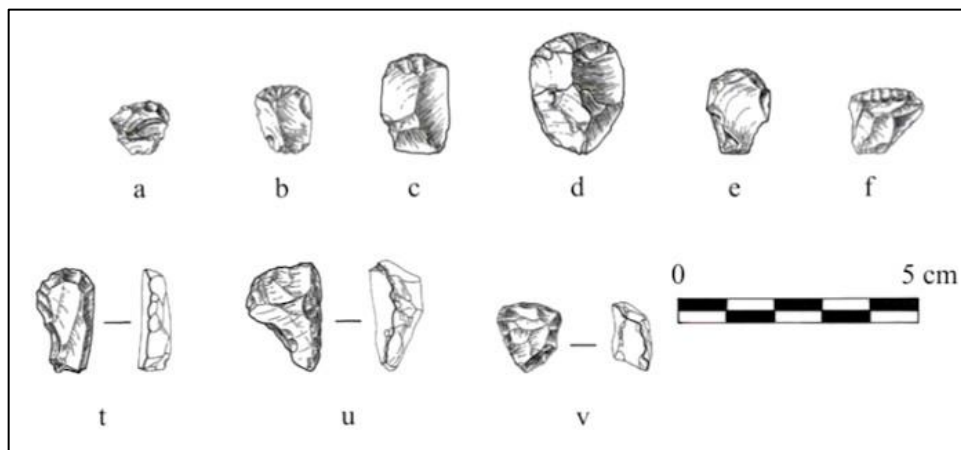


Figure 1.30. Scrapers from BMS, in van Doornum (2005)

Microlithic assemblages made of local quartz with fewer retouched artefacts are also found on the sites of Mphekwane and Leholamogoa excavated by Sadr in the Makgabeng Plateau (Sadr 2007; Modikwa 2008; Bradfield *et al.* 2009). Even in these sites the scraper-segment duo occurs together with other types common in the Wilton such as adzes.

The classification of core types in some of these studies gives preliminary insights about the reduction processes. Bipolar reduction seems to be particularly well-represented (van Doornum 2005, Fig. 1.31). Single and multiplatform flake and bladelet cores also occur (Forssman 2014a). Some ‘radial’ or ‘pyramidal’ cores are also reported in the SLCA, particularly in the south such as at the site of Olieboomspoort (van der Ryst 2007). Nevertheless, most of the cores fall within the ‘informal’ or ‘irregular’ category which does not provide any information on the reduction process.

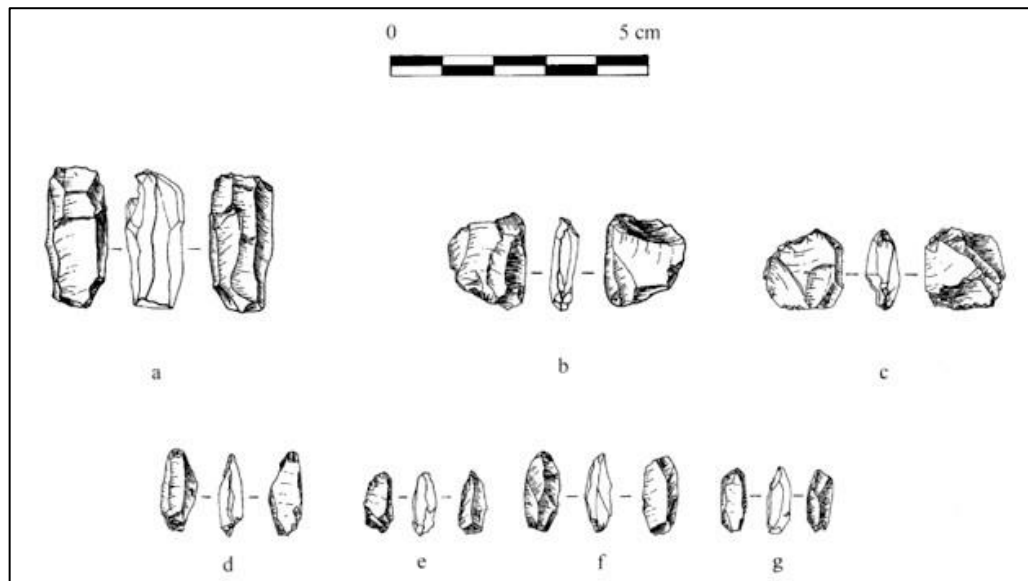


Figure 1.31. Bipolar cores and derived products from Tshisiku shelter, in van Doornum (2005)

Van Doornum (2005, 2008) argues that Balerno Main Shelter which contains a dense archaeological sequence is an aggregation site, whereas the close-by sites of Balerno 2 and 3 are dispersal camps. This interpretation is challenged by Forssman (2014a) who highlighted that dense archaeological occupations could also have resulted from compacted and superimposed different phases of occupation.

b. North of the Limpopo valley: the Amadzimba, Pfupfian and Okavango assemblages

The mid- and late Holocene LSA assemblages of Zimbabwe have been investigated in two main areas: the Matopo Hills (Cooke 1963; Walker 1995a) and the east-northern part of the country (Cooke 1978, 1979; Burrett 2003). The relationship between these assemblages, the Wilton and the Nachikufan are still uncertain.

Nevertheless, in the Matopo (or Matobo) Hills in Zimbabwe are rock shelter sites with long LSA sequences, as well as incredibly well-preserved rock art (Walker 1980, 1995a). The most well-known sites of this area are Pomongwe Cave (4500 BP) (Walker 1995a; Cooke 1963) and Bambata Cave (4000 to 2000 BP) (Walker 1995a). Other sites with dates contemporaneous with the Wilton include Tshangula (Walker 1995a). Evidence of the storage of plant food like marula seeds have been found from around 4800 BP at Pomongwe and Bambata and during the mid-Holocene at Nswatugi Cave (Walker 1995a, Mitchell 2002). The Amadzimba Industry, contemporaneous with the Wilton and dated between 4800 and 2100 BP, is thought to correspond to a phase of more intensive aggregation (Walker 1995a; Mitchell 2002). It is replaced after around 2100 BP by what is called the Ceramic Matopan or Bambata (Walker 1995a) which corresponds to the appearance of pottery in the area.

As noted in the preceding discussion, these Zimbabwean assemblages share typological similarities with the Wilton, through the presence of small scrapers and backed artefacts, but also with the Zambian Nachikufan which comports a broad spectrum of microliths such as triangles and trapezes (geometrics). In the Matopos, triangles and trapezes seem to appear early on during the Nswatugi Industry. They are well-represented in the eponymous site in layers dated between 9220 ± 90 BP and 6490 ± 70 BP, but also occur in later contexts. The scrapers from these dated layers are typologically very similar to the ones found in late Holocene sites in the SLCA (van Doornum 2005; Forssman 2014a). Geometrics and small convex scrapers are also present in the upper layers of Pomongwe dated to the mid-Holocene, and potentially earlier (Walker 1995a). They are also found throughout the stratigraphy at Bambata Cave, although they are only dated in one unit of around 3100 BP. Deep trapezes or ‘tranchets’ are found in this dated unit. The appearance of these tranchets is linked to the Amadzimba Industry. Unfortunately, Walker notes that “*there are no excavated assemblages dating between 3800 and 2200 BP and it is not clear how this stage progresses.*” (Walker 1995a: 205). The archaeological contexts and dating for the Ceramic Matopan are also quite confused. Walker notes, however, a decrease of backed tool which he associates with the use of iron arrowheads. He also notes that “*concaves (spokeshaves) and adzes apparently become slightly more numerous. Technologically, the stone tools show continuity with earlier industries.*” (Walker 1995a: 205).

The Pfupi Industry located in the east-northern part of Zimbabwe was named after a cave excavated by Robinson (1952). It was further typologically defined by Cooke *et al.* (1966;

Cooke 1978, 1979) as a backed-piece dominated assemblages including geometrics. His work was later criticised by Burrett (2003) who notes inconsistencies in the typology used. Unfortunately, the site he excavated (Gosho I) is not directly dated, but associated with the mid- to late Holocene by comparison with the other sites excavated by Cooke and by Walker, as well as pottery typology. He notes the use of bipolar reduction as well as platform-cores, bladelet debitage, and the occurrence of small scrapers, segments, trapezes triangles and tranchets (Burrett 2003: 17).

In Botswana, Malan (1950) noted early on a typological resemblance between west-Botswanan and South African typologies whereas assemblages in the eastern part of Botswana are more similar to the Zimbabwean typology. Yellen and Harpending (1972), for instance, also observe variations in the backed scraper distribution which are absent from the far east of the country, although they occur in South Africa. Walker (1998a) develops a similar idea, highlighting the difference between western and eastern Botswanan tool typologies. He points out, however, that the north-west area of Botswana has more backed tools and borers than in the rest of the country. Interestingly, he seems to observe parallel differences in the rock art between the east and the west of the country (Walker 1998b).

Staying in Botswana, Robbins (1986) and Walker (1994, 1995b) studied archaeological assemblages located in the south east of the country. Robbins (1986) excavated the site of Thamaga which contains undated pre-ceramic layers and also ceramic layers dated at 1190 ± 90 BP. The assemblage is composed of small-end scrapers and segments similar to the ones found in the SLCA (van Doornum 2005). Bladelets are also part of the assemblage. It is said to be of a Wilton affinity and similar to the assemblages of Manyana (Robbins 1985) and Magagarape (Walker 1994). All these sites contain backed scrapers, which could be the typological equivalent of what is called double crescent (e.g. Brooks & Yellen 1977).

Along the Okavango and Botletli River areas, Denbow (1986) and his student Weedman (1993) studied additional archaeological assemblages. Weedman (1993) studied the lithics of several sites located in Botswana along the eastern border of the Kalahari Desert, in the Okavango Delta, and in the Tsodilo Hills, dated to the last 3000 years. She noticed the presence of single and double-platform cores measuring between 20-40mm during the 'Early Toutswe period' dated around AD 600-700. These cores are later replaced in the 'Toutswe' (AD 900 - 1000) and 'Mapungubwe' (AD 1100-1250) periods by less reduced

and so-called ‘formless’ cores. Other core types are also recognised including pyramidal and biconical, each category experiencing variation. Microlithic retouched artefacts, mainly scrapers, are also associated with these assemblages, as well as segments and backed blades. At the site of Toteng, Weedman noticed a decrease of lithic production from around 1500 BC to colonial times, which she associates with better access to iron tools. She also points out, however, the stronger reliance on local lithic material from around AD 300 which may be associated with a more sedentary way of life, or difficulties to access non-local raw materials.

The lithic material from the site of Divuyu, dated between the 6th and 8th centuries AD, is associated with an important concentration of caprine remains (Denbow 2011). The lithics are mainly made of quartz (85%) and chert (15%). There is no information on core types and only two segments were found (Weedman 1993). Lithics are also present in the assemblage from the site of Nqoma, in which sheep and cattle bone were found as well as iron and copper (Denbow 1990). The formal tool assemblage is in this case dominated by backed bladelets (Weedman 1993). The site of Toteng 1, located below the Okavango Delta and close to Lake Ngami features some of the oldest dated sheep (2020±40 BP) and cow (2070±40 BP) bones (Robbins *et al.* 2005). The lithic industry of Toteng 1 is qualified as microlithic, with the presence of ‘backed segments’, segments, backed bladelets, small thumbnail scrapers and drills (Robbins *et al.* 2005, 2008). ‘Trapezoids’ also occur at the site (Robbins *et al.* 2008 Fig. 1.32).

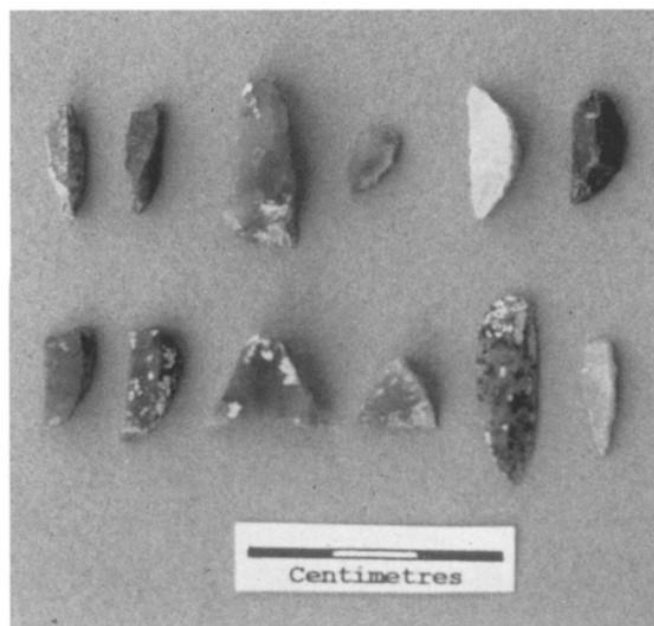


Figure 1.32. Backed pieces and ‘trapezoids’ from Toteng 1, in Robbins *et al.* (2008)

1.7.6. Kalahari lithic assemblages

Other archaeological assemblages located in the north-west of the Kalahari have also been attributed to the Wilton, such as the recent assemblage of $\neq$ gi dated around 100 BP (Brooks & Yellen 1977), that from /xai/xai dated between 3600 and 600 BP, and at that from the site of Mahopa dated from 3200 BP to present (Yellen 1971, Yellen & Brooks 1989). According to Brooks & Yellen (1977), the most characteristic tools are double crescents, which have a backed side opposed to a convex retouched edge. Segments and scrapers are also present. However, thumbnail scrapers are said to be very rare. The ‘double’ or ‘biconvex’ crescents are also quite common in Namibia and are attributed by Sampson (1974) to the ‘Coastal Wilton’ assemblages known from sites located in the Southern Cape. From the /xai/xai and Mahopa LSA artefact type drawings (Fig. 1.33), it seems that, although the sites have been linked to the Wilton, there may be typological differences from the Wilton reference sites, or even from the sites in the SLCA. The artefacts seem bigger and do not correspond to what are referred to as segments in the Wilton. Furthermore, the presence of what seems to be blade-like regular blanks may be derived from a specific blade reduction which is not documented for the Wilton techno-complex.



Figure 1.33. Late Holocene LSA stone tools from Kalahari sites, in Yellen & Brooks (1989)

1.7.7. Zambezi River Valley assemblages: the Nachikufan and Kaposwa industries

The Nachikufan Industry was defined in northern and eastern Zambia after its eponymous site, and recognised in other areas such as in Malawi and around Lake Tanganyika at the border of Tanzania and the Congo (Clark 1950; S. Miller 1971; Derricourt 1976; Kalinga & Pike 2000). According to S. Miller (1971), the Nachikufan appeared around 17 000 BP and persists until historical times. Clark (1950, 1974) divided the Nachikufan in three main phases (I, II and III), and Musonda (1985) proposed a revised chronology. The Nachikufan I spans from 18 000 to 9000 BP. It is characterised by Clark as having “*very small retouched and utilized bladelets and microliths, small convex scrapers, a large number of bored stones and an important heavy scraper element*” (Clark 1974: 141). The Nachikufan II is sub-divided in II A (earlier) and II B. Sub-division II A is dated at Mwela Rocks around 10 000 BP (Clark 1974). According to Musonda (1985) it takes place between 9000 and 5000 BP. There is still a production of bladelets, but the backed microliths are broader. The earliest dates of sub-division IIB are around 6500 BP and the latest around 4000 BP (Sampson & Southard 1973). In IIB, they are also microliths, mainly lunates (equivalent to segments), trapezes, backed and truncated microliths. The subsequent phase, Nachikufan III, is dated between 4000 and 200 BP (Sampson & Southard 1973). It is typologically characterized by high frequencies of segments and curved backed flakes (Bisson 1990). It is associated with LSA or Iron Age pottery in the latter stages from around 2000 BP. According to Musonda (1984), only the assemblages with a high frequency of backed flakes in association with Iron Age artefact should be classified as Nachikufan III. Sampson (1974) has highlighted the high variability occurring within the three phases of the Nachikufan, which could lead to a redefinition of this chronology. Sampson & Southard (1973) propose that, whereas Nachikufan I is well individualised, there is more overlap between phases II and III, perhaps due to a mixing of artefacts and activity variations (Sampson 1974). There is also a lack of dates and secure archaeological context for Nachikufan III (Bisson 1990).

Moreover, a diversity of core reduction strategies seems to have existed during Nachikufan II and III. At Luano Rock Shelter (Bisson 1990), free-hand single- and multiple-platform elongated flake cores were described, as well as radial and bipolar cores. However, the context is uncertain with some evidence of mixing in the upper layers. Also noteworthy is the occurrence of macro-tools which are at the intersection of the tool and core categories. Such artefacts are sometimes called ‘core scrapers’ (e.g. Clark 1958a: 59).

The Nachikufan typologically contrasts with the Wilton as there is a dominant proportion of backed elements whereas scrapers are generally the most common retouched artefact in Wilton assemblages. J. Deacon (1984a) hypothesised that the typological differentiation between Nachikufan and Wilton industries might be explained by different activities carried out in the two areas, with bark processing in the Zambian Nachikufan versus hide processing in the southern African Wilton. For Phillipson (1976, 1977), Nachikufan phases II and III could be qualified as 'Zambian Wilton' as they represent a regional development of the Wilton. Musonda (1985) disagrees and recognises the Nachikufan as a distinct cultural entity. Thus, it remains to this day difficult to assess if the Nachikufan is a different techno-complex, independent from the Wilton, especially due to the lack of comparative technological studies. It is however interesting to note the broader typological variety existing in the Nachikufan II and III assemblages. For example, microlithic trapezes and triangles associated with backed flakes are common in Nachikufan phases II and III whereas these elements are considered rare in South Africa (Clark 1959; Musonda 1984).

In addition to the Nachikufan Industry from Zambia, it is also necessary to consider other related industries from eastern southern Africa. At Kalambo Falls, on the border between Zambia and Tanzania, Clark (1974) established an archaeological sequence from the ESA to the Iron Age based on his excavations at several archaeological sites. The last 4000 years are divided between the Kaposwa Industry (associated with two dates at 3920 ± 40 BP and 3850 ± 40 BP), and the Kalambo Falls Industry corresponding to the Iron Age (dated between 1905 ± 40 BP and AD 1580 ± 50 from surface or sub-surface hillslope soils). Very few stone artefacts are represented in these assemblages, mainly undiagnostic flakes, some of them retouched. The Kalambo Falls Industry is characterised by

Open settlements, permanent occupation but few permanent structural features. Storage pits, grave shafts and furniture. Iron working tools and personal ornaments. Copper (rare). Grindstones, pigments, pots and bowls with bevelled rim, relief chevron decoration. Cattle and wild fauna.
(Clark 1974: 78)

In contrast, the Kaposwa Industry was defined by Clark after the assemblage from Site C excavated in 1963. He found the microlithic industry in what he calls the "Mbwilo Member" (Clark 1974). In the upper layers, the lithic artefacts were mixed with Iron Age artefacts including pottery and iron. Most of the Kaposwa Industry is made on fine-grained chert

and is microlithic. Other coarser raw materials like sandstone, quartzite and dolerite were used for 'heavy work'. According to Clark, there are differences between the Kaposwa Industry and the Nachikufan:

there are considerable differences which makes it impossible, on the basis of the lithic technology, to include the aggregates from the local Kalambo basin within any of the Nachikufan archaeological units. (...) They cannot, therefore, as yet be placed within any of the known Industries or Industrial Complexes of the Later Stone Age in south-central Africa. (Clark 1974: 108)

For Phillipson (1977), the distinction between the Nachikufan and the Kaposwa is more likely to be due to different raw material use than real techno-typological differences. Four categories of Kaposwa cores are defined by Clark (1974): single (especially pyramidal), two platforms, formless and bipolar. Small flakes and bladelets, as well as 'outils esquillés' are also reported. According to Clark, the microburin technique was also used to produce microliths (Fig. 1.34). Interestingly, this technique has not been identified in South African late Holocene assemblages.

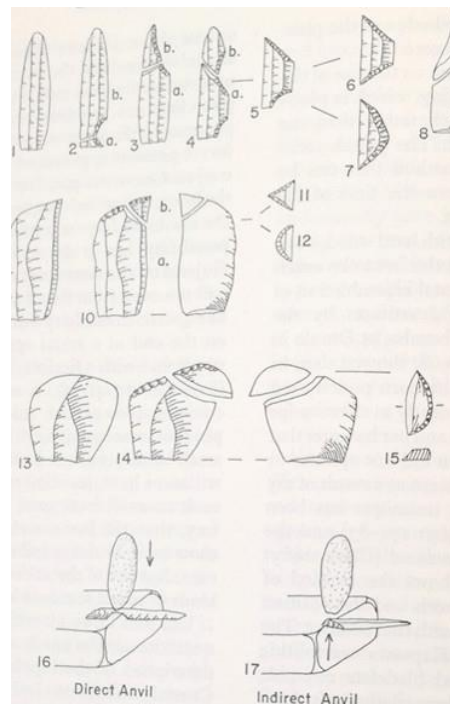


Figure 1.34. Methods to make microliths in the Kaposwa Industry, in Clark (1974)

In comparison to other southern African assemblages, there are very few bipolar cores or *pièces esquillées* in the Kaposwa Industry. The knapping method on the site is mainly free-hand for prismatic, single platform and pyramidal cores. Clark suggests that an intermediary technique of debitage with the use of a punch may have been used to extract blanks. As characteristic stigmata of this technique, he observes point platforms, incipient scarring and crushing of the proximal end. This hypothesis is of interest, as this technique is also not recognised in the South African LSA, although it is hypothesised at some sites (e.g. Wonderwerk Cave: Humphreys & Thackeray 1983). The debitage seems to be generally oriented toward a bladelet production, together with flakes, both under 50mm length. Most of the cores were maintained during the reduction process, with the removal of rejuvenation flakes.

In addition to microliths and cores, macro-tools also exist in the Kaposwa Industry, such as ‘percussion flakes’, grounded and polished stone axes, and bored stones. This is the first mention of polished axes that we come across for southern Africa (Fig. 1.35). As Clark points out, there are only a few of these macro-tools per unit. Some of these heavy tools display crushing and battering of at least one edge and are characteristic of use. It is the case for adzes and choppers, but also of a type called ‘core-scraper’.

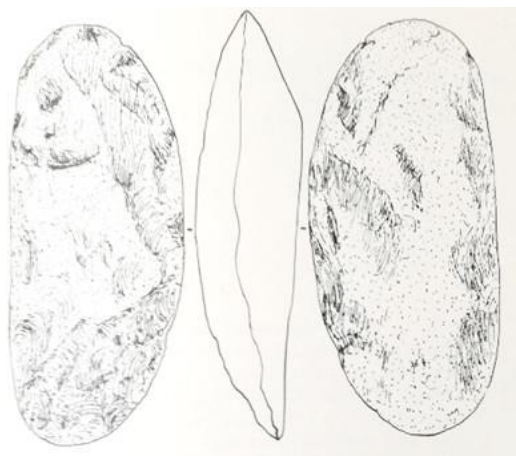


Figure 1.35. Axe, Kaposwa Industry, in Clark (1974)

Microliths also display varied forms, and include: “*backed bladelets and flakes; lunates, trapezes, triangles; shouldered and truncated forms; small scrapers (mostly short end and side), pieces with burin blow*” (Clark 1974: 78). The Kaposwan microlithic retouched pieces are dominated by lunates (equivalent to segments), triangles, trapezes and backed bladelets (Fig. 1.36).

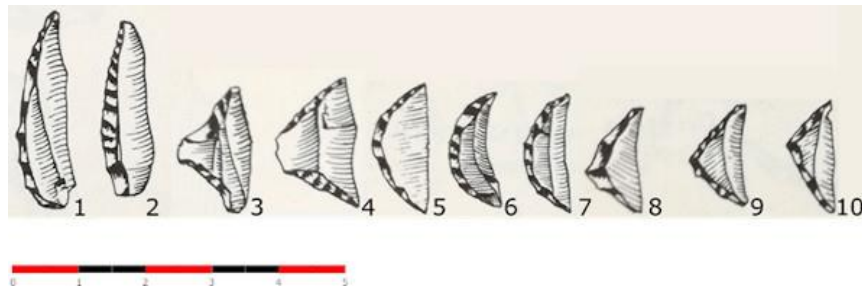


Figure 1.36. Microlith types in the Kaposwa Industry. 1-2: backed bladelets, 3-4: trapezes, 5-7: lunates (segments), 8-10: triangles. After Clark (1974)

Having now reviewed the literature on late Holocene microlithic industries of southern Africa, I now turn to a review of comparable industries along the western edge of southern Africa.

1.7.8. Variations in western southern Africa

a. Northern Cape assemblages

Several sites dated to the last 4000 years have been excavated in the Northern Cape Province of South Africa. The lithic typology of these Northern Cape sites is typologically similar to the Wilton, as it is microlithic with the presence of small scrapers and or segments in most of sites. Nevertheless, some lithic types exist which seem specific to this area, such as denticulates and backed flakes. Very little information is available on the technology used, but both bipolar and single platform free-hand cores are mentioned (Orton 2012). Orton proposes a division of the Northern Cape lithic industries of the last 4000 years (for all sites with or without pottery) into three main groups following the proportion of retouched artefacts and raw material used (Orton 2012: 121). Group 1 has a high proportion of silica rocks, many retouched artefacts including scrapers and backed artefacts and is the only group represented between 4000 to 1000 BC. Group 2 is made on milky quartz, is informal, is associated with a production of flakes, and appears from around AD 1300. For Orton, Group 2 could be linked to the quartz-dominated Doornfontein assemblages of the South African interior associated with pottery (Beaumont *et al.* 1995; Parson 2007). These ‘informal’ assemblages are believed to have been made by herders (Orton 2012, 2013). Lastly, Group 3 is made on clear quartz and quartzite and has many backed artefacts. It only appears from around AD 100 and coexists with Groups 1 and 2. For Orton, Group 3 assemblages, rich in backed-bladelets, would belong to early Khoe-speaking hunter-gatherers with only a few sheep who have not shifted yet to a pastoral way of life (Orton 2012, 2013). He also notes that assemblages combining Group 1 and 3 occur during the second millennium AD. In all three groups, bipolar cores, single-platform, radial and

irregular cores are mentioned along with the production of bladelets and flakes. Single-platform cores do appear in the informal Group 2 assemblages.

Turning now to specific sites, several assemblages are known from the Richtersveld on the western coast of southern Africa. Jakkalsberg N dated to the mid-Holocene contains a quartz-dominated lithic industry with CCS the next most dominant (Orton & Halkett 2010). The retouched artefacts comprise scrapers and backed tools. There are also a few denticulates, backed flakes, triangles and trapezes. Denticulates are generally uncommon for the mid-Holocene South African sites, and the denticulates of Jakkalsberg N are morphologically quite variable but share similar small notching (Orton & Halkett 2001). The site also has single-platform bladelet cores on CCS, as well as flake cores in CCS and quartz, and bipolar quartz cores (although uncommon). Grinding equipment was also found at the site. The nearby site of Jakkalsberg L (dated at 3330 ± 70 BP) contains a similar lithic industry to Jakkalsberg N. Trapezes on this site have been noted as having three backed edges and the longest side unretouched. The presence of a few trapezes and triangles is interesting, as they are virtually unknown elsewhere in South Africa (Orton & Halkett 2010), although examples of triangles might be integrated in the segment category at other sites (J. Deacon 1984a). Very few triangles were found in other Northern Cape sites such as KK002 dated between 1462 ± 24 BP and 175 ± 23 BP (Orton 2012). The same is true for trapezes with one found at Reception Shelter in a layer dated around 1850 BP in association with pottery and domestic animal bones (Orton 2012). KK002 and Reception Shelter are associated with domestic animal remains and would represent “*one night camps of highly mobile Group 3 people with domestic stock*” (Orton 2012: 371). In contrast to the Jakkalsberg sites, the industry from the site of Die Toon, also located in the Richtersveld and dated around 3500 BP, is qualified as ‘informal’ and differs from those from the Jakkalsberg sites by the lack of scrapers, and being made mainly made of quartz (Webley *et al.* 1993). The site of /Hei-/Khomas dated from around 2000 BP is typologically dominated by small scrapers and segments (Webley 2001b). The stratigraphic context is, however, rather insecure as there are some inverted dates (Orton 2012). Unlike most of other Northern Cape sites, adzes are found at /Hei-/Khomas. Webley (2001b) argues that these adzes have wood polish on one side and hide polish on the other.

On the Namaqualand coastline, mid- to late Holocene microlithic assemblages with scrapers and backed artefacts on quartz and CCS have also been described (Dewar 2008). Quartz bipolar debitage, and free-hand single platform and informal cores were found in a

shell midden (PN2009/001) dated around 2600 BP with a variety of scrapers (including backed scrapers) and denticulates (Webley & Orton 2013; Orton 2012). Spoegrivier Cave has lithics from pre-pottery layers dated around 3500 BP that are typologically similar to other Northern Cape assemblages, with scrapers, backed flakes (and bladelets), but without denticulates (Webley 2001a, 2007). This industry is also typologically similar to that from Rooiwal Hollow dated to 2360 ± 60 BP and Rooiwal Midden dated at 1110 ± 50 BP (Orton *et al.* 2005). In general, Dewar (2008) notes that after around 500 BC, the retouched artefact class tends to be dominated by scrapers, quartz is more used, and there is a global trend of 'de-formalisation' of the assemblages. A drop in CCS after 2000 BP is also noted by Orton (2012). In the upper layers of Spoegrivier Cave, microlithic scrapers tend to disappear, while groove stones and grindstones are still found (Webley 2007).

Staying in the Richtersveld, the supposed pastoralist sites of Jakkalsberg A and B and Bloeddrift 23 have a quartz-dominated lithic industry. Jakkalsberg A and B is famous for its concentration of sheep bones, dated around 1300 BP, and the lithic industry seems to be oriented toward a flake production (Webley 1997). There are only five retouched artefacts on site A (two segments, one backed piece and two miscellaneous retouched pieces) as well as grindstones, hammerstones and quartzite cobbles covered in ochre. There are no retouched artefacts on site B, but some grindstones were found. Iron artefacts were also found and interpreted as goods traded from Iron Age communities further north (D. Miller & Webley 1994). The open-air site of Bloeddrift 23, dated at 355 ± 15 BP (A.B. Smith *et al.* 2001), also contains an important concentration of sheep bones. Its lithic industry is also made on quartz and only one backed bladelet was found together with polished schist, hammerstones and grindstones. The category 'flaked chunks' might correspond to cores, but we do not have more information on the technology. Between around 800 and 300 BP, other assemblages with sheep remains, such as Bethelsklip, contain lithic industries with scrapers, segments and backed pieces (Webley 2007). Overall, however, there is too little information given on the lithics to be able to discuss if these pastoral-like sites have a similar lithic technology than the other ones.

In sum, the lithic assemblages of the Northern Cape share similarities with Wilton industries but have some distinct regional differences, perhaps linked to specific raw materials like quartz.

b. In the arid and semi-arid mountains of Namibia

I now consider assemblages from north of the Richtersveld. Archaeologists have established the LSA sequence of Namibia and worked on the arrival of pastoralism in the area (Kinahan 1989, 1991; Richter 1995; Breunig 2003; Vogelsang, R. & Eichhorn 2011; Pleurdeau *et al.* 2012).

Richter (1995) recognises four phases from 3000 BP to present (Fig. 1.37): C2 (3000 – 2000 BP and contemporaneous with the end of the Wilton); D (2000 – 1000 BP concurrent with the Ceramic Wilton); E (1000 – 500 BP corresponding to the Early Iron Age); and F (500 – 0 BP, which he refers to as the ‘Brandberg Culture’).

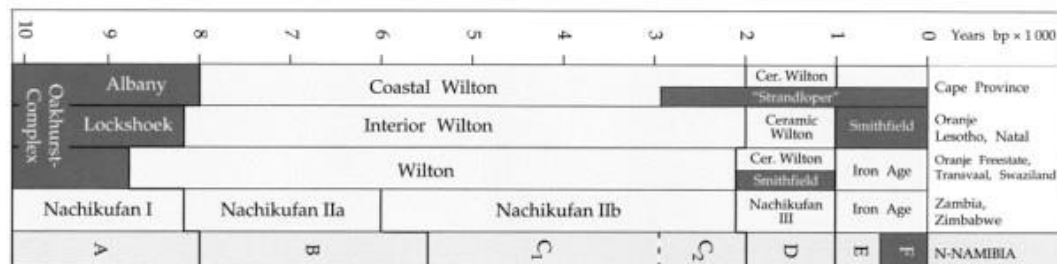


Figure 1.37. Namibian, Zambian and South African LSA sequences, in Richter (1995)

Richter's phases are based on the fluctuation of lithic artefact types, ornaments, the presence/absence of ceramics and rock art. It is interesting to note that, in his figure summarising the successive changes appearing for all the whole archaeological material (rock art included), lithics typology is fairly consistent, although tool-type frequency differs (Fig. 1.38). A whole variety of microliths seem to occur, including single or double backed segments, backed bladelets, trapezes and truncated blanks. Different scraper sizes also seem to occur.

Stone tools (1 symbol = 2 %)	Ornament made of ostrich eggshell and shale, bone points, ostrich eggshell containers, grinding implements, pottery	Rock paintings	Rock engravings	
"BRANDBERG-KULTUR"				F
				E
				D
				C ₂
				C ₁

Figure 1.38. Archaeological sequence of the Brandberg (Namibia), in Richter (1995)

The LSA phase C is mainly microlithic, with a few proportions of large or heavy-duty tools. It is also noted that geometric microliths are more widespread in desert areas than in less arid inland-savanna areas. Part of the variation in stone tool typology is explained by Richter in terms of the different characteristics of the environment, offering more or less resources to peoples, and leading to different occupation types. For instance, rain-catching areas, such as the Erongo mountains, would have been a place of more permanent settlement for people practicing different ranges of activity. Desertic places, such as where the site of Messum 1 is located (Richter 1984), however display a narrower range of lithic artefacts, mainly composed of microliths, echoing more specialised hunting activities. The subsequent LSA phase D corresponds to the introduction of sheep and pottery. The phase E may correspond to shifts into the rock art (with appearance of engraved spoor).

The most recent in Richter's sequence is phase F and corresponds to what is called the 'Brandberg Culture' (Breunig 2003 following Viereck 1967) The term refers to

archaeological sites located in the Brandberg area, dated from around 500 BP onwards. Sites in this phase are considered to be the last in which stone tools occur (Jacobson 1977). The sites on which Breunig and others define this ‘culture’ are open-air abandoned settlements (stone huts and enclosures), some of which still conserve build wood-structures (Breunig 2003). Macrolithic tools, specific pottery types and other kinds of objects, such as stone pipes or European artefacts, are associated with these occupations. Breunig (2003) links the Brandberg Culture with the Damara people occupying the area during the colonial period (A. Inskeep 2003, see Barnard 1992 for more information on Damara). Nevertheless, the ‘Brandberg Culture’ terminology is not kept by Kinahan (1989, 1991) who argues that the chronology and definition of this phase is not yet certain. The appearance of stone huts and enclosures, some of them carrying evidence of stock presence, is rather referred to as a ‘pastoral phase’ by Kinahan (1989). According to him, this phase is concomitant with a desertion of rock shelters.

Overall, the lithic assemblages of Namibia that date between 3000 BP and AD 1000, associate microlithic and macrolithic components. In the Hungorob Ravine, the sites of Falls Rock Shelter (4000 to 700 BP) and Snake Rock Shelter (4000 to 1600 BP) have a lithic industry mainly made of basalt and hornfels. The retouched artefacts, dominated by scrapers and followed by backed tools including segments and points, are made on finer raw materials including crystalline quartz (Kinahan 1989). At the site of Leopard Cave, small segments are also made of quartz (Pleurdeau *et al.* 2012). Macro-tools in basalt are also common at Leopard Cave and also in surface sites of the area (Guillemard in unpublished field report 2017). The lithic technology of basalt is oriented towards the unidirectional production of flakes on slabs, thick flakes or reoriented blocs (Fig. 1.39). Bipolar percussion is used on quartz. The absence of a bladelet production and the emphasis on non-microlithic flake production differs from what is observed in Wilton industries.

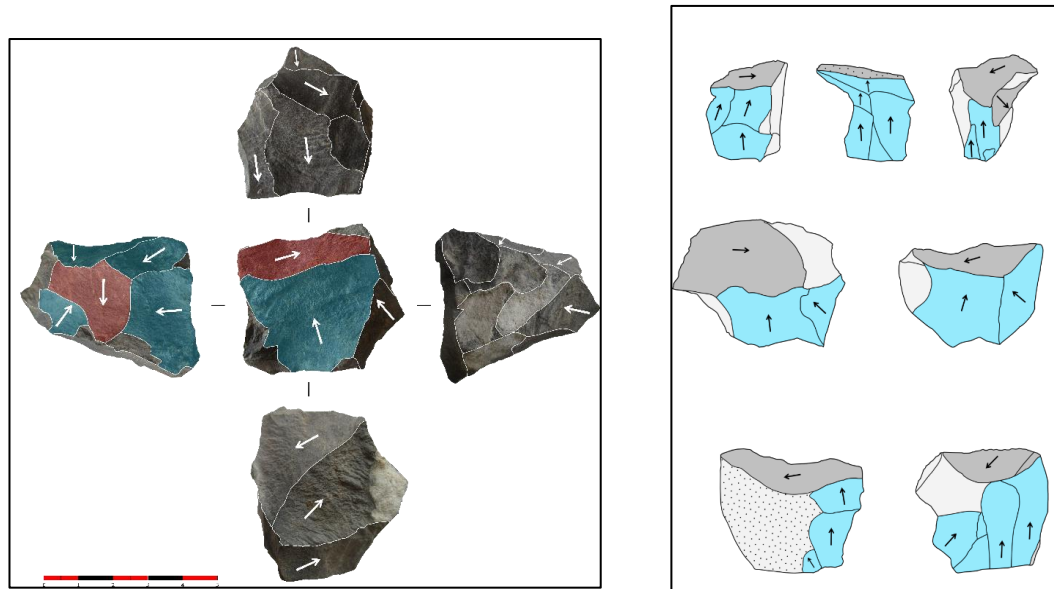


Figure 1.39. Leopard Cave's core (left) and flakes (right), Guillemard in field report (2017)

An interesting component of some Namibian microlithic assemblages is the rather discrete presence of trapezes in some sites, such as at Oruwanje 95/1 (Albrecht *et al.* 2001) and Messum 1 (Richter 1984). This tool type occurs very rarely in South Africa, with the exception of some sites in the Northern Cape.

1.8. Scrapers and backed pieces in late Holocene microlithic assemblages

As noted in the preceding sections, small scrapers and backed pieces are widespread in southern African late Holocene microlithic sites (e.g. J. Deacon 1984a). Typological variations however exist in different areas of southern Africa, and it is to this day not clear if these variations echo 'regional traditions' or if they correspond to the varied ways in which these artefacts have been classified. As we have seen, J. Deacon's classification is the most used in southern Africa, and especially in South Africa. However, further north, Walker and Clark's classifications are used. Some authors have also used terms outside of these three systems in order to describe specific artefacts, often 'in-between' classic types. In the next two sub-headings under this section, I discuss the classification diversity for the scrapers and backed pieces.

1.8.1. Scrapers

In the preceding review of late Holocene southern African industries, I noted that small scrapers are widespread in different areas of the region. Although small end-scrapers, such

as ‘thumbnail scrapers’ (Clark 1959), are seen as characteristic artefacts of the Wilton, few studies have drawn attention to their intra- and inter-site variability. In addition, different terminologies have been used to describe these artefacts, creating some confusion. For instance, descriptors relating to size (J. Deacon 1984a), morphology (Humphreys & Thackeray 1983) or shape that draw analogies with either modern tools or anatomical features (e.g. ‘duckbill scraper’, Goodwin & Van Riet Lowe 1929) are commonly found in the literature. Noting this variety, we could ask if these scrapers might correspond to the same tool. This question becomes particularly relevant to the late Holocene, during which an increase in the regional variability of the lithic assemblages occurs.

During the late Holocene, scrapers generally dominate the typological corpus of Wilton assemblages. At Balerno Main Shelter, they represent 77% of the total retouched artefact (formal tool) assemblage (van Doornum 2005). Other late Holocene Wilton assemblages document variations in the presence of scrapers that range from 100% of the formal tools to less than 10% (Sadr 2015). For instance, they represent 49% of the formal tools at Tshisiku Shelter (van Doornum 2005), 60% at Rose Cottage Cave (Wadley 2000), 66% at Boomplaas (J. Deacon 1984a) and 89% at Jubilee Shelter (Wadley 1996).

Typologically, Wilton scrapers have at least one convex retouched edge framed by straight sides, divergent or parallel (J. Deacon 1984a). Their microlithic size and overall shape has led to the term ‘thumbnail’ scraper (e.g. Clark 1958), which is still widely used in the literature. Different classification systems of these scrapers exist. As we have seen, J. Deacon (1972, 1984a) proposes three scraper types: small (<20 mm), medium (20–30 mm) and large (>30 mm). Within her analytical system, size variation is a way to highlight the microlithisation of the lithic industries. Humphreys and Thackeray (1983) employ a typology inspired by J. Deacon (1972). They classify scrapers using the retouched area as the “*most useful reference point for measurement*” (Humphreys & Thackeray 1983: 307). Morphological types are defined following the length/width ratio, regardless of the technological orientation of the piece. They integrate other data, such as the position of the retouch, its extent and the overall shape of the scrapers. A variety of morphological types are created, such as ‘parallel end-scrapers’ or ‘double side-scrapers’.

Within the Wilton scraper category, different sub-classes are sometimes recognised and isolated by authors who follow various terminologies. One of these sub-classes is ‘scraper-adze’, referring to scrapers characterised by the shaping of one or both of their sides (e.g.

van Doornum 2005). This terminology is particularly confusing as it implies wood-working and is used to describe very different kinds of tools. Furthermore, the fact that the retouched sides of the scrapers may have been used as an active part to work wood is not demonstrated by use-wear analysis.

Van Doornum (2005: 207) uses the term “*scraper-adze*” for scrapers “*with one or both of the lateral edges steeply flaked with adze-retouch*”, implying the working of wood. She recognised them at Balerno Main Shelter. In Rose Cottage Cave, end-scrapers with lateral “*adze-wear*” are mentioned and linked to wood working (Wadley 2000: 93). A similar association between side retouch and wood working is made by Cable *et al.* (1980: 14) for Byneskranskop 1, and by van der Ryst (2007: 134) for scrapers “*with adzing*” from Olieboomspoort. Adze-like terminology is also used for different tool morphologies. Webley (2001: 52), for example, uses the term “*adze-scraper*” to describe a tool with two opposite retouched areas. At the site of Likoaeng (Lesotho) “*scraper-adze*” is used for a large scraper with lateral use-wear (Mitchell *et al.* 2008: 8; Mitchell 2009). Mazel also uses this terminology for large scrapers from the site of eSinhlonhlweni Shelter (Mazel 1986a: 428).

Similarly described artefacts with lateral retouch, called ‘Woodlot scrapers’, also occur in older contexts (9 000–7 000 BP) in the Drakensberg area and its surroundings (Opperman 1987; Mitchell 2000). Woodlot scrapers are reminiscent of ‘duckbill scrapers’ (Mitchell & Arthur 2014). The lateral retouch of scraper-adzes is often described as ‘adze-retouch’, or ‘adzing’ (e.g. Thorp 1997: 240; Wadley 2001: 169; Klatzow 2010: 59), and is associated with wood-working, though no conclusive demonstration has yet been published. The main alternative to this interpretation hypothesises the transformation of the laterals of the scrapers as a way to shape and calibrate their width to facilitate their hafting. This hypothesis has been proposed for the southern African Wilton (H. Deacon 1976: 58; Binneman 1982: 212 cited in Mitchell 2000; Malan pers. comm. in Schweitzer 1988: 48; Brooker 1989: 24) and also at a worldwide scale (Nissen & Dittmore 1974; Gallagher 1977; Rule & Evans 1985; Shott & Scott 1995).

Another sub-class of Wilton scraper is called ‘backed scraper’ and corresponds to pieces with a backed area opposed to the retouched area. These tools have been recognised in the Limpopo River Basin (Walker 1998a; van Doornum 2005), in the South African interior (Mazel 1989b; van der Ryst 2007), and also in the Northern Cape Province (Dewar 2008;

Orton 2012) and further south (Parkington *et al.* 1980; Schweitzer 1988; A.B. Smith *et al.* 1991; Manhire 1993). When identified, backed scrapers generally compose a low percentage of the scraper assemblage (e.g. 9% at Olieboomspoort) (van der Ryst 2007), but have been reported to be as high as 30% in sites in the Northern Cape (Orton & Halkett 2010; Orton 2012). Their function is disputed, and these pieces are alternatively classified within the scraper or the backed tool category. Van Doornum (2005: 205) defines them as “*an end or side scraper that has been backed or blunted on the margin opposite the scraper retouch*”. For Schweitzer (1988: 51), they represent a typological intermediate between segments and scrapers.

This focused overview of late Holocene scraper terminologies highlights the fact that archaeologists have not repeatedly and consistently used similar criteria for description. Although J. Deacon’s classification system is the most commonly found in the literature, the proliferation of terms is symptomatic more of the variety of perspectives embraced by researchers than of lithic variations themselves. As a result of the use of different terminologies and classification systems, it is presently difficult to compare scraper assemblages from different sites and to discuss the significance of this functional class in terms of diachronic distribution and spatial variation. We are left with two main questions. Do Wilton scrapers form one single category of tool or several? What are the main factors behind their variability? These aspects will be discussed in the frame of this thesis, in relation to the analysis of the manufacture, life history, and function (e.g. Rigaud 1977; Shott & Scott 1995; Conard *et al.* 2012; Porraz *et al.* 2016; Porraz *et al.* 2018) of scrapers in the BMS lithic assemblage.

1.8.2. Backed pieces

I now come to the classification diversity of Wilton backed pieces. Microlithic backed pieces are also a common feature of the southern African Holocene lithic industries, especially from around 8000 BP. These are classified as different types depending on the authors and local contexts.

As is the case for the scrapers, J. Deacon’s (1984a) typology has been followed by most researchers in South Africa, resulting in a focus on segments, backed bladelets and backed points. It is, however likely, that the quasi-absence of triangles and trapezes in South Africa results from a lumping of these types with segments. This is visible in Fig. 1.23, which shows the segments as recognised by J. Deacon: significantly, we can see that triangles are

also observable. However, as seen above, the discrete presence of trapezes and triangles is noted in the Northern Cape (Orton & Halkett 2010). In other areas of southern Africa, a more varied backed tool typology has been discussed for the Holocene. In the Matopos of Zimbabwe, a broader variety of backed artefacts has been recognised, including triangles, trapezes and tranchets (see Fig. 1.40; Walker 1995a; Maenzanise 2018). In the Nachikufan, Clark (1950, 1959) also recognised a more varied backed artefact typology. Several authors also note that high proportions of backed tools in LSA assemblages tend to occur in sub-equatorial Africa, as opposed to the southern margins of Africa where scrapers generally dominate the retouch artefact category (J. Deacon 1984b; Sadr 2015).

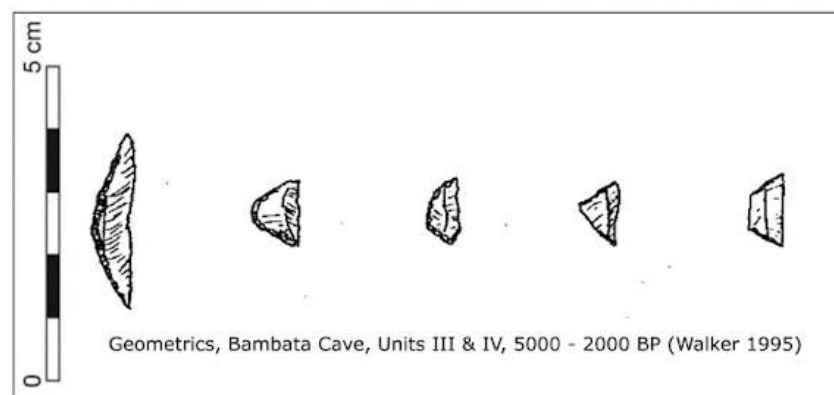


Figure 1.40. Geometrics from Bambata Cave, in Walker (1995)

Other terminologies, such as ‘backed bladelet’ or ‘backed point’, may also be used for different artefact types. In particular, the meaning of the ‘backed bladelet’ terminology appears unclear, as it seems to cover a broad variety of backed artefact types. In Fig. 1.41, showing some artefacts identified as ‘backed bladelets’ by van Doornum (2005), we see both pointed and non-pointed artefacts, segment-like backed pieces, and what could be qualified as a ‘backed point’.

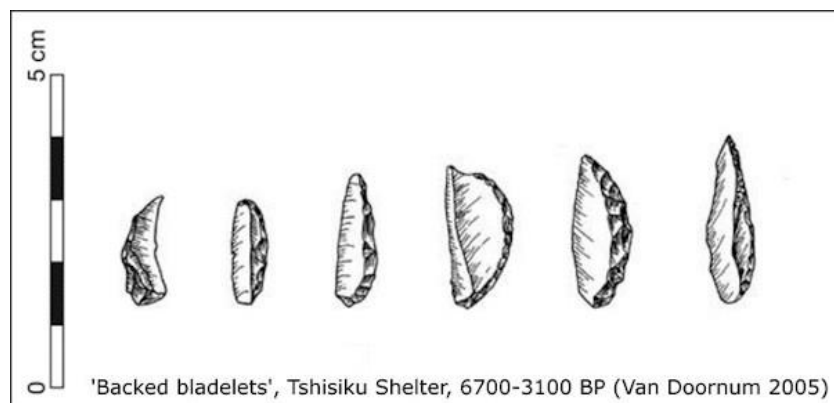


Figure 1.41. Backed bladelets, in van Doornum (2005)

Trends in backed artefact type frequencies are also observable during the Holocene. A strong proportion of segments and backed tools is typologically associated with the Classic Wilton phase (J. Deacon 1984a). Segments are particularly well-represented (more than 50% of the backed piece assemblage) between around 8000 and 5500 cal BP in and around the Maloti-Drakensberg (Guillemard & Witelson in prep; Mitchell 2000; Wadley 2000); as well as further south (J. Deacon 1972, 1974; Wadley 1986, 2000). In some sites, assemblages with strong proportion of segments are identified much more recently, including for the late Holocene (Wadley 2000).

In the next section, I will review some of the typological changes occurring within Wilton industries from the Classic to the Post-Classic Wilton. As we will see, shifts occur in some areas in backed piece typology, that could be associated with the appearance of new tool types.

1.9. From ‘Classic’ to ‘Post-Classic’ Wilton in the interior of southern Africa

Different authors have suggested a typological shift from the mid- to the late Holocene in Wilton assemblages. This shift, corresponding to the passage from Classic to Post-Classic Wilton would be visible in different areas of South Africa, including its southernmost margins and the interior of the country, in and around the Maloti-Drakensberg mountains. The following discussion is extracted from a co-authored article in preparation which reviews the typological shifts occurring in the backed piece typology of the Maloti-Drakensberg mountains and surrounding areas (Guillemard & Witelson, in prep). Tables and a detailed discussion will be available in the published article.

Trends in backed piece typology are indeed visible through the Wilton, and especially at the shift from Classic to Post-Classic Wilton. During the Early Wilton, backed pieces start occurring in rather high proportions in the total retouched assemblage (e.g. 22% at Tloutle, Mitchell 1993, 2000), through to the Classic Wilton (e.g. 19% at Rose Cottage Cave, Wadley 2000, and 12% at Sehonghong, Mitchell 1996b). Some Post-Classic Wilton assemblages continue to have high proportions of backed artefacts, in particular before 3500 BP (e.g. 32% at Diamond 1, Mazel 1984a). After 3500 BP, however, the backed piece proportion is low at most sites (e.g. 5% at Sehonghong, Mitchell 1996a).

Beyond these fluctuations in the proportion of backed pieces, typological shifts appear. While segments were favoured during the Classic Wilton between around 7500 BP and 5000 BP, backed points and backed blades/bladelets become more widespread during the Post-Classic Wilton (J. Deacon 1972, 1974, 1984a; Wadley 1986, 2000; Mitchell 1993, 2000, 2009). This trend is chronologically visible from the site of Diamond 1, in layers dated at 5740–5334 cal BP (Mazel 1984a), through the late Holocene. Assemblages in which segments are still dominant however continue to occur, especially in sites with long sequences of occupation such as at Rose Cottage Cave (Wadley 1992).

The typological variability observed during the late Holocene in and around the Maloti-Drakensberg area could be explained by different factors, such as style preferences or site function (Parkington *et al.* 1980). This review follows Wadley's (2000) interpretation which, highlights the existence of chronological trends, but also more 'site-specific' trends. Many of the Post-Classic Wilton sites with a more diversified backed tool typology indeed do not have earlier occupations. It is, therefore, possible that the typological variability existing in the Post-Classic Wilton may also correspond to the appearance of many 'smaller' sites that may have served different functions or activities.

These typological shifts also occur together with other broadly simultaneous technological trends. As Wadley (2000) notes, it is from around that time that bifacially retouched pressure-flaked bladelets, as well as tanged and barbed arrowheads, appear in this area (Humphreys 1991; Mitchell 1999; Smeyatsky 2014). These artefacts are held to appear from around 3000 BP. Their morphological variations are discussed by different authors (Humphreys 1991; Mitchell 1999; Close & Sampson 1999; Smeyatsky 2014; Bradfield & Sadr 2011). Most of the tanged arrowheads are found in the Orange River Basin (Smeyatsky 2014), although others have been recorded in Lesotho, such as at Likoaeng (Mitchell 2009, see Fig. 1.42) and in coastal contexts (Nelson Bay Cave – Inkseep 1987).

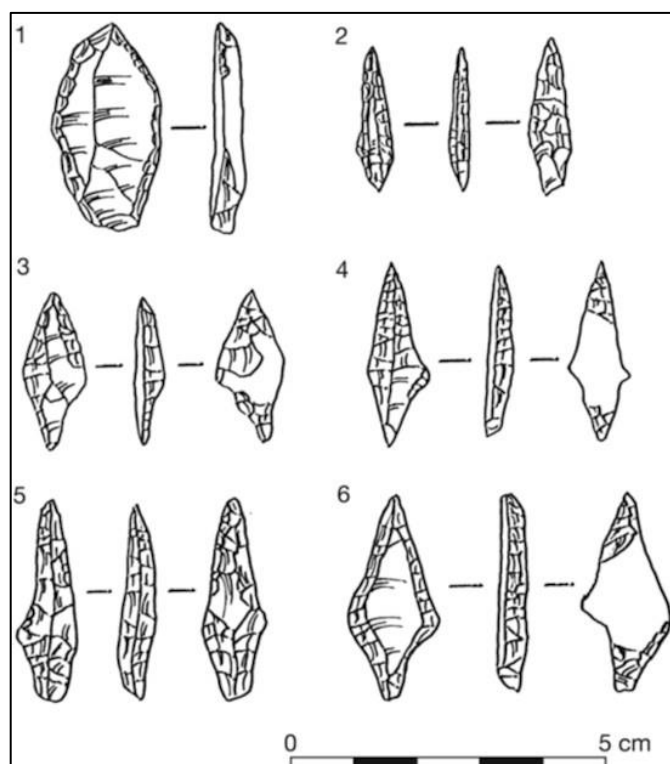


Figure 1.42. Bifacially pressure-flaked points and tanged arrowheads from Likoaeng, in Mitchell (2009)

Smeyatsky (2014) conducted a morphological analysis of these arrowheads and demonstrated that the sample he looked at “*cluster according to their shape attributes*” (Smeyatsky 2014: 31), based on differences between the tang length. Two main groups are individualised, the western Cape group and the middle Cape group which includes sites in eastern Lesotho and eastern Orange River Basin. Smeyatsky hypothesises that the tang length distinction might be due to differences in hafting more than stylistic variations. He further demonstrates that the previous typologies overlap and are therefore not valid. He also notes that there are still uncertainties about the time-range in which these artefacts occur, as many of them are found in undated or uncertain contexts (Smeyatsky 2014). Some of these tanged arrowheads are also directly associated with layers containing pottery, such as at Likoaeng (Mitchell 2009).

Backed pieces are of particular interest to the Wilton because they may reflect activities that are related to hunting practices. If, and this is still largely to be demonstrated, the backed pieces found in these sites from the greater Maloti-Drakensberg area were part of projectiles, a shift in typology may reflect a shift in hunting technology. It is interesting to note that it is also from around 3000 BP that new artefact types, most likely hafted axially,

appear: tanged arrowheads and pressure-flaked points. Together with techno-typological changes, there may, therefore, have been changes in the making of projectiles (most likely arrows), and how backed tool implements were hafted. Although attractive, this hypothesis will nevertheless need to be thoroughly tested in the future. Thus, the rate of change in the lithic register from the Classic to the Post-Classic Wilton in the interior of southern Africa and the reasons behind it are still being investigated and understood.

1.10. Synthesis: Mid- to late Holocene lithic industries of southern Africa

The preceding review of southern African lithic assemblages dated from the mid- to late Holocene give an initial impression of the existing regional variations. We are still, however, faced with some challenges when trying to represent different lithic traditions at a large scale. The use of different and non-harmonised terminologies, as well as an overall lack of lithic drawings in publications make inter-site comparisons difficult. The lumping of different types in one category, such as triangles in segments or truncated blanks in backed bladelets, is also a problem when trying to establish the geographical distribution of some typological features. Lastly, the scarcity of technological information on late Holocene LSA lithic industries is limiting.

Overall, one of the main aspects of variation observed in mid- to late Holocene lithic assemblages concerns backed piece typology. At least five types occur in different areas: segments, triangles, trapezes, double segments, backed bladelets and tanged arrowheads. We saw that segments are the most common Wilton retouched artefact, and is seen as its major *fossile directeur* (Parkington *et al.* 1980). It occurs in variable proportions in all of southern Africa, at sites with or without associated bladelet debitage or scraper-making. Triangles are difficult to typologically isolate, as they were not always identified separately from other types. They occur, however, in Zimbabwe (Walker 1995a) and Zambia (Clark 1950; 1974), as well as in the western part of southern Africa in both Namibia (Richter 1984) and the Northern Cape (Orton 2012). The absence or rarity of triangles in the interior of South Africa may be due either to the fact that archaeologists did not isolate them from segments or that this type is not well-represented in this area.

Another aspect of variation is that double segments or crescents could also be scarce in the interior of South Africa, whereas they seem more common in the western part of southern Africa (Richter 1995) and Botswana (Brooks & Yellen 1977). However, a typological link

might exist with what is called ‘backed scrapers’ (Schweitzer 1988) which are more common in South Africa. Therefore, it is not easy to assess the geographical distribution of this type of artefact. Backed bladelets, on the other hand, are widespread in southern Africa, especially from the Post-Classic Wilton, but their inter-variability remains to be explored (J. Deacon 1984a).

Trapezes are of interest as they seem to be almost absent from the South African Wilton, whereas they appear to be widespread in Zambia in the Nachikufan (Clark 1950) and Kaposwa Industries (Clark 1974), as well as in the Matopos (Walker 1995a) and north-eastern part of Zimbabwe (Burett 2003). In these areas, trapezes occur at or before 6000 BP, and continue to appear through the late Holocene. Very few sites outside of these areas have trapezes recorded in their assemblages, and all are located on the western half of southern Africa: Toteng 1 (Robbins *et al.* 2008), Oruwanje 95/1 (Albrecht *et al.* 2001), Messum 1 (Richter 1984), Reception Shelter (Orton 2012) and Jakkalsberg L (Orton & Halkett 2010). Most of these geometric artefacts may be associated with dates between around 3000 BP to 500 BP (Table 1.5). However, the chronology is quite challenging to estimate for several reasons, including the lack of information relating artefacts and layers, undated layers, and few dates overall. The distribution of trapezes could partly overlap the one of triangles and double segments.

Site	Layer	Date (BP)	Date cal. BC/AD	Reference
Jakkalsberg L	x	3330±70	1743-1421 BC	Orton & Halkett (2010)
Reception Shelter	8-9A	1897±25 ; 1840±26	AD 81-231; AD 129-336	Orton (2012)
Messum 1	D, C & A	2820±55 to 860±55	1081-809 BC to AD 1047-1293	Richter (1984)
Oruwanje 95/1	x	11760±60 to 530±37	11771-11485 BC to AD 1399-1456	Albrecht et al. (2001)
Toteng I	SQ1: 110-115	>1560±60	AD 419-643	Robbins et al. (2008)

Table 1.5. Sites, dates and layers associated with trapezes in the western part of southern Africa

The tanged and barbed arrowheads representing technological changes in the sequence seem to be limited to the interior of southern Africa, and appear only recently in the archaeological sequence (e.g. Smeyatsky 2014). They may correspond to the emergence of new hunting-practices at that time.

The variation of lithic types such as scrapers and adzes in southern Africa, is difficult to estimate. Small thumbnail scrapers seem to be widespread, whereas bigger scrapers may be found in the interior of the country (Sampson 1974; Mazel 1986). Adzes and spokeshaves appear to be more represented in the eastern part of southern Africa, whereas

they are rarer in the Northern Cape and Namibia (J. Deacon 1984a; Richter 1984; Orton 2012).

Few is known about the technology of the Wilton lithic industry, and what variations or other techno-complexes can be seen. Overall, what is highlighted is the occurrence of bipolar debitage and bladelet production, as well as the general microlithism of the Wilton assemblages. Pyramidal, single-platform, multi-platform and radial cores are also cited in different contexts. The use of the punch-technique is also mentioned in some areas, including South Africa, although further experimental studies would be necessary to confirm these observations (Parkington & Poggenpoel 1971; Clark 1974; Humphreys & Thackeray 1983). Although it seems clear that technology differs from place to place, future studies will have to investigate further these different aspects.

In the next section, I present a review focused on the phenomena of change and stability seen in hunter-gatherer societies through the late Holocene, by considering a wider array of archaeological studies, including lithics.

1.11. Changes and stability through the late Holocene

From the typological description of southern African lithic industries, we understand that regional variations occur in late Holocene lithic technologies. As noted in the reviews in earlier sections of this chapter, the appearance of pottery and sheep in the region might correspond to different scenarios regarding the modes of arrival and integration of these elements and practices. However, the introduction of these new elements is generally not clearly associated with a shift in the lithic technologies. Following this idea, J. Deacon states that

The overall impression is that pottery and domestic stock were added to the pre-existing Stone Age tradition and that there is continuity in the range of stone tools made in each region. (J. Deacon 1984b:269)

In the next sections, I review scenarios of transition that took place in different areas of southern Africa. The main shifts observed in hunter-gatherer societies concern changes in settlement patterns (e.g. Forssman 2014a), increased or decreased mobility (e.g. S. Hall 1990), changes of the diet (e.g. Parkington 2016), and in some cases changes in the

archaeological material (Sadr 2013, 2015). The rate of these changes varies from region to region and seems to correspond to different social processes.

1.11.1. In southernmost Africa

Overall, few changes consistent with the appearance of pottery and sheep are detectable in the lithic industries of the Western and Eastern Cape. However, an ‘intensification’ phase is noted in the Eastern Cape from about 4000 BP. This shift visible at the sites of Edgehill and Welgeluk is characterised by a more intensive exploitation of different resources such as freshwater mussels, and the development of storage pits. According to S. Hall (1990), this trend would go together with increased sedentism of hunting-and-gathering populations at that time. Instances of storage pits in the archaeological record also precede the appearance of sheep and pottery in this area. It is the case at Boomplaas Cave where storage pits made to conserve oil-rich fruits were present in the layers preceding what the authors call the ‘herder phase’, associated with a dung layer (H. Deacon *et al.* 1978, H. Deacon 1979). This practice disappears in these dung layers, when the oil-rich seed resource is believed to have been replaced by sheep fat. Storage pits also occur at the site of Melkoutboom (H. Deacon 1976), as well as in Welgeluk (S. Hall 1990). According to S. Hall (1990), this intensification and manifestations of storage practice may have opened the path for the adoption of food production in this region.

In the Western Cape, near Elands Bay Cave, Parkington notes changes in hunter-gatherer settlement patterns due to the arrival of pastoralists (Parkington 1972, 1984, 2006; Parkington *et al.* 1986). According to Parkington *et al.* (1986: 314), the appearance of pastoralism in this area from around 1600-1800 years ago would have caused stress for local hunting-and-gathering populations which is “*fundamentally at odds with the accumulative, possessive ethic of stock and land owners*”. They see a change in the settlement patterns after the appearance of pottery. The coastal (or near-coastal) megamiddens dated between 3000 to 1800 years ago become smaller and are associated with more varied food remains. Following Parkington *et al.* (1986)’s models, hunter-gatherers would have started to settle in other areas to avoid incoming pastoral populations, also resulting in an increased mobility (Parkington *et al.* 1986; Parkington 2016). Changes in the diet are also interpreted as social and environmental changes that restricted settlement options (Parkington 2016). These shifts are believed to be particularly visible from around 1400 years ago. However, few changes in the lithics are noted, such as at the site of Tortoise Cave where the frequency of retouched artefacts (including scrapers, backed pieces and

adzes) differs around 1700 BP after the appearance of pottery (Jerardino 1995; Parkington 2016).

Subtle changes have also been noticed in the lithic assemblages in the southwestern Cape. Sadr and colleagues detect a progressive change in the lithic industries in the Vredenburg Peninsula (VP) (Sadr *et al.* 1992, Sadr & Gribble 2010; Sadr 2014). According to them, shifts in raw material preferences and tool-type frequencies would have occurred maybe as early as 2500 BC. According to Sadr (2013: 180), “*backed elements (...) were more frequent before 2500 BC, adzes (woodworking implements) were common from 2500 to 500 BC, and (hide-working) scrapers became the ubiquitous tools thereafter.*” Sadr (2014: 56) also notes that the lithic typology of the region shifts from being formal to being more informal, with a lesser range of retouched artefacts including scrapers and adzes, together with a more frequent use of quartz. The timing and intensity of change, however, seem to vary from place to place. For Sadr (2014: 71), these changes would not be associated with the arrival of pastoralists, but rather with the internal dynamic of hunter-gatherer societies:

The archaeological evidence has supported the view that the change from a foraging to a herding way of life on the VP was a gradual event, not an abrupt disjunction caused by a single immigration event. (...) Although some herders may have arrived from outside southern Africa, mainly it must have been the local hunter-gatherers who adopted livestock and a low-intensity herding economy.

The model defended by Sadr in the southwestern Cape, although geographically closer to Parkington’s sites, appears more compatible with S. Hall’s (1990). According to Sadr (2013), ‘true pastoralists’, meaning people organised in a fully pastoral way of life, would be more likely to have emerged in the mid- to late second millennium in the Cape area. This is also supported by the kraal site of KFS 5 excavated in this area and dated from the mid second millennium (Fauvelle-Aymar *et al.* 2006). Hunter-gatherers adopting livestock are also discussed, notably at the site of Kasteelberg (Sadr 2004) where many sheep were consumed at the end of the first millennium AD.

It is interesting to note that the transition trajectories discussed by both S. Hall and Parkington regarding the introduction of pastoralism are quite different. On the one hand, the model constructed by S. Hall stresses the increased sedentarism and storage practices

of hunter-gatherer societies, which leaves some room for the adoption of food production by hunter-gatherers. Sadr's models (2003, 2004, 2013, 2014) highlights the implication of hunter-gatherers in the development of herding as a succession of gradual change, and as the presence of hunters-with-sheep. On the other hand, Parkington's model fundamentally opposes the way of life and economies of hunter-gatherers and pastoralists.

1.11.2. In and around the Thukela Basin

According to Mazel (1989a), the Thukela Basin started to be intensively populated by hunter-gatherers around 7000 years ago. Mazel noted changes occurring from the mid- to late Holocene. At Nkupe Shelter, for example, he argues that there was an increase in plant food between 4000 and 2500 years ago. He also notices the increase in adze quantities through time, as well as an increase in grindstones. He associates this increase with the growth of female work and food contribution (Mazel 1992a). Between 3000 and 2000 BP, Mazel (1988, 1989a) proposes an intensification of hunter-gatherer occupations. He also notices a strong reliance on small mammals and fish and hypothesises that the hunter-gatherers of that time may have been sedentary. Similar to S. Hall's model, this could have had implications for the involvement of hunter-gatherers in food-producing economies. Mazel however thinks that the introduction of pottery may have impacted hunter-gatherer's plant-food consumption by increasing the range of plants they could exploit (Mazel 1989a).

Several authors have hypothesised that pastoralists were present in KwaZulu-Natal before the arrival of farmers, and that they might also have interacted with hunter-gatherers (e.g. Lander & Russell 2015). Pottery appears around 2000 years ago in the Thukela Basin, preceding by some 400 years the earliest pottery associated with farmers (Mazel 1984a, 1992). According to Mazel (1992), the first thin-walled pottery differs from the first farmer pottery, and might have been made by hunter-gatherers or pastoralists. Farmers would have arrived later in the area and settled in open-air villages where they cultivated crops and kept cattle, and encountered the local hunter-gatherers with whom they interacted. Two sites belonging to the EIA 'Matola' tradition were excavated in KwaZulu-Natal and dated around AD 300 (Maggs 1980). No direct evidence of agriculture was found around these sites, except the presence of bulrush millet. The subsequent EIA traditions dated from AD 500 are characterized by bigger villages occupied by at least a hundred people. According to Maggs, the diet of these people was based on "*agriculture and pastoralism with a little supplementary hunting, fishing and gathering of wild plants and shellfish*" (Maggs 1989: 32).

According to Mazel (1986), farmers and hunter-gatherers did not fight for resources and would have cohabited in peace. He also thinks that this period of contact may have reinforced and expanded relationship between hunter-gatherers: *“It is possible that, while the hunter-gatherers and Iron Age farmers established close reciprocal bonds, these new circumstances may have aroused a sense of insecurity among the hunter-gatherers and caused them to strengthen and widen their social network”* (Mazel 1989: 22). Maggs (1989) also hypothesises that the bone and stone artefacts found at Iron Age sites might be the consequence of hunter-gatherers hunting for the farmers.

1.11.3. In the Limpopo River Basin and surroundings

As we have seen, the appearance of early pottery, such as Bambata ware, and of Iron Age pottery during the first millennium AD in LSA sites is not clearly associated with a reorientation of hunter-gatherer lithics in the SLCA. It was for instance argued for the site of BMS (van Doornum 2005, 2008). According to van Doornum (2005, 2008), the relative isolation of some hunter-gatherer sites, such as BMS, may have limited the interactions with neighbouring farming communities (van Doornum 2005, 2008). Walker (1995), however, notes that south of the Matopos and in the SLCA there is an increase in hunter-gatherer sites after 2000 BP. According to him, it could be the consequence of the arrival of herders in the Matopos that could have caused a hunter-gatherer migration toward the SLCA. An increase in hunter-gatherer sites after 2000 BP was also noted in eastern Botswana (Campbell *et al.* 1994; Walker 1994, 1995a, 1998a), and more generally in northern South Africa (Mason 1962; Van der Ryst 1998, S. Hall & B. Smith 2000).

After the arrival of farmers, and especially during the second millennium AD, a new social landscape appeared, involving interactions between hunter-gatherers, herders, and agro-pastoralists (Wadley 1996; Forssman 2014a; Mitchell 2002; van Doornum 2005; S. Hall *et al.* 2015). It has been argued by Forssman (2014a) that hunter-gatherer settlement patterns changed during the second millennium AD: rock-shelters being abandoned in favour of open-air camps closer to farmer settlements (Forssman 2014a). Following his model, this shift would have happened at least from around AD 1000, and would have stopped around AD 1300 after the end of the occupation of Mapungubwe. After this date, hunter-gatherer sites become almost inexistent, suggesting an integration of hunter-gatherers into farmers communities and/or a movement of hunter-gatherers outside the area (van Doornum 2005). Forssman develops his argument using Alexander’s (1984) notion of ‘moving frontiers’.

Four phases are discussed from around AD 350: the first moving frontier, the second moving frontier, static frontier and consolidating frontier (Table 1.6).

Date	Van Doornum (2005)	Lombard <i>et al.</i> (2012)	J. Alexander's (1984)
10,000 - 5000 BC	Early pre-contact	Oakhurst	NA
6000 - 2000 BC		Wilton	
2000 - 1220 BC		Final LSA	
1220 BC - AD 350	Late pre-contact	Final LSA / Ceramic final LSA	First moving frontier
AD 350 – 900	Early contact		Second moving frontier
AD 900 – 1010	Zhizo period		Static frontier
AD 1010 – 1300	Leopard's Kopje period		Consolidating frontier
AD 1300 – 1600	NA		European period
From AD 1600	NA		

Table 1.6. Model of 'moving frontiers' in the SLCA, in Forssman (2014a)

Forssman argues that during the first and second moving frontier, corresponding to the Early contact of van Doornum (2005) and the Zhizo period (Huffman 2007), there was a continuity in the hunter-gatherer way of life, although there may have been in some cases an intensification in terms of production, reflecting an increase of the population especially during the second moving frontier. At a different site, there also is a gradual increase in scraper frequency and a decrease in backed tools (van Doornum 2005). It is only during the static frontier period, from around AD 1000, that settlement patterns changed, and that hunter-gatherer productions tended to fade away. Forssman (2014a: 52) writes that it is a period: *"where the previously innocuous changes in the forager record gave way to wholesale shifts in forager identity, ideology and material culture"*.

Further hypotheses evoked by Forssman (2014a) could be formulated to explain the progressive disappearance of hunter-gatherer 'signatures', such as an assimilation into agro-pastoral communities, migrations outside the area, or an archaeological bias. During the 'consolidation frontier', after Mapungubwe is abandoned, he proposes that there would have been:

increasing warfare, the intensification of technologies such as those involved in agriculture, population restriction, consolidation of symbiotic relations between foragers, herders and farmers, encapsulation and, significantly, the disappearance of the forager language and culture. (Forssman 2014a: 56: see Lane 2004).

Forssman (2014a), however, found evidence of hunter-gatherer presence within the last 400 years in Kambaku Camp site where he interprets the presence of lithics as hunter-gatherers living in a farmer homestead, an interpretation that is significant given historical accounts of Bushmen living as part of the farmer economy (Elton 1872; Dornan 1917; see Forssman 2014a for discussion). Schoeman (2006a, 2006b) also proposes that hunter-gatherers were part of farmers' rain-control rituals. S. Hall & B. Smith (2000), in their study of Little Muck Shelter, argue that the site was used for the fabrication of artefacts such as scrapers and OES beads for trading hide and other goods with neighbouring farmers.

As noted already, rock art studies highlight the appearance of the 'new' Geometric Tradition (B. Smith & Ouzman 2004; Eastwood & B. Smith 2005) which might have appeared as early as 2000 BP. However, there are still many uncertainties about the chronology and the authorship of this art. Its development, as well as the presence of 'cross-cultural' motifs such as aprons (Eastwood 2003) may be the sign of a restructuring of different groups of people, including hunter-gatherers, around shared practices and beliefs.

In south-eastern Botswana, at the sites of Thamaga, the transition from hunting-and-gathering to food-producers is visible (Sadr & Plug 2001). This shift, occurring during the contemporaneous LIA, is accompanied by a drop in the stone tool production and an increase in Iron Age pottery sherds and in domestic stock remains. The presence of domestic stock in these LSA sites is for the authors associated with social relations with the surrounding Iron Age settlement. Based on the drop of small-sized animals associated with the appearance of sheep, the authors formulate the interesting hypothesis that sheep replaced part of the fauna of which meat was not shared, such as has been observed in modern contexts (L. Marshall 1976). Sheep would, therefore, have been easily integrated into the social and cultural background of these hunter-gatherers, who would have continued to hunt larger game in parallel. Sadr & Plug conclude: "*By continuing to hunt large and medium game, the people could have maintained the socially important rites of sharing meat even as the individual ownership of domestic stock was becoming economically more important*" (Sadr & Plug 2001: 81). A similar integration of sheep through contact with neighbouring Iron Age communities is proposed for the site of Makwe in Zambia where livestock dated to the first millennium was found in an LSA context (Phillipson 1976; Sadr 2008a).

Still in south-eastern Botswana, 'Iron Age' pastoral sites, also practicing agriculture, emerged from the 9th to the 13th century during a phase called the Toutswe Culture (Denbow 1979, 1984; M. Hall 1987). Different hierarchical levels would also have existed between these sites (Denbow 1984). According to M. Hall (1987), the development of this herding economy would be linked to the parallel expansion of Mapungubwe: "*the rise of centres of power in a tributary mode of production was part of the process of state formation taking place lower in the Limpopo River system*" (M. Hall 1987: 88). Following his idea, the stock-surplus produced in the Toutswe sites would have been transferred to Mapungubwe, and the end of the production, perhaps due to an over-exploitation of the land, could have participated in the fall of the capital.

1.11.4. In arid and semi-arid environments: Northern Cape and Namibia

In Namibia, few changes seem to occur in the archaeological sequence before and after the introduction of pottery (Kinahan 1989, 1991; Breunig 1989; Richter 1991; Lenssen-Erz & Vogelsang 2005). This is noted by Kinahan (1989) who compares the pre-pottery and pottery layers at Falls Rock and Snake Shelters and does not see changes in the archaeological materials or faunal assemblages. It is only later, from what he calls the 'Pastoral Phase', that changes in the archaeological materials and settlement pattern occur, leading to the recent appearance from around 600 BP onwards of stone huts and enclosures in the landscape. A similar sequence is described in the !Khuseb Delta, with the appearance of shell middens as early as around 1800 BP. Part of these middens, especially when associated with amphora-like pottery, are considered a local expression of the pastoral phase recognised in the Brandberg. The people associated with these middens would have relied on shellfish and !nara melon. Kinahan concludes that in the Hungorob ravine and !Khuseb Delta, "*almost a full millennium passed before domestic stock also formed part of the subsistence economy, which shows that the pottery must have moved more quickly into the hunters' possession, having no apparent consequences for the social order*" (Kinahan 1989:146). In this significant and noteworthy case, pottery and domesticated sheep seem to have diffused at different rates. Kinahan (2001) also advocates for a local adoption of livestock by hunter-gatherers, which integrates them into the dynamics of pastoralism development in the area.

In the Northern Cape, few changes appear in the lithic assemblages after 2000 BP (Orton 2012; Dewar 2008): silica rocks tend to be used less, whereas quartz is more frequently employed. Other typological shifts occur such as the disappearance of backed scrapers after

the BC/AD transition. After 2000 BP, two new ‘groups’ occurred, corresponding with new lithic traditions. Following Orton (2012)’s model, there would have been a coexistence of groups of people with different economies, namely hunter-gatherers, hunter-gatherers with sheep, and herders leaving in a more pastoral way of life.

1.11.5. Further insights

In the interior of South Africa, sites that could be linked to pastoral occupation seem to appear rather late. Sampson (2010) discusses livestock kraals dated from around AD 1000 to AD 1750 in the Seacow Valley (Karoo). Following his model, herders would have arrived in this area from the south and would have co-habited with local hunter-gatherers. Similar to Orton’s (2012) model in the Northern Cape, three economical sets would have developed: herders, hunter-with-sheep and hunter-gatherers. Following Sampson’s work in the Orange River area, changes in lithic assemblages also occur very late, from around the 17th century AD. He calls these assemblages ‘Smithfield’, and he and J. Deacon linked this Smithfield to the ‘Late Smithfield’ recognised by Mason further to the north (Mason 1962; Sampson 1972, 1974; J. Deacon 1972, 1974).

At Wonderwerk and Little Witkrans, in the Northern Cape, there is an overall continuity in the lithics throughout the sequence, and no change was noted in the lithics after the appearance of pottery (Humphreys & Thackeray 1983). A similar pattern is noted by other authors throughout southern Africa. It is for instance the case in the Matopos (Walker 1995a), in Zambia in the Nachikufan (Sampson & Southard 1973; Phillipson 1973), and in other assemblages of the country (Phillipson 1984). On the fringes of the Kalahari, Yellen and Brooks (1989) conclude that the introduction of pottery and arrival of Iron Age communities did not impact greatly hunter-gatherers’ ways of life. Yellen & Brooks do not observe changes in the settlement patterns or in the lithic typology. In other parts of Botswana, a similar more sedentary hunter-gatherer settlement pattern may have occurred. Following Denbow (1986), Mitchell (2002) notes that a focus on aquatic resources in the Okavango Delta may have led to a more sedentary way of life, which could have created a favourable context for the adoption of sheep after 2000 BP.

1.11.6. Synthesis: diverse hunting-and-gathering societies and neolithizations

The different regional transition scenarios just presented reflect the complexity of the social processes happening in southern Africa from around 4000 BP to the second millennium AD. Some trends seem to emerge from this overview. Firstly, it appears that in most cases,

the introduction of pottery around 2000 BP is followed by a relative stability of the lithic technology, diet and settlement patterns of southern African hunter-gatherers, lasting for at least 500 years or more. This is, for instance, the case in Namibia (Kinahan 1989), the Northern Cape (Orton 2012), and in the SLCA (van Doornum 2005, Forssman 2012). At a site-scale, most authors also agree that the appearance of pottery does not echo major changes in technologies and diet, and so confirm J. Deacon's prediction (1984a). The reasons raised by different authors to explain this lack of apparent change after the appearance of pottery, despite the tacit expectation that it should, are interesting. S. Hall's emphasis on the development in the Eastern Cape of more sedentary hunter-gatherer societies practising storage could suggest that a shift to food-production could have been more readily adopted. The presence of mid-Holocene storage pits in other areas (e.g. Walker 1995a), and similar models defended by other authors opens questions about the subsistence diversity existing in hunter-gatherer societies preceding the appearance of pottery and domesticated sheep (Denbow 1986; Mazel 1989a, 1989b;). As noted already, this diversity may have led to different transition scenarios to food-production. Studies focusing on hunter-gatherer and agro-pastoralists relationships also acknowledge the existence of an 'early contact' (van Doornum 2005) or 'first/second moving frontier' (Forssman 2014a) which would not have caused stress on hunter-gatherer societies.

Another interesting trend that we have noted in this chapter, one noted by other authors (e.g. Sadr 2013), is the appearance of change in different aspects of hunter-gatherer societies during the first millennium AD. One of the more unilateral changes seems to be a shift in settlement patterns, as well as the progressive disappearance of the lithic industries (Kinahan 1989; Orton 2012; Forssman 2014a). However, although this seems to be a broad trend, the social dynamics in each place seem to be different. For instance, Forssman argues that the shift in settlement pattern from around AD 900 in the SLCA is due to a progressive integration of hunter-gatherer societies into agro-pastoral ones. On the other hand, Kinahan stresses the late appearance of a 'Pastoral phase', corresponding with the progressive abandonment of rock shelters. In this case, hunter-gatherers turning to a herding economy may have appeared locally.

Overall, archaeological evidence for 'fully' pastoral populations before the second millennium AD is still not visible (Sadr 2013). The emergence process of pastoral economies during the second millennium (or slightly before) is, therefore, still to be understood, and appear to be related to different processes involving different actors. In the

SLCA and neighbouring areas, it seems that the emergence of agro-pastoral economies was one of the main factors of change for hunter-gatherer societies who got involved in new economies of subsistence. In other areas, such as in Namibia, the absence of agro-pastoral societies and the emergence of pastoral populations seem to suggest different social processes. The economic background of hunter-gatherer societies preceding the arrival of other populations would also have an impact on how and at what rate food production may have been adopted.

In sum, no single or universal neolithization process applies equally across all of southern Africa: the differences in regional transition scenarios are a result of social complexities arising from the complex interactions between at least three different source populations and multiple iterations that result from far more nuanced small-scale interactions between groups at the local level. It is important to bear in mind that, despite the many independent lines of evidence reviewed in this chapter that are available to investigate such interactions (including historical and ethnographic sources, physical anthropology, genetics, linguistics, rock art, and archaeology), the model in the mind of the researcher greatly affects how the scenarios of transition are understood.

Following the contextual overview presented in this chapter, I now turn to the theoretical chapter of this thesis. This chapter discusses the different theories I will use in order to discuss phenomena of stability and change in the lithic technologies studied at BMS. This chapter lays the foundations for a more detailed critical discussion on the migration models used to explain the introduction of herding practices in southern Africa.

2. THEORY

As we saw in the first chapter of this thesis, different approaches are used to reconstitute the history of late Holocene populations. Depending on the scale at which researchers work, their discipline, and on the specific questions they ask, different interpretations exist (e.g. Hodder 2001; Wynne-Jones 2013). Archaeological studies often shed light on large-scale patterns in the diachronic and synchronic distribution of objects, technologies, practices and symbolic systems. Patterns can also be observed at a the regional-scale and site-scale, giving access to different data and interpretative possibilities.

The aim of my thesis is to investigate phenomena of stability or change of the lithic technologies through the late Holocene, within the socially complex area that is the SLCA (South Africa). In order to do so, it is necessary to question how could I interpret the different archaeological units I am working with, as well as their evolution through time. In this theory chapter, I discuss theoretical and methodological aspects that contribute to rethinking the systematic correlation of particular identities with specific archaeological materials (including lithics), languages and biological aspects within ‘culture-container models’ (Lentz 2017). This discussion is essential for opening interpretative hypotheses on phenomena of change or continuity within the different lithic analytical units that are the lithic system and the techno-complex.

In the course of this study, I was confronted by the view, held by some researchers, that lithics are studied because they are a traditional topic in archaeology, not because such research has anything new to contribute. Pursuing my work, I encountered this view in more precise contexts: some felt that, because lithics do not reflect cultural specificities, lithic studies were of no use to the study of interactions between groups of people. Hence, they felt, studying lithics in a context of interacting populations, as I do in this thesis, was never going to yield any ‘good’ results.

The disparaging view of lithic studies is, I believe, partly a result of the different conceptualisations of archaeology and associated questions held by some. Indeed, why would looking at a style or technological repartition necessarily show an ethnic, linguistic or even ‘economic’ group of people? If thinking in these terms, lithics were not going to give the desired answer. Put another way, and as we shall see in this chapter, large-scale technological entities cannot be attributed to a single ethnic or linguistic identity, and its

connection to a single economy subsistence type must be demonstrated. I consequently ask: must we always think in terms of closed populations or ethnic groups, when recent research demonstrates the diversity of large-scale configurations in the sharing of practices, symbols or technologies? Should we not instead interrogate these phenomena, starting from the production of our own data?

