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What is a Wilton scraper? Perspectives from the Late Holocene assemblage of Balerno Main Shelter, Limpopo Province, South Africa

[1,2]**Iris Guillemard** and [3,4]**Guillaume Porraz**

[1]AnTET-ArScAn, Université Paris Nanterre, Nanterre, France; iris.guillemard@gmail.com
[2]School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand, Johannesburg, South Africa
[3]CNRS, AnTET-ArScAn, Université Paris Nanterre, France; guillaume.porraz@mae.u-paris10.fr
[4]Evolutionary Studies Institute, University of the Witwatersrand, Johannesburg, South Africa

ABSTRACT

Microlithic Wilton scrapers are widespread stone tools of the southern African Holocene Later Stone Age. Though they have been studied and classified in various ways, there are still many uncertainties regarding their fabrication, function and hafting, which ultimately produce one question: are all these scrapers the same tool? The scraper variability in one site, Balerno Main Shelter in the Limpopo Province of South Africa, is investigated through a morpho-functional analysis of the Late Holocene (end-)scraper assemblage. The results of our analysis led us to individualise three types of tool that vary primarily with regard to the characteristics of their passive units (the assumed prehensile part). This classification is accompanied by hypotheses about the hafting and functioning of these scrapers, and carries implications for the categorisation of Wilton scrapers throughout southern Africa.

KEY WORDS: End-scraper, lithics, Wilton, Later Stone Age, Late Holocene, Limpopo, South Africa.

The Wilton techno-complex has been recognised in archaeological sites from South Africa to the southern margins of Central and East Africa (Phillipson 1977; Walker 1995; Robbins et al. 2008; Muianga 2013). Though the exact character of the Wilton may vary importantly from one region to another, it is considered as one techno-typological entity present for most of the Holocene. The Wilton originates from around 8 000 BP and lasts until the end of the Later Stone Age (LSA), persisting after the appearance of sheep and pottery around 2 000 BP (Sampson 1974; Phillipson 1977; Deacon 1984).

The Wilton is a microlithic industry characterised by a miniaturised technology based on small flakes and bladelets (Deacon 1984), some being shaped into small (end-)scrapers and segments which are commonly seen as '*fossiles directeurs*'. Wilton tools rarely exceed 30 mm in maximum dimensions. Following a model outlined by Clarke (1968), Janette Deacon (1972) divided the Wilton complex into three phases (the Early, Classic, and Post-Classic Wilton) representing three stages of development. The Wilton incorporates variations in formal tool frequency, but a morphological continuity in each artefact category is generally noticed throughout all these phases (Deacon 1984; Lombard et al. 2012).

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 items, creating some confusion. For instance, descriptors relating to size (Deacon 1984), morphology (Humphreys & Thackeray 1983) or shape that draw analogies with either modern tools or anatomical features (e.g. Goodwin & Van Riet

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Lowe (1929) for 'duckbill scraper') are commonly found in the literature. We now ask: are all these scrapers the same tool?

This question becomes particularly relevant for the Late Holocene, during which an increase in the regional variability of the lithic assemblages occurs. Initially called 'Post-Classic Wilton' and 'Ceramic Post-Classic Wilton' by J. Deacon (1984), these Late Holocene industries have recently been grouped into broader categories named 'Final LSA' (4 000–100 BP) and 'Ceramic Final LSA' (after 2 000 BP) (Lombard et al. 2012). Lombard et al. (2012) notice the development and the coexistence of different lithic industries (microlithic or not) after 4 000 BP. The Ceramic Final LSA corresponds to the appearance of pottery in LSA sites. This period overlaps with the 'Early herding phase' (Sadr 2013, 2015; Guillemard in press) and the Iron Age (e.g. Huffman 2007). It sees successive migrations of people with a wide range of food-producing economies, more or less relying on herding and agriculture.

During the Ceramic Final LSA, after the spread of food-producing economies and especially during the second millennium AD, a new social landscape flourished (Wadley 1996; Mitchell 2002; Van Doornum 2005; Hall et al. 2013; Forssman 2014). Interactions and the trade of goods may have led to modifications in lithic industries, such as the intensification of scraper production for the making and trading of leather items (Deacon 1984; Hall & Smith 2000; Forssman 2014). Scrapers generally dominate the typological corpus of the Late Holocene Wilton assemblages. In Balerno Main Shelter, located in the northern Limpopo Province, scrapers represent 77% of the total retouched artefacts (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 (Deacon 1984) and 89% at Jubilee Shelter (Wadley 1996).

Given the development of varied socio-economic organisations throughout the Late Holocene, the Limpopo Basin is a key place for deciphering the historical processes in action at this time (e.g. Schoeman et al. 2015). It is recognised as a centre for farming communities during part of the Iron Age (Mitchell 2002; Huffman 2007). Furthermore, during the Late Holocene the Limpopo Basin was part of a complex cultural landscape positioned between the South African Interior Wilton (Sampson 1974) and the northern Zimbabwean Amadzimba industries (Walker 1995; Katsamudanga 2007; Maenzanise 2018). In the Limpopo Basin, several LSA sites dated to the last 3 000 years have been excavated and studied (Mason 1962; Wadley 1987; Walker 1994; Hall & Smith 2000; Van Doornum 2005; Van der Ryst 2007; Bradfield et al. 2009; Forssman 2014). Most of the lithic assemblages relate typologically to the Wilton and contain a high proportion of scrapers (see Forssman 2014).

In this paper, we present our study of the scrapers from Balerno Main Shelter located in the Limpopo Basin. We refine the description of their internal variability, and clarify their functional significance. By discussing their terminology, we also attempt to move away from confusing denominations in order to improve inter-site comparisons. By focusing on the Late Holocene layers, we first wish to characterise the technology used by hunter-gatherers at a period associated with an increased regionalisation of the lithic industries. We also wish to investigate if any techno-typological change may be detected before and after the arrival of agro-pastoral communities in the area.

