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The Still Bay points of Apollo 11 Rock Shelter, Namibia: an inter-regional perspective

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ABSTRACT

Dating to roughly 80,000 to 70,000 years ago, components of the Still Bay technocomplex of southern Africa and their potential behavioural implications have been widely discussed. Stone points with invasive retouch, as defined over 90 years ago by Goodwin and van Riet Lowe, serve as markers for Still Bay assemblages, yet many Still Bay sites remain undated and comprehensive, comparable sets of data for their point assemblages remain unpublished. Much of the Middle Stone Age at the site of Apollo 11 in Namibia was undated until 2010, when a potential Still Bay component was announced. Although a Still Bay assemblage at Apollo 11 would represent the most northwesterly and inland expression of this technocomplex, its points have never been fully analysed. This paper presents their morphometric data and an interpretation of point-production strategies. These results are then compared with data obtained for two South African sites: Hollow Rock Shelter in the Western Cape and Umhlatuzana in KwaZulu-Natal. This comparison demonstrates that whereas there are no statistically significant differences in the morphometric data sets between the three sites, there are both similarities and differences in point-production strategies, cross-section shapes and the use of raw materials for knapping. It is suggested that these similarities and variations represent aspects of how knowledge-transfer systems and knapping conventions were followed on both intra-regional and inter-regional scales.

RESUMÉ



Les composantes du technocomplexe du Still Bay d'Afrique méridionale (datant d'il y a 80,000 à 70,000 ans environ) et leurs potentielles implications comportementales ont été largement discutées. Les pointes de pierre avec retouche invasive, un type défini il y a plus de 90 ans par Goodwin et van Riet Lowe, servent

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d'indicateur des assemblages du Still Bay, mais de nombreux sites du Still Bay restent sans dates et des ensembles complets de données comparables sur leurs assemblages des pointes restent à ce jour inédits. Une grande partie de la séquence de l'âge de la pierre moyen (Middle Stone Age) sur le site d'Apollo 11 en Namibie était sans date jusqu'en 2010, lorsque l'existence d'un assemblage potentiellement attribuable au Still Bay fut annoncée. La présence d'un assemblage du Still Bay à Apollo 11 représenterait l'expression la plus au nord-ouest de ce technocomplexe, et celle se trouvant le plus à l'intérieur des terres. Cependant, les pointes retrouvées sur ce site n'ont jamais été complètement analysées. Cet article présente leurs données morphométriques et une interprétation des stratégies de production de pointes. Ces résultats sont ensuite comparés aux données obtenues pour deux sites sud-africains: Hollow Rock Shelter au Cap Occidental et Umhlatuzana au KwaZulu-Natal. Cette comparaison démontre que, bien qu'il n'y ait pas de différences statistiquement significatives dans les ensembles de données morphométriques entre les trois sites, il existe à la fois des similitudes et des différences dans les stratégies de production des pointes, dans les formes vues en coupe et dans les matières premières utilisées pour la taille. Nous proposons que ces similitudes et ces variations reflètent des aspects de la manière dont les systèmes de transfert de connaissances et les conventions de taille furent suivis aux échelles intrarégionales et interrégionales.

Introduction

The Middle Stone Age of southern Africa dates to between roughly 300,000 and 30,000 years ago and is renowned for genetic, fossil and archaeological evidence that attests to the biological and cultural evolution of early modern humans in the region (e.g. Dusseldorp *et al.* 2013; Lombard *et al.* 2013). The Still Bay technocomplex from several South African sites and its associated behaviours play a key part in this discussion (Henshilwood 2012; Wadley 2015). Thus far, the Middle Stone Age of Namibia is not that well known and has seldom been integrated into regional studies and debates about past human socio-economies and techno-behaviours. This is probably because most of the relevant archaeological work there was conducted before the advent of luminescence dating methods and because the Namibian material was interpreted according to a scheme different from that used for the South African material (e.g. Vogelsang 1998).

Once these obstacles were overcome for Apollo 11 (Vogelsang *et al.* 2010; Figure 1) it became apparent that the site's sequence is similar to that of others in South Africa and Lesotho (see Lombard *et al.* 2012). In fact, Apollo 11 is now recognised as one of the most complete Middle and Later Stone Age sequences in southern Africa that also includes a Still Bay component (Vogelsang *et al.* 2010). This new insight into the Namibian Middle Stone Age sequence opens up the potential for comparative work on a larger, regional scale relating to the spatiotemporal distribution of, and variations in, Still Bay expressions.

In the context of a regional culture-stratigraphic sequence (Lombard *et al.* 2012), the Still Bay pre-dates the Howiesons Poort. Although the debate regarding its exact time-span continues (Guérin *et al.* 2013; Tribolo *et al.* 2013; Jacobs and Roberts 2015, 2017), all but one published age estimate from the site of Diepkloof in South Africa's Western Cape Province indicate that Still Bay sites were occupied between roughly 80,000 and

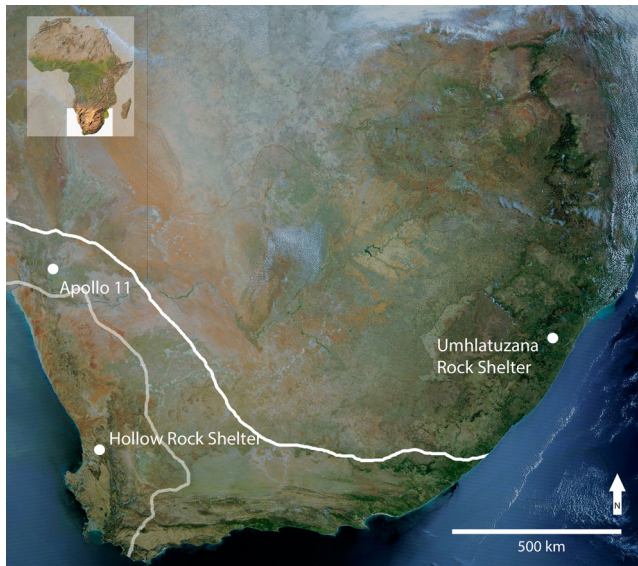


Figure 1. Map of southern Africa showing the location of Apollo 11, Hollow Rock Shelter and Umhlatuzana. Current rainfall zones (from Chase and Meadows 2007: 104, Figure 1) are marked with light grey and white lines. East and north of the white line is the summer rainfall zone. West of the light grey line is the winter rainfall zone. Between the lines is the year-round rainfall zone. The background map is a composite satellite image of South Africa in November 2002 (https://commons.wikimedia.org/w/index.php?title=File:Composite_satellite_image_of_South_Africa_in_November_2002.jpg&ol-did=107710174, consulted 12 June 2017).

70,000 years ago (Jacobs *et al.* 2008a; Tribolo *et al.* 2009, 2013; Lombard *et al.* 2010; Vogel-sang *et al.* 2010; Högberg and Larsson 2011; Feathers 2015; Jacobs and Roberts 2015). For the purposes of this study, we accept this age range as the current consensus, although preliminary work at Sibudu Cave might indicate a pre-Still Bay presence $\sim 77,000$ years ago at that locality in KwaZulu-Natal in southeastern South Africa (Rots *et al.* 2017).

Notwithstanding the Still Bay's prominence in the literature, comprehensive typological and/or technological analyses for dated point assemblages currently only exist for Blombos Cave (Villa *et al.* 2009; Mourre *et al.* 2010; Archer *et al.* 2015; Soriano *et al.* 2015), Sibudu (Soriano *et al.* 2015), Hollow Rock Shelter (Högberg and Larsson 2011; Högberg 2014) and Umhlatuzana Rock Shelter (Lombard *et al.* 2010; Mohapi 2013). Based on a *chaîne opératoire* approach, the Still Bay at Diepkloof has been described as 'a homogeneous phase' showing similarities with other Still Bay sites (Porraz *et al.* 2013). Detailed, comparative work based on a range of attributes is rare (but see Högberg and Lombard 2016a). Previous attempts at regional interpretations based on selected morphometric (e.g. Archer *et al.* 2016) or limited technological traits (e.g. Mackay *et al.* 2014) produced conflicting results about the possible demographic dynamics during the Still Bay (see discussion in Högberg and Lombard 2016a).