We will see in this chapter, and in chapter 6 of this thesis, that different phenomena and interpretative keys are available when studying lithics. At the site-scale, the study of the lithic systems may inform on know-how that are associated with inherited practices and transmitted knowledge. At the regional-scale, aspects relative to networks and ‘transcultural’ practices may be investigated. At the higher techno-complex level, that might be geographically larger than the regional patterns previously observed, other information is accessible, while the transcultural nature of the technical phenomena becomes clear. These large-scale phenomena have sometimes erroneously been associated with archaeological ‘cultures’. I will, however, discuss how the term ‘culture’ is misleading in this context, because the phenomena observed cannot be correlated with single and closed identities.

Furthermore, the notion of ‘culture’ itself is being deconstructed in anthropology, but also archaeology. Researchers indeed argue that different traits of what is composing a ‘culture’, such as language, ideology, practices, and techniques, are not necessarily limited to close groups of people or identities, neither are they necessarily inter-dependant. The notion of ‘cultural package’ or culture as a ‘container model’ is therefore discredited in anthropology, but also more recently in archaeology.

In the frame of this thesis, I am both engaging in discussions around small-scale and large-scale technological patterns. By working in a context of population interactions and economic shift in hunter-gatherer societies, lithic technologies are often looked at through the lens of social or cultural processes. Late Holocene southern African archaeology indeed tends to associate specific artefact categories (e.g. pottery) or practices (e.g. herding) to specific groups of people and identities. In this context, attempts have for instance been made to discriminate lithics made by hunter-gatherers compared to those of potential incoming Khoe herders (e.g. Orton 2012).

These ethnohistorical approaches involve questions such as ‘who is making lithics?’ and ‘how could interaction be detected through the study of lithic systems?’. These questions tackle issues relative to the relationships between technology, culture and ultimately identity, such as Croucher and Wynne-Jones (2006: 108) recall that:

Within all historical and archaeological interpretations of the past assumptions are made about identity; by delineating people, society, or culture for study, we are effectively bringing that unit into existence. Such units are predicated upon the existence of a unifying identity at some level, and yet the definition of this is rarely made explicit.

Being aware of this ‘unifying identity’ is indeed essential when making archaeological models, as it is at the basis of our interpretation of the past. In the context of lithic studies, similar lithic technologies generally appear to be widespread chronologically and spatially, implying that there is an inequation between these specific social questions and the data observed. Furthermore, how practices and technologies could be integrated differently following the social structure in which they exist is often disregarded. In order to go further on these aspects, I present theories and researches highlighting how linking archaeological entities with specific identities may be challenging, and I further discuss how could technological patterns still be interpreted and discussed in social terms.

Before introducing key theoretical aspects relevant to this project, I here emphasise one notion that will occur throughout this thesis: the notion of essentialism as opposed to materialism (Dunnell 1986). These notions, and especially the one of ‘essentialism’, are key for discussing links between technologies and identities. In a paper published in 1986, Dunnell discusses the two different visions. According to him, “*In the essentialist view, the phenomenological world is taken to be constituted by a finite set of discrete entities (...). This view implies a methodology directed toward distinguishing difference, the variation between kinds, from noise. (...) the essentialist position is not innocuous since it eliminates change a priori*” (Dunnell 1986: 153). In opposition, the materialist view “*holds that ‘kinds’ are illusory, transitory configurations; it is the observed variation that is of explanatory significance. (...) The materialist view, in taking ‘kind’ as transitory, permit both relations of difference and change in the temporal dimension.*” (153). This opposition between essentialism and materialism is important, as it partly determines the interpretation of scientific data and the creation of models.

2.1. Challenges in the definition of cultures and populations

One first step towards the interpretation of archaeological patterns, including for lithics, could be to more clearly assess what kind of data do we have access to. Indeed, even though archaeology is a human science, its methodologies are very different compared to those used in anthropology such as in ethnographic studies.

Anthropologists start their study from a predefined existing population of which they may analyse in detail the social structure and its integration with the technical system. For archaeologists, such an approach, if inspiring, is not directly applicable. Indeed, archaeologists do not have, or only partly, access to the social organisation of the societies they study. They try to reconstitute societies starting from objects, which is an inverted process compared to that of anthropologists such as Cresswell (e.g. 1994) does. Because of this inverted thinking process, archaeologists are confronted by questions specific to their field of research, such as: ‘what does the ceramic style distribution I observe represent?’ or, ‘what does this techno-complex say about the culture, society, or economy of the people in the past?’. Generally, the association between techniques and cultural aspects are more investigated through their links than through their absolute correlation. However, the interpretative shift from a set of links between techniques and cultural aspects to a closed cultural package corresponding to ‘peoples’ can quickly and easily occur, and is a shift which imposes real limitations for the understanding of the past (e.g. Demoule 2014).

In this context of interpreting archaeological data; objects, practices and techniques are often discussed in regard to cultural or social aspects. Different approaches exist, based on an opposition between assembling different traits within ‘cultures’ or de-assembling packages with ‘web-like’ visions of how different traits may or not be correlated. Since Leroi-Gourhan (1945) and the development of the school of technology in the 1980s, and especially in France, archaeologists have discussed the links existing between technological and cultural or social aspects. Researchers also developed theories interested in networks and ‘trans-cultural’ practices. Other researchers and schools of thought developed a more direct approach, by effectuating a correlation between technological and/or stylistic units and culture(s). This distinction is important because each one has different implications, and leads to the creation of contrasted models and views of the past. These different approaches are also associated with the scale at which researchers are working. Researchers interested in regional contexts or site-scale patterns will generally

situate themselves in the study of the link between technical and social aspects. However, researchers working at larger scales could tend to have a more ‘correlating’ approach, assembling different data types interpreted as vast cultural entities.

These different visions find echoes in how the notion of ‘culture’ is understood in anthropology and archaeology. In the next section, I present selected examples of culture definition in anthropology, followed by a presentation of the archaeological culture concept. We will see how archaeological cultures may correspond to cumulative visions of what culture is, correlating different traits within culture circles. We will further see how this essentialising vision of culture as a container-model assembling different traits is criticised in anthropology and archaeology.

2.1.1. The notions of culture: de-assembling or assembling cultural ‘traits’

The term ‘culture’ is common in archaeology. The ways in which it is used and understood in this discipline finds echoes in the varied anthropological conceptions of the notion. Different definitions exist, from broad and fluid ones to more precise ones. The critique that ‘culture’ is an ill-defined, vague and imprecise concept is widespread. It is expressed by Kroeber and Kluckhohn (1952:36) in terms that are often repeated in more recent publications:

The lack of mooring of the concept of culture in a body of systematic theory is doubtless one of the reasons for the shyness of the dictionary makers. They have not only been puzzled by the factoring out of various sub-notions and exclusive emphasis upon one of these, but they have probably sensed that the concept has been approached from different methodological assumptions – which were seldom made explicit.

The variety of definitions for culture and its associated notions is indeed reflected in Kroeber and Kluckhohn 1952’s publication that includes more than 160 definitions of culture. The authors classify these selected definitions under seven categories, partly reflecting the broad theoretical orientations of the authors (Kroeber & Kluckhohn 1952: 40): ‘enumeratively descriptive’, ‘historical’, ‘normative’, ‘psychological’, ‘structural’, ‘genetic’ and ‘incomplete definitions’. Amongst others, they emphasise an ‘enumeratively descriptive’ definition of culture given by Tylor (1871: 1):

Culture, or civilisation, (...) is that complex whole which includes knowledge, belief, art, law, morals, custom, and any other capabilities and habits acquired by man as a member of society.

Kroeber and Kluckhohn highlight how the work of Tylor was likely influenced by the German concept of ‘Kultur’ (or ‘Cultur’) developed through the nineteenth and early twentieth centuries (e.g. Klemm 1843–1852). At that time, the concept of culture was closely tied to the concept of ‘civilisation’, which was itself associated with the idea of a hierarchy existing between ‘civilised’ and ‘barbarians’. I here highlight that the notion of ‘Kultur’ is closely linked to the founding idea of ‘culture circles’ developed in archaeology, giving birth to some interpretations of archaeological cultures as closed units representing nation-like entities (Demoule 2014). These enumerative definitions are of interest because they understand cultures as closed entities within which different aspects are linked, such as ‘language’, ‘custom’ and ‘artefacts’ (Kroeber & Kluckhohn 1952).

Together with these definitions, transmission and learning are also cited as key components of what defines culture, within other theoretical frameworks. Young (1934: xiii) for instance writes: “*culture comes down to us from the past*”. The concepts of ‘traditions’ or ‘social heritage’ have been used to define what culture is (Kroeber & Kluckhohn 1952). For instance, Malinowski (1931: 69) writes that: “*social heritage is the key concept of cultural anthropology. It is usually called culture (...). Culture comprises inherited artifacts, goods, technical processes, ideas, habits, and values*”. Radcliffe-Brown (1952: 4–5) writes that “*In a particular society we can discover certain processes of cultural tradition, using the word in its literal meaning of handing on or handing down*”.

The idea that culture corresponds to norms, and standardisations is also common in different definitions, as well as an emphasis on culture developing as a response to external factors (Kroeber & Kluckhohn 1952). Structural definitions of culture had been put forward when Kroeber and Kluckhohn published their overview, as well as more recently by Cresswell:

Culture is the specific configuration adopted by each human society, not only for managing relationships between techno-economical facts (...), social organisations and ideologies, but also for transmitting its knowledge from generation to generation. Technical gestures, social

behaviours, political and juridical institutions, symbolic systems, knowledge, as well as the transmission modalities of knowledge in each of these fields, are among the most important components of a specific culture. These different activities are constituted in networks, and each culture distinguishes itself by their particular way of articulating these networks between them. Culture and society are not synonyms. One culture may integrate many societies, as well as one society may shelter many cultures. (Bensa & Cresswell 1996: 131, my translation)

We perceive in these selected definitions how different aspects may be emphasised about the culture concept. We also get a sense of how these varied definitions may somehow reflect different archaeological approaches, some assembling and correlating data from different disciplines to create cultural packages, and others that could have a more fluid vision of the links between objects, techniques and other social or cultural aspects.

More recently, the concept of culture was criticised as a whole by different anthropologists as a ‘disciplinary dead-end’, and for conducing to an essentialising vision of human groups (Trouillot 2002; see Lentz 2017 for discussion). As Lentz (2017) recalls, the questions ‘can a culture be seen?’, and ‘does culture have boundaries?’ have indeed been raised in different critiques addressed to the concept of culture. The problem of the boundaries of culture has been treated differently between different schools of thought. Lentz, for instance, recalls that according to the work of Bashkow (2004), followers of Franz Boas perceived culture boundaries as permeable. However, she also stresses that since the 1930s:

rather simplistic container models of culture - equating culture and ethnic group or nation and associating it with a specific territory - took hold and became popular outside the academy as well. (Lentz 2017: 188)

As we will see later in this chapter, this vision of culture as a ‘container model’ is interesting for us, because similar discussions exist in archaeology. This vision is indeed often associated with the notion of ‘archaeological culture’, often going together with tree-representation of scientific data, and single-origin multi-disciplinary migration models. As we will see, similar deconstructing trends of the notion ‘archaeological culture’ exist, arguing for a de-assembling of technical, economic, linguistic and biological features of human societies. These alternative visions, also developed in this thesis, allow

understanding better the links existing between specific archaeological phenomena and other social aspects, by acknowledging that both correlation and absence of correlation may exist. It also allows considering that some practices for instance may be broadly adopted, while others may be more closely associated with other traits. Finally, it allows operating a methodological distinction between the type of data we have access to, that may broadly differ depending on the discipline, method and scale of study. These aspects are essential in the frame of this thesis, because they allow a more precise understanding of phenomena of change or continuity of the lithic industries through time and space. They are also important for discussing current migration models explaining the advent of herding practices in southern Africa.

In the next section, I will briefly discuss the notion of archaeological culture and its history. To do so, I will present the case of the Indo-European migrations as exemplifying some of the migration models existing for southern Africa, that I will discuss in the Chapter 6. I will also evocate the semantic relationships existing between the notion of ‘Culture’ and of ‘Techno-complex’. This relationship is interesting, because it shows that, even though techno-complexes are generally not interpreted as cultural ensembles, the idea of an associated ‘cultures’ may still dredge up to the surface.

2.1.2. ‘Archaeological cultures’ as ‘culture-container’ models

One idea behind the notion of ‘archaeological culture’ is that techniques, objects, styles or symbols are cultural. What a ‘culture’ is in archaeology is directly tied to the study of objects, styles and technologies, such as in the archaeological definition of culture given by Clarke (1968: 206): “*A polythetic set of specific and comprehensive artefact-type categories which consistently recur together in assemblages within a limited geographical area.*”

We previously saw that different emphases are put on what ‘culture’ is in anthropology and how some definitions focus on the notions of transmission and learning, while others develop more ‘enumerative’ notions. In these latter notions, culture is often represented as a bounded container, a closed entity integrating different traits, such as artefacts, languages or even ‘psychological’ aspects. This definition of culture may seem particularly attractive for archaeologists because it seems to offer a direct and relatively easy means to correlate objects, techniques, and one culture. However, such conceptions appear flawed in many cases, if not all. I, therefore, return in this section to the notion of ‘culture as a container’

and deconstruct it with a focus on its relationship to the concept of ‘archaeological culture’. This discussion is particularly because correlating archaeological data with ethnic, linguistic or even biological groups is contestable, and, more significantly, may impede the understanding of past social processes.

The concept of ‘archaeological culture’ is understood and used differently according to different authors. Archaeological cultures are generally based on the observation of stylistic, symbolic and technological consistencies observed at a large scale over a definite period of time. As Croucher and Wynne-Jones (2006: 114) recall: “*the observation of recurring coincidences of particular artifacts and material traces constitute the basis of archaeological ‘cultures’, the building block of our reconstruction*”.

An archaeological ‘culture’ is therefore defined from the objects that have preserved through time, and not directly from the societies themselves. Archaeological ‘cultures’ are consequently dependent on how the analyst will ordinate and classify his or her data, and of what is still visible. The use of the word ‘culture’ to discuss large scale archaeological units, such as techno-complexes, is therefore misleading. However, it still tends to pervade many discussions and potentially lead to methodological and theoretical confusions.

2.1.3. History of the notion of ‘archaeological culture’

The notion of archaeological culture was developed in Germany and Austria from the end of the nineteenth century to the beginning of the twentieth century. The concept of ‘Kulturkreis’ - translatable as ‘culture circle’ or ‘culture complex’ - was developed by Fritz Graebner and Wilhelm Schmidt (Kroeber & Kluckhohn 1952; Demoule 2014). According to this concept, the history of any modern culture could be reconstructed and traced back to an original culture-circle. Around the same time, in Germany, Gustav Kossinna (1911) developed a similar idea, applicable to archaeological studies, known as the ‘Kossinna postulate’. Demoule (2014) and discusses his postulate:

Kossinna, and many prehistorians following from him, state a major postulate (...) presented in his 1911 work about Die Herkunft der Germanen (‘the Germans’ origin): ‘Cultural provinces clearly delimited archaeologically coincide at every period with specific peoples or tribes’ (...). There is an identity between an archaeological ‘culture’ defined as an ensemble of ‘types’ of specific objects, and an ethnic group. (...) With

Kossinna, the arrangement of data for classifying them cannot simply be easy classificatory conveniences, nor stylistic variations limited to material objects; behind the distribution, in the same geographical area, of a certain number of tools and pottery decoration, there necessarily is a homogeneous 'people' or an 'ethnic group', with its institutions, its economic system and its language. (Demoule 2014: 172–173, my translation)

In other words, for Kossinna, behind the distribution of a particular archaeological material 'signature' in a specific region is a distinct cultural group. Kossinna's postulate thus stipulates that 'culture circles' may be found archaeologically, and correspond to past peoples. One original culture circle may give birth to more recent culture circles through movements of people keeping their cultural consistency.

2.1.4. Culture circles: the Indo-European model

The definition of what would be an archaeological culture for Kossinna, implies that cultural packages or complexes can be archaeologically reconstituted and traced back to an original 'proto' culture. This vision goes together with a linear and conservative diffusion of cultural entities, classically represented with tree-diagrams (Demoule 2014). In the context of Indo-European studies, the search for the origin and spread of the 'Indo-Europeans', initially a language family, progressively became an archaeological question.

The Indo-European hypothesis, as discussed by Demoule (2014), states the existence of a culturally consistent past Indo-European people, that would have spread its languages through Europe. The origins of Indo-European languages were originally looked for through different linguistic methods, such as comparative grammar and palaeo-linguistics. Many of these works relied on the assumption that all Indo-European languages had a single, common origin, called a 'proto-language'. The subsequent linguistic divisions deriving from this 'mother language' were represented as branches, creating ramifications. The 'single-origin hypothesis' for all Indo-European languages had consequences for the archaeological studies interested in Indo-European 'peoples'. The archaeology, influenced by the single-origin vision developed by linguists, pursued a quest for finding the location, and 'material culture' of these first proto-Indo-Europeans. A shift from linguistic to archaeological questions operated, giving birth to interconnected models and implications. As for the languages, the Indo-European archaeological 'cultures' could be ramified from

one old to more recent cultures. The archaeological and linguistic ramifications from one ancestral culture would then be represented as the different routes taken by the Indo-European peoples. This vision linking in one closed cultural unit the material production, language, ‘race’, economy of subsistence, and ultimately a ‘people’ are nowadays criticised.

The core idea that the archaeological distributions of similar artefacts directly represent the borders of past ‘peoples’ has been criticised by Demoule (2014), who probably is the fiercest French opponent of this theory. He critiques the Indo-European model, which is a combination of “*an archaeological material culture, a people, and a homogeneous language*” (Demoule 2016:165). Beyond the problem of correlating these different aspects, Demoule questions the use of single-origin hypotheses. Such hypotheses are indeed just one kind among many others for explaining similarities between different languages (e.g. Güldeman & Stoneking 2008). Similarly, technique and object distributions cannot necessarily be correlated with one consistent people, and do not necessarily derive from the same origin point. Nevertheless, tree-diagrams are still widely used in different disciplines, including archaeology, to explain similarities between data observed (e.g. techniques, language see Fig. 2.1) (see Kaylan & François 2018 and Demoule 2014 for discussion). They may, for instance, be used to represent style filiation, and are also common in the establishment of migration models in which similarities in the chronological representation of shared ancestry contribute to the alignment of linguistic, genetic and archaeological data and interpretation of it, a matter to which I return in the Chapter 6 of this thesis.

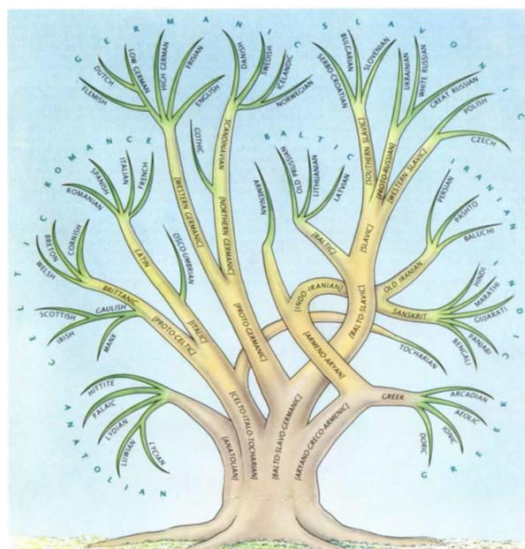


Figure 2.1. Family tree of the Indo-European languages, in Gamkrelidze & Ivanov (1990)

Even today, tree representations are so widespread that they may seem like the easiest and most ‘natural’ way to represent relations of similarity in archaeology. For example, the idea that proto-cultures, associated with ‘proto-peoples’, give birth to more recent observable cultures (and therefore peoples) is still found in social sciences. These kinds or single-origin hypotheses with ramification processes are still common in migration models. This is the case for some migration models established in southern Africa for the late Holocene, as we will see in the discussion. However, these types of representations have been criticised and are progressively rejected in other sciences, including in linguistics (e.g. Kaylan & François 2018). Indeed, their inherent oversimplification often hides a much more complex reality.

When for many archaeologists, it appears clear that similarities in archaeological data may not represent a closed cultural entity, the synonym ‘culture’ to talk about large-scale distributions of similar objects or techniques is still prevalent. This use of the word ‘culture’, even though it is understood as a ‘complex of objects’, is problematic because of the many associated assumptions we just discussed. In this context, lithic industries were not an exception to the rule, and ‘techno-complexes’ or ‘industries’ were often alternatively called ‘cultures’.

2.1.5. Historical relationships between techno-complexes and cultures

The historical relationship between the term of ‘industry’ or ‘techno-complex’ and the one of ‘culture’ (for instance Magdalenian ‘Prehistoric culture’) is an example that there is a temptation to interpret large-scale technological phenomena as cultural entities, when they could, in fact, reflect varied processes (Clark 1982). For Clark *et al.* (1966), ‘Culture’ is an obsolete synonym of ‘Industrial Complex’ and also of ‘Industry’. About this discard of the term ‘Culture’, Clark (1982:169) writes:

The similarities of tools and techniques that bind each of these sets of assemblages as broad classificatory entities are in fact rather generalized and many prehistorians are now sceptical that the common patterns of stone-working are really indicative of sufficient overall tradition to justify the use of terms such as ‘Acheulian culture’ etc. The basic label ‘Industrial Complex’ is preferable since it makes explicit the fact that it refers primarily to basic features of stone craft.

Kleindienst (2006) also discusses the term ‘Basic Unit’ (i.e. the ‘Industry’), and she adds that:

The named units do not designate or imply any ‘people’ other than as individual producers of evidence; they do not indicate ethnicity or the physical form of the ancestors (...). They refer only to the cultural content as defined. Nothing more, nothing less. Definitions can subsequently be expanded, or altered, with cause, but the original name stands. Having done that, one can then speak about behavior of ‘the people’ in any manner that one chooses to interpret cultural evidence. (Kleindienst 2006: 18).

For the author, the Industries may be combined in what she calls “*higher-order units: ‘Complexes’ or ‘Techno-Complexes’ (...). Again, they are only content units*” (Kleindienst 2006: 19). On his side, Clarke (1968: 206) gives a definition of what a **techno-complex** is:

A group of cultures characterized by assemblages sharing a polythetic range but differing specific types of the same general families of artefact-types, shared as a widely diffused and interlinked response to common factors in environment, economy and technology.

Although ‘techno-complex’ is mentioned alongside ‘culture’, it represents a more neutral terminology, open to broader interpretative perspectives. When used in lithic publications, as Clark noted, ‘techno-complex’ is rarely associated with specific cultural entities that may be considered a coherent people or ethnic group. The large-scale nature of techno-complexes indeed prevents most lithic analysts from interpreting their data in those terms.

The interpretation of techno-complexes may also vary depending on the school of thought of the researchers. North American and French lithic research traditions, for instance, share similarities, but also have strong theoretical disagreements (Perlès 2016), as seen in the debate between Binford and Bordes about the different interpretations of Mousterian facies variability (e.g. Bordes & Sonnevile-Bordes 1970; Binford 1973). In the frame of the New Archaeology, Binford developed ‘middle-range theories’ to explain the variability of lithic industries, based on ethnographic inferences. These middle-range theories are concerned with universal or broad interpretations. In contrast, the French technological approach has considered “*since its origin, in line with Leroi-Gourhan (1964 and 1965) and with J. Tixier*

(2012 [1978]), the artefact as the outcome of technical, economic and social choices integrated in cultural traditions” (Perlès 2016: 224).

In French technological approaches, the emphasis put on the concept of transmission and the observation of variability in lithic productions through time and space progressively led to the discussion of ‘lithic traditions’:

Aware of this important variability in the modes of production, French lithic analysts found, through the concept of transmission, the theoretical basis from which they could discuss the expression of diverse technical traditions, integrated within the cultural package of groups themselves distinct. The classic regional or macro-regional approach, therefore is re-based on transmission of technical knowledges rather than typology. In that way, this approach truly becomes historico-cultural. (...) In return, the notion of ‘technical tradition’ becomes an explanatory paradigm, which, in most cases, suffice to itself. (Perlès 2016: 227)

We see in this quotation how lithic data may be interpreted in terms of culturally bounded entities. It should, however, remain clear that for most Prehistorians, ‘cultures’ or ‘traditions’ do not represent a coherent ‘people’, even though the vocabulary employed might be misleading. Some vocabulary may indeed be more appropriate than the terms ‘culture’ or ‘traditions’ because they are less loaded with erroneous connotations. Technical systems and techno-complexes provide two illustrative examples.

We perceive in these discussions how techno-complexes could have been understood as the reflection of past cultures or even past peoples. However, varied interpretations of these large-scale phenomena exist. Hypotheses interested in networks, transcultural practices, and for instance convergences, open alternative perspectives to explore the mechanisms underlying the observation of technological and or stylistic entities.

We saw that archaeological data have sometimes been interpreted in terms of a direct correlation with ethnic or linguistic groups (e.g. see Earle 2008; Demoule 2014 and Fredriksen 2015 for discussion). By developing an approach to the deconstructing of the notion of archaeological culture, archaeology takes a central place within social sciences research. By producing different kinds of information, that contrast with strictly culturalist

or historical points of views, it creates new interpretations about the relationships that exist between humans and their techniques, symbols and for instance languages, which contribute to challenge essentialist visions of the past. Further than this deconstruction, archaeological studies bring a unique understanding of broad phenomena, and offer analytical tools for approaching questions about social interactions and concepts of identity. The question is then, how to interpret these entities. Scott MacEachern for instance interrogates

the ways in which similar stylistic elements can come to be shared within and between different ethnic units, and the possible relationship between large-scale distribution of stylistic elements and the analytical entities that archaeologists (far too loosely) designate as 'cultures' and 'traditions.
(MacEachern 1994: 207)

How could we, as archaeologists interpret the existence of technical or stylistic similarities in time and space? And what 'identities' could these archaeological patterns reflect?

2.2. Working with identities

While many archaeologists investigate the links existing between techniques and social structures, or emphasise notions relative to transmission, others question the identity that could be reflected in their archaeological data. Linking archaeological material with identities brings its own challenges, that are often going beyond archaeological considerations.

The interpretation of the archaeological material is also often linked to aspects relative to identity (Croucher & Wynne-Jones 2006: 108). Being aware of how we may conceive this unifying identity, and how others may conceive it, is essential when making archaeological models, because it often forms the basis of our interpretation of the past. Different authors for instance argue that 'material identities' are not necessarily bounded with other 'identities' such as language. Some indeed propose a distinction between a material identity versus other identities (e.g. Pikirayi 1999, 2007).

These different 'identities', or 'proxies' as we could also call them are indeed not necessarily bounded together. The rarity, or absence of correlation between archaeological,

linguistic, and ‘biological’ data (e.g. genetics) represents a challenge for interdisciplinary studies, as MacEachern (2000: 359) notes:

To what extent are the very different analytical units used in these various disciplines comparable? Under what circumstances may we expect that ethnicity, language, material culture, and gene pool will have covaried in the past, and when can we expect that they will have differed in extent and characteristic?

The fact that languages, genes and objects are not necessarily linked is also highlighted by Sadr (2013: 187): “*Languages leave no archaeological traces except in writing, and there is no simple, universal, static, predictable link between linguistic groups and artefact styles*”. Güldemann and Stoneking (2008: 106) reiterates this idea when talking about the ‘Khoisan’: “*there is a significant absence of overlap in the linguistic, cultural, and biological characteristics of these populations*”. Mitchell (2010) expresses similar critiques. Other authors such as Wynne-Jones (2013) and Croucher and Wynne-Jones (2006) reiterate the same idea that there is no necessarily straightforward link between object-making or style, language groups, and other traits.

In this complex context of defining populations, archaeologists and other scientists, are however most often confronted with this ‘unifying identity’, to use the phrase employed by Croucher and Wynne-Jones (2006). In archaeological and genetic studies, data (e.g. pots or genes) are attributed to peoples, but the difficulty of grasping which identity could we be looking at is highlighted by the varied ways in which populations or individuals are defined in each field.

In the following section, I present recent examples of how populations definition may vary, depending on the scale and specific questions researchers have. This short discussion reminds us that there are very different ways of defining populations, and of differentiating different ‘types’ of identities. These different ways of doing, that are methodological and theoretical, may significantly differ, and represent phenomena that may be completely different from one study to another. This discussion is important because it shows how the identities we used are not ‘natural’ but are the process of an artificial selection of some criteria, for instance, linguistics, economic, ethnic identification, biology, and so on. It is

ones again linked to the question of what are we looking at when observing stylistic or technical similarities, and when change or continuity is observed within these entities.

2.2.1. Populations, identities and proxies

Populations are defined differently in archaeology and other sciences based on the ways they are studied. The analytical choices of the researchers are strongly bound to their research question, discipline and scale of study (e.g. Hodder 2001; Hoder & Hutson 2003). Two methods for defining a studied population are: *a priori* from the outset (e.g. Bantu-speakers, hunter-gatherers, South Africans) or *a posteriori* following the result of the study (e.g. makers of the style 'A'; 1410 C allele) (Fig. 2.2).

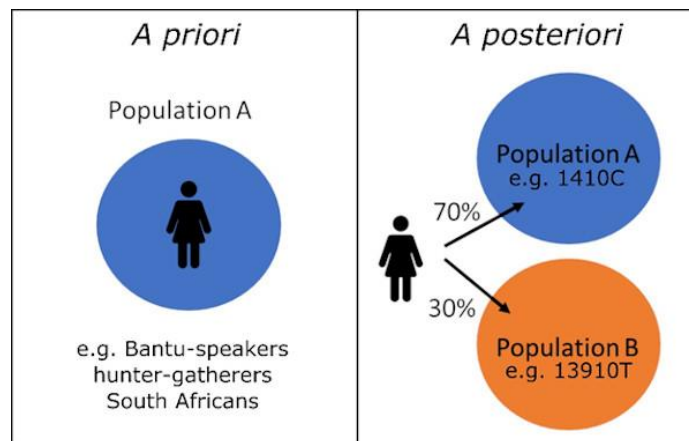


Figure 2.2. Population definitions

Both methods are common in archaeology, and other disciplines such as genetics. The choice of method ultimately corresponds to the question asked by the researchers. This broad distinction already has implications for understanding what phenomena we are looking at, and also for bringing forth associated assumptions. Working on a population defined *a priori* in archaeology may, for instance, create paradigms. When a population is defined *a priori*, assumptions are made about its identity, whether it is national (the Spanish), ethnic or economic (herders). When the population is defined *a posteriori*, the groups created from the scientific data form distinct populations. For instance, the observation that there are stylistic similarities between different pottery types may lead to the creation of the 'style A population'. Similarly, with genes, haplogroups may be created based on ancestry history and similarities. There is, however, a methodological issue as confusion between different population types may, in some cases, lead to the creation of

erroneous models. In the following section I present a few examples of how geneticists and archaeologists working in southern Africa may use different identities.

2.2.2. Examples in archaeology and genetics

Most geneticists choose to use multiple variables to cluster individuals such as geographical location and spoken language associated with ‘population groups’ or ‘ethnic groups’ (e.g. Salas *et al.* 2002). The individuals may also be grouped at a language-family scale. In southern Africa, genetics are indeed influenced to some extent by linguistics, through the sampling of populations grouped by language categories (e.g. Tishkoff *et al.* 2007; Scheinfeldt *et al.* 2010), including Khoe and San groups that may be understood as herders or pastoralists, and hunter-gatherers (e.g. Soodyall *et al.* 2008). It is worth noting that the clustering of populations following linguistic groups can be inconsistent (see Mitchell [2010] for discussion). The ‘ethnicity’ and / or economy of the individuals is the main proxy for other authors, which they resituate within large language families (Pereira *et al.* 2001; Barbieri *et al.* 2014). Others reject the language classification and prefer subjects’ self-identification (Soodyall *et al.* 2008). An individual speaking Afrikaans and self-identifying as Khoe will then be grouped under the Khoe group. Some authors recognise more efficient variables than others. Salas *et al.* (2002) and Uren *et al.* (2016), for example, insist on the efficiency of the geographical location rather than a language variable for defining differences in genetic groups. These few examples reflect the variations of the sampling methods that exist in genetics, and the consequences they may have for the ensuing social interpretations of social entities.

In archaeology, reservations may exist when defining populations ‘*a priori*’ because of the political implications that such definitions can have. The current rarity of these kinds of attempts in archaeology can be explained in part by the growing awareness that using national or ethnic identity as a starting point to dive in the past may rapidly turn into an exercise in essentialism (e.g. see the debate between d’Errico *et al.* 2012 and Pargeter *et al.* 2016 about the use of ‘San’ identity in archaeology).

In most archaeological studies, then, populations are defined *a posteriori*. For instance, similar styles of objects can be grouped and interpreted as ‘cultural’ entities. In many cases, however, the interpretation of the cluster of data observed is not straightforward, and may reflect varied processes. Questions such as ‘what are the social entities behind techno-

complexes or stylistic distributions?’ and ‘what kind of identity may be attributed to the distributions observed?’ are often difficult to answer.

Different interpretations of archaeological data can however be proposed, depending on the scale at which the analyst is working. In the following section, I will present different theories that may be useful for interpreting lithics at three scales of study: the site-scale, regional-scale and large-scale techno-complex unit. These theories contribute to go further than the classic ‘archaeological culture’ vision, by not reproducing culture-container models.

2.3. Working at different scales: beyond ‘culture-container’ models

Researchers studying lithics are also faced with how to interpret the basic archaeological units they observe. Lithic analysts generally firstly work at the site-scale, by focusing on one assemblage. They may secondly integrate their data in a regional scale and compare them with surrounding sites. Finally, they fit their assemblage within a large-scale unit that is the techno-complex. It is here important to note that these three scales are the ones of the analyst. They are, therefore, methodological, more than representing ‘real’ territories for the people who are studied. Different aspects are accessible at these three scales, allowing us to pursue varied research questions. Indeed, these different working units do not necessarily reflect the same processes, and may not be similarly interpreted. In the frame of this thesis, it is necessary to think about the scenario of change or continuity observed at these different scales, and in these different times and spaces.

2.3.1. At the site: technical systems, know-how and heritage

At the site-scale, lithic analysts may study the ‘lithic system’ and its potential relation to other systems. Different theories are helpful to investigate the links that techniques may have with social structures.

Research on techniques as part of transmitted and learnt knowledge have been developed in France (e.g. Mauss 1934; Leroi-Gourhan 1945; Cresswell 1996; Lemonnier 2010). The idea guiding most of these researches is that different techniques (including gestures) involve different ‘know-how’ (*savoir-faire*) created and passed down within global cultural systems or worldviews that condition the ways in which objects are made and perceived. Different techniques, including gestures, may thus be developed for similar actions

depending on the group of people studied. These social contexts or ‘worldviews’ may also impede or allow the appearance and adoption of innovations (e.g. Descola 1994), and lead to the development of ‘socially efficient techniques’ (Guille-Escuret 2004).

When studying an assemblage at the site-scale, archaeologists may face difficulties with the study, and especially the interpretation of their data. Cresswell, highlighted in an interview that:

The main difficulty that the study of techniques has been confronted with for demonstrating their sociologic relevance (...) is that it has been focusing on objects. It appears very clear when reading the first ethnographic works. A ‘material culture’ chapter is always found, in which it is explained that there are bows made that way, pots of these shapes, etc., and then nothing. I am not saying that the shape or use of pots is not linked to society, but the profound relationship is to be found at the processes and structures level. (Bensa & Cresswell 1996: 123, my translation)

In his work, Cresswell (1994, 1996, 2010) links techniques with society at a structural level. For him, techniques and objects are bounded by the social context in which they are produced. He stresses the importance of the social structure, rather than objects themselves for discussing cultural aspects. This emphasis on the structure directly derives from his definition of culture cited above. For Cresswell, the cultural value of objects may only be understood if the structure and processes within which they are integrated are studied. Following this line of thought, one object may not be integrated in the same way in two different societies. Synthesising this set of ideas, Audouze (2002: 285–286) writes:

Leroi-Gourhan did not comment on the fact that these techniques also must be socially compatible (Latour & Lemonnier 1994 p.12-16). (...) This phenomenon was later analysed in details by such cultural technologists as Cresswell (1983, 1994) and Lemonnier (1994). Given these premises, borrowing from a neighbouring group is very similar to inventing since it calls for recombining already existing elements and creating new associations of technical elements.

In that sense, an object adopted by one human group from another human group would not necessarily be integrated into the same structure, and therefore would not be culturally equivalent (with possible exceptions if the two groups share a similar structural organisation). Lemonnier (1992), and Bril (2002, 2010) have also developed research on the link between transmission, society and techniques. Many of these authors published in the French journal *Techniques & Culture* that still publishes articles exploring these aspects. In French archaeology too, research around know-how participated in the promotion of these questions (e.g. Karlin 1991; Pelegrin 1991; Geneste 2010). The notion of ‘fact’ developed by Leroi-Gourhan also joins this discussion.

These discussions are particularly interesting for studying lithics through neolithization processes, as the social and economic structure of the people making the lithics may have changed through time. They allow developing a reflection on the reasons for change or continuity of the techniques within these different social structures. This idea is particularly relevant when interactions between groups are studied, as it opens a broader range of interpretation for objects and techniques moving from a group to another that goes beyond the narrow view that one groups’ objects and techniques are simply adopted ‘as is’ by another. However, as discussed before, the social structure is archaeologically not fully accessible. Only inferences can be made from the archaeological remains and partly thanks to an accumulated knowledge on social processes acquired both from other archaeological, historical and ethnographical studies. In that case, these other studies may feed the reflection of the analyst, without effectuating a direct analogy.

Because the site-scale is the closest the analyst may get to the people, different archaeological methods may be developed to study specific social aspects, such as spatial organisation, activities, and learning processes. The notion of **technical system**, developed by Gille (1979), is discussed by Lemonnier (2010: 51, my translation): “*a technical system is only the combination of multiple processes that articulate with each other, with as much adjustment and reciprocal dependencies, according to their succession or convergences*”

‘Technical systems’ offers a dynamic means to understand lithic material, and is practical for developing structural approaches because it allows one to isolate specific elements and consider them in regard to other technical systems. It also allows one to question their links with social structures or organisations (Cresswell 1996; Lemonnier 2010), without necessarily correlating them with specific cultures, ethnic or linguistic groups. These are

the reasons why this terminology is favoured in this thesis. The *chaîne opératoire* concept created by Leroi-Gourhan (1993) and discussed in the journal *Technique & Culture* may be applied as a method for analysing lithic systems (Inizan *et al.* 1995; Audouze 2002).

2.3.2. Investigating regional archaeology: new perspectives

At the regional-scale, other questions may be asked about the archaeological data observed, including lithic technologies and typologies. Other representations and interpretations than a direct correlation of regional lithic distributions with ethnic or linguistic groups indeed exist. Different alternative explanations are proposed, broadening our theoretical scope.

At the regional-scale, notions around transmission, shared knowledge and networks may partly be accessible. Theories developed by Cresswell can here also be useful to integrate a reflection about the social structure within which objects, including lithics, techniques and practices may fit in. The archaeological context and broad knowledge associated with different site types should be considered for understanding how the studied object or technique may fit in. For instance, pottery generally is not found in the same states of conservation in Iron Age and LSA sites (e.g. Sadr & Sampson 2006). This could mean that they may not have been used in the same ways, and not have been associated with the same activities and relations between peoples.

Working at the regional scale and with potentially different site types, similar technologies shared by varied groups of people may also appear. These interesting phenomena may be discussed thanks to theories interested in the relationship between archaeology and identities, networks, transcultural practices and creolisation processes. Some of these theories, presented below, are interesting because they take into account both phenomena of specificity and ubiquity in the distribution of styles, techniques and practices. These approaches, as much as they recognise the existence of different archaeological contexts, also develop a vision in which the ‘traits’ composing the archaeological ‘package’ recognised in one type-site (e.g. pottery, scrapers, hunting-and-gathering) are not necessarily exclusive and may be found in other archaeological configurations. They, therefore, contribute to shed light on convergences phenomena that should be investigated (e.g. non-exclusive phenomena such as local adaptation to a specific environment, shared history, contact). Working at the regional scale, contrarily to larger scales, also implies that peoples could have been in contact. At this scale, it is reasonable to assume that networks, trade, shared activities and creolisation processes may have occurred.

In the following sections, I present different theories that are useful in the frame of this thesis for discussing lithics and other archaeological materials at the regional-scale. These theories propose different interpretations of the archaeological similarities that may be observed when studying stylistic or technological repartitions.

a. Interwoven influences

Croucher and Wynne-Jones (2006: 116) firstly propose that archaeological patterns, such as ceramic styles visible at a regional-scale, reflect “*broad shared norms, rather than the historical identities*”, by which they mean a pool of common attributes rather than specific ethnic groups. They write that ceramic styles (Croucher & Wynne-Jones 2006:122):

can reflect decisions regarding material expression that relate back to common experience and understanding of stylistic possibilities; these in turn reflect social interactions, movements of people, particularly women, and notions of conformity or individuality.

Elsewhere, Wynne-Jones (2007: 337) writes about ceramics in Tanzania:

The decoration of the pots would not only have been determined by their use, but by the interwoven influences of accepted form, taste and the unique performance of creation (Stahl 2002). That this resulted in such similarity is fascinating and must be looked at in terms of conscious and unconscious processes of identification.

The question about how individuals may be ascribed to a single identity is also interesting: “*an individual can perform or inhabit different identities in different contexts and need not to be assigned to one or other identity group associated with a particular material expression*” (Wynne-Jones 2007:340). This idea is of particular relevance in the context of interactions between different groups, and also to the notion of individual agency within one society.

b. ‘Symbolic reservoirs’ and ‘symbolic sets’

The existence of broad similarities in archaeological material has also been explained through the notions of ‘symbolic reservoirs’ (McIntosh 1989) and ‘symbolic sets’ (MacEachern 1994). The concept of ‘symbolic reservoirs’, developed by McIntosh (1989)

and discussed by Scott MacEachern (1994: 207) is based on the idea that artefact stylistic variation may be explained by the access to and production of coherent systems of symbols and ideologies shared within societies. Wynne-Jones (2013:183) defines a symbolic reservoir as: “*a common and long-shared system of symbols and cosmology, utilized during the process of creating objects and artworks, a pool from which people draw*”.

MacEachern (1994) critiqued the notion of ‘symbolic reservoirs’ in his development of the concept of ‘symbolic sets’. He argued that the margins of the ‘reservoir’ are too strict and well-defined, requiring a less enclosed notion:

We would not then expect to find a well-defined ‘symbolic set’ or ‘reservoir’ (...) but rather a much more amorphous set of overlapping distributions of related cultural elements; these can be shared across linguistic/historical boundaries as easily as within them, and diversely grade into and interact with distributions over a very large area.
(MacEachern 1994: 218).

In addition, MacEachern asks how knowledge may have been transmitted across such boundaries. In his case study, he identifies the movements of people, namely blacksmiths or ‘transformers’, as vectors of material found archaeologically: “*I think it likely that the constant movement of technical and ritual experts between groups constituted perhaps the most important vector for the transmission of symbolic sets from one community and culture to another.*” (MacEachern 1994: 219).

c. Transcultural practices, networks and creolisation

Some authors also argue that some practices may be transcultural rather than culture-specific. In the context of rock art research, Eastwood (2003) describes apron motifs found in the rock art of the SLCA and surrounding areas that he sees as produced by several groups of people. Apron representations are, for him, ‘cross-cultural motifs’ that are symbolically relevant to several different groups of people, especially in the context of initiation practices. Similarly, Pikirayi (1999, 2007) proposes that the multiplicity and diversity of interaction networks between different cultural groups may engender the existence of shared aesthetic and principles.

The study of creolisation processes also contributes to break down the notion of archaeological culture. Instead of considering people as belonging to uniform cultures with strict boundaries, studies of cultural creolisation develop a fluid vision of different characteristics of human groups, such as languages or beliefs. For example, Sam Challis (e.g. 2008, 2014) provides an example from South Africa's colonial era during which multi-ethnic groups formed new identities through shared practices and beliefs related to cattle-raiding. Depending on the authors, the notion of creolisation may however also be aligned with the one of 'cultural containers' as it does not necessarily call into question the idea of strict cultural borders. For the creolisation process to occur, it requires the meeting of two (or more) cultural units, eventually leading to the creation of a new one, replicating similar borders.

To conclude, and recalling Wynne-Jones' (2007: 337) notion of "*interwoven influences*" cited earlier, we can see through the theories presented that material similarities are particularly interesting because they may reflect influences and networks that are wider-reaching than ethnic or language boundaries. Nevertheless, when considering ever larger scales than the regional-scale, other parameters can also contribute to create similarities in styles or techniques, as discussed in the following section.

2.3.3. 'A-cultural' large-scale technical phenomena: tendencies and convergences

Notions of interwoven influences or creolization process are also very interesting to work with large-scale units. Lithic studies indeed also shed light on large-scale technological phenomena through time and space, pervading multiple identities and language groups. These phenomena, often called 'techno-complexes', represent an ensemble of assemblages that have similar technological characteristics in a given time and space. As we saw, this working unit has sometimes been associated with the notion of archaeological 'culture', a notion that is misleading. At the techno-complex scale, social and cultural aspects are indeed difficult to represent, because of the multiplicity of factors that could explain these large-scale distributions.

Phenomena of technical convergences, linked to the notion of tendency developed by Leroi-Gourhan may indeed occur, together with parallel technical evolutions (e.g. Boëda 2013). These processes may significantly contribute to the large-scale nature of technical phenomena. When used in lithic studies, as Clark reminded us with his terminology, the term techno-complex is indeed rarely associated with specific cultural entities as forming

a coherent people or ethnic group. The large-scale nature of techno-complexes refrains most lithic analysts from interpreting their data in those terms. This impossibility is expressed by Eric Boëda:

When you work with the materiality of things, you see that it is impossible. In each geographical space, you have completely different identities. Even more striking: one region will see many identities succeeding, but despite this, will maintain a common trunk, a geographical identity basis. At the technical culture level, we see innovations appearing in a group, and sometimes diffusing to another group, by contact. But where anthropologists would see a population replacing its neighbouring one by bringing in its own culture, I rather perceive that a technical idea has been captured and adapted by the neighbouring population. Working on the materiality of archaeological remains does not confirm the great anthropological narrative. (Boëda & Testot 2015: 152, my translation)

Even though it is broadly recognised that lithic technologies and know-how reflect shared and transmitted knowledge, questions remain about the large-scale chronological and geographical distribution of similar technologies. The ‘boundaries’ of techno-complexes, if such things exist, cannot correspond to consistent ‘cultural packages’ and peoples. The precise question about ‘why technological knowledge is widely shared?’ is not often explored, beyond broad explanations that involve common networks or geographical ranges. However, anthropology has shown that innovations are not necessarily adopted from one society to another (e.g. Descola 1994). In that sense, contacts or networks could be conditions of the spread of knowledge, but not an exclusive explanation for it.

As an alternative understanding of broad technological similarities, chronologically and spatially, Eric Boëda developed a theoretical approach giving a particularly interesting insight on phenomena of technical convergences, especially when considering long time frames. His work partly relies on the notion of tendency developed by Leroi-Gourhan (1945), and presented below.

a. The notion of tendency and facts

Amongst all scholars working on the links between techniques and culture, the work of Leroi-Gourhan (1943, 1945) was particularly influential (see Audouze 2002 for a

discussion on Leroi-Gourhan's work in English). For him, objects produced by humans are described as a "*thin layer*" between them and their environment (*'milieu'*). This layer of objects is at the interface between the external and internal environments. The author defines the external environment as "*all that materially surrounds man: geological, climatic, animal and vegetal environment.*" (Leroi-Gourhan 1945: 333–334, my translation). The internal environment is: "*at each instant of time, in a delimited human mass (most of the time incompletely), what constitutes the intellectual resources of this mass, that is, an extremely complex bath of mental traditions.*" (Leroi-Gourhan 1945: 334, my translation). Following Leroi-Gourhan's theory, the external and internal environments pervade the objects and techniques. The variability of responses given by the interplay between these two environments result in a layer of object enveloping one human group. The varied responses expressed by human groups are termed 'facts' (*faits*). All techniques and objects are, for Leroi-Gourhan, also determined by a universal rule that he calls 'tendency' (*tendance*), which constrains the materialisation of techniques and objects (Leroi-Gourhan 1945: 336). This notion is of particular importance for discussing large-scale repartitions of similar technologies. The tendencies define the modalities of response for a given problem (or task), according to the general setting of the physical world. This technical determinism may lead to the appearance of similar objects when used for the same actions:

we also saw that the number of technical responses is limited and that we can say: 'men have solved the problem of wood by the adze, the problem of iron by the forge, the problem of yarn by the spindle'. Further than the conflict between the physical and mental environments, a superior degree exists. (Leroi-Gourhan 1945: 336, my translation).

Following Leroi-Gourhan's model, tendencies predetermine the modalities of response for a given problem (or task), according to the general setting of the physical world:

Each tool, weapon, or object, from the basket to the house, echoes an architectural balance of which the main structure is consistent with geometric or rational mechanical laws. There is, therefore, an aspect of the technical tendency which ensues from the construction of the universe, and it is consequently natural that roofs have two slopes, adzes are hafted, arrows balanced at the third of their lengths, just as it is natural for a

gastropod of all times to have a spiral-wound shell. (Leroi-Gourhan 1945: 338, my translation).

Leroi-Gourhan synthesises the articulation between tendencies and facts in these terms:

The tendency, which because of its universal nature is full of all the possibility expressible by general laws, goes through the internal environment, pervaded by the mental traditions of each human group; and gets specific particularities, as a thread of light gets diverse properties by going through different entities, it encounters the external environment which gives to these acquired properties an irregular penetration. At the contact point between the internal and the external environment, the film of objects which constitute man's mobilier is created. (Leroi-Gourhan 1945: 339, my translation)

Leroi-Gourhan's theory permits both the study of specificities (through the facts) and also of universal trends (through to the tendencies). His work had a significant influence on anthropologists and archaeologists working on techniques, notably for the notion of convergence.

b. Technical convergences and evolution

Starting from the work of Leroi-Gourhan, Boëda (1997, 2005, 2013) proposes an alternative vision of lithic technologies, that relies on notions developed by Simondon (1958). The author develops a theoretical approach giving a particularly interesting insight on phenomena of technical convergences, especially when considering long time frames. Boëda asks: "*How could we explain that the same object, realised and used identically, is produced in different locations, without possible contacts as ethnology demonstrates, at different times as archaeology shows.*" (Boëda 2013: 16, my translation). For him, certain manifestations of objects:

may evolve due to their structural potential and therefore correspond to new functional constraints, whereas other objects will not evolve, by keeping the same functional register, regardless of the human type or of its environment. This temporal transcendence, therefore 'a-cultural', stipulates that certain structure of objects have an evolutive potential

which translates itself into a cycle governed by 'laws'. However, the tempo of the evolution, its rhythm and frequency, will only be the fact of Man. Depending on the constraints that societies impose on themselves or are subject to, Man invents, innovates and diffuses techniques. (Boëda 2013: 16, my translation)

Following these observations, Boëda discusses the concept of '*lignées techniques*' (technical lines), in which are the evolutionary processes of technical objects, from 'abstract' to 'concrete', correspond to a progressive integration between the units composing the tool or the core. If needs change, the 'line' disappears and may be replaced by another. Boëda's work is particularly relevant to large-scale technical phenomena in lithic studies, especially in diachronic perspectives. Processes of the diffusion of technology and the potential adoption of techniques may also be investigated from different perspectives, including social ones. Techno-complexes may thus be explained by different processes, including technical convergences, but also as discussed by researchers cited earlier who are breaking away from culture-container models (e.g. MacEachern 1994, 2000).

2.4. Conclusion

We saw in this chapter how the concepts of culture and identity are closely linked to the interpretation of archaeological data. Different anthropological conceptions of what culture are reflected in the interpretation of 'archaeological cultures'. However, as in anthropology, the concept of culture in archaeology is increasingly being deconstructed, especially when understood as a 'cultural package' or 'cultural container'. Recent approaches highlight the unreliability of drawing correlations between objects or techniques and language, ethnic, and biological groups. The observation in lithic studies of large-scale technical phenomena pervading multiple identities is particularly relevant, and requires special attention. With these points in mind, the lithic technology at BMS was studied and interpreted in regard to the broader southern African context. Additional aspects relevant to the context of this study, in particular concerning the appearance of herding practices in southern Africa will also be discussed in the light of this theoretical framework.

3. METHODS

3.1. The lithic technology method

3.1.1. The chaîne opératoire concept

The *chaîne opératoire* concept was defined by André Leroi-Gourhan (1943, 1993 as followed:

Techniques are at the same time gestures and tools, organised in sequence by a true syntax which gives the operational series both their stability and their flexibility. The operational syntax is generated by memory and is born between the dialogue between the brain and the material realm. (Leroi-Gourhan 1943: 114, translation by Audouze [2002])

The concept is later reformulated by Pierre Lemonnier (1980: 8, translation by Audouze [2002]): “Operational sequences are series of actions which transform a raw material from its natural state to a manufactured state. These operations are made with actions on matter, preparatory phases of rest and they are associated with a knowledge and a know-how”. The *chaîne opératoire* concept is particularly used in studies interested in techniques for investigating the chain of event occurring for object-making. This concept was applied and develop in the frame of lithic studies, especially in the French journal ‘Techniques & culture’ published since 1983.

3.1.2. Terminology

Further than a concept, the *chaîne opératoire* is also a method used in the frame of lithic studies. The methodology of lithic *chaîne opératoire* seeks to recognise each stage of the lithic fabrication process, from the choice of raw material to the discard stage. It is closely linked to the notion of intention of production, which is the object and associated functional properties that are looked for.

The lithic *chaîne opératoire* includes the selection of raw material, tool production, use, and discard. Specific methods and techniques are used in order to create the intended products. These methods and techniques vary through time and space and are commonly used, together with typological data, as broad chronological markers. Following the works

of Tixier (1967, 2012), Inizan *et al.* (1995) and Pelegrin (1997), definitions of specific terminologies used in this thesis are given below:

The method is the general scheme that the knapper has in mind during the debitage in order to obtain the intended product. It is the succession of gestures organized logically in order to produce an intentional product (blank, retouched tool – e.g. Levallois method). The method can be assessed by analysing the organisation and chronology of the removal scars on the cores and blanks, and by integrating the elements in a global system.

The sequence is a standardised succession of removals that may be repeated and that is executed in order to obtain specific products. It may be, for instance, the succession of bladelet removal on a core, that may be situated at a specific moment of the core reduction process. The sequence is logically and chronologically organised. Different sequences for different purposes may exist.

The technique of extraction corresponds to the modalities of application of the force (direct and indirect percussion, pressure), the nature and morphology of the knapping tools (stone hammer, organic hammer...), and the kind of gesture used to knap (including body position, holding of the piece, and knapping gesture). Techniques of extraction may change through the same reduction process. The techniques used can be diagnosed through the analysis of stigmata on the blanks and cores. Experimentation may here be used to compare with an experimental assemblage. In the frame of this thesis, experimentation done by different authors and published lithic studies are used as a reference. I mainly relied on the publications by Callahan (1987), Cotterell and Kamminga (1987), Pelegrin (1997), de la Peña (2015), Hiscock (2015) and Shott and Tostevin (2015).

Three techniques of extraction, alternatively called ‘modalities’ were discussed for BMS assemblage: free-hand, anvil-rested and bipolar. Free-hand (*main levée*) corresponds to the extraction of a blank with a hammer on a volume held in hand. The anvil-rested modality (*percussion sur nucleus posé*) is when the core is stabilised on an anvil, with no intention to create opposite removal coming from the anvil. Blanks can be extracted with a direct or indirect percussion. At BMS however, no stigmata characteristic of indirect percussion was noted. The bipolar modality (*percussion bipolaire sur enclume*) is here understood as a technique consisting in extracting blanks with an axial percussion from a hammered

platform and an opposite end resting on an anvil thanks to the compression of forces occurring between the hammered and rested platforms.

By differentiating between ‘anvil-platform’ and ‘axial bipolar’ modalities, I agree with the ‘strong’ bipolar debitage definition given by Hiscock as opposed to ‘anvil-rested’ debitage:

bipolar blows are those in which a hammer strikes a rock which is resting on an anvil, and strikes into it in line with the point at which the rock is in contact with the anvil (Hiscock 1982, 1996, 2003, 2009). This restricts bipolar blows to those that immobilize and compress the struck piece between the anvil and hammer. This restricted, stronger, definition differentiates bipolar blows from those applied to cores which are merely rested on an anvil, but not compressed between the hammer and the anvil. (Hiscock 2015: 343)

When using the term ‘bipolar’, I will therefore imply that the gesture of percussion is axial, whereas they may be off-axis in the case of anvil-platform modality. Callahan (1983: 19–21) gives a definition of ‘anvil-platform’ cores:

[they] may be similar to freehand platform cores, as above, except that crushing is usually exhibited on the base of the core. Similar core with rather parallel sides and flattened base may be indicative of anvil use, even though no crushing of the base is apparent. Such a strong base on the core or the use of a wooden anvil would tend to resist crushing even though the anvil were used (...). Anvil cores may also resemble some bipolar cores. The difference lies in the way the force is oriented. In anvil percussion, the force is oriented obliquely away from the anvil whereas in bipolar percussion the force is oriented directly into the anvil.

Only the cores displaying crushing at the base with a plain to filiform platform, and removal scars displaying stigmata closer to the free-hand than axial bipolar percussion were classified in this category. Although I am aware that this anvil-rested modality may not cause damage on the distal base of the core, I restricted the diagnosis of this modality to clear examples in order to avoid confusion with the free-hand and axial bipolar modalities.

Concerning the structure of the core, five different areas are considered: the extraction surface, striking platform, flanks, back and base of the core (Fig. 3.1). The extraction surface is the surface from which blanks are extracted. The striking platform is the area associated with the extraction surface from which the knapper hits the core in order to detach blanks. The flanks are the ‘sides’ of the core ‘framing’ the extraction surface. The back of the core is the area opposite to the extraction surface. The base of the core is the basal ‘end’ of the core, that may or not rest on an anvil.

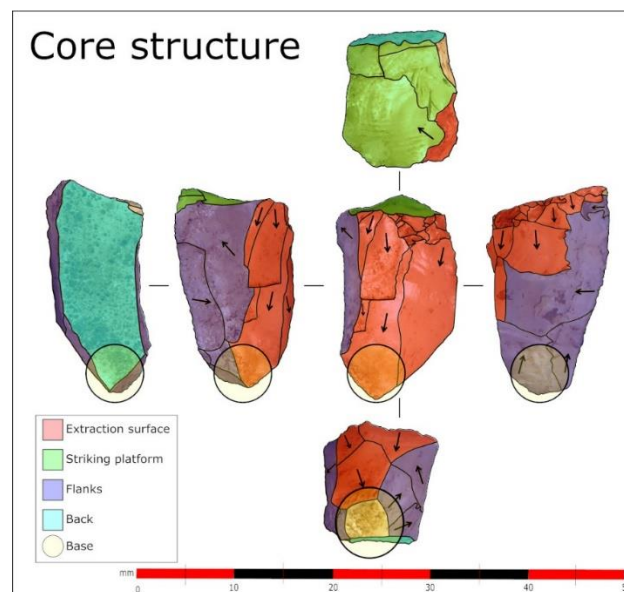


Figure 3.1. Cores' structure and units

3.1.3. Data registered for Balerno Main Shelter

For BMS assemblage, the *chaîne opératoire* method will be applied following the guideline of Inizan *et al.* 1995, mainly based on the orientation and chronology of the flaking scars on the cores and blanks. The lithic *chaîne opératoire* method allows reconstructing the core's reduction process and blank production through a ‘mental’ or physical (refitting) reconstruction of the debitage methods. It also allows understanding how the volume of the bloc was potentially selected, prepared and managed through the debitage. As practical examples of this method, I refer to the published PhD thesis of F. Bon (2002), the article on the Robberg from Elands Bay Cave by Porraz *et al.* (2016), Soriano *et al.* (2007) and de la Peña (2015) for bipolar debitage.

Following an initial qualitative study of the material, different data are registered in databases. I created files for each raw material: chert, agate, quartz and dolerite. For each

of these raw materials, I created an excel database for the cores, the lamellar products and the flakes.

a. Core database

In the database for the cores, I took both qualitative and quantitative data. I firstly registered the coordinates of the artefacts: Square, layer and spit. I also gave a number for each core preceded by the letter c for 'core' (ex: c443). The following data were taken:

TECHNIQUE: the extraction technique that corresponds to the discard stage of the core. Three techniques were noted: **free-hand**, **anvil-platform** and **bipolar** (Fig. 3.2).

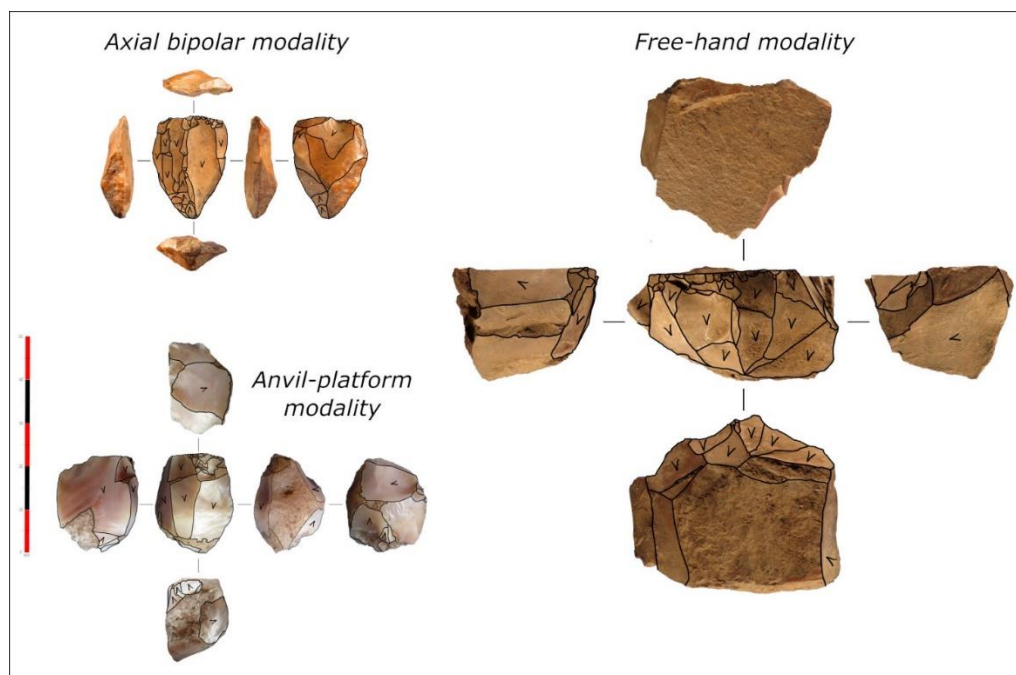


Figure 3.2. Percussion modalities recognised for BMS cores

REMOVAL SCARS: type of removal scars visible on the core: flakes, elongated flakes and bladelets. These categories are not exclusive. The bladelet removal scar category corresponds to cores on which at least one bladelet removal scar was observed, together with other removal scar types. The flake and elongated flake removal scar categories correspond to the type of removal scar mostly represented.

REMOVAL SCARS' ORIENTATION: the orientation visible on the removal scars of the core: unidirectional and multidirectional. Cores with opposite removal scars resulting from the use of an anvil are also noted. (Fig. 3.3)

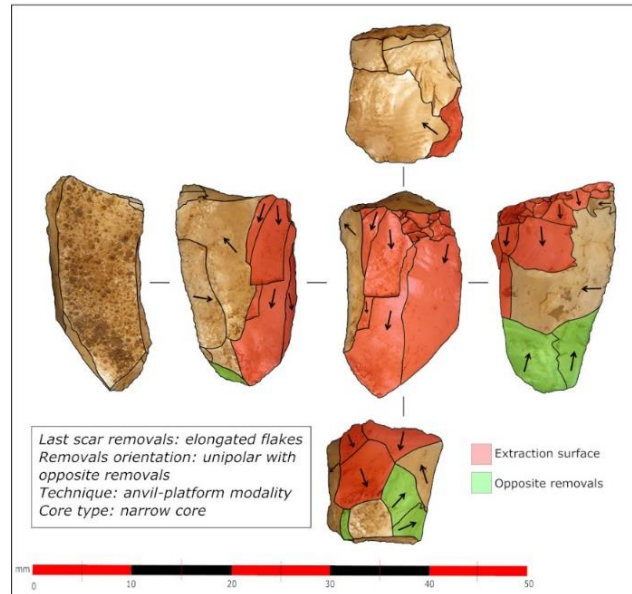


Figure 3.3. Example of data registered for the core analysis

CORTEX: cortex percentage ranging from 0%, 1-10%, 10-40%, 40-60%, 60-80%, 80-100%.

LENGTH: maximum length of the surface of extraction, also called the '*carène*' (the longitudinal convexity). (Fig. 3.4)

WIDTH: maximum width of the core, perpendicularly to the surface of extraction, also called the '*cintre*' (the transversal convexity).

THICKNESS: thickness of the core taken between the middle of the surface of extraction and the back of the core.

WEIGHT: weight of the core

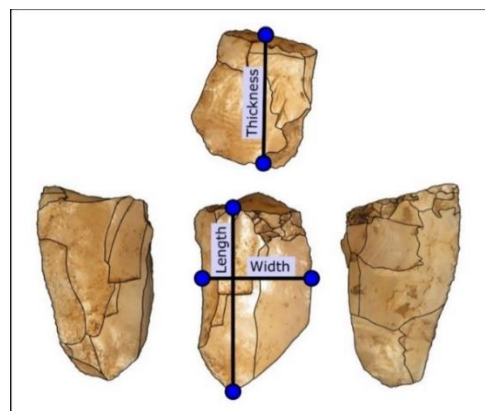


Figure 3.4. Measures taken on the cores

TYPE: type of the core, following the core typology developed for the BMS assemblage.

Four core categories were created: Narrow cores, wide cores, cubic cores, pyramidal cores and flat cores. Each of these core categories is discussed in more details in the results section. A quick description is however given below as a comparative reference for other microlithic assemblages.

Narrow cores (Fig. 3.5)

Cores with one preferential extraction surface located on an elongated part of the volume. The narrow extraction surface is ‘framed’ by two independent steep flanks that are natural or created by the removal of transversal flakes. The core section is triangular to cubic. Elongated blanks, including bladelets and flakes, are unidirectionally extracted from these cores through different modalities including free-hand, anvil-platform and bipolar. The distinctive bipolar narrow cores are the ones with one preferential extraction surface, and where the steep flanks are still observable.

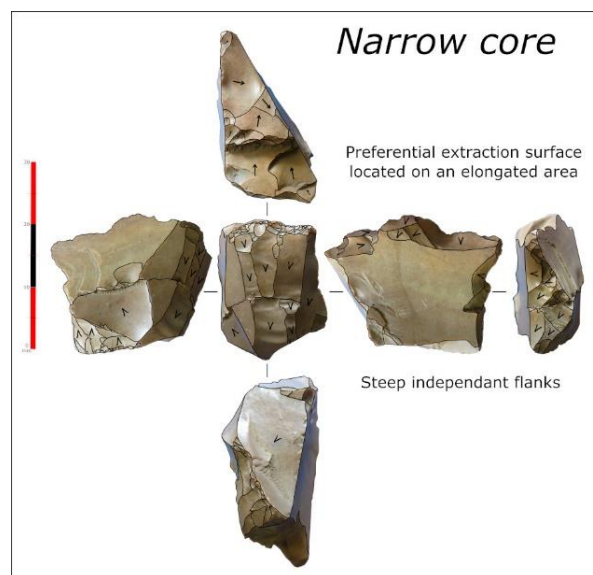


Figure 3.5. Narrow core type

Wide cores (Fig. 3.6)

Cores with one preferential extraction surface located on a wide area of the volume. The flanks of the cores are independent from the extraction surface. Flakes and sometimes elongated flakes are unidirectionally extracted mostly through free-hand percussion. An anvil could also have been used to rest these cores.

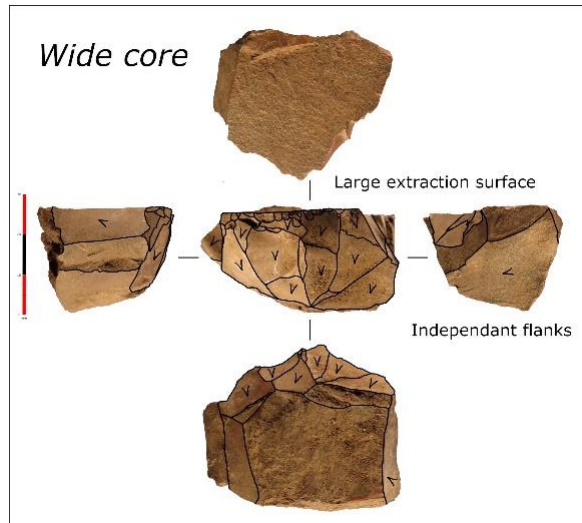


Figure 3.6. Wide core type

Cubic cores (Fig. 3.7)

Cores with multiple independent extraction surfaces from which blanks, including bladelets, are unidirectionally extracted. Former extraction surfaces may be used as striking platforms or form independent 'sides'.

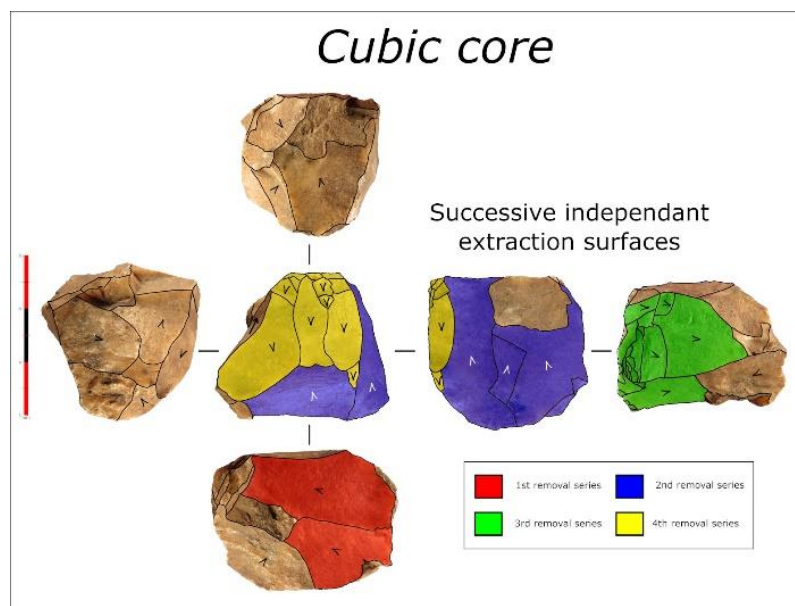


Figure 3.7. Cubic core type

Pyramidal cores (Fig. 3.8)

Cores with a wide and plain striking platform from which blanks are extracted on almost all the periphery of the volume. The extraction surface is therefore not restricted to one area of the core but turns around the volume. The base of the core is appointed. Free-hand and anvil-platform modalities may have been used to extract blanks.

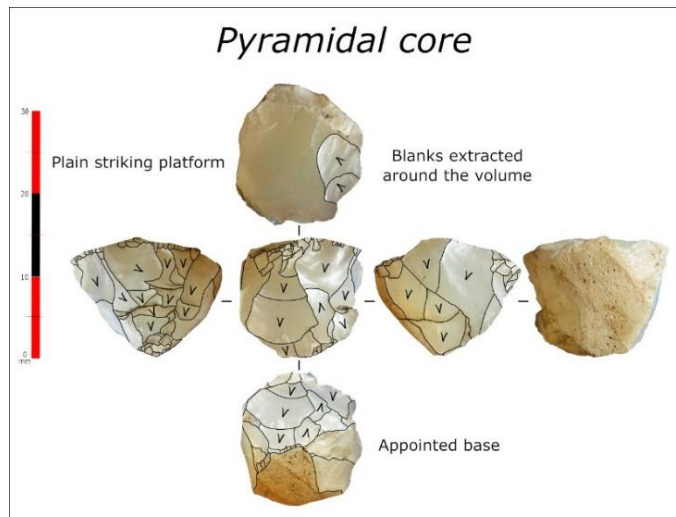


Figure 3.8. Pyramidal core type

Flat cores (Fig. 3.9)

Cores made of blanks from which blanks are bipolarly extracted thanks to an axial bipolar percussion. They are typical of axial bipolar cores with two opposite crushed ends and 'compressed flakes' removals with marked waves of percussion.

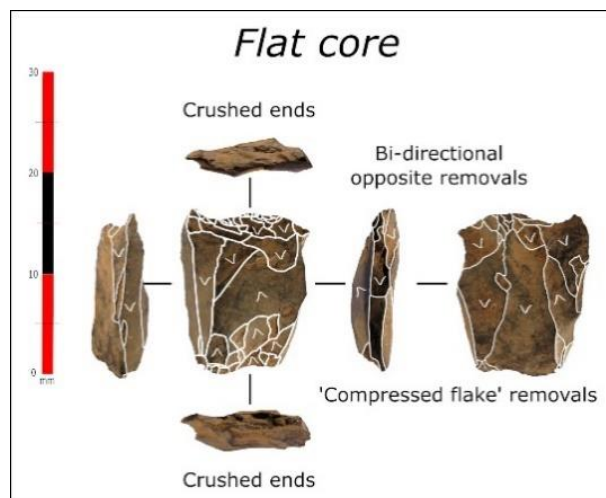


Figure 3.9. Flat core type

REMARKS: remarks on specific aspects of the core.

b. Lamellar blank database

The lamellar blank database corresponds to all blanks linked to the bladelet extraction: bladelets, elongated flakes and lamellar flakes. Each artefact has a number (ex: 289). I

firstly registered the coordinates of the artefacts: Square, layer and spit. The following data were taken:

TYPE: the type of lamellar product, including **bladelets**, **elongated flakes** and **lamellar flakes**. (Fig. 3.10)

A **bladelet** is a flake which is at least twice as long as wide in its axis of debitage, and which was extracted during a lamellar sequence. It can display previous removal scars of bladelet, demonstrating its inscription into the bladelet extraction sequence. Bladelets are rather thin and narrow and have two cutting edges meeting in the distal part. They tend to have regular parallel side edges. The side edges may also be convergent, expanding or irregular.

An **elongated flake** is a flake which is longer than wide, associated with the bladelet extraction sequence and on which some previous elongated flake removals are visible. These flakes are less regular than bladelets but are part of a similar reduction process, preceding, framing or intercalated in the bladelet extraction sequence.

A **lamellar flake** is any flake, elongated or not, related to the lamellar sequence. It can, for instance, be a flake that takes away part of the extraction surface, from any direction, and on which bladelet removal scars are visible.

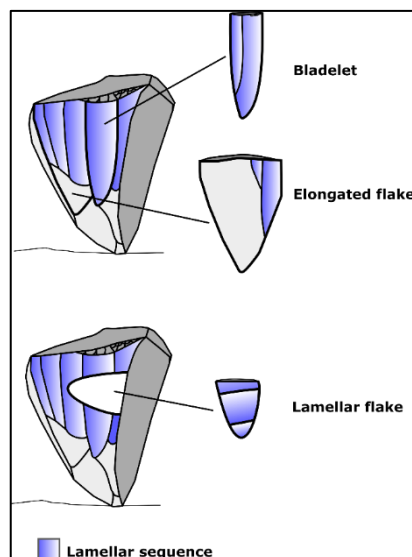


Figure 3.10. Bladelet, elongated flake and lamellar flake

LENGTH: maximum length in the technological axis of the piece

WIDTH: width taken in the middle of the piece, perpendicularly to its technological axis

THICKNESS: thickness taken in the middle of the piece

(Fig. 3.11)

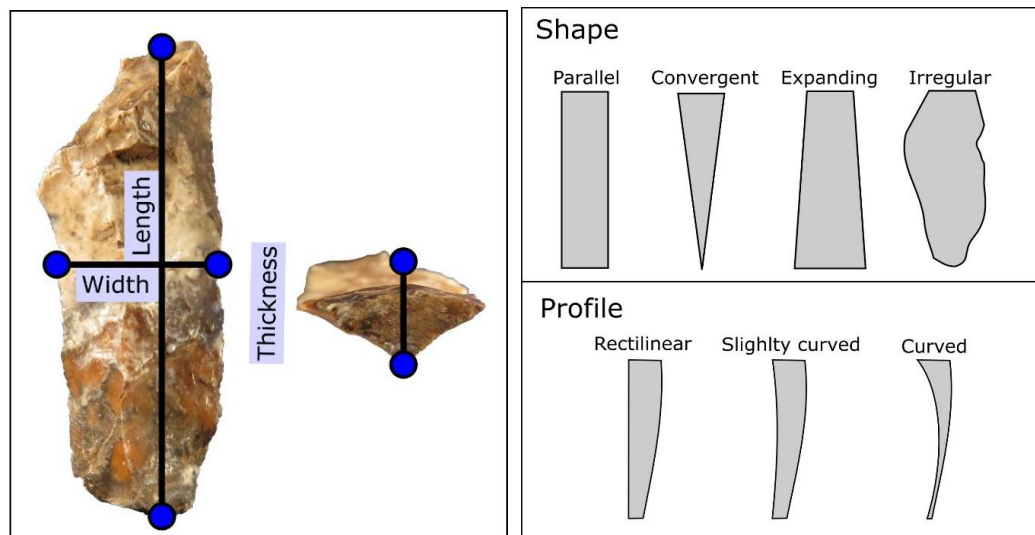


Figure 3.11. Measures taken on the bladelets (left), shape and profile categories (right)

CORTEX: cortex percentage ranging from 0%, 1-10%, 10-40%, 40-60%, 60-80%, 80-100%.

BLADELET PROFILE: the curvature of the bladelet, rectilinear, slightly curved and curved.

BLADELET SHAPE: the overall shape of the bladelet: parallel, convergent, expanding, irregular

REMOVAL SCARS ORIENTATION: unidirectional, opposite or multidirectional

PLATFORM: plain, punctiform, filiform or crushed, x for a missing platform

TECHNIQUE: the technique used to extract the bladelet: free-hand or bipolar

REMARKS: additional comments

c. Flake database

The following data were registered in the flake database, in addition to the coordinates:

SIZE: the maximum length of a flake, regardless of its technological orientation. The measures were taken with circles of 1 to 6 cm of diameter

CORTEX: cortex percentage ranging from 0%, 1-10%, 10-40%, 40-60%, 60-80%, 80-100%

PLATFORM: plain, punctiform, filiform or crushed, x for a missing platform

TECHNIQUE: the technique used to extract the bladelet: free-hand or bipolar

d. Statistical analysis

The statistical analysis will be used to support the qualitative analysis. If a pattern is noticed, for example the production of wide and short flakes, they will be isolated and counted. If a knapping technique is recognised, the blanks presenting characteristic stigmata will also be counted and compared to the rest of the lithics. Counts and graphs will be realised in Excel (Microsoft Office 16) and Past3. According to the distribution of the values, and the nature of the data compared, different tests of significant variation are used, such as Student T-test, X² or Fisher exact test. The site Biostatgv (<https://biostatgv.sentiweb.fr/>) was used to run the tests.

3.2. The techno-functional method

3.2.1. Concepts and terminology

The techno-functional method characterises the structure of a tool by defining the different units composing it, as well as their degree of integration or independence. François Sigaut defines the **structure**:

[it] corresponds to the question: what is it, what is it made of? We look at the object through its sub-systems (organs, pieces, elements...), through the arrangement of these sub-systems between them (assemblages, articulations...), and through the external shape resulting from this arrangement. (Sigaut 2012:105, my translation)

The techno-functional approach has been applied for lithic studies (Boëda 1997, 2001, following Lepot 1993). The degree of normalisation of each part of the tool is analysed, as well as their interface. It is a way to break from traditional tool typology, which considers the entire shape of the tool as a single unit. If one object shape varies, the traditional typology will tend to create different types. A study of the structure will, on the other hand, spot which part of the tool is standardised, and which one varies. A more precise typology may then be proposed. These approaches have been applied successfully in South Africa in Pleistocene contexts (e.g. Soriano *et al.* 2015).

François Sigaut (1991, 2012) also established an important distinction between the **functioning** and the **function** of a tool. Techno-functional studies may allow us to formulate hypotheses on the functioning of a tool, whereas its function (and also functioning) is more likely deciphered through use-wear analyses. Sigaut (1991, 2012) defines the functioning as what corresponds to the question: ‘how does it work?’ On the other hand, the function answers to the question: ‘what is it for, what is the use?’

Techno-functional analyses may be applied to cores, blanks and retouched artefacts. In the frame of this thesis, I will focus on the techno-functional studies of the scrapers, geometrics and convergent tools. I will also partially use it in order to study the cores’ structures, and to define the technical properties that were looked for in the blank production.

3.2.2. Scraper analysis

a. Scraper definition

The term ‘scraper’ applies to all blanks with an edge modified by a continuous convex to straight-convex retouch (Demars & Laurent 2000; Andrefsky 2005). These tools are generally understood as scraping implements for hides or other materials (e.g. Guéret 2013; Forssman *et al.* 2018). Occasionally the unmodified edges of the tools can also be used, but archaeological examples remain very scarce (Porraz *et al.* 2018). One recurrent result seen from functional studies is the use of end-scrapers in a longitudinal motion, with the worked material being perpendicular to the axis of the *front*. Diverse categories of scrapers have been defined, varying with the characteristics of the retouch (i.e. delineation, extension and incidence) and its location. Wilton scrapers are microlithic, most often measuring less than 30mm in both length and width. In the present context of study, Wilton scrapers can broadly be classified as end-scrapers, which are blanks with distal retouch. This distal retouch, alternatively called *front*, is generally convex and has an angle less than 75°. The *front* is delimited by two sides, retouched or not, that are parallel, divergent or convergent.

For the present study and in order to assess the variability of Wilton late Holocene scrapers, I combined two methods, namely a technological method and a morpho-functional method. The technological method aimed at integrating the study of the tool within its whole lithic reduction process, i.e. its *chaîne opératoire* (Inizan *et al.* 1995). Such study aims to characterise the successive stages of manufacture of the scrapers: from the selection of the raw material to the production and selection of the blank, to the shaping, use and the discard

of the tool. All these parameters are critical when discussing the morphological and dimensional variability characterising a scraper assemblage (e.g. Andrefsky 2009).

b. Method of analysis

In order to assess the variability of Wilton Late Holocene scrapers, I combined two methods, namely a technological method and a morpho-functional method. The technological method aims to situate the study of the tool within its entire lithic reduction process—its *chaîne opératoire* (Inizan *et al.* 1995). This method sheds light on the strategies behind the choices made at different stages of tool production. It also permits the formulation of hypotheses about the intentions of production behind these choices.

For the present study, the *chaîne opératoire* analysis aims to characterise the successive stages of scraper manufacture, from the selection of raw material to the production and selection of the blank, to the shaping, use and discarding of the tool. All these parameters are critical when discussing the morphological and dimensional variability characterising a scraper assemblage (e.g. Andrefsky 2009).

The morpho-functional method reproduces the general principles of the techno-functional studies focusing on the structure of artefacts (Boëda 1997; Sigaut 1991, 2012). Two interconnected units can be distinguished for characterising the structure of a tool: the active unit (i.e. the working edge) and the passive unit that can be held or hafted. The passive unit is formed by the prehensile part and by the receptive part; the receptive part is the intermediary area between the active and prehensile units (Lepot 1993). Use-wear studies are complementary to this approach.

Diverse categories of scrapers have been defined, depending on the characteristics of the retouch (i.e. delineation, extension and incidence) and its location. Wilton scrapers can broadly be classified as end-scrapers, which are blanks with distal retouch. This distal retouch, alternatively called *front*, is generally convex and has an angle of less than 75°. The *front* is delimited by two sides, retouched or not, that are parallel, divergent or convergent. Various use-wear studies document that *fronts* were mainly used to work hides, but also vegetal and other materials (e.g. Guéret 2013; Forssman *et al.* 2018). Occasionally the unmodified edges of the tools may also be used, but archaeological examples remain scarce (Porraz *et al.* 2018). One recurring result from functional studies is the use of end-

scrapers in a longitudinal motion, with the worked material being perpendicular to the axis of the *front*.

Following the analytical principals of the techno-functional studies (Lepot 1993; Boëda 1997), I divided the tools into two main parts: the active and the passive units. The active unit is formed by the *front*, while the passive unit is formed by the body of the scraper (Fig. 3.12). Considering that microlithic scrapers were likely hafted, I acknowledge that the totality of the prehensile part is not preserved.

The study sought to characterise the morphological variation of the scrapers by distinguishing the active and passive units. Various data were taken in order to record both dimensional and qualitative parameters (Fig. 3.12).