WILTON SCRAPER CLASSIFICATIONS AND TERMINOLOGIES

Wilton scrapers have at least one convex retouched edge framed by straight sides, divergent or parallel (Deacon 1984). 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. J. Deacon draws attention to scrapers in the LSA as a useful means of classification for those techno-complexes. She recognises a cultural value in their size variation through time, observing that "changes in the style or norms of scraper manufacture reflect cultural change" (Deacon 1972: 36). She proposes a classification according to three scraper types: small (<20 mm), medium (20–30 mm) and large (>30 mm) (Deacon 1972, 1984). 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 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. Other data are integrated, 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 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). They have been recognised in different Late Holocene sites such as Balerno Main Shelter (Van Doornum 2005), Rose Cottage Cave (Wadley 2000), Byneskranskop 1 (Cable et al. 1980) and Olieboomspoort (Van der Ryst 2007). 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 et al. 1998; 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 (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 & Dittemore 1974; Gallagher 1977; Rule & Evans 1985; Shott & Scott 1995).

Another sub-class of Wilton scraper is called a 'backed scraper' and corresponds to pieces with a backed area opposed to the retouched area. These tools have been recognised in the Limpopo Basin (Walker 1998; Van Doornum 2005), in the South African interior (Mazel 1989; Van der Ryst 2007), and also in the Northern Cape Province (Dewar 2008; Orton 2012) and further south (Parkington et al. 1980; Schweitzer 1988;

Smith et al. 1991; Manhire 1993). When identified, backed scrapers generally compose a low percentage of the scraper assemblages (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 overview of Wilton scraper terminologies highlights the fact that archaeologists have not integrated and repeatedly used similar criteria for description. Although Deacon's classification system is the most commonly found in the literature, the proliferation of terms is symptomatic of the variety of perspectives embraced by researchers. Deacon's classification, for example, has the advantage of highlighting the microlithisation process occurring over a long time frame. Nevertheless, her classification contributes to obscuring the variability existing within Wilton scrapers with regard to their functional characteristics. Even if the use of other terms such as 'backed-scrapers' and 'scraper-adzes' offers one way to catch the internal variability of Wilton scrapers, these terms are based on broad assumptions and represent 'in-between' typological categories.

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? To answer these questions, we need to situate the study of scrapers within a broad theoretical framework that engages with their manufacture, life history, and function (e.g. Rigaud 1977; Shott & Scott 1995; Conard et al. 2012; Porraz et al. 2016; Porraz et al. 2018).

WILTON SCRAPERS IN A TECHNOLOGICAL AND MORPHO-FUNCTIONAL FRAMEWORK: METHODS

In order to assess the variability of Wilton Late Holocene scrapers, we combined two approaches, namely a technological approach and a morpho-functional approach. The technological approach aims to situate the study of the tool within its entire lithic reduction process—its *chaîne opératoire* (Inizan et al. 1995). The concept of *chaîne opératoire*, which may be translated as 'operational sequence' (Audouze 2002), was introduced by André Leroi-Gourhan (1964) and refined by later scholars (see Lemonnier 2004 for discussion). In the context of lithic studies, the *chaîne opératoire* concept "allows one to relate the different stages of production to each other and to order them along with related factors, including physical and economic ones, terminology, places, social relations, symbolics, etc." (Audouze 2002: 287). 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 approach reproduces the general principles of the techno-functional studies focusing on the structure of artefacts (Boëda 1997). Sigaut (2012) defines the study of structure as a detailed analysis of the different units constituting the tool. He establishes an important distinction between a) the function, and b) the functioning of a tool. The function of a tool is 'what is it made for?', whereas the functioning is 'how does it work?'. 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.

The term 'scraper' applies to all blanks with an edge modified by a continuous convex to straight-convex retouch (Demars & Laurent 2000; Andrefsky 2005). 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 principles of the techno-functional studies (Lepot 1993; Boëda 1997), we divide 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. 1). Considering that microlithic scrapers were likely hafted, we acknowledge that the totality of the prehensile part is not preserved.

Our study sought to characterise the morphological variation of the scrapers, notably by distinguishing the active and passive units. Various data were taken for recording dimensional and qualitative parameters (Fig. 1). First, the raw material and blank type were noted. While the technological axis was systematically recorded, all scrapers were oriented within the axis of their *front*. Various measurements were taken, such as the maximum length of the scrapers (perpendicular to the *front*), the *front* width, and the maximum thickness (in the middle of the piece). The width of the base was measured at one third of the scraper's length from its unretouched end. Angles were measured against reference angles taken with a goniometer, ranging from 10° to 100°. The angles were measured 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. To investigate the stages of discard, we associated different data, such as the angle of the *front*, the presence/absence of deep retouch flakes removing part of the *front*, and 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

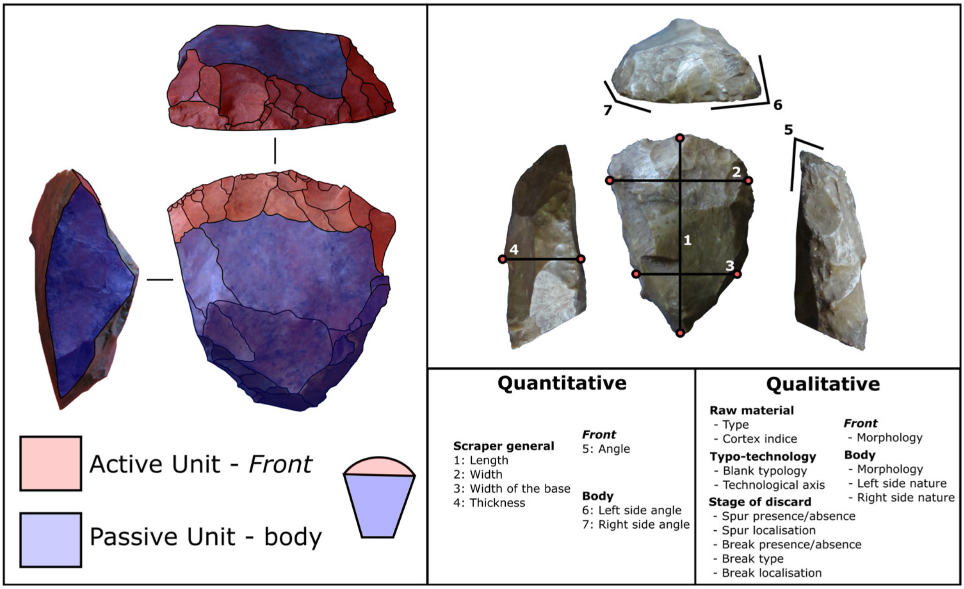


Fig. 1. Active and passive units of a Wilton Late Holocene scraper from Balerno Main Shelter, quantitative and qualitative data registered.

of the retouch (e.g. Weedman 2002). Different studies have demonstrated that *front* spurs are accidents created by hinged retouch, and that corner spurs can be linked with the sharpening of the scraper (see Eren et al. 2013 for discussion). The presence of spurs may lead to the discarding of scrapers, as they may damage soft materials such as hides (Weedman 2002). Spurs are, therefore, a significant techno-functional feature to record. Finally, all breaks were described, using terminology borrowed from the work of Bertouille (1989, 1991) and Chesnaux (2014). Breaks may have occurred during use or resharpening, or may be intentional. Three types of breaks were recognised: neat breaks with no orientation, neat breaks with an orientation, and flexion breaks with an orientation. The location of the break was recorded, as well as its orientation when visible.