The Still Bay type fossil is a thin (≤ 10 mm), invasively retouched, bifacial, foliate or lanceolate point with a semi-circular or wide-angled pointed butt and a lenticular cross-section (Goodwin and van Riet Lowe 1929). Understood as a technocomplex (see discussion in Lombard *et al.* 2012), we expect to see assemblages sharing a context or

class of artefacts with many, but not all, properties in common. Each Still Bay assemblage could thus include different styles of the same family of artefacts (such as points), as a response to common socio-economic and/or environmental factors (Clarke 1968). A technocomplex, such as the Still Bay, can thus be widespread (Sampson 1974), with subtle shifts in tool frequencies, design or style, whilst retaining broad similarities (Deacon 1980).

Based on observable and measurable characteristics (such as elongation, thinness or cross-section shapes), style has been defined as something that is spatiotemporally unique (Sackett 1982). Variation in style could reflect the social identity of a group/society, either consciously (e.g. Wiessner 1983, 1985) or passively (e.g. Sackett 1982). Working with material from the Middle Stone Age, Thackeray and Kelly (1988: 23) suggested, however, that the stylistic attributes recognised by archaeologists are ‘a reflection not of social reality, but rather the structuring principles of the society — the way things might be ideally — rather than the way they are in practice’.

Because ‘much of human niche construction is guided by socially learned knowledge and cultural inheritance’ (Odling-Smee *et al.* 2003: 260), we suggest that one way of looking at these structuring principles is by exploring knowledge-transfer systems. The actions of toolmakers are intimately constrained by the knowledge-transfer systems in which they are situated (Riede 2006). Technologies and their attributes are thus embedded in social knowledge systems (Lemonnier 1993) and knowledge transmission from one generation or group to another is performed in that context. The reconstruction of production strategies for stone tools (such as Still Bay points) reveals traditions of knowledge-transfer systems as processes of production techniques and their conceptual roots (Karlin and Julien 1994). With adequate spatiotemporal resolution, such work could contribute to the hypothetical reconstruction of relationships between generations and/or communities based on the attributes of their artefacts.

Even though the Still Bay point inventory from Apollo 11 Rock Shelter has played a prominent role in discussions surrounding the definition and spatiotemporal spread of the Still Bay, and has been mentioned in demographic reconstructions (e.g. Conard *et al.* 2014; Mackay *et al.* 2014; Archer *et al.* 2016), a detailed analysis of the points themselves has not yet been presented. Building on previous work (Villa *et al.* 2009; Högberg and Larsson 2011; Högberg and Lombard 2016a), we developed an approach for the direct, detailed comparison of invasively retouched bifacial and unifacial point assemblages. This approach constitutes a matrix analysis in which several attribute-based knapping strategies — as observed on all the preforms, whole and broken points of each assemblage — are interpreted in terms of a five-phase production sequence and the use of raw materials for knapping. We propose that these knapping strategies represent knowledge-transfer systems (shared traditions) between generations of point knappers and/or between groups on the landscape. Here, we present the morphometric data and knapping strategies recorded for Still Bay points from Apollo 11 and compare the results with those from other sites for which suitable data are available.

Apollo 11 and its Still Bay assemblage

Wendt (1976) initially excavated Apollo 11 almost 50 years ago and his excavation was subsequently re-opened by Vogelsang *et al.* (2010) to collect new samples for dating its

sequence and for establishing a finer degree of chronological differentiation for the site's lithic assemblages. Vogelsang (1998; Vogelsang *et al.* 2010) provides thorough discussions of the site's physical setting, environment and excavation history and we therefore give only a short summary here. Oriented northwest, Apollo 11 is about 28 m wide and 11 m deep and is situated in the semi-desert of the western foothills of Namibia's Huns Mountains, an area dominated by Dwarf Shrub Savanna. The site is about 20 m above the valley floor on the eastern slope of the ephemeral Nuob River, which feeds into the Gariep/Orange River drainage system (Figure 2). Apollo 11's geology is associated with the black limestone of the southern Witputs sub-basin of the Nama Group with inclusions of shale, sandstone and quartzite, unconformably underlain by the Namaqualand Metamorphic Complex (Vogelsang *et al.* 2010). Currently, the region is located in the modern/Holocene year-round rainfall zone (Chase and Meadows 2007), with a mean annual precipitation of less than 100 mm and high variation in rainfall from year to year (Vogelsang *et al.* 2010).

Vogelsang *et al.* (2010) cautiously identified the Still Bay at Apollo 11 as the unit previously known as MSA 2 and dated with OSL to $71,000 \pm 3000$ years ago (Vogelsang 1998). As is the case for other long-sequence Middle Stone Age sites in southern Africa (Lombard *et al.* 2012), the Still Bay at Apollo 11 is overlain by the Howiesons Poort technocomplex with an OSL age estimate of $63,000 \pm 2000$ years, from which it is separated by a thin sterile layer dating to $67,000 \pm 3000$ years ago (Vogelsang *et al.* 2010). Although the points seem less elongated than those typically attributed to the Still Bay technocomplex from sites such as Blombos, Sibudu and Diepkloof (e.g. Villa *et al.* 2009), Vogelsang *et al.* (2010) report that the typical 'Still Bay facial retouch' is represented on four bifacial points, 14 unifacial points and 13 edge-retouched points. They describe seven 'basal end scrapers



Figure 2. Apollo 11 Rock Shelter (in the middle, bottom third of the image) in the foothills of the Huns Mountains, Namibia. Photograph kindly provided by Ralf Vogelsang.

on pointed blades' as a separate category. According to their analysis, retouched tools constitute 6.8% of the complete Still Bay assemblage, which contains 5521 artefacts. Quartzite is the preferred material used for 52.4% of the assemblage. This material is mostly of a fine-grained quality, obtained from the local riverbed and nearby outcrops. Calcareous mudstone was used for 34.0% of the assemblage (Vogelsang *et al.* 2010). Interesting organic finds from the Still Bay context at Apollo 11 include ostrich eggshell fragments with fractures that point to the use of ostrich eggshell flasks, along with two rib fragments with notches (Vogelsang 1998; Vogelsang *et al.* 2010).

Our approach

Before starting our analysis, we worked through the whole lithic assemblage from the Wendt and Vogelsang excavations stored at the National Museum of Namibia to ensure that we had seen all the potential points, point preforms, point fragments and bifacial thinning flakes. We analysed all point-related pieces of the MSA 2 or Still Bay from Apollo 11 as identified by Vogelsang *et al.* (2010), by building on the method described in Högberg and Lombard (2016a). First, we conducted an attribute analysis including typological, morphometric and technological aspects of each uniquely numbered piece, including all the finished points, unfinished points, point preforms and broken points from the assemblage (N = 25; Figure 3). We included in our analysis pieces not previously detected as point fragments, but identified as such while working systematically through the whole lithic assemblage.

To facilitate future replication, we present our analytical and interpretative matrix method in a series of tables and figures below (see also Högberg and Lombard 2016a). In sum, the recorded attributes include raw material, the fragment type/completeness of the piece (Figure 4), length-width-thickness measurements, the base shape, the cross-section (Figure 4), the centredness of the dorsal ridge at the bilateral equilibrium, the placement of the bifacial equilibrium plane, whether the pieces were worked on one or both sides, the blank type (Table 1) and the use of pressure flaking as defined by Crabtree (1973), Patten (1978) and Patterson (1998) (see also Mourre *et al.* 2010; Högberg and Lombard 2016b). Based on a matrix of these criteria we interpret, where possible, the production phase (Table 2) and point-production strategy for each piece (see Table 3 and Figure 5 for hypothetical interpretative matrices).