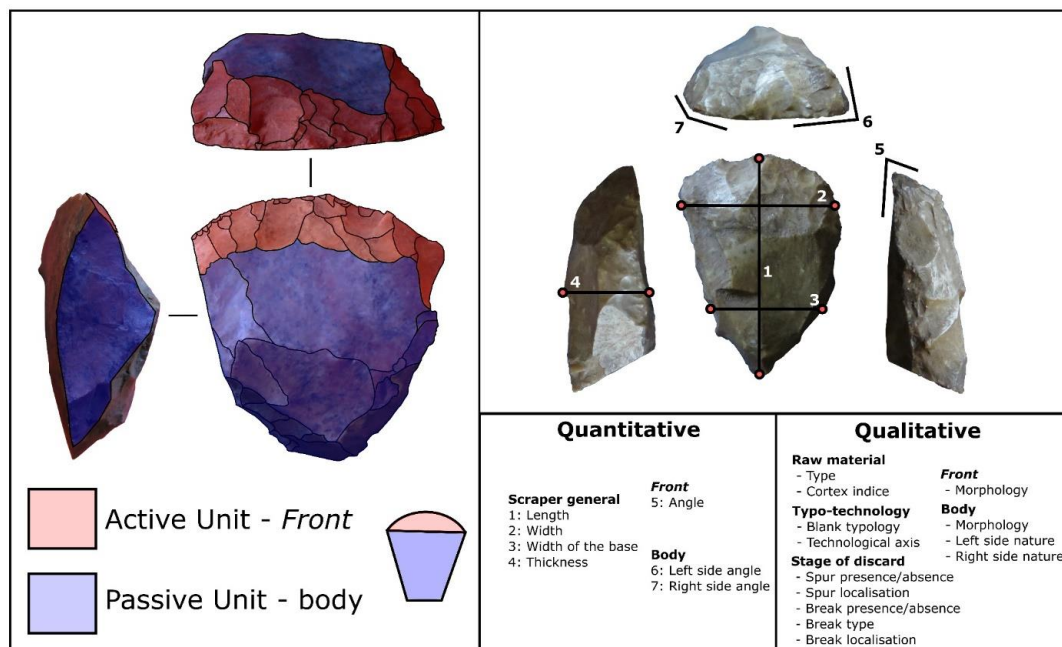


Figure 3.12. Scraper's units (left) and data registered (right)

Data were taken with regard to raw materials and the types of blanks that were chosen. While the technological axis was systematically recorded, all scrapers were oriented within the axis of their *front*. Multiple measurements were taken such as the maximum length of the scrapers (perpendicular to the *front*), the maximum width (parallel to the *front*) and the maximum thickness (in the middle of the piece). Angles were measured against reference angles ranging from 10° to 100°. They were taken in the middle of the front as well as on both edges. The morphology of the *front* and the edges was also recorded and measured independently. I associated different data in order to investigate the stages of discard, such

as the angle of the *front*, the presence/absence of deep retouch flakes removing part of the front, the morphology of the *front*, as well as the presence/absence of spurs. A spur is a sharp projection located in the middle of the *front* or at the corner of the retouch (e.g. Weedman 2002). Different studies demonstrated that *front* spurs are accidents created by hinged retouched, and that corner spurs can be linked to the sharpening of the scraper (see Eren *et al.* 2013 for discussion). The presence of spurs may lead to the discard of the scraper as they stop being functional, especially for working hides (Weedman 2002), and therefore are important techno-functional features to record. Finally, all breaks were recorded and described using terminology borrowed from the work of Bertouille (1989, 1991) and Chesnaux (2014).

3.2.3. Backed tools

a. Backed tools definition

Backed pieces are blanks modified by an abrupt retouch, creating a blunt edge. The action of creating a ‘backed area’, or a ‘back’ is referred to as ‘backing’. Backing an artefact allows shaping a blank and creating standardised morphologies with specific functional properties. The backing may be made to create a prehensile unit facilitating the hafting or the handling of the artefact and to shape an active unit such as a point.

A backed edge may be continuous or limited to a specific area and can be more or less invasive. Pelegrin (2004) discusses three backing techniques: direct free-hand percussion with the artefact resting on a surface; pressure-flaking; and a rubbing action (*égrisage*) made with a soft hammer (such as a sandstone pebble). The retouch may be made from the ventral surface (direct), from the dorsal surface (inverse), or from both directions (crossed). Backed artefacts are generally associated with projectile components, as deduced from diagnostic impact fractures (e.g. Wadley 1989; Crombé *et al.* 2001; Chesnaux 2014; Tomasso *et al.* 2018) (Fig. 3.13). Several studies demonstrated that they could have been hafted in a different way (see a on Fig. 3.13, Charrié-Duhaut *et al.* 2016), used for different purposes (Wadley & Binneman 1995), and for both projectile components and cutting implements (e.g. Christensen & Valentin 2004).

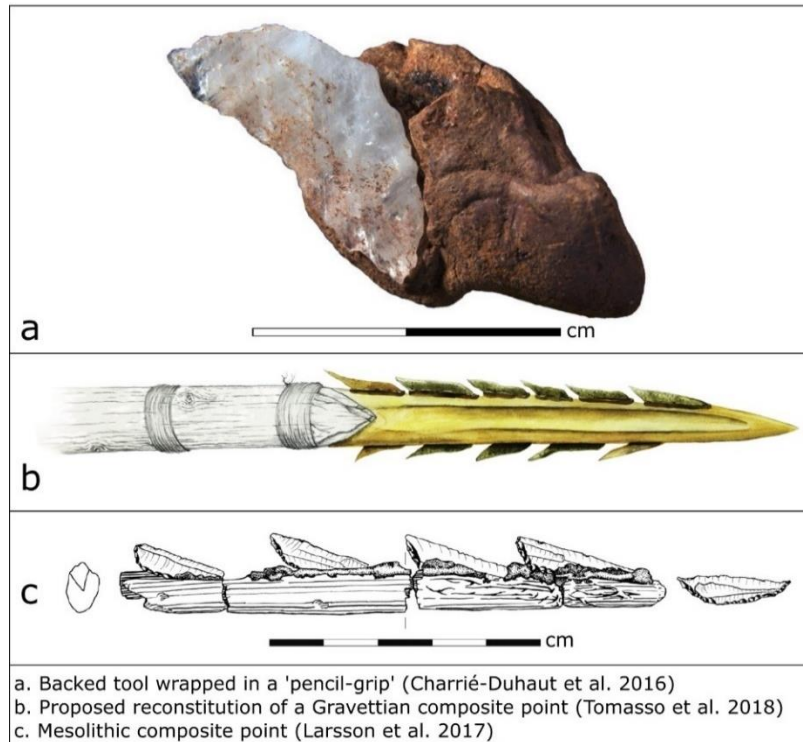


Figure 3.13. Examples of hafted microliths

In order to have a systematic classification system, I initially adopted a classic typology considering the overall shape of the artefact. This typology uses the same terminology than the one used by J. Deacon (1984a) and other authors (e.g. Walker 1995a). I however restricted my typology to specific definitions and artefact categories:

Segments are crescent-like artefacts. They have two opposed points created by the association of a convex backing – or ‘arc’ – opposed to a cutting edge. The backing is continuous.

Triangles are triangle-like artefacts with two points created by the association of two combined straight backings opposed to a cutting edge.

Trapezes are trapeze-like artefacts with two points created by the association of independent straight backings transversal to a rectilinear cutting edge. The backed or unmodified space left between the two backings is roughly parallel to the cutting edge.

Backed points are elongated pieces with a with one or two straight or straight-convex backings. An axial point is created by the meeting between the backing and the unretouched edge, or by the meeting of two backings in the extremity of the piece.

Indeterminates are broken fractions of backed tools, too broken to be classifiable in any formal tool category.

Beyond this classic typology, the main typological classification I use is functionally oriented, and relies on the determination of the different units that compose the tool. This classification based on the work of Chesnaux (2014) has the advantage of categorising the backed pieces following functional criteria rather than their overall morphology. This method allows constructing hypotheses on the functioning and function of the backed artefacts. This classification system was already applied in a southern African context by Maenzanise (2018). I describe my functional classification in the following section.

b. Functional structure and classification

For the BMS backed tools assemblage, I considered both morphological and functional aspects for the backed tool classification. I divided the tools following two broad morphological categories: the **geometrics** and the **convergent tools**.

Geometrics are microlithic backed artefact with standardised geometrical shapes. Three main shapes are generally discussed for southern Africa: segments, triangles and trapezes (e.g. J. Deacon 1984a; Walker 1995a). Geometrics are commonly interpreted as projectile components. Following this interpretation, the back is a passive area used for facilitating the hafting and is opposed to a cutting edge.

Convergent tools have one or two points, most frequently in the axis of the artefact. They regroup different types such as backed points and borers. The backing may be partial and used to shape a point, or covering the totality of an edge.

Following the classification system of Chesnaux (2014). I further focused on the different functional units of the geometrics and convergent pieces. Chesnaux divides the tools into three units: the point(s), the cutting edge(s) and the backing(s) (Fig. 3.14). I agree with Maenzanise (2018: 32) to say that a point is a sharp or rounded tip which has at least one retouched edge and an angle less than 90°. The cutting edge is a sharp edge, and a backing an abrupt retouch superior or equal at 75°. Each of these units – the point(s), cutting edge and backing – has different properties and assumedly have different functions. The point may be piercing, the cutting edge may cut/dilacerate, and the backing may be practical to hold or haft. The association between these three units creates tools with different functional properties. In her experimentation, focusing on backed artefact mounting and

use as projectile components, Chesnaux was able to demonstrate that segments and triangles have similar properties and may have been similarly used, though they vary in their overall morphology.

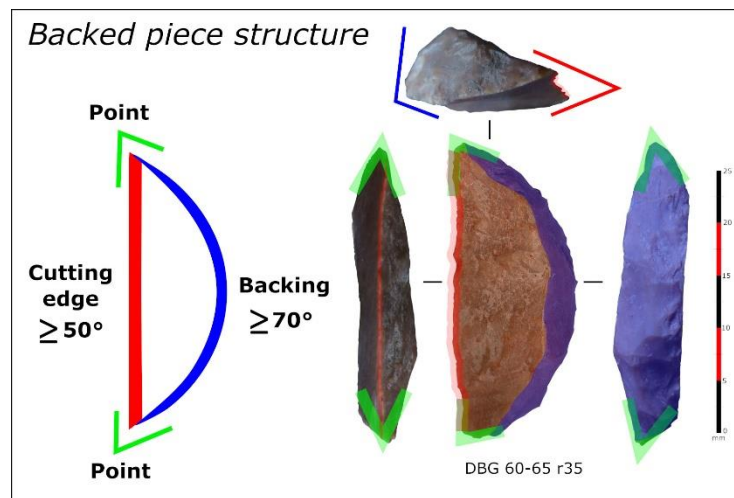


Figure 3.14. Backed piece's structure

Chesnaux's classification also specifies if the axis of the point(s) is centred (axial) or off-centred (off-axis). This data is important, as it may be linked to the hafting and functioning of the backed tools, and if relevant, to their position on a composite arrow. Off-centred double-points, such as segments, may for instance be used as barbed components, whereas centred points may be used as axial projectiles. Other functions and uses may also be associated with these artefacts.

Chesnaux (2014: 28) defines five types of backed tools: centred mono-point (*monopointe axée*), off-centred mono-point (*monopointe déjetée*), double-point (*double pointe*), triple-point (*triple pointe*) and longitudinal cutting edge (*tranchant longitudinal*). This terminology was adapted for the site of BMS where similar and different backed tool types occur. I also further emphasised a functional aspect by differentiating the **backed tools with a cutting edge and the ones with no cutting edge**. Therefore, centred mono-points were for instance sub-classified depending on the absence/presence of a cutting edge. I further specified if the double-points are centred or off-centred, as both occur. No triple-points or longitudinal cutting edges were observed.

In total, six morpho-functional types were defined, under two broad class of tools, the geometrics and the convergent tools (Fig. 3.15):

- The geometrics are all off-centred double-points with cutting edges. Three shapes were discussed within this category: segments, triangles and trapezes. The segments are ‘crescent-like’ artefacts. Their backing is convex, continuous and opposed to a cutting edge. The triangles have two straight backings meeting around the mid-length of the artefact. Trapezes have two discontinuous straight backings and an unretouched or retouched edge, roughly parallel to the cutting edge.
- The convergent tools were divided between the artefacts with or without a cutting edge. The convergent tools with a cutting edge are centred mono or double-points and off-centred mono-points. The convergent tools with no cutting edge are centred mono- or double-points, and off-centred mono-points.

centred mono-points. The convergent tools with no cutting edge are centred mono- or double-points, and off-centred mono-points.

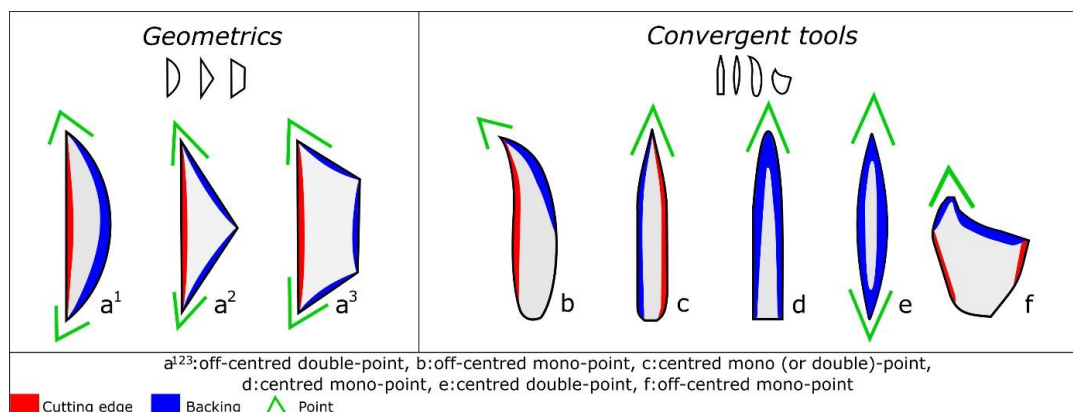


Figure 3.15. Geometrics and convergent tools' structures

The broken backed pieces were isolated and associated with specific types when possible. I classified backed pieces following the presence/absence of a cutting edge, and I observed the position of the cutting edge in relation to the backing. The delineation of the backing was also looked at, because it allows differentiating, for instance, the segments from the triangles. A portion of backed tool with a continuous convex backing opposed to a cutting edge is likely to be a segment. In some cases, it was not clear if the broken backed pieces were off-centred (such as geometrics) or centred, such as centred mono or double points. These artefacts were not attributed to any category.

c. Data registered

Different aspects relative to the size and the overall shape of the backed tools were registered in a database (Fig. 3.16).

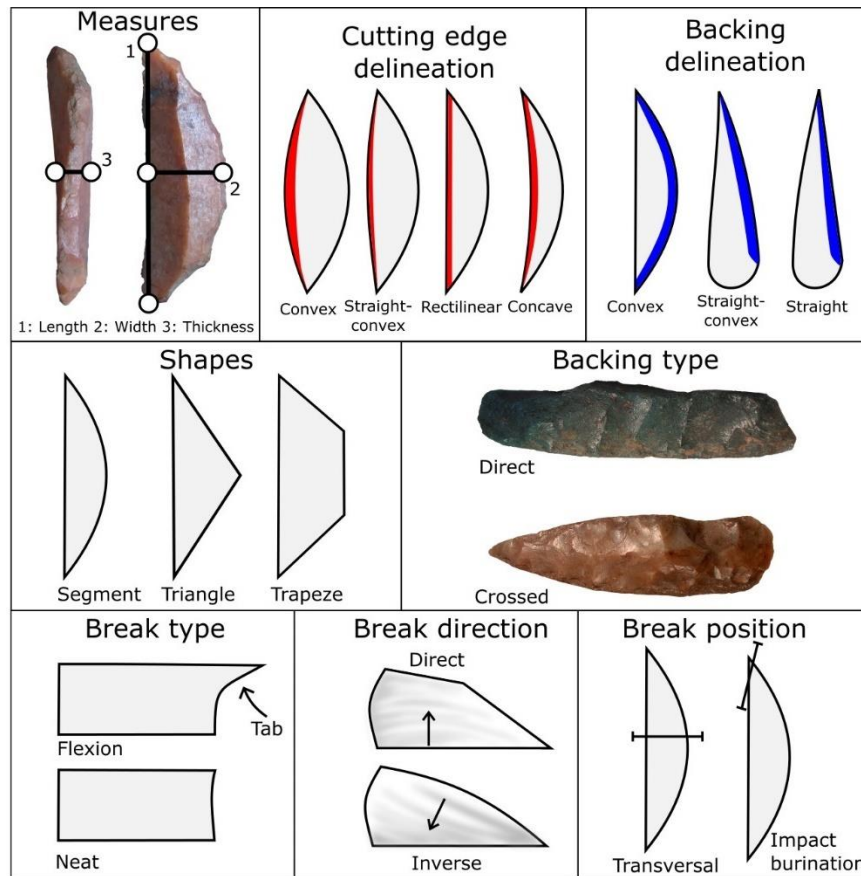


Figure 3.16. Data registered for the geometrics and convergent tools

I took the maximum length of the complete artefacts, often corresponding to the length of the cutting edge. I measured the width and thickness in the middle of the piece. I noted the raw material and cortex proportions. When possible, I specified the blank from which these artefacts were made, and the overall tool profile (straight, slightly curved, curved). I also classified the geometrics in three shapes: segment, triangle and trapeze.

In order to further describe the functional units constituting the tools (the point, the backing and the cutting edge), I registered additional observations. I registered the cutting edge's delineation as: rectilinear, straight-convex, convex or concave. I looked at the position of the backing on the blank considering the blank's technological orientation: left, right, left + right. I also registered the delineation of the backed edge: rectilinear, straight-convex,

convex, concave; as well as the backing type: direct or crossed. I isolated all of the broken backed tools, and only measured their widths and thicknesses. If the piece was complete enough, further observations were also taken.

Following the work of Chesnaux (2014) and her predecessors (e.g. Odell 1981; Geneste & Plisson 1990; Soriano 1998; O'Farrell 2005), I characterised the breaks. I registered the position of the break: transversal or impact burination; their direction: direct or inverse; the presence/absence of a tab (*languette*) or if the breaks are neat; and the presence/absence of associated stigmata such as a spin-off. I also noted the occurrence of 'impact burination' (*fractures burinantes*), and marked tabs that may both be diagnostic of impact, and use of the backed artefact as an arrow component (see Chesnaux 2014 for discussion). I also registered the presence of rushing and rounding of the tip if it was observed.

3.2.4. Others

Other retouched artefacts were also analysed. The definitions of the types recognised at BMS are listed below.

Borers are elongated pieces shaped by one or several backing with a straight delineation. Borers have at least one appointed extremity that displays crushing of the tip. They do not have a cutting edge.

Double-backed artefacts are pieces with a convex retouched area, similar to a *front*, that is opposed to a straight backing.

Awls are artefacts with a point shaped by the meeting of a concave and a convex retouch.

Truncated bladelets are blanks that have been obliquely truncated in their distal part. The backing delineation is straight.

Miscellaneous backed artefacts are not classifiable into one of the former categories.

3.3. Analysis of the sequence

3.3.1. Data compared

All lithic assemblages may vary to some extent between different layers. When comparing assemblages, it is therefore important to assess at what scale we wish making this

comparison, and what question we want to answer. For the BMS assemblage, I created tables presenting all categories of artefact per raw material at the beginning of the chert, agate and quart sections. These tables give a first overview of the patterns of continuity or change. I further looked for potential changes in the methods and techniques used to produce blanks and retouched artefacts. In order to investigate these aspects, I observed the repartition of the core and blank's categories that I defined through the sequence. I also compared the dimensions of flakes and bladelets (when they occur) through the sequence, as well as the technique of extraction used. For the scrapers, I compared the number of the different scraper types I created between the pre-ceramic and ceramic phases. For the backed tools, I compared further data between the pre-ceramic and ceramic phases, including the backed tool types, raw material used, backing type and location, and profile.

3.3.2. Statistics

In order to quantify the change or continuity through the sequence, I used Excel (Microsoft Office 16) for the quantitative comparison, as well as Past3 for the making of graphs. Statistical tests were also carried out, such as Student T-Test, Fischer exact test or χ^2 . These tests were run on the website BiostaTGV.

4. BALERNO MAIN SHELTER AND STUDY AREA

4.1. The SLCA

4.1.1. Environmental data

The Shashe-Limpopo Confluence Area (SLCA) is located in the middle Limpopo River Basin. This basin is situated in the eastern-central part of southern Africa. This area is characterised by a seasonal cycle of precipitation with over 90% of the rainfall experienced in summer. The climate is quite arid, at the transition between the Kalahari Desert to the west and the tropical and sub-tropical climates to the north and east. Following Bouvet *et al.* (2018) and Sayre *et al.* (2013), the Limpopo River Basin has between around 6 and 10 dry months, and has ombrotypes from semi-arid to humid (Fig. 4.1). The SLCA is one of the driest areas of the Limpopo Basin.

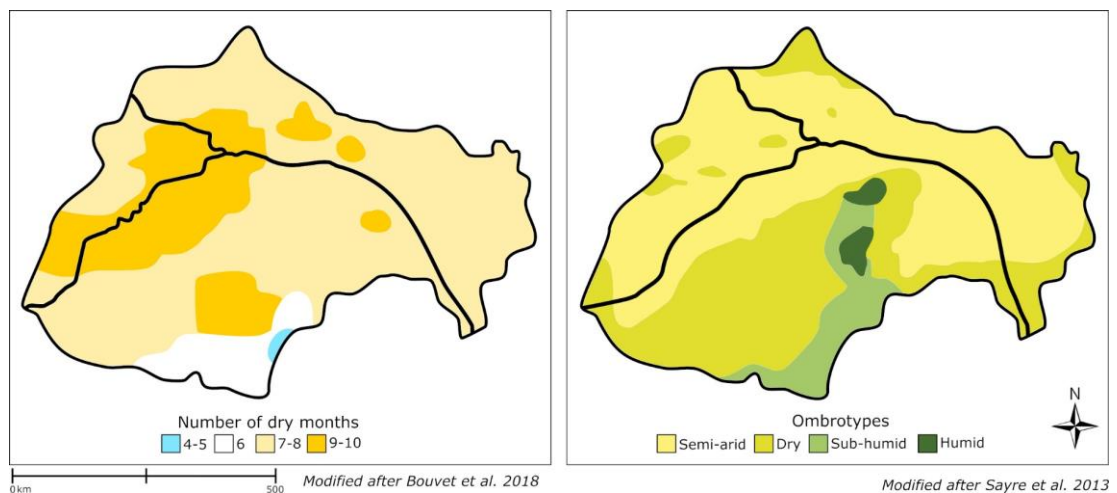


Figure 4.1. Number of dry months and ombrotypes of the Limpopo River Basin

The vegetation of the Basin includes subtropical dry grasslands, savannas and shrublands. It is mostly covered by Mopane savanna (A. Low & Rebelo 1996; Sayre *et al.* 2013), as is the case in the SLCA (Fig. 4.2). Patches of forest and broadleaf savannas also occur, as well as salt pans.

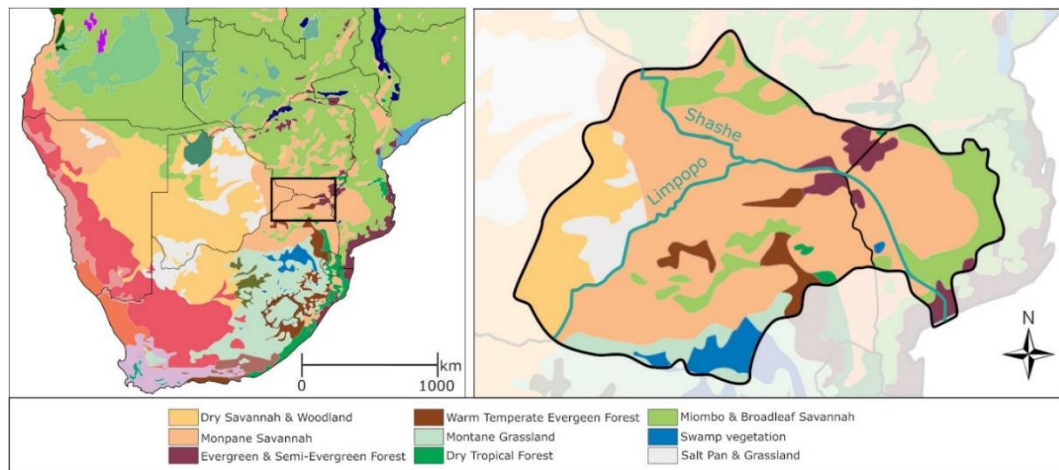


Figure 4.2. Vegetation of the Limpopo River Basin, simplified after Biondi et al. (2015) and Sayre et al. (2013)

Holmgren *et al.* (1999) characterised the paleoclimatic variations in this area through the late Holocene. They describe a succession of cool/dry and warm/wet conditions. From 300 to 1 BC, the climate was cool, succeeded by a warm and wet period in the first two centuries AD. There was then a brief cool and dry interval in the mid-fifth century AD (Talma & Vogel 1992; Holmgren *et al.* 1999). These oscillations likely reshaped the environment of the Limpopo River Basin. The changes in the amount of rainfall would also have influenced the distribution of diseases, especially of the tsetse fly, opening and closing corridors for the expansion of cattle herding (Gifford-Gonzalez 2000).

If looking closer at the SLCA, environmental niches are observable. Overall, the SLCA may be divided in three main ‘spaces’: the fluvial system, the valley (or flood plain) and the interior (Fig. 4.3). Rock shelters and koppies are mostly located behind the flood plain, that is more or less wide depending on the geological setting. The transition from the fluvial system to the flood plain’s environments is particularly well described by Eastwood & Cnoops (1999: 4):

The Limpopo and Shashi Rivers have become a life-giving artery, fringed in places by magnificent riparian forest. Towering Jackal Berry and Nyala Berry trees form the upper canopy of this forest, while the Fever Bark trees and giant Sycamore Figs jostle for space on the river banks. (...) The fan- or Malala palm is widespread on the floodplain, often fringing the several seasonal and some perennial pans fed by the Limpopo’s floodwaters. (...) There is an abrupt transition between the riverine vegetation and that of the adjacent interior. A mosaic of mopane scrub and woodland dominates

most of the Limpopo basin. Along the numerous dry watercourses draining the interior into the Limpopo, Apple-leaf and Ana trees provide a striking contrast to the monotonous surroundings. (...) pools at the junction of the two seasonally-flowing rivers provide a perennial water-source for local human communities, their livestock, and the game animal which abound in this region.

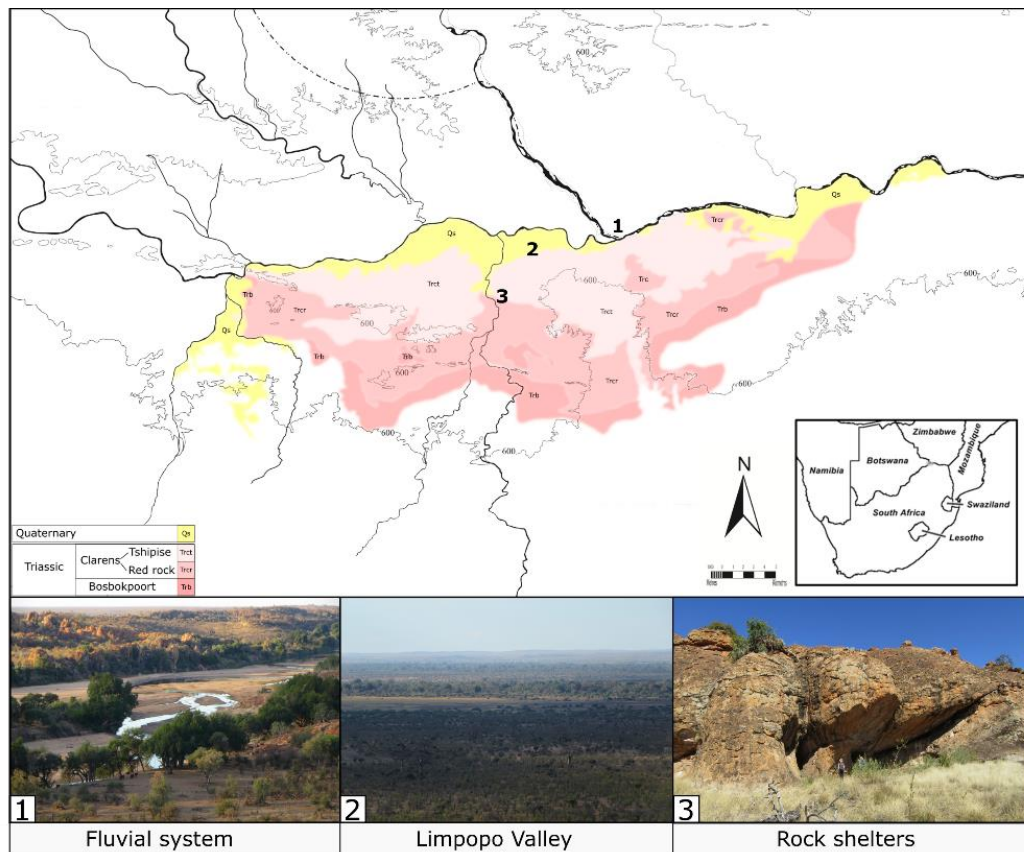


Figure 4.3. SLCA geology and three spaces, simplified after Brandl (2002)

When looking more closely at the geology, we see that the Limpopo River surroundings are constituted of quaternary deposits, sometimes creating terraces of several meters (following geological description from Brandl 2002). The Limpopo floodplain is more or less narrow following the local geology. The Triassic deposits found in and behind the flood plain belong to the Karoo Supergroup and is composed of sand made of clayish sandstone. Behind the floodplain, sandstone koppies are found. The most common formations are the one of Clarens and Bosbokpoort, also dated to the Karoo Supergroup. It is mainly in this area that rock shelters made of sandstone formed between 150 to 50

million years ago with Stone Age occupation are found. Flat-topped koppies are also visible (Eastwood & Cnoops 1999).

4.1.2. Archaeological research in the SLCA

Many archaeological sites have been discovered in the Limpopo floodplain and rock shelters of the SLCA (Fig. 4.4)

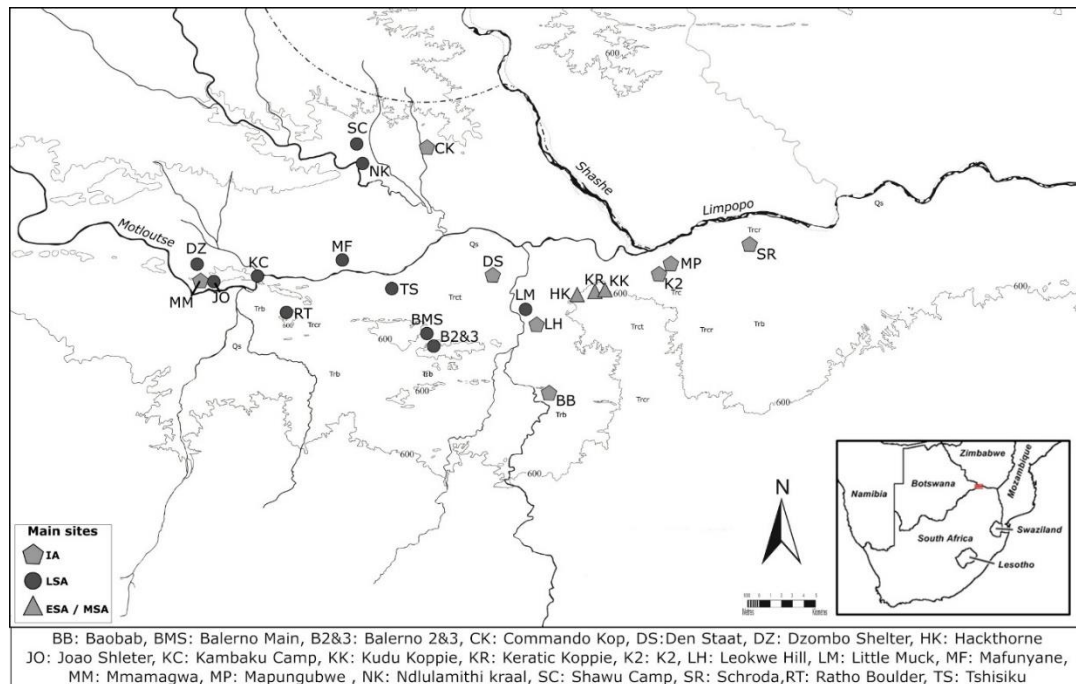


Figure 4.4. Main archaeological sites of the SLCA

A research program led by K. Kuman led to the discovery of Early and Middle Stone Age occupations (Kuman *et al.* 2005). Based on the lithic assemblages, the site of Kudu Koppie was attributed to late ESA occupations and to the MSA (Pollarolo & Kuman 2009). Levallois-like debitage have been described (Wilkins *et al.* 2010; Sumner 2013). The sites of Hackthorne and Keratic Koppie were also affiliated to the ESA (Sangoan $\approx 300\,000$ BP) and undated MSA (Kuman *et al.* 2005).

LSA sites are more widespread than ESA and MSA sites. Relatively few archaeological assemblages dated to the mid-Holocene, between 8000 and 4000 BP were discovered. No LSA sites with older occupations were found, to the exception of BMS with layers dated to $11\,040 \pm 90$ BP ($11\,102$ – $10\,772$ cal BC) and 7350 ± 80 BP (6368 – 6023 cal BC). The site

of Tshisiku also contains mid-Holocene layers dated to 6750 ± 60 BP (5743–5555 cal BC) and 5440 ± 60 BP (4375–4156 cal BC).

The other sites or surface assemblages correspond to late Holocene settlements, dated to between 3000 BP and the 18th century. It is the case for the sites of Balerno Main Shelter, Tshisiku Shelter and Balerno 3 studied by van Doornum (2005, 2007, 2014). It is also the case for the site of Little Muck Shelter (van Doornum 2000; S. Hall & B. Smith 2000; Forssman *et al.* 2018). These sites located south of the Limpopo river, have all been found in rock shelters in the interior of the SLCA. The research lead by Forssman (2014a), and later by Seiler (2016) also led to the discovery of open-air sites with LSA material. Many Iron Age sites also have been excavated and studied in the SLCA, such as open-air settlements (e.g. Huffman 2007) and hill-top sites (Schoeman 2006a).

4.2. Balerno Main Shelter

4.2.1. Site presentation

Balerno Main Shelter (BMS) is located in the SLCA, near other late Holocene archaeological sites such as Tshisiku Shelter and Little Muck (Fig. 4.5). BMS was excavated in the late 1990s and the early 2000s by Simon Hall and his team (van Doornum 2008). The shelter is located within a large sandstone outcrop in which four squares were opened. Another excavation took place below the dripline (not considered in this study). Nine stratigraphic units were defined inside the shelter, from the surface to the bedrock, and excavated to a maximum depth of around 120 cm. The sequence is dated between 11,120–10,890 BC and AD 1740–1800, and is sealed by a thick hardened dung layer that corresponds to a late farmer occupation dated around AD 1600–1800 (van Doornum 2005, 2008).

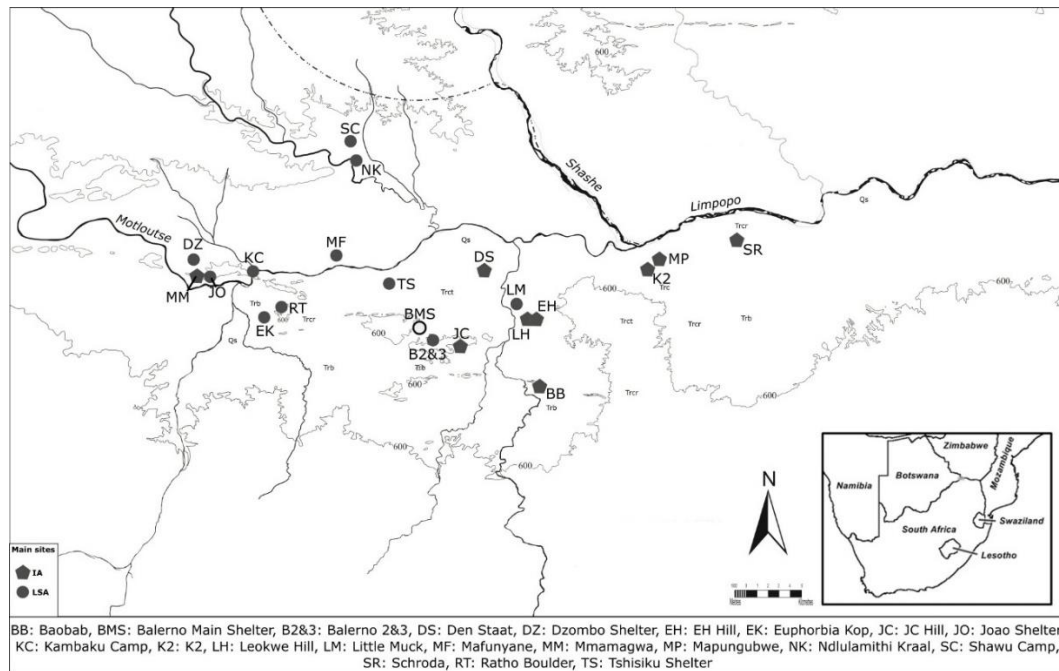


Figure 4.5. Main late Holocene archaeological sites of the SLCA

In July 2018, I visited the site with David Pearce, Alex Schoeman and Anastassiya Kravtsova. I could at this occasion take pictures of the site and the rock art, and locate the excavation area inside the shelter. Such as most LSA sites, BMS is located behind the floodplain (Fig. 4.6). It is close by to Leokwe Hill, an Iron Age site dated from around AD 900–1200 (Vogel & Calabrese 2000).

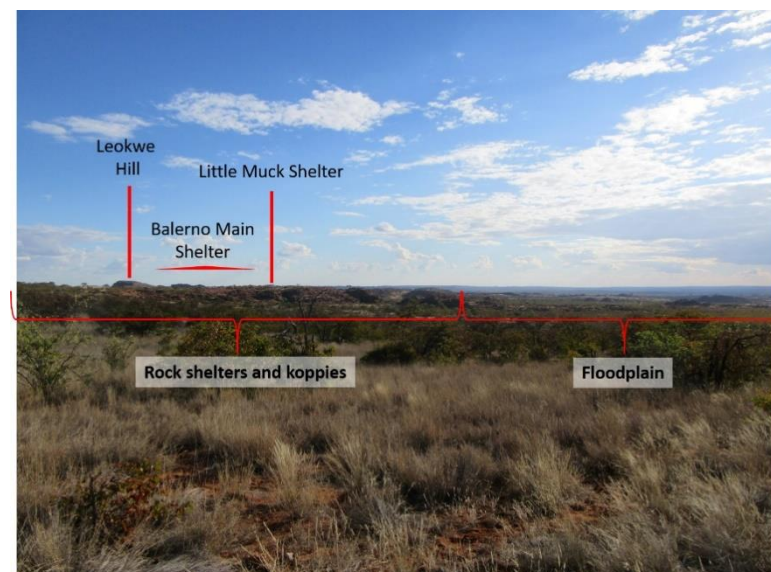


Figure 4.6. Location of BMS relatively to the floodplain

The site of BMS is a notable feature of the landscape. It is one of the biggest sandstone outcrops and has a large and high aperture (Fig. 4.7). It measures 23m length, 5m depth and 6m height (Eastwood & Cnoops 1999).

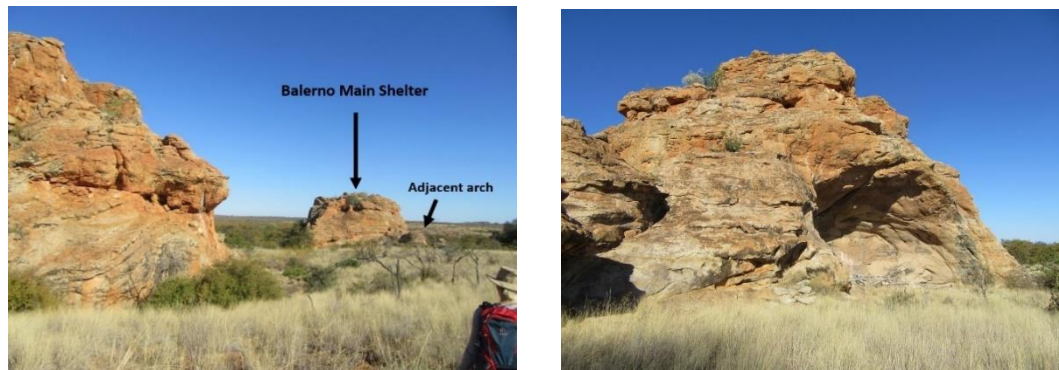


Figure 4.7. Balerno Main Shelter's view

A daga flooring, remnant of a 'farmer occupation' covers a large portion of the floor, together with a thick dung crust (Fig. 4.8).

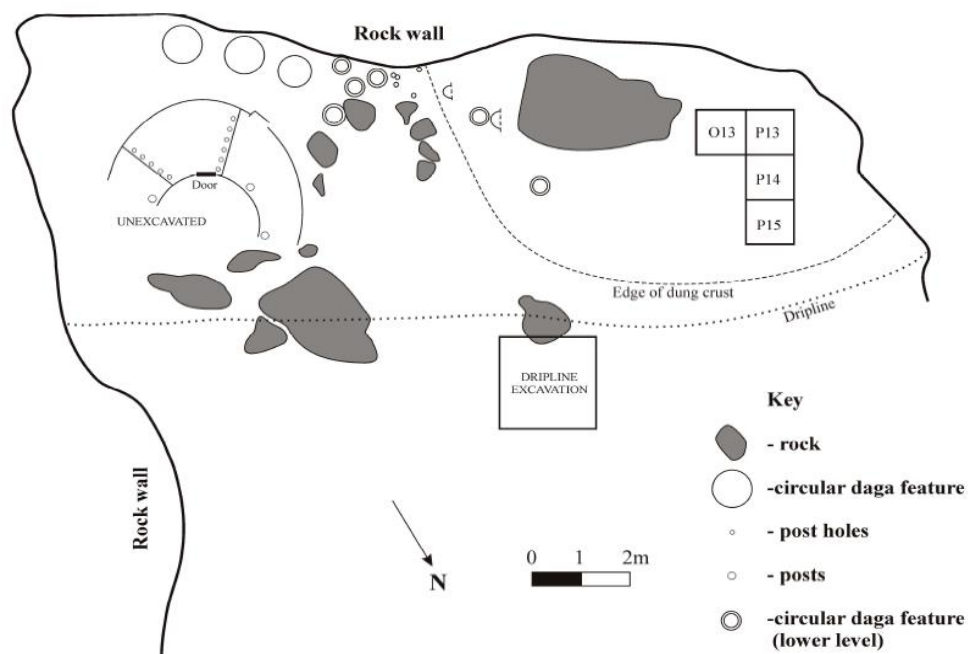


Figure 4.8. Excavation plan and daga features, in van Doornum (2005)

The excavation inside the shelter is located on its right, next to a large rock that is still there today (Fig. 4.9). This location was chosen because of the hardened dung that had sealed the deposits in this area of the shelter (van Doornum 2005).



Figure 4.9. Location of the excavation inside the shelter (in blue)

A trench was opened (squares O13, P13, P14 and P15, see Fig. 4.8) and excavated by spits of 50 mm. Stratigraphic units were defined during the excavation, “*according to differences in colour, texture and dampness*” (van Doornum 2005: 64).

4.2.2. Balerno Main Shelter stratigraphy

For this study, I focused on the layers dated between 260–60 BC and the seventeen-century AD, corresponding to the succession from the Final to the Ceramic LSA. Stratigraphic sections (Fig. 4.10) are available in van Doornum’s PhD thesis (2005), as well as a photograph of the section in P13 (Fig. 4.10).

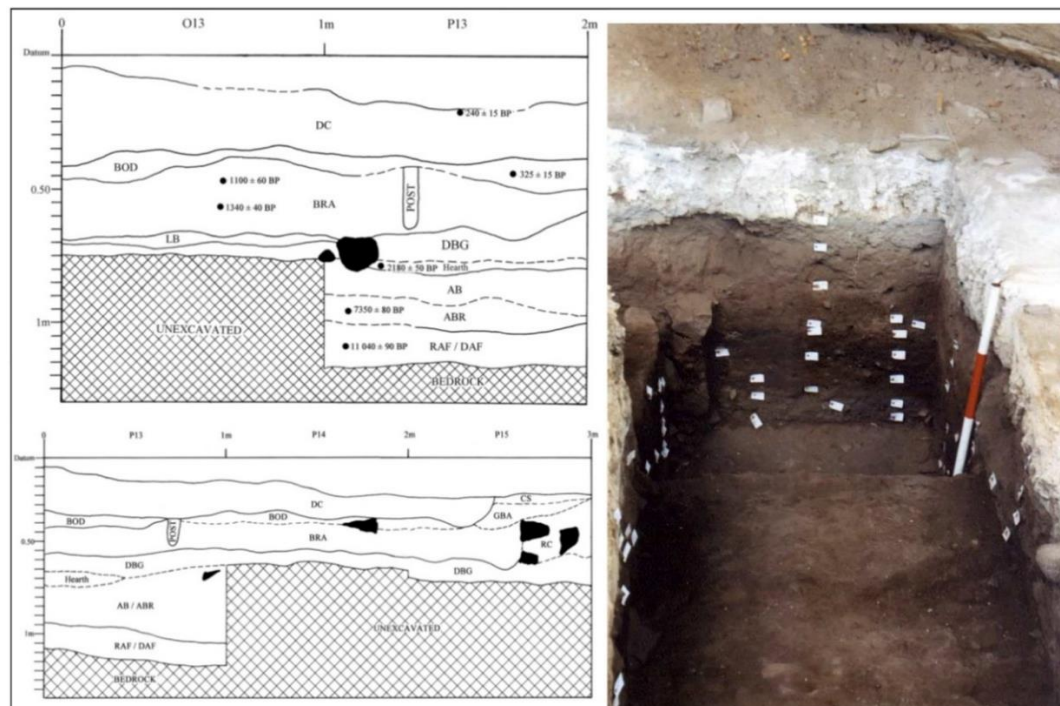


Figure 4.10. Stratigraphic section, from van Doornum (2005)

Two main layers are considered that are, from base to top, Damp Black Grey (DBG) with both pre-pottery and the first pottery-bearing levels, and Brown Red Ash (BRA) with pottery. Fifteen to seventeenth-century layers Grey Ash (GA), Base of Dung (BOD), Dung Contact (DC) and Dung Black Dung (DBD) were also sampled and grouped under the ‘Below Surface’ (BS) unit.

The layer DBG is an “*oily grey deposit flecked with charcoal*” (van Doornum 2008: 257), in which a hearth has been recognised (DBG hearth). BRA is a fairly homogeneous thick “*brown-red-artifact-rich layer*” (van Doornum 2008: 257). It “*extends slightly into the darker, greyer levels of Damp Black/Grey below*” (van Doornum 2005: 64). The layer Grey Ash is an ashy layer at the contact between BRA and the Dung Crust. Base of Dung corresponds to the basal consolidated portion of Dung Crust in which cemented lithics were found. Dung Contact is a thin layer at the contact with Dung Crust that is a consolidated layer of dung with low archaeological remain density. Damp Black Dung is a “*damp, sticky black/pink dung*” located in P15, adjacent to Base of Dung.

Pre-pottery layers were not reached in P14 and O13. The pre-ceramic layers are represented by the lower part of DBG and the hearth. They correspond to the Final LSA phase, called ‘Late pre-contact’ by van Doornum (2005, 2008). The overlying layers, associated with pottery, correspond to the Ceramic Final LSA, called ‘Early contact’ and ‘Contact’ by the same author.

4.2.3. Dates

A total of seven dates were obtained at BMS (Table 4.1). The older layers ABR and DAF are not included in this study.

Balerno Main Shelter dates				Calibrated date range (SHCal13)	
Sample No.	Stratigraphic position	Material dated	Age BP	95,4%	68%
Pta 7972	Surface	Charcoal	240±35	AD 1631-1947	AD 1654-1798
Pta 8604	O13 DC/BRA interface	Charcoal	325±15	AD 1508-1649	AD 1515-1645
Pta 8614	P13 BRA 45-50	Charcoal	1100±60	AD 877-1151	AD 895-1030
Pta 8603	P13 BRA 55-60	Charcoal	1340±40	AD 651-857	AD 678-765
Pta 8609	P13 DBG Hearth	Charcoal	2180±50	358-59 BC	349-73 BC
Pta 8591	P13 ABR	Ostrich eggshell	7350±80	6368-6023 BC	6239-6068 BC
Pta 8639	P13 DAF	Ostrich eggshell	11040±90	11102-10772 BC	11013-10810 BC

Table 4.1. Calibrated dates from BMS, after dates in van Doornum (2005)

The hearth in DBG is dated to 2180±50 BP (262–59 cal. BC; calibration curve SHCal 13) while BRA is dated to 1340±40 BP (cal. AD 651–857) and 1100±60 BP (cal. AD 877–

1151). One date was also made for the surface layer to 240±35 BP (cal AD 1631–1810, 93% confidence interval).

4.2.4. Previous studies

Bronwen van Doornum made a typological study of the late Holocene lithic assemblage. She also compiled previous analysis and a presentation of the different archaeological remains found at the site. The data presented below are mostly extracted from her PhD thesis published in 2005, and stated otherwise. Van Doornum interpreted the site as an aggregation camp.

a. Lithics

Van Doornum (2005, 2008) analysed 34 881 artefacts made of chert, agate, quartz, quartzite and dolerite. Her analysis showed no notable differences in the lithic typology through the sequence. According to her, blanks are predominantly extracted with a bipolar technique. She also notes the use of free-hand percussion on agate. Small flakes and bladelets are produced, some of which are later transformed in retouched artefacts mostly made of chert and agate. Retouched artefacts, which comprise 3,7% of the whole lithic assemblage, are dominated by scrapers (N=990, 77%) and followed by segments (N=123, 10%) (van Doornum 2005).

b. Fauna

According to van Doornum (2005), the fauna is only composed of wild animals. She describes the assemblage as follows:

The majority of the faunal assemblage consisted in highly fragmented, unidentifiable bone. Classes that were well-represented include reptiles (specifically tortoise) and bovids of several size classes. Other less well-represented classes include mammals (indeterminate), fish, bird, rodents, suids, and small carnivores. (van Doornum 2005: 131–132)

Tortoises are the most represented faunal remains, while size I bovids are the most common bovid class. Van Doornum notes that fish vertebrae were only found in the layers associated with pottery between DBG 60-65 and BRA 45-50.

c. Pottery

Pottery sherds are found in BMS sequence from the spit 60-65 of DBG to the surface (Fig. 4.11). The sherds identified in BRA are attributed to the Bambata and Mzonjani traditions (van Doornum 2005). Van Doornum (2005: 150) writes that:

Two Mzonjani sherds (jar fragments with punctate decoration) and a Bambata sherd (a jar fragment with a hatched pattern) were found in BRA, as well as an Early Iron Age (AD 350 – AD 600) sherd (with cross-hatched patterns on it, which was too small to be identified to exact type). In BRA 45–50 (AD 910–920; AD 950–1020) a possible Bambata/Happy Rest (b) jar fragment is present, and in BRA 50-55 another possible Bambata sherd with rippling on the lip was recovered.

The sherds in Damp Black Dung levels have been identified as “post-1700 AD jar rims” (van Doornum 2005: 149) that would be typical of the last half of the Late Iron Age period.

The identification of some Bambata sherds seems uncertain, and doubt subsists about if some of them could rather correspond to an EIA tradition. Tom Huffman told me that the sherds taken in photo by van Doornum (Fig. 4.11) seemed to him to correspond to an EIA tradition (Huffman, pers. comm.).



Figure 4.11. Decorated pottery sherds from BMS, in van Doornum (2005)

The Mzonjani tradition corresponds to the eastern stream of the EIA, dating between around AD 350 and AD 500 (Huffman 2007). As we saw in Chapter 1, Bambata pottery sparks debate between researchers. While Sadr (2008b) argues that Bambata pottery could have been made and used by LSA hunters and herders, Huffman sees it as belonging to an EIA tradition (Huffman 2005). At BMS, given the lack of refitting and the fragmented aspects of the sherds, it is difficult to undoubtedly assess the stylistic tradition of these pots, and if they could have been made in situ. In any case, they correspond to a period between the beginning and the middle of the first millennium AD. There is, therefore, a chronological gap between these Bambata or EIA sherds found in BRA 55-50 and 45-50 dated to 1340 ± 40 BP (cal. AD 651–857) and 1100 ± 60 BP (cal. AD 877–1151). Other undecorated pottery sherds are unidentified.

d. Bone tools, beads, ochre and specularite

A total of 21 pieces of ‘worked bones’ were found at BMS, mainly identified as broken points and broken matting needles (Fig. 4.12, van Doornum 2005: 134). A small engraved fragment of bone was also discovered (Fig. 4.12).



Figure 4.12. Bone tools and decorated bone fragments, from BMS, van Doornum (2005)

Ostrich eggshells were also found at the site (van Doornum 2005). Some of them were transformed in situ in beads. The whole bead *chaîne opératoire* is represented, as the whole bead-making process is visible, including fabrication discards, pre-shaped beads and complete beads (Fig. 4.13). One glass bead was also found in BOD. Ochre and specularite were also found through all the sequence until a decrease from BOD level.

Eastwood and Cnoops identified several engravings made by incision, pecking and abrasion (Table 4.2).

Slashmarks	13	Antelope	2
Small incised lines	many	Rhinoceros	3
U-shape	1	Giraffe	1
Double diamond	1	Kudu	1
Concentric circles	1 set	Elephant	1

Table 4.2. Representations noted by Eastwood & Cnoops (1999) at BMS

This concentration of engravings is unique in the SLCA, and different remarkable features exist. Firstly, it appears that at least some engravings and the giraffe were painted (Willcox 1963; Eastwood & Cnoops 1999). Painted engravings are very rare in southern Africa, and this may be the only example in South Africa. During his visit at the site (Fig. 4.15), Willcox traced some of the rock art, and later described the painted and engraved giraffe in an article.

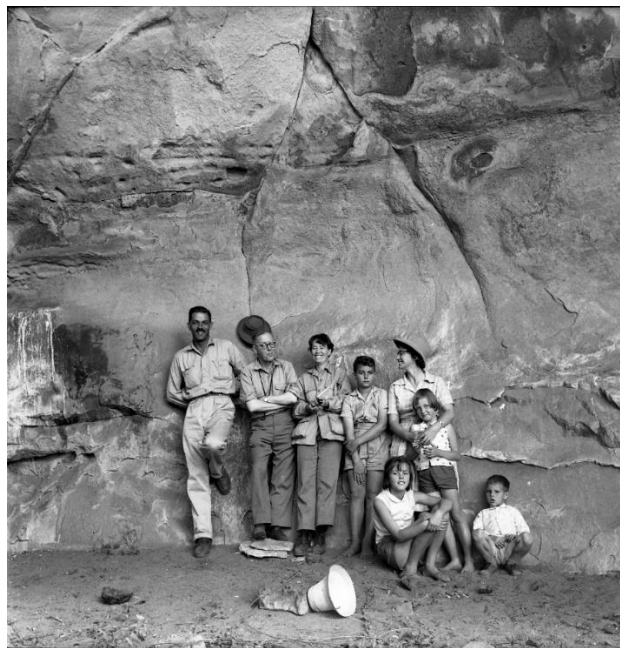


Figure 4.15. Alexander R. Willcox and his family at BMS. RARI courtesy

According to him, the giraffe would have been painted with at a black and a pinkish-white painting (Fig. 4.16). When Eastwood and Cnoops visited the site, they made similar observations and realised another tracing (Fig. 4.14). During our visit at the site in July 2018, the paint was still partly visible (Fig. 4.16).

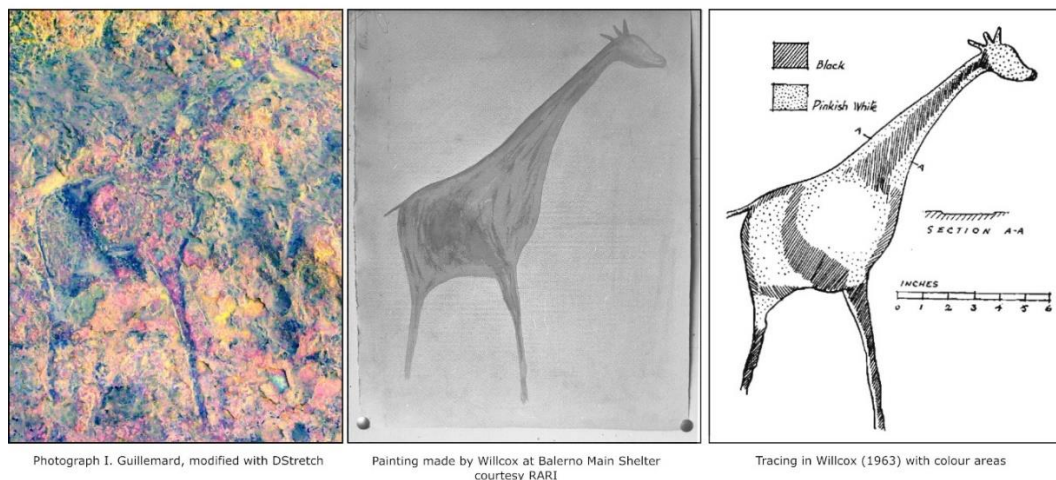


Figure 4.16. Painted giraffe engraving at BMS

Secondly, another remarkable feature is the presence of picked diamond-like shapes (Fig. 4.17). These representations are not found, to my knowledge, in the other rock shelter of the area. I, however, found a mention of a potentially similar pecked or engraved representation on a stone pillar excavated at the Iron Age site of Leokwe Hill (Calabrese 2007). Diamond-shaped motifs engraved on rocks are also discussed by Hollmann (2017), for instance at the site of Gestoptefontein Hill in the North-West Province (South Africa). The author links diamond-like motifs and similar motifs found on ‘Kho-San’ clothing items, including aprons, while Eastwood (2003) also associates diamond motifs with ‘Northern Sotho’ representations.

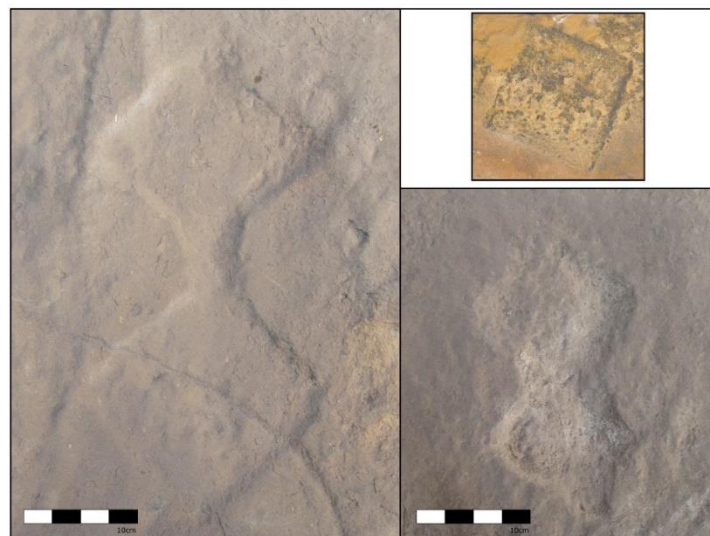


Figure 4.17. Diamond-shaped petroglyphs at BMS

Finally, the presence of three engraved rhinoceroses is also worth noting, as these representations are also rare. Nevertheless, paintings of rhinoceroses occur in other rock shelters of the SLCA (Eastwood & Cnoops 1999).

Following this presentation of the SLCA and BMS, I now turn to the description of the results from the lithic technological study.

5. RESULTS

5.1. Presentation of the assemblage and sampling strategy

The late Holocene lithic assemblage of BMS was firstly studied by Bronwen van Doornum (2005, 2008). Following her count, this assemblage contains 34 881 lithic artefacts, excluding chips. She characterised it as “*a typical Later Stone Age microlithic assemblage*” (van Doornum 2005: 98) with a production of scrapers and backed tools, including segments. She also noted the widespread use of the bipolar technique to extract blanks.

For this study, I sampled the BMS assemblage following the stratigraphic section drawing and the dated layers. I choose to analyse the assemblage from the squares P13 and P15 because they are the only squares containing pre-pottery DBG layers. The square P13 also has successive dated layers (Fig. 5.1). According to the descriptions made by the excavators of the site, I focused on the areas that have been less affected by post-depositional processes. I avoided the ‘Rocky Corner’ layer, as well as the Dung Crust and Surface layers that have been more exposed to post-depositional processes.

I studied the whole late Holocene lithic assemblage of the squares P13 and P15, including all spits of Damp Black Grey (DBG) and BRA (Brown Red Ash) layers, and a selection of layers situated below the surface including Grey Ash (GA), Base of Dung (BOD), Dung Contact (DC) and Damp Black Dung (DBD). I grouped GA, BOD, DC and DBD under the appellation ‘Below Surface’ (BS). The layers GA, BOD and DC are all situated at the contact between BRA and Dung Crust (DC). The localisation of DBD is adjacent to BOD.

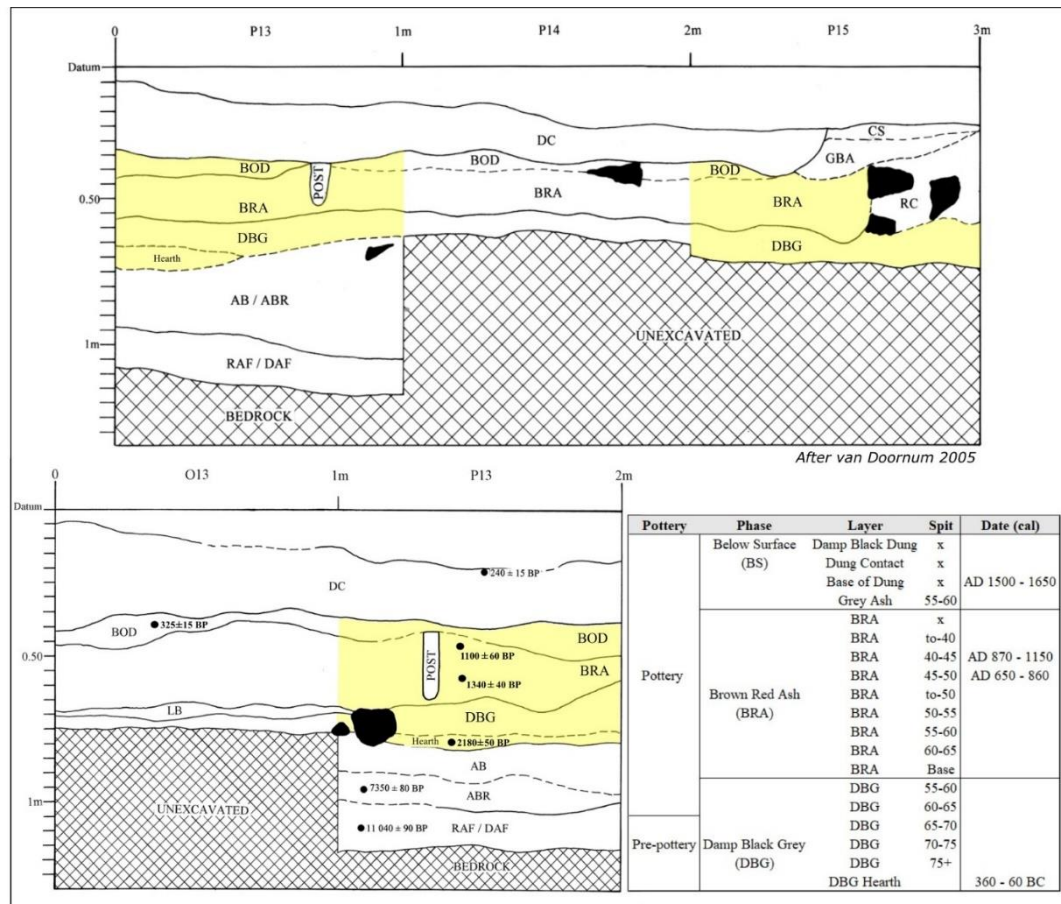


Figure 5.1. Stratigraphic sections and sampled layers

I initially proceeded to a qualitative analysis of the assemblage, keeping the raw material classification made by van Doornum during her study. This first step allowed me to recognise specific technological patterns. At this stage of the study, I extracted blanks, cores, and technical pieces from the chunk and chips bags corresponding to the former curation of the collection. I then created my classification and databases in order to quantify and support my qualitative analysis. The cores have been a primary focus of the study, as they carry crucial information on the reduction processes. I also focused on the flake and bladelet production, as well as on the retouched artefacts.

5.1.1. Assemblage studied

I analysed a total of 13 087 lithic artefacts in chert, agate and quartz, that I registered in databases. The quartzite assemblage was too small to reconstitute the *chaîne opératoire*, and the dolerite assemblage will be presented in future publications. I may, however, at this stage, highlight that the dolerite assemblage is macrolithic, and mostly associated with a flake production through the whole sequence. Few lamellar blanks are also extracted. The

occurrence of macrolithic debitage in late Holocene assemblages, otherwise dominated by microlithic productions, is common, and has been highlighted by many authors (e.g. Clark 1974; see Chapter 1).

The count presented on Table 5.1 corresponds to the lithic assemblage from P13 and P15, except for the retouched artefact count highlighted in grey including all squares, after a count modified from van Doornum (2005).

BMS LATE HOLOCENE SAMPLED ASSEMBLAGE															TOTAL
Layer	Spit	N/%	Flakes	Bladelets	Lamellar flakes	Elongated flakes	Cores	Core fragments	Chunks	Nodules	Total	Scrapers	Backed pieces	Others	
Damp Black Dung	x	N 35 % 58%	0 0%	0 0%	0 0%	1 2%	0 0%	24 40%	0 0%	60 100%	2 50%	2 50%	0 0%	4 100%	64
Dung Contact	x	N 62 % 53%	6 5%	0 0%	3 3%	1 1%	0 0%	45 38%	0 0%	117 100%	x x	x x	x x	x x	117
Base of Dung	x	N 73 % 52%	2 1%	0 0%	5 4%	5 4%	0 0%	55 39%	0 0%	140 100%	40 68%	18 31%	1 2%	59 100%	199
Grey Ash	x	N x % x	8 x	x x	x x	11 x	0 x	x x	0 x	19 x	15 68%	7 32%	0 0%	22 100%	41
Grey Ash	55-60	N 150 % 46%	15 5%	2 1%	13 4%	8 2%	4 1%	134 41%	0 0%	326 100%	15 4%	1 100%	0 0%	16 100%	342
BRA	x	N 442 % 45%	62 6%	4 0%	52 5%	42 4%	7 1%	371 38%	0 1%	987 100%	18 86%	3 14%	0 0%	21 100%	1008
BRA	to-40	N 26 % 46%	1 2%	0 0%	6 11%	3 5%	0 0%	21 37%	0 0%	57 100%	4 100%	0 0%	0 0%	4 100%	61
BRA	40-45	N 99 % 46%	15 7%	3 1%	2 1%	10 5%	0 0%	88 41%	0 0%	217 100%	0 0%	0 0%	0 0%	0 0%	217
BRA	45-50	N 383 % 60%	28 4%	1 0%	34 5%	21 3%	0 0%	170 27%	1 0%	638 100%	8 62%	5 38%	0 0%	13 100%	651
BRA	to-50	N 232 % 66%	23 7%	3 1%	19 5%	18 5%	0 0%	54 15%	0 0%	349 100%	7 58%	5 42%	0 0%	12 100%	361
BRA	50-55	N 811 % 49%	76 5%	7 0%	70 4%	45 3%	6 0%	624 38%	0 0%	1639 100%	73 87%	10 12%	1 1%	84 100%	1723
BRA	55-60	N 977 % 52%	52 3%	11 1%	80 4%	52 3%	5 0%	711 38%	0 0%	1888 100%	57 77%	15 20%	2 3%	74 100%	1962
BRA	60-65	N 337 % 51%	15 2%	3 0%	41 6%	20 3%	0 0%	250 38%	0 0%	666 100%	20 83%	4 17%	0 0%	24 100%	690
BRA	Base	N 151 % 43%	13 4%	1 0%	29 8%	6 2%	8 2%	144 41%	0 0%	352 100%	6 50%	6 50%	0 0%	12 100%	364
DBG	x	N x % x	8 x	x x	x x	6 x	x x	x x	0 x	14 x	44 83%	8 15%	1 2%	53 100%	67
DBG	55-60	N 343 % 46%	22 3%	8 1%	35 5%	21 3%	0 0%	323 43%	0 0%	752 100%	31 89%	4 11%	0 0%	35 100%	787
DBG	60-65	N 325 % 39%	16 2%	5 1%	43 5%	24 3%	0 0%	411 50%	2 0%	826 100%	7 39%	9 50%	2 11%	18 100%	844
DBG	65-70	N 780 % 44%	128 7%	13 1%	71 4%	49 3%	6 0%	741 41%	1 0%	1789 100%	50 64%	25 32%	3 4%	78 100%	1867
DBG	70-75	N 622 % 53%	101 9%	9 1%	66 6%	39 3%	2 0%	328 28%	6 1%	1173 100%	35 66%	15 28%	3 6%	53 100%	1226
DBG	75+	N 122 % 44%	26 9%	1 0%	27 10%	11 4%	1 0%	90 32%	0 0%	278 100%	7 64%	3 27%	1 9%	11 100%	289
DBG Hearth		N 71 % 36%	25 13%	14 7%	15 8%	9 5%	0 0%	60 31%	1 1%	195 100%	10 83%	2 17%	0 0%	12 100%	207
Total		N 6041 % 48%	642 5%	85 1%	611 5%	402 3%	39 0%	4644 37%	18 0%	12482 100%	449 74%	142 23%	14 2%	605 100%	13087

Table 5.1. Total sampled assemblage of BMS

The late Holocene microlithic assemblage is dominated by flakes (48%) and followed by chunks (37%). The bladelets make 6% of the assemblage, and the cores 3%. The retouched artefacts make 5% of the assemblage.

5.1.2. Raw materials

Five raw materials have been identified in the BMS assemblage: chert, agate, quartz, dolerite and quartzite. Chert and agate are fine-grained raw materials belonging to the ‘cryptocrystalline silicates’, or CCS family for short (Wadley *et al.* 2017). Definitions of these types of raw materials are given below.

Chert: fine-grained siliceous sedimentary rock created by chemical precipitations and biogenic processes (Rapp & Hill 1998; Cairncross 2004). They are mostly composed of calcium carbonates and may occur in beds forming secondary deposits in rocks such as limestones, dolomites and chalks (Whittaker 1994; Rapp & Hill 1998). Nodules of chert may form naturally, and found exposed on the surface after the layer containing them eroded out (Andrefsky 2005).

Agate: fine-grained crystalline quartz variety. Bands of colour are characteristics and caused by impurities within the structure of the stone (Rapp & Hill 1998). Internal crystals may grow within agate nodules. This raw material is associated with volcanic activities, and the presence of basalt.

Quartz: a stable and very hard mineral made of pure silicon dioxide (Cairncross 2004). Even though the structure of quartz is dense and homogeneous, many macroscopic fissures are created during the mineral formation. These fissures allow less control of the extracted blanks than for the CCS.

Dolerite: dark and coarse-grained basaltic igneous rock (Rapp & Hill 1998).

Quartzite: metamorphous sandstones, almost entirely composed of quartz (Cairncross 2004). It occurs in cobble or bedded forms (Andrefsky 2005).

These different raw materials are all locally available around BMS, in riverbeds. In his description of the geology of the area, Brandl (2002) indicates places where these raw materials may be found (Fig. 5.2). CCS materials, including chert, occur at the contact between resistant cliffs capped by Tshipise sandstone in the Red Rock Members. Brandl (2002: 36) writes that below these cliffs, “*concretions and irregular veins of cryptocrystalline silica (probably chalcedony) are frequently encountered*”. It is the case at Tsolwe Hill situated 3km away south of BMS. This hill is visible in Fig. 5.2 where it is framed by a dashed rectangle.

Brandl (2002) also notes the presence of dry river channels filled with quartz pebbles to the south-east (Fig. 5.2). Quartz pebbles may likely be found in other channels than the one framed on the map, following Brandl’s descriptions. Many non-perennial rivers indeed

cross the whole SLCA area and could have carried quartz pebbles. Furthermore, quartz could also have formed in the vicinity of the dolerite dykes.

Agate is found in amygdales in the basalt of the Letaba Formation, at the contact zone with sandstone, as well as in riverbeds (Cairncross 2004; Wadley *et al.* 2017). Such instances are described by Brandl (2002: 41) down in the south at 60 km away from BMS. However, patches of basalt Letaba Formation are also exposed closer to BMS, and could also have produced agate (Fig. 5.2). Instances of quartzite and dolerite are also widespread in the SLCA (Brandl 2002).

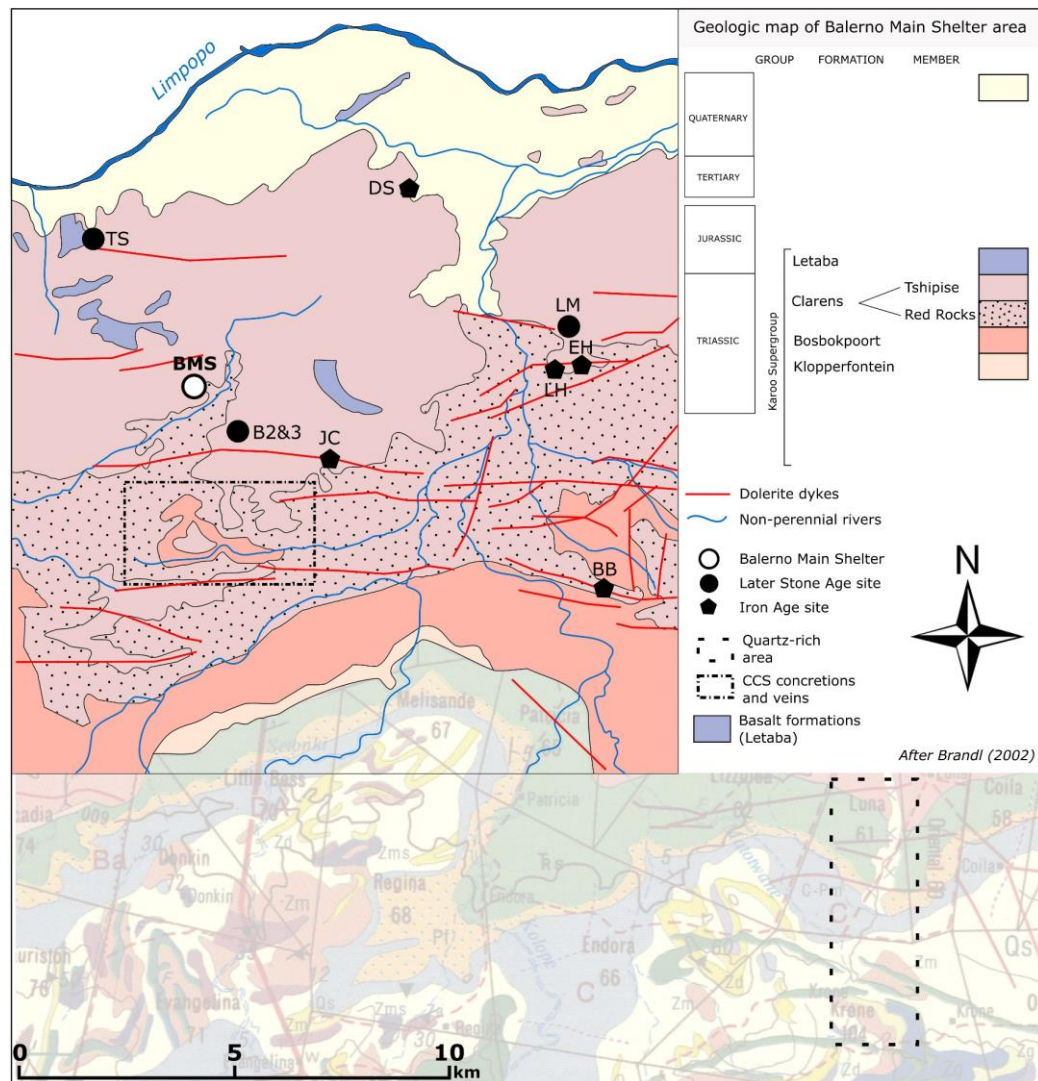


Figure 5.2. Geological map of BMS's surroundings, simplified after Brandl (2002)

To conclude, all raw materials are locally available in riverbeds and strategic points of the landscape. Some of them could also derive from further away, such as the agate formations

located 60 km away, close to the village of Vetfontein. Quartz is also mostly found south of the Karoo Supergroup formations, in Swazian gneiss of the Beit Bridge Complex, in the area indicated on Fig. 5.2.

It is finally possible that some of the raw materials from the BMS assemblage were collected further away. Agate is also formed in many areas of Botswana, close to the SLCA in Bobonong area, around 80 km away from BMS (Jain *et al.* 2013). Pink agates are formed in primary position in this area, that look like part of the agate assemblage from BMS (Fig. 5.3). The cortex of the pink agate at BMS is, however, quite thin and impacted and could instead derive from a river bed. Precise geological analyses would be necessary to go further on these questions.



Figure 5.3. Pink agate

Many of the knapped raw materials found in BMS assemblage are cortical nodules, or have impacted natural areas indicating that they were likely collected in riverbeds. Many non-perennial rivers flow close to BMS (Fig. 5.3). CCS raw material could also have been collected on gravels from eroded surfaces, such as around the Tsolwe Hill.

The agate and quartz initial volumes are nodules (Fig. 5.4). Some agate blanks also have non-impacted double patina surfaces, and could have been collected on the surface. The chert used for knapping is found in four states: small blocs with rounded and impacted surfaces likely coming from riverbeds, slab-like cortical volumes that could have been found close to primary sources, and volumes with double-patina without impact (Fig. 5.4). These last pieces could have been collected on the surface, or have been altered by chemical actions. Most CCS material has a shiny aspect, potentially created by chemical alterations (M. Igreja, pers. com). Many pieces also present traces of heat, but no evidence for heat treatment was found.

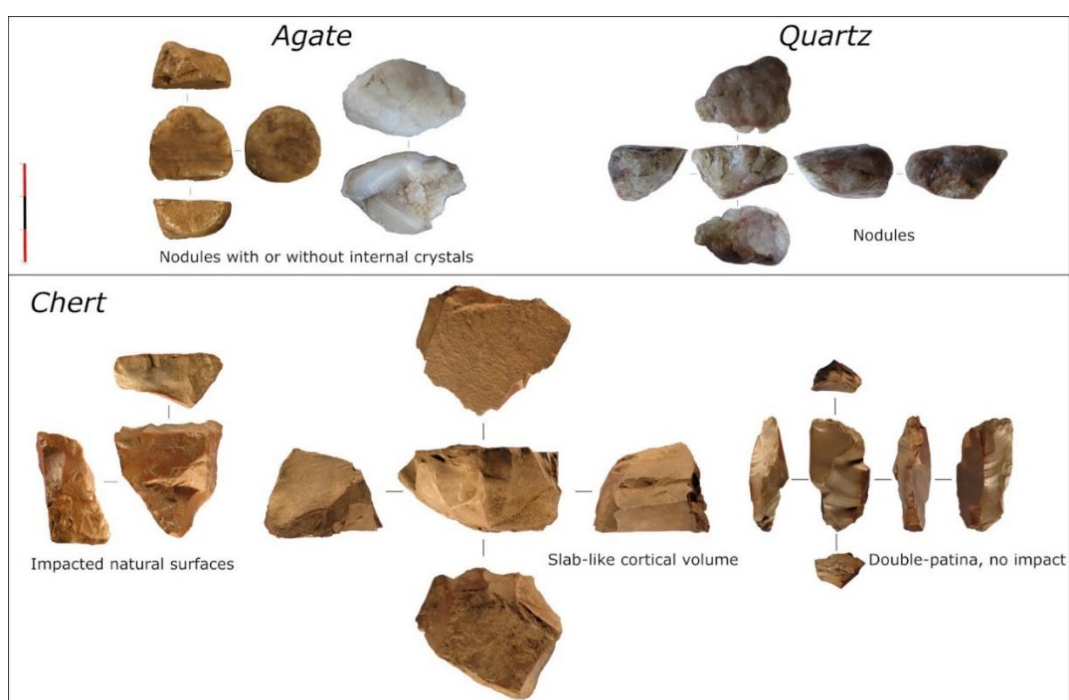


Figure 5.4. Raw material types at BMS

In the next sections, I present the analysis of the lithic technology per raw material, in order to shed light on potential adaptations to specific raw materials.

5.2. Chert

There are 7749 chert artefacts. Flakes (49%) and chunks (40%) are the most represented artefact categories. Blanks are dominated by flakes and followed by bladelets (6%). Cores make 3% of the assemblage. There are 356 retouched artefacts (5% of the total chert

assemblage) including scrapers (N=292; 82%), backed pieces (N=57; 16%) and others such as borers (N=7, 2%) (Table 5.2).

BMS LATE HOLOCENE CHERT SAMPLED ASSEMBLAGE															
Layer	Spit	N/%	Flakes	Bladelets	Lamellar flakes	Elongated Flakes	Cores	Core fragments	Chunks	Nodules	Total	Retouched artefacts			
												Scrapers	Backed pieces	Others	Total
Damp Black Dung	x	N 26 % 58%	0 0%	0 0%	0 0%	1 2%	0 0%	18 40%	0 0%	45 100%	x x	x x	x x	x x	x x
Dung	x	N 42 % 51%	3 4%	0 0%	2 2%	1 1%	0 0%	34 41%	0 0%	82 100%	x x	x x	x x	x x	x x
Base of Dung	x	N 46 % 49%	1 1%	0 0%	2 2%	3 3%	0 0%	42 45%	0 0%	94 100%	x x	x x	x x	x x	x x
Grey Ash	x	N x % x	8 x	x x	x x	5 x	0 x	x x	x x	13 x	7 64%	4 36%	0 0%	0 100%	11 100%
Grey Ash	55-60	N 87 % 43%	11 5%	2 1%	2 1%	7 3%	4 2%	91 45%	0 0%	204 100%	11 100%	0 100%	0 100%	0 100%	11 100%
BRA	x	N 265 % 42%	46 7%	4 1%	5 1%	18 3%	7 1%	282 44%	7 1%	634 100%	13 100%	0 100%	0 100%	0 100%	13 100%
BRA	to-40	N 14 % 42%	1 3%	0 0%	2 6%	1 3%	0 0%	15 45%	0 0%	33 100%	4 100%	0 100%	0 100%	0 100%	4 100%
BRA	40-45	N 75 % 49%	8 5%	2 1%	0 0%	6 4%	0 0%	62 41%	0 0%	153 100%	0 0%	0 0%	0 0%	0 0%	0 0%
BRA	45-50	N 201 % 53%	15 4%	0 0%	11 3%	11 3%	0 0%	140 37%	1 0%	379 100%	5 56%	4 44%	0 0%	0 100%	9 100%
BRA	to-50	N 151 % 79%	18 9%	3 2%	6 3%	12 6%	0 0%	0 0%	0 0%	190 100%	5 71%	2 29%	0 0%	0 100%	7 100%
BRA	50-55	N 448 % 47%	46 5%	7 1%	11 1%	22 2%	5 1%	422 44%	0 0%	961 100%	58 92%	5 8%	0 0%	0 100%	63 100%
BRA	55-60	N 620 % 52%	30 3%	10 1%	10 1%	32 3%	1 0%	485 41%	0 0%	1188 100%	45 83%	7 13%	2 4%	2 100%	54 100%
BRA	60-65	N 274 % 52%	14 3%	3 1%	9 2%	9 2%	0 0%	218 41%	0 0%	527 100%	17 85%	3 15%	0 0%	0 100%	20 100%
BRA	Base	N 102 % 45%	9 4%	1 0%	4 2%	4 2%	6 3%	102 45%	0 0%	228 100%	5 71%	2 29%	0 0%	0 100%	7 100%
DBG	x	N x % x	7 x	x x	x x	0 x	0 x	x x	x x	7 x	24 50%	2 50%	0 50%	0 50%	26 50%
DBG	55-60	N 241 % 74%	17 5%	6 2%	11 3%	13 4%	0 0%	39 12%	0 0%	327 100%	28 100%	0 100%	0 100%	0 100%	28 100%
DBG	60-65	N 225 % 37%	12 2%	5 1%	14 2%	15 2%	0 0%	336 55%	2 0%	609 100%	5 42%	5 42%	2 17%	2 100%	12 100%
DBG	65-70	N 420 % 41%	97 9%	6 1%	5 0%	25 2%	6 1%	475 46%	0 0%	1034 100%	33 72%	12 26%	1 2%	1 100%	46 100%
DBG	70-75	N 289 % 57%	53 10%	5 1%	11 2%	10 2%	2 0%	133 26%	2 0%	505 100%	25 69%	9 25%	2 6%	2 100%	36 100%
DBG	75+	N 37 % 33%	12 11%	1 1%	5 5%	3 3%	1 1%	52 47%	0 0%	111 100%	2 50%	2 50%	0 0%	0 100%	4 100%
DBG	Hearth	N 22 % 32%	5 7%	12 17%	1 1%	2 3%	0 0%	27 39%	0 0%	69 100%	5 100%	0 100%	0 100%	0 100%	5 100%
Total		N 3585 % 49%	413 6%	67 1%	111 2%	200 3%	32 0%	2973 40%	12 0%	7393 100%	292 82%	57 16%	7 2%	7 2%	356 100%

Table 5.2. Sampled chert assemblage

5.2.1. Cores

There are 200 complete cores and 32 core fragments made of chert. These cores are consistent with a microlithic production. The complete cores measure on average 22,5 mm length, 15,8 mm width, 9,8 mm thickness and weight 4,5 gr (Table 5.3). All of them are used to produce microlithic blanks, including flakes and bladelets.

Cores	Length	Width	Thickness	Weight
Mean	22,5	15,8	9,8	4,5
Median	21,5	14,9	8,7	2,9
Min	11,6	5,8	3,2	0,2
Max	42,6	35,8	30,2	35
Stand. dev	5,8	6,2	4,4	4,7
N	193	199	198	190

Table 5.3. Chert cores' measures

Variations in the intentions of production and geometry of the cores occur. In the following section, I present the cores' geometries and associated removal scars. Four core types were defined: '**Narrow cores**', '**Wide cores**', '**Cubic cores**' and '**Flat cores**'. For each core category, I describe the intentions of production, core organisation, methods and sequences of extraction within which techniques of extraction are also included. The relationships between the four core types is discussed at the end of the chert section.

a. Narrow cores

The first 'narrow core' category described is the most represented at BMS. A total of 127 (64%) cores are attributed to this category. These narrow cores have varied removal scars, but all have a similar geometry and organisation. They measure on average 22,8 mm length, 13,4 mm width, 9,6 mm thickness and weight 3,5 gr (Table 5.4).

Narrow cores	Length	Width	Thickness	Weight
Mean	22,8	13,4	9,6	3,5
Median	21,7	13,1	8,7	2,7
Min	13,7	5,8	3,2	0,2
Max	36,8	23,2	26,4	15,9
Stand.dev	4,8	4,1	3,9	2,7
N	125	127	126	124

Table 5.4. Chert narrow cores' measures

i. Narrow cores' organisation

Narrow cores tend to be elongated and pyramidal with a triangular to rectangular section, one preferential striking platform and one extraction surface (Fig. 5.5). Their structure is declined in five units: 1) extraction surface, 2) striking platform, 3) flanks, 4) back, and, 5) base of the core. All these units are more or less integrated or independent of each other, and give the cores a specific geometry.