For this study, we investigated the scrapers from the Final to the Ceramic Final LSA layers dated between 260–60 BC and the end of the first millennium AD. The scrapers' characteristics, reduction process and stages of discard were first analysed. Their structure was then inferred by looking at the properties of the different units of the tools.

THE SITE

Balerno Main Shelter is located in the Shashe Limpopo Confluence Area (SLCA), near other Late Holocene archaeological sites such as Tshisiku Shelter and Little Muck (Fig. 2). The site 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 (Fig. 3). In 2000, four squares (O13, P13, P14 and P15) were excavated inside the shelter. Another excavation took place below the dripline but is not considered

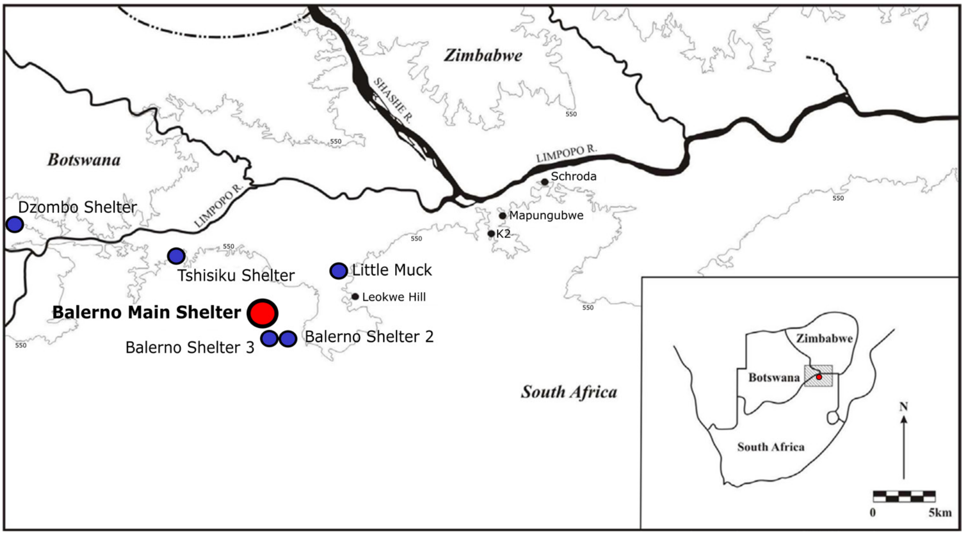


Fig. 2. Map of the Shashe-Limpopo Confluence Area (SLCA) with location of Balerno Main Shelter and other sub-contemporaneous archaeological sites, modified after Van Doornum 2008.

in this study as stratigraphic connection with the excavation inside the shelter could not be established. From the surface to the bedrock, 13 stratigraphic units reaching a maximum depth of around 110 cm were defined inside the shelter. They were excavated stratigraphically, with deeper units subdivided into 5 cm spits. The sequence is dated from around 11 120–10 890 BC to AD 1675–1800, and is sealed by a thick, hardened dung layer corresponding to a late farmer occupation dated around AD 1600–1800 (Van Doornum 2008).

For this study, we focused on the layers dated between 260–60 BC and AD 650–1150, corresponding to the succession from the Final to the Ceramic LSA. The dashed red line within the layer DBG (Damp Black Grey) represents the spit 65–60 marking the limit between the pre-ceramic and ceramic layers (Fig. 3). The two layers considered here are, from base to top, DBG with both pre-pottery and the first pottery-bearing levels, and Brown Red Ash (BRA) with pottery (Fig. 3). The layer Grey Ash is at the contact between BRA and the Dung Crust. The layer DBG is an "oily grey deposit flecked with charcoal" (Van Doornum 2008: 257), in which a hearth was recognised (DBG hearth). BRA is a fairly homogeneous thick "brown-red, artefact-rich layer" (Van Doornum 2008: 257). It "extends slightly into the darker, greyer levels of Damp Black/Grey below" (Van Doornum 2005: 64). The hearth in DBG is dated at 2 180±50 BP (262–59 cal. BC; calibration curve SHCal 13) while BRA is dated to 1 340±40 BP (cal. AD 651–857) and 1 100±60 BP (cal. AD 877–1151). Pre-pottery layers were not reached in squares P14 and O13. The sherds in BRA include examples attributed to the Bambata and Mzonjani facies (Van Doornum 2005: 149–50).

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' by the same author.