Results

The Still Bay points from Apollo 11 Rock Shelter

Most of the retouched points, point preforms and broken points from the Apollo 11 Still Bay context (N = 25) (Table 4, Figure 3) are made of quartzite (N = 15, 60%). Quartz is the second most common raw material used (N = 7, 28%), with four examples in crystal quartz, two in milky quartz and one in rose quartz. Three points are made of other rock types, namely cryptocrystalline rocks (N = 2) and calcareous mudstone/hornfels (N = 1).

The points from Apollo 11 associated with the Still Bay context are in different phases of production. Most (N = 20, 80%) are in phase 2 (early worked pieces) or phase 3 (preforms). We identified a single phase 5 finished point (unique number 019; Figure 3). Apart from the plentiful Blombos Cave assemblage (Villa *et al.* 2009), whole phase 5 points are



Figure 3. The points, preforms and point fragments from Apollo 11 Rock Shelter included in the present analysis. The pieces are arranged according to completeness or fragmentation as represented in Table 4.

under-represented at most sites because most pieces are broken or unfinished. In our analyses we therefore use the data for all the whole and almost whole points throughout production phases 2-5. Consequently, our results and interpretations for both Apollo 11 and the comparative work discussed below are skewed towards the higher end expected for Still Bay point assemblages with larger numbers of phase 4 and 5 points. Data for the separate production phases at Apollo 11 can be extracted from Table 4.

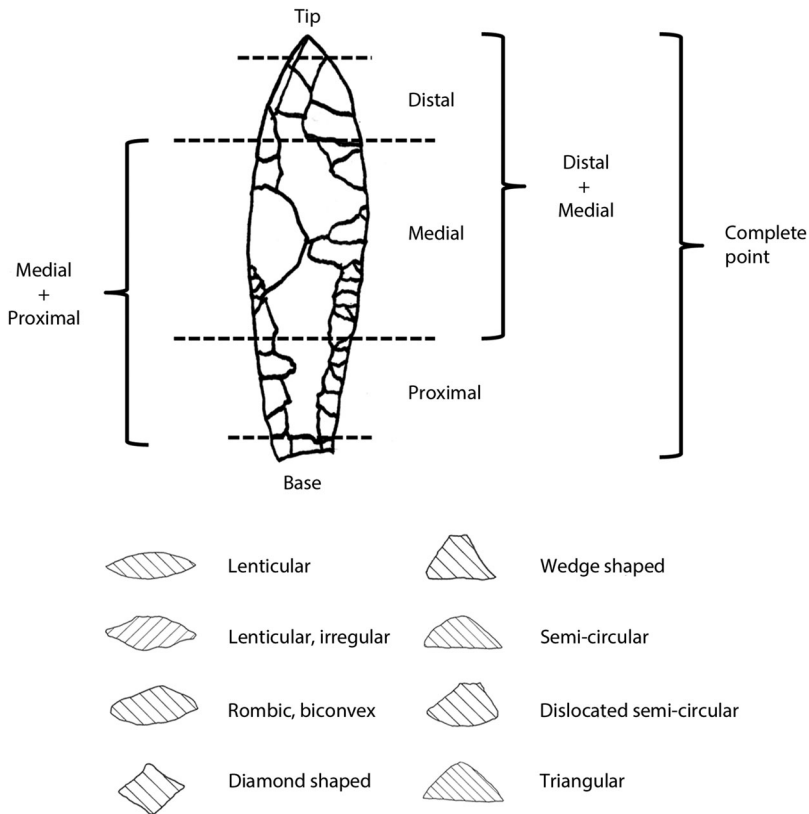


Figure 4. Description of complete points, fragment types and cross-sections as used in the analysis.

Slightly more than two-fifths of the points are whole or almost whole ($N = 11$, 44%). The rest of the assemblage represents a range of fragment types (Table 4). When the whole (complete) and almost whole pieces are separated out from the rest of the population, morphometric trends point towards an aim of producing elongated, narrower points with a thickness of ≤ 10 mm. Nine (82%) of the whole and almost whole pieces are ≤ 10 mm thick, regardless of their production phase (Figure 6). Relatively small standard deviations of 0.6 and 0.4 in the length:width and width:thickness ratios respectively indicate a strong relationship in these aspects during point production and the anticipated end product (Table 5), whereas a length:thickness relationship is less pronounced, probably because general thinness is maximised for each piece. Only the width:thickness ratio shows some standardisation with a coefficient of variation value (CV) below 20 (Table 5; Fisher 2006).

Three of the whole points have the characteristic semi-circular butt usually associated with finished Still Bay points and none seem to have been shaped deliberately to display wide-angled pointed butts. All three points with semi-circular butts are unifacial points with invasive retouch. Invasive bifacial retouch has been recorded on eight (32%) of the point fragments, so that we were unable to assess base shapes for bifacially worked points in the assemblage. More than half of the pieces in the assemblage miss their proximal ends or bases/butts ($N = 14$, 56%). Of the bifacial pieces, all but one (87.5% of bifacial pieces and 28% of the whole assemblage) have lenticular or irregular lenticular cross-sections. Of the

Table 1. Analytical method/procedure: definition of attributes used during the analysis of points from the Apollo 11 Rock Shelter Still Bay context.

Attribute	Label	Definition	Reference
Tool number + context		Each tool has been given a unique number for our analysis. Context refers to the square and level marked on each tool by Wendt	
Raw material	QZ	Quartzite	Defined according to Wendt (1976).
	Q	MQ = milky quartz, CQ = crystal quartz, RQ = rose quartz	
Dimension	CM + H	Calcareous mudstone + hornfels	See Högborg and Larsson (2011: 137, Table 2).
	CC	Cryptocrystalline	
	Length	The longest line of the artefact, measured in mm along the length axis	
	Width	The widest part of the artefact, measured in mm at a right angle to the length axis	
Fragment type or complete point	Thickness	The thickest part of the artefact measured in mm	See Figure 4 in this text Villa <i>et al.</i> (2009: 448, Table 4).
	T	Tip	
	D	Distal part	
	M	Medial part	
	P	Proximal part	
	B	Base	
	D + M	Distal + Medial part	
	P + M	Proximal + Medial part	
	C	Complete point	
	AC	Almost complete point, missing only the tip	
Base shape	ACB	Almost complete point, missing only the base	Semi-circular is distinguished from Straight by a continuous line with no 'corners' (Villa <i>et al.</i> 2009: 442ff., Figure 1).
	PT	Pointed	
	SC	Semi-circular	
Cross-section	ST	Straight	See Figure 4 and Högborg and Lombard (2016a: 9-10, Table 2 and Figure 4).
	L	Lenticular	
	LI	Lenticular, irregular	
	RB	Rhombic, biconvex	
	DS	Diamond-shaped	
	WS	Wedge-shaped	
	SC	Semi-circular	
Ridge at the bilateral equilibrium on each face on the point	DSC	Dislocated semi-circular	See Högborg and Lombard (2016a: 9, Table 2).
	T	Triangular	
	1	Not clearly defined	
	2	Centred	
	3	Off-centred, located towards one of the edges	
Placement of the bifacial equilibrium plane	4	Following original ridge on one side, no ridge on the other side	See Högborg and Lombard (2016a: 9-10, Table 2 and Figure 4).
	5	Following original ridge on one side, indistinct, not centred or centred on the other side	
Worked on both sides	C	Centred	See Högborg and Lombard (2016a: 9-10, Table 2 and Figure 4).
	NC	Not centred	
Indication of use of pressure flaking	Y	Yes	See Högborg and Lombard (2016b: 55, Table 1).
	Y	Yes	
Blank type			See Högborg and Lombard (2016a: 9-10, Table 2 and Figure 4).
	N	Nodule	
	B	Blade	
Production phase	F	Flake	See Högborg and Lombard (2016a: 9-10, Table 2 and Figure 4).
		See Tables 2 and 3.	