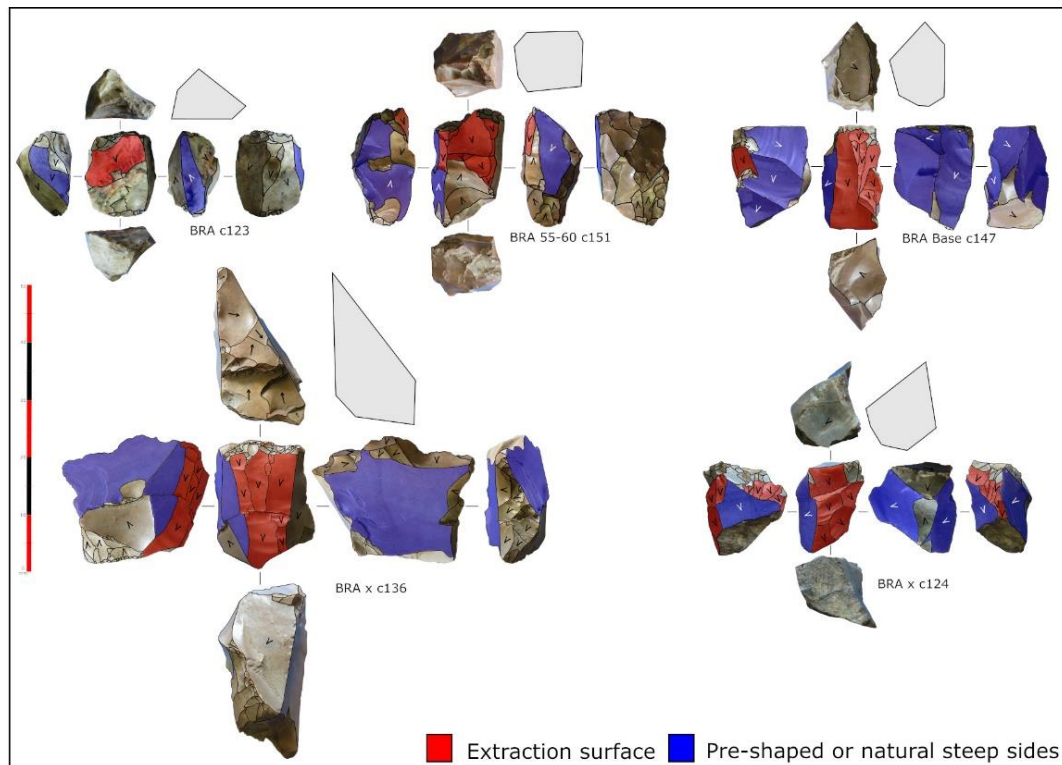


Figure 5.5. Chert narrow cores' structure

The narrow cores have one extraction surface associated with one striking platform. The extraction surface is delimited by two steep flanks that are independent. The flanks may be converging towards the back of the core. When it is the case, flanks and back form a single integrated unit. The back of the core may also be roughly parallel to the extraction surface, creating a rectangular section. The base of the narrow cores is generally appointed. Considering the techniques of percussion recognised, most of them have axial bipolar stigmata, fewer being characteristic of anvil-platform and free-hand modalities (Table 5.5). Each of the cores' units (extraction surface, striking platform, sides and back, and base of the core) is described in more detail below.

Narrow cores	Free-hand	Anvil platform	Bipolar	Total
N	3	35	81	119
%	3%	29%	68%	100%

Table 5.5. Number of narrow chert cores per technique of percussion

Extraction surface

There is one main extraction surface that does not overlap on the flanks of the core. The extraction surface is most often located on a long and narrow part of the volume. The

longitudinal and transversal convexities of the extraction surface tend to be rectilinear. Distal longitudinal convexities are nevertheless created by the removal of large flakes. Transversal convexities may also be created by elongated flake removals. The largest and longest extracted blanks may reach the base of the core, whereas smaller elongated blanks such as bladelets only reach between half and the two-thirds of the extraction surface length.

Striking platform

There is one striking platform associated with one extraction surface. The striking platform is generally plain, but may also be filiform or crushed. Plain platforms are opened by the removal of a large flake, or flat natural surfaces are used. Convexities may be maintained thanks to the removal of small flakes, but only a few cores reflect this platform management. No tablets were found, highlighting this low degree of maintenance. The angle formed between the striking platform and the extraction surface varies, but most cores show angles close to 90°.

Flanks and back of the core

The flanks are steep and may be convergent toward the back of the core. The flanks correspond to steep natural surfaces or are created by the removal of large transversal flakes. The configuration created by the association between the extraction surface, the flanks and the back of the core creates triangular to rectangular sections.

Base of the core

The base of the narrow cores is appointed, with or without opposite flakings and crushings associated with the use of an anvil. If an anvil is used, opposite flakes may be extracted, which contributes to maintaining the rectilinearity of the extraction surface.

ii. Intentions of production and their associated strategies

Different removal scars are visible on the narrow cores. 36 (28%) of them display bladelet removals, also associated with elongated flake or flake removal scars. 75 (59%) mostly have elongated flake removal scars, and 16 (13%) only have flake removal scars. The bladelet, elongated flake and flake productions are associated with specific technical actions and sequences of extraction that are described below.

Bladelet production

- The bladelets removals are intercalated between elongated flake and flake removals, and often extracted in a '1,3,2' sequence. The former extraction of flakes and elongated flakes creates narrow surfaces and adequate transversal convexities that are used to extract bladelets. Bladelets are often centred and follow the ridges of previous removal scars as guides.
- The bladelet extraction sequence is short, and bladelet removal scars are generally no longer than the two-third of the extraction surface's length. Considering that the average core length is of 23 mm, two-third of this length makes an average of 15 mm, which is consistent with the average length of chert bladelets (17 mm).
- The narrow cores with bladelet removal scars often have plain platforms. This indicates that bladelets were mostly extracted with free-hand percussion, or on cores resting on an anvil.

Elongated flake production

- Elongated flakes are removed to open the extraction surface. A free-hand percussion was likely used to extract these flakes, as most of them reach the base of the core. Some elongated flake removals are also slightly overshot, which would not be possible if an anvil was used.
- Elongated flakes are also removed at later stages and are intercalated with bladelet extraction sequences. They recreate adequate convexities with narrow surfaces that are used for the bladelet extraction.

Flake production

- Flake removals are visible on almost all narrow cores. They are removed to open the extraction surface and to create transversal convexities for the bladelet extraction.
- Large transversal flakes are also extracted to shape the flanks and back of the cores. The flanks' profiles are rectilinear, suggesting that an axial gesture of percussion may have been used to remove these transversal flakes.
- Flakes are also (rarely) extracted to open and maintain striking platforms. In that case, free-hand percussion was used, as no opposite crushing was ever detected in the striking platform area.
- Opposite flake removals created by the counter-force of the anvil also occur.

Cores with only flake removals present many hinged removal scars, leading to the discard of the core. These narrow cores with many hinged removals often have a crushed platform and opposite flakings resulting from the use of an anvil, associated with an axial bipolar technique of percussion. In contrast, narrow cores with bladelets or elongated flake removals are associated with free-hand or anvil-rested percussions.

iii. Synthesis

Following this analysis, different points may be highlighted.

- The flanks of the cores are firstly opened or natural surfaces used.
- A striking platform is then opened and used for the free-hand extraction of elongated flakes that create the extraction surface. A natural surface may also be used as a striking platform.
- Flakes and elongated flakes are then extracted, creating transversal convexities.
- Bladelets are subsequently extracted from these convexities and follow the former removal scar ridges. The bladelet sequence is short, and bladelets are generally no longer than two-thirds of the extraction surface's length. The extraction surface remains rectilinear through the core's reduction process.
- After the opening of the extraction surface, an anvil may be used to stabilise the core. At this point of the reduction process, opposite flaking may occur, and the striking platform progressively becomes narrower. Irregular opposite flakes are extracted when the striking platform becomes very thin, and that the percussion gesture consequently becomes axial. At the shift from the anvil-rested modality to the axial bipolar modality, the extraction surface tends to become more rectilinear.
- The core is discarded once the angle between the extraction surface and the striking platform is near-90°, often resulting in many hinged accidents. These hinged accidents are always observed on narrow cores associated with an axial bipolar percussion, where only flake removals are observable. They also frequently occur on cores with a plain platform that were associated or not with an anvil.

In the course of the core reduction, free-hand, anvil-rested and axial bipolar percussion modalities are used. In most cases, the axial bipolar percussion occurs at the end of the core reduction process, after the striking platform becomes narrow and the core thin. Beyond this core reduction trend, each modality may also be used flexibly at different moments for specific actions.

b. Wide cores

Five (2,5%) other chert cores present a slightly different organisation, associated with contrasted intentions of production. These cores are wide and non-elongated. They measure on average 22,4 mm length, 28,6 mm width, 19,1 mm thickness and weight 20 gr (Table 5.6).

Wide cores	Length	Width	Thickness	Weight
Mean	22,4	28,6	19,1	20
Median	18,6	27,5	16,4	17,2
Min	11,6	23,5	12,2	9,5
Max	36,5	35,3	30,2	35
Stand.dev	10,3	4,4	7	10,9
N	5	5	5	5

Table 5.6. Chert wide cores' measures

i. Wide cores' organisation

The wide cores are made of slab-like volumes with two rather parallel natural planes that are natural or cortical (Fig. 5.6). They have a wide and short extraction surface that is not located on the most elongated part of the volume. Between 60% and 80% of the cores are covered by natural surfaces. The extraction surface is restricted to one area of the volume and does not overlap on the flanks of the core.



Figure 5.6. Chert wide cores with extraction surface indicated in red

Extraction surface

The extraction surface is located on a rather wide and short section of a slab-like volume. Its longitudinal profile varies from rectilinear to slightly curved, but a trend cannot be observed because of the small sample. Rather short blanks are unidirectionally removed

and reach the base of the core. Only flake removals are visible, and no sign of anvil-use was detected.

Striking platform

The striking platform is natural and plain. No preparation or maintenance of it was observed.

Flanks and back

The flanks are naturally steep or prepared by the removal of transversal flakes. The back of the core is unmodified.

Base of the core

The base of the core is not appointed, nor is associated with opposite crushing.

ii. Intentions of production and associated strategies

Only flake removals are visible on these wide cores. The flakes, which are rather short, are unidirectionally extracted from an unprepared and unmanaged platform. Hinged flakes occur. In some cases, the knappers may have tried to exploit the convexities created by former flake removals, in order to produce more elongated and narrow blanks, such as visible on the c36 (Fig. 5.6).

The oldest visible flakes are slightly overshot, and no stigmata associated with the use of an anvil are noted. It indicates that free-hand percussion was used. The core is discarded once the extraction surface's convexities are not exploitable anymore.

iii. Synthesis

The wide cores have one short and wide extraction surface that is restricted by two unexploited flanks and two natural planes. Flakes are unidirectionally extracted with a free-hand percussion until exhaustion of the extraction surface's convexities, and the potential occurrence of hinged flakes.

c. Cubic cores

A few other cores (N=5, 2,5%) also present a slightly different organisation, even though they also share similarities with the narrow and wide cores. They measure on average 27,8 mm length, 29,3 mm width, 18,3 mm thickness and weigh 17,3 gr (Table 5.7).

Cubic cores	Length	Width	Thickness	Weight
Mean	27,8	29,3	18,8	17,3
Median	25,7	31,9	19,7	14,4
Min	23,2	22,4	14,4	11,7
Max	39,6	34,1	21,1	23,9
Stand.dev	6,7	5,2	2,8	5,6
N	5	5	5	5

Table 5.7. Chert cubic cores' measures

i. Cubic cores' organisation

The cubic cores have successive and independent extraction surfaces from which flakes and elongated blanks are extracted (Fig. 5.7). The juxtaposition of rectilinear extraction surfaces and/or natural surfaces creates an overall cubic geometry.

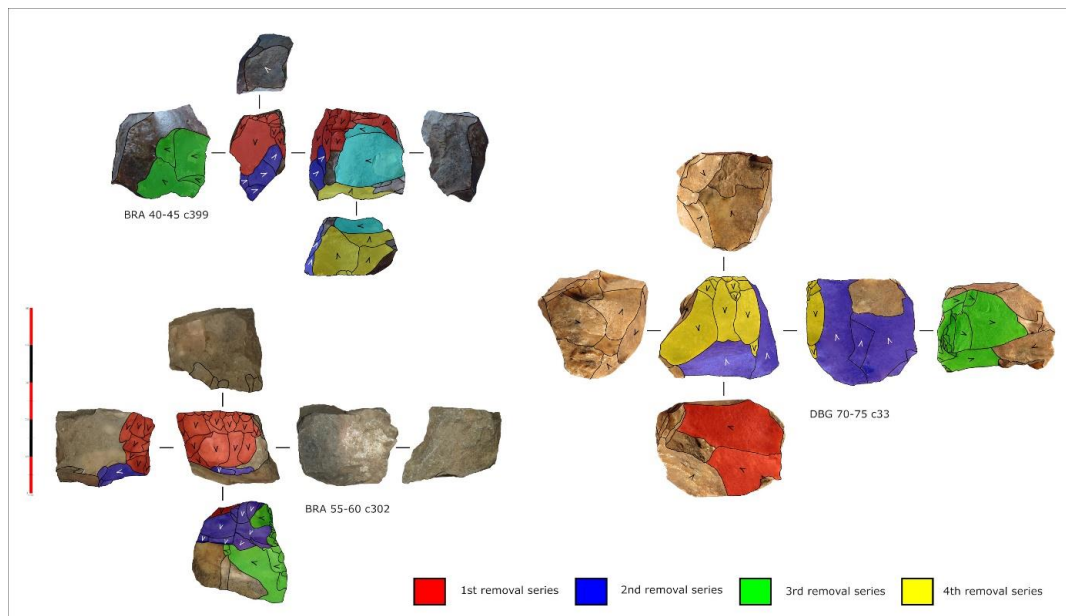


Figure 5.7. Chert cubic cores' geometry and removal series

Extraction surface

The extraction surfaces are not especially elongated. Some are located on narrow areas of the volume (see yellow removal sequence on c33, Fig. 5.7), but wider extraction surfaces also occur (see red removal sequence on c302, Fig. 5.7). All extraction surfaces tend to have a rectilinear longitudinal profile and are exploited independently. Blank removals never alternate from one extraction surface to another. Flakes and a few elongated blanks are unidirectionally removed.

Striking platform

The striking platforms are plain. They are opened by a flake removal, are natural, or correspond to a former extraction surface. There is no management of these striking platforms. On all cores, the angle between the striking platform and the extraction table is close to 90°.

Flanks and back

The flanks of the extraction surfaces are steep and rectilinear. They are natural or correspond to a former extraction surface. The back of the cores is unmodified and roughly parallel to one extraction surface.

Base

Different core bases exist, depending on the extraction surface we look at. Most are roughly parallel to the striking platform, but convergent bases also occur. No crushing is detected, suggesting that free-hand percussion was likely favoured, even though anvils could have been used to stabilise the cores.

ii. Intentions of production: associated methods, sequences and techniques

- Flakes removal are mostly represented on cubic cores. They are similar to the one observed on the wide slab cores. Most have roughly parallel sides and tend to be hinged. Others are convergent.
- Narrower and elongated blank removals, located on a narrow extraction surface, also occur (yellow sequence, c33, Fig. 5.7). These kinds of sequences are similar to bladelets' extraction sequences. A similar sequence could have been initiated, and failed, on a narrow edge of the core c399 (red sequence, Fig. 5.7).
- The flake extraction sequence, such as seen on c302 (Fig. 5.7) is continuous and only rare intercalated events were noticed. The sequences of elongated blank extractions are short, and it is therefore difficult to assess the regularity of these intercalated events.

iii. Synthesis

The cubic cores share similarities with the two former core categories described. The extraction surfaces are independent and constrained by steep rectilinear flanks that sometimes correspond to former extraction surfaces. The cubic cores are reoriented multiple times, creating an overall cubical geometry that corresponds to an advanced stage

of reduction. All extraction surfaces are rectilinear and at an angle near to 90° with their associated striking platforms. Blanks are generally removed in a ‘1,2,3’ sequence, rather than the ‘1,3,2’ sequence often observed on the ‘narrow’ cores. The removal scars observed are consistent with the flakes found in the collection.

d. Flat cores

A total of 44 other cores have been attributed to the ‘Flat core’ category. All of them are bipolar cores from which flakes have been extracted with an axial bipolar percussion. These cores measure on average 20,6 mm length, 18,4 mm width, 7,4 mm thickness and weight 3,3 gr (Table 5.8).

Flat cores	Length	Width	Thickness	Weight
Mean	20,6	18,4	7,4	3,3
Median	19,6	17,2	7,4	2,8
Min	12,6	6,9	3,9	0,4
Max	41,3	35	12,7	9,4
Stand.dev	6,4	5,2	2,1	2,3
N	44	44	44	44

Table 5.8. Chert flat cores’ measures

i. Flat core’s organisation

The flat cores tend to be square and very thin, with more elongated cores also occurring. They have one hammered platform opposed to a crushed base, both characteristic of axial bipolar percussion.

Irregular small flakes are extracted from the hammered and opposite platforms, creating bi-directional opposite removals (see c9 and c24 on Fig. 5.8). Flake removals reach both faces of the core (c24, Fig. 5.8), even though they generally invest one preferential extraction surface (c17, Fig. 5.8). The flat cores are also rarely rotated. No former steep and rectilinear sides are observed, such as for the narrow core type.

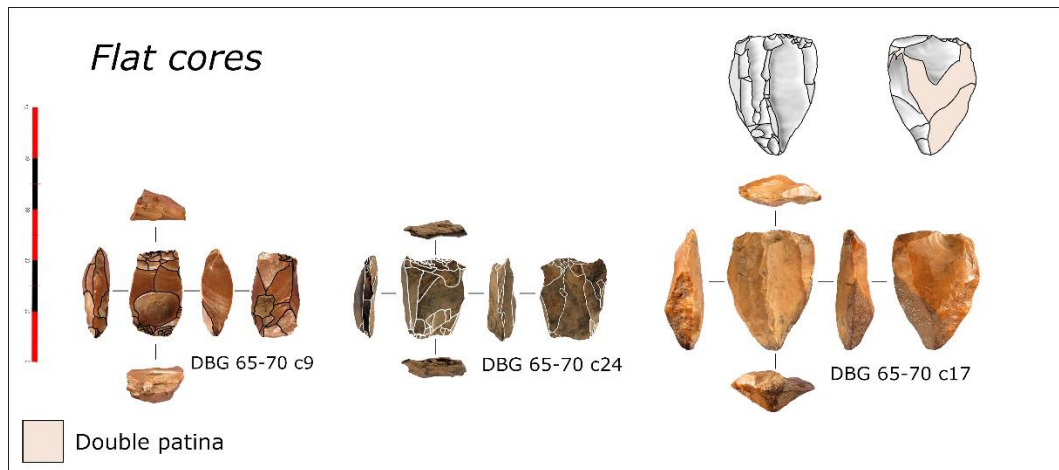


Figure 5.8. Chert flat cores

ii. Intentions of production: associated methods, sequences and techniques

Irregular small and thin flakes are removed from these flat cores. Elongated blanks are also extracted just before the occurrence of small hinged flakes, such as for the c17 (Fig. 5.8).

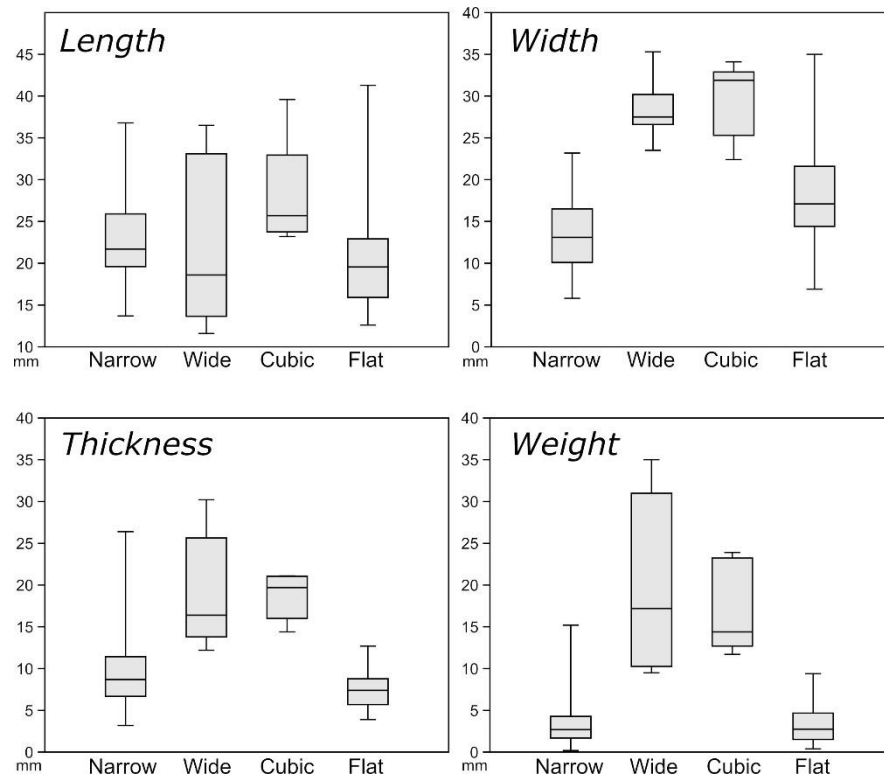
iii. Synthesis

The flat cores are bipolar axial cores from which small thin flakes, and some elongated blanks have been extracted. Because of the occurrence of extensive removal scars, it is often not possible to clearly assess if these bipolar cores could correspond to an advanced stage of reduction of the narrow cores, or if they could be made of blanks. Given their very thin aspect, I nevertheless estimate that at least 23 of them are likely to have been made of blanks.

e. Comparison between the core types

Following this analysis and definition of four core types, I now ask if they could correspond to the same reduction process, or if they are independent. To do so, I compare their structure, intention of production and associated strategies in order to see if the methods and ‘solutions’ used are overall similar or different.

If comparing the different core types’ dimensions, we see that they have similar lengths (even though variations are noted), but that their widths, thicknesses and weight appear quite different (Graph 5.1).



Graph 5.1. Chert core types' dimensions

This similarity of the length is interesting, because it corresponds to the length of the extraction surface. We see that all cores all have similar maximum length dimensions, and that their average lengths are all situated between around 20 mm and 25 mm. This similarity highlights the intention to produce microlithic blanks from all core types, that are calibrated in length.

Looking at the width, thickness and weight, I note that the narrow and flat cores have similar measures, which contrasts with the dimensions of the wide and cubic cores. We saw that the narrow cores have different stages of reduction that are associated with different percussion techniques. Cores from which blanks have been extracted with a bipolar percussion correspond to advanced stages of reduction. Flat cores all correspond to an axial bipolar percussion. In many cases, it is not clear if flat cores may correspond to an advanced stage of reduction of the narrow cores, or if they could be made of blanks. The dimension comparison between the flat and narrow cores supports the hypothesis that some of the flat cores could indeed correspond to an advanced stage of reduction of the narrow cores.

Wide and cubic cores also share similar widths, thicknesses and weights. I hypothesise that some wide cores could have been shifted in order to open another extraction surface, progressively creating cubic cores. The extraction surfaces of the wide and cubic cores are both wide, which contrasts with the narrow core structure. Wide and cubic cores are also more oriented towards a flake production, at least in their advanced discard stage.

The fact that the wide cores are heavier than the narrow and flat cores can be explained by their low degree of reduction. On the wide cores, only one extraction surface is exploited and most of the volume remains unmodified. Cubic cores also appear heavier, though slightly less than the wide cores. This could also partly support the hypothesis that wide cores could have been reoriented and shifted into cubic cores. It also indicates that the reduction process of the cubic cores may have been quite long.

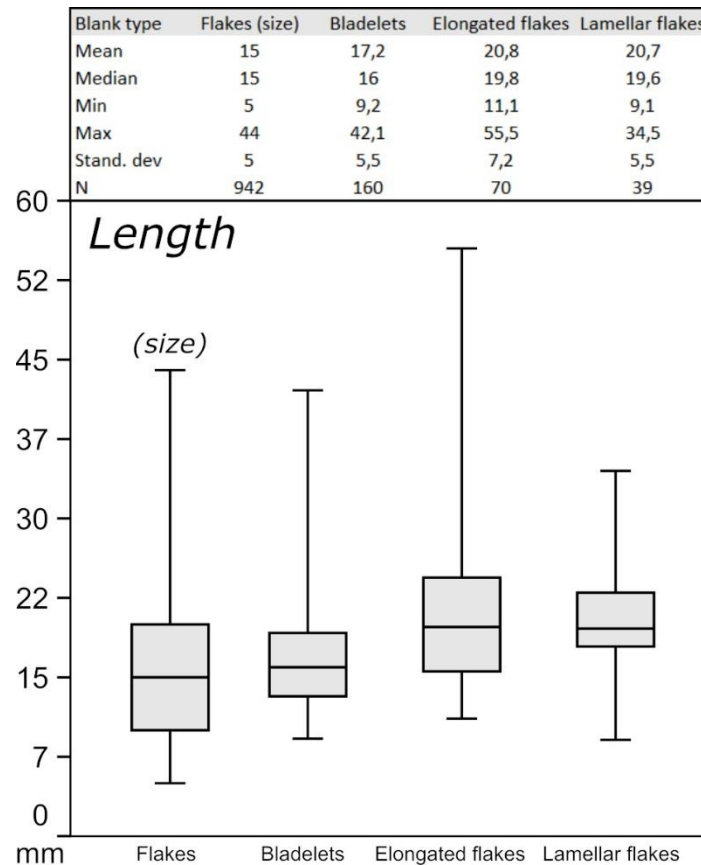
The strategies to produce blanks are slightly different between the core categories, even though they share similarities. Indeed, while narrow cores and flat cores are reduced in thickness in the course of their reduction process, blank being extracted from only one extraction surface, cubic cores use a different reduction strategy. Blanks are successively removed around the core, reducing the periphery of the volume by exploiting different 'facets', eventually leading to this particular cubic geometry.

To conclude, two main similarities are noticeable. Firstly, extraction surface lengths are similar and overall, below 30mm in all core categories, implying that blanks with a standardised length were looked for. Secondly, the extraction surfaces are in most cases limited to one area of the core that is constrained between two natural or prepared flanks, or that are independent. The reduction strategy between narrow and flat core on one side, and cubic cores on the other, differs. Given the types of blank extracted, the wide aspect of the extraction surfaces and the similar dimensions, I hypothesise that wide cores could have been reoriented, creating cubic cores.

In the following section, I describe the blanks produced in chert and see how they could be related to the results from the cores' analysis. This section gives us more information on the intentions of production, and specific associated strategies.

5.2.2. Blanks

The blanks that are produced in chert range from bladelets to flakes. In total, 413 bladelets, 111 elongated flakes and 67 lamellar flakes have been analysed, as well as 3585 flakes. These blanks generally measure less than 25 mm (for the maximal dimension) and have similar lengths (Graph 5.2).



Graph 5.2. Chert blank types' dimensions

a. Flakes, elongated flakes and lamellar flakes

They are 3585 flakes made of chert, including flakes (N= 3585), elongated flakes (N=111) and lamellar flakes (N=67). There are 1220 (32%) complete flakes (all categories) against 2474 (67%) broken flakes.

i. Flakes

The flakes (N= 3585) generally measure between 10 mm and 25mm (Table 5.9). Half of them measure less than 15 mm, and 40% between 15 and 24 mm. Only 11% of the flakes measure 25 mm or more.

Size category	5_14 mm	15_24 mm	25_34 mm	35_44 mm	Total
N	485	387	93	8	973
%	50%	40%	10%	1%	100%

Table 5.9. Chert flake sizes categories

Cortex	Flakes	Elongated flakes	Lamellar flakes	Total
Non-cortical (0%)	615 64%	37 56%	27 69%	679 63%
Cortical (1-100%)	351 36%	29 44%	12 31%	392 37%
Total	966 100%	66 100%	39 100%	1071 100%

Table 5.10. Chert blank types' cortex presence/absence

Most of the flakes are broken (68%) and are cortical (63%) (Table 5.10). The flakes are variable in terms of size, presence/absence of cortex and technique of extraction. Their morphology varies between square, rectangular and divergent, and their profile is rectilinear or slightly curved. Hinged short flakes frequently occur. No evident standardised morphologies or functional attributes were noted in the flake population beyond their microlithic sizes and rectilinear profiles.

When comparing the presence/absence of cortex by size class, we notice that small flakes are generally non-cortical, whereas bigger flakes tend to be more cortical (Table 5.11). This variation likely reflects the reduction process of the cores.

Size category	5_14 mm	15_24 mm	25_34 mm	35_44 mm	Total
Non-cortical	74%	57%	38%	25%	64%
Cortical	26%	43%	62%	75%	36%
Total	100%	100%	100%	100%	100%

Table 5.11. Chert flakes' cortex presence/absence per size category

When considering the techniques of extraction, I noted the occurrence of different platform types (Table 5.12). Most flakes are associated with a free-hand percussion (N=704; 77%), and have plain to filiform platforms with a marked to diffuse bulb of percussion.

Platform type	Plain	Punctiform	Filiform	Crushed	Total
N	507	101	167	383	1158
%	44%	9%	14%	33%	100%

Table 5.12. Chert flakes' platform types

The bipolar flakes (N=214, 23%) are divided into two categories: the short compressed flakes, and the elongated stick-like products (Fig. 5.9). The short compressed flakes have marked waves of percussion. They have irregular shapes and have crushed to filiform platforms opposed to crushed distal ends. Stick-like products have crushed and star-like platforms, elongated fracture planes and a crushed distal end.

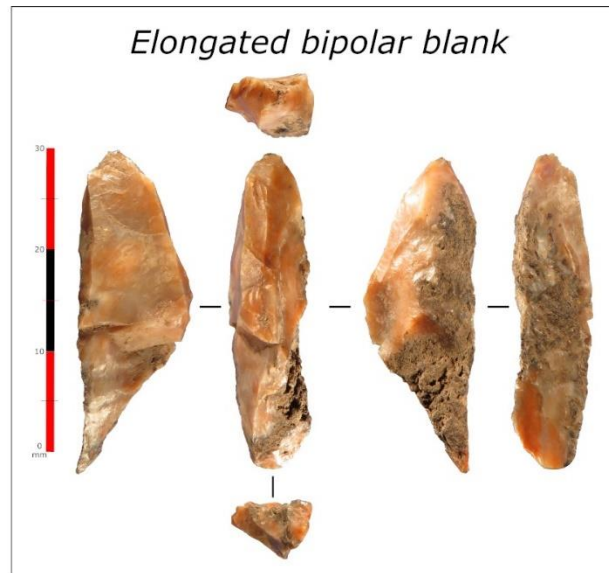


Figure 5.9. Elongated stick-like chert blank

It is interesting to note that flakes exhibiting stigmata ‘in-between’ free-hand and bipolar techniques occur (N=82). These flakes may have a plain platform and a crushed distal end, or a crushed platform associated with a slightly curved profile with no marked waves of percussion. These artefacts reflect the variety of gestures applied, stages of reduction processes, as well as the use or not of an anvil. Cores with a plain platform resting on an anvil, that can be called ‘anvil-platform’, can create blanks that are very similar to the ones extracted with a free-hand percussion (e.g. Callahan 1987). The most diagnostic blanks extracted from ‘anvil-platform cores’ associate plain platforms and crushed distal ends.

When crossing platform types with different size classes, we see that platforms are plain for every size category, but that all platform types are also represented for all size categories (Table 5.13). This indicates that the gestures and modes of extraction likely varied through the reduction process.

Size category	5_14 mm	15_24 mm	25_34 mm	35_44 mm	Total
Plain	176	155	45	4	380
%	40%	44%	57%	50%	43%
Punctiform	55	20	1	0	76
%	13%	6%	1%	0%	9%
Filiform	75	45	9	1	130
%	17%	13%	11%	13%	15%
Crushed	134	132	24	3	293
%	30%	38%	30%	38%	33%
Total	134	132	24	3	879
%	100%	100%	100%	100%	100%

Table 5.13. Chert flakes' sizes against platform types

Going further, we see that free-hand and bipolar flakes, as well as flakes with in-between stigmata (called 'intermediary'), are also equally represented in all size categories (Table 5.14). A free-hand percussion is preferentially used for extracting flakes of all sizes. It is interesting to note that the axial bipolar technique is also represented in all size category, meaning that this technique was likely used at different stages of the reduction process and/or on different core sizes.

Size category	5_14 mm	15_24 mm	25_34 mm	35_44 mm	Total
Free-hand	239	183	42	4	468
%	69%	59%	61%	57%	64%
Intermediary	36	28	5	0	69
%	10%	9%	7%	0%	9%
Bipolar	72	100	22	3	197
%	21%	32%	32%	43%	27%
Total	347	311	69	7	734
%	100%	100%	100%	100%	100%

Table 5.14. Chert flakes' size categories against techniques of extraction

To conclude, chert flakes are microlithic and have a rectilinear profile. Very few of them measure more than 25 mm. They have parallel, divergent or irregular sides, that may have cutting edges. Bipolar flakes are either short and irregular or elongated stick-like products. Cortical flakes tend to measure more than 25mm, even though smaller flakes are also cortical. The techniques of extraction observed are variable, reflecting the use of different gestures and potential core types. Free-hand-like flakes with a plain platform are the most represented.

ii. Elongated and lamellar flakes

Elongated flakes and lamellar flakes also occur. These artefacts sometimes display bladelet removal scars organised in sequences of extraction (Fig. 5.10).

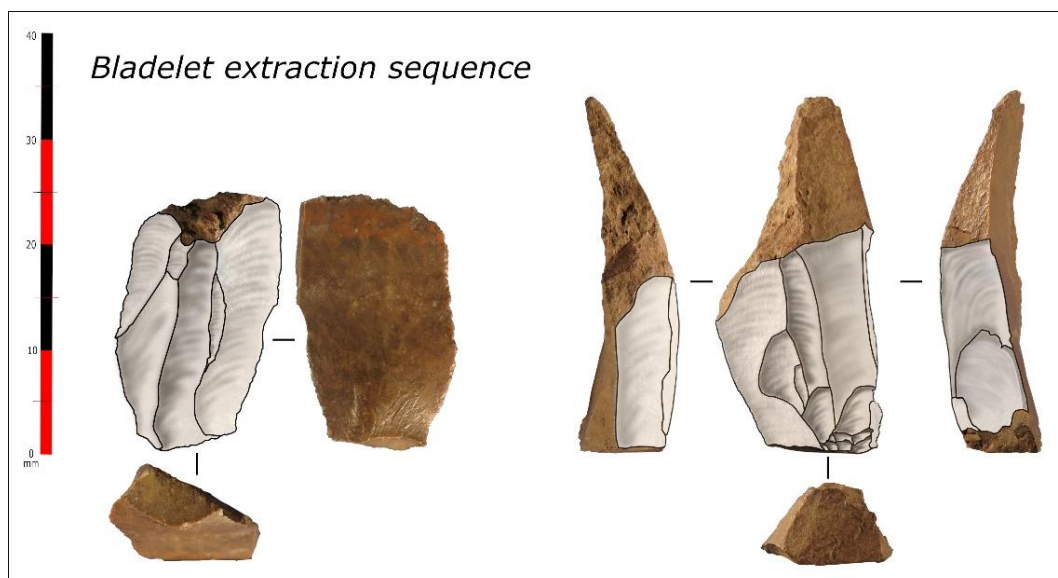


Figure 5.10. Bladelet extraction sequence on chert elongated flakes

The elongated flakes (N=111) measure on average 20,8 mm length, 8,9 mm width and 4 mm thickness (Table 5.15). A few of them measure more than 25 mm (N=14; 13%). They are 70 (63%) complete and 41 (37%) broken elongated flakes. Slightly more than half of them are non-cortical (N=37; 55%). Elongated flakes often display elongated flake or bladelet removal scars. They are thin and have two long cutting edges that are parallel, irregular or convergent (Table 5.16, Fig. 5.11).

Elongated flakes	Length	Width	Thickness
Mean	20,8	8,9	4
Median	19,8	8,6	3,8
Min	11,1	3,1	1,1
Max	55,5	20,8	9,8
Stand.dev	7,2	3,1	1,8
N	71	104	110

Table 5.15. Chert elongated flakes' dimensions

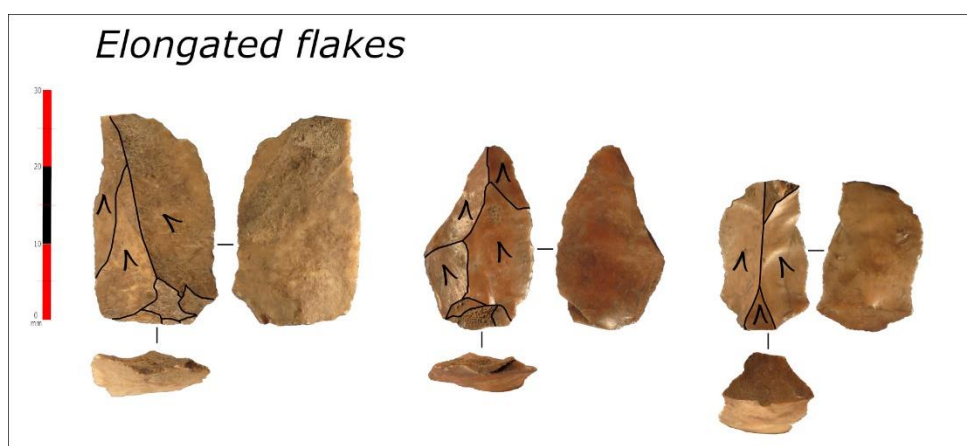


Figure 5.11. Chert elongated flakes

Their profile is rectilinear (N=79, 73%), slightly curved (N=20, 19%) or curved (N=9, 8%). As for the bladelets, most of them have plain platforms (Table 5.16). Elongated flakes are extracted through a free-hand percussion (N=52, 81%), and only a few of them have been detached with an axial bipolar percussion (N=12, 19%).

Shape	N	%	Platform	N	%
Parallel	33	37%	Plain	43	54%
Convergent	23	26%	Punctiform	9	11%
Divergent	3	3%	Filiform	7	9%
Irregular	31	34%	Crushed	20	25%
Total	90	100%	Total	79	100%

Table 5.16. Chert elongated flakes' shape and platform types

Overall, elongated flakes are thin rectilinear blanks with two opposed cutting edges. The presence of cortical elongated flakes indicates that they were detached from the beginning of the reduction process, or in order to remove cortical areas at later stages. Elongated flakes are associated with a free-hand percussion, and fewer with an axial bipolar percussion.

I also isolated 67 lamellar flakes. They measure on average 20,7 mm length, 11 mm width and 4,9 mm thickness (Table 5.17). Lamellar flakes do not necessarily have sharp cutting edges, but they are affiliated to the bladelet extraction sequence because they display bladelet removal scars. The absence of sharp cutting edges differentiates them from the elongated flakes at a functional level.

Lamellar flakes	Length	Width	Thickness
Mean	20,7	11	4,9
Median	19,6	10,3	4,7
Min	9,1	3,6	2,3
Max	34,5	21,5	8,9
Stand.dev	5,5	3,9	1,6
N	39	63	110

Table 5.17. Chert lamellar flakes' dimensions

Lamellar flakes are mostly parallel (N=27, 57%) and rectilinear (N=40, 68%) (Table 5.18) and non-cortical (69%).

Shape	N	%	Profile	N	%
Parallel	27	57%	Rectilinear	40	68%
Convergent	8	17%	Slightly curved	8	14%
Divergent	4	9%	Curved	11	19%
Irregular	8	17%	Total	59	100%
Total	47	100%			

Table 5.18. Chert lamellar flakes' shape and platform types

Both free-hand and bipolar lamellar flakes were identified and associated with a variety of platform types (Table 5.19). As for the other blanks, they mostly have plain striking platforms.

Platform	N	%
Plain	20	43%
Punctiform	6	13%
Filiform	5	11%
Crushed	15	33%
Total	46	100%

Technique	Free-hand	Bipolar	Total
N	26	15	41
%	63%	37%	100%

Table 5.19. Chert lamellar flakes' platform types and technique of extraction

To conclude, the lamellar flakes are 'technical pieces'. They are less cortical than the elongated flakes, meaning that they were mostly extracted after the first phases of preparation of the cores. Some of the lamellar flakes are likely to correspond to cleaning events of the surface of extraction.

b. Bladelets

There are 405 chert bladelets, including 160 (39%) complete and 245 (61%) broken bladelets. If counting the bladelets transformed in backed pieces, it makes 415 bladelets. These artefacts measure on average 17,2 mm length, 6,4 mm width and 2,5 mm thickness (Table 5.20). Only 13 bladelets measure more than 25 mm length. Most bladelets have parallel cutting edges (N=235, 68%), and their profile is rectilinear (N=280, 73%) (Table 5.21).

Bladelets	Length	Width	Thickness
Mean	17,2	6,4	2,5
Median	16	6	2,3
Min	9,2	3	0,8
Max	42,1	16,9	9,5
Stand.dev	5,5	2,2	1
N	160	400	406

Table 5.20. Chert bladelets' dimensions

Bladelet shapes	Parallel	Convergent	Divergent	Irregular	Total
N	235	60	29	24	348
%	68%	17%	8%	7%	100%

Bladelet profiles	Rectilinear	Slightly curved	Curved	Twisted	Total
N	280	66	21	14	381
%	73%	17%	6%	4%	100%

Table 5.21. Chert bladelets' shapes and profiles

i. Bladelet production and techniques of extraction

Almost all bladelets (Fig. 5.12) are rectilinear and parallel, and some of them are slightly hinged. Most are non-cortical (N=128, 82% of the complete bladelets), meaning that they were preferentially extracted after the first phases of debitage. Bladelets have either a trapezoidal or triangular section. They have unidirectional (87%) or more rarely multidirectional (13%) removal scars.

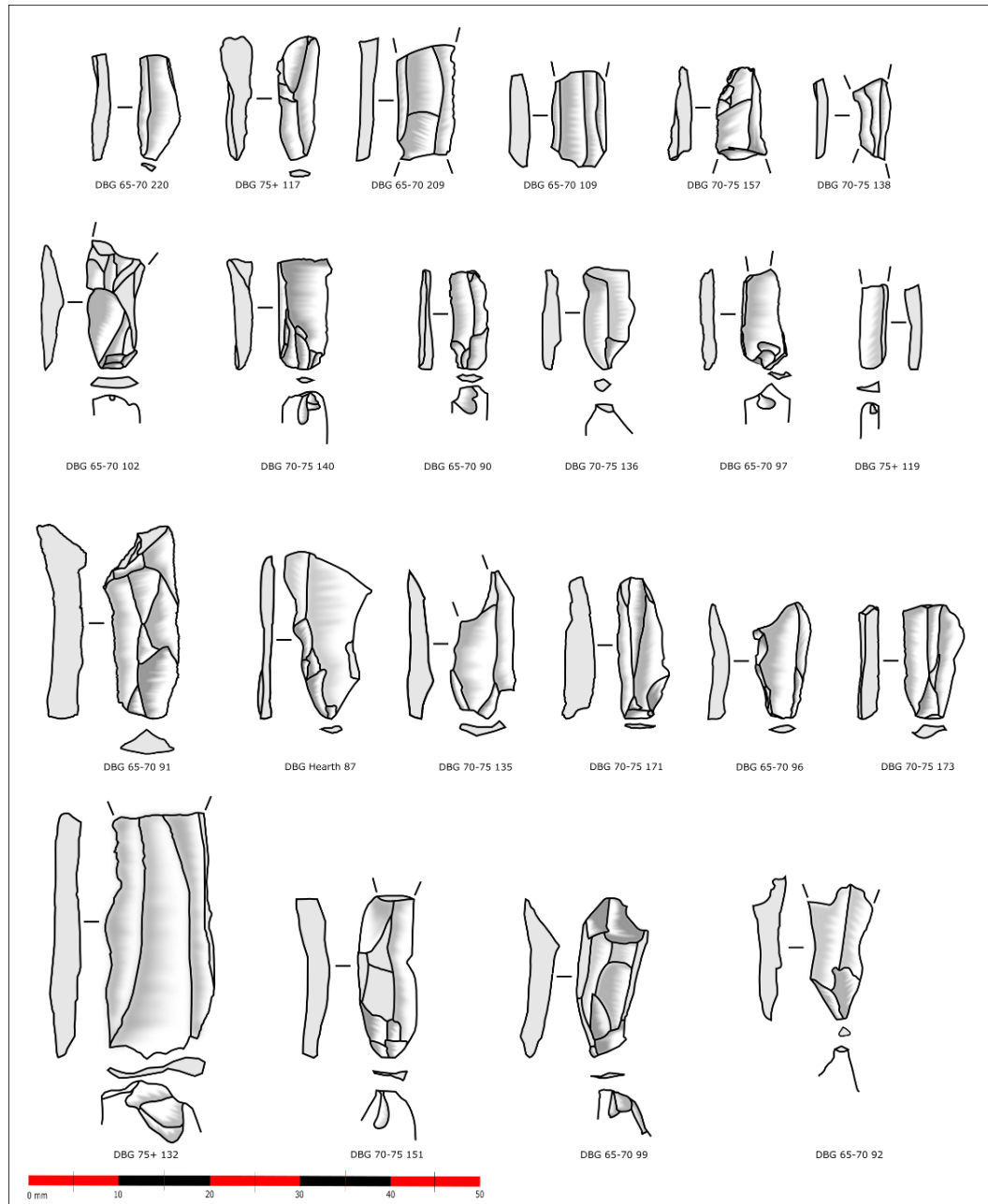


Figure 5.12. Chert bladelets

Former removal scars ridges created by the removal of former blanks are commonly used for extracting bladelets. When looking at the bladelets with a triangular section, we see that

they are extracted at the conjunction of two former removal scars (such as the number 3 of the bladelet framed in red on Fig. 5.13). After the extraction of narrow and convergent bladelets, the extracted bladelets become parallel and take away more than two removal scars, creating a trapezoidal section. When looking at these parallel bladelets with a trapezoidal section, we see that successive removal scars overlap on the same surface (1,3,2 order of removal), rather than moving to the periphery of the former removal scars (1,2,3 order of removal) (Fig. 5.13).

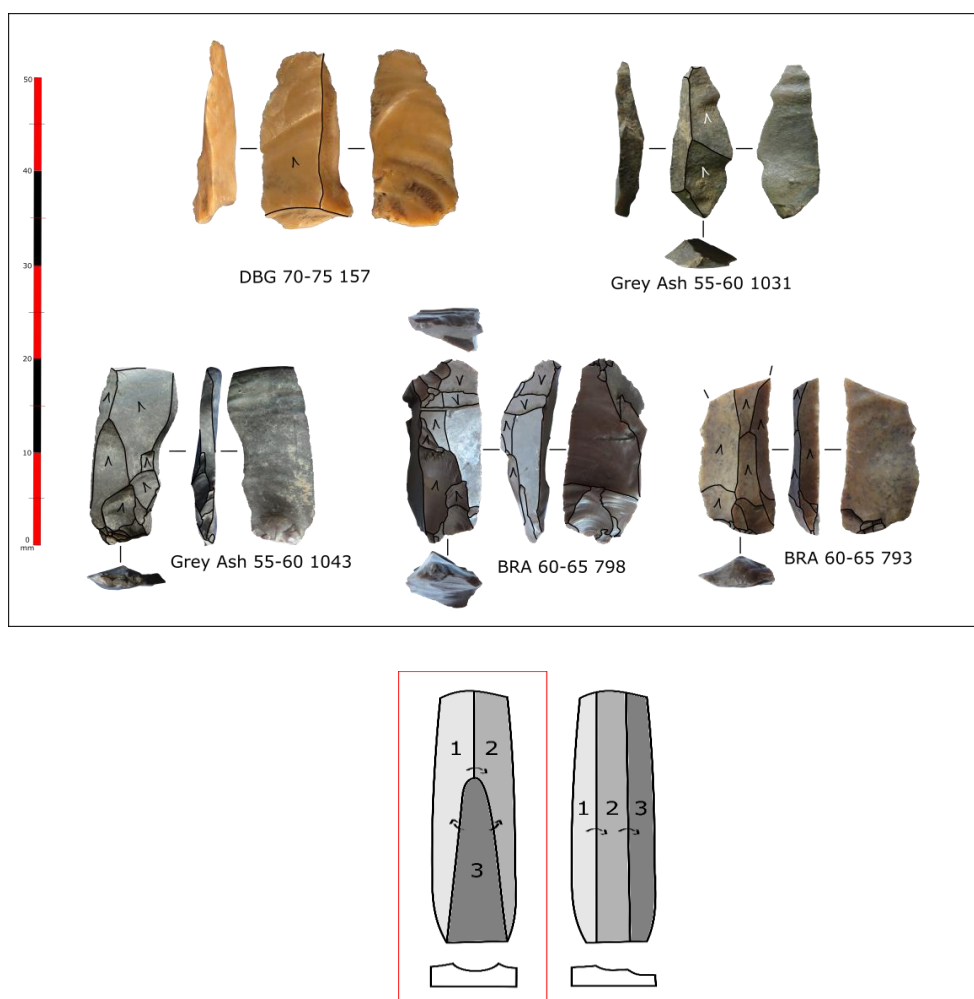


Figure 5.13. Sequence of removals visible on chert bladelets

Most bladelets have plain (N=73, 33%) or punctiform (N=25, 11%) platforms, generally associated with free-hand percussion. Filiform platforms, that may be created by a free-hand or a bipolar percussion, are also widespread (N=52, 24%), as well as bladelets with a crushed platform, generally associated with axial bipolar percussion (N=68, 31%). If considering a broader array of stigmata characteristic of axial bipolar percussion, there are

52 (28%) bipolar bladelets. These bladelets have crushed platform, marked waves of percussion and distal flaking.

The bladelets that are classified as free-hand (N=110, 68%) display marked to diffused bulbs of percussion, no or few marked waves of percussion and no distal crushing. A few bladelets have distal opposite flakings (21%), even though they can have a plain striking platform. These bladelets with stigmata ‘in between’ free-hand and bipolar percussions are potentially resulting from the use of an anvil associated with a tangential to axial percussion gesture on a core with a plain striking platform.

When considering different bladelet shapes in regard to their platforms, I noted slight variations. Convergent and irregular bladelets have slightly more filiform and crushed platform than the parallel and divergent bladelets that are generally associated with a free-hand percussion (Table 5.22). Varied platform types are also associated with different profile categories (Table 5.23), reflecting the combination of percussion gestures and the use or not of an anvil.

Shape/Platform	Parallel	Convergent	Divergent	Irregular	Total
Plain	48	9	12	4	73
%	35%	23%	44%	27%	33%
Punctiform	17	4	3	1	25
%	13%	10%	11%	7%	11%
Filiform	33	13	3	3	52
%	24%	33%	11%	20%	24%
Crushed	38	14	9	7	68
%	28%	35%	33%	47%	31%
Total	136	40	27	15	218
%	100%	100%	100%	100%	100%

Table 5.22. Chert bladelets' shapes against platform types

Profile/Platform	Rectilinear	Slightly curved	Curved	Twisted	Total
Plain	48	17	4	6	75
%	29%	39%	27%	75%	32%
Punctiform	21	6	1	1	29
%	13%	14%	7%	13%	12%
Filiform	41	11	5	0	57
%	24%	25%	33%	0%	24%
Crushed	58	10	5	1	74
%	35%	23%	33%	13%	31%
Total	168	44	15	8	235
%	100%	100%	100%	100%	100%

Table 5.23. Chert bladelet's profiles against platform types

If looking at bladelets that are either associated with a free-hand or a bipolar percussion, I noted closer affinities between the extraction technique used and the bladelet shapes (Table 5.24). Parallel and expanding bladelets are mostly detached with a free-hand percussion, whereas there are more convergent and irregular bladelets that are extracted with an axial bipolar percussion.

Shape/Technique	Parallel	Convergent	Expanding	Irregular	Total
Free-hand	95	13	17	6	131
%	77%	50%	77%	50%	72%
Bipolar	28	13	5	6	52
%	23%	50%	23%	50%	28%
Total	123	26	22	12	183
%	100%	100%	100%	100%	100%

Table 5.24. Chert bladelets' shapes against technique of extraction

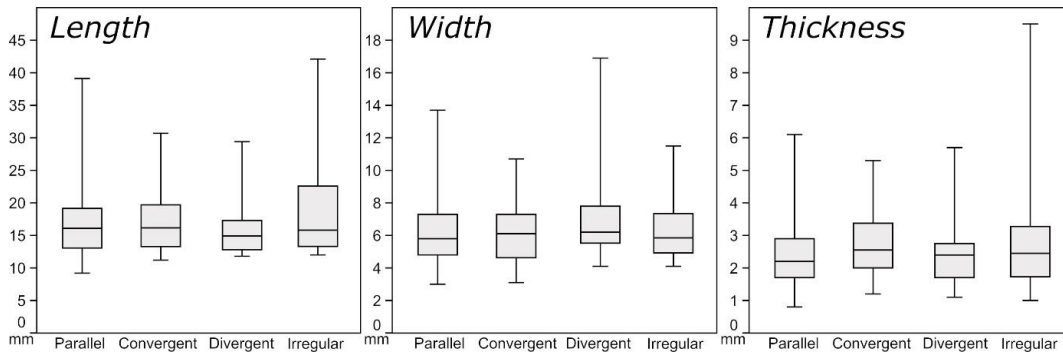
Synthesis

Different points may be highlighted from the chert bladelet analysis:

- Chert bladelets are microlithic, generally rectilinear with parallel sides, and extracted on a restricted narrow surface of a core. They follow former removal scar ridges as guides in a '1,3,2' sequence of extraction.
- Convergent bladelets with a triangular section generally start the bladelet extraction sequence. They are followed by the removal of parallel bladelets with a trapezoidal section.
- Parallel and expanding bladelets tend to have been extracted with a free-hand or anvil-rested percussion, whereas more convergent and irregular bladelets may have been extracted with an axial bipolar percussion. This could be explained by the fact that some convergent bladelets reach the appointed base of reduced and less elongated narrow cores exploited with an axial bipolar percussion.
- The variety existing in terms of shapes, platform types and profiles likely reflect the use of different gestures of percussion, as well as the use or not of an anvil. The presence of bladelets with in-between stigmata likely correspond to blanks extracted on the core with a plain platform resting on an anvil.

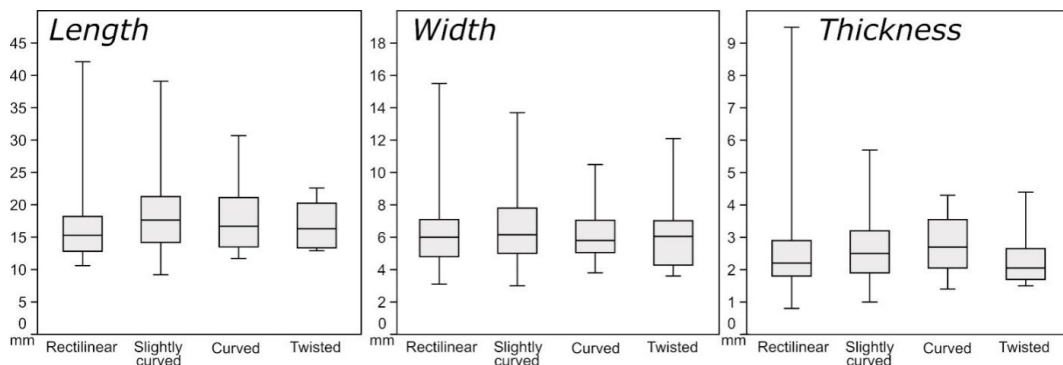
ii. Morpho-functional properties

We saw that convergent bladelets are generally extracted at the beginning of the bladelet extraction sequence, followed by the extraction of parallel bladelets. As a whole, all bladelet shapes have similar dimensions (Graph 5.3).



Graph 5.3. Chert bladelets' dimensions per shape categories

When the bladelets' profiles, we also see that they have similar dimensions (Graph 5.4). Rectilinear bladelets have maximum dimension that are slightly longer than the other ones, supporting the fact that rectilinearity was looked for at every moment of the bladelet extraction.



Graph 5.4. Chert bladelets' dimensions per profile categories

During my analysis, I also noted slight morphological differences, that I think partly reflect the order and moment at which bladelets are extracted. The bladelets with a triangular section are convergent, parallel or irregular. Convergent bladelets have unidirectional removal scars (85%), and more rarely have multidirectional ones (15%). They are mostly rectilinear (78%), few being slightly curved (14%), curved (7%) or twisted (2%). Parallel bladelets with a trapezoidal section are also mostly rectilinear (73%) or slightly curved (19%). Very few are curved (4%) or twisted (4%).

The divergent bladelets tend to be slightly more curved than the parallel bladelets, as 64% are rectilinear, 25% slightly curved and 11% curved. This might be explained by the fact that some divergent bladelets slightly overshoot on the distal convexities previously created by elongated flake removals. Irregular bladelets are also slightly less rectilinear (61%).

The fact that convergent and parallel bladelets are very rectilinear highlights their inscription within the same extraction sequence, and the intention to produce rectilinear blanks. On the other hand, divergent and irregular bladelets tend to be slightly more curved probably because they were extracted at more varied moments of the reduction sequence, maybe in a slightly less controlled way.

Beyond these slight morphological variations, it is important to note that strong functional similarities exist. All bladelets have two opposite cutting edges, of which one at least is rectilinear. The distal end of all bladelets does not have sharp edges. Indeed, because rectilinear bladelets were looked for, the distal end is slightly hinged in many cases. It is, therefore, not cutting, even for some convergent bladelets. No standardisation in terms of angle or even general morphology of the convergent end of these bladelets was also observed.

In sum, the main functional criteria that were looked for were **long cutting edges** and **rectilinear products**.

c. Synthesis on the chert blank analysis

We saw that while flakes are extracted at varied moments of the reduction process, bladelets are extracted in short sequences that are intercalated between elongated flake and flake removals. This observation is also supported by the presence/absence of cortex per blank type. Most bladelets are indeed non-cortical, whereas more flakes, elongated flakes and lamellar flakes have cortical areas (Table 5.25). Lamellar flakes that are directly linked to the bladelet extraction sequence are proportionally less cortical than the flakes and elongated flakes. The fact that elongated flakes have the highest proportion of cortex is consistent with the fact that they were likely extracted from the beginning of the reduction process in order to create the extraction surface, or to remove cortical surfaces at a later stage of the core reduction process.

Cortex	Yes	No
Flakes	37%	63%
Elongated flakes	45%	55%
Lamellar flakes	31%	69%
Bladelets	18%	82%

Table 5.25. Percentage of cortex presence/absence per blank types

We also saw that, rather than moving to the periphery of the former removal scars when extracting blanks (1,2,3 sequence), bladelets and elongated flakes are extracted from the same restricted surface of extraction (1,3,2 sequence). This is consistent with the extraction sequences observed on the narrow cores.

Most blanks have stigmata that are characteristic of a free-hand extraction. It is here important to highlight that free-hand like blanks could also have been extracted from cores resting on an anvil, especially if not reaching the base of the core, as is the case for most bladelets.

The techniques used to extract blanks also vary from free-hand to axial bipolar. Blanks displaying in-between stigmata exist, in the bladelet and flake production. This stresses the links existing between free-hand and bipolar percussion and their potential interconnection with the same reduction process, which is also consistent with the reduction process observed for the narrow cores. The free-hand or anvil-rested techniques, that are overall favoured, is particularly well represented for the elongated flakes and flakes (Table 5.26). They are slightly more bipolar blanks in the lamellar flake category, which can be explained by the presence of ‘stick-like’ elongated bipolar blanks on which bladelet removals are visible.

Technique	Free-hand	Bipolar
Flakes	77%	23%
Elongated flakes	81%	19%
Lamellar flakes	63%	37%
Bladelets	73%	27%

Table 5.26. Percentage of free-hand and bipolar technique of extraction per chert blank types

The occurrence of bipolar flakes in all size classes also indicates that this technique of percussion was used at different stages of the reduction process, and/or on different core

types. Following the chert blank analysis, I conclude that all blanks share common technomorphological features:

- Chert blanks belong to a microlithic production and only a few artefacts measure more than 25mm.
- The vast majority of the blanks have a rectilinear profile.
- Bladelets and elongated flakes have a long and sharp cutting edges, one of which at least has a straight delineation.
- Flakes are generally small (between 10 and 20mm) and are very variable in terms of shape and presence/absence of a cutting edge.
- The distal end of all blanks, including bladelets, is not sharp and often slightly hinged.
- Small (<25mm) and rectilinear products with at least one cutting edge were looked for.

Finally, the order of removal observed on the bladelets and elongated flakes, their dimensions and their associated extraction techniques are similar to what is observed on the narrow cores. I consequently hypothesise that most bladelets and elongated flakes were extracted from the narrow cores.

5.2.3. Retouched artefacts

There are 356 retouched artefacts made of chert that are dominated by scrapers (N=292, 82%) and followed by backed pieces (N=57, 16%). Other retouched artefacts also occur (N=7, 2%) that include four borers (convergent tools), two double-backed artefacts and one awl. These artefact types are introduced in the next sections, and will be presented in more detail in a dedicated section.

a. Scrapers

There are 292 chert scrapers. They measure on average 15,4 mm length, 13,4 mm width and 5,3 mm thickness (Table 5.27) and include 230 (79%) complete scrapers and 62 (21%) broken ones.

Scrapers	Length	Width	Thickness
Mean	15,4	13,4	5,3
Median	15,1	13,1	5,1
Min	8	7,5	1,9
Max	32,8	22,5	11,7
Stand.dev	3,7	2,8	1,8
N	254	256	291

Table 5.27. Chert scrapers' dimensions

All the scrapers are made of flakes, except one that is made of a bladelet. Scrapers are mostly non-cortical (64%) against 82 (36%) cortical (Table 5.28). Most of them are end-scrapers (N=166, 67%), 44 (18%) are retouched on the proximal and 37 (15%) are side-scrapers.

Cortex (%)	0	1-40	40-80	80-100	Total
N	147	59	20	3	229
%	64%	26%	9%	1%	100%

Table 5.28. Number of chert scrapers per cortex percentage

I classified the scrapers in three categories that will be described in their dedicated section: thumbnail, V-shaped and short-arc. As a matter of introduction, I define thumbnail scrapers as small end-scrapers made of flakes with a straight-convex to a convex retouched area. V-shaped scrapers are slightly longer end-scrapers, with a lateral and divergent abrupt retouch on the sides, constraining the width of the scraper. Short-arc scrapers are small side-scrapers with a wide retouched area.

These three scraper types occur through the sequence, both in pre-pottery and pottery layers (Table 5.29). Thumbnail scrapers are the most represented, followed by V-shaped and short-arc scrapers.

Chert scrapers						
Layer	Spit	Thumbnail	V-shaped	Short-arc	x	Total
Grey Ash	x	6	1	0	0	7
		86%	14%	0%	0%	100%
Grey Ash	55-60	7	2	1	1	11
		64%	18%	9%	9%	100%
BRA	x	12	0	0	1	13
		92%	0%	0%	8%	100%
BRA	to-40	2	0	0	2	4
		50%	0%	0%	50%	100%
BRA	40-45	0	0	0	0	0
		0%	0%	0%	0%	0%
BRA	45-50	2	1	1	1	5
		40%	20%	20%	20%	100%
BRA	to-50	2	1	0	2	5
		40%	20%	0%	40%	100%
BRA	50-55	32	5	7	14	58
		55%	9%	12%	24%	100%
BRA	55-60	32	3	2	8	45
		71%	7%	4%	18%	100%
BRA	60-65	15	1	0	1	17
		88%	6%	0%	6%	100%
BRA	base	4	0	0	1	5
		80%	0%	0%	20%	100%
DBG	x	16	3	0	5	24
		67%	13%	0%	21%	100%
DBG	55-60	19	2	0	7	28
		68%	7%	0%	25%	100%
DBG	60-65	5	0	0	0	5
		100%	0%	0%	0%	100%
DBG	65-70	19	3	2	9	33
		58%	9%	6%	27%	100%
DBG	70-75	14	6	2	3	25
		56%	24%	8%	12%	100%
DBG	75+	0	2	0	0	2
		0%	100%	0%	0%	100%
DBG	Hearth	3	2	0	0	5
		60%	40%	0%	0%	100%
Total		190	32	15	55	292
		65%	11%	5%	19%	100%

Table 5.29. Chert scraper types per layer and spit

All these scraper types have similar dimensions, even though V-shaped scrapers tend to be slightly longer and thicker, whereas short-arc scrapers appear wider (Fig. 5.14).

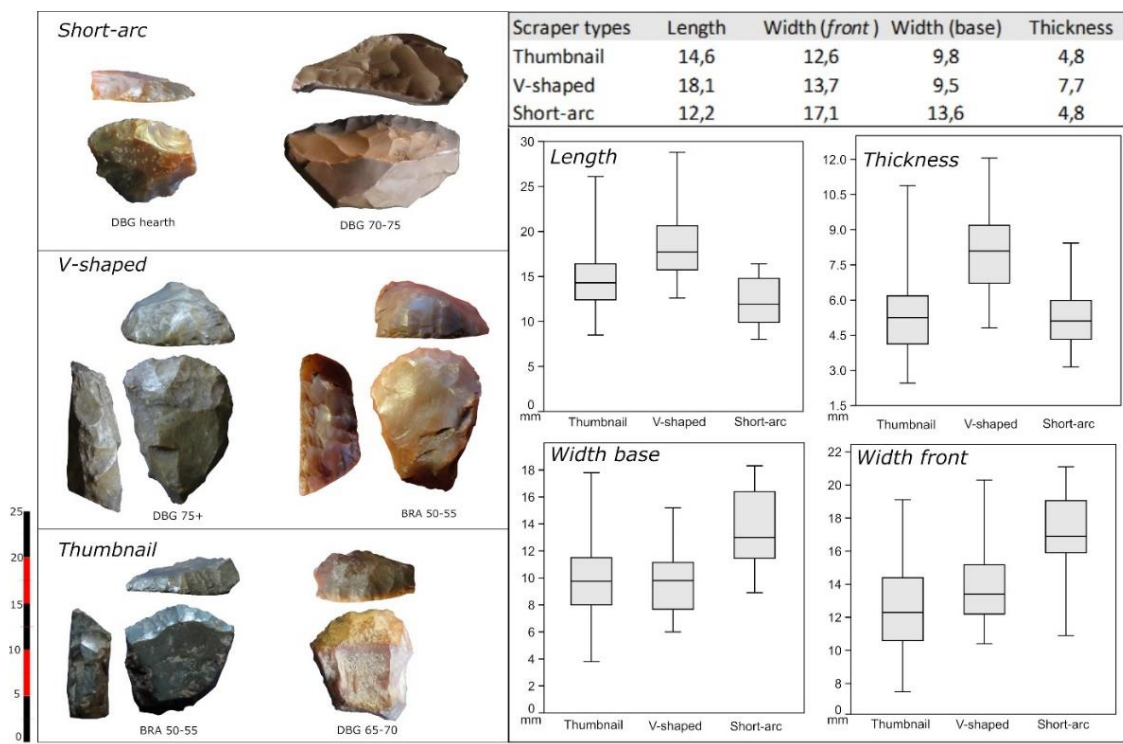


Figure 5.14. Chert scraper types' dimensions

To conclude, chert scrapers are small (generally <20 mm), made of flakes that are cortical or not, and all thumbnail, V-shaped and short-arc types occur in pre-pottery and pottery layers. I now come to the chert backed pieces.

b. Backed pieces

There are 57 backed pieces made of chert, including 26 geometrics and four convergent microliths (Fig. 5.15). A total of 27 pieces are indeterminate because too fragmented. The geometrics and convergent backed pieces have similar dimensions (Table 5.30).

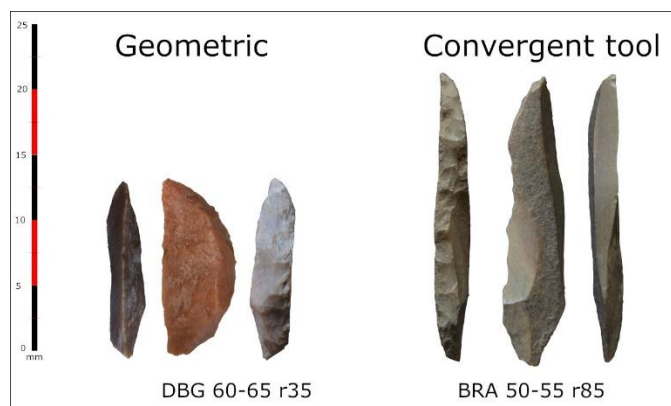


Figure 5.15. Chert geometric and convergent tool (backed piece)

Backed pieces (BP)	Length	Width	Thickness
Geometrics	18,2	7,1	2,7
Convergent BP	15,9	6,5	3

Table 5.30. Chert backed pieces' dimensions

Chert geometrics occur through the whole sequence (Table 5.31). Segments are the most represented and one triangle occurs. There are four convergent backed pieces occur, all present in the pottery-bearing layers (BRA unit).

Chert backed pieces		Geometrics			Convergent tools	Broken/Indeterminate	Total
Layer	Spit	Segments	Triangles	Trapezes			
Grey Ash	x	2	0	0	0	2	4
		50%	0%	0%	0%	50%	100%
Grey Ash	55-60	0	0	0	0	0	0
		0%	0%	0%	0%	0%	0%
BRA	x	0	0	0	0	0	0
		0%	0%	0%	0%	0%	0%
BRA	to-40	0	0	0	0	0	0
		0%	0%	0%	0%	0%	0%
BRA	40-45	0	0	0	0	0	0
		0%	0%	0%	0%	0%	0%
BRA	45-50	3	0	0	0	1	4
		75%	0%	0%	0%	25%	100%
BRA	to-50	1	0	0	0	1	2
		50%	0%	0%	0%	50%	100%
BRA	50-55	2	0	0	2	1	5
		40%	0%	0%	40%	20%	100%
BRA	55-60	2	1	0	1	3	7
		29%	14%	0%	14%	43%	100%
BRA	60-65	2	0	0	0	1	3
		67%	0%	0%	0%	33%	100%
BRA	Base	0	0	0	1	1	2
		0%	0%	0%	50%	50%	100%
DBG	x	1	0	0	0	1	2
		50%	0%	0%	0%	50%	100%
DBG	55-60	0	0	0	0	0	0
		0%	0%	0%	0%	0%	0%
DBG	60-65	2	0	0	0	3	5
		40%	0%	0%	0%	60%	100%
DBG	65-70	4	0	0	0	8	12
		33%	0%	0%	0%	67%	100%
DBG	70-75	4	0	0	0	5	9
		44%	0%	0%	0%	56%	100%
DBG	75+	2	0	0	0	0	2
		100%	0%	0%	0%	0%	100%
DBG	Hearth	0	0	0	0	0	0
		0%	0%	0%	0%	0%	0%
Total (N)		25	1	0	4	27	57
%		44%	2%	0%	7%	47%	100%

Table 5.31. Chert geometrics and convergent tools per layer and spit

A total of 17 backed pieces are made of bladelets, and six of elongated blanks. The other 34 backed pieces' blanks are impossible to assess. Overall, all the selected blanks are thin, rectilinear and non-cortical. Only three artefacts, including two segments, have

cortical areas. The breaks observed are all transversal, mostly direct (N=20, 74%) and neat (N=21, 84%). Four backed pieces have transversal flexion breaks.

c. Other retouched artefacts

There are four borers, two double-backed artefacts and one awl (Fig. 5.16). The borers and double-backed artefacts are made of rather thick blanks, which contrasts with the thin blanks selected for the backed pieces. All these retouched artefacts are of microlithic dimensions and measure less than 20 mm (Table 5.32).

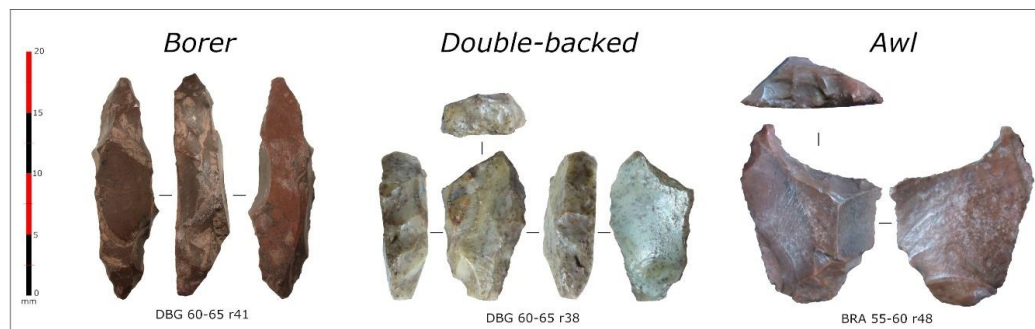


Figure 5.16. Chert borer, doubled backed artefact and awl

Others	Length	Width	Thickness	N
Borers	19	5,3	3,6	4
Double-backed	13,6	7,3	3,3	2
Awl	13,9	10,9	3,7	1

Table 5.32. Chert other retouched artefacts' dimensions

Borers have at least one crushed or rounded extremity. The double backed artefacts are similar to the scrapers, but have a concave retouch on their distal end that is not observed in the scraper category. The awl also has a concave retouch associated with a short backing. No break plane is associated with this artefact that could indicate that it corresponds to a discard, such as a microburin. No other artefact is similar to this one in the BMS assemblage.

5.2.4. Synthesis and observation within the sequence

a. Synthesis of the chert analysis

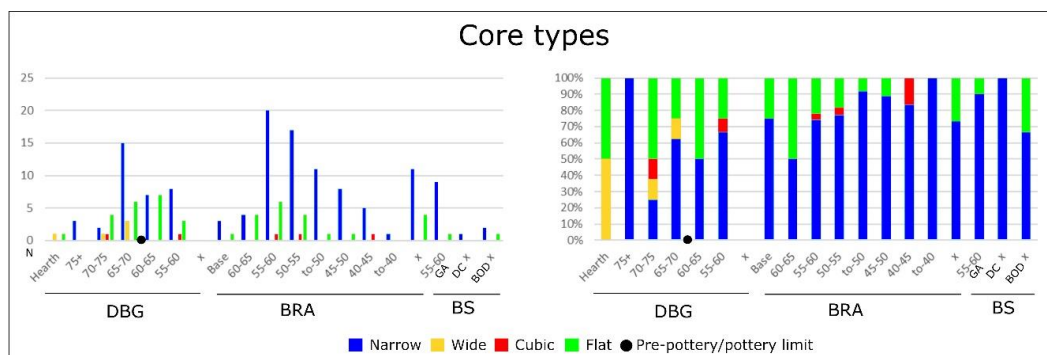
Different key elements may be highlighted from the chert analysis.

- Four core types have been defined: narrow, wide, cubic and flat cores.
- The narrow cores are used to extract different types of blanks, including bladelets through short sequences of extraction that are intercalated between elongated flake and flake removals. A free-hand percussion is firstly used, and the core may then be stabilised on an anvil. At the most advanced stages of the reduction sequence, an axial bipolar percussion can be used.
- The wide and cubic cores are more oriented towards the production of flakes that are more or less elongated. They could represent two different discard stages of the same method.
- The flat cores could correspond to an advanced stage of the narrow cores, or be made of blanks. Even though elongated blanks could have been extracted, they mainly display irregular flake removal scars.
- Rectilinear microlithic blanks with at least one cutting edge are produced
- Flakes are transformed in scrapers and borers, whereas thin blanks, including bladelets, are transformed in backed pieces.

b. Observation within the sequence

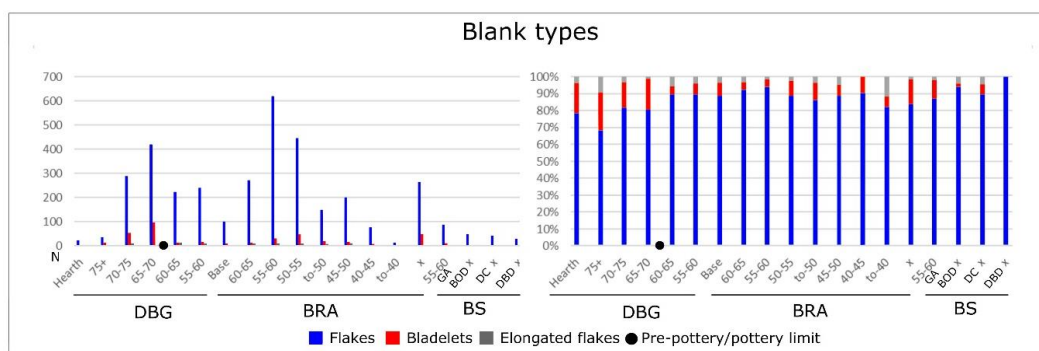
All cores categories, blank types, scraper types and geometrics types occur in the late Holocene sequence of BMS.

Looking more precisely at this distribution, we see that the narrow cores are represented in almost all layers and overall dominate the core assemblage (Graph 5.5). The other core categories occur in all layers, except the wide cores that are only found in the pre-pottery layers. I formerly hypothesised that the wide cores and cubic cores could correspond to the same reduction process. Following this idea, the fact that the wide cores are only present in the pre-pottery layers could simply represent differences in discard stages, rather than the occurrence of an independent method of production.



Graph 5.5. Chert core types' distribution in the BMS late Holocene sequence

All blank types also occur in all layers in similar proportions, showing a continuity of the intentions of production (Graph 5.6). Bladelets are slightly more represented in the pre-pottery DBG layers, but continue to occur in BRA until being less represented in the BS layers. They, however, maintain the same characteristics in all layers (e.g. dimensions, rectilinearity).



Graph 5.6. Chert blank types' distribution in the BMS late Holocene sequence

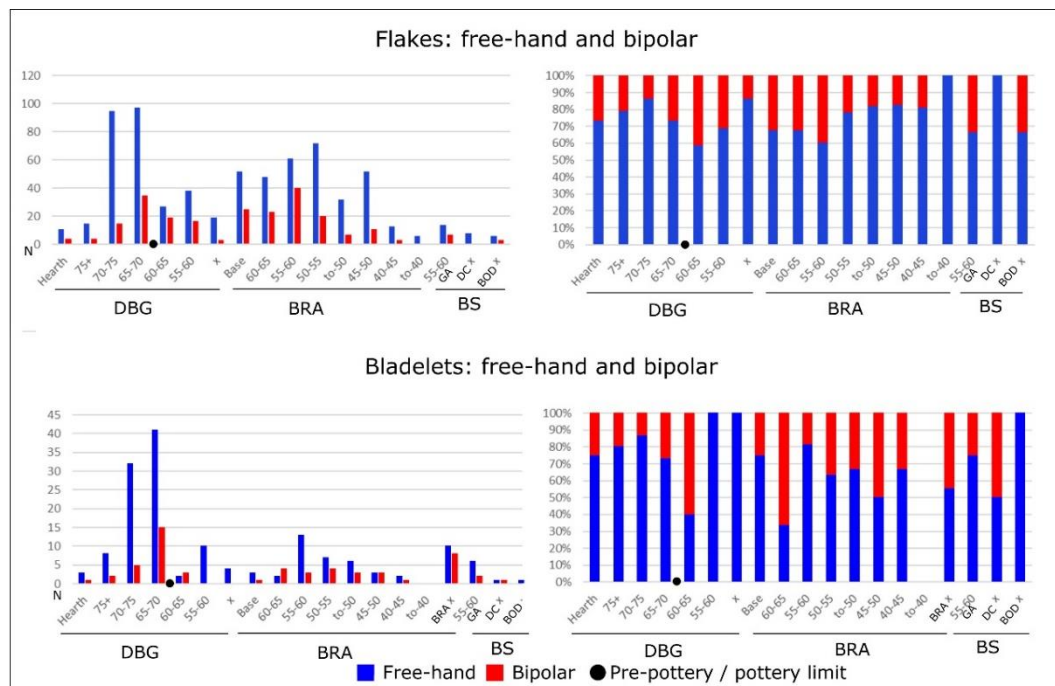
Flakes and bladelets have similar dimensions in all layers. This is observable when comparing the average length, width and thickness of the bladelets from DBG, BRA and BS (Table 5.33). When looking at the flakes, we notice that there tend to be bigger flakes in the BS layers (Table 5.33), which could be due to an aleatory sampling effect. Flakes from all layers indeed fit within a microlithic production, and these dimensional variations are not correlated with the appearance of new core types, methods, techniques, or sequences of extraction.

Bladelets	Length	Width	Thickness
BS	19,2	6	2,3
BRA	16,9	6,6	2,7
DBG	17,3	6,3	2,4

Flake sizes	5_14 mm	15_24 mm	25_34 mm	35+ mm	Total
BS	20%	38%	40%	2%	100%
BRA	38%	33%	26%	3%	100%
DBG	47%	33%	19%	1%	100%

Table 5.33. Chert bladelets and flakes' dimensions per DBG, BRA and BS units

If looking at the techniques of extraction, it appears that blanks with free-hand like stigmata are the most represented through the sequence (Graph 5.7). These stigmata are also visible on blanks extracted with free-hand or anvil-rested percussions. The axial bipolar technique is also widespread in all layers. Slightly more bipolar bladelets are represented in the pottery-bearing layers. I, however, argued that the bladelets' techniques of extraction vary through the same reduction process, depending on the narrow cores' reduction stages. Because narrow cores are mostly represented in the pottery layers, I hypothesise that this variation rather reflects a sampling of bladelets produced from reduced narrow cores, and potentially from some flat cores, and not a change of the methods or techniques of production.



Graph 5.7. Chert flakes and bladelet's technique of extraction in the BMS late Holocene sequence

To conclude, there is no change through the sequence in the methods, techniques and intentions of production for the chert raw material. In the following section, I present the results obtained for the agate lithic assemblage.

5.3. Agate

There are 2197 agate artefacts. Flakes (51%) and chunks (29%) are the most represented artefact categories. Blanks are dominated by flakes and followed by bladelets (11%). Cores make 4% of the agate assemblage. There are 172 retouched artefacts (8% of the total assemblage) that include scrapers (N=114; 66%), backed pieces (N=52; 30%) and other retouched artefacts (N=6, 3%) (Table 5.34).

BMS LATE HOLOCENE AGATE SAMPLED ASSEMBLAGE											Retouched artefacts				
Layer	Spit	N/%	Flakes	Bladelets	Lamellar flakes	Elongated flakes	Cores	Core fragments	Chunks	Nodules	Total	Scrapers	Backed pieces	Others	Total
Damp Black Dung	x	N 1 % 50%	1 50%	0 0%	0 0%	0 0%	0 0%	0 0%	1 50%	0 0%	2 100%	x x	x x	x x	x x
Dung Contact	x	N 15 % 68%	15 68%	3 14%	0 0%	0 0%	0 0%	0 0%	4 18%	0 0%	22 100%	x x	x x	x x	x x
Base of Dung	x	N 13 % 62%	13 62%	1 5%	0 0%	0 0%	2 10%	0 0%	5 24%	0 0%	21 100%	x x	x x	x x	x x
Grey Ash	x	N x % x	x x	x x	x x	x x	6 x	0 x	x x	0 x	x x	8 73%	3 27%	0 0%	11 100%
Grey Ash	55-60	N 31 % 58%	31 58%	4 8%	0 0%	0 0%	0 0%	0 0%	18 34%	0 0%	53 100%	4 100%	0 0%	0 0%	4 100%
BRA	x	N 74 % 52%	74 52%	16 11%	0 0%	0 0%	8 6%	0 0%	43 30%	0 0%	141 100%	5 71%	2 29%	0 0%	7 100%
BRA	to-40	N 10 % 71%	10 71%	0 0%	0 0%	0 0%	0 0%	0 0%	4 29%	0 0%	14 100%	0 0%	0 0%	0 0%	0 0%
BRA	40-45	N 21 % 51%	21 51%	7 17%	1 2%	0 0%	1 2%	0 0%	11 27%	0 0%	41 100%	0 0%	0 0%	0 0%	0 0%
BRA	45-50	N 61 % 69%	61 69%	13 15%	1 1%	3 3%	6 7%	0 0%	4 5%	0 0%	88 100%	3 75%	1 25%	0 0%	4 100%
BRA	to-50	N 38 % 56%	38 56%	5 7%	0 0%	2 3%	3 4%	0 0%	20 29%	0 0%	68 100%	2 50%	2 50%	0 0%	4 100%
BRA	50-55	N 123 % 47%	123 47%	30 12%	0 0%	4 2%	7 3%	1 0%	95 37%	0 0%	260 100%	14 74%	4 21%	1 5%	19 100%
BRA	55-60	N 134 % 49%	134 49%	22 8%	1 0%	8 3%	10 4%	4 1%	92 34%	0 0%	271 100%	12 75%	4 25%	0 0%	16 100%
BRA	60-65	N 15 % 50%	15 50%	1 3%	0 0%	1 3%	1 3%	0 0%	12 40%	0 0%	30 100%	3 100%	0 0%	0 0%	3 100%
BRA	Base	N 24 % 48%	24 48%	4 8%	0 0%	2 4%	1 2%	2 4%	17 34%	0 0%	50 100%	1 25%	3 75%	0 0%	4 100%
DBG	x	N x % x	x x	1 x	0 x	1 x	6 x	0 x	x x	0 x	x x	20 74%	6 22%	1 4%	27 100%
DBG	55-60	N 32 % 52%	32 52%	5 8%	2 3%	1 2%	2 3%	0 0%	19 31%	0 0%	61 100%	3 43%	4 57%	0 0%	7 100%
DBG	60-65	N 39 % 51%	39 51%	4 5%	0 0%	1 1%	2 3%	0 0%	31 40%	0 0%	77 100%	2 33%	4 67%	0 0%	6 100%
DBG	65-70	N 197 % 53%	197 53%	31 8%	7 2%	14 4%	7 2%	0 0%	117 31%	1 0%	374 100%	17 55%	12 39%	2 6%	31 100%
DBG	70-75	N 129 % 49%	129 49%	48 18%	4 2%	15 6%	6 2%	0 0%	59 22%	4 2%	265 100%	10 67%	4 27%	1 7%	15 100%
DBG	75+	N 41 % 45%	41 45%	14 15%	0 0%	5 5%	5 5%	0 0%	27 29%	0 0%	92 100%	5 71%	1 14%	1 14%	7 100%
DBG	Hearth	N 33 % 41%	33 41%	20 25%	2 2%	4 5%	3 4%	0 0%	18 22%	1 1%	81 100%	5 71%	2 29%	0 0%	7 100%
Total		N 1031 % 51%	1031 51%	229 11%	18 1%	61 3%	76 4%	7 0%	597 29%	6 0%	2025 100%	114 66%	52 30%	6 3%	172 100%

Table 5.34. Sampled agate assemblage

5.3.1. Cores

There are 76 complete cores and seven core fragments made of agate. These cores are consistent with a microlithic production and measure on average 20,2 mm length, 17,4 mm

width, 12,3 mm thickness, and weight 6,1 gr (Table 5.35). All of them are used to produce microlithic blanks, including flakes and bladelets.