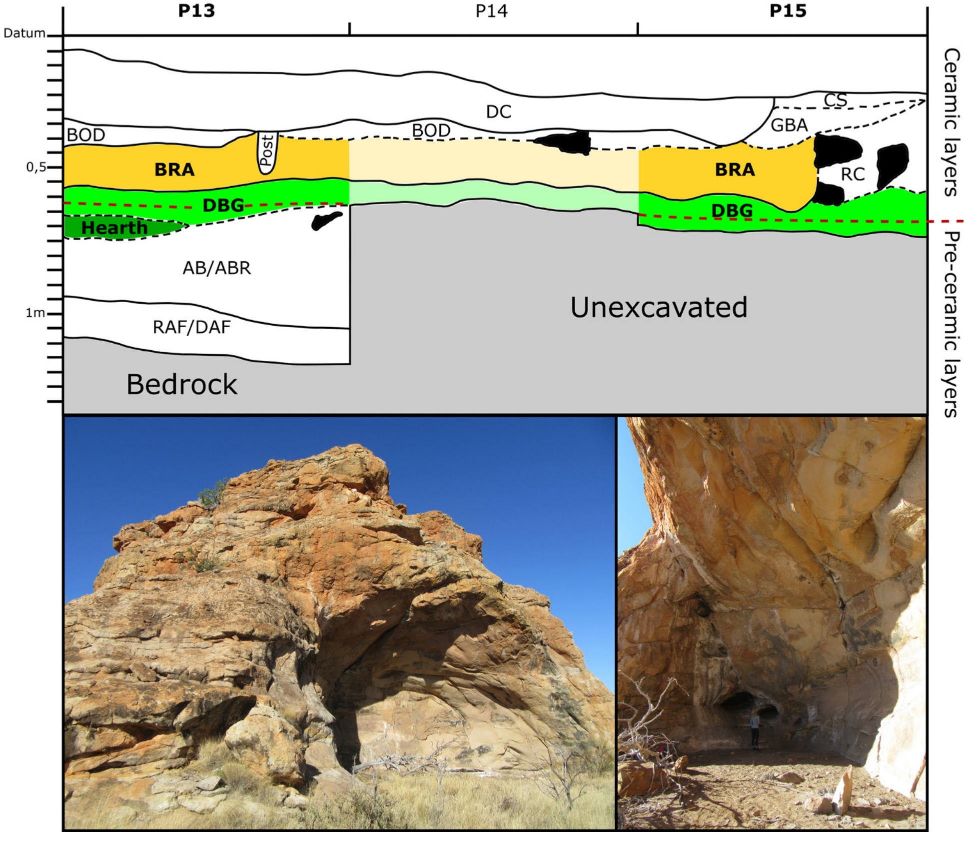


Fig. 3. Balerno Main Shelter stratigraphy, modified after Van Doornum 2008. Photographs by I. Guillemard.

Van Doornum (2005, 2008) made a typological study of the lithics. In total, she analysed 34 881 artefacts made of chert, agate, quartz, quartzite and dolerite. These raw materials are all potentially locally available in outcrops or riverbeds, as is the case for the Botswanan side (Forssman 2014). However, precise sourcing is still lacking for the area around Balerno. Van Doornum's analysis showed no notable differences in the lithic industries of pre-ceramic and ceramic phases. According to her, blanks from both layers are predominantly extracted with a bipolar technique. She also notes the use of freehand percussion on agate. Small flakes and bladelets are produced, some of which are later transformed into retouched artefacts. The most common raw materials used for retouched artefacts are chert and agate. Retouched artefacts, which comprise 3.7% of the whole lithic assemblage, are dominated by scrapers (N=990, 77%), followed by segments (N=123, 10%) (Van Doornum 2005).

SAMPLE ANALYSED

We selected all scrapers from squares P15 and P13, layers BRA and DBG. A total of 420 scrapers were extracted, including 111 associated with the pre-ceramic occupations and 263 associated with the Ceramic Final LSA occupations; 46 pieces

TABLE 1
Number of scrapers per phase, layer and spit.

Phase	Layer	Spit	N
Ceramic Final LSA	Grey Ash	x	16
	BRA	55–60	15
		–40	4
		–50	7
		45–50	8
		50–55	73
		55–60	58
		60–65	20
		base	6
		x	18
	DBG	55–60	31
		60–65	7
Total Ceramic Final LSA			**263**
Final LSA	DBG	65–70	55
		70–75	38
		75+	8
	DBG Hearth	x	10
Total Final LSA			**111**
Unknown	DBG	x	46
Grand Total			**420**

from DBG are not assigned to a cultural phase but have been integrated into our database (Table 1).

The main characteristics of the scrapers and their reduction process

The scrapers are made principally of chert and agate (Table 2) with only ca. 3% made of quartz, quartzite and dolerite. In the total lithic assemblage, chert represents 49%, quartz 16%, dolerite 15%, agate 14% and quartzite 5% (Van Doornum 2005).

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. On scrapers with a visible platform, freehand

TABLE 2
Number and percentage of scrapers per raw material.

Raw material	Chert	Agate	Quartz	Quartzite	Dolerite	Total
N	293	117	3	4	3	420
%	70%	28%	1%	1%	1%	100%

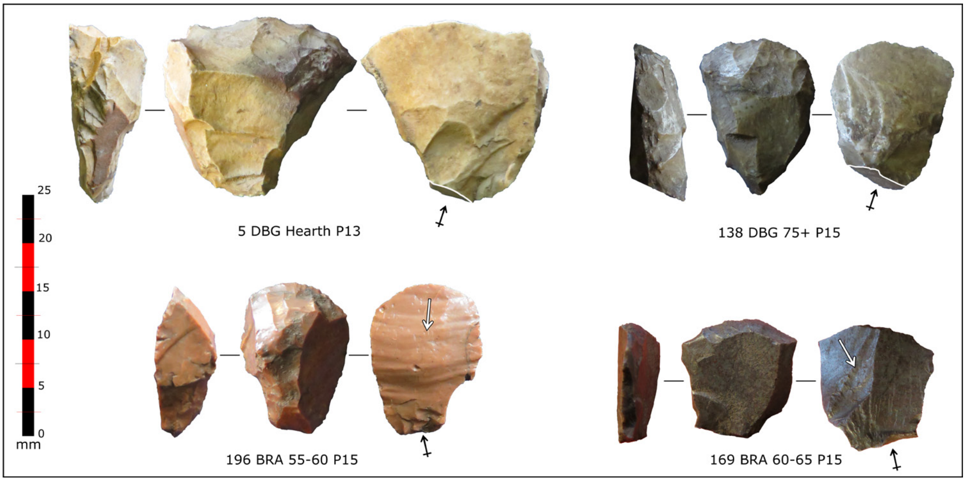


Fig. 4. Scraper blanks extracted with a free-hand percussion (no. 5 & 138) and a bipolar percussion (no. 196 & 169).

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. 4). The set of technological observations suggests that the blanks were selected at different stages of the reduction process, and potentially from among different *chaînes opératoires*.