(Continued)

Table 1. Continued.

Attribute	Label	Definition	Reference
	2, 3, 4 or 5		See Figure 5 , Tables 2 and 3 and Högberg and Lombard (2016a: 6, Table 1) .
Point-production strategy	1	Bifacial nodule pps 1	See Figure 5 and Högberg and Lombard (2016a: 9-10, Table 2 and Figure 4) .
	2	Bifacial nodule pps 2	
	3	Bifacial blade pps	
	4	Bifacial flake pps	
	5	Unifacial pps	
	N	Not possible to determine	

Note: since not all attributes can be observed on every single point, the total number of points per attribute varies in the figures and tables presented. Points are presented in the figures with what we have interpreted as the proximal end down and the distal end up.

Table 2. Definitions for interpreting production phases (modified from [Högberg and Lombard 2016a: 6, Table 1](#)).

Production phases	
Phase	Definition
Phase 1	<i>Blank</i> : consisting of an unmodified or slightly worked flake, a blade or a nodule.
Phase 2	<i>Initial shaping</i> : consisting of a worked piece with a distinct shape, clearly showing the intentions of the knapper to produce a point. The worked piece has several negative removal scars on its surface.
Phase 3	<i>Preform shaped as a point</i> : consisting of a shaped piece with several invasive surface-covering negative flake-removal scars. The edges are regular. The preform is larger than finished points from the same contexts, but the proportions between length, thickness and width demonstrate that the preform can be reduced to a finished point, similar to those in the assemblage.
Phase 4	<i>Advanced shaping</i> : consisting of a clearly shaped form with well-balanced proportions. The tip and the base are defined. The edges are pronounced and stable. Commonly, several invasive surface-covering negative flake removals reach over the length axis of the point, i.e. the bilateral equilibrium plane, on one or two faces of the point. The piece appears to be a finished point, but lacks the final retouch or serration along the edges and on the tip.
Phase 5	<i>Finished point</i> .

Note: since not all attributes can be observed on every single point, the total number of points per attribute varies in the figures and tables presented. Points are presented in the figures with what we have interpreted as the proximal end down and the distal end up.

unifacial pieces ($N = 17$), eleven (65% of unifacial pieces and 44% of the whole assemblage) have triangular cross-sections, making this the most common form of cross-section.

Other forms of cross-sections as defined in [Table 3](#) and shown in [Figure 4](#) are present on a few examples ([Table 4](#)). We have not recorded any pieces with rhombic, biconvex or diamond-shaped cross-sections. Diamond-shaped cross-sections are associated with points produced from blade blanks ([Högberg and Lombard 2016a: 10, Figure 4](#)). Based on these observations, we conclude that blades were probably not used as blanks for the points from Apollo 11. This inference is further supported by the fact that where identification of blanks was possible, nodules ($N = 7$, 41%) and flakes ($N = 10$, 59%) were identified as blanks (instead of blades) for the production of the Still Bay points present. We note, however, that for almost one third of the points ($N = 8$, 32%) we were unable to determine the blank type.

The most commonly used strategy to manufacture the points recovered from Apollo 11 is the unifacial point-production strategy ($N = 17$, 71%). Seven (29%) of the pieces were made using the bifacial nodule point-production strategy 1. For one point, we were not able to determine a point-production strategy. The majority of the points and point fragments ($N = 15$, 60%) have a ridge at the bilateral equilibrium, following the original ridge of a flake on one side and lacking a ridge on the other. These pieces are associated with the

Table 3. Matrix for attributes and definitions in relation to point-production strategies and production phases used in the analysis, described for phase 2, 3 and 4 points (from Högborg and Lombard 2016a: 9-10, Table 2).

Point-production strategy	Phase 2	Phase 3	Phase 4
<i>Cross-section</i>			
Bifacial nodule pps 1	Lenticular, irregular	Lenticular	Lenticular
Bifacial nodule pps 2	Lenticular, irregular	Rhombic, biconvex	Rhombic, biconvex
Bifacial blade pps	Wedge-shaped or keeled	Wedge-shaped, keeled or dislocated semi-circular	Diamond-shaped
Bifacial flake pps	Triangular	Triangular or dislocated semi-circular	Dislocated semi-circular
Unifacial pps	Triangular	Triangular or dislocated semi-circular	Semi-circular
<i>Ridge at the bilateral equilibrium on each face of the point</i>			
Bifacial nodule pps 1	Not clearly defined	Not clearly defined	Centred
Bifacial nodule pps 2	Not clearly defined	Off-centred, located towards one of the edges	Off-centred, located towards one of the edges
Bifacial blade pps	Follow original ridge on blade on one side. No ridge on the other side	Follow original ridge on blade on one side. Indistinct, not centred or centred on the other	Follow original ridge on blade on one side. Indistinct, not centred or centred on the other side
Bifacial flake pps	Follow original ridge on flake on one side. No ridge on the other	Follow original ridge on flake on one side. Indistinct or not centred on the other	Follow original ridge on flake on one side. Indistinct or not centred on the other side
Unifacial pps	Follow original ridge on flake or blade on one side. No ridge on the other side	Follow original ridge on flake or blade on one side. No ridge on the other side	Follow original ridge on flake or blade on one side. No ridge on the other side
<i>Placement of the bifacial equilibrium plane</i>			
Bifacial nodule pps 1	Centred	Centred	Centred
Bifacial nodule pps 2	Not centred	Not centred	Not centred
Bifacial blade pps	-	Not centred	Centred
Bifacial flake pps	-	Not centred	Not centred
Unifacial pps	-	-	-
<i>Worked on both sides</i>			
Bifacial nodule pps 1	Yes	Yes	Yes
Bifacial nodule pps 2	Yes	Yes	Yes
Bifacial blade pps	No	Yes	Yes
Bifacial flake pps	No	Yes	Yes
Unifacial pps	No	No	No
<i>Other characteristics</i>			
Bifacial nodule pps 1			
Bifacial nodule pps 2		Away-from-edge knapping using two platforms	
Bifacial blade pps		Pressure flaking sometimes used for thinning point	
Bifacial flake pps	Platform from original flake visible on point butt	Platform from original flake visible on point butt	Platform from original flake visible on point butt
Unifacial pps	Platform from original flake or blade visible on point butt	Platform from original flake or blade visible on point butt	Platform from original flake or blade visible on point butt

unifacial point-production strategy. Also associated with this strategy, are the points and point fragments (N = 17, 68%) worked on one side only (Table 6). Nine (36%) of the pieces do not have a clearly defined ridge at the bilateral equilibrium on each face on the point, while 22 (88%) do not have a centred bifacial equilibrium plane (Table 6). Pressure flaking was used for the production and final shaping of six (two in phase 3, three in phase 4 and one in phase 5) of the points and point fragments at Apollo 11 (Table 6 and Figure 7).