Cores	Length	Width	Thickness	Weight
Mean	20,2	17,4	12,3	6,1
Median	19,5	16,1	11,3	4
Min	10,8	7,1	4	0,7
Max	32,2	50,7	34,7	45,8
Stand.dev	4,6	7	5,8	6,8
N	76	76	76	76

Table 5.35. Agate cores' measures

The agate cores have different geometries and are associated with different methods of extraction. I defined a total of four core types: '**Narrow cores**', '**Pyramidal cores**', '**Cubic cores**' and '**Flat cores**'. For each core category, I describe the intentions of production, core organisation, methods and sequences of extraction within which techniques of extraction are included. The relationships between these core types are discussed at the end of the agate section.

a. Narrow cores

The first core category is the narrow core (N=39, 64%, Fig. 5.17). This category is the same as for the chert, but I will later discuss the specificities for the agate. These cores have different removal scars, but all share similar geometries and organisations. They measure on average 22 mm length, 15,1 mm width, 11,7 mm thickness and weight 5,1 gr (Table 5.36).

Narrow cores	Length	Width	Thickness	Weight
Mean	22	15,1	11,7	5,1
Median	21,4	13,8	10,6	3,9
Min	16,1	7,1	4,7	0,8
Max	31,6	24	26	28,8
Stand.dev	3,6	4,9	4,8	4,8
N	39	39	39	39

Table 5.36. Agate narrow cores' measures

i. Narrow cores' organisation

The agate narrow cores have a rectangular to pyramidal shape, and generally have a rectangular to quadrangular section with a few triangular sections occurring. They have one preferential extraction surface associated with one striking platform. These cores are slightly elongated. The extraction surface is delimited by two steep flanks that are

independent. The flanks correspond to the natural convexities of the unmodified agate nodule, or are created by the removal of large transversal flakes. The back of the core is generally left unmodified. The bases of the narrow cores are convergent. 41% of the cores are associated with a free-hand percussion, 27% with anvil-rested modalities and 32% with an axial bipolar modality (Table 5.37). Each of the core's unit is described below.

Narrow cores	Free-hand	Anvil platform	Bipolar	Total
N	15	10	12	37
%	41%	27%	32%	100%

Table 5.37. Number of narrow agate cores per technique of percussion

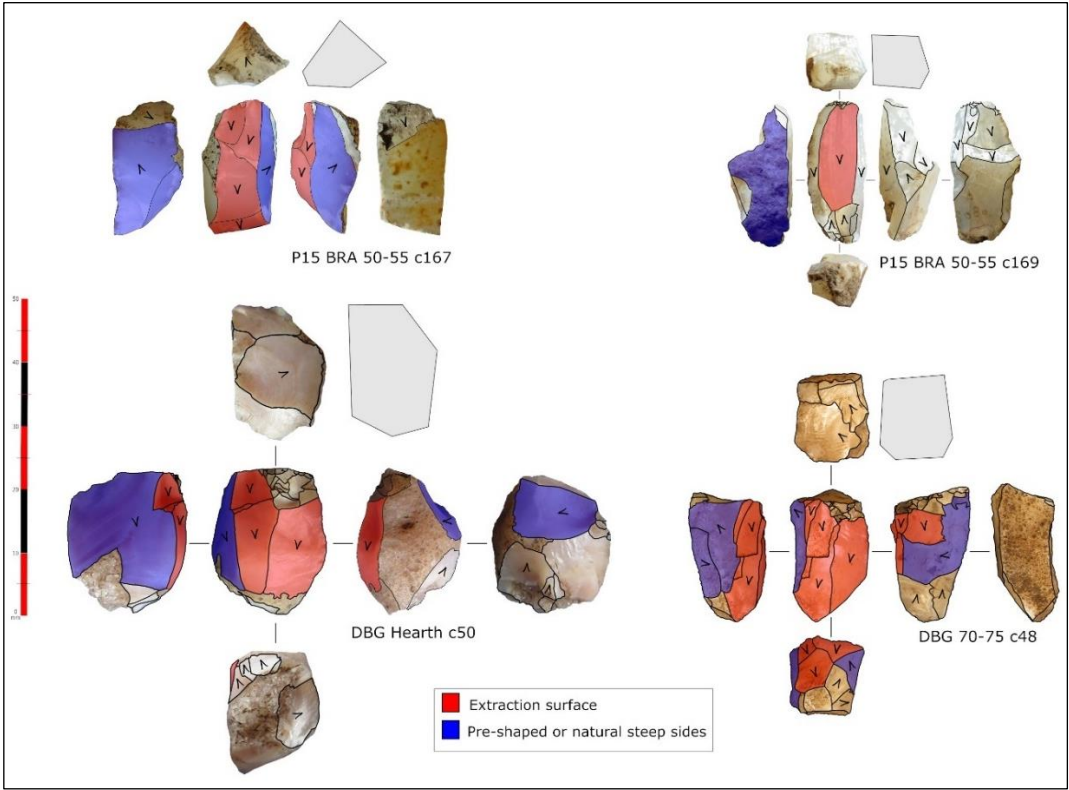


Figure 5.17. Agate narrow cores' structure

Extraction surface

The narrow cores made of agate have one extraction surface that is located on the most elongated area of the volume. The extraction surface is independent of the flanks of the cores. Blanks are unidirectionally extracted from one striking platform. The largest and longest extracted blanks reach the base of the core, whereas smaller but also elongated blanks, such as bladelets, generally only reach the one-third or half of the extraction surface's length. The longitudinal profile of the extraction surface is slightly curved to

rectilinear. Distal convexities are observed on most cores, that are created by the removal of elongated flakes reaching the base of the core. The transversal profile of the extraction surface is rectilinear to convex. Transversal convexities are thanks to the removal of flakes that may be elongated (see c50 on Fig. 5.17). These transversal convexities are used to extract narrow elongated blanks such as bladelets.

Striking platform

The narrow cores have one striking platform that is generally plain but may also be filiform or crushed. Plain platforms are created by the removal of flakes (see c48 on Fig. 5.17), or correspond to a split surface (c53 on Fig. 5.18). The angle between the striking platform and the extraction surface is sometimes maintained by the removal of a few small flakes, but only rare cores display this platform management. As for the chert, no tablets were found, reflecting the low degree of maintenance of these striking platforms. The angle formed between the striking platform and the extraction surface is generally close to 90°, leading to the discard of the core.

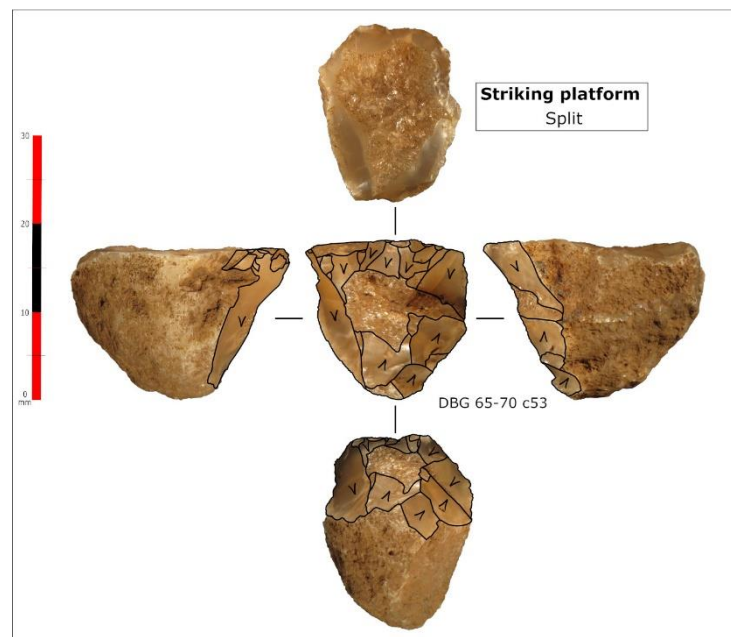


Figure 5.18. Agate narrow core with a striking platform made of a split surface

Flanks and back of the core

The flanks of the narrow cores are steep and independent of the extraction surface. They are created by the removal of large flakes or kept unmodified (c53, Fig. 5.18). Split surfaces could also have been used to create flanks, as it could be the case for the core c167 (Fig.

5.17). The back of the cores is generally left unmodified. When the flanks are convergent, the flanks and back are integrated. In most cases, however, the back of the core is roughly parallel to the extraction surface and independent of the flanks, creating a quadrangular to rectangular section.

Base of the core

The narrow cores' bases tend to be convergent, with or without opposite flakings and crushing associated with the use of an anvil. When opposite flaking occurs, it straightens the distal longitudinal convexity initially created by the removal of large elongated flakes. In that case, the extraction surface becomes rectilinear.

ii. Intentions of production and their associated strategies

Different removal scars are visible on the narrow cores. Seven (18%) cores have bladelet removals, also associated with elongated flake or flake removals, 23 (61%) mainly have elongated flake removals, and 8 (21%) only have flake removals. These different blank extractions are associated with specific technical actions, and sequences of extraction that are described below.

Bladelet production

- Bladelet removals are intercalated between elongated flakes or flake removals. It is for instance visible on the core c169 (Fig. 5.17), from which one bladelet was extracted at the junction between two former elongated flake removal.
- Sequences of bladelet extraction on very narrow surfaces are rarely observed. There are no more than one or two bladelet removal scars visible on the extraction surface.
- Longer sequences of bladelet extraction may, however, be observed, such as for the core c315 (Fig. 5.19). These are rarer than the occurrence of one or two intercalated bladelets between elongated flakes or flake removals. In all cases, the bladelet extraction is always preceded by the removal of flakes or elongated flakes.
- Bladelet removals are centred and follow the convexities created by previous removal scars.
- Bladelet removals may or not reach the base of the cores. In any case, they measure between 10 and 20mm, which is similar to the length of the bladelets in agate.
- Bladelet removal scars are visible on narrow cores associated with free-hand, anvil-platform and bipolar extraction modalities.



Figure 5.19. Bladelet sequence of extraction on an agate narrow core

Elongated flake production

Most cores also display elongated flake removal scars, that may be associated or not with bladelet removal scars:

- Elongated flakes are extracted with a free-hand percussion in order to open the extraction surface, and to create transversal convexities.
- They are very closely associated with the bladelet production because of their close intercalation, and share dimensional similarities.

Flake production

There are only a few cores that exclusively present flake removals. This is the case for the core c53, on which the extraction of elongated products was impossible because of internal crystals (Fig. 5.20). It is also true of cores that are very reduced and associated with an axial bipolar percussion, such as seen on the core c174 (Fig. 5.20).

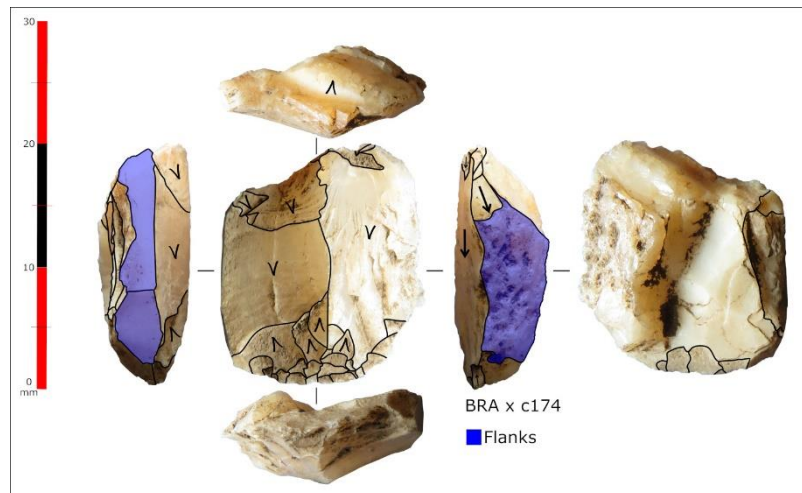


Figure 5.20. Agate narrow core with axial bipolar percussion stigmata

Flakes may also be removed from rather short cores to create the extraction surface, or to create transversal convexities for the bladelet extraction. They may also be extracted to shape the flanks or the narrow cores and to maintain the angle between the plain striking platforms and their associated extraction surfaces.

iii. Synthesis of the narrow core analysis

Following this analysis of the narrow cores, different points can be highlighted:

- Different types of volumes are used to create narrow cores. Agate nodules may be split, or pieces of agate with double patina and rectilinear natural surfaces selected.
- In an initial phase, the flanks of the cores are opened, followed by the opening of the striking platform. Split surfaces may also be used, either to create one flank or to create the striking platform.
- Elongated flakes are then extracted, creating longitudinal and transversal convexities.
- Bladelets can be consequently extracted from narrow surfaces, following the transversal convexities created by former elongated flake or flake removals. On the narrow agate core, there is a close intercalation between the bladelet and elongated flake removals. Long bladelet extraction sequences are only rarely observed.
- After the opening of the extraction surface, an anvil may be used to maintain the core. At this point in the reduction process, opposite flaking may be created and the striking platform progressively becomes narrower. Irregular opposite flakes are extracted when the percussion gesture becomes axial and the striking platform very

thin. However, most agate cores are discarded before reaching this last reduction stage.

- Cores are discarded when convexities are not useable anymore, after the occurrence of hinged flake removals. The occurrence of internal crystals sometimes limits the core's reduction.

Overall, the patterns observed for the agate narrow cores are very similar to the ones observed for the chert. However, natural convexities of the agate nodules are more often used for creating the flanks. The use of the split technique is also noted to create adequate surfaces, which is not commonly observed for the chert. Fewer agate narrow cores are also associated with an axial bipolar percussion than for the chert. This might be explained by the fact that agate volumes may be less reduced than chert volumes because of the presence of internal crystals that are not suitable for knapping. Finally, bladelets tend to be more closely intercalated with elongated flakes and flakes than for the chert.

b. Pyramidal cores

I classified a total of seven (11%) cores as 'pyramidal cores'. These cores present a different extraction strategy than the narrow cores. They measure on average 15,8 mm length, 24,5 mm width, 18,4 mm thickness and weight 12,5 gr (Table 5.38).

Pyramidal cores	Length	Width	Thickness	Weight
Mean	15,8	24,5	18,4	12,5
Median	14,1	20,5	15,2	8,6
Min	12,5	13,8	12,8	2,3
Max	25,5	50,7	34,7	45,8
Stand.dev	4,5	12,3	7,7	15
N	7	7	7	7

Table 5.38. Agate pyramidal cores' measures

i. Core organisation

The pyramidal cores have shapes and dimensions that are similar to the ones of the narrow cores. They have a plain striking platform opposed to a convergent base (Fig. 5.21). However, the extraction surface is not limited to one area of the core, but 'turns around' the volume. The different cores' units are described below.



Figure 5.21. Agate pyramidal cores

Extraction surface

The extraction surface is located on the perimeter of a volume that is wider than longer. The longitudinal convexity of the extraction surface is rectilinear. Blanks are unidirectionally extracted from a plain striking platform. Former ridges and transversal convexities are used for the removal of blanks, but the blank extraction progressively moves away from its starting point to invest almost the whole volume. Flake removals are mostly visible, even though elongated blanks have also been extracted, such as on the core c56 (Fig. 5.21). Hinged blank removals occur in the last phases of the blanks' extraction.

Striking platform

The striking platforms of these cores are all plain. They are opened by the removal of a large flake and maintained *a minima* by the removal of very few short flakes. The angle between the striking platform and the extraction surface is close to 90° (see c56, Fig. 5.21) or below it (see c173, Fig. 5.21).

Back of the core

A small area of these cores is left unretouched, forming the back of the core. The angle between this natural area and the striking platform is closed to 90°. Blanks could not have been extracted from this area, which explains why the whole volume is not invested by blank removals.

Base of the core

The base of the pyramidal cores is convergent, and can be associated with opposite crushing and flaking due to the use of an anvil. Two pyramidal cores are clearly associated with an anvil-platform modality.

ii. Intention of production and their associated strategies

Flakes and elongated flakes are extracted from these pyramidal cores. Even though the extraction surface is not limited to one area of the core, but progressively reaches its flanks, similar ‘solutions’ are used to extract elongated blank: former ridges are used as guides, such as seen on the core c443 (Fig. 5.22).

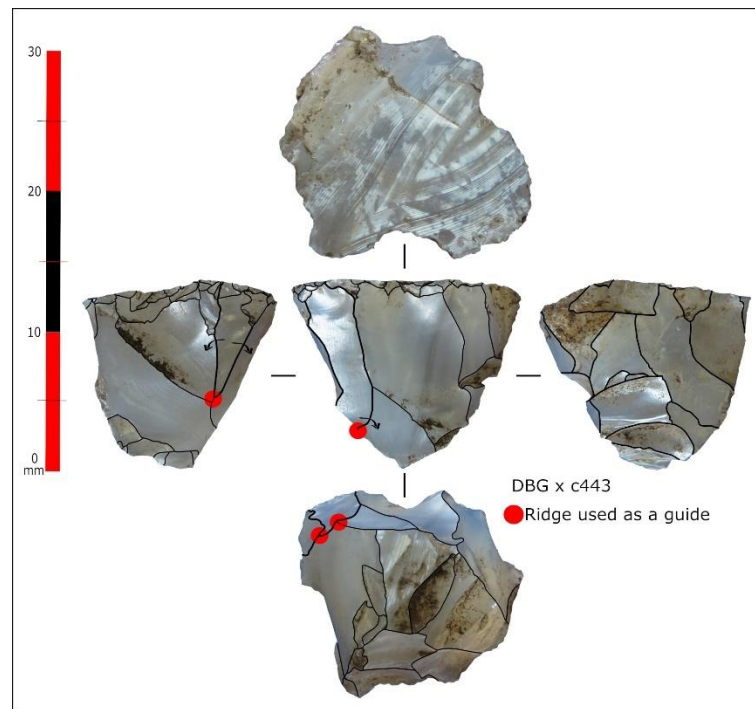


Figure 5.22. Ridges used as guides on an agate pyramidal core

Flakes are also extracted, many of which are hinged, such as observed on the c56 core (Fig. 5.21). An anvil-platform modality is sometimes used to extract blanks, such as seen on the c173 (Fig. 5.21) and c443 (Fig. 5.22). Some cores, such as the c56 (Fig. 5.21) do not display crushing at the base and could correspond to a free-hand modality.

iii. Synthesis of the pyramidal core analysis

Following the pyramidal core analysis, several points can be highlighted:

- The pyramidal cores have a plain platform, an extraction surface turning around the volume and a convergent base.
- Blank, mostly flakes but also elongated blanks, are unidirectionally extracted. Centred blanks may be extracted using former removal scar ridges.
- Flakes are extracted, and bladelets could also have occasionally been intercalated and produced from these cores.

c. Cubic cores

I classified six other agate cores as ‘cubic cores’. These cores are similar to the ones made of chert. Wide cores, potentially corresponding to an initial stage of reduction, were not found in the agate assemblage. Agate cubic cores measure on average 18,9 mm length, 18,5 mm width, 16,6 mm thickness and weight 8,4 gr (Table 5.39).

Cubic cores	Length	Width	Thickness	Weight
Mean	18,9	18,5	16,6	8,4
Median	17,5	17	15,3	5,8
Min	12,5	13,2	12,1	3,1
Max	26,3	30,8	27,7	20,7
Stand.dev	5,8	6,5	6,4	7,1
N	6	6	6	6

Table 5.39. Agate cubic cores’ measures

i. Cubic cores’ organisation

The cubic cores have multiple independent extraction surfaces that are created after the successive reorientation of the core. These reorientations give the volume a cubic geometry. Flakes, bladelets and elongated flakes are extracted. One of these cores was refitted (Fig. 5.23).

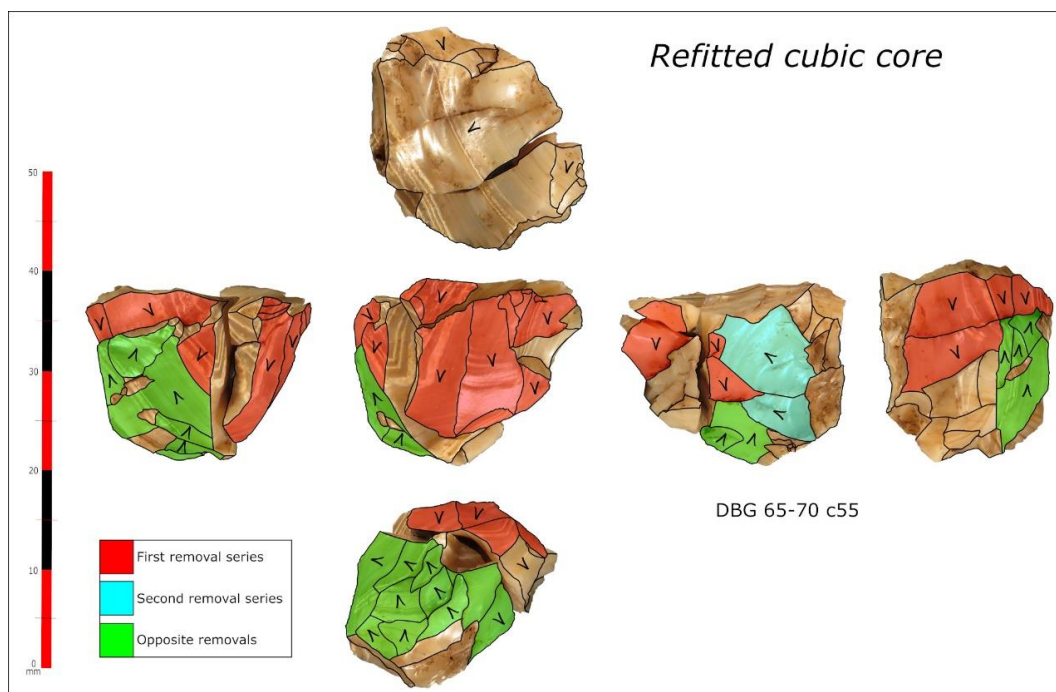


Figure 5.23. Refitted agate cubic core with successive removal series

Extraction surfaces

Two or more extraction surfaces succeed each other and are exploited independently. The longitudinal and transversal profiles of the extraction surfaces are rectilinear. Blanks are unidirectionally extracted and, in some cases, turn around the volume, such as for the first removal series of the core c55 (Fig. 5.23). In that sense, they share similarities with the pyramidal cores.

Striking platform

The striking platforms are plain. They are opened thanks to the removal of a large flake, or correspond to a former extraction surface. The angle between the striking platform and extraction surface is closed to 90°, leading to the removal of hinged blanks and to the discard of the core.

Base of the core

Depending on the associated extraction surface, the base of the core generally tends to be convergent and is associated or not with crushing and opposing flaking. An anvil could, therefore, have been used to maintain the cores. Some cubic cores, however, only display free-hand-like stigmata.

ii. Intention of production and their associated strategies

The cubic cores mostly have flake removal scars (N=5, 83%), many of them being hinged. Only one core has a few bladelet removals. Different points can be highlighted:

- Flakes are not especially elongated, and many of them are hinged. They are extracted on restricted surfaces, or partly overlap on the flanks of the cores. The core is rotated once the convexities of the extraction surface are not exploitable anymore.
- All cubic cores are associated with free-hand or anvil-platform extraction modalities.
- The logic behind this core-type is to 'turn around' the volume rather than exploiting one surface.

d. Flat cores

I analysed a total of 9 (15%) flat cores. All of them have been hammered with an axial bipolar percussion. Small and irregular flakes are extracted from them, as well as more

elongated products. The flat cores measure on average 18,2 mm length, 15,8 mm width, 6 mm thickness and weight 2,1 gr (Table 5.40).

Flat cores	Length	Width	Thickness	Weight
Mean	18,2	15,8	6	2,1
Median	17,4	16,2	5,5	1,7
Min	14,5	8,3	4	0,7
Max	27	23,4	8,8	5,6
Stand.dev	3,5	4,7	1,6	1,6
N	9	9	9	9

Table 5.40. Agate flat cores' measures

i. Flat cores' organisation

Flat cores are generally not elongated, tend to be square and are very thin (Fig. 5.24). They have one hammered and crushed platform that is opposed to a crushed base. Irregular small flakes are extracted from both ends, creating bi-directional opposite removals.

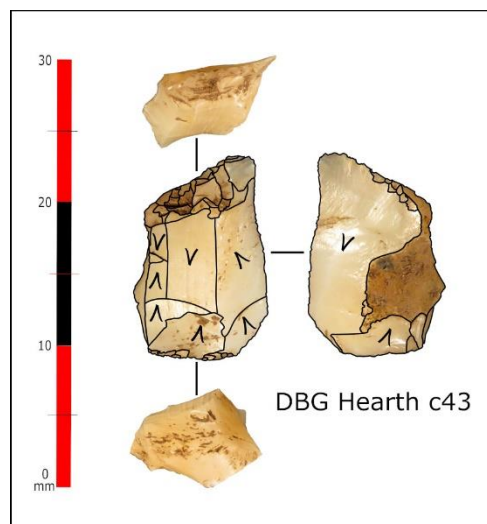


Figure 5.24. Agate flat core

Agate flat cores' organisation can be summarised in a few points:

- One preferential extraction surface is often recognisable because more invested by blank removals. The extraction surface is very rectilinear.
- The striking platform is crushed and linear. It has stigmata characteristic an axial percussion.
- The flat cores have no flanks. Most of them were likely made of blanks.
- The base of the core is crushed, linear and associated with flaking typical of the counter-choc created by the contact with an anvil.

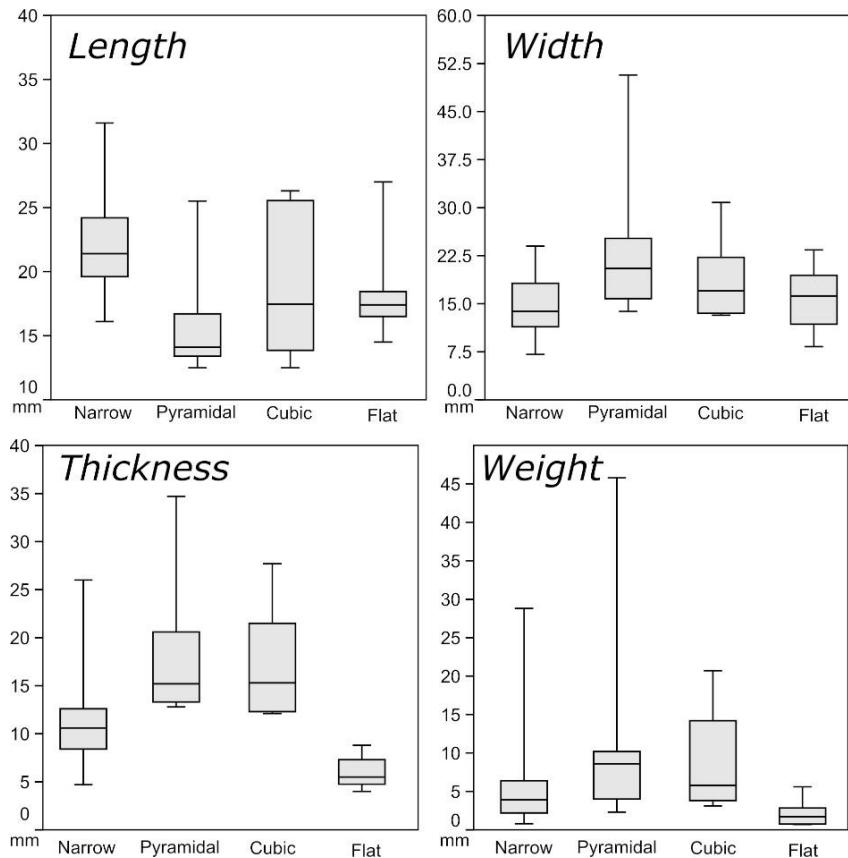
ii. Intentions of production and associated strategies

Irregular ‘compressed’ flakes, typical of an axial bipolar percussion, are mostly extracted from these flat cores, especially during the last stages of the reduction process. Former elongated blank removal scars are also visible on two cores, indicating that a former extraction phase may have existed in some cases. If flakes were selected to make these core, their reduction process may, however, have been somewhat limited, and blanks rapidly extracted through an axial bipolar technique.

e. Comparison between core types

Following the definition and analysis of these different core types, I now ask if they could be linked in the same reduction process, or be independent of each other. When comparing the different core types dimensions, we see that they have similar lengths, widths and weights (Graph 5.8). This supports the observation that microlithic blanks of similar dimensions (notably lengths) were looked for in all core types.

The subtle dimension variations between the different types of cores are consistent with the observations made during the core analysis. The narrow cores tend to be slightly longer than the other core types, which is consistent with the choice of the most elongated part of the volume to install the extraction surface. Wide and cubic cores are slightly thicker than the other cores categories, which is explained by the fact that blanks are extracted around the volume, rather than successively extracting blanks towards the inside of the core. The flat cores are particularly thin, as many of them have likely been made of blanks.



Graph 5.8. Agate core types' dimensions

I argued that the narrow cores' reduction process goes through different stages of reduction that are associated with different techniques of extraction. After the initial removals with a free-hand modality, the core may be rested on an anvil. Through the reduction process, cores exploitation may eventually shift in an axial bipolar modality. The rectilinear and independent flanks of the cores are however still visible, which is a characteristic of the narrow cores. Some flat cores could correspond to very reduced narrow cores, but I noted that most narrow agate cores are not reduced until the application of an axial bipolar percussion, contrarily to the chert.

Flat and narrow cores share a similar reduction logic, blanks being extracted from one extraction surface, rather than on the periphery of the core. On the other hand, pyramidal and cubic cores have a logic of reduction oriented towards the exploitation of the periphery of the volume (Fig. 5.25). Similar technical solutions may, however, sometimes have been used for the extraction of centred elongated blanks, using former removal scars as guides.

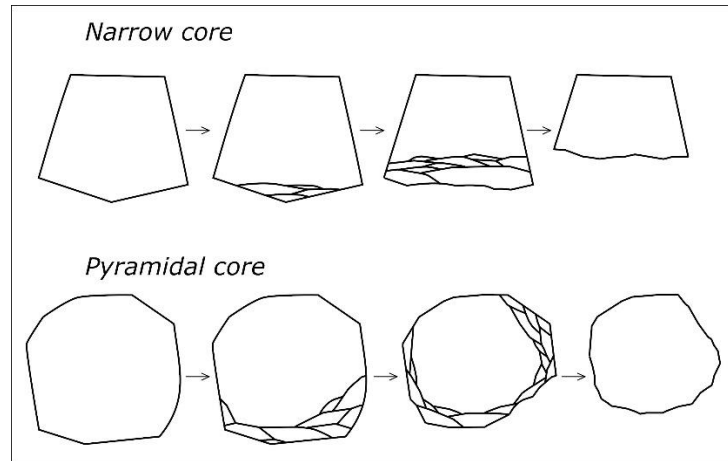


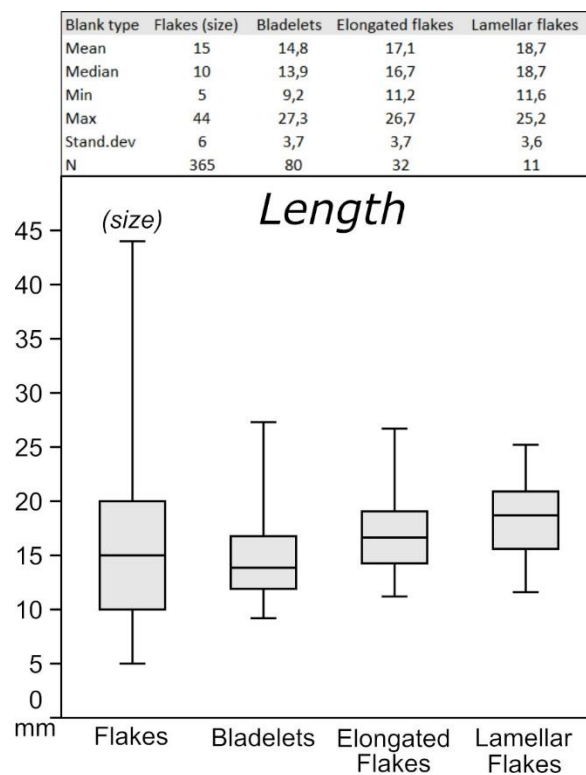
Figure 5.25. Agate narrow and pyramidal cores' reduction logics

The narrow cores are oriented towards the extraction of closely intercalated elongated flakes and bladelets. Pyramidal and cubic cores display an integration of flakes and elongated blank production using similar 'solutions'. Flat cores mainly have irregular flake removal scars, but more elongated blanks may have been extracted at former reduction stages.

There is no possible reduction process from the narrow to the pyramidal cores, because the reduction logic is different. I thus hypothesise that, in most cases, these four core types are independent of each other, apart from a few narrow cores that could have been reduced in flat cores. In the following section, I describe the analysis of the blanks produced in agate and see how they could be related to the core analysis results.

5.3.2. Blanks

In total, I classified 229 bladelets, 61 elongated flakes and 18 lamellar flakes, as well as 933 flakes made of agate. These blanks generally measure less than 25 mm (for the maximal dimension) and have similar lengths (Graph 5.9).



Graph 5.9. Agate blank types' dimensions

a. Flakes, elongated flakes and lamellar flakes

They are 1012 flakes made of agate, including flakes (N= 933), elongated flakes (N=61) and lamellar flakes (N=18) (Fig. 5.26). There are 408 (40%) complete flakes (all categories) against 604 (60%) broken flakes.

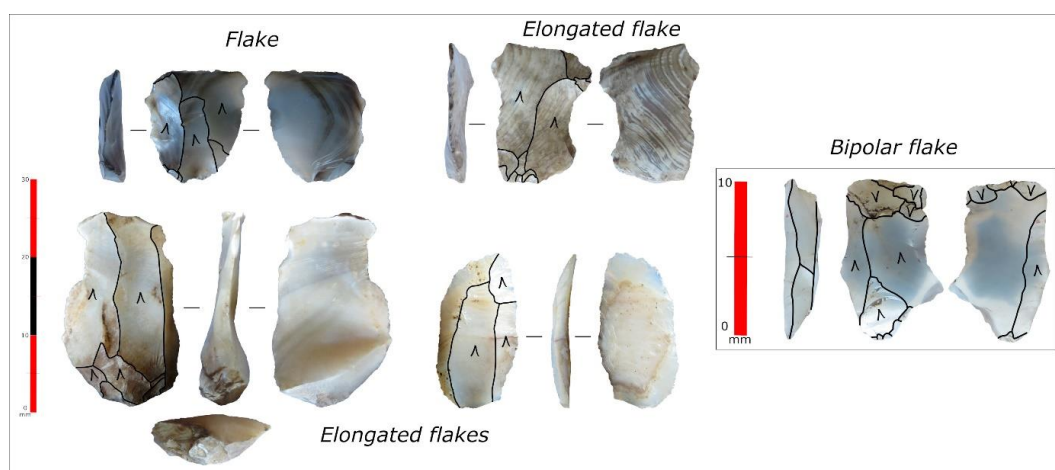


Figure 5.26. Agate flake and elongated flakes

i. Flakes

Flakes (N= 933) generally measure between 10 and 25 mm (Table 5.41). Half of them measure less than 15 mm, and 39% between 15 and 24 mm. Most flakes are broken (N=604, 60%) and are cortical (N=230, 56%) (Table 5.42).

Size category	5_14	15_24	25_34	35_44	Total
N	202	142	20	1	365
%	55%	39%	5%	0%	100%

Table 5.41. Number of agate flakes per size category

Cortex	Flakes	Elongated flakes	Lamellar flakes	Total
Non-cortical (0%)	157 43%	15 47%	6 55%	178 44%
Cortical (1-100%)	208 57%	17 53%	5 45%	230 56%
Total	365 100%	32 100%	11 100%	408 100%

Table 5.42. Agate blank types per presence/absence of cortex

Flakes are variable in terms of size, presence/absence of cortex and technique of extraction. Most flakes are short, and their morphology varies from square to rectangular. Their profiles are rectilinear to slightly curved, and many hinged flakes occur (Fig. 5.26). Many flakes have two opposite side cutting edges, and may have a rather blunt distal edge. When comparing the presence/absence of cortex by size class, it appears that the smaller flakes tend to be less cortical than the bigger ones, which reflects the reduction process of the cores (Table 5.43). The flakes have different platform types. Most of them are plain, but also crushed, filiform and punctiform (Table 5.44).

Size category	5_14 mm	15_24 mm	25_34 mm	35_44 mm	Total
Non-cortical	54%	32%	15%	0%	43%
Cortical	46%	68%	85%	100%	57%
Total	100%	100%	100%	100%	100%

Table 5.43. Agate flake size categories per cortex presence/absence

Platform type	Plain	Punctiform	Filiform	Crushed	Total
N	258	46	63	74	441
%	59%	10%	14%	17%	100%

Table 5.44. Agate flakes' platform types

The bipolar flakes (N=30, 11% of the complete flakes) are short compressed flakes that are often convergent and have irregular cutting edges (Fig. 5.27). They have crushed to filiform platforms that are opposed to crushed distal ends. They display marked waves of percussion. No stick-like bipolar products were observed.

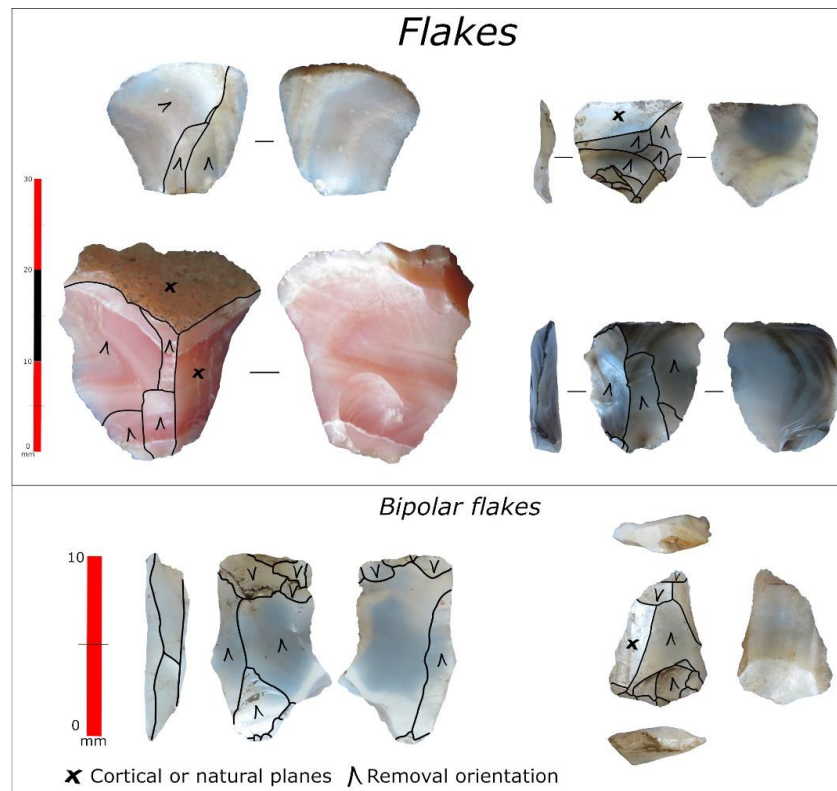


Figure 5.27. Agate flakes and bipolar 'compressed' flakes

A few flakes exhibit in-between stigmata of percussion (N=21). These artefacts could correspond to blanks produced through an anvil-rested modality. When comparing platform types with size classes, we see that the plain platforms are better represented for all size categories. Other platform types also occur, and are represented in all size categories (Table 5.45). This indicates that the gestures and modes of extraction applied likely varied through the reduction process, even though free-hand or anvil-rested percussion was favoured.

Size category	5_14 mm	15_24 mm	25_34 mm	35_44 mm	Total
Plain	100	75	9	1	185
%	54%	58%	53%	100%	56%
Punctiform	28	11	1	0	40
%	15%	9%	6%	0%	12%
Filiform	34	16	1	0	51
%	18%	12%	6%	0%	15%
Crushed	22	27	6	0	55
%	12%	21%	35%	0%	17%
Total	184	129	17	1	331
%	100%	100%	100%	100%	100%

Table 5.45. Agate flake size categories per platform types

Going further, I propose that the free-hand percussion is preferentially used for extracting flakes of all sizes, including 5_14 mm sizes (Table 5.46). This could be explained by the overall low number of reduced cores associated with a bipolar percussion.

Size category	5_14 mm	15_24 mm	25_34 mm	35_44 mm	Total
Free-hand	144	87	8	1	240
%	88%	77%	57%	100%	82%
Intermediary	11	7	3	0	21
%	7%	6%	21%	0%	7%
Bipolar	8	19	3	0	30
%	5%	17%	21%	0%	10%
Total	163	113	14	1	291
%	100%	100%	100%	100%	100%

Table 5.46. Agate flake size categories per technique of extraction

In sum, agate flakes are microlithic and have a rectilinear to slightly curved profile. They tend to be short and have a square to rectangular morphology. They generally have two opposed side cutting edges and slightly hinged distal edges. The bipolar flakes are short and irregular. The free-hand percussion or anvil-rested modalities (producing similar stigmata) are favoured for extracting flakes, even though variability in platform type and the presence of bipolar compressed flakes reflect the use of different gestures and methods of extraction.

ii. Elongated and lamellar flakes

The elongated flakes and lamellar flakes also occur, some that display bladelet removal scars. The elongated flakes (N=61) measure on average 17,1 mm length, 9,1 mm width and 3,3 mm thickness (Table 5.47). A few of them measure more than 20 mm (N=6; 19%).

They are 32 (53%) complete and 29 (47%) broken elongated flakes. There are almost as many non-cortical flakes (N=15, 47%) as cortical ones (N=17, 53%).

Elongated flakes	Length	Width	Thickness
Mean	17,1	9,1	3,3
Median	16,7	9,1	3
Min	11,2	3,8	1,4
Max	26,7	13,6	7,4
Stand.dev	3,7	2,1	1,5
N	32	60	61

Table 5.47. Agate elongated flakes' dimensions

Elongated flakes generally display elongated flake and bladelet removal (Fig. 5.28). They are thin and have two long cutting edges that are generally parallel or convergent, but may also be irregular (Fig. 5.28).



Figure 5.28. Agate elongated flakes

Their profile is rectilinear (N=33, 55%), slightly curved (N=8, 13%) or curved (N=19, 32%). As for the bladelets, most of the elongated flakes have plain platforms (Table 5.48). They are extracted through a free-hand percussion (N=28, 76%), and only a few are associated with an axial bipolar percussion (N=3, 8%) or present in-between (intermediary) stigmata (N=6, 16%).

Shape	N	%	Platform	N	%
Parallel	18	33%	Plain	20	44%
Convergent	13	24%	Punctiform	10	22%
Divergent	7	13%	Filiform	9	20%
Irregular	16	30%	Crushed	6	13%
Total	54	100%	Total	45	100%

Table 5.48. Agate elongated flakes' shapes and platform types

Overall, the elongated flakes are thin rectilinear elongated blanks with two opposed cutting edges. The presence of cortex on these artefacts indicates that they were extracted from the beginning of the reduction process, or to remove cortical parts of the cores at later stages. Elongated flakes are associated with a free-hand percussion, and fewer with an axial bipolar percussion.

A few lamellar flakes were also isolated (N=18). The overall shape of these flakes varies, and they measure on average 18,7mm length, 12,5mm width and 4,8mm thickness (Table 5.49). Lamellar flakes mostly have irregular edges (N=8, 53%) and are rectilinear (N=7, 50%) (Table 5.50). Most of them are non-cortical (61%). I identified free-hand and bipolar lamellar flakes, associated with a variety of platform types (Table 5.51).

Lamellar flakes	Length	Width	Thickness
Mean	18,7	12,5	4,8
Median	18,7	11,8	4,9
Min	11,6	6,3	2,2
Max	25,2	22,9	7,9
Stand.dev	3,6	4,3	1,5
N	11	18	18

Table 5.49. Agate lamellar flakes' dimensions

Shape	N	%	Profile	N	%
Parallel	4	27%	Rectilinear	7	50%
Convergent	3	20%	Slightly curved	2	14%
Divergent	0	0%	Curved	5	36%
Irregular	8	53%	Total	14	100%
Total	15	100%			

Table 5.50. Agate lamellar flakes' shapes and profiles

Platform	N	%
Plain	10	77%
Punctiform	1	8%
Filiform	1	8%
Crushed	1	8%
Total	13	100%

Technique	Free-hand	Bipolar	Total
N	11	1	12
%	92%	8%	100%

Table 5.51. Agate lamellar flakes' platform types and technique of extraction

Overall, they are very few lamellar pieces. Together with the absence of tablets or crest, it indicates that the cores' convexities were not regularly re-shaped, even though surfaces of extractions could be occasionally 'cleaned'. Furthermore, the high number of cortical flakes in all size categories is a clue for saying that cores' reduction sequences were probably short, without a proportionally important production of non-cortical blanks. I also note that when bladelet removals are visible on elongated or lamellar flakes, they are often centred, and follow former removal scar ridges as guides.

b. Bladelets

There are 229 agate bladelets, including 80 (35%) complete and 149 (65%) broken ones. Including bladelets transformed in backed pieces, it makes 244 bladelets. Bladelets measure on average 14,8 mm length, 6,3 mm width and 2,1 mm thickness (Table 5.52). Only two bladelets measure more than 25 mm length. Most bladelets have parallel cutting edges (N=41, 53%), and their profile is mostly rectilinear (N=44, 56%) (Table 5.53).

Bladelets	Length	Width	Thickness
Mean	14,8	6,3	2,1
Median	13,9	6,2	1,9
Min	9,2	2,7	0,8
Max	27,3	12	6,2
Stand.dev	3,7	1,9	0,9
N	80	229	229

Table 5.52. Agate bladelets' dimensions

Bladelet shapes	Parallel	Convergent	Divergent	Irregular	Total
N	41	23	6	8	78
%	53%	29%	8%	10%	100%

Bladelet profiles	Rectilinear	Slightly curved	Curved	Total
N	44	25	10	79
%	56%	32%	13%	100%

Table 5.53. Agate bladelets' shapes and profiles

i. Bladelet production and technique of extraction

The bladelets either have a rectilinear or a slightly curved profile (Fig. 5.29). Only a few of them are slightly hinged. They are mostly non-cortical (N=193, 85% of the complete bladelets), meaning that they were preferentially extracted after the cortex removal. Most bladelets have a trapezoidal section, with unidirectional (93%) removal scars and more rarely multidirectional ones (7%). Bladelets are generally parallel. Fewer bladelets have a triangular section and tend to be convergent.

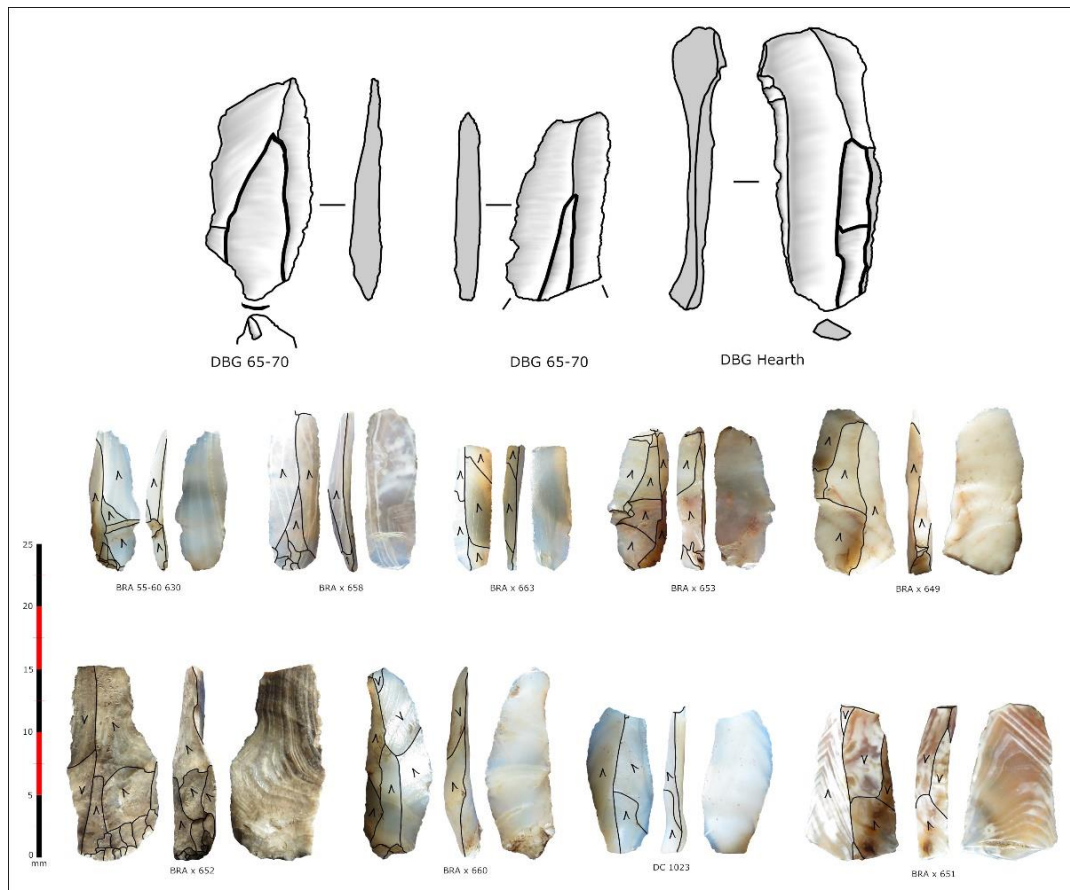


Figure 5.29. Agate bladelets

The bladelets are generally centred and extracted at the junction between two former elongated blank removal scars. They do not generally display long sequences of bladelet

extraction, and often take away shorter flake-like removals, such as for the 649 (Fig. 5.30). Many of the former removal scars observed are also hinged. These observations, including the elongated flake analysis, support the hypothesis that agate bladelets were closely intercalated with other blank types, rather than being extracted in long series. This is consistent with what is observed on the narrow cores.

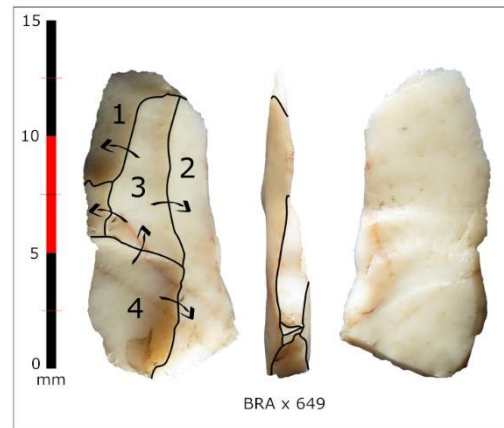


Figure 5.30. Sequence of removals on an agate bladelet

Regarding the techniques of percussion, I noted that most bladelets have plain (N=61, 41%) platforms. Only a few bladelets have a crushed platform (N=16, 11%) and only 5 (4%) bladelets are classified as bipolar. When considering different bladelet shapes in regard to their platforms, we see that all platform types are well-represented for the parallel bladelets, whereas the convergent bladelets mostly have plain platforms (Table 5.54). This is probably because convergent bladelets are mostly extracted at the beginning of the (short) bladelet extraction sequence, therefore with a free-hand or anvil-rested modality. Because most cores are not reduced until axial bipolar stages, there are only a few convergent bladelets that reach the appointed base of the cores. I also noted varied platform types that are associated with different profile categories (Table 5.55), reflecting the combination of different percussion gestures and use or not of an anvil.

Shape/Platform	Parallel	Convergent	Divergent	Irregular	Total
Plain	27	12	4	9	52
%	37%	60%	44%	45%	43%
Punctiform	13	5	1	1	20
%	18%	25%	11%	5%	16%
Filiform	23	2	4	7	36
%	32%	10%	44%	35%	30%
Crushed	10	1	0	3	14
%	14%	5%	0%	15%	11%
Total	73	20	9	20	122
%	100%	100%	100%	100%	100%

Table 5.54. Agate bladelets' shapes against platform types

Profile/Platform	Rectilinear	Slightly curved	Curved	Total
Plain	36	15	6	57
%	40%	38%	55%	41%
Punctiform	17	6	2	25
%	19%	15%	18%	18%
Filiform	24	14	3	41
%	27%	36%	27%	29%
Crushed	12	4	0	16
%	13%	10%	0%	12%
Total	89	39	11	139
%	100%	100%	100%	100%

Table 5.55. Agate bladelets' profiles against platform types

A total of 116 (86%) bladelets are associated with a free-hand extraction against 5 (4%) with an axial bipolar percussion and 13 (10%) with intermediary stigmata. Bladelets, including all shapes, are mostly detached with a free-hand percussion or anvil-rested modality (Table 5.56).

Shape/Technique	Parallel	Convergent	Divergent	Irregular	Total
Free-hand	56	19	9	13	97
%	92%	100%	100%	100%	95%
Bipolar	5	0	0	0	5
%	8%	0%	0%	0%	5%
Total	61	19	9	13	102
%	100%	100%	100%	100%	100%

Table 5.56. Agate bladelets' shapes against technique of extraction

Synthesis

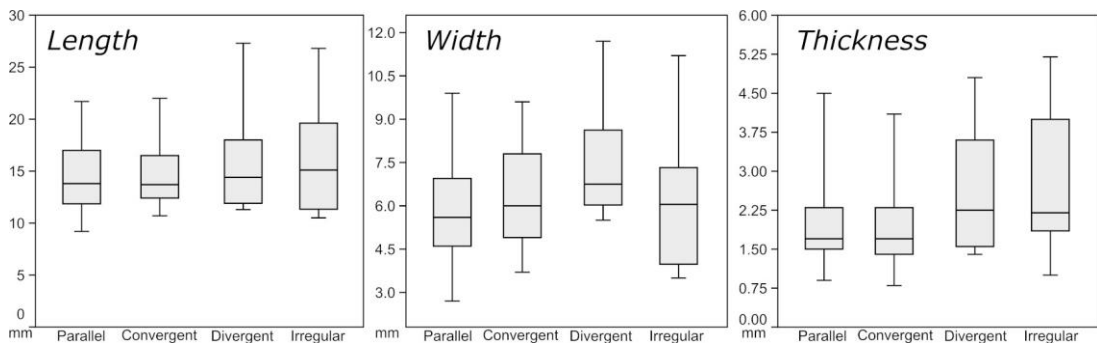
Following the agate bladelet analysis, a few points should be highlighted:

- Agate bladelets are microlithic, rectilinear, have parallel sides and almost all of them are extracted with a free-hand percussion or anvil-rested modality.
- The occurrence of bipolar bladelets and bladelets with 'in-between' free-hand and bipolar stigmata indicate that an anvil was used to stabilise the core.
- No standardised series of bladelet extraction were noted. In contrast, bladelets were closely intercalated between elongated banks and flake removals, which is consistent with what is observed on the cores.
- Bladelets are often centred and extracted using former blank removal scar' ridges as guides.
- Hinged removal scars are often visible, likely due to the intention of producing rectilinear blanks without maintaining the longitudinal convexities of the

extraction surfaces, neither the angle between the striking platform and extraction surface.

ii. Morpho-functional properties

All bladelets' shapes have similar dimensions, highlighting the fact that standardised dimensions were looked for (Graph 5.10).



Graph 5.10. Agate bladelets' dimensions per shape categories

The bladelets have two opposite cutting edges, one of which at least that is rectilinear. Bladelets with an irregular cutting edge often occur, and more rarely with two irregular cutting edges (N=8, 10% of the complete bladelets). The distal end of the bladelets is often slightly hinged and not sharp.

Bladelets with a trapezoidal section have parallel sides and are rectilinear (N=75, 62%) or slightly curved (N=32, 26%). Divergent bladelets are proportionally more curved (36% curved). They mostly have unidirectional removal scars (89%), and a few have opposite removal scars, potentially resulting from the use of an anvil to rest the core (15%).

Bladelets with a triangular section are generally convergent. Convergent bladelets are rectilinear (N=17, 53%), slightly curved (N=9, 28%) or curved (N=6, 19%). They may correspond to the first bladelet extracted on a 'guiding' ridge, and therefore only have unidirectional removal scars. Only a few convergent bladelets reach the appointed base of the core and take away part of the opposite removals created by the use of an anvil (Fig. 5.31). In total, 10 (32%) of the convergent bladelets have opposite removal scars, potentially resulting from this process.

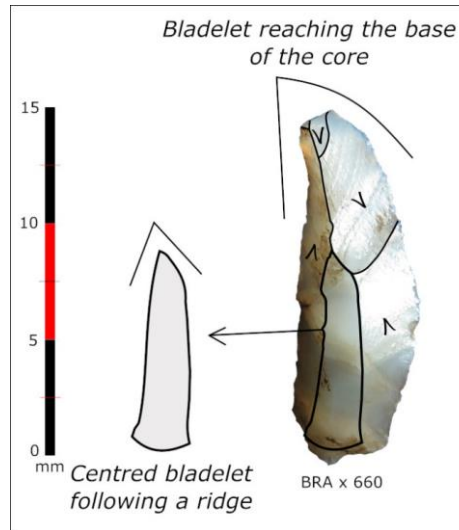


Figure 5.31. Convergent agate bladelets

To conclude, all bladelets have similar dimensions, opposed cutting edges, a blunt distal edge and are rectilinear. The main functional criteria that were looked for were **long cutting edges** and **rectilinearity**.

c. Synthesis on the agate blank analysis

All agate blanks share common techno-morphological features. They belong to a microlithic production, are generally rectilinear and mostly have free-hand like percussion stigmata. The different blank types are variable in terms of cortex presence/absence. Most bladelets are non-cortical, whereas there are as more cortical and non-cortical flakes, elongated flakes and lamellar flakes (Table 5.57). This supports the hypothesis that bladelets were removed at specific moments of the reduction process.

Cortex	Yes	No
Flakes	57%	43%
Elongated flakes	55%	45%
Lamellar flakes	45%	55%
Bladelets	14%	86%

Table 5.57. Percentage of cortex presence/absence per agate blank types

I demonstrated that bladelets are closely intercalated between elongated flake removals. Bladelet sequence extractions are indeed rare, because one or two bladelets are more often occasionally extracted in between flake or elongated flake removal scars.

Free-hand percussion stigmata are mostly represented for all blanks, and especially for the bladelets. The occurrence of a few bipolar blanks, and blanks with intermediary stigmata, as well as the variety of platform types indicates that varied gestures have been applied, with the use or not of an anvil to stabilise the core. To conclude on the agate blank analysis, I stress that:

- Blanks belong to a microlithic production, only a few artefacts measuring more than 25mm.
- The vast majority of the blanks have a rectilinear profile.
- Bladelets and elongated flakes have long and sharp cutting edges, one of which at least has a straight delineation.
- Flakes are generally small (between 10 and 20mm), tend to be square-like and slightly hinged.
- Small (<25mm) and rectilinear products with at least one cutting edge were looked for.

The blank analysis is consistent with the core analysis, also showing that bladelets are intercalated, especially on the narrow cores. The presence of many hinged flakes is also consistent with what is observed on most cores. Finally, the under-representation of bipolar blanks is reflected by the low number of cores associated with an axial bipolar technique of percussion.

5.3.3. Retouched artefacts

There are 172 retouched artefacts made of agate that dominated by scrapers (N=114, 66%) and followed by backed pieces (N=52, 30%). Other retouched artefacts also occur (N=6, 3%) including retouched bladelets.

a. Scrapers

There are 114 scrapers made of agate. They measure on average 13 mm length, 13,3 mm width and 5 mm thickness (Table 5.58). There are 86 (75%) complete scrapers and 28 (25%) broken ones. All the scrapers are made of flakes. They are mostly cortical (56%) against 44% non-cortical ones (Table 5.59). Most of them are end-scrapers (N=56, 53%), 16 (15%) are retouched on the proximal and 33 (31%) are side-scrapers.

Scrapers	Length	Width	Thickness
Mean	13,0	13,3	5,0
Median	12,4	13,4	4,8
Min	8,3	8,1	2,2
Max	22,1	21,3	9,1
Stand. dev	3,1	2,8	1,4
N	97	98	113

Table 5.58. Agate scrapers' dimensions

Cortex (%)	0	1-40	40-80	80-100	Total
N	41	28	18	0	87
%	47%	32%	21%	0%	100%

Table 5.59. Number of agate scrapers per cortex percentage

I also identified thumbnail, V-shaped and short-arc agate scrapers. The thumbnail scrapers are the most represented, followed by short-arc and V-shaped scrapers (Table 5.60). These three types are represented through the late Holocene sequence of BMS.

AGATE Scrapers						
Layer	Spit	Thumbnail	V-shaped	Short-arc	x	Total
Grey Ash	x	7	0	0	1	8
		88%	0%	0%	13%	100%
Grey Ash	55-60	3	0	0	1	4
		75%	0%	0%	25%	100%
BRA	x	2	1	2	0	5
		40%	20%	40%	0%	100%
BRA	to-40	0	0	0	0	0
		0%	0%	0%	0%	0%
BRA	40-45	0	0	0	0	0
		0%	0%	0%	0%	0%
BRA	45-50	1	2	0	0	3
		33%	67%	0%	0%	100%
BRA	to-50	2	0	0	0	2
		100%	0%	0%	0%	100%
BRA	50-55	9	1	1	3	14
		64%	7%	7%	21%	100%
BRA	55-60	6	0	4	2	12
		50%	0%	33%	17%	100%
BRA	60-65	3	0	0	0	3
		100%	0%	0%	0%	100%
BRA	Base	0	0	0	1	1
		0%	0%	0%	100%	100%
DBG	x	12	2	6	0	20
		60%	10%	30%	0%	100%
DBG	55-60	1	0	2	0	3
		33%	0%	67%	0%	100%
DBG	60-65	2	0	0	0	2
		100%	0%	0%	0%	100%
DBG	65-70	10	1	4	2	17
		59%	6%	24%	12%	100%
DBG	70-75	2	1	7	0	10
		20%	10%	70%	0%	100%
DBG	75+	1	1	1	2	5
		20%	20%	20%	40%	100%
DBG	Hearth	3	0	1	1	5
		60%	0%	20%	20%	100%
Total (N)		64	9	28	13	114
		%	56%	8%	25%	11%

Table 5.60. Agate scraper types per layer and spit

All these scrapers have similar dimensions, even though, as for the chert, V-shaped scrapers tend to be slightly longer and thicker, whereas short-arc scrapers appear wider (Fig. 5.32). To conclude, agate scrapers are small (generally <20 mm), made of flakes that are cortical or not, and all thumbnail, V-shaped and short-arc types occur in pre-pottery and pottery layers.

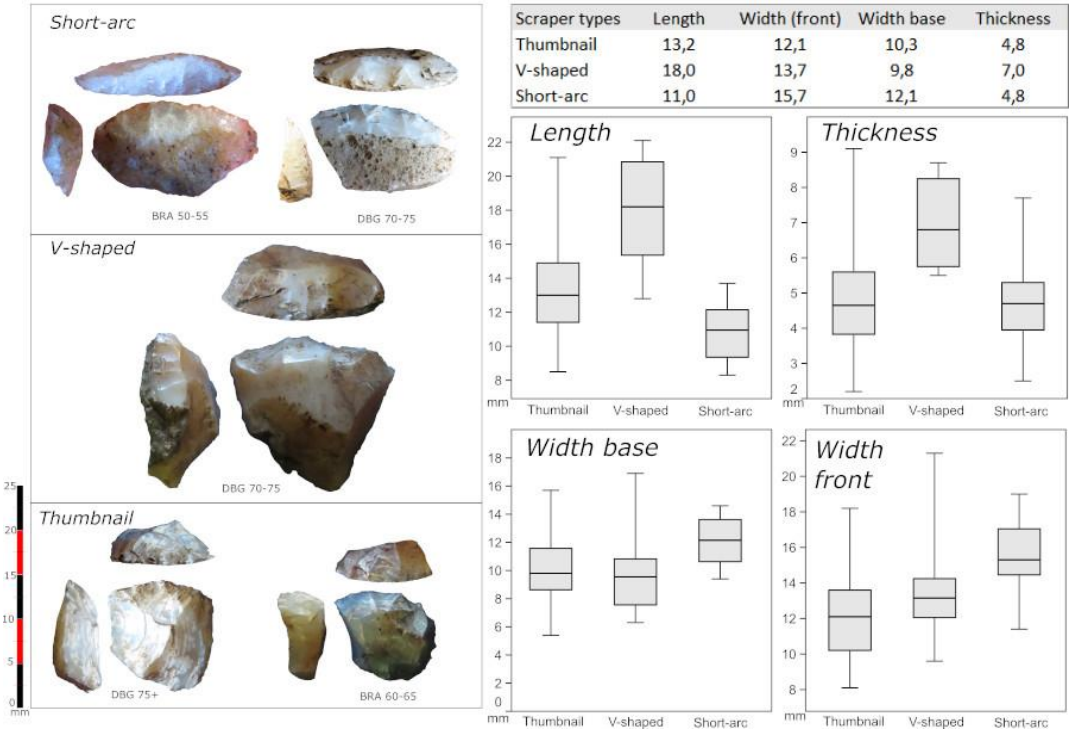


Figure 5.32. Agate scraper types' dimensions

b. Backed pieces

I analysed 52 backed pieces made of agate, including 33 geometrics and 3 convergent backed pieces (Fig. 5.33). 16 pieces are indeterminate because too broken. Geometric and convergent backed pieces have similar dimensions (Table 5.61).

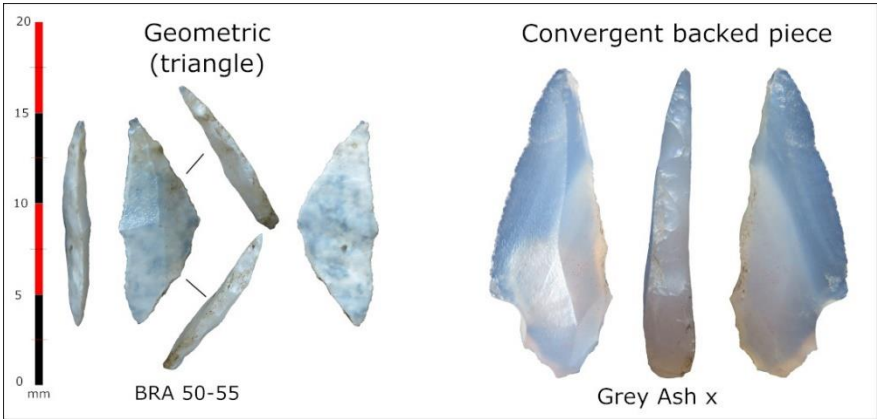


Figure 5.33. Agate geometric and convergent backed piece

Backed pieces	Length	Width	Thickness
Geometrics	13,7	6,1	2,2
Convergent tools	14,7	4,1	2,1

Table 5.61. Agate geometrics and convergent tools' measures

The geometrics are represented through the whole sequence. They include segments (N=23, 44%), but also triangles (N=7, 13%) and trapezes (N=3, 6%) (Table 5.62). Segments and triangles occur in pre-pottery and pottery-bearing layers, whereas trapezes all occur in the pre-pottery DBG layers. As there are only three of them, the sample is too small to assert if this could correspond to a typological trend.

AGATE backed pieces		Geometrics			Convergent tools	Broken/indeterminate	Total
Layer	Spit	Segments	Triangles	Trapezes			
Grey Ash	x	1 33%	0 0%	0 0%	1 33%	1 33%	3 100%
Grey Ash	55-60	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
BRA	x	2 100%	0 0%	0 0%	0 0%	0 0%	2 100%
BRA	to-40	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
BRA	40-45	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
BRA	45-50	1 100%	0 0%	0 0%	0 0%	0 0%	1 100%
BRA	to-50	2 100%	0 0%	0 0%	0 0%	0 0%	2 100%
BRA	50-55	1 25%	1 25%	0 0%	1 25%	1 25%	4 100%
BRA	55-60	2 50%	2 50%	0 0%	0 0%	0 0%	4 100%
BRA	60-65	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
BRA	Base	1 33%	0 0%	0 0%	0 0%	2 67%	3 100%
DBG	x	3 50%	0 0%	0 0%	0 0%	3 50%	6 100%
DBG	55-60	2 50%	0 0%	0 0%	0 0%	2 50%	4 100%
DBG	60-65	0 0%	1 25%	0 0%	1 25%	2 50%	4 100%
DBG	65-70	6 50%	3 25%	2 17%	0 0%	1 8%	12 100%
DBG	70-75	1 25%	0 0%	0 0%	0 0%	3 75%	4 100%
DBG	75+	1 100%	0 0%	0 0%	0 0%	0 0%	1 100%
DBG	Hearth	0 0%	0 0%	1 50%	0 0%	1 50%	2 100%
Total (N)		23	7	3	3	16	52
%		44%	13%	6%	6%	31%	100%

Table 5.62. Agate geometric and convergent tools' types per layer and spit

All backed pieces are made of thin and rectilinear blanks. A total of 15 backed artefacts are made of elongated blanks, including bladelets. The other 37 backed pieces' blanks are

impossible to assess. Only six backed pieces, including geometrics and broken pieces, have cortical areas. The breaks observed are all transversal, direct (N=10, 59%) or indirect (N=7, 41%). They are mostly neat (N=20, %) with only two flexion breaks and one impact break.

c. Other retouched artefacts

There are six other retouched artefacts made of agate that are: three retouched bladelets, one truncated bladelet, one truncated flake and one borer. All these artefacts are microlithic.

The retouched bladelets (Fig. 5.34) measure on average 7,2 mm width and 2,3 mm thickness. They have a convex retouch area opposed to a straight cutting edge. The retouch is not abrupt such as for the backed pieces, but creates a cutting edge. These retouched bladelets are the only individuals found in the sampled assemblage. They are all transversally broken, one with a flexion break.



Figure 5.34. Agate retouched bladelets

The truncated flake and bladelet are also microlithic. They measure on average 18 mm length, 6,6 mm width and 3,4 mm thickness. Only their distal part is obliquely truncated (Fig. 5.35). These are also the only individuals of the sampled assemblage.

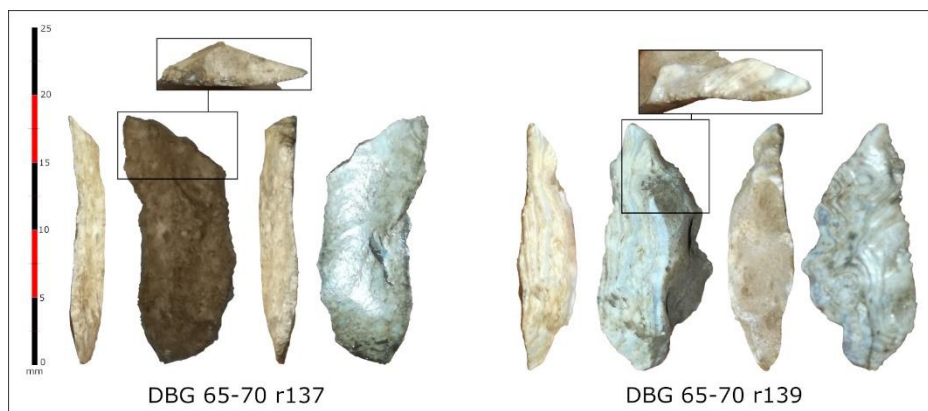


Figure 5.35. Agate truncated blanks

The borer is made on a thick cortical blank. One extremity of the tool is broken and the other display crushing (Fig. 5.36).

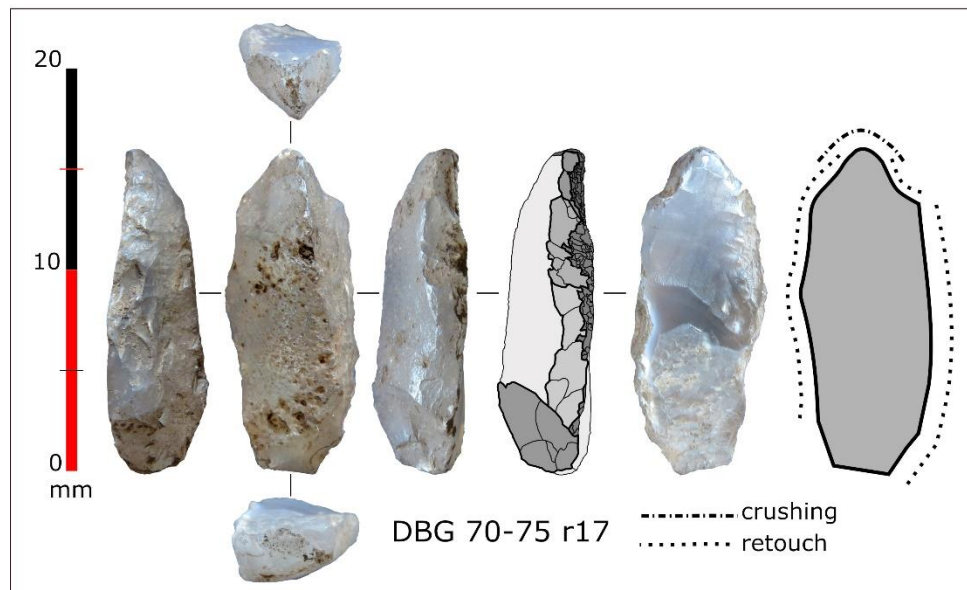


Figure 5.36. Agate borer

5.3.4. Synthesis and observation within the sequence

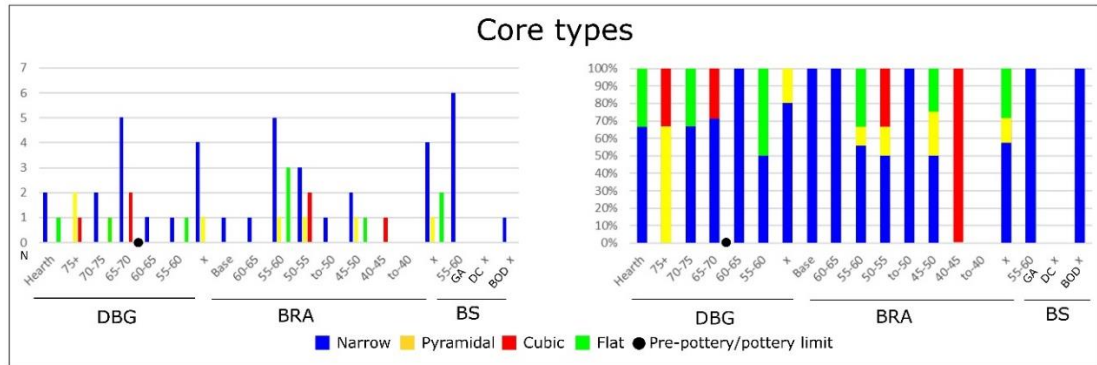
a. Synthesis of the agate analysis

Different key elements may be highlighted from the agate analysis.

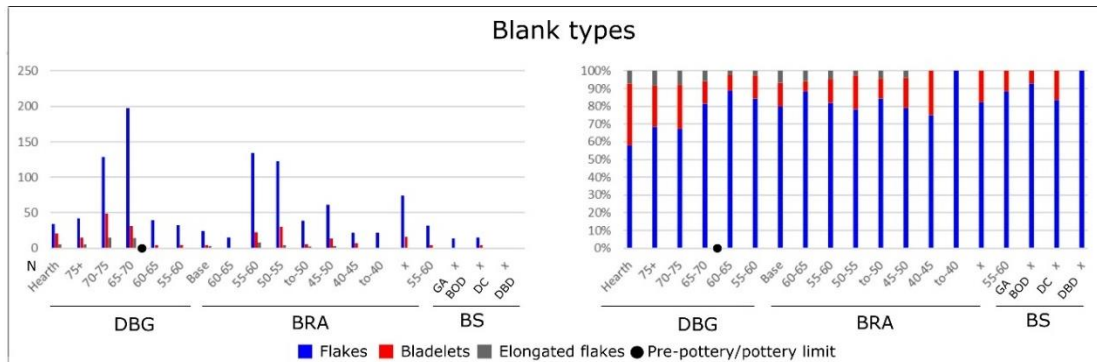
- Four core types have been defined: narrow, pyramidal, cubic and flat cores.
- Narrow cores are used to extract different types of blanks, including bladelets that are closely intercalated between elongated flakes and flakes. A free-hand percussion is firstly used, and the core may then be stabilised on an anvil. Only a few narrow cores reach the axial bipolar stage of reduction.
- Pyramidal and cubic cores display elongated and flake removal scars. Bladelets could also have been occasionally extracted from these cores.
- There are very few flat cores. Most of them were likely made of blanks. Small irregular flakes are extracted from them, as well as more elongated blanks that were potentially extracted in former stages of reduction.
- Rectilinear microlithic blanks with at least one cutting edge were produced.
- Thin and thicker flakes were transformed in scrapers and borers, whereas thin blanks, some corresponding to bladelets, were transformed in backed pieces.
- The geometric typology is varied, including segments, triangles and trapezes.

b. Observation within the sequence

When looking at the distribution of the different core types in the sequence, we see that narrow cores are the most represented core types, and occur in almost all layers (Graph 5.11). The other core categories are also found through the whole sequence, except in the BS layers in which only narrow cores are found. All blank types also occur in all layers in similar proportions, showing a continuity of the intentions of production (Graph 5.12).



Graph 5.11. Agate core types' distribution in the BMS late Holocene sequence



Graph 5.12. Agate blank types' distribution in the BMS late Holocene sequence

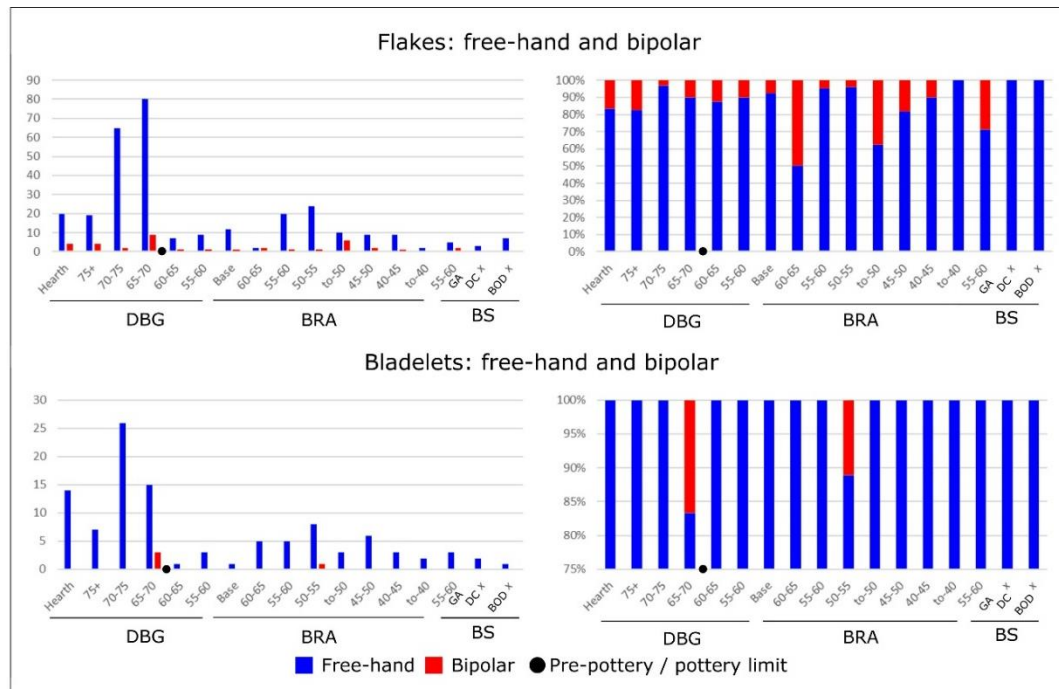
Flakes and bladelets also have similar dimensions in all layers. This is observable when comparing the average length, width and thickness for the bladelets from DBG, BRA and BS layers (Table 5.63). The flake sizes are also similar through the sequence.

Bladelets	Length	Width	Thickness
BS	14,8	6	1,9
BRA	14,7	6,1	2,1
DBG	14,8	6,5	2,2

Flake sizes	5_14mm	15_24mm	25_34mm	35+ mm	Total
BS	40%	60%	0%	0%	100%
BRA	50%	46%	3%	1%	100%
DBG	59%	34%	7%	0%	100%

Table 5.63. Agate bladelets and flakes' dimensions per DBG, BRA and BS units

Free-hand and bipolar flakes occur in all layers (Graph 5.13). Blanks with free-hand stigmata (that can also be created with anvil-rested modalities) are massively represented in all layers, and the few bipolar bladelets occur both in pre-pottery and pottery layers (Graph 5.13).



Graph 5.13. Agate flakes and bladelet's technique of extraction in the BMS late Holocene sequence

To conclude, I argue that there is no change through the sequence in the methods, techniques and intentions of production for the agate raw material. In the following section, I present the results obtained for the quartz lithic assemblage.

5.4. Quartz

I analysed 3082 quartz artefacts. Flakes (46%) and chunks (35%) are the most represented artefact categories. The blanks are dominated by flakes and followed by elongated flakes (14%). The cores make 6% of the assemblage. There are 17 retouched artefacts (0,6% of the total assemblage) including scrapers (N=3; 18%) and backed pieces (N=14; 82%) (Table 5.64).

BMS LATE HOLOCENE QUARTZ SAMPLED ASSEMBLAGE										
Layer	Spit	N/%	Flakes	Elongated flakes	Cores	Chunks	Total	Retouched artefacts		
								Scrapers	Backed pieces	Total
Damp Black x Dung		N	8	0	0	5	13	x	x	x
		%	62%	0%	0%	38%	100%	x	x	x
Dung x Contact		N	5	1	0	7	13	x	x	x
		%	38%	8%	0%	54%	100%	x	x	x
Base of Dung x		N	14	3	0	8	25	x	x	x
		%	56%	12%	0%	32%	100%	x	x	x
Grey Ash 55-60		N	32	11	1	25	69	0	1	1
		%	46%	16%	1%	36%	100%	0%	100%	100%
BRA x		N	103	47	16	46	212	0	1	1
		%	49%	22%	8%	22%	100%	0%	100%	100%
BRA to-40		N	2	4	2	2	10	0	0	0
		%	20%	40%	20%	20%	100%	0%	0%	0%
BRA 40-45		N	3	2	3	15	23	0	0	0
		%	13%	9%	13%	65%	100%	0%	0%	0%
BRA 45-50		N	121	20	4	26	171	0	0	0
		%	71%	12%	2%	15%	100%	0%	0%	0%
BRA to-50		N	43	11	3	34	91	0	1	1
		%	47%	12%	3%	37%	100%	0%	100%	100%
BRA 50-55		N	240	55	16	107	418	1	1	2
		%	57%	13%	4%	26%	100%	50%	50%	100%
BRA 55-60		N	223	62	10	134	429	0	4	4
		%	52%	14%	2%	31%	100%	0%	100%	100%
BRA 60-65		N	48	31	10	20	109	0	1	1
		%	44%	28%	9%	18%	100%	0%	100%	100%
BRA Base		N	25	23	1	25	74	0	1	1
		%	34%	31%	1%	34%	100%	0%	100%	100%
DBG 55-60		N	70	23	6	265	364	0	0	0
		%	19%	6%	2%	73%	100%	0%	0%	0%
DBG 60-65		N	61	28	7	44	140	0	1	1
		%	44%	20%	5%	31%	100%	0%	100%	100%
DBG 65-70		N	163	52	17	149	381	2	1	3
		%	43%	14%	4%	39%	100%	67%	33%	100%
DBG 70-75		N	204	40	23	136	403	0	2	2
		%	51%	10%	6%	34%	100%	0%	100%	100%
DBG 75+		N	44	17	3	11	75	0	0	0
		%	59%	23%	4%	15%	100%	0%	0%	0%
DBG Hearth		N	16	10	4	15	45	0	0	0
		%	36%	22%	9%	33%	100%	0%	0%	0%
Total		N	1425	440	126	1074	3065	3	14	17
		%	46%	14%	4%	35%	100%	18%	82%	100%

Table 5.64. Sampled quartz assemblage

5.4.1. Cores

There are 129 cores made of quartz. These cores are microlithic and measure on average 20,5 mm length, 15,1 mm width, 10,5 mm thickness and weight 5,2 gr (Table 5.65). All of them are used to produce microlithic blanks, including flakes and elongated flakes.

Cores	Length	Width	Thickness	Weight
Mean	20,5	15,1	10,5	5,2
Median	19,8	13,6	8,7	2,6
Min	10,1	5,8	3,1	0,3
Max	42,5	48	34,5	40,5
Stand. dev	6,1	7,4	6	7,2
N	125	128	128	124

Table 5.65. Quartz cores' measures

All the quartz cores have similar dimensions and structures. The quartz that was knapped at BMS is not a homogeneous raw material, and it tends to break easily, making the technological reading difficult. Furthermore, the use of an anvil together with axial gestures of percussion, appears from the beginning to the end of the reduction process, allowing less discernment of different phases of reduction. For this reason, I firstly present a general overview of quartz cores, from which I extract the cores that I could more precisely classify.

a. General overview

Most of the bipolar cores measure less than 30 mm length and are elongated. Almost all of them have stigmata characteristic of an axial bipolar percussion, with opposite crushing and flaking (Fig. 5.37). These axial bipolar cores are often too reduced to assess if they may originally have been narrow cores or if they may have been made of blanks. All cores, however, share similar dimensions, overall morphologies and intentions of productions.