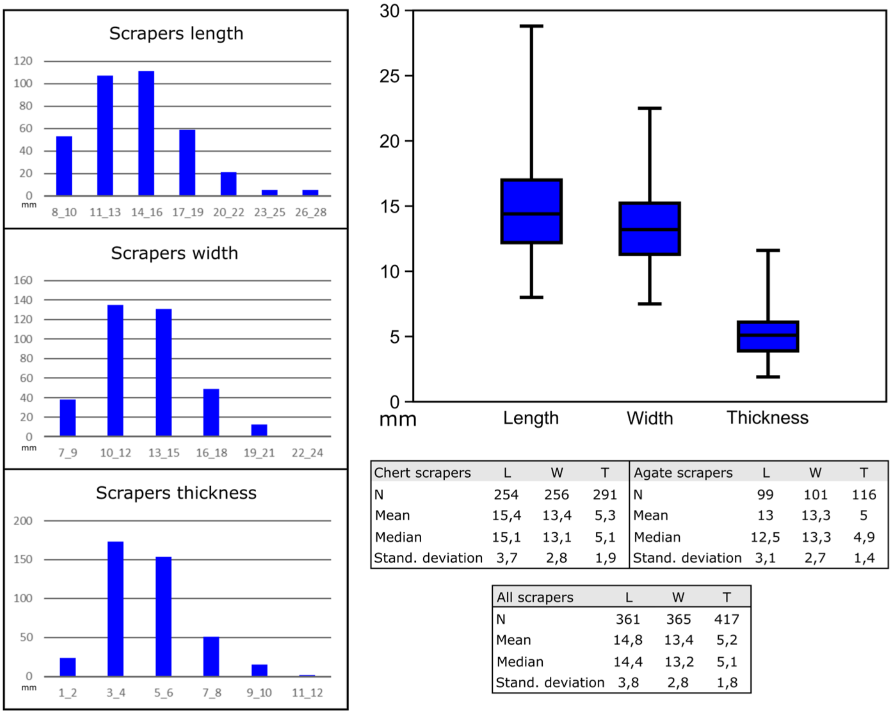
The *front* is in 60% of the cases located on the distal technological axis of the blank, on 18% on a side, 17% on the proximal, and 5% diagonally to the technological axis. Typologically speaking, 82% of the tools may be classified as end-scrapers and 18% as side-scrapers. For 8% of the scrapers, the tool was reoriented, and another *front* opened.

On average, the scrapers measure ~14 mm in length and width, and ~5 mm in thickness (Fig. 5). We observe a unimodal distribution of the length, width and thickness values of all scrapers, and no different clusters. We notice that very few scrapers are longer than 20 mm, and that the width values (corresponding to the width of the *front*) are grouped, displaying a narrower range than the length values (Fig. 5). There also are no major differences between the scrapers in agate and chert.

Interestingly, if we 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 3). However, only 1% of the unmodified blanks are longer than the scrapers, suggesting 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.

The *front* angles range from 30° to 100°, 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 tend to have steeper *fronts* than the ones in agate (Table 4).

In the course of the reduction process, the succession of retouch contributes to the creation of spurs (Fig. 6). Spurs have been recorded for 21% of all the scrapers.



Chert scrapers	L	W	T
N	254	256	291
Mean	15,4	13,4	5,3
Median	15,1	13,1	5,1
Stand. deviation	3,7	2,8	1,9

Agate scrapers	L	W	T
N	99	101	116
Mean	13	13,3	5
Median	12,5	13,3	4,9
Stand. deviation	3,1	2,7	1,4

All scrapers	L	W	T
N	361	365	417
Mean	14,8	13,4	5,2
Median	14,4	13,2	5,1
Stand. deviation	3,8	2,8	1,8

Fig. 5. Scrapers' length, width and thickness in mm.

TABLE 3

Blank and scraper number per size class.

Length	5–15 mm	16–25 mm	26–45 mm	Total
Blank number	633	451	99	1183
%	54%	38%	8%	100%
Scraper number	243	113	6	362
%	67%	31%	2%	100%
χ^2 (2, N=1 545) = 31.06, p <0.05				

TABLE 4

Front angle value per raw material.

***Front* angle (°)**	**Chert**	**Agate**
30–40	7%	12%
50–60	62%	70%
70–80	29%	18%
90–100	2%	0%
N	**291**	**116**

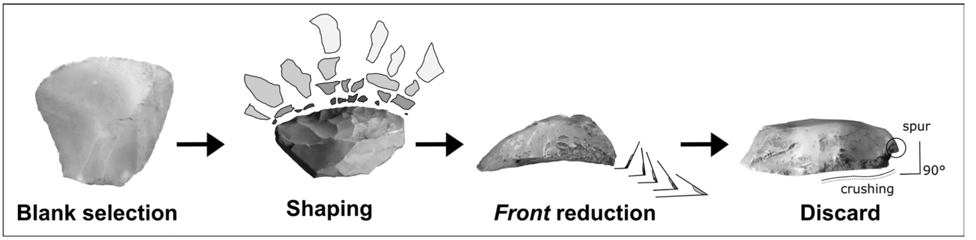


Fig. 6. Blank selection, shaping, sharpening and discard.

On 6% of the scrapers, a deep flake removal taking away part of the retouched area was also recorded. This flake removal corresponds to the last operation before the discarding of the tool.

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). 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 between ca. 60° and 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.

Structure of the scrapers

To characterise the two morpho-functional units of the tool, we first described their general morphologies. We 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. 7). 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.

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 notably illustrated by the measurements in Figure 7. Overall, most of the scrapers have a convex to straight-

TABLE 5

Front angle average per length category.