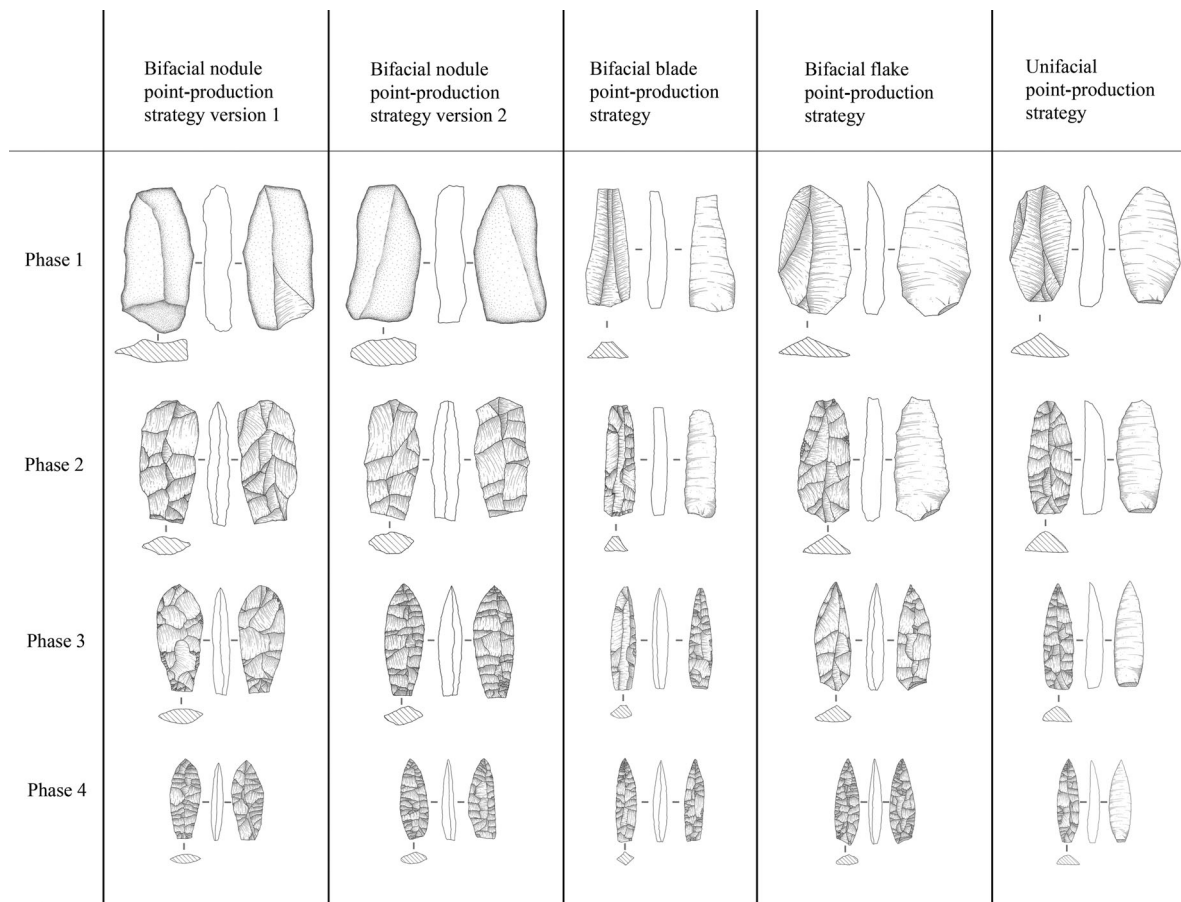


Figure 5. Illustration of the interpretative matrix with identified point-production phases and strategies (slightly modified from Högberg and Lombard 2016a: 10, Figure 4).

**Table 4.** Analytical data from all 25 points from Apollo 11 Rock Shelter (see Tables 1, 2 and 3 for the definition of attributes).

ID	Rock	Fragmentary/ complete	Length	Width	Thickness	Base	Cross- section	Ridge	Bifacial equilibrium plane	Worked on both sides	Pressure flaking	Blank type	Phase	Production strategy
<i>Complete points, in descending order from most to least finished phase in production</i>														
019	QZ	C	91	25	10	SC	T	4	NC	N	Y		5	5
021	CC	C	62	18	6	SC	SC	4	NC	N	Y	F	4	5
002	CQ	C	36	22	8	ST	T	4	NC	N	N	F	3	5
003	MQ	C	45	23	8	SC	T	4	NC	N	N	F	3	5
020	CQ	C	46	23	9	ST	T	4	NC	N	Y		3	5
013	CC	C	68	36	10	ST	WS	1	NC	N	N	F	2	5
016	QZ	C	72	30	8	ST	WS	4	NC	N	N	F	2	5
024	QZ	C	67	37	11		T	4	NC	N	N	F	2	5
<i>Almost complete points, missing only the base</i>														
011	CQ	ACB	60	31	11		L	1	C	Y	N	N	3	1
<i>Almost complete points, missing only the tip</i>														
012	QZ	AC	57	25	10	ST	SC	4	NC	N	N	F	2	5
014	CQ	AC	29	17	5	ST	T	4	NC	N	N	F	2	5
<i>Proximal + medial part</i>														
004	QZ	P + M	43	26	13	ST	LI	1	NC	Y	N	N	2	1
015	QZ	P + M	40	22	8	ST	SC	4	NC	N	N		3	5
<i>Distal + medial parts</i>														
005	QZ	D + M	43	25	11		L	1	C	Y	N	N	3	1
023	CM + H	D + M	40	23	5		DSC	1	NC	Y	N	N	3	1
017	QZ	D + M	73	30	16		T	4	NC	N	N	F	2	5
025	QZ	D + M	50	28	10		L	1	C	Y	N	N	2	1
<i>Medial parts</i>														
001	MQ	M	26	18	8		LI	3	NC	Y	N	N	2	1
010	RQ	M	26	32	11		LI	1	NC	Y	N	N	2	1
022	QZ	M	60	27	14		T	4	NC	N	N	F	2	5
<i>Distal parts</i>														
008	QZ	D	26	12	5		T	4	NC	N	Y		4	5
006	QZ	D	29	19	6		WS	1	NC	N	Y		3	5
018	QZ	D	33	10	9		T	4	NC	N	N		2	5
<i>Tips</i>														
007	QZ	T	24	13	7		T	4	NC	N	Y		4	5
009	QZ	T	17	16	6		LI	1	NC	Y	N		4	

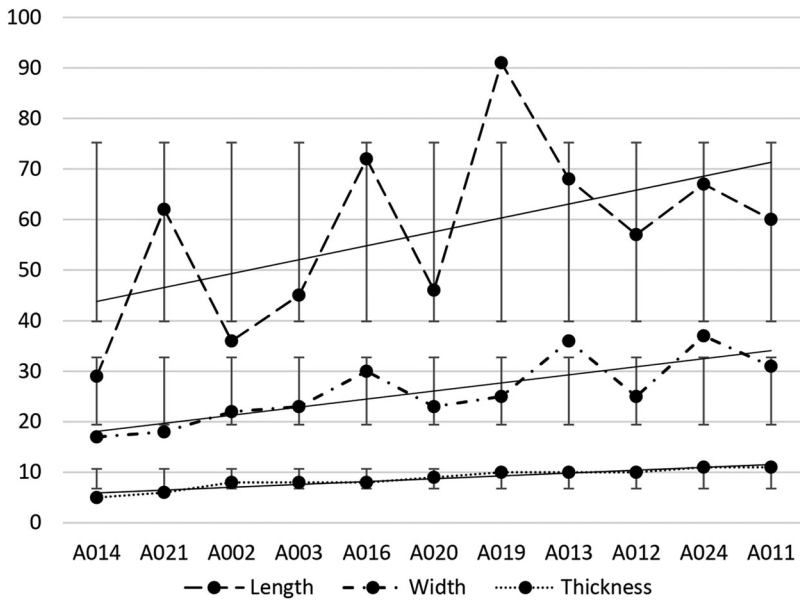


Figure 6. The relationships between length, width and thickness measurements for the complete and almost complete Apollo 11 pieces (see Figure 3 and Table 4), arranged from thinnest to thickest, with standard deviation bars and trend lines for each dimension.

Table 5. Summary of the morphological data of whole and almost whole pieces (N = 11) from Apollo 11 Rock Shelter.

Unit	Minimum	Maximum	Mean	SD	CV
Length	29	91	57.5	17.7	30
Width	17	37	26.1	6.7	26
Thickness	5	11	8.7	2	22
Length:width ratio	1.7	2.4	2.1	0.6	29
Length:thickness ratio	5.8	8.3	6.7	1.9	28
Width:thickness ratio	3.4	3.4	2.1	0.4	19

Table 6. Summary of some technological attributes.