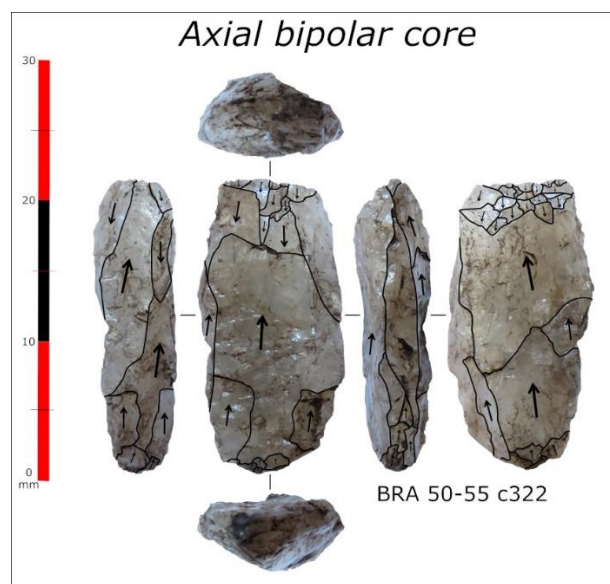


Figure 5.37. Quartz axial bipolar core

Small nodules of quartz are selected and split to initiate the blank extraction. Chunks of quartz may also be used, but it is more rarely the case. Most cores have cortical areas (N=69, 54%). These rounded cortical areas are sometimes used to create the back and flanks of the cores. The cores have one preferential striking platform and only one core was rotated. The extraction surface is generally located on the longest area of the selected volume. It may be restricted to one face of the core, but may also invest the back of the core when an anvil is used associated with an axial gesture of percussion. The removal scars are either elongated flakes or flakes (Table 5.66).

Removal scars	Elongated flakes	Flakes	Total
N	67	53	120
%	56%	44%	100%

Table 5.66. Quartz cores' removal scar types

The blanks are all unidirectionally extracted. Most of the cores (N= 73, 63%) have opposite flaking due to the use of an anvil. Many cores are also appointed. Only 10 cores exclusively display free-hand stigmata, against 84 for axial bipolar stigmata (Table 5.67). Another 24 cores are attributable to the anvil-rested modality. Within all these cores, 53 could be attributed to the narrow core category and one to the wide core categories. I present these artefacts in the next section.

Technique	Free-hand	Anvil-platform	Bipolar	Total
N	10	24	84	118
%	8%	20%	71%	100%

Table 5.67. Quartz cores' techniques of percussion

b. Narrow cores

I isolated 57 (44%) cores that I classified as narrow cores (Fig. 5.38). They measure on average 20,8 mm length, 12,8 mm width, 9 mm thickness and weight 3,2 gr (Table 5.68).

Narrow cores	Length	Width	Thickness	Weight
Mean	20,8	12,8	9	3,2
Median	20,1	11,9	8	2,3
Min	10,8	5,8	4,1	0,4
Max	36,9	27,5	20,2	16,3
Stand. dev	5	4,8	3,8	3,1
N	55	57	57	55

Table 5.68. Quartz narrow cores' measures

i. Narrow cores' organisation

The narrow cores made of quartz are elongated and have one preferential extraction surface associated with one striking platform. The extraction surface is generally independent of the flanks and back of the core. The flanks correspond to the natural convexities of the unmodified quartz nodule, or are more rarely created by the removal of transversal flakes.

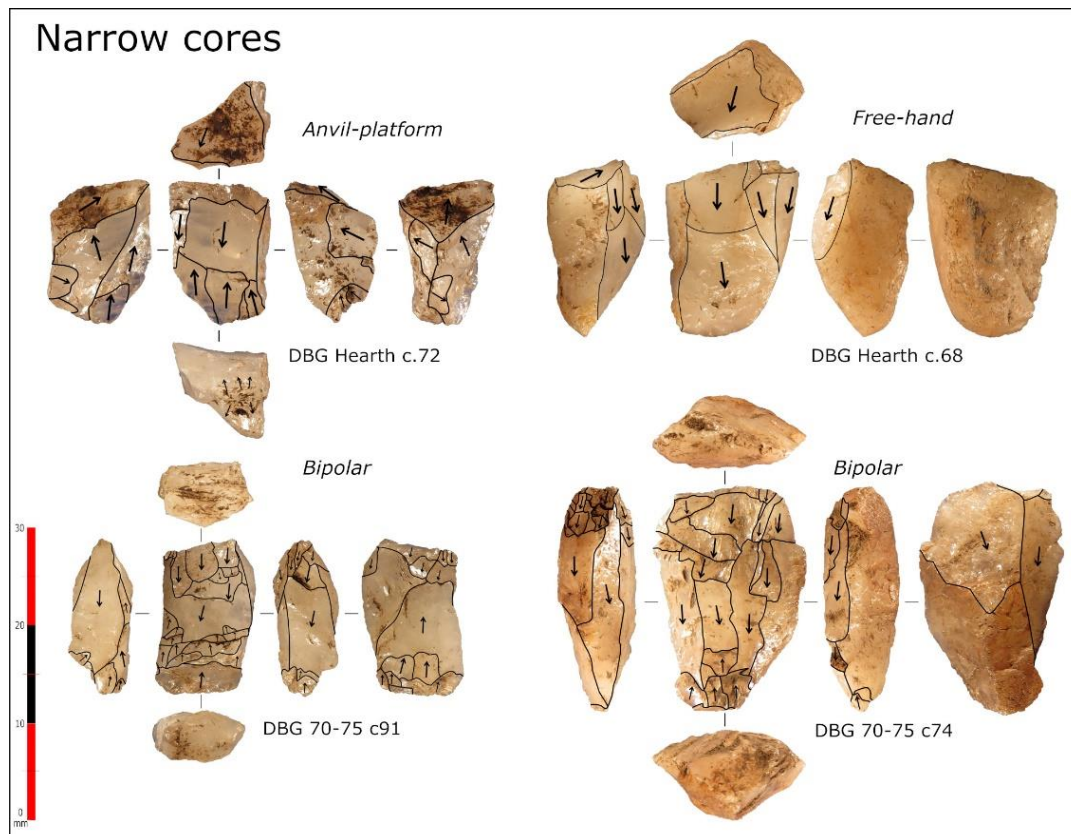


Figure 5.38. Quartz narrow cores

Extraction surface

The extraction surface is located on the most elongated part of the core. It is generally rectilinear but may also rarely have distal convexities created by the removal of elongated flakes. The extraction surface generally does not overlap on the flanks of the cores. Flakes may also invest the back of the core when the percussion becomes more axial and the striking platform narrower. Flakes and elongated flakes are unidirectionally extracted, followed in some cases by the removal of small and hinged irregular flakes at the end of the reduction process.

Striking platform

The striking platform is generally crushed, but plain platforms opened by the removal of a flake also occur. These striking platforms are not maintained by the removals or tablets or flakes. In most cases, the angle between the striking platform and the extraction surface is too close to 90° for continuing extracting blanks.

Flanks and back of the core

The flanks of the core are generally convergent and also form the back of the core. Most of them correspond to the natural convexities of the quartz nodule, creating a roundish to triangular section. In a few cases, the flanks of the cores are opened by the removals of transversal flakes, creating steep independent sides.

Base of the core

In almost all cases, the base of the cores is convergent and display crushing and flaking due to the use of an anvil.

ii. Intentions of production and associated strategies

Elongated flakes (N=45, 79%) and flakes (N=12, 21%) are removed from these narrow cores. Narrow cores are therefore more oriented towards an elongated flake production than the other less distinctive cores of the sampled assemblage, even though the intentions of production remain very similar. Many narrow cores only display a few removal scars on their extraction surface, flakes or elongated flakes covering almost the whole area of the extraction surface (Fig. 5.39).

When finer successions of blank removals are observable, it appears that elongated flakes are generally initially extracted, followed by the removal of shorter flakes. This is visible on some narrow cores associated with an axial bipolar percussion, where I represented a series of elongated blank followed by the removal of small irregular and short hinged flakes during the last stages of reduction (Fig. 5.39).

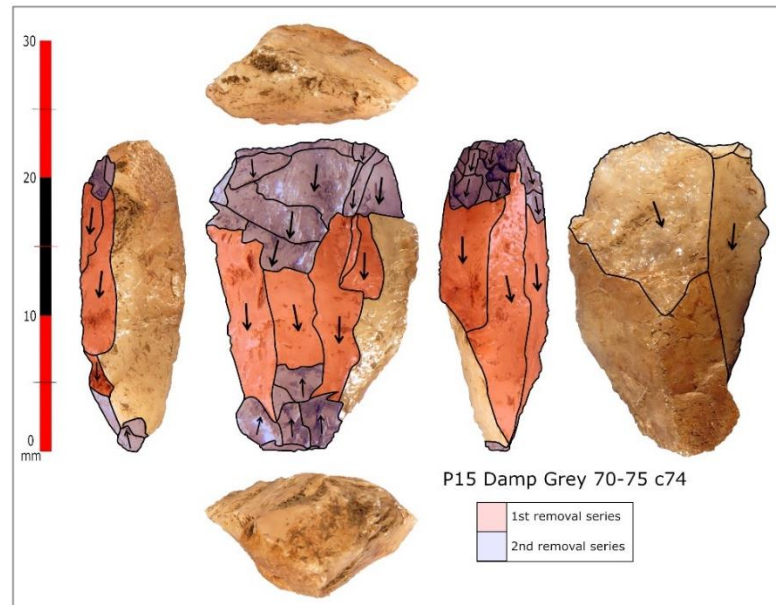


Figure 5.39. Elongated blank removal series on bipolar quartz core

The flakes and elongated flakes are directly extracted from the striking platform. These blanks tend to invest most of the width and length of the extraction surface. Their removal succeeds to each other without using narrow transversal convexities to extract narrower blanks. No bladelet production was observed, such as for the other raw materials.

iii. Synthesis of the narrow core analysis

The narrow cores are made of small nodules. At least some of these nodules were likely split in order to create adequate convexities. The flanks and back of the cores are generally left unmodified. A plain striking platform may be opened, and a few elongated flakes extracted with a free-hand percussion. Cores are then stabilised on an anvil, and successive elongated flakes are extracted. During this anvil-rested extraction modality, the extracted blanks generally invest most of the extraction surface' length and width. At this stage of reduction, opposite flaking and crushing may occur. Following the successive removal of blanks, the striking platform gets thinner and the percussion gesture more axial. Cores then shift into 'axial bipolar cores'. At this stage, the striking platform becomes crushed, and many small irregular hinged flakes are produced from the hammered and resting ends. Because the cores become very thin, flakes may also invest the back of the core. This reduction sequence from free-hand to anvil-platform and axial bipolar modalities are illustrated in Fig. 5.40.

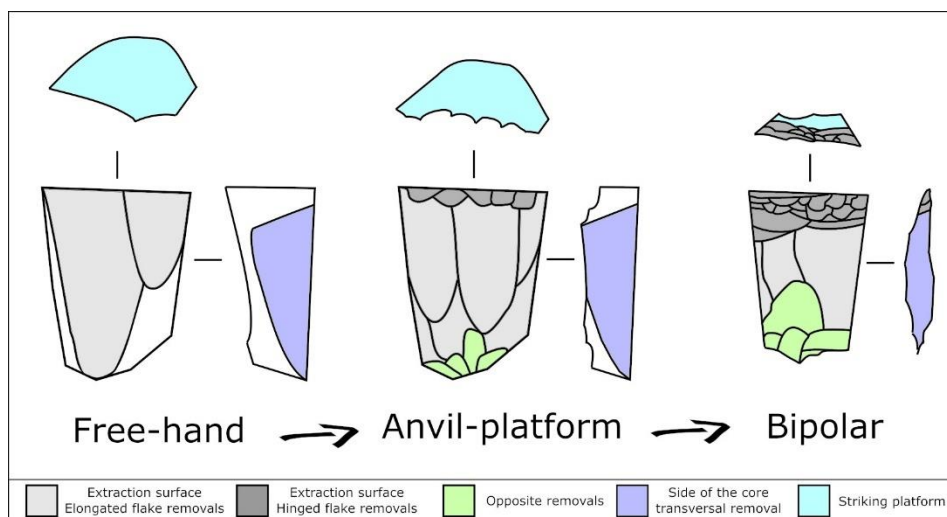


Figure 5.40. Quartz narrow core reduction sequence

c. Wide core

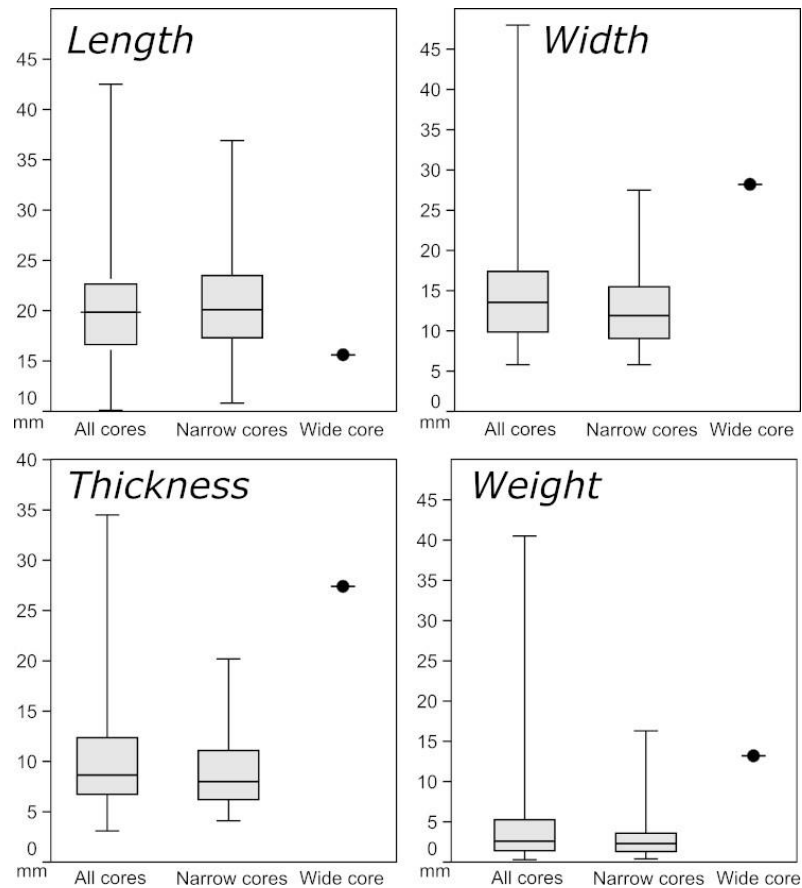
One wide core was also isolated (Fig. 5.41). This core measure 15,6 mm length, 28,2 mm width 27,4 mm thickness and weighs 13,2 gr. Contrarily to the narrow cores, the extraction surface is not located on the most elongated part of the blank, but on a large area of the volume. However, the length of the extraction surface is similar to the one of the narrow cores, as well as the type of blanks extracted. Furthermore, the base of the core is also convergent. The natural convexities of the quartz nodule are used to create the striking platform, flanks and back. One large flake is initially extracted to open the extraction surface. Narrow transversal convexities are then used to extract narrower blanks successively (Fig. 5.41).



Figure 5.41. Quartz wide core

d. Comparison between core types

The narrow cores have similar dimensions than the other less distinctive cores (Graph 5.14). Indeed, we saw that all quartz cores share similar organisations (one preferential striking platform) and intentions of production (elongated flakes and flakes). The wide core tends to be of larger dimensions, but once again has similar intentions of production.



Graph 5.14. Quartz core types' dimensions

Different volumes were selected, including nodules, split pieces and blanks, and were exploited similarly. Because many cores are 'bipolar' and covered by blank removals, it is not possible to assess if they could have been made of blanks and directly trimmed with an axial bipolar percussion, or if they could correspond to reduced narrow cores.

5.4.2. Blanks

There are 1865 quartz blanks, including 336 (18%) flakes, 440 (24%) elongated flakes and 1088 (58%) broken blanks. These blanks generally measure less than 25 mm and have similar sizes (Table 5.69).

Size	5_14 mm	15_24 mm	25_34 mm	35 + mm	Total
Flakes	180	103	19	1	303
	59%	34%	6%	0%	100%
Elongated flakes	133	150	23	2	308
	43%	49%	7%	1%	100%
Total	313	253	42	3	611
	51%	41%	7%	0%	100%

Table 5.69. Quartz blanks per size category

a. Flakes

The flakes (N=303) generally measure between 10 and 20 mm. Most quartz flakes have irregular shapes and all have a rectilinear profile. Flakes generally do not have more than one or two removal scars on their dorsal surface (Fig. 5.42). This is consistent with the fact that only a few flakes are generally removed from the cores 'extraction surfaces. There are almost as many cortical and non-cortical flakes (Table 5.70).

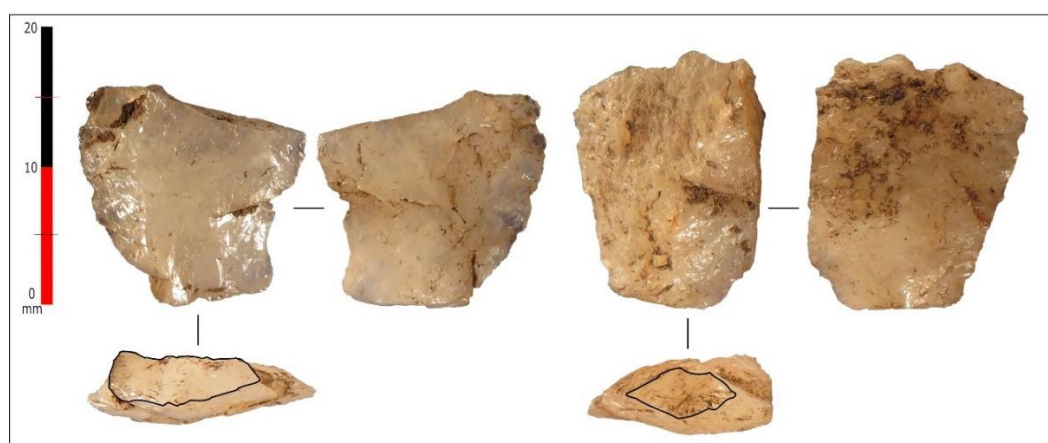


Figure 5.42. Quartz flakes with plain striking platforms

Cortex	Yes	No	Total
Flakes	146	187	333
%	44%	56%	100%

Table 5.70. Number of cortical and non-cortical quartz flakes

I also noted different platform types (Table 5.71). Most flakes and broken blanks have a crushed platform, which contrasts with the data for chert and agate. Plain platforms are also commonly observed (Fig. 5.42). If considering an array of stigmata characteristic of axial bipolar percussion, there are as many free-hand and bipolar flakes (Table 5.72). However, given the difficult technological reading, it is likely that more bipolar flakes exist but are more complicated to identify.

Platform types	Plain	Punctiform	Filiform	Crushed	Total
Flakes	91	8	44	115	258
	35%	3%	17%	45%	100%
Broken	38	3	19	50	110
	35%	3%	17%	45%	100%

Table 5.71. Platform types per number of quartz flakes and broken blanks

Technique	Free-hand	Bipolar	Total
Flakes	91	92	183
	50%	50%	100%
Broken	38	17	55
	69%	31%	100%

Table 5.72. Technique of extraction per quartz flakes and broken blanks

I also hypothesise that many of the broken blanks broke during the knapping because of internal fissures of the quartz. It is especially the case if the angle between the striking platform and extraction surface was closed to 90°. Most quartz blanks indeed do not hinge but break instead, because of the lack of homogeneity of the raw material. When looking at the platform types per size categories, all categories are similarly represented for the three size categories (Table 5.73).

Flakes	Plain	Punctiform	Filiform	Crushed	Total
5_14 mm	45	3	28	63	139
%	32%	2%	20%	45%	100%
15_24 mm	34	3	11	34	82
%	41%	4%	13%	41%	100%
25_34 mm	7	0	2	8	17
%	41%	0%	12%	47%	100%
Total	86	6	41	105	238
%	36%	3%	17%	44%	100%

Table 5.73. Quartz flakes' platform types per size categories

b. Elongated flakes

There are 440 elongated flakes made of quartz. These flakes are generally convergent to parallel and have two opposite cutting edges. Some of them are similar to bladelets, such as seen in Fig. 5.43. However, they are not as well represented in the quartz assemblage as in the other raw materials. I also did not observe recurrent bladelet extraction sequences or intercalations. These artefacts were therefore grouped within the 'elongated flake' category.



Figure 5.43. Quartz elongated flakes

The elongated flakes generally measure between 10 and 20 mm and are slightly bigger than the flakes. They have a rectilinear profile. Contrarily to the flakes, the elongated flakes more often display sequences of removals on their dorsal surface (Fig. 5.43). Previous hinged/broken flake removals are often observed on their dorsal face, meaning that some elongated flakes could have been used to ‘clean’ the extraction surface.

The elongated flakes are mostly non-cortical (Table 5.74). They could have been preferentially extracted after the cortical parts were removed, contrarily to the flakes that were extracted at all moments of the core reduction process. Elongated flakes mostly have crushed striking platforms, even though other platform types occur (Table 5.75). Bipolar blanks are also more represented in the elongated flake category (Table 5.76). This could be because elongated flakes tend to reach the base of the cores, and therefore take away opposite flaking resulting from the anvil.

Cortex	Yes	No	Total
Elongated flakes	124	304	428
%	29%	71%	100%

Table 5.74. Quartz elongated flakes per cortex presence/absence

Platform types	Plain	Punctiform	Filiform	Crushed	Total
Elongated flakes	50	17	58	202	327
%	15%	5%	18%	62%	100%

Table 5.75. Quartz elongated flakes’ platform types

Technique	Free-hand	Bipolar	Total
Elongated flakes	46	185	231
%	20%	80%	420%

Table 5.76. Quartz elongated flakes' technique of extraction

When looking at the platform types per size categories, we see that all types are similarly represented for the three size categories, even though crushed platform dominate (Table 5.77). This highlights the fact that axial bipolar percussion was favoured from the beginning to the end of the reduction process.

Elongated flakes	Plain	Punctiform	Filiform	Crushed	Total
5_14 mm	16	4	15	72	107
%	15%	4%	14%	67%	100%
15_24 mm	16	8	24	87	135
%	12%	6%	18%	64%	100%
25_34 mm	3	3	6	15	27
%	11%	11%	22%	56%	100%
Total	35	15	45	174	269
%	13%	6%	17%	65%	100%

Table 5.77. Quartz elongated flakes' platform types per size categories

c. Synthesis of the blank analysis

The flakes and elongated flakes share common technological features:

- All blanks are microlithic, have a rectilinear profile and have at least one cutting edge.
- The distal part of the blanks is often broken or takes away opposite flake removals coming from the anvil.
- The techniques of extraction are variable, but are mostly associated with the use of an anvil. Flakes with plain platform nevertheless occur, implying that free-hand and anvil-rested modalities were also used to extract blanks.

5.4.3. Retouched artefacts

There are 17 retouched artefacts made of quartz that are dominated by backed pieces (N=14, 82%) and followed by scrapers (N=3, 18%).

a. Scrapers

The three quartz scrapers are found both in the pre-pottery (DBG 65-70) and pottery layers (BRA 50-55). There is one thumbnail, one V-shaped and one indeterminate scraper. They measure on average 22,8 mm length, 14,4 mm width and 7,5 mm thickness (Table 5.78).

Scrapers	Length	Width	Thickness
Mean	22,8	14,4	7,5
Median	22,8	14,8	7,2
Min	17,6	12,3	5,3
Max	28	16,2	9,9
Stand.dev	7,4	2	2,3
N	2	3	3

Table 5.78. Quartz scrapers' dimensions

Two scrapers are non-cortical and one is cortical. One scraper is made of an elongated flake, and the original blank from the other two are indeterminate. One scraper has a neat transversal break (Fig. 5.44).

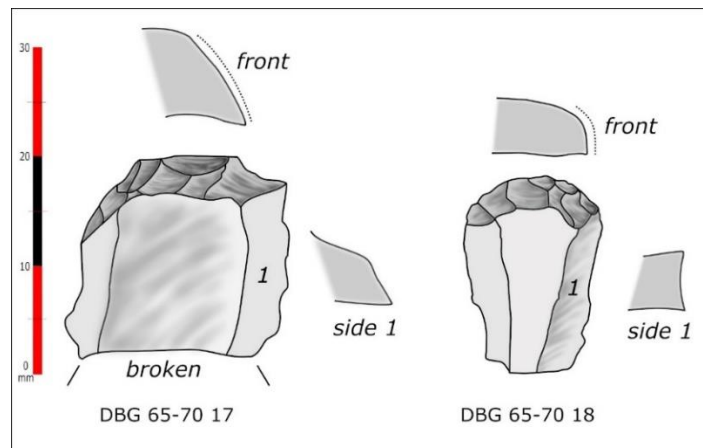


Figure 5.44. Quartz scrapers

b. Backed pieces

There are 14 quartz backed pieces that include nine geometrics, one convergent backed piece and four broken backed pieces. They measure on average 16,7 mm length, 7,5 mm width and 3,5 mm thickness (Table 5.79).

Backed pieces	Length	Width	Thickness
Mean	16,7	7,5	3,5
Median	16,5	7,9	3,6
Min	12,1	4,1	1,9
Max	22	9,7	5
Stand.dev	3,1	2	0,8
N	8	14	14

Table 5.79. Quartz backed pieces' dimensions

All the geometrics are segments (Fig. 5.45) and the convergent backed piece is a backed point. Segments measure on average 16,7 mm length, 7,3 mm width and 3,4 mm thickness. All the selected blanks are thin, rectilinear and non-cortical. A total of 8 pieces are broken. All the breaks are transversal and neat.



Figure 5.45. Quartz backed pieces

5.4.4. Synthesis and observation within the sequence

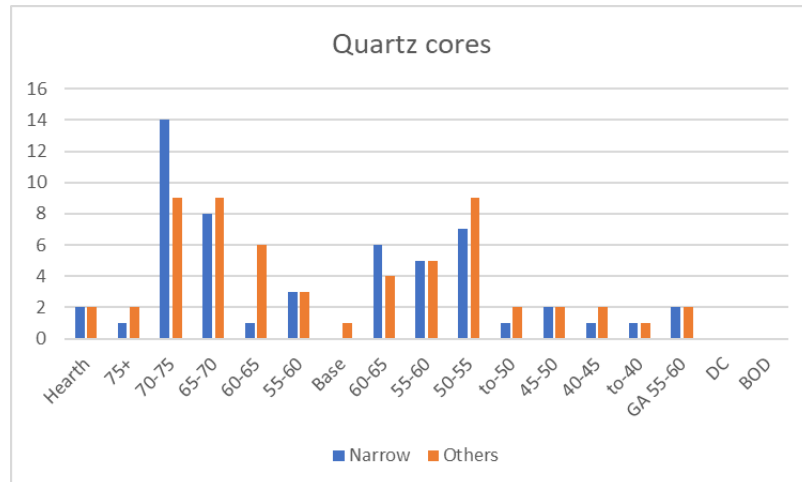
a. Synthesis of the quartz analysis

Different key elements may be highlighted from the quartz assemblage analysis.

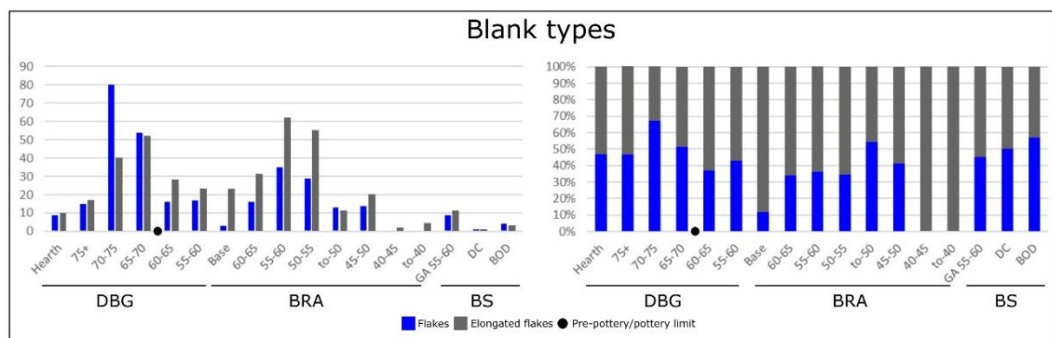
- All core types share strong similarities: they have similar dimensions and have one preferential extraction surface associated with one striking platform.
- The extraction surface is most often located on the most elongated part of the volume.
- The axial bipolar technique is broadly used to extract blanks on all cores.
- Blanks are microlithic, rectilinear, and often broken or hinged.
- Only a few blanks generally invest the extraction surface, and sequences of extraction are only visible on some elongated flakes.
- No intercalated bladelet production was observed.
- A few rather thick flakes are transformed in scrapers, and thin blanks in backed pieces.
- There are very few retouched artefacts that are dominated by geometrics (segments).

b. Observation within the sequence

Quartz cores, including narrow cores, occur in all layers, to the exception of DC and BOD layers (Graph 5.15). All blank types also occur in all layers in similar proportions, showing a continuity of the intentions of production (Graph 5.16).



Graph 5.15. Quartz cores distribution in the BMS late Holocene sequence



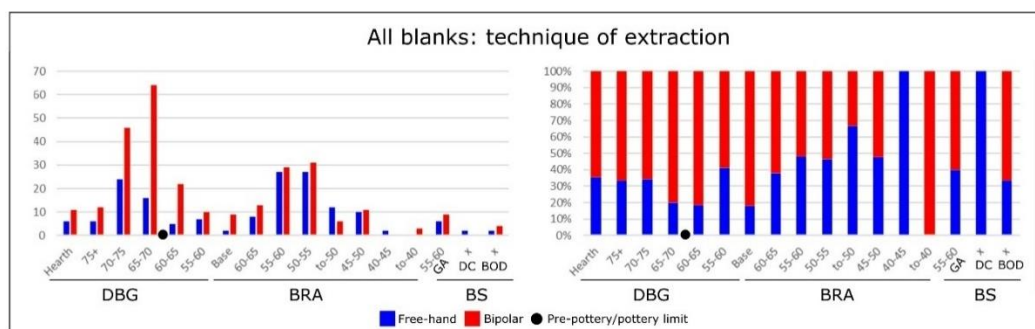
Graph 5.16. Quartz blank types' distribution in the BMS late Holocene sequence

The flakes and elongated flakes have similar sizes in all layers. This is observable when comparing the percentage of individuals per size category for the DBG, BRA and BS units (Table 5.80). Free-hand and bipolar blanks occur in all layers (Graph 5.17). I note that bipolar blanks are overall better represented throughout the sequence.

Flake sizes	5_14 mm	15_24 mm	25_34 mm	35+ mm
BS	42%	50%	8%	0%
BRA	53%	36%	10%	1%
DBG	65%	31%	4%	0%

Elongated flake sizes	5_14 mm	15_24 mm	25_34 mm	35+ mm
BS	31%	46%	23%	0%
BRA	31%	59%	9%	1%
DBG	58%	33%	8%	0%

Table 5.80. Flake and elongated flake sizes per DBG, BRA and BS units



Graph 5.17. Quartz blanks' technique of extraction in the BMS late Holocene sequence

To conclude, there is no change in the methods, techniques and intentions of production for the quartz raw material.

5.5. Synthesis and comparison between raw materials

Following the analysis of the chert, agate and quartz assemblages, it is necessary to highlight the technological similarities and specificities observed between these raw materials.

Similarities:

- All raw material assemblages are microlithic: the extracted blanks generally do not exceed 25mm length or size.
- All blanks are rectilinear
- The narrow cores were recognised for all raw materials
- Scrapers and backed pieces are made of all raw materials
- Three percussion modalities are used: free-hand, anvil-platform and axial bipolar

Specificities:

- Bladelets are only produced in chert and agate. Consequently, the intercalated method of extraction only exists for the chert and agate and not for the quartz.
- Short bladelets extraction sequences are commonly observed for the chert, whereas agate bladelets are more closely intercalated between other blank types.
- The narrow cores that are made of chert are more often pre-shaped (flanks and striking platform) than the ones made of agate and quartz that most often use the natural convexities of the nodules.
- Pyramidal cores only occur in agate.

- Even though free-hand, anvil-platform and bipolar modalities occur in all raw material, there are slight differences in their representativity: the free-hand modality is generally more represented for the agate, while the axial bipolar modality is more represented for the quartz.
- Chert and agate have similar percentages of retouched artefacts, whereas the percentage is very low for the quartz.
- Chert and agate retouched artefacts are dominated by scrapers, whereas backed pieces are more represented for the quartz.
- Agate geometrics have a more varied typology including segments, triangles and trapezes.

In the following sections, I present more in detail the retouched artefact analysis, including all raw materials. The scraper analysis presented in this thesis was published in 2019 in *Southern African Humanities* (Guillemard & Porraz 2019).

5.6. The scrapers

5.6.1. Presentation of the assemblage

The scrapers from BMS are all microlithic. They measure on average 15 mm length, 14 mm width and 5 mm width. Most of them belong to the ‘small scraper’ category created by J. Deacon (1984a), and could be considered as typologically typical of Wilton scrapers.

Variations in the morphology and techno-functional attributes of these scrapers however occur. In the following analysis and discussion, I describe the scraper population as a whole and further propose a new classification in three types: thumbnail, V-shaped and short arc scrapers. Hypotheses on the functioning of these tools are opened at the end of this discussion.

In order to more precisely study the scraper assemblage from BMS, I selected all scrapers from squares P15 and P13, layers BRA and DBG, as well as a few scrapers from the layer Grey Ash at the contact between BRA and Dung Crust. A total of 420 scrapers were sampled, including 111 associated with the pre-pottery layers and 263 associated with the pottery-bearing layers (Table 5.81). 46 pieces from DBG are not assigned to a cultural phase but have been integrated into the database.

Phase	Layer	Spit	N
Pottery-bearing layers	Grey Ash	x	16
	BRA	x	18
		to-40	4
		40-45	0
		45-50	8
		to-50	7
		50-55	73
		55-60	73
		60-65	20
		Base	6
	DBG	55-60	31
		60-65	7
Total pottery layers			263
Pre-pottery layers	DBG	65-70	55
		70-75	38
		75+	8
	DBG Hearth	x	10
Total pre-pottery layers			111
Unknown	DBG	x	46
Grand Total			420

Table 5.81. Sampled scraper assemblage

5.6.2. Main characteristics of the scrapers and their reduction process

Scrapers are made principally of chert and agate with only ca. 3% made of quartz, quartzite and dolerite (Table 5.82). In the total lithic assemblage, chert represents 49% of the assemblage, quartz 16%, dolerite 15%, agate 14% and quartzite 5% (Van Doornum 2005), highlighting the fact that CCS raw materials were favoured to make scrapers.

Raw material	Chert	Agate	Quartz	Quartzite	Dolerite	Total
N	293	117	3	4	3	420
%	70%	28%	1%	1%	1%	100%

Table 5.82. Number of scrapers per raw material

The scrapers are made from flakes, cortical (41%) or not (59%), and very occasionally from elongated products such as bladelets (1%). The profile of the scrapers is generally rectilinear, which is consistent with the blank production at BMS. On scrapers with a visible platform, free-hand percussion is mostly represented. Few examples of scrapers document the use of bipolar percussion (N=47), recognisable by the presence of opposed removal scars and crushed platform (Fig. 5.46).

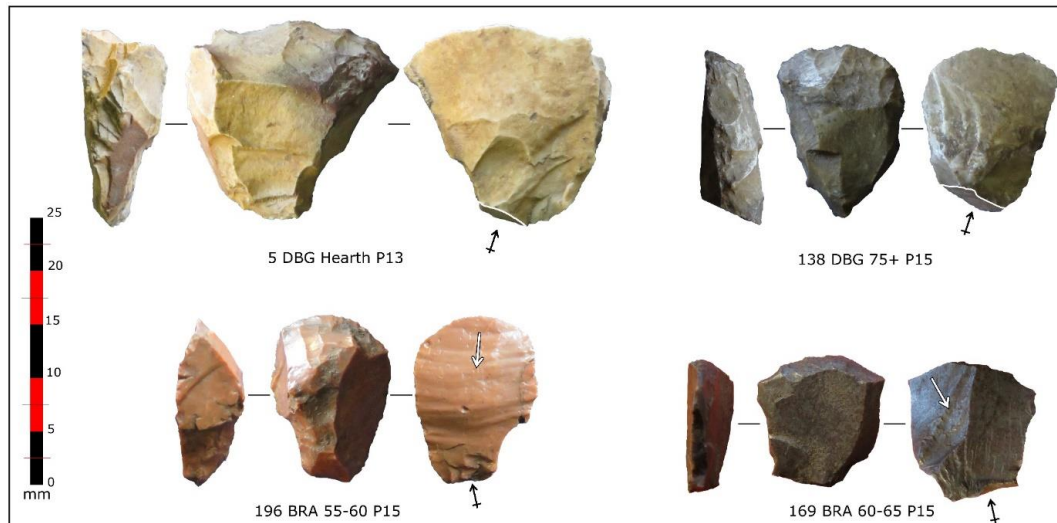
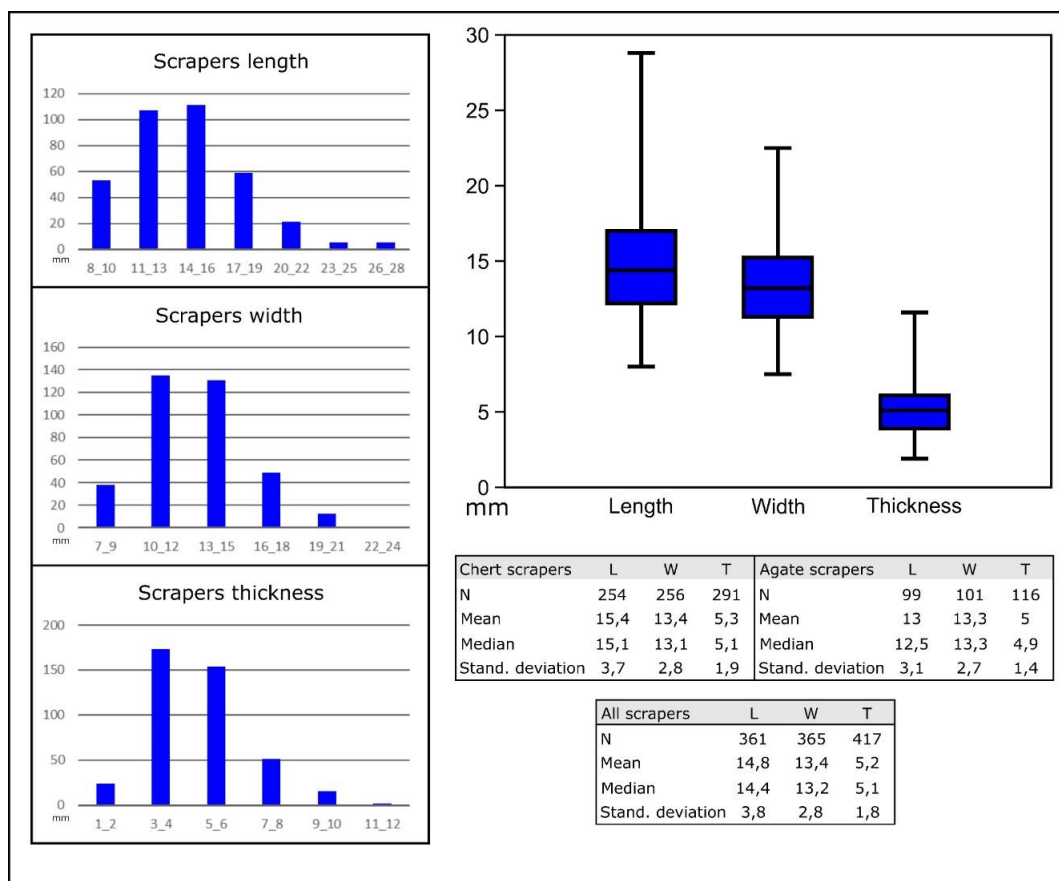


Figure 5.46. Scrapper blanks associated with varied extraction techniques

The *front* of the scrapers, corresponding to the convex to straight-convex retouched area, is in 60% of the cases located on the distal technological axis of the blank, on 18% on a side, 17% on the proximal, and 5% diagonally to the technological axis. Typologically speaking, 82% of the tools may be classified as end-scrapers and 18% as side-scrapers. For 8% of the scrapers, the tool was reoriented, and another *front* opened.

On average, the scrapers measure ~14 mm in length and width, and ~5 mm in thickness (Graph. 5.18). I observe a unimodal distribution of the length, width and thickness values of all scrapers, and no different clusters. Very few scrapers are longer than 20 mm, and their width values (corresponding to the width of the *front*) are grouped, displaying a narrower range than the length values (Graph. 5.18). There also are no major dimensional differences between the scrapers in agate and chert.



Graph 5.18. Scrapers' measures

Interestingly, if I compare the length of the blanks made of agate and chert with the length of the scrapers (predominantly made of chert and agate), we observe a significant difference (Table 5.83). However, only 1% of the unmodified blanks are longer than the scrapers. This suggests that the longest blanks were chosen to be modified, or that the reduction of the blanks by the retouch was limited. Still, there are slightly more scrapers in the 5–15 mm long category than blanks, which likely reflects a limited diminution of the size due to the sharpening process.

Length	5-15mm	16-25mm	26-45mm	Total
Flake number	633	451	99	1183
%	54%	38%	8%	100%
Scraper number	243	113	6	362
%	67%	31%	2%	100%
$\chi^2(2, N=1545) = 31, p < 0.05$				

Table 5.83. Flake and scraper sizes

The *front* angles range from 30° to 90°, with a standard deviation of 14°. Most of the values lie between 50° and 70°, with a mean of 60°. When comparing chert and agate, it appears that the scrapers in chert and in agate have similar front angle values. Chert scrapers however tend to have slightly steeper *fronts* than the ones in agate (Table 5.84).

<i>Front</i> angle°	Chert	Agate
30-40	7%	12%
50-60	62%	70%
70-80	29%	18%
90-100	2%	0%
N	291	116

Table 5.84. *Front* angle category per chert and agate

In the course of the reduction process, the succession of retouch contributes to the creation of spurs (Fig. 5.47). Spurs have been recorded for 21% of all the scrapers.

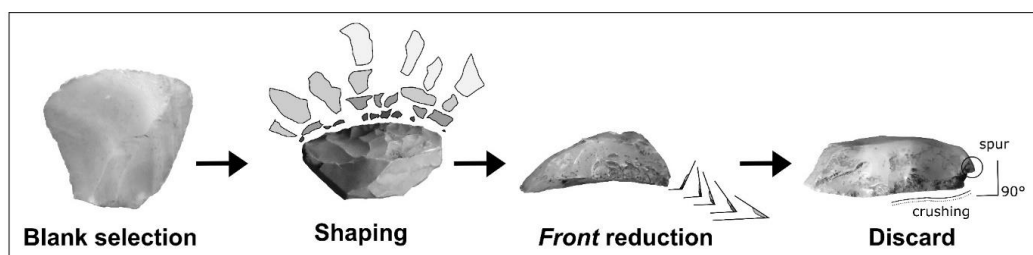


Figure 5.47. Scrapers' reduction process

On 6% of the scrapers, a deep flake removal taking away part of the retouched area was also recorded (indicated in orange on Fig. 5.48). This flake removal corresponds to the last operation before the discarding of the tool.

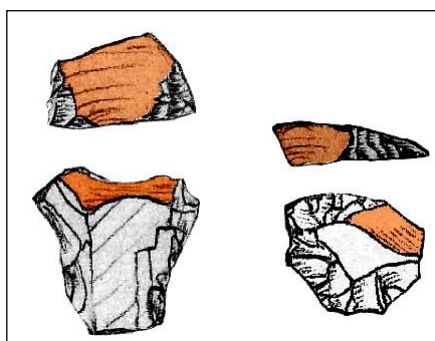


Figure 5.48. 'Last flake' on scraper fronts

A difference in the state of discard between the smaller and longer scrapers is also visible, the longer scrapers tending to have steeper *fronts* (Table 5.85). The smaller and thinner scrapers have a retouched edge which is not particularly steep, measuring less than 60° (which is the mean value), but on which spurs may occur. The *front* angles of the longer scrapers are steeper, with values spanning from ca. 60° to 70° (except for two scrapers). These results suggest that there is not a continuous reduction sequence from the biggest to the smallest scrapers, but that this difference reflects the selection of blanks with different sizes.

Length (mm)	Front angle average	Scraper number
7-10	53°	53
11-14	58°	153
15-18	63°	108
19-22	64°	37
23-26	69°	8
27-30	57°	3
Total	61°	362

Table 5.85. Number of scrapers per length and *front* angle average categories

5.6.3. Structure of the scrapers

Scrapers were divided in two morpho-functional units: the *front* (in red on Fig. 5.49) and the body (in blue on Fig. 5.49) In order to characterise the two morpho-functional units of the tool, I initially described their general morphologies. I defined three classes of *front* morphology: convex, straight-convex, and straight. Six morphological categories were created for the body of the scrapers that are: square, quadrangular, trapezoidal, triangular, asymmetric divergent and irregular divergent (Fig. 5.49). The square category defines forms with angles between the *front* and the sides that are between ca. 80° and 90°, the quadrangular category has angles of between ca. 70° and 80°, while the trapezoidal and triangular categories have angles of 70° and less.

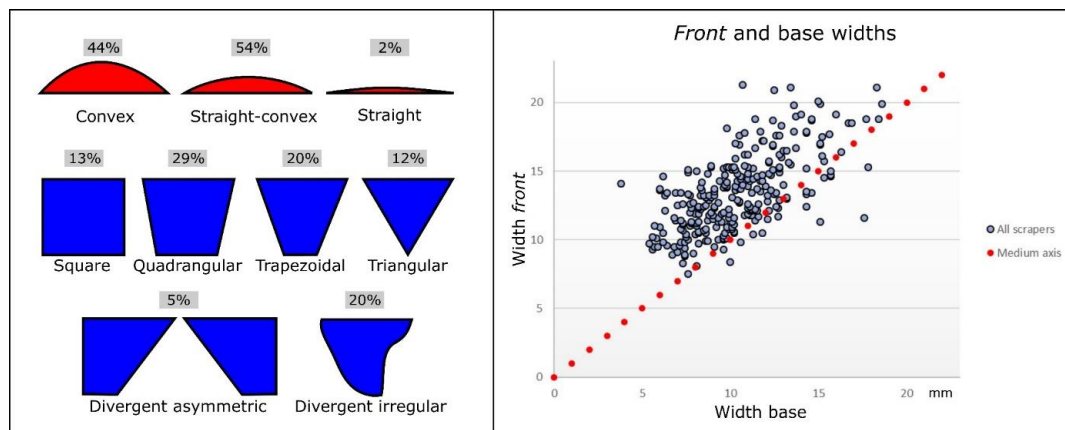


Figure 5.49. Front and body categories (left), scrapers plotted by front and base width (right)

Most of the scrapers have sides which are divergent towards the *front*, meaning that their base width is narrower than their *front* width. This is illustrated by the measurements in Fig. 5.49. Overall, most of the scrapers have a convex to straight-convex *front* and have a divergent body that is quadrangular, trapezoidal or triangular (Table 5.86).

Active/passive units	Square	Quadrangular	Trapezoidal	Triangular	Divergent asymmetric	Divergent irregular	Total
Convex - N	17	43	35	13	4	28	140
%	12%	31%	25%	9%	3%	20%	100%
Straight-convex - N	27	48	35	23	13	37	183
%	15%	26%	19%	13%	7%	20%	100%
Straight - N	0	3	1	0	0	0	4
%	0%	75%	25%	0%	0%	0%	100%
Total	44	94	71	36	17	65	327

Table 5.86. Scraper numbers per front and body categories

Combining the measures taken with the morphologies of the units, I recognise three main types of scrapers (Fig. 5.50). Broken scrapers (17%) are naturally not considered within the following categorisation.

- Scrapers with a straight-convex to convex *front*, most often associated with a square-to-quadrangular unretouched passive unit. Divergent passive units may also occur as a result of blank shape variation. Their average length/width ratio is 1,2. Considering their overall ‘squarish’ morphology, I decided to keep the descriptive term of ‘**thumbnail scrapers**’ to individualise them. At BMS, thumbnail scraper is the predominant scraper category as it represents 76% of all complete scrapers.
- Scrapers with a straight-convex to convex *front* associated with a divergent passive unit, most of which are transformed by retouch into a trapezoidal-to-triangular shape. The blanks used to make these scrapers are generally thicker. Their average length/width ratio is 1,4. I named these scrapers ‘**V-shaped scrapers**’. They represent 12% of all complete scrapers.
- Scrapers with a short prehensile part and a wide *front*. In contrast with the two former categories that are mostly end-scrapers, 87% of these scrapers are side-scrapers, meaning that the *front* is located on the side of the blank (oriented on its technological axis). All four backed scrapers were assigned to this category. Their average length/width ratio is 0,7. Given their short prehensile part, I individualised them as ‘**short-arc scrapers**’. They represent 11% of all complete scrapers.

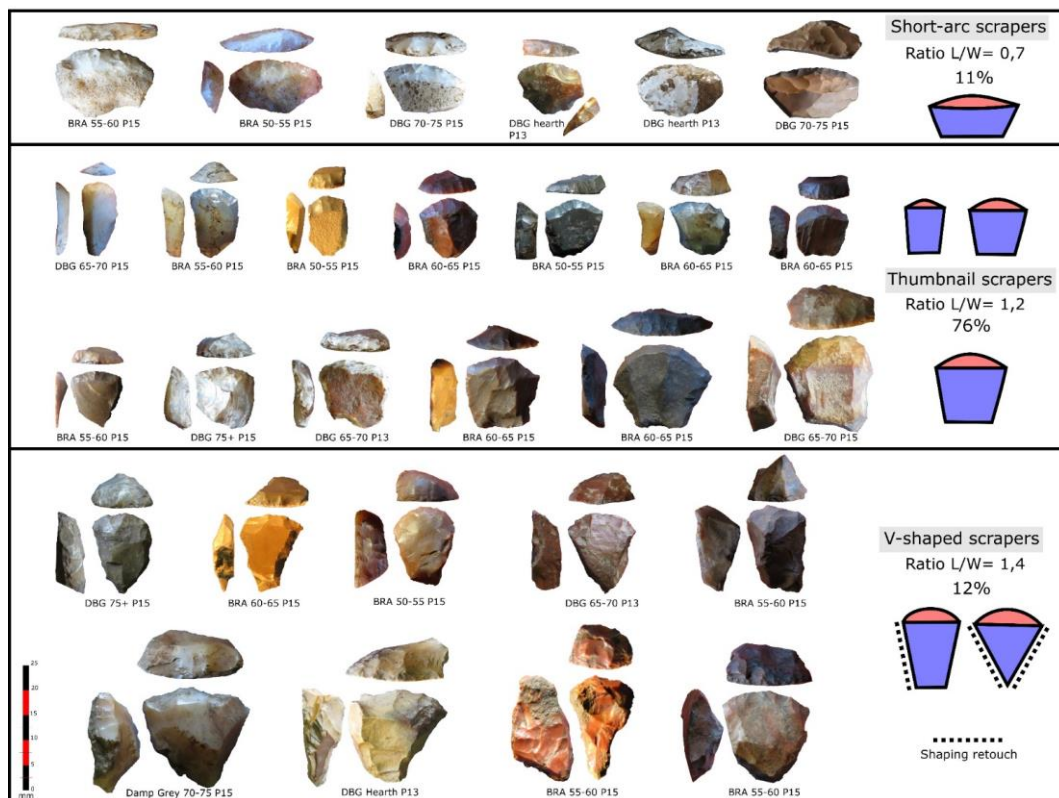


Figure 5.50. Thumbnail, V-shaped and short-arc scrapers

5.6.4. Discussion of the three types recognised at Balerno Main Shelter

Following this classification, I conducted further analyses to refine the nature of the morpho-functional typology, and to investigate the potential reduction process from one type to another. I accordingly provide a detailed description of the units forming the scrapers and discuss their differences and similarities. This part of the analysis raises questions on how the scrapers were functioning.

Regarding the dimensions of the three scraper types, I note that the length/width ratio differs between scraper types. Student t-tests comparing the ratio of all types were run. There is a significant difference in the ratio scores for thumbnail (mean=1,2, standard deviation=0,3) and short-arc (mean=0,7, standard deviation=0,1) scrapers, $t(103) = 17,9$, $p < 0.05$; for thumbnail and V-shaped (mean=1,4, standard deviation=0,3) scrapers, $t(56) = 3,8$, $p < 0.05$; and for V-shaped and short-arc scrapers, $t(52) = 13$, $p < 0.05$. T-tests comparing the length, *front* width, base width, and thickness per scraper type were also carried out. The V-shaped scrapers are thicker and longer than the other two types (Fig. 5.51) and tend to have steeper *front* angles. This suggests the selection of thicker and longer blanks, potentially increasing the life of the tool. The short-arc scrapers have thickness

measurements similar to the thumbnail scrapers but are much wider (Fig. 5.51). The base width of the short-arc scrapers is significantly different from thumbnail and V-shaped scrapers. Furthermore, their technological orientation differs. These observations support the hypothesis that different blanks were used for each type, and that each scraper type has an independent reduction sequence.

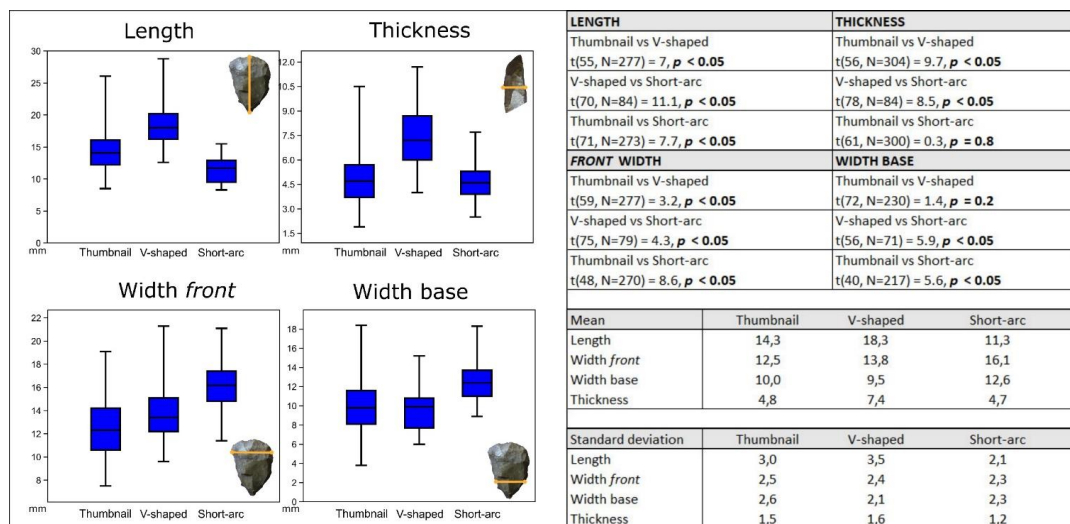


Figure 5.51. Scraper measures and comparisons per type

I also noted similarities among the thumbnail and V-shaped scrapers. The *front* widths of these scrapers, although significantly different, have close means, with 12,5 mm for the thumbnails and 13,8 mm for the V-shaped. The base widths are not significantly different, suggesting that the base widths of V-shaped scrapers are regularised and normalised to a dimension similar to that of the thumbnail scrapers. The coefficient of variation of the width base is 26% for thumbnail scrapers, 22% for V-shaped scrapers and 18% for short-arc scrapers.

When looking at the front morphologies, we see differences between the three types. The thumbnail and V-shaped scrapers have either a convex or straight-convex *front*, whereas the short-arc scrapers have a straight-convex front morphology (Fig. 5.51). After exclusion of the 'straight' *front* category (not enough individuals), I ran a χ^2 test comparing the number of convex and straight-convex values for the three scraper categories, which gave significant differences: χ^2 (2, N=329) = 11,4, $p < 0.05$.

The scrapers also tend to have different body morphologies. V-shaped scrapers mainly have trapezoidal-to-triangular body morphologies, whereas the thumbnail scrapers have more

quadrangular-to-asymmetric body morphologies (Fig. 5.51). The short-arc scrapers are mainly quadrangular to asymmetric, with a very low number of trapezoidal-to-triangular individuals. V-shaped scrapers with square and quadrangular bodies also occur. However, I still classified these artefacts as V-shaped, as their divergent shape was intentionally created by an abrupt retouch. The remaining variability observed for the thumbnail scrapers' bodies corresponds to the shape of the blank selected. I ran a χ^2 test comparing the different body morphologies per scraper type, which is significant: $\chi^2 (6, N=291) = 41,2, p < 0.05$.

I now come to the edge angles of these scraper categories. The values of the *front* angles per category are significantly different: $\chi^2 (4, N=345) = 21,9, p < 0.05$. We notice that the *front* angles of the thumbnail and short-arc scrapers have values lying between 50° and 60° (Fig. 5.52). On the other hand, the V-shaped scrapers have steeper *front* angles, more than half of them measuring between 70° and 90°. These results mean that some of the V-shaped scrapers may reflect more intense cycles of reduction. The results should, however, be understood first with regard to the nature of the selected blanks that were significantly thicker for the V-shaped category than for the two others (see Kuhn 1990). Ultimately, the different properties of the *front* edges might also relate to different scraper use.

When looking at the side edges of the blanks for each category, we see that the V-shaped and short-arc scrapers tend to have steeper sides than the thumbnail ones. This difference is explained by the steep retouch on the V-shaped scrapers, and by the frequent occurrence of a side platform on the short-arc scrapers, but also by the occurrence of breaks (N=89, i.e. 21%).

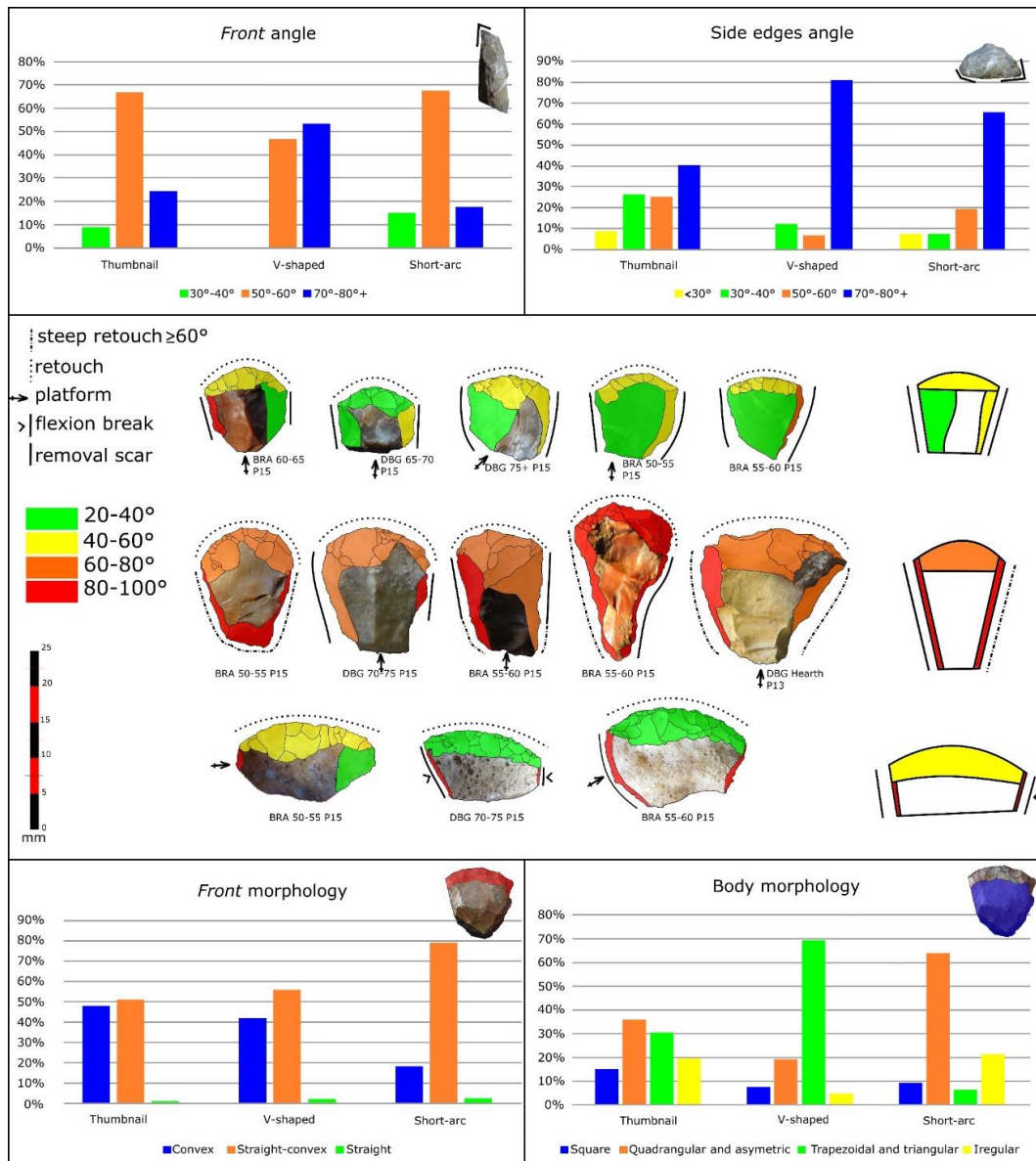


Figure 5.52. Angle measures, front and body morphologies per scraper types

On the 89 broken scrapers, 21 have a 'flexion break' (Fig. 5.53), 24 have a 'neat break' on which the orientation is visible, and the rest (N=44) have a 'neat break' without visible orientation. These breaks are either perpendicular (side of the scraper broken) or transversal (parallel to the *front* axis). Flexion breaks have a visible orientation and a 'tab' (*languette*). These kinds of breaks are created by the application of a constant force on a piece which is built-in or held on one or two sides, by bending it until rupture (Bertouille 1989, 1991). It is also described by Fischer and Rasmussen (1984) as a 'bending fracture'. Following Bertouille (1989, 1991) and Chesnaux (2014: 46), it is argued that the presence of a tab

strictly attests to the flexion break stigmata. A ‘neat’ break does not have a tab but may have a visible orientation.

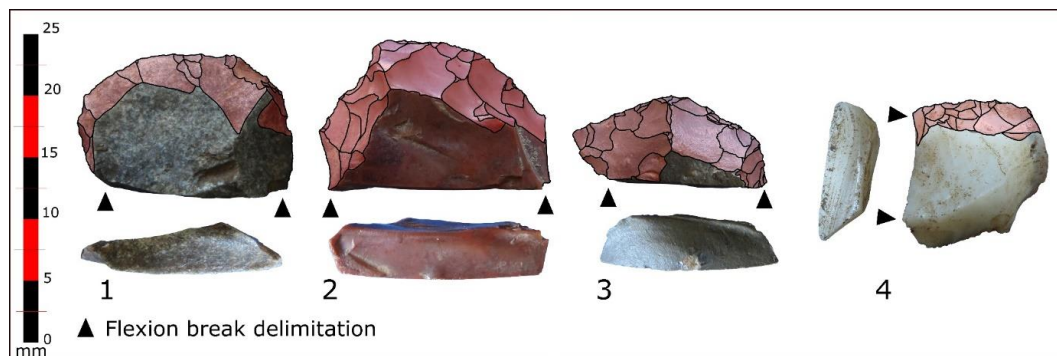


Figure 5.53. Flexion breaks on scrapers

The breaks with a tab are mostly transversal (71%) and all occur on thumbnail scrapers. Only six flexion breaks are perpendicular, including five thumbnail scrapers and one short-arc scraper. When including breaks with an orientation but no tab, eight other thumbnail scrapers have a transversal break, as well as seven additional short-arc scrapers. It is interesting to note that for thumbnail scrapers, flexion breaks occur transversally or perpendicularly, whereas for short-arc scrapers, they only occur perpendicularly.

These kinds of fractures can be associated with different phenomena: intentional snapping, break during use, break during sharpening, or by trampling. On BMS scrapers, the force was applied from the ventral to the dorsal surface in 95% of the cases and can be called ‘direct flexion’ (Rigaud 1977). This regularity in the flexion orientation indicates that these breaks are not random and likely not due to post-depositional agents. Regularity in the location of these breaks on the thumbnail (transversal) and short-arc scrapers (perpendicular) also suggests a repetitive phenomenon. Therefore, breaking of the scraper during use appears to be a plausible hypothesis. Nevertheless, intentional breaks may have been marginally made, as deduced from one scraper showing a flexion break associated with a bulb of percussion (Fig. 5.53).

5.6.5. What are the ‘Wilton’ scrapers at Balerno Main Shelter?

The scraper assemblage at BMS is consistent with the Wilton scraper collections as described by J. Deacon (1984a) and others (H.J. Deacon 1976; Humphreys & Thackeray 1983; Forssman 2014a). In order to extrapolate this data and establish comparisons with other sites, we first need to synthesise our results and formulate interpretations.

The BMS scrapers are made of two main raw materials, chert (70%) and agate (28%), although quartz, dolerite and quartzite have been worked occasionally. The preference for CCS raw materials for manufacturing tools is rather common in other Wilton sites of the SCLA (e.g. Forssman 2014a, van Doornum 2005), though quartz always represents a substantial proportion of the assemblages. The selection of these two raw materials to manufacture scrapers likely relates to their mechanical (e.g. control of the fracture) and functional (e.g. hardness of the raw material) properties.

The lithic study shows that the blanks selected and transformed into scrapers were flakes, mostly associated with a free-hand percussion. These flakes were likely selected at different moments of the reduction sequences (starting from the initial stages as seen by the selection of cortical blanks). The flakes used for V-shaped scrapers are rather thick and cortical, and probably derive from phases of preparation of the cores. Thumbnail and V-shaped scrapers tend to be made of thinner blanks, and could be derived from more varied moments of the extraction sequences. In any case, bladelets and elongated flakes displaying bladelet removal scars are not used to make scrapers. This indicates that most scrapers' blanks correspond to blanks extracted 'around' the bladelet extraction sequences.

All data converge to indicate that the manufacture of scrapers was not associated with a specific *chaîne opératoire* devoted to the production of scraper blanks. On the contrary, I suggest that blanks were selected at different stages and were potentially associated with different reduction sequences and core types. It is also noted that the longitudinal profiles of the scrapers tend to be rectilinear, which is consistent with the blank production at BMS.

Typologically speaking, scrapers from BMS are most usually end-scrapers with an active part that has been shaped in the technological axis of the blank. Dimension is one of the main criteria in their definition, as they are all microlithic scrapers and hardly ever exceed 25 mm in maximum dimension.

In brief, the typical BMS scraper is squarish in morphology with a mean dimension of around 14–15 mm. However, beyond this archetype, I recognise three morphological categories of scrapers that differ with regard to the characteristics of their active and passive units:

- The first category recognises the thumbnail end-scrapers, which can be distinguished by their square-to-quadrangular body. Their mean dimensions are as follows: 14 mm length, 12,5 mm width and 5 mm thickness.
- The second category is the V-shaped end-scrapers, which can be distinguished by their retouched sides and divergent trapezoidal-to-triangular body. Their mean dimensions are: 18 mm length, 14 mm width and 7 mm thickness.
- The third and last category is the short-arc scrapers. Typologically speaking, they differ in the sense that they are predominantly side-scrapers. Their mean dimensions are: 11 mm length, 16 mm width and 5 mm thickness.

This classification relates to broader technological and metric properties. The thumbnail and the V-shaped scrapers have similar *front* widths (ca. 13–14 mm wide), but the V-shaped scrapers are significantly longer and thicker. The V-shaped scrapers have sides that have been shaped by retouch, for the desired morphology that is more triangular than square. Whether V-shaped scrapers illustrate an adaptation to thicker blanks (i.e. a variation of thumbnail scrapers) or a desired functional morphology (i.e. a tool type) still requires clarification. Short-arc scrapers are easily distinguishable because of their significantly wider *fronts* and because of the significantly shorter length of their body.

The categories I recognise do not represent different stages of discard, and there is no possible succession from one morphological type to another. It is also worth recalling that the scrapers from BMS have experienced a low intensity of transformation, as illustrated by the overlaps observed between the dimensions of the unmodified blanks and the scrapers. 21% of the scrapers present a spur, suggesting that the tools were abandoned after reshaping of the *front*, and 17% of the scrapers are broken.

Finally, I note differences between the breaks observed on the three scraper types: the thumbnail scrapers have flexion breaks that are predominantly parallel to the *front*, the short-arc scrapers have flexion breaks that are predominantly perpendicular to the *front*, while the V-shaped scrapers are rarely broken.

If we consider the diachronic distribution of the scrapers, from the pre-pottery layers to the pottery-bearing layers, I do not observe marked changes in the scraper. Thumbnail scrapers

are the most represented type in both phases (Table 5.87). There are, however, proportionally more thumbnail scrapers in the pre-pottery layers, which has for now no straightforward interpretation. Further comparative studies on other assemblages would be necessary to confirm this trend and develop interpretations.

Phase	Thumbnail	V-shaped	Short-arc	Total
Pottery-bearing layers	56 62%	18 20%	17 19%	91 100%
Pre-pottery layers	175 81%	21 10%	20 9%	216 100%
Total	231	39	37	307
%	75%	13%	12%	100%

Table 5.87. Percentage of scraper types per archaeological phase

5.6.6. The scrapers in motion

Use-wear studies are not yet widespread for LSA contexts, and there are still many unknowns concerning the function and functioning of the scrapers during the Wilton, as well as the way they were handled or hafted (see Rots 2005 for a study in a European context). Wilton scrapers are often associated with hide-working (e.g. H. Deacon & J. Deacon 1980), although the association is more assumed than demonstrated (for an exception, see Law de Lauriston 2014). A recent use-wear study on the scrapers of the late Holocene site of Little Muck Shelter, near BMS, indicates that wood, bone and hides were also worked with scrapers that seem to be typologically similar to the ones at BMS (Forssman *et al.* 2018).

Hafting of microlithic elements seems to be a common practice, although it is not necessarily systematic. It is, for example, not the case for a Holocene segment found inserted into an organic mastic component from Elands Bay Cave (Charrié-Duhaut *et al.* 2016). According to the authors, “*there is no indication or marks that the adhesive was used to fix the tool into a wood or bone handle*” (Charrié-Duhaut *et al.* 2016: 289). Following ethnographic studies, we also know that a wide array of hafting systems exists, as well as varied scraper functioning (Gallagher 1977; Keeley 1982; Mansur-Franchomme 1987; Plisson 1987; Stordeur 1987; Weedman 2006; Beyries & Rots 2008). Mansur-Franchomme (1987), in her study of hafted scrapers in Patagonia, highlights the fact that scrapers hafted in similar ways can be used for different actions, leaving different use-wear patterns on the tools. Her study also demonstrates that similar morphologies of scrapers

could be hafted into very different hafting systems, depending on the area and the people using them.

An iconic example of a Wilton ‘hafted’ scraper has been found at Boomplaas in South Africa (H. Deacon & J. Deacon 1980). The scraper is covered in mastic and only its *front* is free of adhesive, suggesting that the distal retouch edge is the active unit of the tool. Traces of mastic were also found on scrapers from the site of Melkhoutboom covering similar areas of the pieces (H. Deacon 1976). Hafted scrapers were most likely attached to a wood or bone handle (H. Deacon 1966), following different orientations and inclinations (Bousman 2005). However, there is no consensus on that general question, and some authors (e.g. Opperman 1987) hypothesise that ‘Woodlot’ scrapers with a lateral retouch were end-mounted, and were not necessarily hafted in mastic, but rather, for instance, in wood.

At BMS, there is no direct evidence of adhesives or wood hafts. Nevertheless, different observations allow for a discussion of the way(s) in which the scrapers were hafted, or not. Several authors link the control of the scraper size—especially the width—with the hafting system (Clark 1959: 232; Sampson 1974: 298; H. Deacon & J. Deacon 1980: 37). From this perspective, the shaping of the body of the scraper is intended to normalise the passive unit (morphology and dimensions). The intensity of the shaping may vary following the nature of the initial blank. This hypothesis has been proposed for different contexts, such as for the southern African Wilton (H. Deacon 1976: 58; Malan pers. comm. in Schweitzer 1988: 48; Brooker 1989: 24), and the Late Oakhurst/Early Wilton Woodlot scrapers (Opperman 1987; Mitchell 1993, 1994), as well as in other parts of the world (e.g. Shott & Scott 1995). At BMS, we saw that V-shaped scrapers were made on thicker blanks and were more intensively shaped than the thumbnail scrapers. Despite these differences, V-shaped and thumbnail scrapers fall within the same dimensional variability, especially the *front* width, suggesting that the shaping was intended to regularise the dimensions of thicker specimens, and not to create various and interchangeable active units. This, in turn, suggests that these two scraper types may have been integrated into a similar hafting system.

Apart from criteria that relate to dimensions, breaks can also be indirect evidence of hafting (Odell 1981; Keeley 1982). At BMS, the occurrence of flexion breaks on thumbnail and

short-arc scrapers is of interest. Three hypotheses are favoured to explain the origin(s) of the breaks:

- Scrapers were intentionally broken in order to limit their width or length, or to create a 'natural back'. The intentional snapping of flakes used for scraper blanks has, for instance, been argued at the site of Melkhoutboom (H. Deacon 1976: 64). At BMS, only one flexion break bears technical marks that are suggestive of an intentional break.
- The flexion breaks may result from an accident during use. The scraper would have snapped because of the pressure applied through the handle, and the break would have been located preferentially at the contact between the active and the passive units (i.e. at the limit of the haft). Shott and Scott (1995: 58–9), who call flexion breaks “*bend or snap fractures*”, consider them to be evidence of hafting. The force applied on the scraper, made possible by the hafting, would create this type of fracture: “*They are unlikely to have occurred in hand-held specimens because sufficient loading for fracture could not easily have been imposed by hand*”. For Keeley (1982), it is the increased force exerted on the hafted scraper that may lead to the creation of flexion breaks. A similar idea is expressed by Grimes and Grimes (1985: 41), who note that when the piece is held in a rigid shaft, the break is more likely to occur “*where the tool emerges from the socket*”. Most broken specimens from BMS are broken at the contact between the active and passive units, which is consistent with the hafting hypothesis and is also supported by the archaeological example from Boomplaas (H. Deacon & J. Deacon 1980).
- Flexion breaks may have occurred during sharpening of scrapers, due to vibrations and bending forces caused during knapping (Rigaud 1977; Shott & Scott 1995; Guéret 2013). For Rigaud (1977) and Guéret (2013), a flexion break may only occur if the scraper is hafted while resharpened. Breaks could develop randomly on the *front* (depending on the location and orientation of the percussion), and if hafted, could develop preferentially on the limit of the haft, as may be the case for some BMS scrapers.

According to Stordeur (1987), hafting of scrapers in alignment with the handle would not create as many breaks as hafting of scrapers perpendicularly to the handle. In the latter case, the force acts as a flexion on the tool and can create oblique breaks. At BMS, the flexion breaks are mostly direct, meaning that the force was applied from the ventral to the dorsal surface. This orientation of flexion breaks is associated by Rigaud (1977: 37) with a motion in a negative cut (*coupe negative*), meaning that the ‘attack angle’ (*angle d’attaque*) is located at the intersection between the ventral surface and the retouched edge. In this modality, the scraper may be used in a motion orientated toward and not away from the user (Fig. 5.54). Inferring from an implement mounted on a bird bone from Plettenberg Bay (H. Deacon 1966), H. Deacon and J. Deacon (1980) suggest that the scraper with mastic from Boomplaas Cave may have been mounted almost perpendicularly to the haft (Fig. 5.54). They refer to it as *side mounted*. Their interpretation is consistent with our observations and I suggest that the BMS thumbnail scrapers were potentially similarly hafted. Two fragments of worked bones with engraved slash-marks, were also found in BMS late Holocene assemblage (Fig. 4.12, van Doornum 2005), that could relate to a similar practice.

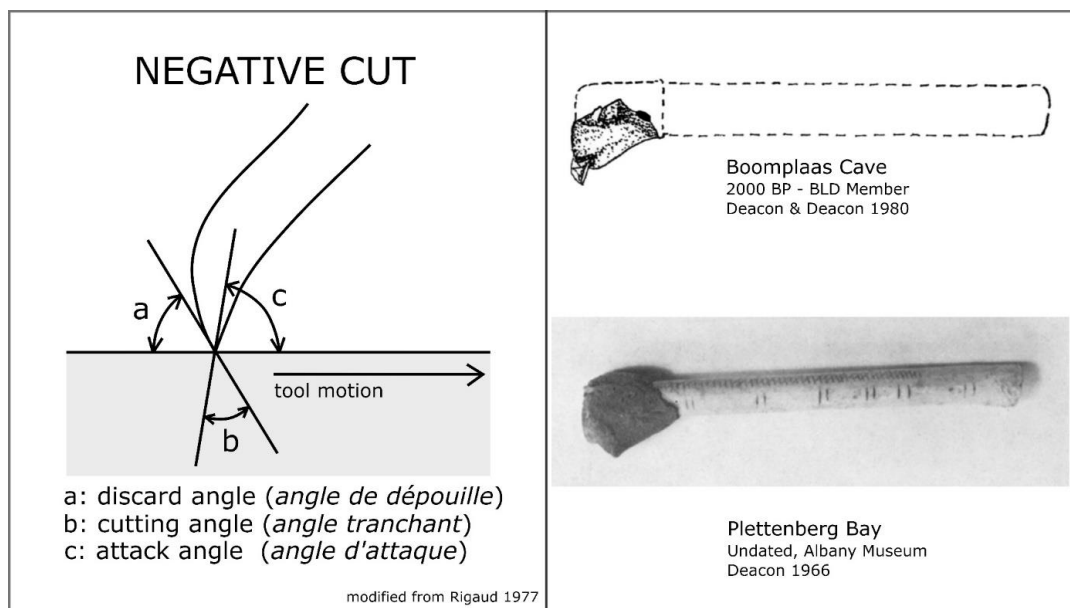


Figure 5.54. Proposed hafting method and tool motion

The short-arc scrapers, however, illustrate a different tool conception. The technological orientation of these scrapers differs from the others. The prehensile part is short and the *front* almost always straight-convex. We also notice the fact that flexion breaks, when they occur, are located on the sides of the tool and not in its mesial part. It is therefore likely

that this tool was used in a different motion and/or for different purposes from the other two categories.

For the V-shaped scrapers, I highlighted that their sides are shaped down to reach a similar width to that of the thumbnail scrapers. The absence of flexion breaks is likely due to the fact that V-shaped scrapers are thicker, and are therefore less likely to break. It could also mean that the V-shaped scrapers were end-mounted, as has been argued for Woodlot scrapers (Mitchell 1993). As Stordeur (1987) recalls, a ‘distal’ mounting, or ‘end-mounting’, consolidates the scraper with the hafting system, creating fewer or no breaks. However, the similarities between the thumbnail and V-shaped scraper widths may suggest that they were integrated into a similar hafting system, rather than reflecting two different hafting modalities. We should, however, not diminish the influence that different hafting methods might have had on the material being worked, or, conversely, the influence that the manufacture of particular end products might have had on how the tool was fixed to its handle.

5.6.7. Conclusion on the scraper study

In the present study, I focused on the scraper collection from BMS and selected 420 specimens from the Final LSA (dated to 262–59 cal. BC) and the first Ceramic Final LSA occupations (dated to cal. AD 651–857 and cal. AD 877–1151). The classification I used emphasised morphometrical criteria and summarised variations observed in the structure of the tools (active versus passive units). I abandoned the equivocal ‘functional’ terminologies such as ‘scraper-adze’ (in this collection, removals on the sides of the scrapers are intentional and not functional) and I also distanced my analysis from dimensional categories (J. Deacon 1984a).

My study resulted in recognising one main tool type that is squarish in morphology and microlithic in dimension (ca. 14–15 mm). This main tool type overlaps the morphological attributes of the so-called ‘thumbnail’ end-scrapers and constitutes ~76% of this sample. In addition to this main type, I recognised two other types: the V-shaped end-scrapers and the short-arc scrapers. While the thumbnail and V-shaped end-scrapers may have been hafted similarly (for a transversal use), the attributes of the short-arc scrapers suggest that they represent a distinct functional population.

This study shows technological and functional variations within ‘Wilton scrapers’ with the existence of three main types. No diachronic change is observed from the pre-ceramic (Final LSA) to the ceramic occupations (Ceramic Final LSA), which is consistent with the technological and typological continuity observed in the lithic assemblages of the Limpopo River Basin before and after the appearance of the first pottery, and before and after Iron Age settlement (Van Doornum 2005; Forssman 2014a).

Wilton scrapers find their technological roots within the southern African LSA (J. Deacon 1984a), but they may have been produced and used by people with different, or in transitional, modes of subsistence. As such, Wilton scrapers embody a category of actions (scraping) that were practised in varied cultural and economic contexts. There is now a need to investigate the Wilton scrapers ‘in action’, in order to investigate the variety of steps and intentions that were likely associated with this functional morphotype.

Thus, a Wilton scraper, such as observed at BMS, is a formal tool that accompanied the cultural and technological changes that southern African populations experienced from ca. 8 000 cal. BP, and persisted after the appearance of pottery and Iron Age communities. As I will further develop in the Chapter 6, I argue that scrapers, and stone tools, are not ‘monolithic cultural tools’ but may be associated with diverse subsistence economies and groups of people. In the next section, I present the analysis of the geometrics and convergent tools of BMS.

5.7. The geometrics and convergent tools

As for the scrapers, all backed pieces and convergent tools from the pre-pottery layers of the squares P13 and P15 were integrated, as well as the ceramic layers Brown Red Ash (BRA) and Grey Ash. All backed artefacts from the layers without spits Damp Grey were also looked at. In total, I analysed 125 geometrics and convergent tools (Table 5.88).

Phase	Layer	Spit	Geometrics	CT
Pottery-bearing layers	Grey Ash	x	8	0
	BRA	x	3	0
		to-40	0	0
		40-45	0	0
		45-50	5	0
		to-50	5	0
		50-55	10	0
		55-60	16	2
		60-65	4	0
		Base	6	0
	DBG	55-60	4	0
		60-65	9	2
Total pottery layers			70	4
Pre-pottery layers	DBG	65-70	25	3
		70-75	15	3
		75+	3	0
	DBG Hearth		2	0
Total pre-pottery layers			45	6
Unknown	DBG	x	8	1
Grand Total			115	10

Table 5.88. Sampled assemblage of geometric and convergent tools

5.7.1. Results

The geometrics and convergent tools from BMS are microlithic. They measure on average 15,4 mm length, 6,7 mm width and 2,9 mm thickness (Table 5.89). Using a classic typology, we see that segments are dominating the assemblage, followed by backed points and borers (Table 5.90). A total of 31 pieces were not classified because too broken.

All	Length	Width	Thickness
Mean	15,4	6,7	2,9
Median	15,7	6,2	2,8
Min	7,5	3,2	1,3
Max	25,3	12,2	5,7
Stand. dev	3,7	2	0,9
N	70	55	125

Table 5.89. Geometric and convergent tools measures

Type	Sub-type	N	%
Geometrics	Segment	57	46%
	Triangle	8	6%
	Trapeze	3	2%
Convergent backed piece	Backed point	10	8%
Convergent tool	Borer	6	5%
	Truncated blanks	2	2%
	Double-backed	2	2%
	Awl	1	1%
Indeterminate	Broken	31	25%
	Miscellaneous	5	4%
Total		125	100%

Table 5.90. Backed pieces and convergent tool types

As shown in Fig. 5.55 most of the complete backed tools are geometrics (75%), followed by convergent tools (25%). All the geometrics are off-centred double-points, whereas the convergent tools are sub-divided into different types.

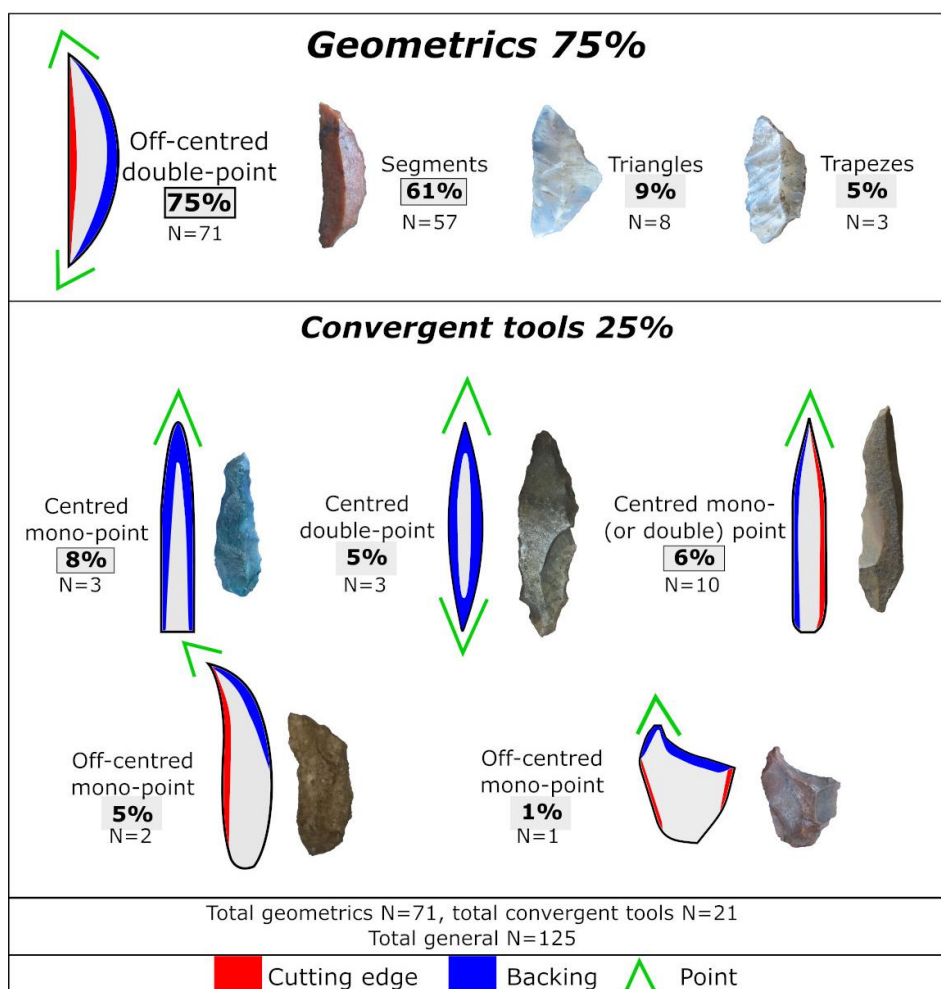


Figure 5.55. Techno-functional typology for geometrics and convergent tools

The backed pieces are made of chert (48%), agate (41%) and quartz (10%). There are no backed pieces in dolerite and quartzite. The selected blanks vary depending on the backed artefact types, but are mostly non-cortical (88%), thin (<3mm) and rectilinear (67%). In order to discuss the blank selection, I compared the dimensions of the backed tools, bladelets and flakes (Fig. 5.56). The backed pieces' length and width are significantly different compared to that of the bladelets. However, I note that it differs by only a few millimetres. Their thicknesses are almost identical, and not significantly different. In total, at least 37% of the backed tools are bladelets or elongated blanks. On most blanks, however, it is impossible to assess if flakes or bladelets were used.