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**

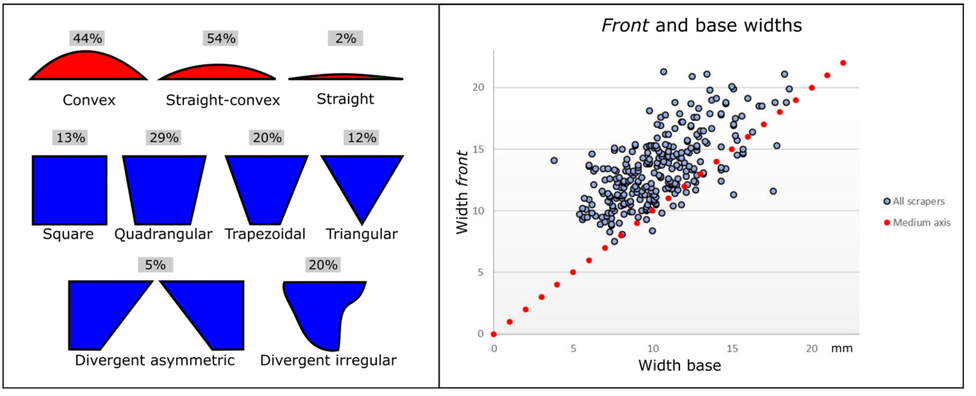


Fig. 7. Active unit (front, N= 395) in red and passive unit (body, N=328) in blue. Percentage of representation for each category given. The graph on the right represents the scrapers' width and base width. All scrapers above the medium axis are divergent.

convex *front* and have a divergent body that is quadrangular, trapezoidal or triangular (Table 6).

Combining the measures taken with the morphologies of the units, we recognise three main types of scrapers (Fig. 8). Broken scrapers (17%) are naturally not considered within the following categorisation.

1. 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, we decided to keep the descriptive term of '**thumbnail scrapers**' to individualise them. At Balerno Main shelter, thumbnail scraper is the predominant scraper category as it represents 76% of all complete scrapers.
2. 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

TABLE 6

Number of scrapers per active and passive unit categories.

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**

shape. The blanks used to make these scrapers are generally thicker. Their average length/width ratio is 1.4. We named these scrapers **'V-shaped scrapers'**. They represent 12% of all complete scrapers.

3. 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, we individualised them as '**short-arc scrapers'**. They represent 11% of all complete scrapers.

Discussion of the three types recognised at Balerno

Following this classification, further analyses have been conducted to refine the nature of our morpho-functional typology, and notably to address the question of the potential reduction process from one type to another. We 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, we first 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. 9) 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. 9). 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.

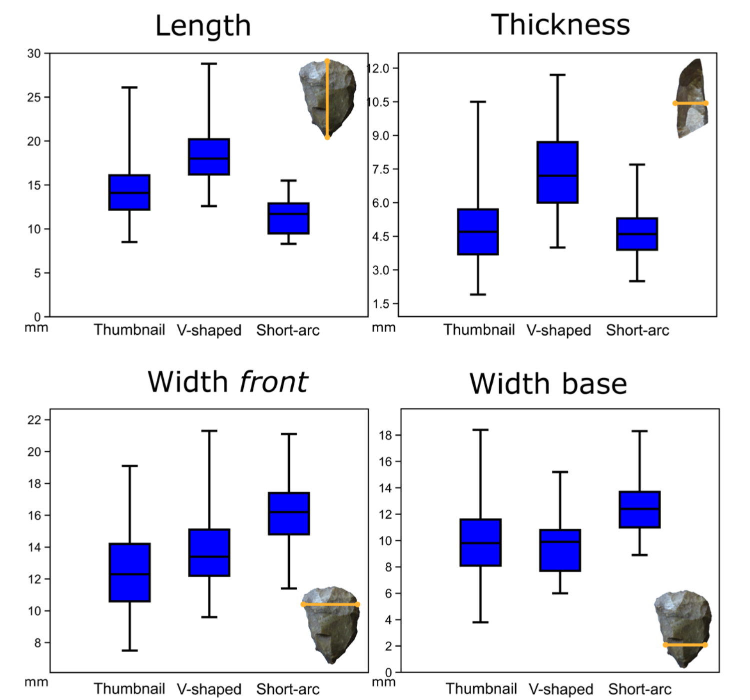
Similarities were also noted among the thumbnail and V-shaped scrapers. The *front* widths of these scrapers, although significantly different, have close means, with 12.5 mm for the thumbnails and 13.8 mm for the V-shaped. The base widths are not significantly different, suggesting that the base widths 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. 10). After exclusion of the 'straight' *front* category (not enough individuals), we 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.

Fig. 8. Thumbnail, V-shaped and short-arc scrapers as recognised at Balerno Main Shelter.

The scrapers also tend to have different body morphologies. The V-shaped scrapers mainly have trapezoidal-to-triangular body morphologies, whereas the thumbnail scrapers have more quadrangular-to-asymmetric body morphologies (Fig. 10). 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, we still classified these artefacts as V-shaped, as their divergent shape was intentionally created by a straight retouch. The remaining variability observed for the thumbnail scrapers' bodies corresponds to the shape of the blank selected. We ran a χ^2 test comparing the different body morphologies per scraper type, which is significant: χ^2 (6, N=291) = 41.2, p <0.05.

We now come to the edge angles of these scraper categories. The values of the *front* angles per category are significantly different: χ^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. 10). 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 (Fig. 10) 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.



LENGTH	**THICKNESS**
Thumbnail vs V-shaped	Thumbnail vs V-shaped
t(55, N=277) = 7, $\boldsymbol{p}$ **< 0.05**	t(56, N=304) = 9.7, $\boldsymbol{p}$ **< 0.05**
V-shaped vs Short-arc	V-shaped vs Short-arc
t(70, N=84) = 11.1, $\boldsymbol{p}$ **< 0.05**	t(78, N=84) = 8.5, $\boldsymbol{p}$ **< 0.05**
Thumbnail vs Short-arc	Thumbnail vs Short-arc
t(71, N=273) = 7.7, $\boldsymbol{p}$ **< 0.05**	t(61, N=300) = 0.3, $\boldsymbol{p}$ **= 0.8**
***FRONT* WIDTH**	**WIDTH BASE**
Thumbnail vs V-shaped	Thumbnail vs V-shaped
t(59, N=277) = 3.2, $\boldsymbol{p}$ **< 0.05**	t(72, N=230) = 1.4, $\boldsymbol{p}$ **= 0.2**
V-shaped vs Short-arc	V-shaped vs Short-arc
t(75, N=79) = 4.3, $\boldsymbol{p}$ **< 0.05**	t(56, N=71) = 5.9, $\boldsymbol{p}$ **< 0.05**
Thumbnail vs Short-arc	Thumbnail vs Short-arc
t(48, N=270) = 8.6, $\boldsymbol{p}$ **< 0.05**	t(40, N=217) = 5.6, $\boldsymbol{p}$ **< 0.05**

Mean	Thumbnail	V-shaped	Short-arc
Length	14,3	18,3	11,3
Width *front*	12,5	13,8	16,1
Width base	10,0	9,5	12,6
Thickness	4,8	7,4	4,7

Standard deviation	Thumbnail	V-shaped	Short-arc
Length	3,0	3,5	2,1
Width *front*	2,5	2,4	2,3
Width base	2,6	2,1	2,3
Thickness	1,5	1,6	1,2

Fig. 9. Scrapers' length, width and thickness comparison per scraper type.