	Placement of the bifacial equilibrium plane		Worked on both sides		Indication of the use of pressure flaking			
	N	%	N	%	N	%		
Centred	3	12	Yes	8	32	Yes	6	24
Not centred	22	88	No	17	68	No	19	76
Total	25	100	Total	25	100	Total	25	100

Inter-regional variation in Still Bay point morphologies and production strategies

Here, we compare directly the Apollo 11 morphometric results with those from Hollow Rock Shelter and Umhlatuzana Rock Shelter (Högberg and Lombard 2016a) to affirm the Still Bay status of the Apollo 11 assemblage. We then explore inter- and intra-regional



Figure 7. Apollo 11: close-up of negative flake removals from pressure flaking on point number 021.

trends in knowledge-transfer systems based on point-production strategies. While some other dated Still Bay assemblages have been described, published morphometric data sets for their point populations are few (see Archer *et al.* 2015, 2016; Soriano *et al.* 2015 for discussion) and the Apollo 11 sample of 25 pieces is relative small. Pending further excavation at the site, our study nevertheless comprises all the material representing the Apollo 11 Still Bay point population and as such contributes to inter-regional discussions of this technocomplex. As is true for most assemblages, greater numbers of artefacts generated by future excavations might affect our interpretations of the data.

Comparative morphometric analysis

Morphometrically, the mean metric values reveal that the shape of the Apollo 11 points is almost identical to that of the Umhlatuzana assemblage and very similar to that of Hollow Rock Shelter (Figure 8). At all three sites, the shape ratio (length:width, length:thickness and width:thickness) mean values are very similar. The points from Hollow Rock Shelter are, on average, slightly wider, thicker and somewhat longer, compared to those from Apollo 11 and Umhlatuzana (Figure 8). A one-way analysis of variance test (ANOVA) for independent samples revealed that there are no statistically significant differences between the shape ratios of the three samples (length:width $p = 0.115$; length:thickness $p = 0.204$; width:thickness $p = 0.062$).

The comparison of morphometric values demonstrates that points from the three sites are similar in shape. The standard deviations for all the shape ratios show that even from the early stages of manufacture point shape deviated little (or not at all) at the three sites (Figure 9). We interpret this result to be a strong indication that ‘shape’ was an important aspect of Still Bay point production. Similar to what has been previously established for the Still Bay points from Umhlatuzana (Lombard *et al.* 2010), the emphasis of the points’ makers appears to have been especially placed on the length:width ratio of points also at Apollo 11 and Hollow Rock Shelter, with means and standard deviations being almost identical at all three sites. Across the board, the Umhlatuzana assemblage shows

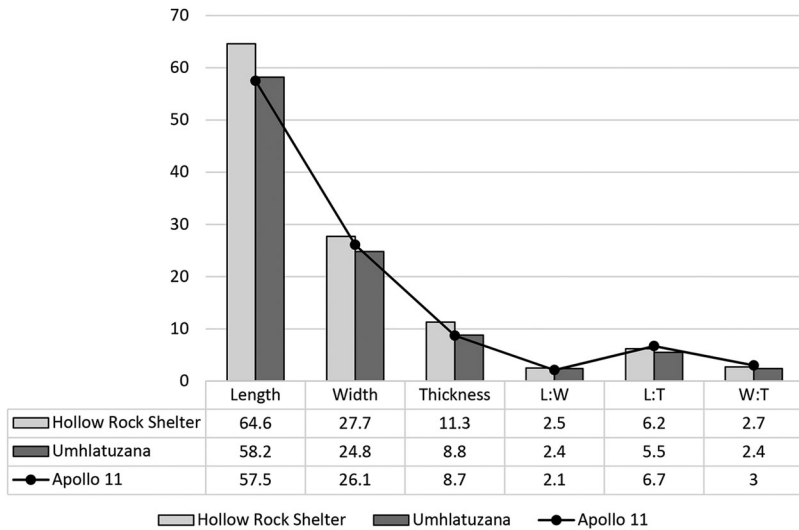


Figure 8. Comparative mean morphometric values for Still Bay complete and almost complete point assemblages from Apollo 11 Rock Shelter (N= 11), Hollow Rock Shelter (N = 20; 13 whole points, six whole points with tip or base missing and one point with lateral break [Högberg and Larsson 2011: 137, Table 3]) and Umhlatuzana Rock Shelter (N = 16, including eight serrated points [Lombard *et al.* 2010]). The data include points from all phases of manufacture.

the least deviation in size and shape, whereas the points from Hollow Rock Shelter display the most deviation regarding width and thickness. At Apollo 11, length was the least consistent morphometric dimension, but was still very similar to that at Hollow Rock Shelter.

Generally, the smaller the standard deviations (SD), the smaller are the values for the coefficient of variation and thus the greater the degree of standardisation. Fisher (2006)

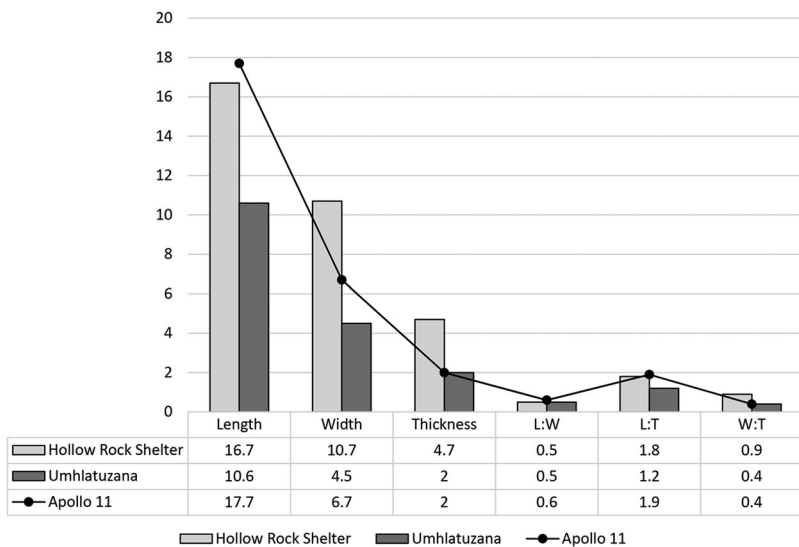


Figure 9. Comparative standard deviation values for Still Bay complete and almost complete point assemblages for Apollo 11 Rock Shelter, Hollow Rock Shelter and Umhlatuzana Rock Shelter. The samples are the same as described for Figure 8.

used 20 as a cut-off point to indicate standardisation in lithic assemblages and, being cautious, Wadley and Mohapi (2008) suggested a value of 10 as a clear indication of standardisation. Using Fisher's benchmark, we see that only the points from Umhlatuzana show some standardisation in terms of length, width and their width:thickness ratio, the dimension for which the Apollo 11 point assemblage also displays some standardisation, but this is the least standardised metric at Hollow Rock Shelter (Figure 10). If we follow the parsimonious approach of Wadley and Mohapi, however, it seems that notwithstanding an emphasis on shape, the trend for Still Bay point populations in general is not to be particularly standardised regarding either size or shape (Figure 10). We nevertheless again draw attention to the fact that pieces of all the production phases are included so that values are skewed towards the higher end of the expected range for Still Bay points.

Our current data set indicates more similarity between the point populations from Apollo 11 and Umhlatuzana, with that from Hollow Rock Shelter being somewhat different and with the least standardised of all dimensions (Figure 10). Because early-phase points are included here, the original nodule sizes, affected by rock type amongst other things (see section on raw material use below), would also result in inflated SD and CV values. For example, when large quartzite nodules are mostly chosen for production blanks (as with some of the pieces from Hollow Rock Shelter), we may expect a substantial difference in proportions, and sometimes also shape ratios, between phase 1 and phase 5 points at the site (a large nodule is heavily knapped into a point, continuously changing size and shape). On the other hand, when small nodules or blades are chosen (such as those at Umhlatuzana), there will be slighter differences in proportions and shape ratios between phase 1 and phase 5 points (much less reduction is required to knap such pieces into shape).