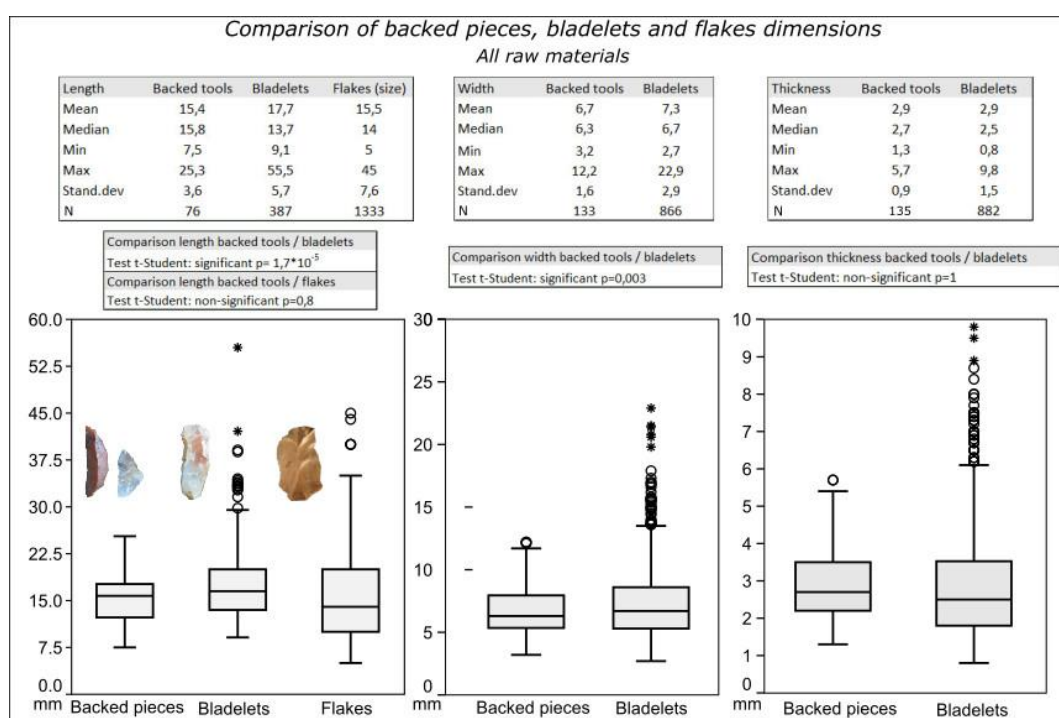


Figure 5.56. Backed tools' dimensions against flakes and bladelet's dimensions

Because most bladelets are rectilinear, non-cortical and with similar thicknesses, I hypothesise that these blanks, together with thin elongated flakes, were preferentially selected to make most of the backed pieces. The absence of bipolar blanks also supports this hypothesis, suggesting that the selected blanks were extracted in between the opening and discard of the chert and agate cores. Furthermore, no segmentation technique such as a microburin or an intentional snapping was observed. I further hypothesise that the thin and elongated blanks that were selected were then directly shaped down by retouch.

Concerning the shaping of the blanks, we see that both direct and crossed retouch were realised. The use of an inverse retouch (creating a crossed backing) mostly occurs on the thicker part of the blank, for regularising the profile of the tool (Fig. 5.57).

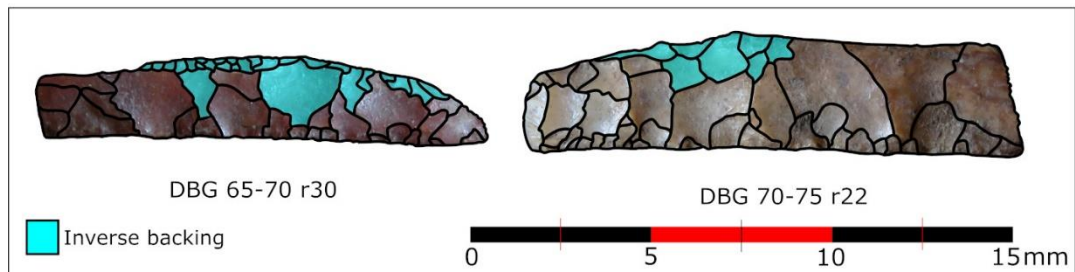


Figure 5.57. Inverse backing on backed tools

Concerning how the backing was made, Pelegrin (2004) lists three techniques: direct stone percussion, soft-hammer pressure-flaking, and rubbing with a soft-hammer stone (*égrisage*). The direct stone percussion often creates rather irregular removal scars, whereas the pressure-flaking creates more regular removal scars. This last technique may also create ‘micro-overshoots’. The rubbing of the edge with a stone creates regular, but non-extensive backing. All these techniques may be combined during the shaping of one tool.

For the assemblage from BMS, the backing removal scars appear more or less regularly depending on the artefacts, and no specific trend was noted. It is difficult to assess if direct percussion or pressure-flaking was used. A non-extensive retouch overlapping the backing is however commonly observed (Fig. 5.58), and could be characteristic of a rubbing of the edges with a stone. This technique could also have been used on the very thin backed pieces, such as the r89 (Fig. 5.58).

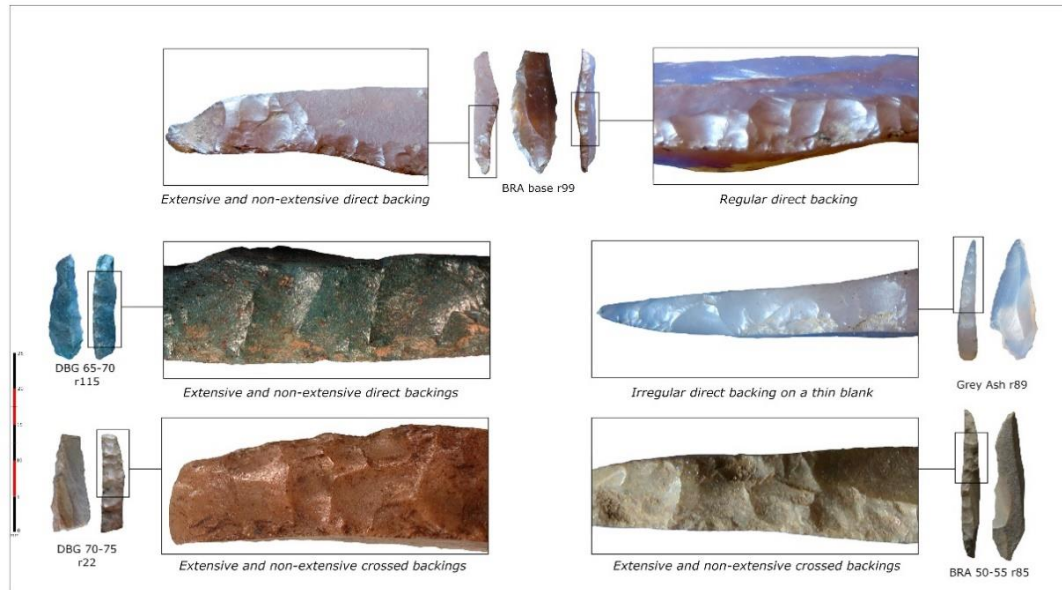


Figure 5.58. Backing types

5.7.2. The geometrics

The geometric backed pieces are all off-centred double-points. They have two opposite points, and a cutting edge opposed to a backing. There are 49 complete geometrics, and 22 broken pieces associated with this category.

The complete geometrics measure on average 14,9 mm length, 6,5 mm width and 2,7 mm thickness (Fig. 5.59). They are made of agate (48%), chert (38%) and quartz (14%), and are mostly non-cortical (93%). On all geometrics, at least 30% of the blanks derive from the bladelet production. Their profile is mostly rectilinear (78%) to slightly curved (22%).

Within these geometrics, three shapes were recognised: segments (N=57, 80%), triangles (N=8, 13%) and trapezes (N=3, 7%) (Fig. 5.59). Segments are largely dominating the assemblage.

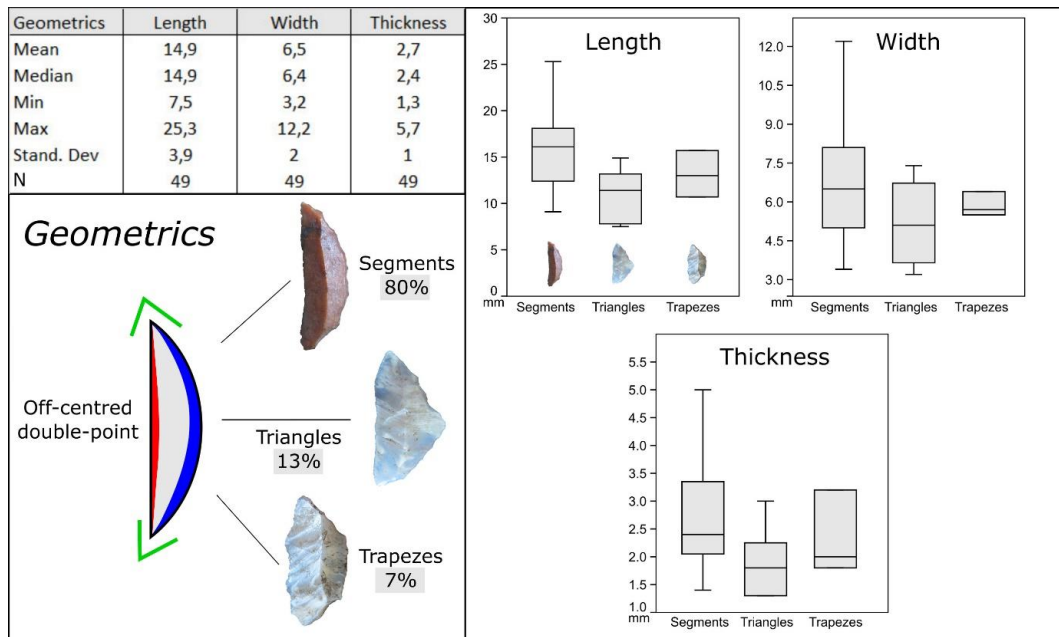


Figure 5.59. Geometric types' dimensions

As shown in Fig. 5.59, the segments are overall longer, wider and thicker than the triangles, and to a lesser extent than the trapezes. The length and thicknesses of the segments and triangles are significantly different, and their width not significantly different (Table 5.91). Because they are too few trapezes, their values were not integrated. The segments are equally made of agate and chert, whereas the triangles are preferentially made of agate (Table 5.92).

T-test	Segment vs Triangles
Length	Significant, $p= 0,006$
Width	Non-significant, $p= 0,09$
Thickness	Significant, $p= 0,02$

Table 5.91. Comparison of segments and triangles dimensions

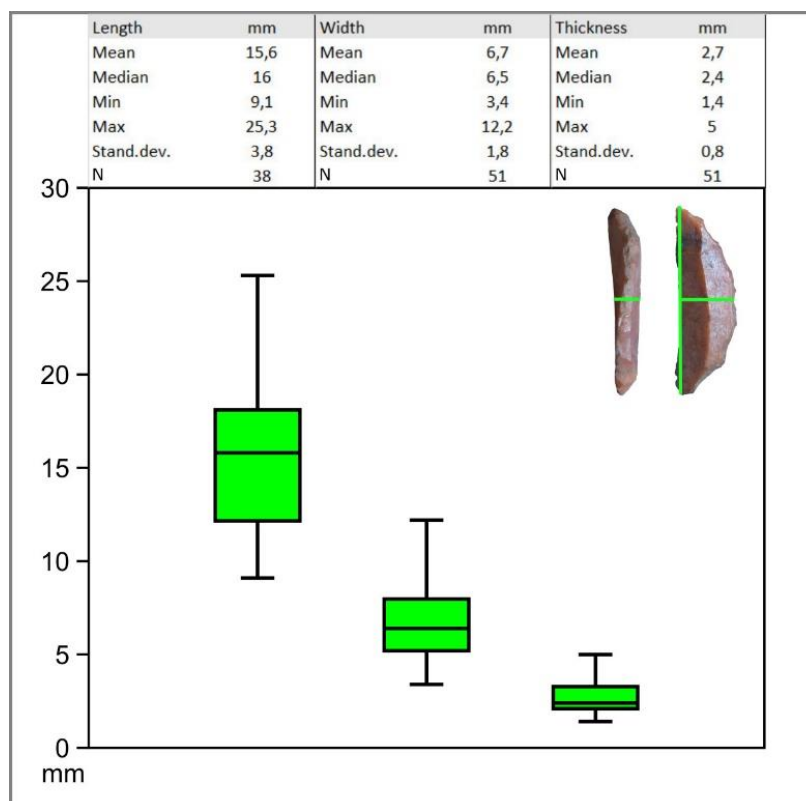
Raw material	Agate	Chert	Quartz	Indet	Total
Segments N	23	24	9	1	57
%	40%	42%	16%	2%	100%
Triangles N	7	1	0	0	8
%	0,875	0,125	0	0	1

Table 5.92. Number of segments and triangles per raw material

a. The segments

The segments (N=57 including 20 broken) measure on average 15,6 mm length, 6,7 mm width and 2,7 mm thickness (Graph. 5.19). I did not observe a difference of size depending

on the raw material used. The comparison between the length, width and thickness values are not significantly different (Table 5.93).



Graph 5.19. Segment's dimensions

Length	Mean	Median	Min	Max	Stand. Dev	N																												
Agate	14,5	14,9	9,1	20,4	3,3	17																												
Chert	16	14,4	10,8	25,3	4,9	12																												
Quartz	17,1	16,7	12,1	22	3,1	7																												
Width	Mean	Median	Min	Max	Stand. Dev	N																												
Agate	6,5	6,5	3,4	8,8	1,7	22																												
Chert	6,4	5,6	4,5	12,2	1,9	19																												
Quartz	7,7	8,2	4,2	9,7	1,9	8																												
Thickness	Mean	Median	Min	Max	Stand. Dev	N																												
Agate	2,4	2,2	1,4	5	0,8	22																												
Chert	2,8	2,6	1,9	4,2	0,7	19																												
Quartz	3,4	3,3	1,9	5	0,9	8																												
<table border="1"> <thead> <tr> <th colspan="7">Test t-student Agate-Chert</th></tr> </thead> <tbody> <tr> <td colspan="7">Length: non-significative p=0,4</td></tr> <tr> <td colspan="7">Width: non-significative p=0,9</td></tr> <tr> <td colspan="7">Thickness: non-significative p=0,09</td></tr> </tbody> </table>							Test t-student Agate-Chert							Length: non-significative p=0,4							Width: non-significative p=0,9							Thickness: non-significative p=0,09						
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Table 5.93. Segments' dimensions per raw material

The segments (Fig. 5.60) are non-cortical at 94%, and 32% (N=18) of them are directly associated with the bladelet production. The segments' profile is straight in 75% (N=38), slightly curved in 22% (N=11) and indeterminate in 4% (N=2) because too broken.

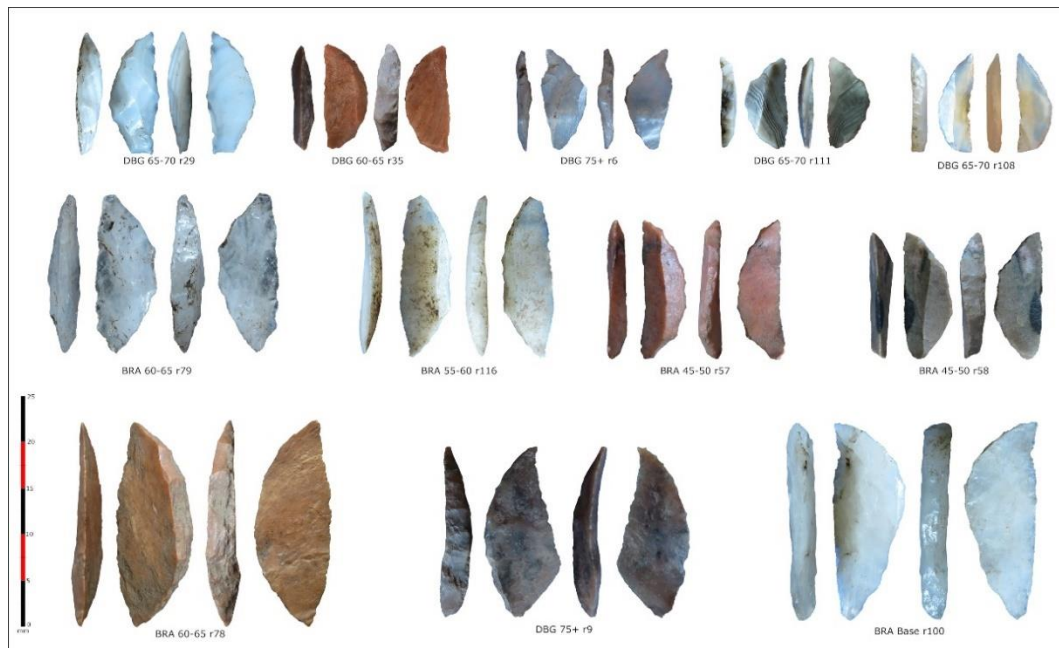


Figure 5.60. Segments

The cutting edge delineation of the segments is straight in 82% (N=42) of the cases, but may also be slightly convex or triangular, such as the piece r9 (Fig. 5.60). The backing is convex in 92% (N=47) and straight-convex in only 8% (N=4). It is located either on the left of the blank (37%, N=19) or the right (35%, N=18), and 27% (N=14) were indeterminate. The backing is most often direct (71%, N=36). In total, 35% (N=20) of the segments are broken (Fig. 5.61).

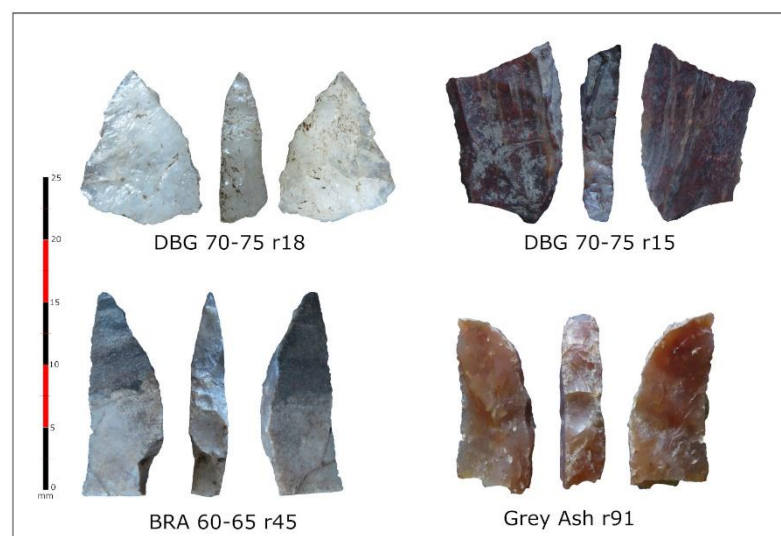


Figure 5.61. Broken segments

The breaks are transversal in 90% (N=17), and 10% (N=2) are impact burinations (Fig. 5.62). All the transversal breaks are neat. 37% (N=7) of the breaks are direct, 21% (N=4) inverse and 42% (N=8) indeterminate. Another segment is also crushed and flaked at a tip.

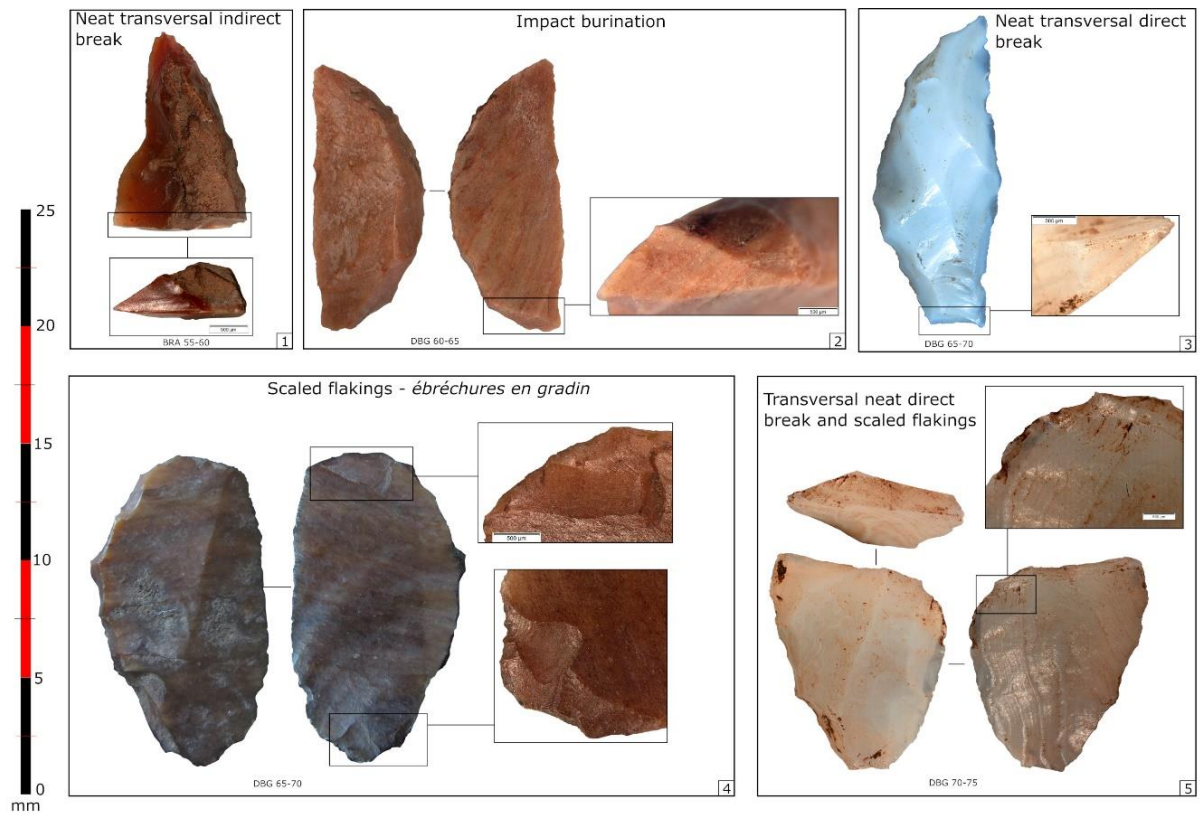


Figure 5.62. Break types on segments

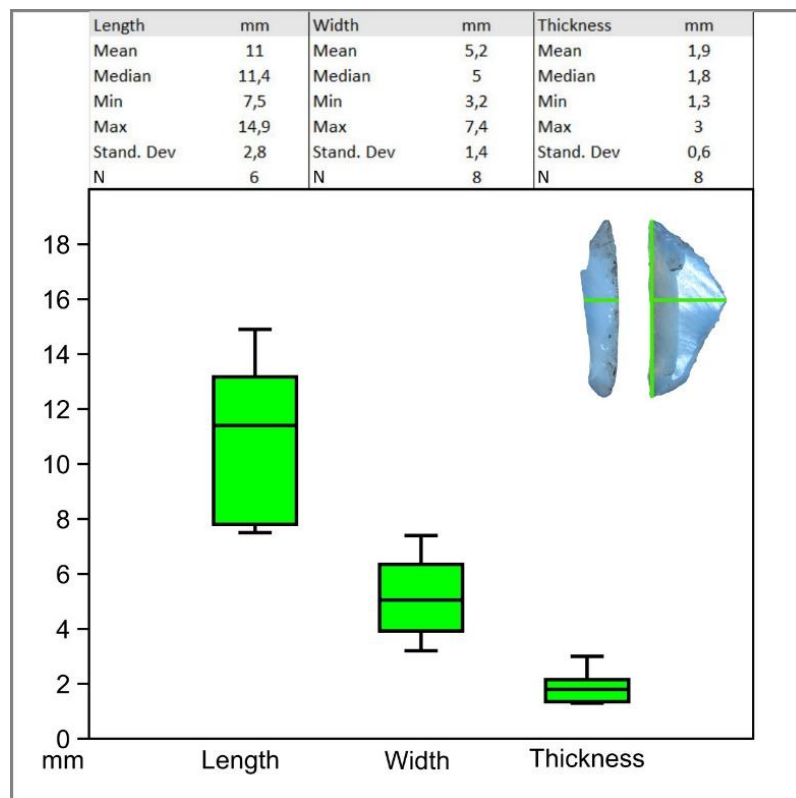
The neat breaks are not diagnostic, meaning that they may have been created through different processes including trampling, retouch or use. The absence of regularity in the break direction might reflect the plurality of these processes. On the other hand, burination of the tips are generally interpreted as impact fractures. Scaled flaking (*ébréchures en gradin*) with a similar orientation, perpendicularly or obliquely to the cutting edge, may also be impact stigmata (Chesnaux 2014: 60). Based on the present data published in the literature (both experimental and archaeological), I conclude that some of these artefacts were used as composite point components. However, considering the diversity of macro-scars that have been recorded, I do not exclude other interpretations and consider that various functions may relate to the use of the segments.

To summarise, the shape of the segments is standardised, with a convex to straight-convex backing opposed to a straight cutting edge, and two appointed tips. The blanks are non-

cortical, made on thin elongated blanks such as bladelets, the other being too difficult to determine. Either agate or chert blank were selected and rectilinear blanks chosen. The backing is mostly direct. Segments are generally damaged, potentially reflecting different processes. Among these, some are likely indicative of their use as arrow components, potentially as barbed implements.

b. The triangles

The triangles (N= 8 complete including 2 broken specimens) measure on average 11 mm length, 5,2 mm width and 1,9 mm thickness (Graph. 5.20).



Graph 5.20. Triangles' dimensions

All the triangles (Fig. 5.63) are non-cortical, and 63% (N= 5) of them are associated with the bladelet production. The triangles' profile is straight (N=6) and slightly curved in (N=2). Their cutting edges' delineation is straight in 88% (N=7) and concave in 13% (N=1). The backings are located on the left of the blank in 63% (N=5), on the right in 25% (N=2) and 13% (N=1) were indeterminate. The backing is direct in 75% (N=6).



Figure 5.63. Triangles

Two triangles are broken, and one is flaked on a tip. One of them is broken in both extremities by transversal inverse breaks, one neat and the other one by flexion (Fig. 5.64). Neat breaks are not diagnostic, but flexion breaks may be diagnostic of impact if the tab (*languette*) of the flexion break is higher than 1,8 mm (Chesnaux 2014: 60). In the case of this triangle, the tab is clearly visible, though it is not as long as 1,8 mm. However, given the small dimension of the piece, the length limit fixed by Chesnaux may be different. This piece may, therefore, have been used as a projectile component.

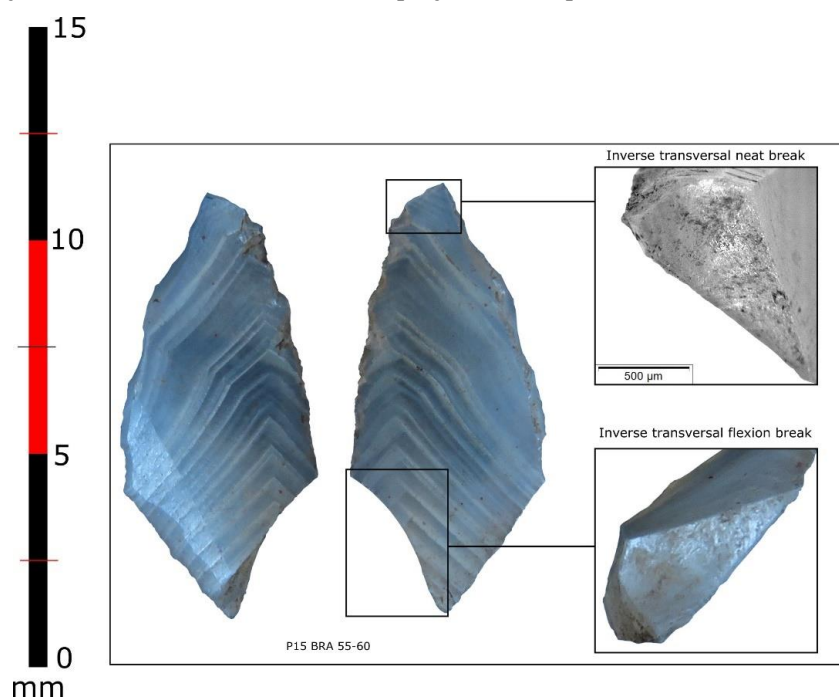


Figure 5.64. Broken triangle

In sum, triangles are regularly shaped, with two straight backings meeting around the middle of the piece, a cutting edge opposed to the backing and two points. The blanks are non-cortical, at least partly derived from a bladelet production. Rectilinear blanks were selected. The backing is direct in most of the cases.

c. The trapezes

The trapezes (N= 3) measure on average 13mm length, 6mm width and 2mm thickness (Fig. 5.65). All trapezes are made of agate (Fig. 5.66). Two are not-cortical, and one has less than 10% of cortex. One is made of a bladelet, and their profile is rectilinear. Their cutting edges are straight to concave. The trapezes have either two (N=2) or three backed edges (N=1), and the backing is always direct. One trapeze has an impact burination on both appointed ends (Fig. 5.67).

Length	mm	Width	mm	Thickness	mm
Mean	13	Mean	6	Mean	2
Median	13	Median	5,7	Median	1,8
Min	10,7	Min	5,5	Min	1,3
Max	15,7	Max	6,4	Max	3
Stand.dev.	3	Stand.dev.	0	Stand.dev.	1
N	3	N	3	N	9



Figure 5.65. Trapezes’ dimensions

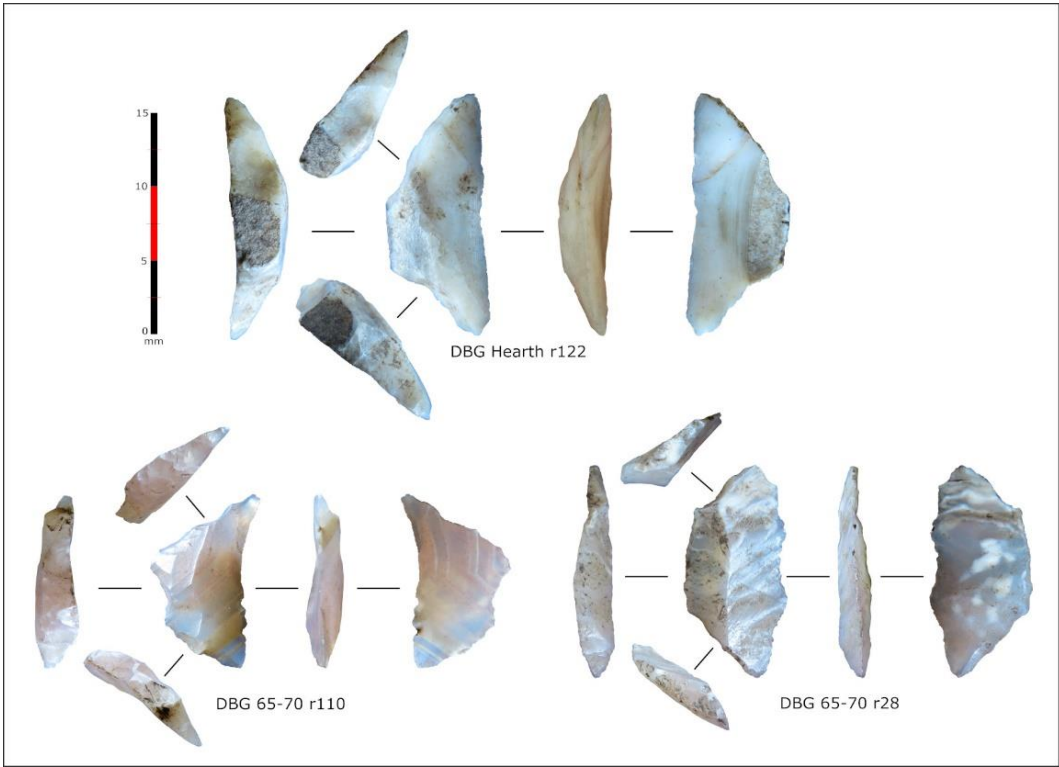


Figure 5.66. Trapezes

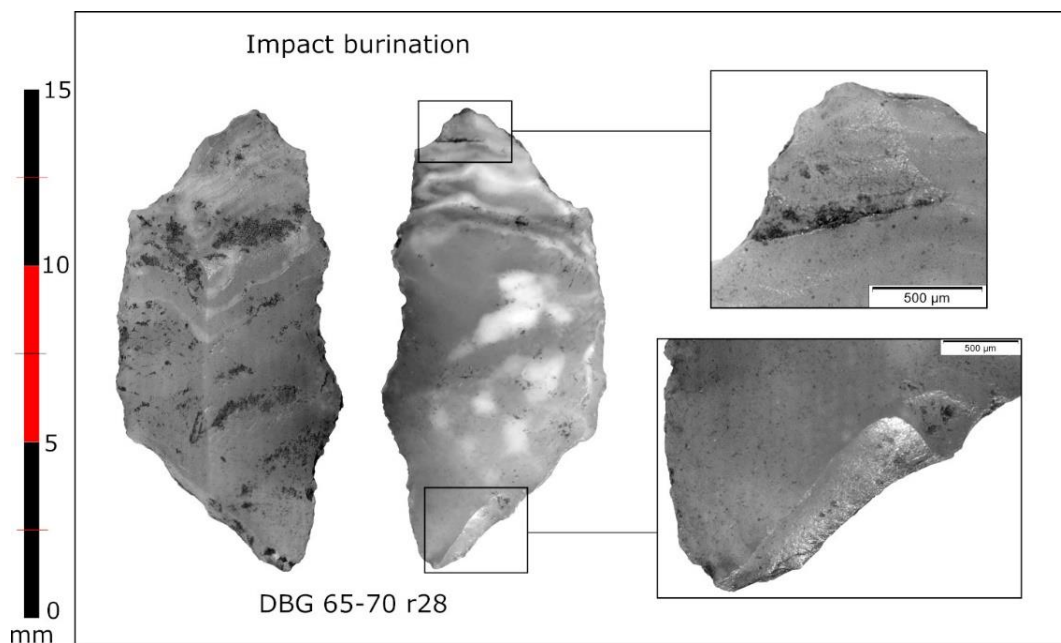


Figure 5.67. Impact burination on a trapeze

Trapezes are similar in many ways to segments and triangles: they have a straight cutting edge, and two appointed extremities. Only their backings differ. There are unfortunately too few pieces to hypothesise if trapezes may be a recurrent type or not. In one case, the discontinuous backing may be the result of an adaptation to the blank. Indeed, the lack of backing in the middle of the piece r122 (Fig. 5.66) is likely due to the presence of a steep cortex area. However, a similar explanation cannot be given for the other two artefacts.

5.7.3. The convergent tools

The convergent backed tools are a family of tools that integrates different sub-types. They all have the specificity to be convergent, with one or two opposite points. There are 17 complete convergent tools, and six broken pieces. The convergent tools measure on average 16,6 mm length, 6,4 mm width and 3,2 mm thickness (Fig. 5.68). They are made of chert (65%), agate (30%) and quartz (4%), and are mostly non-cortical (78%). On all convergent tools, 39% of the blanks derive from the bladelet production. Their profile is mostly rectilinear (91%).

The convergent tools have different functional properties. It is firstly possible to divide them between the ones with a cutting edge (N=15) and the ones without (N=8) (Table 5.94, Fig. 5.68). The convergent tools with a cutting edge are centred mono- or double-points (N= 10) or off-centred mono-points (N=3), as well as two miscellaneous. The convergent

tools without a cutting edge are centred mono-points (N=3) and double-points (N=3), or off-centred mono-points (N= 2).

Convergent tools N=23	
With a cutting edge N=15; 65%	Without cutting edge N=8; 35%
Centred/Mono double-point N=10; 43%	Centred mono-point N=3; 13%
Off-centred mono-point N=3; 13%	Centred double-point N=3; 13%
Miscellaneous N=2; 9%	Miscellaneous N=2; 9 %

Table 5.94. Convergent tool types

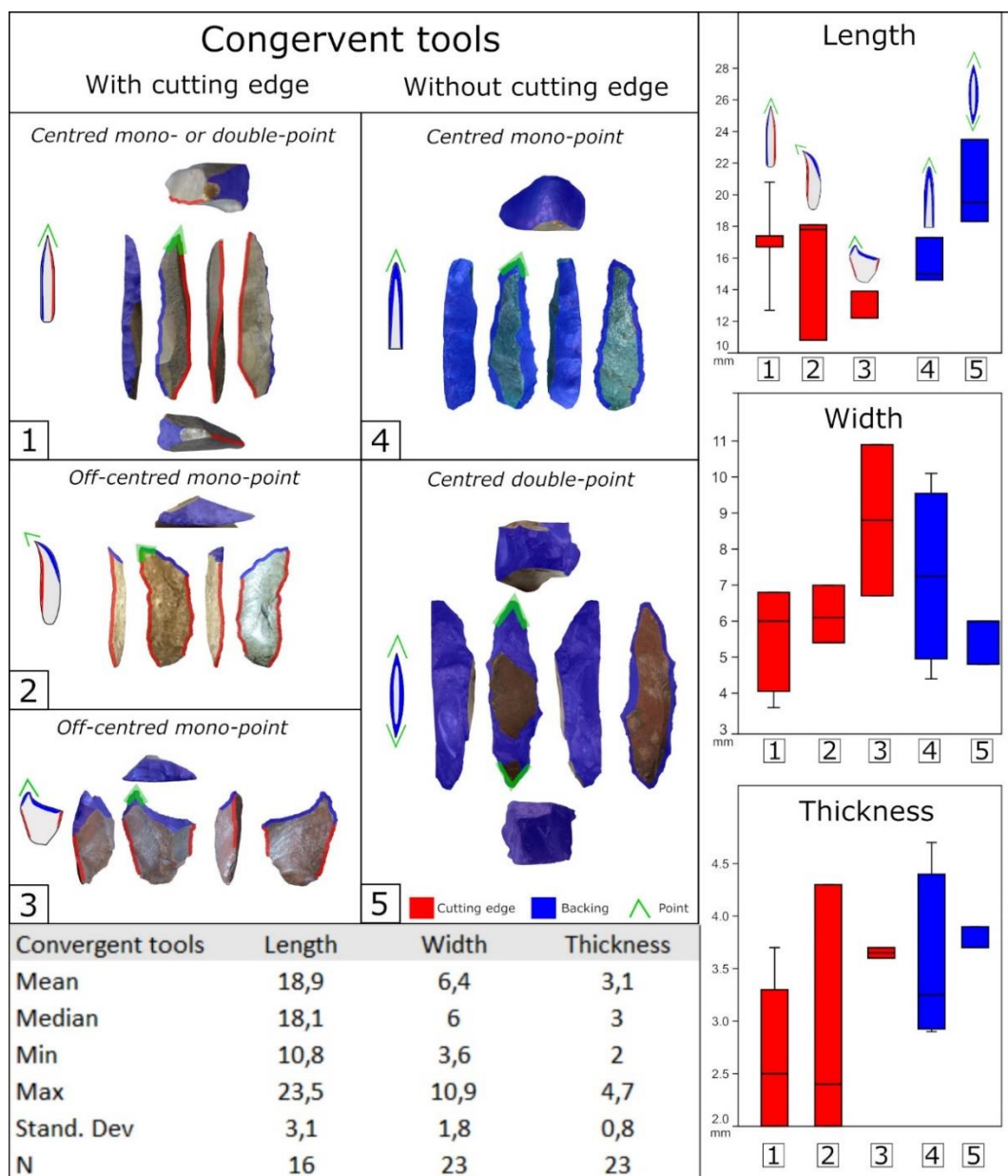


Figure 5.68. Convergent tool typology and dimensions

The convergent backed tools with a cutting edge may be used for both piercing and cutting/dilacerating. The ones without a cutting edge are shaped to create one or two opposite points. Their function may be more specifically linked to piercing or drilling. These tools with no cutting edges are also thicker and wider than the convergent tools with a cutting edge (Fig. 5.68), and therefore probably more resistant to the application of pressure.

a. Convergent tools with a cutting edge

In total, there are eight complete convergent tools with a cutting edge, and seven other broken artefacts that may belong to this category. They measure on average 16,6 mm length, 6 mm width and 2,9 mm thickness (Table 5.95).

Convergent tools with a cutting edge	Length	Width	Thickness
Mean	16,6	6	2,9
Median	17,4	6	2,5
Min	10,8	3,6	2
Max	20,8	10,9	4,3
Stand. Dev	3	1,8	0,9
N	8	15	15

Table 5.95. Dimensions of the convergent tools with a cutting edge

On these 15 convergent tools with a cutting edge, 10 are centred mono or double-points that may be qualifiable of ‘backed points’. On Fig. 5.69 we see one complete centred mono-points (see r89) and one broken piece that may be a double-point (see r99 on Fig. 5.69). The piece r85 may also have been a double point, its proximal extremity being broken. These artefacts are heterogeneous in terms of shaping. The piece r99 is retouched on both edges for creating a point while the others are only retouched on one edge. We notice that the backing delineation of at least two pieces is rectilinear, except at the base of the point where it is slightly curved (see r89 and r85). This may be related to the hafting of these artefacts, or the creation of an opposite point.

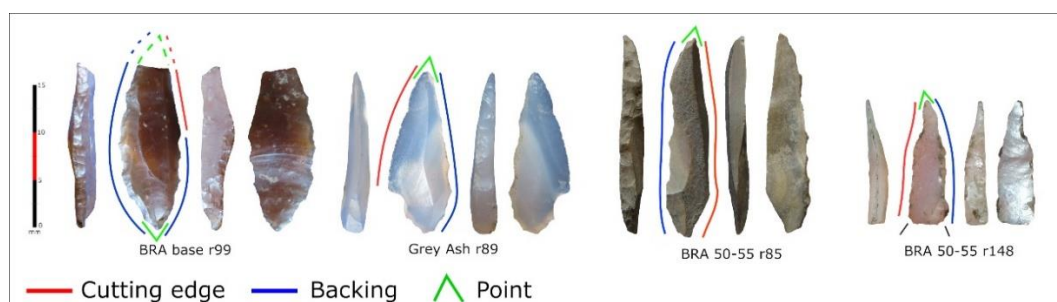


Figure 5.69. Convergent tools with a cutting edge

All of the breaks observed are transversal, and only the piece r90 that has a transversal break with a stepped termination that may be diagnostic of impact (Fig. 5.70). The cutting edge of the same piece also bears marked and repeated flaking, which may also be diagnostic of the use of the tool as a projectile point.

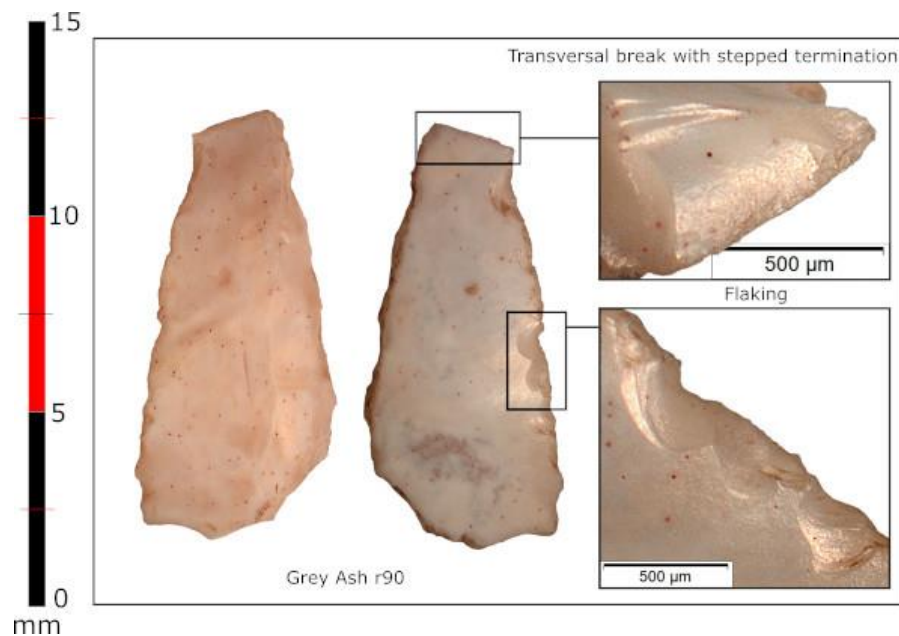


Figure 5.70. Break and flaking on a convergent tool with a cutting edge

Within the convergent tools with a cutting edges, they are also two off-centred mono-points made of agate, qualifiable of obliquely truncated pieces (see Fig. 5.35 in agate *chaîne opératoire* study). They measure on average 18 mm length, 6,2 mm width and 3 mm thickness. Only the distal part of the blank is truncated, created a point. No diagnostic breaks were observed on these artefacts.

One artefact was finally classified as an off-centred mono-point (Fig. 5.71). A point is shaped on a flake by a concave and convex retouch. It measures 13,9 mm length, 10,9 mm width and 3,7 mm thickness.



Figure 5.71. Awl

It has two straight cutting edges corresponding to the unmodified edges of the blank. This artefact was classified as an ‘awl’ by van Doornum (2005). However, there are no typological equivalent in the rest of the assemblage, and its function and functioning remain unclear.

b. Convergent tools with no cutting edge

In total, there are eight convergent tools with no cutting edge including three centred mono-points, three centred double-points and two other backed tools with no cutting edges that may also be called ‘double backed’ artefacts. They measure on average 17,1mm length, 6,6mm width and 3,6mm thickness (Table 5.96).

Convergent tools without cutting edge	Length	Width	Thickness
Mean	17,1	6,6	3,6
Median	17	6,3	3,7
Min	12,2	4,4	2,9
Max	23,5	10,1	4,7
Stand. Dev	3,4	1,8	0,6
N	8	8	8

Table 5.96. Dimensions of the convergent tools without cutting edges

The centred mono and double-points (N=6, Fig. 5.72) have similar characteristics, and may alternatively be called ‘borers’. They all have similar dimensions, and are made of the same

kinds of blanks. They measure on average 18,3 mm length, 6,3 mm width and 3,7 mm thickness (Table 5.97)

Borers	Length	Width	Thickness
Mean	18,3	6,3	3,7
Median	17,8	6	3,7
Min	14,6	4,4	2,9
Max	17,3	10,1	3,5
Stand. Dev	3	2	0,6
N	6	6	6

Table 5.97. Borers' dimensions

The selected blanks are not linked to the bladelet production and most of them have natural planes (cortex or natural slab surface). The backing is limited to the distal part of the tool, or may also be located along the edges of the blank. In some cases, steep edges may also be unmodified (see r41 on Fig. 5.72).

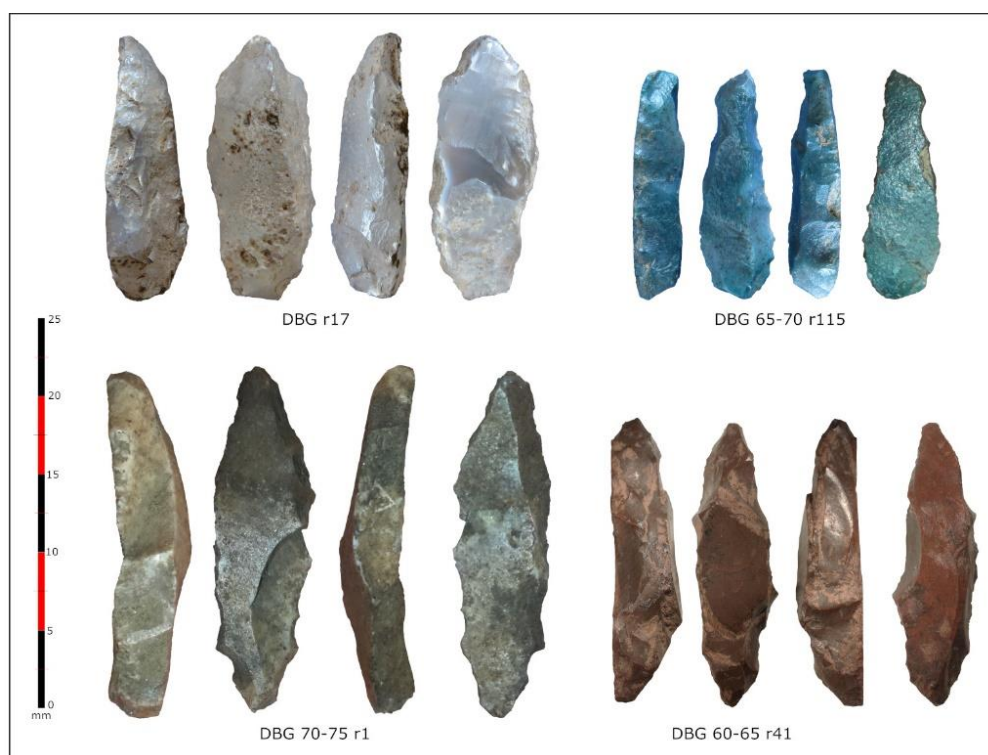


Figure 5.72. Borers

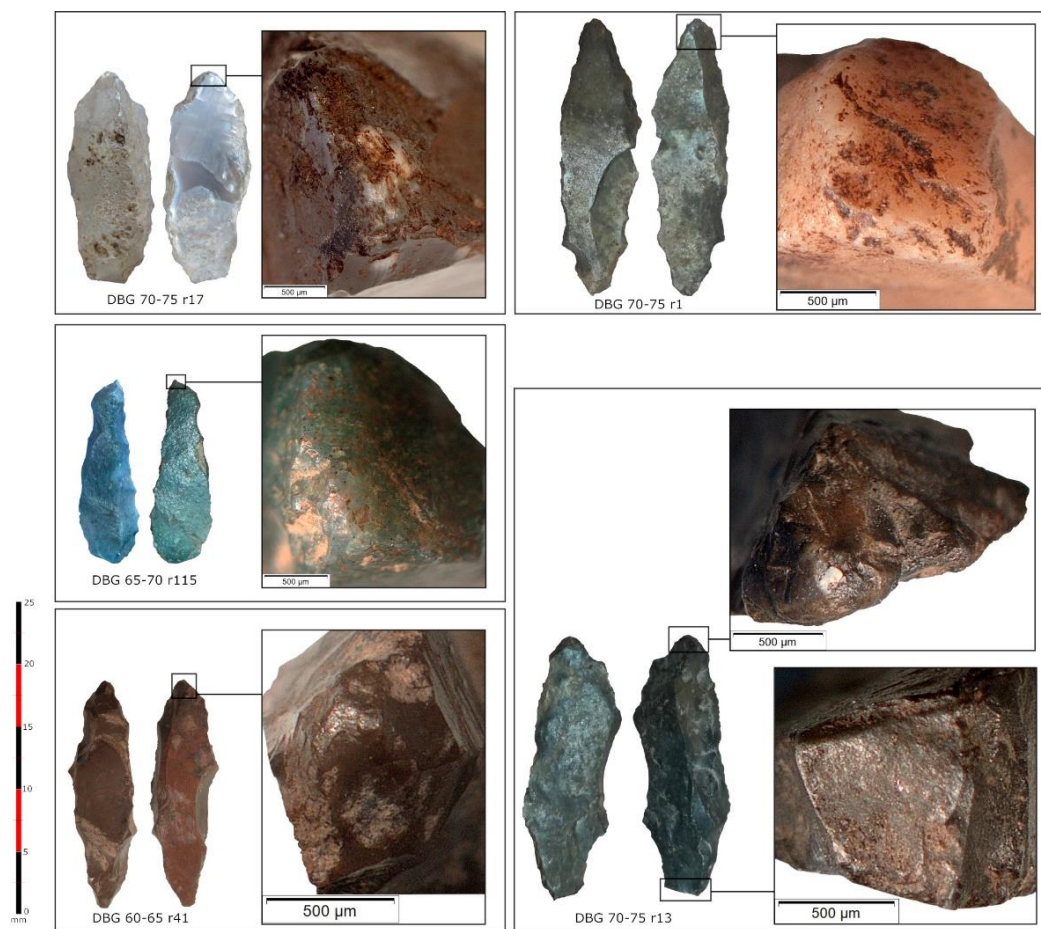


Figure 5.73. Distal crushing and rounding on the borers

The pieces r17, r115 and r1 have one crushed extremity. The extremity of the numbers r41 and r13 have a rounded aspect. These stigmata likely result from the use of these pieces as ‘borers’. Only one of these artefacts is broken by a transversal direct neat break (r13, Fig. 5.73).

Finally, two other artefacts may be classifiable of backed tools without a cutting edge (Fig. 5.74). These pieces may be called ‘double-backed’ artefacts. They measure on average 13,6 mm length, 7,3 mm width and 3,3 mm thickness (Table 5.98).

Double-backed	Length	Width	Thickness
Mean	13,6	7,3	3,3
Median	13,6	7,3	3,3
Min	12,2	6,7	3
Max	15	7,9	3,6
Stand. Dev	2	0,9	0,4
N	2	2	2

Table 5.98. Double backed artefacts’ dimensions

It is not clear if the intention behind their production was to create a point or a *front*, as for a scraper. The double backed artefacts do not have cutting edges or sharp points, and are entirely shaped by retouch. The two lines of retouch have different properties, one is a straight backing which is opposed to a convex retouch. The backing is slightly steeper than the convex retouch. Given these observations, they may be more filiated with the scrapers than the backed tools. However, the presence of a concave backing in the distal part of the pieces is unusual, and not observed among the other scrapers. The status of these double-backed artefacts, therefore, remains uncertain.



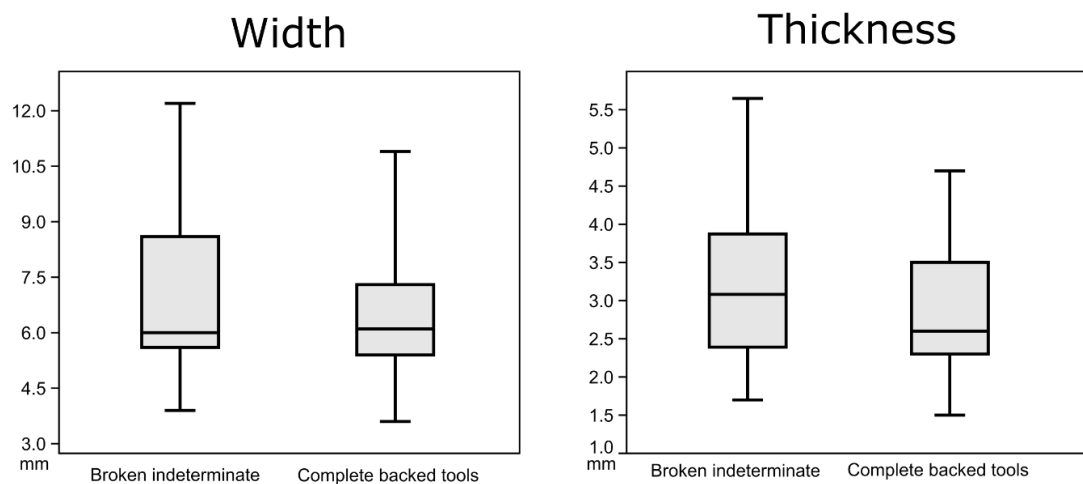
Figure 5.74. Double-backed artefacts

c. Summary on the convergent tools' analysis

To summarise, the convergent backed tools with a cutting edge differ in many aspects from the convergent backed tools without a cutting edge. The tools with a cutting edge are thin and narrow, whereas the ones selected for the tools with no cutting edge are thick. The stigmata observed also differ: the backed points (with a cutting edge) are transversally broken and at least one may have been used as a projectile component. On the other hand, the centred mono- and double points with no cutting edges are generally complete, and display crushing and rounding at the tip, likely related to drilling or piercing actions. Given these observations, I conclude that these two broad convergent tool types were used for different activities.

d. Broken backed tools and miscellaneous

On all the 64 broken backed artefacts, 35 were not attributable to a specific type. Looking at their dimensions, they are of similar dimensions as the complete backed tools (Graph. 5.21).



Graph 5.21. Comparison between indeterminate broken backed tools and complete backed tools' dimensions

Five 'miscellaneous' complete pieces were also not classified in any former category (Fig. 5.75). The piece r69 (Fig. 5.75) could be classified of a 'backed bladelet' with a longitudinal cutting edge that is opposed to a straight backing, and no point. There are no other comparable artefacts, and it is therefore not possible to hypothesise if it is a specific tool type, or the pre-shape of a geometric. The piece r134 (Fig. 5.75) could be a pre-shape of a segment. It is however made on a rather thick cortical blank, which contrasts with the thin non-cortical blank generally selected to make geometrics. The piece r133 (Fig. 5.75) could correspond to a fabrication discard.



Figure 5.75. Miscellaneous

To conclude, different data emerge from the analysis of the backed tools from BMS:

- I identified two broad families: the geometrics and the convergent tools.
- The geometrics share functional similarities, and stigmata relative to their use as projectile components were found. I nevertheless emphasise the specificities of

the triangles, that are smaller than the segments, and preferentially made in agate. This aspect may be linked to more specific functional needs that are, for now, not identified. It may also be related to broad ‘stylistic’ aspects linked to the preferences of the people making them. Further studies integrating other assemblages will be necessary to see if this trend is only specific to BMS assemblage, or if it is more widespread.

- The convergent tools, however, differ in many ways. The ones with a cutting edge may also be related to projectile components. The fact that they are centred may mean that they were hafted differently. Alternative hypotheses could however be proposed, and further use-wear studies on other assemblages will be needed to go further on these questions. The convergent backed tools without a cutting edge are particularly different from the other backed tools. The blank selected to make them do not derive from the bladelet production, and are thicker. Furthermore, the rather blunt edges of these tools (backed or not), suggest that they could have been hafted or hold-handed. Finally, crushing and rounding of the tips indicate the continuous application of pressure on the points, rather than a break created by a violent shock.

5.7.4. Comparison between the Final LSA and Ceramic Final LSA layers

The backed artefacts occur in the pre-pottery and pottery-bearing layers (Table 5.99). There is no significative difference in the distribution of the geometrics and convergent tools between the pre-pottery and pottery layers (Table 5.99). For the geometrics, the presence of segments and triangles were also compared between the two phases. Their distribution is not significantly different (Table 5.99). The trapezes were not integrated because there are only three of them.

Types	Preceramic	Ceramic	Total
Geometrics	27	40	67
Convergent tools	10	13	23
Total	37	53	90
Fischer's exact test: non-significant p=0,8			

Geometrics	Preceramic	Ceramic	Total
Segments	18	35	53
Triangles	3	5	8
Total	21	40	61
Fischer's exact test: non-significant p=1			

Table 5.99. Distribution of geometrics, convergent tools, segments and triangles in preceramic and ceramic layers

The sub-types of the convergent tools are too few to test statistically. I note that the backed points occur in both pre-pottery and pottery-bearing layers. The off-centred mono-points, also called truncated pieces, occur in the preceramic layers only, as well as the centred mono- and double-points with no cutting edge. The double-backed pieces only occur in the ceramic layers. The raw material used for the backed artefacts, are not significantly different between the preceramic and ceramic layers (Table 5.100). There is also no shift in the choice of backing type or backing type location (Table 5.101).

Raw material	Agate	Chert	Quartz	Total
Preceramic (n)	22	26	3	51
%	43%	51%	6%	100%
Ceramic (n)	29	37	11	77
%	38%	48%	14%	100%
Total	51	63	14	128
Fischer's exact test: non-significant p=0,3				

Table 5.100. Number of scrapers per raw material and preceramic and ceramic phases

Backing types	Preceramic	Ceramic	Total
Direct	30	35	65
%	75%	63%	
Crossed	10	21	31
%	25%	38%	
Total	40	56	96
	100%	100%	
Fischer's exact test: non-significant p=0,3			

Backing location	Preceramic	Ceramic	Total
Left	15	21	36
%	60%	57%	
Right	10	16	26
%	40%	43%	
Total	25	37	62
	100%	100%	
Fischer's exact test: non-significant p=1			

Table 5.101. Backing types and location in preceramic and ceramic phases

Most geometrics and convergent tools have a rectilinear profile (N=93, 78%) are non-cortical (N=123, 90%), and their dimensions are similar (Table 5.101). I ran a Fischer's exact test to compare the tool profile from preceramic and ceramic phases that gave non-significant results (Table 5.102).

Geometrics and CT profiles	Preceramic	Ceramic	Total
Rectilinear	32	57	89
%	73%	83%	79%
Slightly curved	12	12	24
%	27%	17%	21%
Total	44	69	113
%	100%	100%	100%
Fischer's exact test: p=0,2			

Table 5.102. Comparison between geometric and convergent tools' profiles in preceramic and ceramic phases

I also demonstrated that the blank selection varies depending on the type of tool made. I did not observe a shift in the blank selection from the preceramic to the ceramic layers. In conclusion, on the samples that are statistically viable, there is no change between the preceramic and ceramic layers in the backed tool making, blank selection, or in the raw material used to make the backed tools.

Following the analysis of the chert, agate and quartz's assemblages, as well as a detailed study of the scrapers and of the geometrics and convergent tools, I now synthesise the data collected.

5.8. The lithic system of Balerno Main Shelter: synthesis

The lithic system of BMS appears consistent as a whole. All artefact categories are microlithic and links can be drawn between the cores, blanks and retouched artefacts, indicating that they form a coherent system. Different observations highlight this coherence:

- The microlithic rectilinear blanks are produced from cores (most often narrow cores) through free-hand, anvil-rested and axial bipolar modalities. Rectilinearity is visible on most cores' extraction surfaces, most blanks, and on the retouched artefacts profiles.
- The study of the extraction sequences visible on the narrow cores shows that the bladelets were extracted in short sequences, more or less intercalated between elongated flakes and flake extractions. This is also visible on most bladelet and elongated flake removal scars, establishing a direct link between the cores and the blanks of the assemblage.

- The different gestures applied throughout the narrow cores' reduction processes are reflected in the blank production for each raw material: free-hand and bipolar blanks are rather well represented for the chert, supporting the fact that most narrow cores were reduced from free-hand to anvil-rested to bipolar modalities. Agate blanks mostly display free-hand stigmata, which is consistent with the low number of axial bipolar cores, while the quartz blanks are more broadly associated with an axial bipolar percussion, which is consistent with the many bipolar cores observed.
- The scraper and backed piece production generally do not necessitate an extensive technical reinvestment. Scrapers, and especially thumbnail scrapers, are not intensively resharpened; and backed pieces are directly shaped down from thin blanks (potentially bladelets), without using a segmentation technique. The scrapers' dimensions are similar to the flakes' dimensions, while the backed pieces are similar to the bladelets and some flakes' dimensions. These data support a link between the blank production and the retouched artefact production.
- No change was noted in the methods, techniques and typology through the late Holocene sequence of BMS.

Following these observations, I now propose a synthesis of the *chaînes opératoires* of BMS.

5.8.1. *Chaînes opératoires*

Even though variations may occur in the core reduction processes and blank production between the different raw materials, the *chaînes opératoires* observed in agate, chert and quartz are mostly similar. The bladelet production on chert and agate is intercalated on narrow cores, and more occasionally on wide, pyramidal or cubic cores.

While series of bladelet removals are observed on the chert, these are rarer when considering the agate. It might be explained because the agate cores' reduction process is generally slightly shorter than for the chert. The selected raw material is indeed generally slightly smaller than for the chert, and internal crystals limit the extraction of blanks from agate nodules. Because of these crystals, fewer blanks extracted, and the knappers may

have had to ‘turn around’ the volume to avoid the inside of the core. Similar solutions are nevertheless used to extract elongated blanks including bladelets: transversal convexities created by former blank removals are used, and the bladelets are often centred and follow a former ridge of a removal scar as a guide. This ‘solution’ is used whenever possible for the agate, whereas it is more standardised for the chert.

Most quartz cores have a similar dimension and structural organisation than the chert and agate narrow cores. Such as for the agate, natural convexities of the pebbles are often used to create the sides and back of the core. Quartz and agate nodules have indeed roughly the same dimensions, and less material can be extracted from them than from the chert. Because of the many fissures occurring in the quartz raw material of BMS, it is not possible to control the blank extraction as well as for the chert and agate. Bladelets are therefore not extracted from quartz nodules, and the quartz cores’ convexities are not managed at all. However, quartz cores’ organisations are similar to the ones of the agate and chert narrow cores: they have one preferential extraction surface that is independent of the flanks. In some rare instances, the sides of the cores are pre-shaped such as for the other raw materials. Even if it is not possible to extract bladelets from the quartz, elongated blanks are extracted. The core reduction process, going from free-hand percussion to anvil-rested and axial bipolar modalities also occur, even though the axial bipolar method is more broadly used. In the following section, I propose a representation of the *chaînes opératoires* at BMS.

a. Main operational sequence and bladelet production

In the precedent presentation of the results, I have described the bladelet, elongated flake and flake’s productions. The core analysis of all raw materials revealed that one main core organisation, corresponding to the ‘narrow cores’ was favoured to extract blanks and bladelets for the chert and agate. I have shown that these cores have one preferential extraction surface associated with one striking platform. The extraction surface is independent of the flanks and back of the core. The flanks and back may correspond to natural convexities, or be created by the removal of large transversal flakes.

Elongated flakes are initially removed with a free-hand percussion, opening the total length of the extraction surface. Other elongated or non-elongated flakes are then removed, creating transversal convexities from which bladelets can be extracted (Fig. 5.76). The bladelet extraction sequence is short, and new convexities are re-created in the course of

the core reduction process. Convergent bladelet with a triangular section may initially be extracted and followed by the extraction of parallel bladelets with trapezoidal sections (Fig. 5.76). This is the case for the chert. In agate, only one or one or two bladelets are generally punctually extracted. Nevertheless, successive removals of agate bladelet also occur occasionally.

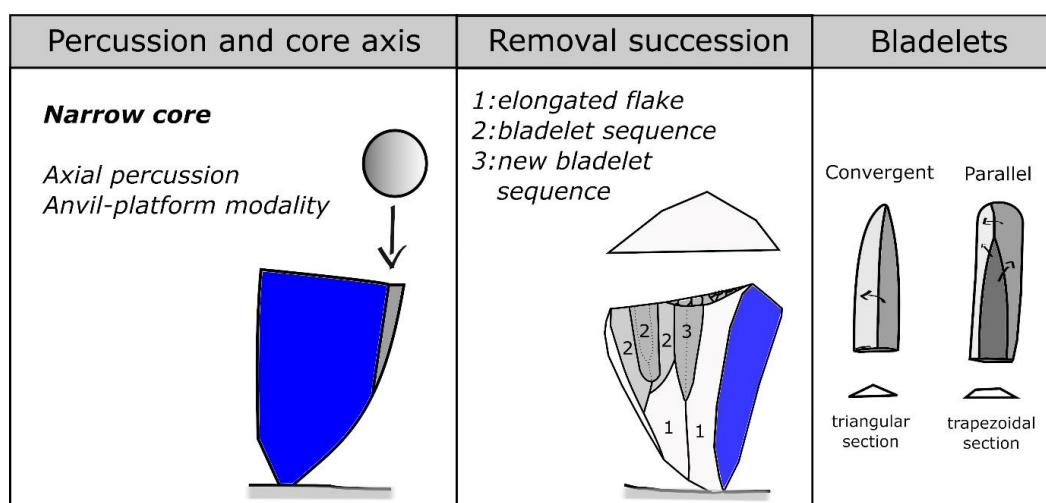


Figure 5.76. Bladelet extraction sequence on narrow cores

I also highlighted that different modes and gestures of percussion are applied during the narrow core reduction process, as described in the blank and core analyses. Most blanks and removal scars are associated with a free-hand percussion, especially during the initial phases of debitage.

In the course of the narrow core reduction, an anvil is used to stabilise the core. The steep and independent flanks may be used as prehensive areas (Fig. 5.77), while the core rests on an anvil, without necessarily creating opposite flaking. This anvil may be used flexibly at different stages of the blank extraction, after the initial free-hand shaping of the core parts and convexities.

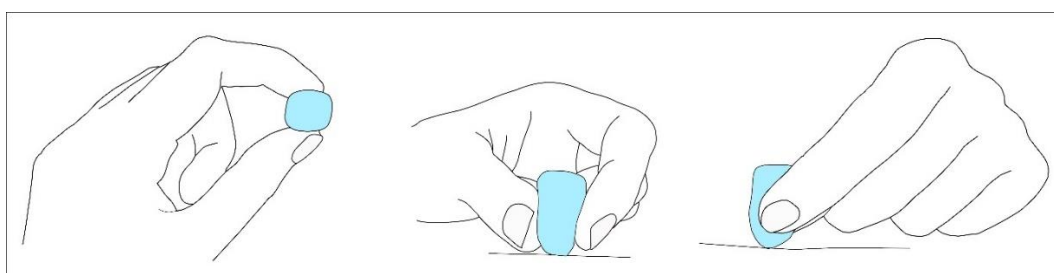


Figure 5.77. Proposed maintain of narrow cores on an anvil

The use of an anvil, that can be associated with more or less axial gestures of percussion, contributes to maintain a rectilinear extraction surface, a characteristic that was looked for by the knappers at the site. The reduction of the striking platform of the core leads to the creation of very narrow striking platforms, and the automatic application of an axial percussion, creating axial bipolar cores. At this stage, many opposite irregular flaking occur. I argue that the narrow cores were, therefore, going through a free-hand modality, then an anvil-platform modality, and a final reduction stage corresponding to an axial bipolar modality (Fig. 5.78).

This reduction process, including different stages associated with specific techniques of percussion, is a trend. Each technique of percussion could have been used flexibly too. However, for the chert, many narrow cores are associated with an axial bipolar percussion. In contrast, most chert blanks are associated with free-hand stigmata that could be created by free-hand or anvil-rested modalities. This gap supports the hypothesis that most blanks were created with free-hand or anvil-platform modalities, and that axial bipolar modalities were only used in a last stage of reduction. The reduction process from anvil-rested to axial bipolar modalities is logical, also given the fact that blanks are also extracted from only one area of the volume, leading to a more and more thin core thickness, and to axial gestures of percussion. There may be more interconnection between the free-hand and anvil-platform modalities, but I argue that because of the very small dimensions of the cores, and of the widespread use of an anvil (reflected by the high number of 'bipolar' cores), I think that the anvil-rested modality must have been favoured, while the free-hand percussion was mostly used at the beginning of the reduction process for opening the extraction surface. Here again, I highlight the fact that free-hand like blanks, with plain platforms, a bulb of percussion and no opposite crushing, can also derive from anvil-rested modalities. The high number of free-hand like blanks may, therefore, represent both from free-hand and anvil-rested modalities.

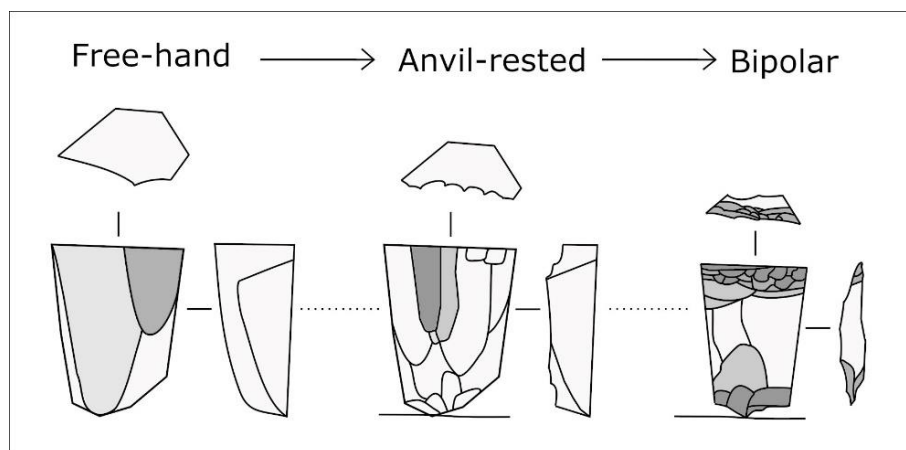


Figure 5.78. Narrow cores' reduction process

No anvil stigmata were detected for the wide and cubic cores made of chert, meaning that free-hand percussion was likely favored through the reduction process. Many free-hand blanks, especially flakes, therefore derive from these cores.

Cores, including all categories, are discarded once the extraction surface is not exploitable anymore. The intention to create rectilinear products and the absence of striking platform management leads to the occurrence of many hinged blanks. If possible, these accidents are corrected, but if not, the core is discarded. On most cores, the angle between the extraction surface and the striking platform is close to 90°. The occurrence of these accidents, and the impossibility to rectify the extraction surface may happen at many stages of the core reduction, after only a few blanks have been removed, after bladelets removals, or at the very end of the reduction process when the core has completely shifted in an axial bipolar core.

The blanks produced may also be shaped to create diverse artefacts. Flakes are used to create scrapers. All kinds of flakes may be used (cortical or not, and potentially varied shapes), but small flakes are generally selected. We saw that three scraper types exist: thumbnail, V-shaped and short-arc scrapers. Thumbnail and short-arc scrapers are generally not very reduced, meaning that small flakes were likely selected. V-shaped scrapers are made of thick flakes, some that may have naturally steep sides, otherwise shaped down to a standardised width. Considering the narrow-cores, I argue that these types of flakes likely derived from the initial phases of debitage, or phases of re-shaping of the convexities. Non-cortical thin bladelets and flakes are favoured for the creation of backed pieces. Rather thick and elongated blanks are also transformed in borers.

Three main stages associated with specific blank production and techniques of extraction are associated with the narrow cores (Fig. 5.79):

- In the initial free-hand phase, cortical and non-cortical flakes, more or less elongated are extracted in order to shape the core convexities rapidly. This includes the opening of a striking platform, creation of independent steep flanks, and opening of the extraction surface. The rather large and thick blanks produced may then be transformed in V-shaped scrapers and borers.
- In a second phase, the core may be stabilised on an anvil, while elongated flakes and flakes are extracted. These thinner, and potentially still cortical blanks, may be transformed in a variety of retouched artefacts, including thumbnail and short-arc scrapers and backed pieces. Following the removal of elongated flakes, after the initial phase and beginning of this second phase, bladelets are extracted on narrow transversal convexities. Sequences of extraction are short, especially for the agate. The extraction surface is continuously reshaped by the removal of elongated flakes and successive bladelets extraction. The bladelets and thin elongated flakes produced may be transformed in backed pieces. Elongated flakes may also be transformed in scrapers. The thin ones may be shaped in thumbnail and short-arc scrapers, while the thicker elongated flakes may be regularised by a lateral retouch, creating V-shaped scrapers. During this second phase, associated with anvil-platform or free-hand modalities, the core gets thinner and the striking platform narrower. This progressively leads to the application of an axial bipolar percussion.
- The third and last phase consists in the last reduction stage of the core associated with an axial bipolar percussion. At this stage, few elongated flakes may still be produced, but the removal of short irregular and often hinged flakes rapidly occurs. This leads to the discard of the core.

Because rectilinearity is looked for, and because there is no management of the striking platform angles, hinged accidents can occur in any of these phases of reduction, leading to the discard of the core. The *chaîne opératoire* associated with the narrow-cores is the most represented at BMS. Other core types are however associated with different strategies of reduction, such as the wide and cubic cores.

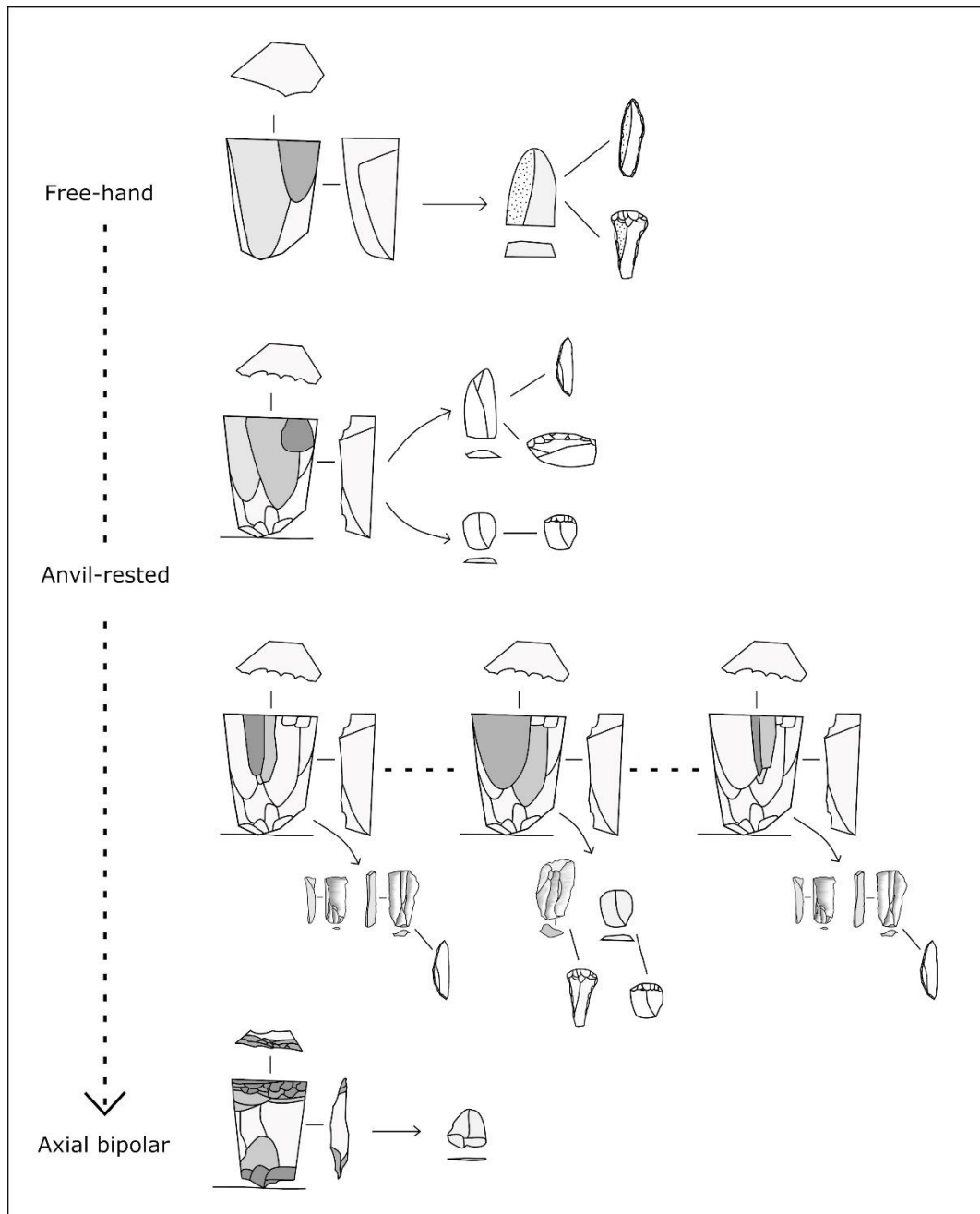


Figure 5.79. Main chaîne opératoire (operational sequence)

b. Wide to cubic core reduction process

The wide and cubic cores have independent surfaces of extractions, that are not located on the most elongated part of the volume. Slab-like volumes with two parallel planes are used in chert to create the wide cores. Flakes, that are not especially elongated are unipolarly extracted. Following the exhaustion of the extraction surface's convexities, I hypothesise that the wide cores could have been rotated and progressively reduced in cubic cores (Fig. 5.80). A similar structure would be successively recreated, extraction surfaces being always

delimited by two steep flanks that may then correspond to former extraction surfaces. In contrast with the narrow cores, the cubic core reduction strategy is to ‘turn around’ a volume rather than exploiting only one surface of extraction until the core gets very thin.

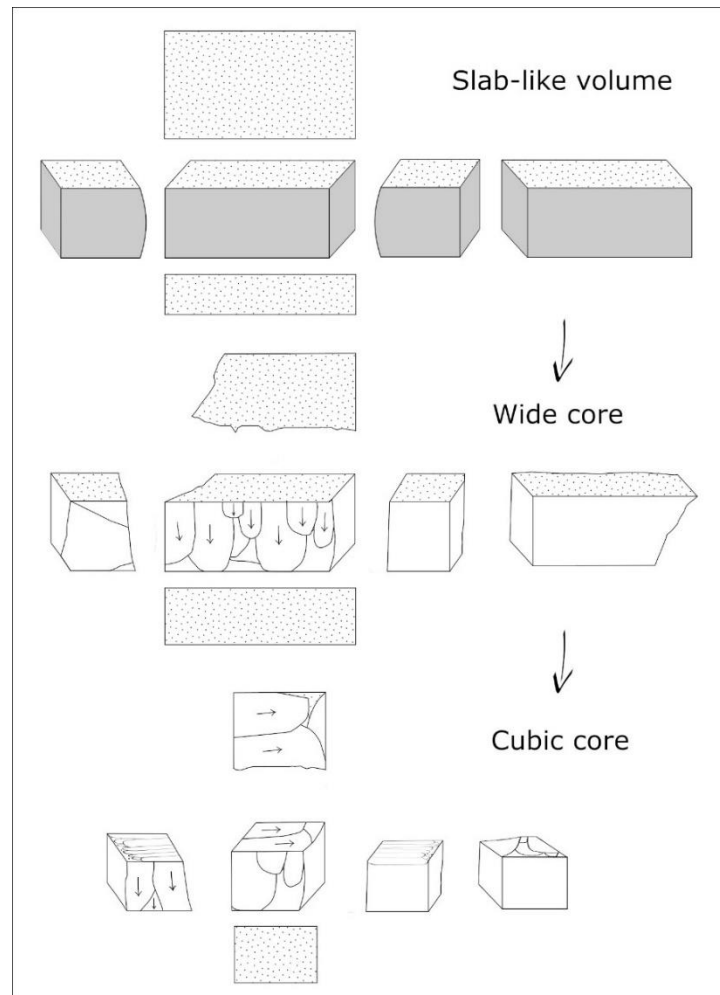


Figure 5.80. Wide to cubic core reduction process

Flakes, more or less elongated, are mostly extracted from these cores. Bladelets could also have been extracted too, but it is not as regularly observed as for the narrow cores. These flakes could then have been transformed in the different retouched artefact categories previously discussed, especially in scrapers and borers. Some of the thin and elongated flakes produced could also have been transformed in backed pieces.

c. Anvil-use and flat core ramification

Anvils are used at different moments of the reduction process associated with the narrow and flat cores, but also with the pyramidal and cubic cores made of agate (Fig. 5.81). Anvils

are used to split agate or nodules with an axial gesture of percussion. They are also used to stabilise cores, until the last removals of small irregular flakes, on different core types. This widespread and flexible use of an anvil is one central characteristic of the BMS assemblage.

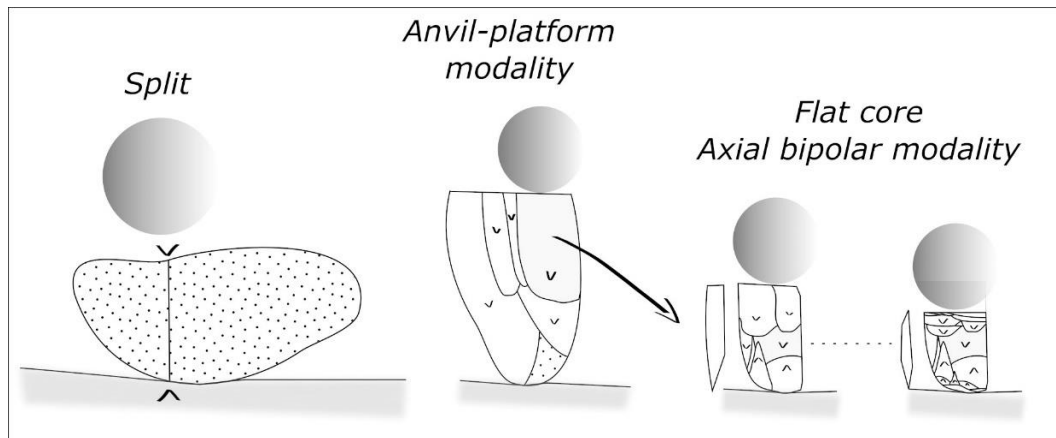


Figure 5.81. Anvil uses in the BMS lithic system

Another interesting technological feature of the BMS lithic system is the use of blanks to create flat cores. This secondary selection, called ‘ramification’ has been observed for the chert and the agate (Fig. 5.82). It probably existed for quartz too, but is difficult to assess.