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%).

On the 89 broken scrapers, 21 have a 'flexion break' (Fig. 11), 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

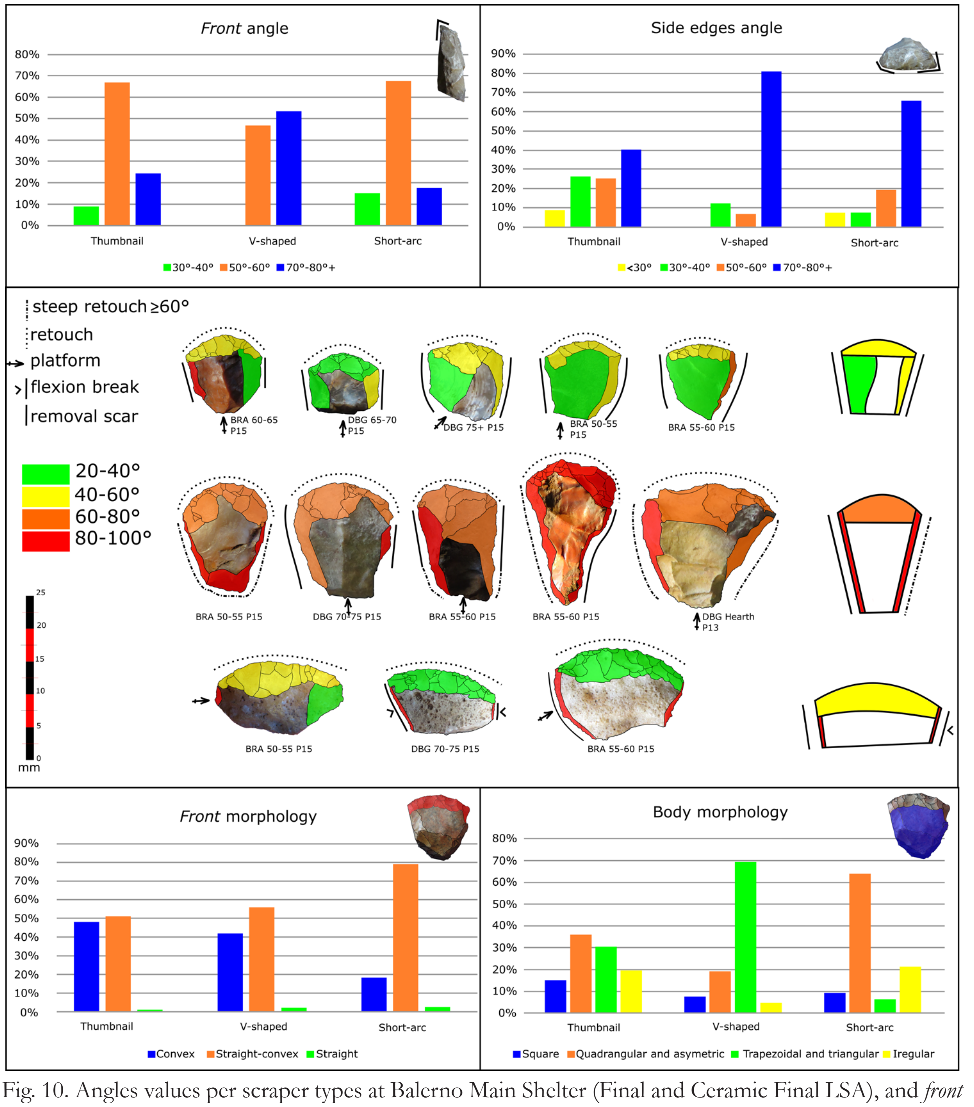


Fig. 10. Angles values per scraper types at Balerno Main Shelter (Final and Ceramic Final LSA), and *front* and body morphologies per scraper type.

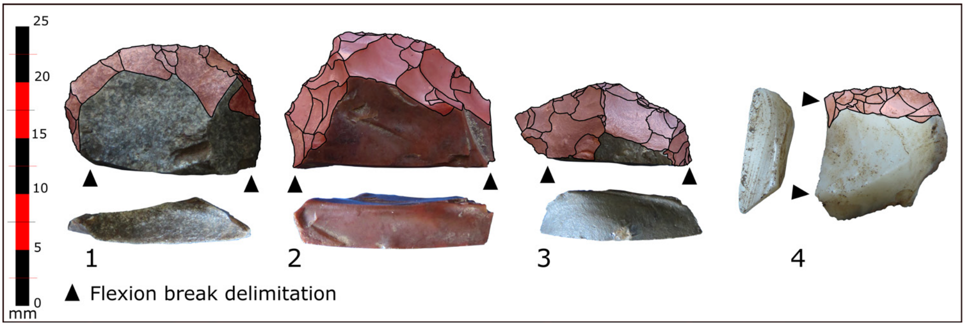


Fig. 11. Flexion breaks. 1 & 3: transversal direct flexion break, 2: transversal direct flexion break with stigmata suggesting an intentional fracture, 4: perpendicular flexion break.

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 et al. (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.

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 Balerno's 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 are not due to post-depositional agents. Regularity in the location of these breaks on the thumbnail (transversal) and short-arc scrapers (perpendicular) 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. 11.2).

What are the 'Wilton' scrapers at Balerno Main Shelter?

The scraper assemblage of Balerno Main Shelter is consistent with the Wilton scraper collections as described by Deacon (1984) and others (H.J. Deacon 1976; Humphreys & Thackeray 1983; Forssman 2014). In order to extrapolate our data and establish comparisons with other sites, we first need to synthesise our results and formulate interpretations.