We also conducted a comparative analysis of the relationship between the recorded cross-sections for Still Bay points at Apollo 11, Hollow Rock Shelter and Umhlatuzana

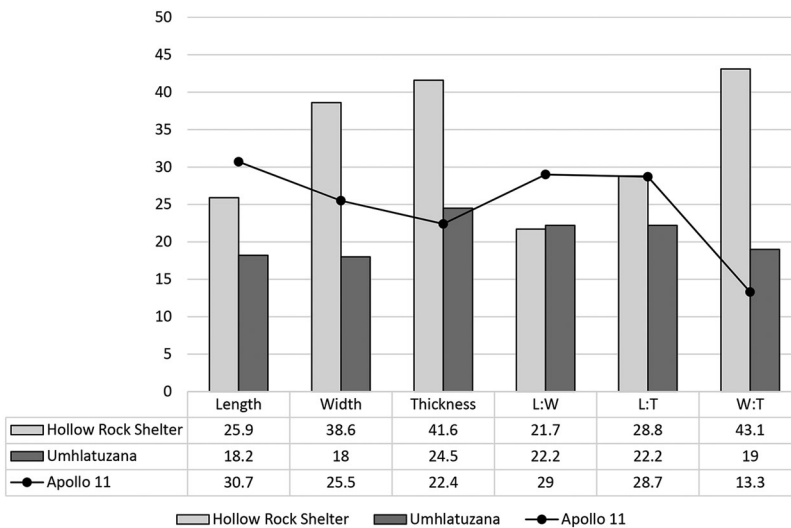


Figure 10. Comparative coefficient of variation (CV) values for Still Bay complete and almost complete point assemblages for Apollo 11 Rock Shelter, Hollow Rock Shelter and Umhlatuzana Rock Shelter. The samples are the same as described for Figure 8.

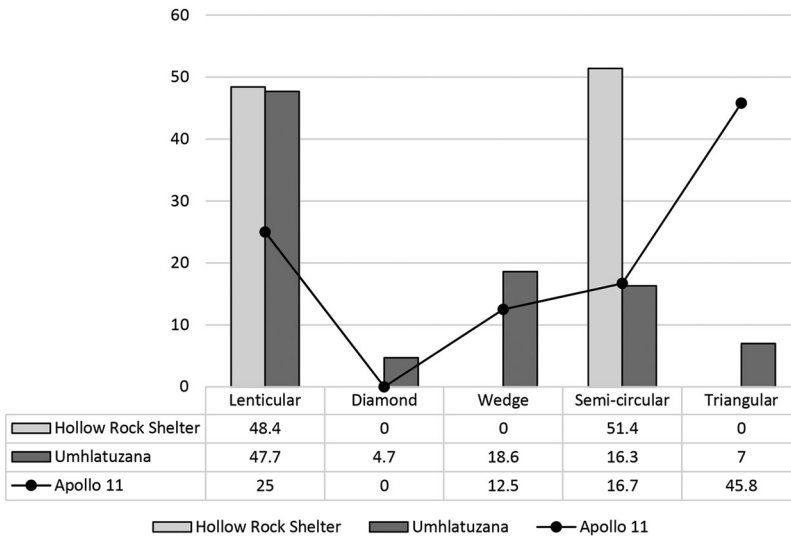


Figure 11. Frequencies in the percentage of cross-section shapes recorded for each assemblage analysed. Note that similar cross-sections, such as lenticular and lenticular-irregular or semi-circular and dislocated semi-circular, have been conflated. Cross-sections of fragments are not always clearly identifiable, thus only pieces with secure cross-section identifications are included here.

(Figure 11). Although we followed a fine-grained procedure during recording in the context of identifying point-production strategies, here we conflate similar cross-section categories (lenticular/lenticular-irregular and semi-circular/dislocated semi-circular) to correlate with the archetypal Still Bay point definition provided by Goodwin and van Riet Lowe (1929). In the Apollo 11 assemblage most pieces have triangular cross-sections ($N = 11$, 45.8%). Here, we recorded lenticular cross-sections on six pieces (25%), semi-circular cross-sections on four (16.7%) and wedge-shaped on three (12.5%) (Figure 11). The Hollow Rock Shelter assemblage, on the other hand, contains no pieces with triangular cross-sections and only two cross-section shapes are represented, in almost equal proportions, i.e. semi-circular ($N = 33$, 51%) and lenticular ($N = 31$, 48.4%) (Figure 11). The narrow assortment of cross-section shapes at Hollow Rock Shelter is interesting because at least four different point-production strategies have been identified for Still Bay points at this site. The Umhlatuzana assemblage is dominated by pieces with lenticular cross-sections ($N = 41$, 47.7%). Here, wedge-shaped ($N = 16$, 18.6%) and semi-circular ($N = 14$, 16.3%) cross-sections are almost equally frequent, while pieces with triangular ($N = 6$, 7.2%) and diamond-shaped cross-sections ($N = 4$, 4.7%) are relatively rare.

A decade or so ago, values for tip cross-sectional areas (TCSA, calculated by multiplying half the maximum width by the maximum thickness) were thought to inform on weapon-delivery systems (Shea 2006; but see Sisk and Shea 2009; Lombard and Phillipson 2010). Because weapon use was a hot topic of research and TCSA values can be calculated from broken points (as long as their maximum widths and thicknesses are intact), data are available for this metric attribute for many dated Still Bay sites (Shea 2006; Wadley 2007; Villa *et al.* 2009; Mohapi 2013). We therefore use TCSA values not to infer function, but as a directly comparable morphometric attribute that might reveal general trends in Middle Stone Age point production through time.

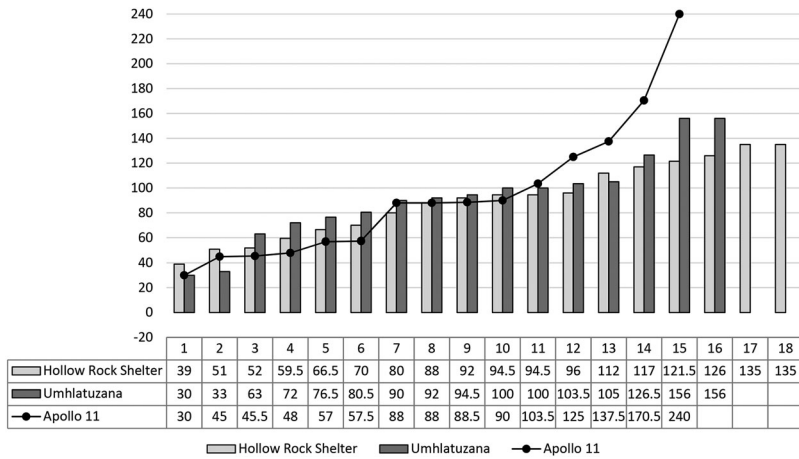


Figure 12. TCSA values for individual phase 3-5 points and point fragments from Apollo 11 Rock Shelter, Hollow Rock Shelter and Umhlatuzana Rock Shelter with logarithmic analysis and forward forecast by two periods for each site.

We compare the TCSA values calculated for the points and point fragments representing production phases 3-5 (thus excluding blanks and initially worked pieces) at Apollo 11, Hollow Rock Shelter and Umhlatuzana. Most points (N = 41, 90%: Apollo 11 N = 12, 80%; Hollow Rock Shelter N = 17; 94%; Umhlatuzana N = 12, 75%) have TCSA values of between 40 and 140 (Figure 12). The points from Hollow Rock Shelter are most consistent in this attribute, with those from Apollo 11 displaying the most deviation, but only two pieces have values above 140. Conducting an ANOVA test for independent samples resulted in a value of $p = 0.0970$, showing no statistically significant differences between the three samples.