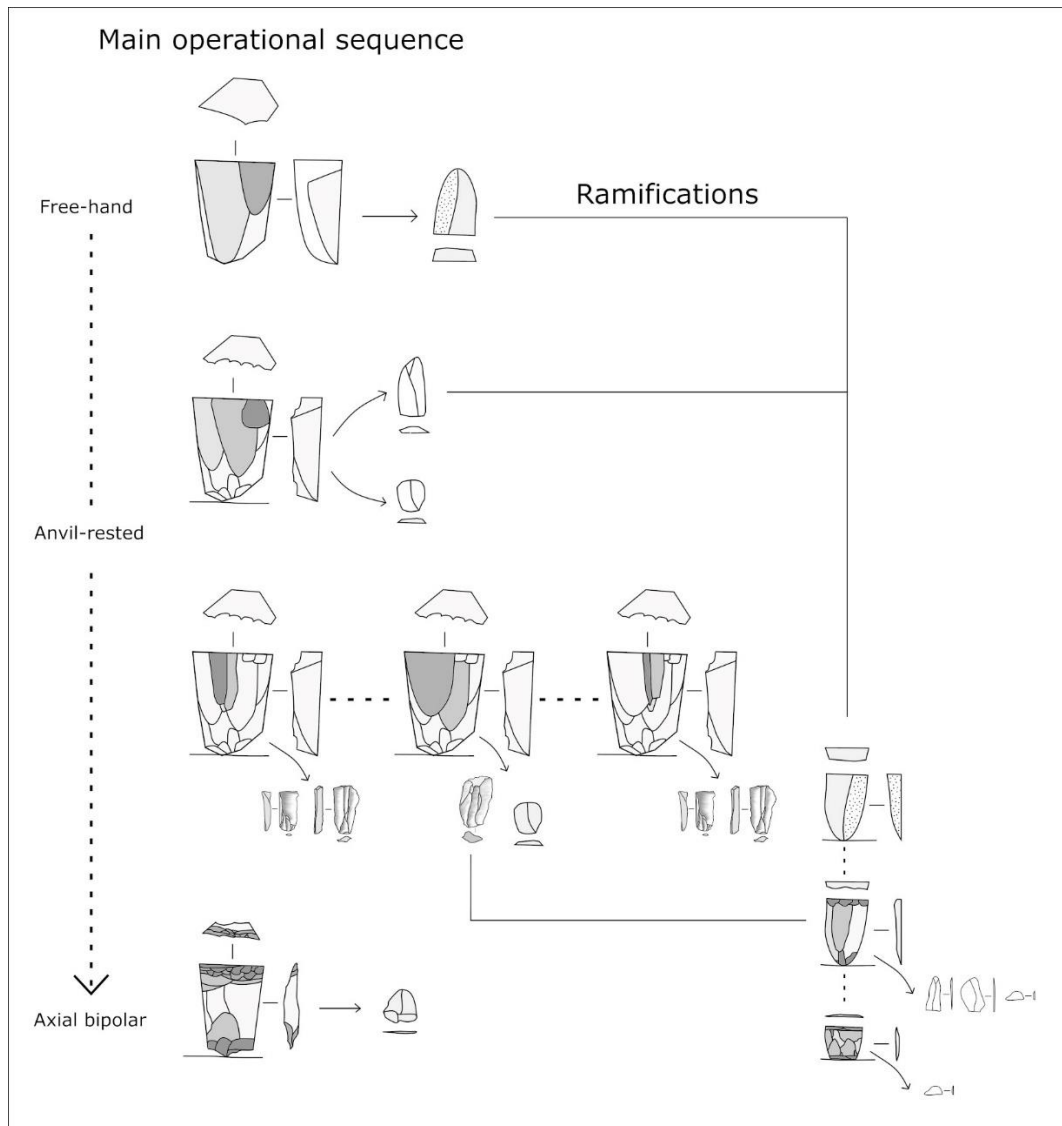


Figure 5.82. Flat core ramifications and reduction sequence

Rather thick blanks, cortical or not, are selected to create ‘flat’ cores. The initial phases of the reduction process can only be inferred because these cores are found in advanced stages of reduction. The observation of flake and rather elongated flake removal scars preceding the removal of small and irregular hinged flakes could, however, indicate that a short extraction sequence preceded them. The plain platforms of some flakes could, for instance, have been used as a striking platform for these secondary flat cores, permitting to extract few blanks, before the final removal of many opposite and hinged irregular flakes. This hypothesis should be further explored in future studies, together with experimentations.

5.8.2. Conclusion and comparison with other late Holocene LSA assemblages

In conclusion, the lithic system of BMS appears consistent as a whole and stable through time. It may be defined as a microlithic system oriented towards the production of small blanks, including flakes, elongated flakes and bladelets, and the confection of small end-scrapers and geometrics. One of the main technical criteria of this assemblage is the use and constant reshaping of narrow convexities for the extraction of bladelets. Free-hand, anvil-rested and axial bipolar modalities are used in the same reduction sequences. A few other methods of production exist, consisting of extracting blanks around the volume of raw material.

Further comparative studies will have to assess if the late Holocene lithic system, methods and techniques recognised at BMS could be comparable to other late Holocene sites. If comparing typological data, inferences may already be made in regard to the other lithic industries presented in the Chapter 1 of this thesis.

It appears that bladelet production is widespread through the Wilton in southern Africa, from around 8000 BP to the late Holocene, as discussed in the Chapter 1. It is for instance the case at reference-sites for the Wilton located in southernmost Africa, such as Boomplaas Cave and Nelson Bay Cave (J. Deacon 1984a). When focusing on late Holocene contexts, we see that bladelet productions are mentioned in the SLCA (e.g. Forssman 2014a), and in many other areas of southern Africa (e.g. Wadley 1992; Webley 1992; Mitchell *et al.* 1994; Modikwa 2008; Lombard & Parsons 2008; Dewar & Orton 2013; Witelson 2016). The BMS assemblage, therefore, fits within this pattern, that is widely recognised.

If comparing the retouched artefact typology from BMS to other sites, similarities may also be found. Looking more closely at the site of Boomplaas, we see that similar retouched artefacts occur in the BLA (5485–5080 cal BC), BLD (55 cal BC – cal AD 238) and DGL (cal AD 249–681) ‘Members’. The small scrapers described by J. Deacon (1984a) have similar shapes and dimensions than the ones found at BMS. Thumbnail scrapers are widespread, and scrapers with wide retouched areas and short bodies are also visible on J. Deacon’s drawings. It is also in the BLD Member that the hafted scraper mentioned in the scraper analysis of this thesis was found. Following J. Deacon’s typology, many authors working in South Africa described similar small or thumbnail scrapers, that are a characteristic of the Wilton (see Guillemard & Porraz 2019 for discussion). Adzes are,

however, widespread in many other Wilton sites of southern Africa, but do not occur at BMS (e.g. J. Deacon 1984a; Mazel 1984a).

LSA Scrapers with a lateral retouch also exist, but are more generally associated with older contexts. It is the case at Boomplaas Cave, where they occur around 8600–7800 cal BC (J. Deacon 1984a), as well as in the Maloti-Drakensberg area where they are called ‘Woodlot scrapers’ (Opperman 1987; Mitchell *et al.* 1998; Mitchell 2000), and are broadly associated with the ‘duckbill scrapers’ of the interior of South Africa (Mitchell & Arthur 2014). These types of scrapers with a lateral retouch are mostly associated with Oakhurst or Early Wilton contexts. However, scrapers with lateral retouch also occur more recently in the SLCA, such as at BMS, where they are integrated into the late Holocene lithic systems. These scrapers, often called ‘scraper-adze’ occur at Tshisiku Shelter (dated between 5725–5518 and 1503–1128 cal BC; van Doornum 2007), Dzombo Shelter (dated between 351–60 cal BC and cal AD 1666–1890; Forssman 2014a), Mafunyane Shelter (estimated between pre-AD 150 and AD 1000–1220; Forssman 2014a) and Balerno Shelter 2 (approximately dated according to ceramic style at AD 350–600, van Doornum 2005). Similar scrapers also occur in other late Holocene southern African sites (see Guillemard & Porraz 2019 for discussion). Most of these mid- to late Holocene scrapers, that I call ‘V-shaped scrapers’ do not dominate the scraper assemblages and belong to the ‘small scraper’ category of J. Deacon (1984a). This differs from the older Oakhurst or Early Wilton assemblages where scrapers with a lateral retouch seem to be better represented, and potentially of larger dimensions.

Geometrics, such as the ones studied at BMS, are also widespread in late Holocene LSA sites of southern Africa, especially segments (e.g. Sampson 1974; Clark 1974; J. Deacon 1984a; Kinahan 1989; Walker 1995a; Richter 1995; Robbins *et al.* 2008). J. Deacon (1984a) did not separate different sub-types, such as trapezes and triangles, even though the latter are visible on her lithic drawings. Probably because many authors followed her typology for the LSA, triangles and trapezes may not have been recognised or isolated by different authors. The fact that trapezes and triangles are only evoked for a few sites of South Africa and Namibia (e.g. Orton & Halkett 2010) could therefore rather be an artefact of research rather than a ‘real’ typological trend. Triangles and trapezes have indeed been broadly recognised and discussed in south-central Africa, in the Nachikufan of Zambia (e.g. Clark 1974; Musonda 1984), and more to the south in the Matopos of Zimbabwe (Walker 1995a). This is likely due to the influence of J.D. Clark and N.J. Walker, who

worked with fine typological grids, as well as more recent studies (Maenzanise 2018). The use of segmentation techniques for bladelets and the creation of backed pieces, such as described in the Kalambo Falls (Clark 1974), has not been observed at BMS, and is, to my knowledge, not discussed for other late Holocene southern African assemblages.

To conclude, the presence of segments at BMS is consistent with Wilton typologies, and more broadly with most late Holocene assemblages. The occurrence of triangles and trapezes at BMS is likely not ‘original’, as more of those could be expected in other late Holocene South African sites. In any case, it is consistent with other sites of the Matopos where these types have been described (Maenzanise 2018; Walker 1995a).

Lithic assemblages from other areas are, however, not oriented toward bladelet production, and contrast with other late Holocene microlithic assemblages, such as the one of BMS (Fig. 5.83). It is for instance the case in the highlands of Lesotho, in sites such as at Likoaeng (Mitchell 2009) or in the upper layers of Sehonghong (Mitchell 1996a). The absence of bladelet production in these ‘Highlands assemblages’ could maybe correspond to a local phenomenon of regionalisation, also be associated with the appearance of pressure-backed points and tanged arrowheads from around 3000 years ago (Guillemard & Witelson in prep). The typological shifts occurring in this area from the mid- to late Holocene also incline me to individualise these assemblages, as they may differ from other contemporaneous ‘Wilton’ assemblages. The close-by assemblages of the Thukela basin may also differ from the Wilton, if considering the scraper typology and overall dimensions of the lithic artefacts (e.g. Mazel 1989b).

The lithic technology of other late Holocene sites located in Namibia, such as Leopard Cave, is also characterised by a flake production, bladelets being inexistent, or only occurring on the margins (Guillemard in Leopard Cave activity report 2017; Pleurdeau *et al.* 2012). The methods used to produce flake also seem to differ from what has been observed in Wilton sites, and are different from BMS lithic technology. Flake debitage, similar to that of Leopard Cave, have been discussed in the Brandberg area and occur next to bladelets and microliths productions (e.g. Breunig 2003). These ‘Brandberg and Erongo assemblages’ seem, therefore, to be both technologically different and typologically similar to the Wilton. More in the south, in Namaqualand, many ‘informal’ quartz assemblages could also differ from the Wilton. Bladelet and geometric productions are also often evoked, which maintain similarities with the Wilton. Other assemblages of the Kalahari

could finally differ from the Wilton, because potentially associated with blade debitage, and because they have much larger backed tools (e.g. Yellen & Brooks 1989). I therefore also propose to isolate for now these ‘Kalahari assemblages’.

In this overview, we get a sense of the regional variations occurring in the late Holocene LSA technologies. To conclude, I propose to isolate five clusters of assemblages that could differ from the Wilton, while waiting for new comparative analyses. The first three are the ‘Highland assemblages’ located in Lesotho, the ‘Brandberg and Erongo assemblages’ located in Namibia, and the ‘Kalahari assemblages’ located in north-eastern Botswana. These three clusters could present significant technological dissimilarities with the Wilton. I also propose to isolate the Thukela Basin assemblages and the Namaqualand assemblages, because they could also be technologically quite different. However, they also share strong typological similarities with the Wilton. The five clusters are represented on Fig. 5.83.

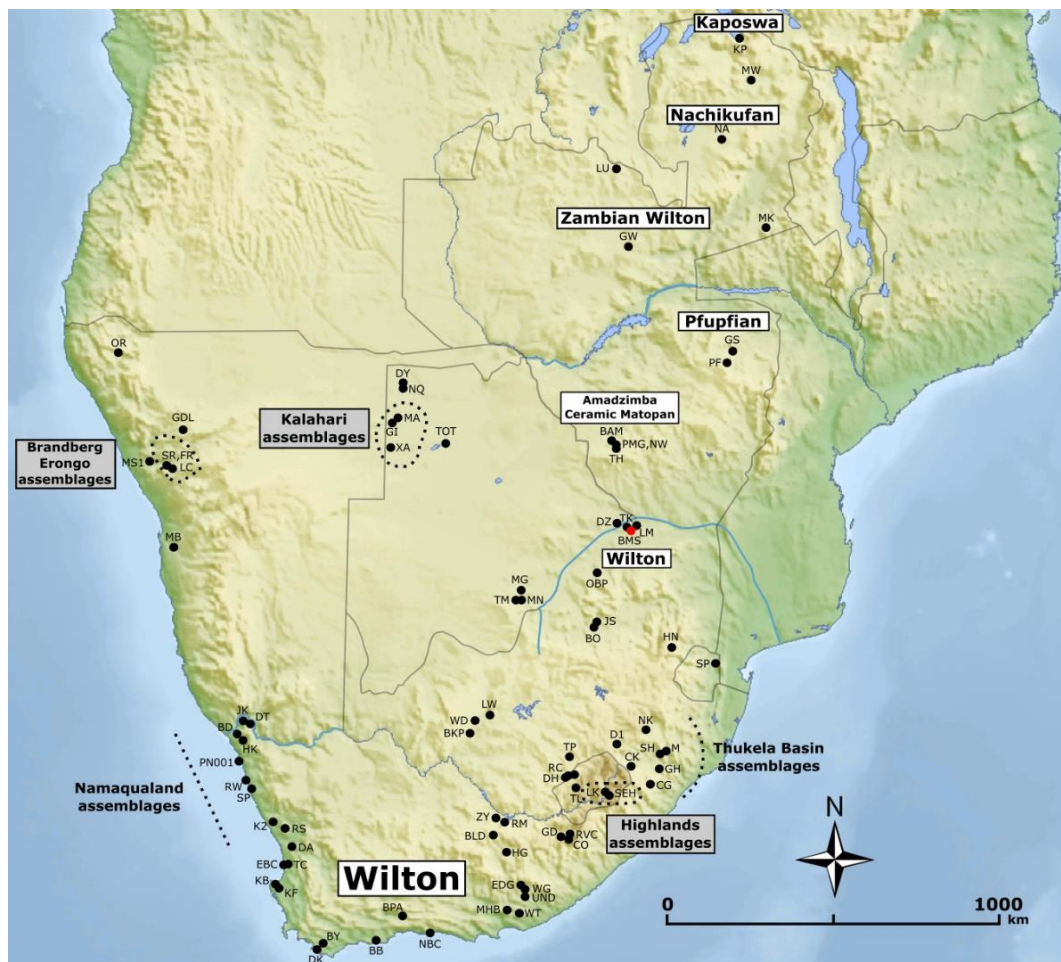


Figure 5.83. Techno-complexes of southern Africa and proposed regional clusters

Following the typological comparison with the sites studied by J. Deacon (1984a) in southernmost Africa, and other associated assemblages presented in the Chapter 1 of this thesis, I argue that the BMS lithic system fits within the Wilton techno-complex of southern Africa. This is mostly due to the microlithic character of the assemblage associated with a bladelet production, the presence of small thumbnail scrapers and segments. Typological variations are observed when comparing BMS to other Wilton assemblages, such as the absence of adzes and the presence of V-shaped scrapers through the late Holocene.

I further propose that the Wilton, Amadzimba, Zambian Wilton, Nachikufan and Kaposwa industries share broad typological similarities, that will also have to be further investigated. Assemblages from these different industries are indeed all microlithic, and associate scrapers and geometrics. Finer typological variations however occur, such as the dominance of backed tools over scrapers in south-central Africa and in the Nachikufan, as well as the presence or absence of specific types. Interestingly, segments are broadly represented, even in the western parts of southern Africa where many assemblages are described as ‘macrolithic’ or ‘informal’. This macro-scale uniformity, integrating finer typo-technological variations, was noted by different authors, including Phillipson (1977), going up to the eastern margins of Africa. Nevertheless, I also think that the continuation of lithic analyses in southern Africa will reveal more precise techno-typological variations that will contribute to refine and better understand the repartition of the Wilton techno-complex, and more generally of the microlithic systems with scrapers and backed pieces. However, the broad typological similarity as it is observed today raises interesting questions.

In the following chapter, I develop two aspects central to this thesis. The first part (A) discusses how we could interpret the stability and similarities seen in late Holocene southern African lithic assemblages. In this discussion, I address both aspects relative to transitions (time) and distribution (space), breaking away from ‘culture-container models’ of interpretation. In the second part of this discussion (B), I take a step further by engaging with the problem of correlation or de-correlation of varied ‘traits’ when modelling migrations, in the context of Khoe herders’ migrations. I challenge the automatic equation between linguistic, genetic and archaeological data, coupled with the making of single-origin hypothesis migration models based on tree-like dispersions. This discussion also contributes to break away from culture-containers models, and open new possibilities for re-assembling multi-disciplinary studies.

6. DISCUSSION

A. Interpreting lithics

Following the study of the BMS lithic assemblage and a review of late Holocene lithic industries, it is now possible to discuss these data at different scales. The main question asked in this thesis was to assess if change or continuity in the lithic technologies could be detected through the late Holocene, during a period corresponding to the arrival of food-producing populations. From the analysis of the lithic system at BMS, I could demonstrate that no change in the lithic technologies occurred through the late Holocene sequence. This result is consistent with most (typological) lithic studies from other late Holocene sites in southern Africa (e.g. J. Deacon 1984a, see Chapter 1).

This ‘stability’ of the lithic technologies through time opens different questions. Stability is often conceived as the opposite of change. Technological change may be commonly explained as the result of varied factors such as the arrival of new populations with new technologies, adaptation to new environments, shifts in hunting techniques (e.g. use of bow and arrow), progressive isolation of certain populations (e.g. regionalization process), and so on. In contrast, when lithic systems remain stable through time, we tend to assume that none of these elements occurred, or only had a minimal and non-visible impact on hunter-gatherer societies.

In late Holocene southern Africa however, stability of lithic technologies does not reflect an overall ‘social’ or ‘cultural’ stability. Hunter-gatherers indeed progressively engaged in varied neolithization processes including the progressive adoption of herding practices in some areas (Sadr 2013; Kinahan 2019, see Chapter 1), using and potentially making pottery (Sadr 2008b; Fewlass *et al.* 2020), and interacting with and coming closer to agro-pastoral communities (Forssman 2014a). Should the absence of the ‘impact’ of these varied processes on the lithic technologies lead us to conclude that social or economic data are not accessible through lithic studies? Or could it rather point to specific social aspects and phenomena that could have been disregarded? It is this last option that I will explore in the first part of this chapter.

I indeed think that rather than seeing the absence of change in lithic technologies as an absence of ‘proof’ for or an ‘invisibility’ of social phenomena, the absence of change

should be regarded and questioned for what it is: a continuation of transmission, technologies that may be shared and fit within different groups of peoples with varied subsistence economies and practices. These aspects indeed reflect social processes and technical phenomena that should be investigated, in relation to networks, convergences in practices and activities, and potential shared history. The ‘social signal’ of continuity is therefore not ‘weak’, but represents a sum of processes and histories that should be explored.

Furthermore, observing the sharing of similar lithic technologies by varied populations contributes to the breaking down of ‘culture container’ models. Indeed, lithic studies are one of the many archaeological fields showing that practices and technologies may extend beyond the society that is studied. It is, furthermore, one striking example that there is no necessary correlation between techniques, language groups, ‘ethnic identities’, economies of subsistence, or biological traits. It is therefore necessary to de-correlate these cultural packages for examining more precisely phenomena of dependence or independence between different aspects.

In order to formulate hypotheses to explain the continuity of lithic technology, it is firstly necessary to assess what data we could access for each scale of study. We saw in the Chapter 2 of this thesis that different theories may be applied for thinking lithic technologies at different scales. In the first part of the discussion chapter, I will therefore consider lithics at three scales: the site-scale, regional-scale and extra-regional techno-complex scale. I will consider stability through time, but also integrate geographical aspects by looking at synchronic phenomena of technological similarity at regional and extra-regional scales. Considering space in addition to time is indeed relevant to discuss what lithic units, such as techno-complexes, could represent. Different hypotheses can be proposed depending on the geographical distribution of a technical or stylistic phenomenon.

6.1. Balerno Main Shelter lithic system through time

6.1.1. What data are accessible?

Working at the site-scale, the lithic analyst may reconstitute the methods and techniques that people were using at the site in order to make tools. We saw in the Chapter 2 how techniques are part of transmitted know-how corresponding to shared norms and principles

that are passed down from generation to generation (e.g. Mauss 1934; Leroi-Gourhan 1943, 1945; Latour & Lemonnier 1994; Cresswell 1996). These know-how are imbedded within the social structure of the people perpetuating them. Different social aspects could indeed be seen in lithic technologies, such as who is making the lithics (e.g. are there ‘specialists’), hierarchical relations (e.g. prestige goods) and specific objects for specific tasks (e.g. arrows for killing specific animals). The social structure is, however, not directly accessible archaeologically, and studying its links with the technical system is therefore very limited. Some social aspects could, however, still be discussed.

Depending on the quality of the archaeological record, it is possible to access ‘moments of time’ and work with a material that was left by a potentially rather small group of people. It is therefore sometimes possible to assume that vertical transmission (from generation to generation) of knowledge occurred between groups of people that could be broadly related. When working at larger scales, other aspects come into play for explaining similarities and continuity of lithic technologies, beyond the notion of vertical transmission or ‘shared heritage’. Of course, palimpsests blur and mix these ‘moments of time’ by compressing them, sending us a signal that may ultimately correspond to varied social organisations. However, this is the very nature of archaeological data, as only a few sites allow us to approach these ‘instants’ (e.g. see Likoaeng in Lesotho in Mitchell *et al.* 2011), and there are still ways to approach these questions in sites that may have a less fine-grained archaeological record.

6.1.2. Scenario of continuity through time

After analysing lithic technologies through time at BMS, I concluded that they do not change through time, until their progressive disappearance in the Below Surface layers.

One initial hypothesis that I propose is that this stability of the lithic system likely reflects a continuation of the transmission chain of know-how, still occurring after the potential social and economic shifts associated with the arrival of food producing economies in the area. This transmission, or shared heritage could have been transmitted vertically but also horizontally across groups of people. It is indeed impossible in our case to assess how many ‘societies’ could have succeeded on the site, nor it is possible to assume that people belonged to a common and continuous group, such as a family unit or a specific ‘ethnic’ unit. However, we do know that these potentially varied societies shared a similar lithic technology, implying that this knowledge was transmitted through the late Holocene.

At BMS, the interactions and new practices that likely occurred did not lead to a loss or change of this technical knowledge, until the second millennium AD. For this knowledge to be remembered and transmitted, it must have kept a social efficiency, that was still valued by the people perpetuating it. Following a similar line of thought, I also argue that the lithic system was still adapted to the potentially varied social structures succeeding during the first and second millennium AD at BMS. It might mean that similar categories of actions may have been performed through time, for which the lithic tools produced were still considered adequate. It does not necessarily mean that the associated activities or worked material were the same, but simply that the tools were still socially and functionally adapted to pursue varied tasks.

It is also interesting to note that if hunter-gatherers of the Limpopo valley progressively started merging with agro-pastoral communities during the second millennium AD (Forssman 2014a), they could also have used 'new' non-lithic tools, for instance made of iron, for new categories of actions or activities. In that sense, the progressive disappearance of lithic technologies, rather than their replacement by a new one, could be partly explained by this progressive merging. Similar arguments have been made in varied areas of southern Africa (e.g. Weedman 1993). Furthermore, even in places where techno-technological shifts occur in lithic industries, the chronology of these changes generally seems to precede the introduction of sheep and pottery technology in southern Africa (e.g. J. Deacon 1984a, Wadley 2000, Guillemard & Witelson in prep). Most often, and as at BMS, the stone tool production tends to diminish, before vanishing at different rates and times, depending on the region. This hypothesis will have to be further explored in sites in which iron and stone tool materials are associated, which is not the case at BMS.

Assuming that the lithic technologies observed at one site are embedded within social aspects also does not imply that similar technologies could not have been developed by other people and then integrated within different or similar social structures through time and space (e.g. Croucher & Wynne-Jones 2006; Boëda & Testot 2015). In that sense, technologies are part of individual societies and may be investigated as such, but may also be more widely shared through varied configurations. As previously stated, this continuity of the lithic technology at BMS does not therefore mean that people at the site 'remained the same', but simply that their technical knowledge was still transmitted and adequate for the categories of actions realised, before and after the arrival of agro-pastoral populations.

The continuity of technical knowledge through time also implies that a similar lithic technology may be used by hunter-gatherers, and hunter-gatherer societies going through a potential process of neolithization. At BMS, there is indeed no correlation between the appearance of pottery, potentially associated with new practices and contacts with agro-pastoral societies, and new lithic technologies. In that sense, the lithic technology recognised in this site could be ‘trans-economical’, meaning that people with changing and potentially differing economies of subsistence and ways of life could have shared a similar lithic technology. This argument is broadly supported by the analogous stability of lithic typologies before and after the introduction of sheep and pottery at sites across southern Africa (see Chapter 1). This broad stability phenomenon is particularly well reflected in the classifications that are employed to talk about pre- and post- 2000 BP lithic technologies, highlighting a continuity by simply adding the ‘Ceramic’ term before the name of the regional techno-complex, rather than creating a new name (e.g. J. Deacon 1984a, Lombard *et al.* 2012).

Future studies will also have to be made on the pottery assemblages from different LSA sites. In many cases, it is indeed complicated to assess if the pottery could have been made by the hunter-gatherers themselves, or if they could for instance have been exchanged, or collected on the surface. Palimpsests could also have contributed to blur the archaeological signal. These future studies will help us understanding better the different social processes that are associated with the occurrence of pottery in LSA sites.

Beyond the site-scale, we may now discuss the potentially varied archaeological contexts associated with lithic technologies in the SLCA. Together with an observation of other archaeological data, such as pottery and rock art, varied social processes taking place during the late Holocene should also be considered.

6.2. Social processes in the Limpopo valley

At the regional scale, we saw that the assemblage of BMS is typologically similar to other close-by contemporaneous sites, with or without associated pottery. This includes the sites studied by van Doornum (2005) and Forssman (2014a), both with and without associated pottery, and situated more or less close to Iron Age sites. These observations support the ‘trans-economical’ nature of lithic industries in this area. It indeed shows that varied hunter-gatherer groups, more or less integrated with agro-pastoral societies, likely shared a similar

lithic technology. There also seems to exist, therefore, a shared knowledge that is not affected by the potential progressive rapprochement between hunter-gatherers and agro-pastoral societies in the Limpopo valley.

6.2.1. Lithics and places

An interesting set of publications also discusses the presence of lithic artefacts in varied site-types (Schoeman 2006a, Forssman 2014a, Seiler 2016). As discussed earlier in this thesis, similar lithic technologies exist in LSA horizons with or without associated pottery, meaning that these techniques are shared by hunter-gatherer societies potentially engaging in different practices and subsistence economies. Lithic artefacts are not only found in rock shelter sites, traditionally associated with hunter-gatherers, but are also in Iron Age contexts. For instance, lithics have been found on hilltops, places where agro-pastoral communities performed rain-making ceremonies (Schoeman 2006a) and in or close to Iron Age homesteads (Forssman 2014a, Seiler 2016).

Generally, when lithics are found in or close to Iron Age sites, they are interpreted as brought in by hunter-gatherers (e.g. Schoeman 2006a; Wadley 2001). However, the association between lithics and hunter-gatherers should be opened to discussion. How could we assume that the people who made these tools were hunter-gatherers, especially if found in Iron Age contexts? As we saw, lithic technologies and typologies remained the same through the late Holocene in the SLCA. A similar situation existed in other areas of southern Africa, highlighting the potential trans-economical nature of Wilton lithic technologies. This continuity of the lithic technologies through the late Holocene implies that microlithic industries should not necessarily be attributed to hunter-gatherers. Furthermore, the hypothesis, proposed by Forssman (2014a), that the people making stone tools were living *in situ* is also plausible. In that case, their social and economic organisation may greatly differ from other hunter-gatherer groups of the area, and could be considered as being part of agro-pastoral societies. Finally, the fact that agro-pastoralists could have made and used stone tools should not be disregarded, even though their technology might differ from what is found in LSA sites (e.g. Nyamushosho 2016).

It is at this stage difficult to go further with these hypotheses, given the many uncertainties surrounding the lithic assemblages found in Iron Age sites. Further studies will have to be realised in different site types, in order to understand better the relationship between Iron Age lithics and lithics found in LSA rock shelter sites. Geomorphological contexts will also

have to be clearly assessed in these future studies in order to rule out the possibility of palimpsests.

6.2.2. Creolisation processes and convergence phenomena

As lithics are found in different site-types and are associated with diverse subsistence economies, and potentially diverse language groups, it is important to acknowledge that the same is also true for other artefact types, such as pottery. As we have seen, pottery is indeed present in LSA and Iron Age sites of the SLCA. Pottery seems, however, to have been used and curated differently between Iron Age and LSA sites, highlighting that objects in a single category, even if stylistically similar, may correspond to different practices because they not integrated within the same social structures in different contexts (e.g. Sadr 2008b).

What MacEachern (1994) calls shared ‘symbolic sets’ also seem to exist when looking at the rock art of the SLCA. Images or symbols that are associated with certain rock art ‘Traditions’, themselves associated with language groups, actually appear widespread. For instance, certain motifs are common depictions in the rock arts of the fine-line ‘San’ Tradition, Geometric so-called ‘Khoe’ tradition and ‘Northern Sotho’ white paintings (e.g. Eastwood *et al.* 2010). The strict association between these traditions and specific language groups or populations should, therefore, also be opened to discussion, in particular for the Geometric tradition. The observation that similar motifs are passed down through time, and occur in the same rock shelter spaces, could reflect the existence of shared practices and beliefs in different social contexts, potentially linked to initiation practices (Eastwood 2003, Eastwood *et al.* 2010). I argue that it could also indicate that creolisation processes occurred in the SLCA, contributing to perpetuate certain practices and symbols. Starting from these observations, convergences in practices could represent ‘nodes’ around which groups of people may gather, interact and merge. In the SLCA, we know, for instance, that hunting and gathering was practiced both by hunter-gatherers and agro-pastoral populations following different degree of reliance on wild game (e.g. van Doornum 2005; Mothulatshipi 2008; Antonites *et al.* 2016). Ethno-archaeological studies have also highlighted the importance of certain beliefs linked to rain, and initiation practices in different societies (Schoeman 2006a). These are only a few examples of practices around which interaction could have occurred. Furthermore, and significantly, these potential convergences of practices may archaeologically appear as consistent units, when they may in fact common practices integrated into different social structures.

Following these ideas, we could ask how could technical know-how, practices and symbols have been transmitted and shared in the Limpopo valley? In his study context, MacEachern (1994) argues that the movement of certain people was likely associated with the spread of technical knowledge at regional scales. A similar ethno-archaeological argument is often made when discussing travelling ‘San’ ritual specialists that would offer their services to other populations including agro-pastoral communities (e.g. Kinahan 2017). These itinerant specialists would travel and potentially contribute to the diffusion of knowledge through varied groups. Schoeman (2006a) also argues that such process existed in the SLCA for rain-making ceremonies, for which San shamans were ‘hired’ as ritual specialists. Other varied interactions between groups of people may also have occurred, such as trade, marriages and services.

Finally, if considering linguistic and genetic studies for this area, and for southern Africa in general, we see that Khoisan and Bantu languages mutually influenced each other, and that the genetic profiles of individuals are always diverse (see Chapter 1). These arrays of clues indicate that further than interactions, creolisation processes likely occurred in the Limpopo valley, potentially driven by shared practices and beliefs. In that sense, considering lithics on hilltops, or in Iron Age sites as ‘hunter-gatherer-made’ may in fact oversimplify a far more complex reality.

It is also important to consider that convergences in practices, beliefs and categories of action could also partly explain the large geographical and chronological distribution of stylistic or technological attributes observed in archaeology. These aspects are particularly important when considering larger scale phenomena, such as lithic techno-complexes.

6.3. Interpreting late Holocene lithic technocomplexes of southern Africa

As previously stated, I argue that the BMS assemblage fits within the Wilton techno-complex of southern Africa, itself being part of mid-to late Holocene microlithic industries with associated scrapers and backed pieces. Within this microlithic phenomenon, widespread in southern Africa, differences in technologies occur. It is for instance interesting to note that backed pieces are common in Namibian late Holocene assemblages, although the lithic technology of some sites however broadly differ from what is observed in ‘Wilton’ sites. These large-scale similarities indeed also reflect what criteria we are

looking at as lithic analysts. The fact that lithic typology appears to be more widespread that technological aspects is in that sense interesting.

What the Wilton 'is' therefore directly derives from what categories of objects we have been considering as markers. The Wilton is also what is 'left to be seen' from varied processes including vertical and horizontal transmissions of knowledge, convergences and similar evolutions. Movement and contacts between people could partly explain the large-scale distribution and great-time-depth of these technological entities. However, given the large areas considered, it seems that other processes could also explain the widespread and multiple nature of microlithic industries in southern Africa. Such an idea is discussed by David Phillipson (1977) about sub-Saharan microlithic industries:

“In most areas broadly parallel evolutions led to the development of a basically microlithic technology (...). Such evidence as we have emphasized the ability of indigenous technological development to follow broadly parallel courses at different times, resulting sometimes in the presence of contemporaneous industries in neighbouring areas at markedly contrasting stages of technological development. The independence and idiosyncrasies of many of the local successions are such that we can probably discount the possibility of a common ancestor for all the microlithic industries of eastern and southern Africa. Here, migration or even substantial population movement on other than a regional scale seems to have played no great part in the dissemination of mode 5 technology” (Phillipson 1977: 54).

The conclusions reached by Phillipson (1977) echo in some respect theories developed by Boëda (e.g. 2013) about the techno-logical evolution of lithic technologies and phenomenon of convergences. These processes may indeed lead to the observation of similar technical phenomena at large scales. If mapping mid- and late Holocene microlithic industries, in southern and eastern Africa, we can observe the wide geographical distribution of this phenomena (Fig. 6.1).

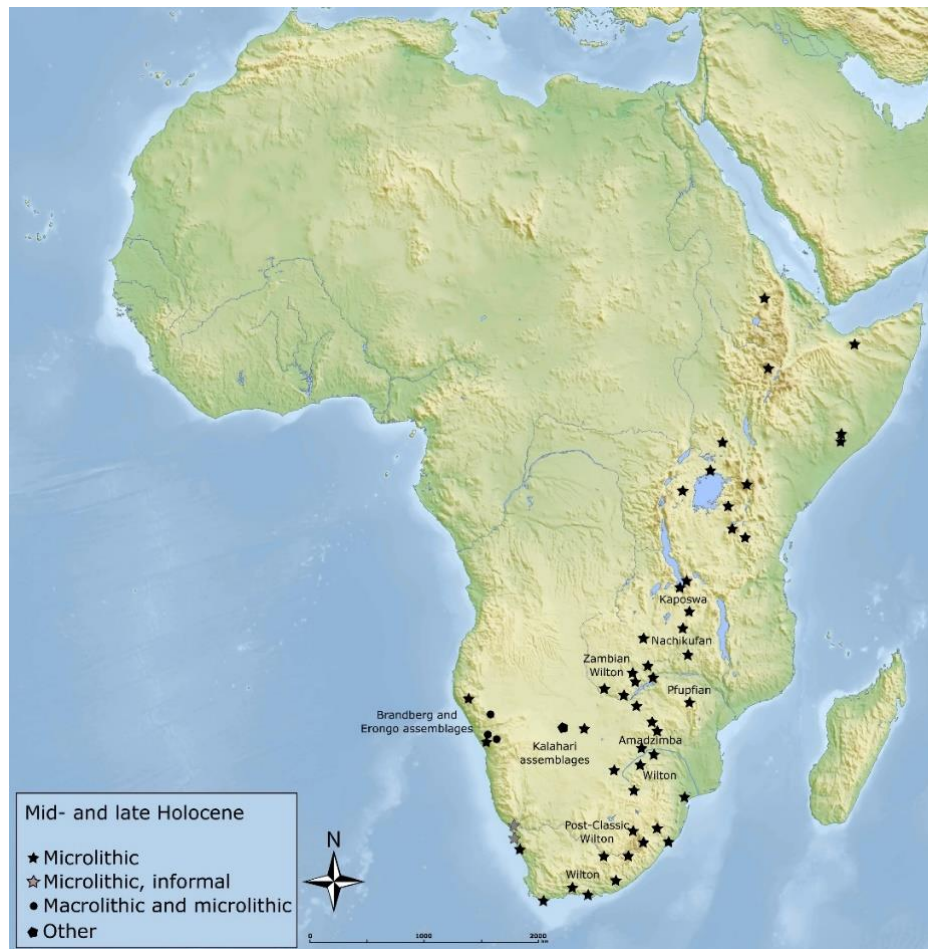


Figure 6.1. Mid- and late Holocene microlithic phenomena in southern and eastern Africa, after Phillipson for East Africa (1977)

The observations made by Phillipson also have implications for discussing migration models, and the pastoral migration of supposedly Khoe-speaking herders from eastern to southern Africa. Different authors, including this thesis, insist on the fact that lithic technical phenomena may pervade varied language and biological groups, but can also be trans-economical. That said, and considering the widespread nature of microlithic industries in sub-Saharan Africa during the mid- to late Holocene, retracing migrating populations using lithics may appear challenging, simply from a technological or typological point of view. Only precise technological studies could potentially aid in the decipherment of the past movements of people perpetuating specific know-how along their migrations. These know-how should be systematically associated with evidence of herding practices in order to draw a line between them and one economy of subsistence. With the exception of research by Sadr (2015) shedding light on potential movements of people introducing a ‘northern’ lithic tradition rich in backed pieces in southern Africa, no such

observations have so far been made. Further work would need to be done in order to explore this hypothesis. In any case, even if one lithic technology could hypothetically be linked to certain herder populations, it could not be correlated with a language group, simply because herding practices and lithic technologies, are not exclusive to certain language groups. Finding 'Khoe' lithics is, therefore, problematic at a theoretical level.

Finally, and I will develop this aspect further in the second half of the discussion, migration models based on single-origin hypotheses associated with one 'proto-people' are also problematic at a theoretical level. Finding a starting point corresponding to the older innovation that will then be diffused is possible archaeologically. Finding an end point, generally corresponding to the most recent and farthest point on the map, is also possible archaeologically. However, what happens in between and how the new practice is diffused is complex and cannot correspond to a linear movement of one people keeping its cultural integrity through time. Internal change, social dynamics, adaptation to contrasted environments and the integration of local people in the process of diffusion should, therefore, not be neglected. Phenomena of convergences should also be taken in account. In that sense, similarities in practices and technologies should be thoroughly investigated and not necessarily interpreted as a movement of people keeping its cultural integrity through time. For instance, the occurrence of pastoralism in arid landscapes is widespread in the world. To find similar adaptations in eastern and southern Africa is therefore not necessarily surprising, and could represent a local adaptation to specific climatic conditions, rather than the arrival of culturally defined Khoe pastoralists.

6.4. Conclusion

To conclude, what are the implications of BMS case study, the observation of the regional context and of the widespread aspects of mid to late Holocene microlithic technologies?

Firstly, that potential social and economic shifts occurring in hunter-gatherer societies, as a result of varied processes, do not impact the transmission link of know-how existing in these societies. Furthermore, that the new activities do not necessitate the modification of the lithic systems. Similar categories of actions may have been realised, and tools made of other materials were potentially used for the eventual answering of new needs. When considering the regional patterns and archaeology of the SLCA, we see that objects that look the same in two (or more) different sites, such as lithics and pottery, and symbols in

rock art, were all passed down through time and space in archaeological contexts that may have differed from each other. It is to this day not clear if, and to what extent, site palimpsests could have modelled this archaeological vision. However, rock art, linguistic and genetic studies also demonstrate that interactions occurred. Furthermore, the fact that lithic technologies generally do not change after the appearance of pottery, such as BMS, and in other sites after the development of food-producing practices, is another archaeological trend that inclines us to not necessarily associate one lithic technology with one economy of subsistence.

Therefore, the presence of lithics in varied type-sites could reflect the existence of interactions, processes of creolisation, and also of similar categories of action and practices in varied societies. Considering finally the widespread aspect of microlithic industries with scrapers and backed pieces, it further appears that this technical phenomenon pervades multiple identities with groups of people likely speaking different languages, and having varied genetic profiles. Furthermore, it also makes difficult the observation of the spread of stone-tool using pastoralists, simply because their lithic technology might be similar to the one of hunter-gatherers living in southern Africa. A crucial point of this discussion is that in any case, even if applying the idea of a culturally consistent Khoe migration from eastern to southern Africa, in western southern Africa, where pastoral societies firstly emerge chronologically and where the environment is most suited to pastoralism, both macrolithic and informal lithic industries also occur, contrasting with pastoral eastern African lithics.

In the second half of the discussion, I will further discuss aspects relative to the correlation or de-correlation of varied characteristics for representing past populations and migrations. The use of multi-disciplinary migration models indeed nowadays tends to consider results from linguistic, genetic and archaeological studies at the same level. The automatic alignment between the different analytical units specific to these disciplines through the use of correlation is problematic and often limits our interpretative options. These models are indeed most often based on single-origin hypotheses modelling similarity as a horizontal filiation process, through the use of tree-diagrams. However, many other processes beyond a common ancestry could lead to similarity.

This discussion is particularly interesting for the late Holocene archaeology in southern Africa. Many archaeologists have indeed highlighted the ‘invisibility’ of Khoe pastoral

migrations from around 2000 years ago (e.g. Sadr 2008a). However, following multi-disciplinary and genetic studies, Khoe herders are supposed to be everywhere in southern Africa from around 2000 BP, including in the SLCA where the introduction of sheep is archaeologically associated with later Iron Age contexts. We can ask then, why is there such a gap between the archaeological data and the narratives developed in multi-disciplinary models?

B. Towards ‘Neolithizations’ of southern Africa

The combined use of linguistic, genetic and archaeological studies for establishing migration models is common in southern African research on pastoralism. According to some of these models, sheep would have diffused with Khoe-speaking people through southern Africa from around 2000 years ago. In the literature, ‘Khoe people’ and ‘herders’ or ‘pastoralists’ are often used as synonyms. Many implications follow from this and tend to determine the models we currently have for discussing the advent of herding practices in southern Africa. The second part of the discussion challenges the correlation made between language groups, gene signatures and economies of subsistence, before turning to a revaluation of the archaeological context of the early herding phase. In light of recent debates concerning the identification and dates of early sheep bones, I discuss the archaeological data relative to the appearance of herding practices in order to reassess the evidence we are relying on. Following this discussion, I argue that the use of a single model for explaining the advent and development of herding practices in southern Africa is inadequate, and I instead suggest that diverse actors were involved in these processes. The discussion that follows was published in 2020 in *Azania* (Guillemard 2020).

6.5. Migration models and neolithization of southern Africa

6.5.1. Equating language, genes and subsistence?

Southern African late Holocene archaeology is often associating language groups with specific ‘material cultures’ and subsistence economies. We saw in the Chapter 1 of this thesis that a tripartition of southern African populations is commonly observed in the archaeological literature: the ‘San hunter-gatherers’, the ‘Khoe herders’ or ‘Khoe pastoralists’ and the ‘Bantu farmers’. These three broad populations represent the basic units that many archaeologists use, for instance for discussing migrations or interactions.

San, Khoe and Bantu, further than being language groups, are often understood as broad ethnic groups, and correspond in the mind of some to consistent cultural entities.

Different problems emerge from such practice. The first is that as archaeologists, we have access to specific data, that is different from the one linguists or ethnologists could have access to. As recalled in the Chapter 2 of this thesis, there is no necessary correlation between linguistic and archaeological data (e.g. MacEachern 2000). Furthermore, talking about Khoe or Bantu culture entities that could be visible archaeologically and mapped falls within culture-container models. We saw how these visions, in archaeology but also anthropology, are nowadays criticised. Speaking about a 'Khoe' or a 'Bantu' 'archaeological culture' indeed conveys the idea that it exists culturally closed groups of people, forming a consistent identity, language, practices and 'material culture' that could be seen archaeologically. This essentialist vision of past human societies is especially problematic because it forces us to think in closed paradigms, when more and more, archaeology and anthropology shows that human societies are not closed 'spheres' but could rather be represented as flexible systems that may overlap between different populations. If looking at a specific class of object or practice, we may, therefore, observe that it is shared by different language groups. Some objects or practices may, in contrast, be more specific to one language group.

6.5.2. Khoe peoples as herders of pastoralists

When considering the appearance of herding practices in southern Africa, Khoe 'people' or Khoe-speakers are generally associated with as the first herders or pastoralists. As a recall of the time period we are here concerned with, the 'pre-Iron Age' herding phase, also called the 'early herding phase' is generally dated from around 300 BC to the beginning of the Iron Age around AD 300 (Sadr 2013). Three main models of how sheep were introduced at that time are debated. The first model consists of a rather large-scale migration of herders coming from further north (Ehret 1982; Elphick 1985, 1998; A.B. Smith 1992). Another model, proposed by Sadr (2015), hypothesises that livestock was introduced by smaller groups of people arriving in successive infiltrations in southern Africa. The third model proposed by Jerardino *et al.* (2014) suggests that diffusion was the main process driving the appearance of sheep. The debate regarding how and when sheep reached southern Africa is ongoing, and no consensus has been reached. It seems, however, that the demic migration hypothesis of herders coming from eastern Africa, mainly based on linguistic and genetics grounds, is receiving more attention (e.g. Breton *et al.* 2014).

Regardless of the different models that have been proposed and defended by researchers, the early herding phase is broadly accepted as consistent phase for the whole of southern Africa. Different lines of evidence exist to discuss this period of time, including linguistics (e.g. Ehret 1982; Güldemann 2008; Blench 2009, 2013), genetics (e.g. Henn *et al.* 2008; Breton *et al.* 2014) and archaeological studies (e.g. A.B. Smith 2008; Lander and Russell 2018). Interestingly, in all these disciplines, a similar idea is often expressed: sheep were introduced in South Africa by herders or pastoralists speaking ‘Khoe’ or ‘Khoe-Kwadi’ languages. Why do researchers have this idea and how did it influence the models we currently have?

The debate concerning if, how and when the Khoe pastoralist migration occurred opposes different perspectives such as essentialism and materialism. This opposition is important, as it partly determines the interpretation of scientific data and the creation of models. Regarding the construction of Khoe pastoralist migration models, I here emphasise the flaws of an essentialist perspective by adopting a more materialist approach.

The aim of this discussion, is to challenge the models on the appearance of herding equating ‘Khoe people’ with herders or pastoralists. To do so, I discuss the assumptions behind this idea, and secondly question the archaeological data on the appearance of sheep in southern Africa. Later in this chapter, the recent debates on sheep identification and associated dates are referred to. The variety of social models that may be linked to the introduction of herding practices is finally discussed. For this, I also consider archaeological evidence for sheep herding in Iron Age contexts, especially in the Limpopo River Basin.

The assumption that Khoe-speakers in South Africa are herders or pastoralists is indeed widespread. According to some of the models discussing the appearance of herding practices, sheep would have diffused with Khoe-speaking people through southern Africa from around 2000 years ago. In the literature, ‘Khoe people’ and ‘herders’ or ‘pastoralists’ are often used as synonyms. Many implications follow from, and cast a shadow on the history of Khoe-speakers in southern Africa.

We saw in the Chapter 1 of this thesis how the assumption that Khoe-speakers are herders or pastoralists partly finds its roots in the history of colonisation of South Africa. At the time of European colonisation, different records depict local populations, often in a depreciating manner. We saw that the ‘Hottentot’ of the Cape area were later referred to as

‘Cape Khoekhoe’ and described as a pastoral population herding caprine and cattle (Ehret 1982). I insisted on the fact that when studying the historical archives, historians and archaeologists are thus confronted by many challenges, in particular to estimate the reliability of these early records (McGranaghan 2015). Uncertainties found in historical literature led to debates concerning the degree of flexibility and interconnection existing between ‘Hottentot’ (Khoekhoe pastoralists) and ‘Bushmen’ (San hunter-gatherers), in colonial times and in the past (Barnard 2008). The debate reached the field of archaeology, opposing different points of view (e.g. A.B. Smith *et al.* 1991; Schrire 1992).

Like ‘Khoekhoe’, the word ‘Khoe’ came to be used for defining pastoralists or herders, often in opposition to the ‘San’ who are presented as hunter-gatherers. This morphing from one concept to another partly determined our understanding of the past because it entailed strong assumptions when discussing the appearance of herding practices in southern Africa. Although the idea that ‘San’ (and so San-speaking) hunter-gatherers could have turned to herding has been suggested, the image of herders as Khoe-speaking people persists. This can be said for the fields of archaeology (e.g. H. Deacon *et al.* 1978; Walker 1983; Klein 1986; A.B. Smith 2006; etc.), linguistics (Ehret 1998, 2008; Güldemann 2008), genetics (Soodyall *et al.* 2008; Breton *et al.* 2014), and rock art studies (B. Smith and Ouzman 2004; Eastwood and B. Smith 2005; Orton 2013). Initially a language group, ‘Khoe’ came to incarnate a ‘herding people’ in many different studies. Finding their origin meant, therefore, more than a mere linguistic reconstruction, as it also meant tracing back the origins of herding in southern Africa.

The combined use of linguistic, genetic and archaeological studies for establishing migration models is common in southern African research on pastoralism. The emergence of herding practices in southern Africa has been investigated by researchers coming from different fields, including archaeology, linguistics and genetics. While few archaeological evidence for sheep remains exist for the early herding phase, the idea that Khoe-speaking herders are present in the landscape as early as the BC/AD transition seems to be received wisdom. It is especially true when reading the linguistic and genetic literature. Why is there such a gap between the archaeological data and the results from other disciplines?

Linguistics played a crucial role in the search as Khoe languages origins, as it was able to discuss the evolution and potential origins of language groups (Haacke & Eiseb 2002). Different methods were used, such as palaeo-linguistics which includes comparative

grammar and glottochronology (e.g. Ehret 1982). Whether in these linguistic studies the equation between Khoe-speakers and herding groups was claimed, or whether the link was made by researchers from other disciplines, ‘finding the origin of Khoe languages’ became ‘finding the origin of herders or pastoralists’. Extrapolating from the existence of similar words or structures in different Khoe languages, linguists recreated ‘proto’ languages that they located in different areas of Africa.

Two main geographical origins for the proto- Khoe languages have been discussed. Firstly, and following Ernst Westphal (1963), Richard Elphick (1985) argues that proto-Khoe languages were spoken in northern Botswana, where Khoe-speaking people acquired cattle from Bantu-speaking people. From there, Khoe languages, and herding, would have spread in South Africa following different routes. Second, Roger Blench (2009, 2013) proposes that proto-Khoe-speakers would have interacted with Cushitic pastoralists in central Zambia, and subsequently would have developed herding. The existence of languages potentially related to Khoisan languages (Sandawe and Hadza) is one of the linguistic arguments in favour of ancient relationships between eastern and southern African populations, although it is still debated (Güldemann & Stoneking 2008; Blench 2013). Tom Güldemann (2008), on his side, argues for a demic migration of pastoralists speaking Khoe-Kwadi languages (including Khoe languages) which may originate from East Africa. Other points of origins for Khoe languages have been proposed (see Sadr [2008] for discussion). Beyond language affinities, linguists have also argued that Khoe-speakers were keeping stock for a long time, and independently from Bantu-speakers. Tom Güldemann (2008) and Christopher Ehret (2008), for instance, discuss the existence and evolutionary pattern of words related to domestication in Khoe or Khoe-Kwadi languages, such as ‘sheep’ or ‘cow’. Following their study, these words would have existed in proto-Khoe languages prior to the Bantu-speakers’ migrations.

Another important field for the modelling of human migration is genetics, which is today playing a central role in the reconstruction of the spread of herding practices. We saw in the Chapter 2 of this thesis how the varied sampling strategies used by geneticists may impact the social interpretation of their results. Some genetic studies also assume that people sharing a common type of gene have a similar economy of subsistence. This is for instance the case with an article, already evocated in Chapter 1, published by Henn *et al.* (2008) looking at Y-chromosomal data to retrace a ‘pastoralist migration’ from eastern to southern Africa. In their article, the authors conclude: “*Our Y-chromosomal evidence*

supports a demic diffusion model of pastoralism from eastern to southern Africa ≈ 2000 years ago” (Henn *et al.* 2008: 10693). However, they also suggest an alternative hypothesis: *“a nonpastoralist interpretation is also possible ... it would have involved, minimally, male hunter-gatherer individuals moving between the regions”* (Henn *et al.* 2008: 10697). This last hypothesis has its importance in the following discussion.

Most of the current genetic research points to an East African location for the diffusion of herding practices in southern Africa (e.g. Henn *et al.* 2008; Pickrell *et al.* 2012; Schlebusch *et al.* 2012). The picture is, however, quite complex as similar genes are only found among specific East and South African populations (e.g. Barbieri *et al.* 2014). An interesting set of genetic articles also emphasises the presence of the lactase persistence allele C-14010 in Khoe-speaking pastoral populations of southern Africa and in pastoral populations of East Africa (Schlebusch *et al.* 2012, Breton *et al.* 2014; Macholdt *et al.* 2014; Ranciaro *et al.* 2014 – see Chapter 1).

After this short overview, and discussion of linguistic and genetic studies in Chapter 1, several points are worth noting. Following the linguistic literature, Khoe-speakers may already have been herding from around 2000 BP, as their vocabulary includes words specific to domestication. It is, however, important to recall that linguists have different opinions on where, when and how Khoe-speakers acquired livestock. These questions are still open, especially given that the archaeological evidence for herding practices is particularly scarce before the mid first millennium AD. Using specific words in proto-languages to find past habits has also been criticised, for instance in the context of Indo-European studies (Demoule 2014). It is also important to note how linguistic studies greatly impacted archaeological and genetic studies. Indeed, the existence of groups of people speaking potentially Khoe-related languages in eastern Africa led geneticists to sample these populations for testing their hypotheses. Furthermore, the concept of ‘proto-languages’ that are represented through tree-like diagrams, progressively shifted to proto-populations and proto-herders or pastoralists, to finally create an archaeological ‘Khoe culture’. The single-model hypothesis used in linguistics, explaining all modern linguistic similarities by a ‘mother tongue’ and the principle of filiation, was then echoed in archaeology with a ‘mother culture’ that would give birth to more recent expressions, notably evidence for herding. In that sense, migration models such as the one discussed here, follow similar tree-like dispersions and are associated with similar ideas of

conservatism, and absence of awareness of processes such as borrowing and convergences (Fig. 6.2).

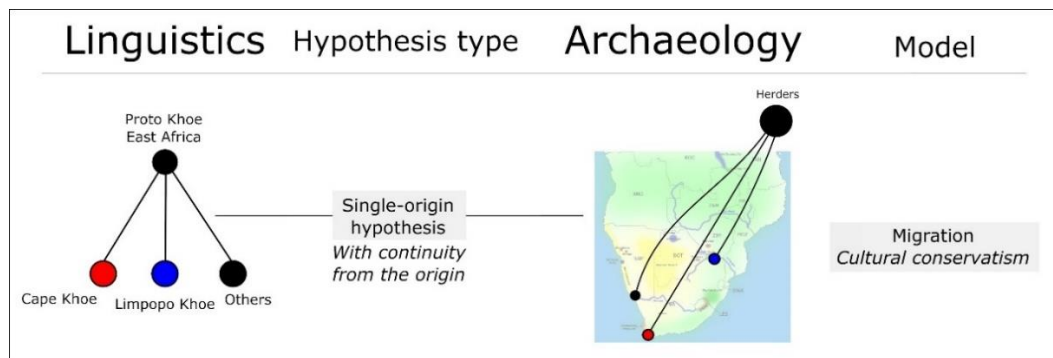


Figure 6.2. Shift of single-origin-type hypotheses from linguistics to archaeology

6.5.3. An essentialist way of thinking

Other and perhaps more deleterious problems indeed appear when trying to match the archaeological material with proto-languages, and ultimately with a ‘proto-people’. As discussed in the Theory chapter, Sarah Croucher and Stephanie Wynne-Jones (2006: 108) recall that assumptions are always made about identity when studying past populations, qualified as an ‘unifying identity’. In the research context on the appearance of herding and pastoralism, this ‘unifying identity’ is often incarnated by a ‘Khoe people’. However, the systematic association between herders and a ‘Khoe people’ is debatable.

In the context of Bantu migrations, criticisms were also expressed by different authors against the idea of a ‘Bantu entity’ lying in the association between Bantu languages and one ethnic group (Chrétien 1985; M. Hall 1987). Chrétien highlights that this concept is linked to one of cultural or historical ‘races’ deriving from the Indo-European model. As we saw in the Chapter 2, Demoule (1991, 2014) explains that following this theory, there would have been a process involving the simultaneous spread of a new economy of subsistence and Indo-European languages. The idea that there is necessarily a coincidence between archaeological materials and language, and that ‘archaeological cultures’ are homogeneous groups is discarded by the author: *“matching a language with a given material culture is a bold assumption There may be coincidence between a material culture and a given, self-defined ethnic group, but it is not always the case”* (Demoule 2016: 171). This vision, criticised by Demoule and Chrétien, can be associated with essentialist thinking. Other authors, insisted on the importance of social change in

migrating societies, due to the interactions occurring with different groups of people. Denbow (2014: 157) comes back on this idea about the Bantu migrations:

As Ceramic Later Stone Age (CLSA) and Early Iron Age (EIA) peoples moved south of the Congo River they interacted with and absorbed a varied population of indigenous foragers, in the process incorporating new ideas, values and practices. Hence, as Vansina (2004: 33) remarks: 'it is absolutely wrong to think of all the resulting societies as consisting of a single invariant forager input and a style input of Bantu agriculturalists.

Likewise, and joining authors such as MacEachern (2000) I argue that a language group, such as Khoe, does not necessarily match with a biological group, nor necessarily with an economy of subsistence or class of objects. Indeed, if it is to match, this should be demonstrated and not taken as an assumption.

Following this argument, I argue that translating proto-Khoe languages into a Khoe 'people' who are herders or pastoralists is problematic. It assumes that this people practiced herding, continued herding during its migrations, and were still herding at their point of arrival. This conservative idea is especially problematic as the archaeology has not yet provided any strong evidence to support it. Sadr (2008a) also insisted on the fact that Khoekhoe may be a rather recent social construct, and that the attributes contributing to their identity, such as language and economy, may not have been the same in the past.

Using 'Khoe', 'Khoekhoe' or 'Khoe-Kwadi' instead of terms such as 'herders' or 'pastoralists' also minimises the potential existence of peoples with different languages introducing or turning towards herding practices. Several social models involving different actors, may better explain the introduction and development of herding to and in southern Africa. Employing such terms also casts a shadow on the history of Khoe-speakers themselves, who may have had different social and economic structures through time and space. Although it is irrefutable that some Khoe-speakers were indeed pastoralists (e.g. Fauvelle-Aymar 2008), does this evidence mean that such pastoralism would have been the same everywhere, as well as at all times in the past?

In southern Africa, varied Khoe and San languages are spoken, that are not automatically associated with different modes of subsistence (Güldemann & Stoneking 2008; Mitchell

2010; Sadr 2013). For instance, Khoe-speaking groups are not all herders; some are hunter-gatherers (Barnard 1992; Mitchell 2010). Reconstituting language genealogy, Barnard (1988) proposes that ‘Early Khoe’ located north of South Africa came down and separated into two branches: those who moved south and became Khoekhoe, practicing herding, and those who moved in the Kalahari and became Kalahari ‘Khoe Bushmen’ practicing hunting and gathering. Barnard further argues that Khoe-speakers in South Africa may have included both hunter-gatherer and herders: “*The Khoe-speakers, who arrived in the area after the non-Khoe-speaking Bushmen but before the Bantu-speakers, included both hunter-gatherer and herder populations*” (Barnard 1992: 158–159). Although it may have been clear for different authors that Khoe-speakers of the past may have been hunter-gatherers, this idea seem to have been forgotten especially in the frame of genetic and archaeological studies.

Two questions may be now asked: does the spread of a language or a gene mean that herding practices spread? And is archaeological evidence for herding in southern Africa a proxy for Khoe-speakers?

These issues are particularly pressing, as the existence of inter-feeding models, especially written by geneticists are taking more and more space in historical and archaeological narratives. The equation of results from different disciplines, and a certain confusion emerging from erroneously defined populations represent real limits for our understanding of the past. In the following section, I discuss the archaeological data on the appearance of herding in southern Africa.

6.6. Archaeological data on the appearance of herding practices in southern Africa

The discussion started more than ten years ago by Sadr (2008), questioning the archaeological invisibility of Khoekhoe pastoralists is still up-to-date. In his article, Sadr synthesised the state of knowledge on early herding, including data from different disciplines. Even at that time, the author was highlighting the lack of archaeological evidence for pastoralism during the first millennium AD, and concluded that “*the absence of evidence for Khoekhoe pastoralists in the first millennium AD archaeology of southern Africa can be explained by their arrival during the second millennium*” (Sadr 2008a: 180).

Today, with the growing contribution from the field of genetics, the existence of an independent migration of Khoe-speaking pastoralists coming from East Africa around 2000 years ago seems to be even clearer. However, further even than the impossibility to archaeologically define language groups, the archaeological research could point out to varied and complex scenarios.

6.6.1. Finding the evidence for herding

Deciphering the appearance and development of herding practices is indeed challenging, since many factors may influence the archaeological assemblages of stock-owning groups, and especially the presence/absence of caprine remains. In discussing the archaeological evidence, sheep remains are the primary matter taken in consideration, as an initial basis for reflection. The presence/absence and amount of sheep bones in a site may be an initial indicator of the economy of subsistence of the group of people, but is not necessarily a mirror of their social and economic organisation. As Tim Ingold (1984) points out, what distinguishes hunting-gathering and herding societies is the opposition between collective and divided access to resources. In that sense, the sole amount of domestic animal remains in a site is not the main distinctive criteria between two types of economies, it is how this resource is accessed and shared. As a complementary perspective, Testart (1982) emphasises the differences existing in the management of resources (implying storage) in different hunting-gathering societies, and highlights the diversity of social and economic models existing. Moreover, sheep remains may be absent from an archaeological site where people were herders. Different authors highlight the low archaeological visibility of pastoral groups (e.g. Arthur 2008). Kinahan (2001) for instance reminds us that sheep are not necessarily kept in the camps. The focus on rock shelter excavations may therefore represent a bias, open-air sites with evidence of domestic stock not being found. Different practices, such as the removals of caprine bones to avoid the spreading of botulism may also diminish the representation of caprine remains in archaeological sites (Kinahan 2001).

These examples collectively remind us that, in addition to the amount of sheep remains, other data should be taken in consideration when investigating the shift to pastoralism. In this regard, other work has indeed been done on other archaeological aspects for discussing ‘herder migrations’, notably on pottery and stone artefacts (e.g. Sadr 1998; Orton 2012; Dewar & Marsh 2019). However, pottery and other archaeological material such as stone artefacts, are not necessarily linked to herding or specific ethnic groups (Croucher & Wynne-Jones 2006).

Aware of these difficulties, I nevertheless question the evidence we are working with, and how it may need revision. Different problems arise, especially linked to the identification of sheep bones, but also the lack of direct dating, as well as taphonomical issues. It is therefore knowing that evidence could be still to discover that the following data is presented, accordingly to the current state of knowledge.

Until recently, a fair amount of sheep remains dated around 300 BC – AD 300 have been found in different Later Stone Age (LSA) sites of southern Africa, supporting the existence of a pre- Iron Age herding phase (e.g. Lander and Russell 2018). However, the chronology and models established on these remains appear more and more unstable.

6.6.2. A fragile chronology

As we saw in the Chapter 1 of this thesis, sheep firstly appear in southern Africa at the end of the first millennium BC in LSA sites attributed to hunter-gatherers (e.g. Sadr 2003). The earliest caprine bones found in southern Africa are dated from around 300 BC. Many of the early evidence has, however, recently been contested in regard to their identification, dates, and taphonomical aspects.

Recently, questions have arisen about the chronology of appearance for sheep in southern Africa. As we saw in the first chapter, it appears that faunal remains that were previously attributed to caprine were misidentified, and corresponded to wild antelopes of the same size class (Horsburgh *et al.* 2016, 2017; Le Meillour 2017). A debate is now ongoing about what anatomical part of the sheep or goat skeletons are the most diagnostic when making an archaeozoological identification. Different authors raised the issue that post-cranial bones are in that sense not diagnostic enough for differentiating caprine for springbok for instance. This ongoing debate instils doubt regarding many of the sheep identification in LSA sites. However, unless further analyses are made on the faunal material, it is at the moment impossible to resolve this issue.

This problem in the identification, associated dates and potential taphonomical issues is central when discussing the chronology of herding appearance. The associated dates of the sites discussed here are listed in the Chapter 1 of this thesis. Some of the remains of Bambata (Zimbabwe), are, for instance, attributed to sheep with caution (Walker 1983). Other sheep remains are dated by association with the stratigraphic unit in which they were found. It is the case for the sites of Falls Rock Shelter and Snake Rock Shelter (Kinahan

2016), as well as /Hei-/Khomas, Geduld (A.B. Smith and Jacobson 1995) and Boomplaas (see Pleurdeau [2012] for discussion). Pleurdeau *et al.* (2012) in their review of the early sheep bones recall that some sheep remains are in an uncertain stratigraphic position. It is for instance the case for Oruwanje 95/1 (Albrecht *et al.* 2001).

Considering these issues, four sites containing caprine remains dated before around AD 500 could be further discussed: Spoegrivier (353 cal. BC – cal. AD 70 ; Vogel *et al.* 1997), Toteng 1 (144 cal. BC – cal. AD 60 ; Robbins *et al.* 2008, 2005), Blombos (48 cal. BC – cal. AD 211 ; Henshilwood 1996) and Kasteelberg (cal. AD 340–628; A.B. Smith 2000) (Table 1.1. and Fig. 6.3). Complementary ongoing work is being done for Leopard Cave (Namibia).

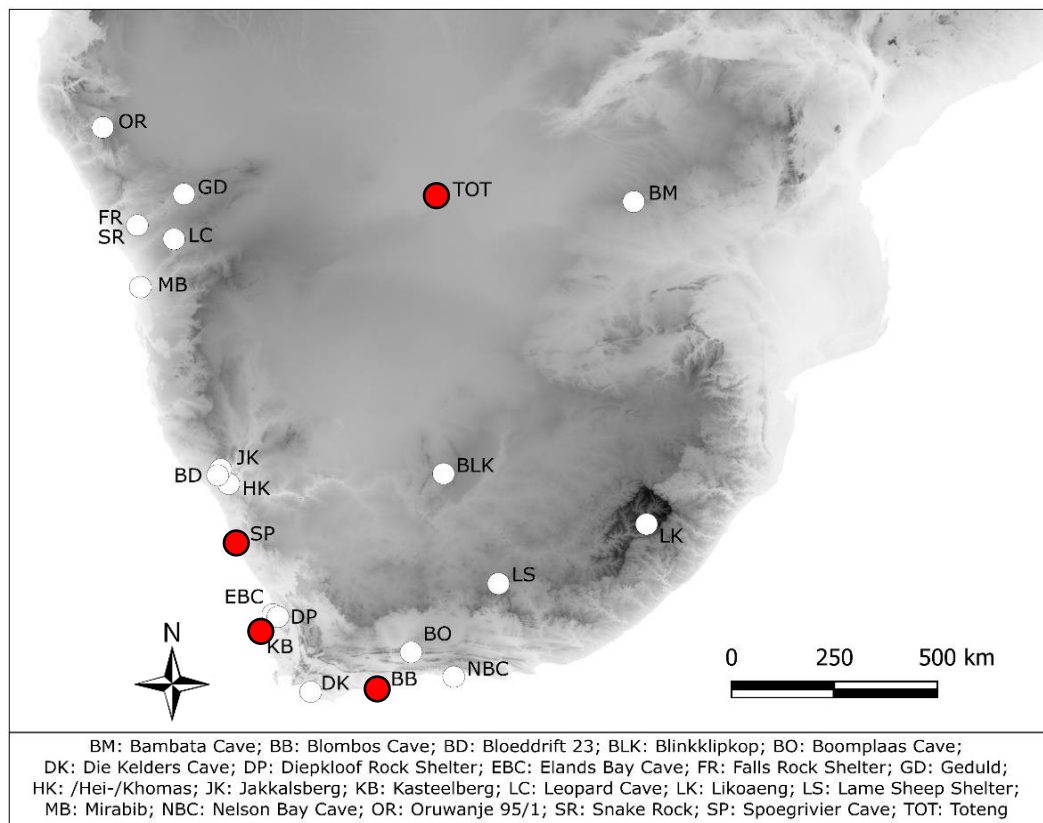


Figure 6.3. Sites with sheep remains directly dated for the Early Herding Phase

At Spoegrivier, most of the sheep remains are located in layers dated between cal. AD 30–321 and AD 680–964 (Webley 2002). Downward movement of sheep bones from the upper layers was noticed by Webley (2002), who suggests that the date at 353 cal. BC – cal. AD 70 may be anomalous. While the dated sheep remain is a phalanx (considered unreliable by Horsburgh *et al.* 2016), twelve of the undated sheep remains are teeth and all located in

the upper layers that potentially date from cal. AD 300 (Webley 1992, 2002). At Toteng 1, only a few caprine remains have been identified, and part of the stratigraphy appears to be disturbed, with dates ranging between 5000 and 500 BP (Robbins *et al.* 2008). Here, the one sheep bone dated is an astragalus and is considered more reliable by Horsburgh *et al.* (2016). They however doubt the other remain which is a calcaneum. The sites of Kasteelberg, on the other hand, hold many sheep remains in comparison to the other sites. Although Horsburgh *et al.* (2016) recall that some of these remains are post-cranial, there is little doubt that there are caprines here.

Generally, the faunal assemblages found in the ‘early’ sites also bear very few sheep bones (Sadr 2013). We also saw that generally, there is no clear evidence of a global diet reorientation during the first millennium AD (e.g. Dusseldorp 2006). It is particularly clear when comparing the density of sheep remains in LSA sites of that time with those in Iron Age sites (Sadr 2008a). From around the mid-first millennium AD, and especially during the second millennium AD, the number of sheep remains increases in some sites. As a whole, these observations could be consistent with the hypothesis a small proportion of caprine was initially included in the subsistence economy of the people at these sites, and that a focus on pastoralism developed later (Sadr 2008a).

6.7. Towards ‘neolithizations’ of southern Africa

In the context of genetic studies, we saw that links between southern and eastern African populations existed with a flow of genes starting from East Africa, where pastoralism first appears from around 5000 BP (D. Wright 2014). However, the eastern African genetic signature in southern African Khoe- and non-Khoe-speakers is one amongst many, meaning that interactions and the creation of new groups of people was constant. Gene flow, especially when not related to milk consumption, should also not be viewed as a proxy for the spread of an economy of subsistence. Some geneticists such as Barbieri *et al.* (2014: 439) discuss this idea on the basis of their genetic study of Khoisan populations: “*simple linguistic classification is not a good predictor of genetic variation between populations*”. The presence of lactase persistence alleles in hunter-gatherer populations also indicates that a population being initially pastoral may have shifted to other modes of subsistence, without having as a consequence the disappearance of this trait. Finally, although different genetic studies show the complexity of population movements and contacts, the emphasis on a single point of origin located in eastern Africa to explain the

emergence of herding in southern Africa resembles the linguistic models reconstructing proto-languages. These types of hypotheses, in linguistics based on the existence of a single language giving birth to all modern spoken languages, are ‘single-origin hypotheses’. It is an important point to highlight, given that other hypothesis types integrating different points of origin could have been proposed.

Considering the fact that there are only a few sites with early sheep remains, and that the status of some sheep identifications may need to be clarified, the current chronology starting from around 2000 BP appears more and more uncertain. This also entails different perspectives on who the actors responsible for sheep introduction may have been. As mentioned above, the idea that Khoe people are the ‘first’ herders firstly relies on an association between a people and an economy of subsistence. But it also relies on this early chronology, preceding the arrival of agro-pastoralists, marking the beginning of the Iron Age. If the dates of the first sheep remains start overlapping with the ones of agro-pastoral sites, a variety of regional models may be offered to us. It is especially the case for the eastern part of southern Africa where the absence of early sheep remains, including those not directly dated, is noteworthy. The appearance of herding linked to agro-pastoral communities is indeed well-documented in the eastern part of southern Africa (e.g. Lander and Russell 2018), as well as from the second millennium AD in different areas (Sadr 2008a). The current model states that Iron Age ‘people’, linguistically linked to Bantu-speaking populations, migrated southward to reach South Africa in the beginning of the first millennium AD, from around AD 300 (Huffman 2007). This statement includes nuances when expressed by others. For Phillipson (1977), ‘Bantu farmers’ actually includes a broad variety of cultures, languages, beliefs and economies.

Bearing the diversity of Iron Age economies in mind (see Chapter 1), as well as the fragile chronology of the early caprine bones, it is now necessary to focus on regional contexts for understanding the different transition scenarios to herding that may have occurred in southern Africa. Although in some areas, hunter-gatherer and agro-pastoral settlements have been well-identified, no clear archaeological record of an independent herding population preceding the EIA has been discovered. On the other hand, archaeological evidence of interactions between hunter-gatherers and agro-pastoralists are visible, for instance in the Limpopo valley (S. Hall and B. Smith 2000; Schoeman 2006a; S. Hall *et al.* 2013; Forssman 2014a, 2017). In other areas, the involvement of local hunter-gatherers in the development of pastoralism is also discussed (Kinahan 2001).

It seems that we are now at a turning point in our understanding of this early herding phase, concerning not only its chronology, but also its geographical location, and actors involved. Regional models bringing into play different actors will probably emerge in the years to come, rather than continuing to apply of a unifying model that explains the advent of herding through a Khoe migration.

To the question if we could equate economies of subsistence, language and genes in the context of ‘Khoe pastoral migrations’, no single answer can be given. Some Khoe-speakers of the past may have been herders, but others not. Khoe-speakers should therefore be considered in a plural manner, not only as a synonym of herders or pastoralists. Indeed, matching a proto-language with a people may result in a constructed entity linking language, gene and ‘material culture’. This essentialist view of the past minimises the social change that herding and hunter-gathering societies of southern and eastern Africa may have gone through.

I also suggest that, perhaps the wrong question has been asked. Finding Khoe-speakers may not mean finding herders, as they may have been hunter-gatherers. Indeed, if we do not use the presence of geometric rock art as evidence for the presence of Khoe-speaking herding populations, then only the linguistic and genetic data remain. It has not been demonstrated that gene spread is automatically accompanied by cultural spread. In other words, sharing a gene may not mean sharing the same economy of subsistence. A similar criticism may be addressed for the interpretations of linguistic studies, as people speaking similar languages may or may not have had different cultures and economies of subsistence. Furthermore, both these disciplines tend to rely on the archaeological finds to date the events they are describing. Given the problems emerging with the chronology for the early appearance of sheep, the picture may become even more complex. We also know that a great diversity of languages and cultures have been highlighted by ethnographers in modern (or sub-modern) southern African hunter-gatherer groups (Barnard 1992). It necessarily implies that one archaeological signature, especially when found at a large scale, does not correspond to one people. In the same way, beliefs and symbols can be shared by different cultures, and be used in the identity construction of new groups (e.g. Eastwood 2003; Challis 2012). It therefore seems natural that one language is not necessarily correlated with one economy of subsistence.

I then showed that evidence of early sheep remains in the western part of southern Africa could support the antiquity of herding practices (e.g. Dewar & Marsh 2019). However, the language spoken by these people is inaccessible archaeologically. Furthermore, it is only later that pastoral societies developed in the area. In other regions of southern Africa, such as in the SLCA, the emergence of herding practices overlaps with the advent of agro-pastoral communities. Rather than trying to find the original ‘Khoe herder’, other hypotheses for who the Khoe-speakers were should be opened up, and a plurality of actors considered when discussing of the introduction and development of herding practices in southern Africa.

Linguists, geneticists and archaeologists have insisted on the many interactions occurring between groups of people in southern Africa. Acknowledging these interactions is important, as it may blur the categories of people archaeologists are working with. Our reflection could also be taken a step further, as in other areas of southern Africa. Indeed, interaction entails that the groups interacting are independent and different from each other. In its more caricatured expression and if lacking strong evidence, it may still reproduce an essentialist line of thought. Following a more materialist point of view, I argue that it is important to consider that groups of people can change through time, merge and go further than just interacting. People migrating from eastern Africa to southern Africa for instance, but also people along the ‘Iron Age’ migrations, may have developed different social practices and cultures on contact with of different environment and local populations. Considering that a language group, especially at a large linguistic scale, is consistent with a static culture seems to be an unlikely scenario.

Following this idea, the fact that ‘proto-Khoe’ represented a group of people economically consistent in space and time is highly unlikely, especially as Khoe-speaking groups with different economies of subsistence do exist in modern time. Unravelling the models inter-feeding each other is now a priority in order to go further in the understanding of the emergence of pastoralism in southern Africa. Tracing language or gene dispersion may not mean retracing the expansion of herding practices. Furthermore, archaeological evidence for herding may not necessarily be a proxy for Khoe-speakers. The archaeology also needs its own questions, separated from linguistic terminologies. The use of terms such as ‘hunter-gatherer’, ‘herders’ and ‘pastoralists’ seem to be more appropriate when looking at the archaeological past than the use of terms such as ‘Khoe’, as it offers a broader frame of reflection. Looking at the shifts occurring from the mid-Holocene to the second millennium

AD in different areas of southern Africa will also certainly highlight the diversity of hunter-gatherer economic backgrounds, transitions to herding, interactions and social changes, as has been shown already for different regions (Mazel 1989b; S. Hall 1990; Kinahan 2001; Sadr 2005; Orton 2012; Lander and Russell 2018). One model for the whole of southern Africa is not to be expected, but rather a mosaic of social processes involving different actors.

CONCLUSION

In this thesis, I argued that ‘culture-container models’ are often associated with specific representations and interpretations of similarity in archaeology. These models often conceptualize archaeological similarity as ‘archaeological culture circles’, that, if correlated with other parameters such as spoken language and economies of subsistence, would be consistent with past ‘peoples’. The use of single-origin hypotheses and tree-diagram representations often go together with these models, especially if modelling migrations. As we saw, such models and representations have many limitations.

How could we think beyond ‘single-origin’ hypotheses, and what kind of phenomena could the archaeological pattern of similarity represent? When we observe archaeologically similarities in techniques or practices, we investigate them by defining their chronological length and geographical distribution. What the ‘circle’ that we draw around these patterns of similarity is, however actually integrates different processes happening at varied scales of time, that get compacted in a single unit, for instance in a lithic techno-complex. The transmission of knowledge and ‘shared heritage’, are one main process that leads to the observation in archaeology of similar practices and technologies through time. But is it the only process that could lead to similarity?

I argue, firstly, that transmission of knowledge can indeed occur vertically within one human group, however defined, through a filiation system. This is approachable at the site-scale, in archaeological sites in which ‘moments of time’ can be observed. Secondly, however, transmission can also occur horizontally from one group to another. This idea is the basis for many theories presented in the Chapter 2, that discuss the existence of shared practices and knowledges across multiples identities. The idea of horizontal transmission is important, because it highlights the fact that one technology or practice could correspond to diverse identities and social structures. It also gives access to events happening almost simultaneously, whereas vertical transmission processes are often considered through the lens of their origin, and therefore project a potentially much longer time-depth. Integrating the idea of horizontal transmission therefore complexifies our interpretation of archaeological sequences, but also of ‘circles’ of similar technologies or practices that are observed in archaeology. Migration models based on single-origin hypotheses and tree-diagram filiation systems do not generally consider this horizontal variable, because similarity is conceptualized in terms of its primary origin. This conceptualization of

similarity tends to essentialize human groups by thinking of them only in terms of their supposed origin. Crucially, if horizontal transmission is neglected, a migration model assumes that only one group of people is responsible for the spread of one technology or one practice, when in fact, diffusion, adoption and integration of particular technology or practice may exist within several human groups. Migration models based on single-origin types should, therefore, be complexified by firstly considering horizontal transmissions.

Thirdly, beyond vertical and horizontal transmissions, phenomena of convergences in technologies and practices should also be explored in relation to the conceptualization of similarity in archaeology. Two types of convergences were highlighted in the frame of this thesis: 1) the independent appearance of similar technologies or practices; and, 2) adaptative convergences.

As we saw, Phillipson and Boëda, noted the existence of convergences in the form of independent innovations, and similar evolution of lithic technologies. These kinds of phenomena, especially interesting and still under study, are particularly visible if they are geographically and/or chronologically separated. One of the most striking examples is the occurrence of bifacially pressure-faked points at different times in many places around the globe. These convergences are, however, much more difficult to perceive when working in a geographically linked area, as is the case in sub-Saharan Africa. Phillipson nevertheless argues that the widespread aspect of microlithic industries from the mid- to late Holocene in this part of the world likely includes independent innovations and parallel technological evolutions. Even if difficult to demonstrate at this stage, this idea should nevertheless be kept in mind when working with large-scale archaeological units. In addition to vertical and horizontal transfers, independent convergences in technologies and practices should be considered.

Adaptative convergences are also of interest, and partly echo the notion of ‘tendency’ developed by Leroi-Gourhan. Indeed, social and geographical environments partly determine certain practices. This idea, although debatable for lithic technologies, that can be shared across different environment types, is nevertheless important when considering the appearance of herding practices and pastoralism in southern Africa. In this context, we know that sheep were necessarily introduced, because they are not indigenous to this part of the world, and that groups of people with varied subsistence economies have herded caprines. Furthermore, we saw that Khoe-speakers are not necessarily only herders, and

that diversified neolithization processes occurred in southern Africa. Reaching this conclusion, I further argue that caprines are not primarily or exclusively associated with Khoe, or necessarily with East Africa, because they were horizontally transferred through varied groups of people. This horizontal transmission of sheep implies that diverse groups of people have consequently integrated sheep in their social structure, and practiced different kinds of subsistence economies. In terms of this hypothesis, when caprines reached southern Africa, the subsistence economies and social structures of the people introducing them likely differed from the ‘original’ East-African herders. However, adaptative convergences may here play an important role for the creation of archaeological similarities between the two regions: indeed, the environment directly impacts the different subsistence economies that may be practiced. It is common knowledge that pastoralism is adapted to semi-arid to arid areas where agriculture is impossible. These different adaptations are visible in southern Africa: whereas pastoralism is more developed in the western areas, agro-pastoral economies are more common in more irrigated lands. Considering these environmental limitations, it is therefore likely that, when caprines reached southern Africa, similar adaptations to those in eastern Africa occurred, with pastoral economies being visible in the most arid places. Importantly, this adaptative convergence also creates an archaeological similarity that it is not necessary to explain terms of a direct cultural continuity of people coming from East Africa.

Nevertheless, the fact that people moved from eastern to southern Africa, as demonstrated by genetic studies, is irrefutable. However, genetics, linguistics and archaeology also show that one gene, element of language, technique or practice is not necessarily exclusive to one group of people. In southern Africa, the lactose allele typical of eastern African pastoralists is, for instance, found in varied (modern) individuals sampled in western *and* eastern parts of southern Africa (when eastern populations are sampled, which is not always the case). The fact that eastern African and southern African pastoralists share genetic similarities only means that individuals in their genetic history shared genes through vertical *and* horizontal transmission. Fundamentally, it does not mean that a gene reflects a cultural, social, or economic entity. A gene could be passed down in diverse populations, and it would be wrong to assume that the people at the geographical origin of the gene are the same in any other respect than genetic as the people carrying the gene is more recent times. By considering only the ‘oldest’ ancestry, single-origin filiation models also project a time-depth that is too deep for considering finer-scale social variations.

Following these concluding remarks, I argue that the similarity observed in the distribution of pastoral populations in eastern and southern Africa therefore likely represents processes of vertical and horizontal transmissions of sheep in southern Africa, followed by in-situ adaptative convergences to similar environments. The genetic similarity alone cannot be correlated with a social or economic similarity.

In sum, further than single-origin-type hypotheses and linear tree-diagram migration models, which project the oldest ‘ancestry’ onto all the data, more variables and time-scales should be taken in account including: 1) vertical transmission (filiation) potentially representing long time-depth; 2) horizontal transmission (transfer) representing more immediate time-depth; and 3) convergences including independent innovations or adaptations.

Importantly, these processes are not mutually exclusive, and if considered together, may greatly improve our understanding of complex patterns of archaeological similarities. As discussed, ‘change’ should also be taken in account. The reasons behind the changing of societies, technologies or beliefs are case-specific and could correspond to internal social dynamics, technological evolution, or contacts, leading to more or less rapid diffusion. The conclusion that what we see today or in historical records is the same as what happened in the past should be demonstrated, as social change is more likely than social continuity.

The situations we study as archaeologists can appear similar even though they may correspond to different past processes or groups of people who are not necessarily in contact. Moreover, the varied reasons for change or continuity may not be archaeologically accessible. Varied trajectories can also lead to similar adaptations to specific environments. Similarities in practices or economies of subsistence, such as pastoralism, do not therefore necessarily derive from the same processes and point of origin.

In this thesis, I also argued that late Holocene southern African lithic technologies could be shared through time and space by people with varied economies of subsistence, highlighting the ‘trans-economical’ aspect of Wilton industries. This argument is particularly important when considering the more neolithization processes and will have to be compared with examples from other parts of the world. It is also relevant when considering hunter-gatherer societies. In Chapters 1 and 6 of this thesis, I highlighted the variety in southern African late Holocene hunter-gatherer social and economic

organisation. This necessarily implies that the Wilton, or more broadly late Holocene microlithic industries, integrate different hunter-gatherer societies and economies. In that sense, the trans-economical, and perhaps trans-social, nature of lithic technologies is palpable when considering hunting-and-gathering archaeology. The reasons for this shared knowledge should therefore also be investigated in terms of horizontal transmission, for instance through networks and innovation convergences, in addition to vertical 'shared heritage'.

Further research is needed to keep investigating the reasons for both the stability and change of southern African late Holocene lithic technologies through time. With the help of new and more varied multi-disciplinary analytical models, new interpretative hypotheses will help us to free ourselves from the stultifying grip of culture-container models.

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