The Balerno 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 chert and agate in manufacturing tools is rather common in other Wilton sites of the SCLA (e.g. Forssman 2014), 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 varied in terms of technology. The blanks document various extraction techniques (but predominantly freehand percussion), show various morphologies (but predominantly flakes), and indicate selection from various moments within the reduction sequences (starting from the initial stages as seen by the selection of cortical blanks). 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, we suggest that blanks were selected at different stages and were potentially associated with different reduction sequences. However, the longitudinal profiles of the scrapers tend to be rectilinear.

Typologically speaking, scrapers from Balerno 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 criterion in their definition, as they are all microlithic scrapers and hardly ever exceed 25 mm in maximum dimension. In brief, the typical Balerno scraper is squarish in morphology with a mean dimension of around 14–15 mm. However, beyond this archetype, we are inclined to recognise three morphological categories of scrapers that differ with regard to the characteristics of their active and passive units:

1. 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.
2. 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.
3. 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.

Our 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 we 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 Balerno 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, we

TABLE 7

Scraper types per phase.

Scraper types	Thumbnail	V-shaped	Short-arc	Total
Final LSA				
N	56	18	17	91
%	62%	20%	19%	100%
Ceramic Final LSA				
N	175	21	20	216
%	81%	10%	9%	100%
Total N	**231**	**39**	**37**	**307**
%	**75%**	**13%**	**12%**	**100%**

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 Final LSA to the Ceramic Final LSA, we do not observe marked changes in the scraper attributes from the Final LSA to the Ceramic LSA. We see that thumbnail scrapers are the most represented type in both phases (Table 7). There are, however, proportionally more thumbnail scrapers in the Ceramic Final LSA layers, which has for now no straightforward interpretation. Further comparative studies on other assemblages would be necessary to confirm this trend and develop interpretations.

THE SCRAPERS IN MOTION

Use-wear studies are not yet widespread for LSA contexts (see Binneman 1982 for an exception), 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. Deacon & 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 Balerno Main Shelter, indicates that wood, bone and hides were also worked with the scrapers (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 exist, 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 (Deacon & 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 (Deacon 1976). Hafted scrapers were most likely attached to a wood or bone handle (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 Balerno, 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; Deacon & 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 (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 Balerno, we have seen that V-shaped scrapers were made on thicker blanks and were more intensively shaped than the thumbnail scrapers. However, 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 Balerno, 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:

1. 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.J. Deacon 1976: 64). At Balerno, only one flexion break bears technical marks that are suggestive of an intentional break.
2. 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.

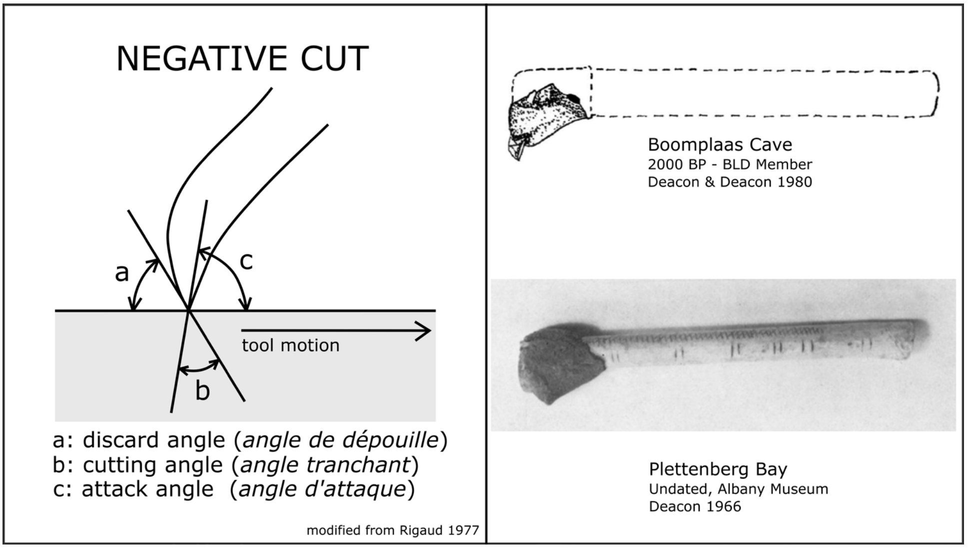


Fig. 12. Hypothesis of a thumbnail scraper motion for Balerno Main Shelter. Left: modified after Rigaud (1977), top right: Deacon & Deacon 1980, bottom right: Deacon 1966.

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 in Shott & Scott 1995), 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 Balerno 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 (Deacon & Deacon 1980).

3. 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 Balerno 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 Balerno, 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. 12). Inferring from an implement mounted on a bird bone from Plettenberg Bay (Deacon 1966), Deacon and Deacon (1980) suggest that the scraper with mastic from Boomplaas Cave may have been mounted almost perpendicularly to the haft (Fig. 12). They refer to it as *side mounted*. Their interpretation is consistent with our observations and we suggest the Balerno thumbnail scrapers were likely similarly hafted.

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, we 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.

CONCLUSION

What, then, is a Wilton scraper? Wilton scrapers represent a category of formal tool that typifies most of the Holocene lithic assemblages in southern Africa from around 8 000 cal. BP. They generally dominate the typological corpus, suggesting that this tool was commonly handled by populations. How these tools varied technologically and functionally, regionally and temporally, is worth investigating.

In the present study, we focused on the scraper collection from Balerno Main Shelter 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). Our classification emphasised morphometrical criteria and summarised variations observed in the structure of the tools (active versus passive units). We abandoned the equivocal 'functional' terminologies such as 'scraper-adze' (in our collection, removals on the sides of the scrapers are intentional and not functional) and we also distanced our analysis from dimensional categories (Deacon 1984).

Our 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 our sample. In addition to this main type, we 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.

Our 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 Basin before and after the appearance of the first pottery, and before and after Iron Age settlement (Van Doornum 2005; Forssman 2014).

Wilton scrapers find their technological roots within the southern African LSA (Deacon 1984), 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 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. Such tools can contribute to discussions on how hunters, herders and agro-pastoralists interacted and influenced each other. We argue that scrapers, and stone tools, are not 'monolithic cultural tools' but may reflect complex cultural and socio-economical interactions. More research on scrapers and lithic assemblages from different site types and regions will be necessary to improve our understanding of cultural and social changes occurring in the Limpopo Basin, and elsewhere in southern Africa, from the Final to Ceramic LSA.

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