Comparative point-production strategy analysis and raw materials

Still Bay points from the Apollo 11 assemblage were produced using the bifacial nodule point-production strategy version 1 and the unifacial point-production strategy (see Table 4 and Figure 5). For one point, we were unable to specify a point-production strategy (Table 4). Whereas the bifacial nodule point-production strategy version 1 starts from a raw, naturally formed or slightly worked nodule or nodule-like flake, the unifacial point-production strategy starts with a flake blank (Figure 5). Hypothetically, a blade can also be used as a blank for the unifacial point-production strategy. We have, however, no evidence of blades having been used as blanks from Apollo 11. With the bifacial nodule point-production strategy version 1, the point is worked on both planes using all sides on the lateral margins as platforms for knapping throughout the production process. With the unifacial point-production strategy, only the ventral side of the flake is used as a platform. Invasive flakes are detached to shape the dorsal side of the flake into a point. The ventral side of the original flake blank is left unworked. Consequently, two very different strategies were used to produce the Still Bay points excavated from Apollo 11.

In a previous study, we analysed regional variations in point-production strategies, comparing the Still Bay assemblages from Hollow Rock Shelter with those from

Table 7. All points included in the present analysis from Apollo 11 Rock Shelter, Hollow Rock Shelter and Umhlatuzana Rock Shelter presented in numbers and percentage of the whole assemblage of points for each point-production strategy (top percentage line), as well as in relation to stone type used (bottom percentage line). Note that crystal quartz points from Umhlatuzana Rock Shelter and Apollo 11 Rock Shelter, as well as a point made out of rose quartz from Apollo 11, are all included in the quartz data below. Data on Hollow Rock Shelter and Umhlatuzana Rock Shelter are from Högberg and Lombard (2016a: 16, Table 3).

Raw material	Bifacial nodule pps 1		Bifacial nodule pps 2		Bifacial blade pps		Bifacial flake pps		Unifacial pps		Pps not known		Totals		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
<i>Apollo 11 Rock Shelter</i>														N = 25	
Quartzite	3	12	0	0	0	0	0	0	11	44	1	4	15	60	
		20								73.3		6.7	3	12	
CC + CM/H	1	4	0	0	0	0	0	0	2	8	0	0	3	12	
		33.3								66.7				100	
Quartz	3	12	0	0	0	0	0	0	4	16	0	0	7	28	
		42.8								57.2				100	
Total	7	28	0	0	0	0	0	0	17	68	1	4	25	100	
<i>Hollow Rock Shelter</i>														N = 69	
Quartzite	21	30.4	1	1.5	0	0	8	11.6	0	0	2	2.9	32	46.4	
		65.6		3.2				25			6.2			100	
Silcrete	8	11.6	3	4.3	0	0	13	18.8	3	4.3	1	1.4	28	40.6	
		28.6		10.7				46.4		10.7		3.6		100	
Quartz	9	13	0	0	0	0	0	0	0	0	0	0	9	13	
		100												100	
Total	38	55.1	4	5.8	0	0	21	30.4	3	4.35	3	4.35	69	100	
<i>Umhlatuzana Rock Shelter</i>														N = 97	
Quartzite	17	17.5	0	0	22	22.7	6	6.2	0	0	3	3	48	49.4	
		35.4				45.8		12.5				6.3		100	
Hornfels	2	2.1	0	0	6	6.2	3	3.1	15	15.5	0	0	26	26.9	
		7.7				23.1		11.5		57.7				100	
Quartz	22	22.7	0	0	0	0	0	0	1	1	0	0	23	23.7	
		95.7								4.3				100	
Total	41	42	0	0	28	29	9	9	16	16.5	3	3.5	97	100	
<i>Point production summary for all three sites</i>														N = 191	
Quartzite	41	21.5	1	0.5	22	11.5	14	7.3	11	5.8	6	3.1	95	49.7	
		43.2		1.0		23.2		14.7		11.6		6.3		100	
Quartz	34	17.8	0	0	0	0	0	0	5	2.6	0	0	39	20.4	
		87.2								12.8				100	
CC + CM/H	1	0.5	0	0	0	0	0	0	2	1	0	0	3	1.6	
		33.3								66.7		0		100	
Silcrete	8	4.2	3	1.6	0	0	13	6.8	3	1.6	1	0.5	28	14.7	
		28.6		10.7				46.4		10.7		3.6		100	
Hornfels	2	1.0	0	0	6	3.1	3	1.6	15	7.9	0	0	26	13.6	
		7.7				23.1		11.5		57.7				100	
Total	86	45.0	4	2.1	28	14.7	30	15.7	36	18.8	7	3.7	191	100	

Umhlatuzana (Högberg and Lombard 2016a). Here, we compare and discuss these results with new data on point-production strategies from Apollo 11. There are striking similarities and differences between the three sites (Table 7). At all of them there is evidence of points having been produced with the bifacial nodule point-production strategy version 1 and the unifacial point-production strategy. However, the relative frequency of these strategies varies. At Apollo 11 the unifacial point-production strategy is most common, with 68% (N = 17) of points produced using this strategy. At Hollow Rock Shelter,

however, only 4.35% ($N = 3$) and at Umhlatuzana 16.5% ($N = 16$) of points were produced using the unifacial point-production strategy. On the other hand, at Hollow Rock Shelter (55.1% $N = 38$) and Umhlatuzana (42% $N = 41$) most points were produced with the bifacial nodule point-production strategy version 1, whilst at Apollo 11 only 28% ($N = 7$) of points were produced in this manner.

Apollo 11 is the only site out of the three where points were produced using only two production strategies. At both Hollow Rock Shelter and Umhlatuzana knappers used four different strategies. However, the bifacial nodule point-production strategy version 2 was used only for points from Hollow Rock Shelter and the bifacial blade point-production strategy is thus far unique to some of the points from Umhlatuzana. Both of these sites have points produced with the bifacial flake point-production strategy, a strategy that we have not recorded at Apollo 11.

Pressure flaking is known to have been a technique used for the production of Still Bay points (Mourre *et al.* 2010; Högborg and Lombard 2016b). At Hollow Rock Shelter it was used for the final shaping of points (Högborg and Larsson 2011), while at Umhlatuzana pressure flaking was used for the final shaping of Still Bay points, the deliberate flaking of serrated edges and the thinning of point preforms (Högborg and Lombard 2016b). The use of pressure flaking at Apollo 11 is similar to that of Hollow Rock Shelter, i.e. it was used for the final shaping of some points.

At all three sites, knappers used quartzite and quartz to knap Still Bay points, but the frequencies in which they did so differ (Figure 13). At Apollo 11, quartzite was used more frequently, while at Hollow Rock Shelter quartz was used less frequently. Other, local rock types were used at all three sites, such as silcrete at Hollow Rock Shelter, hornfels at Umhlatuzana and cryptocrystalline/calcareous mudstone at Apollo 11. (Note that here we use the term 'local' for rock types that are represented in the point assemblage at only one of the three sites. We do not imply that these rock types were always locally extracted).

Looking at preferred point-production strategies for the various rocks, we also observed interesting variation between the sites. At Apollo 11, knappers made most points on all three rock categories using the unifacial strategy; this strategy dominates amongst quartzite points in particular ($N = 11$), with more points attempted using the bifacial nodule point-production strategy version 1 on quartz ($N = 3$) and local materials ($N = 1$). On the other hand, at Hollow Rock Shelter knappers seem to have preferred this latter strategy to produce points on quartzite ($N = 21$) and quartz ($N = 9$), but mostly used the bifacial flake strategy for silcrete ($N = 13$). At Umhlatuzana, we observed a preference for three different point-production strategies on the three raw material groupings. Here, knappers mostly used the bifacial blade point-production strategy for quartzite ($N = 22$), the unifacial strategy for hornfels ($N = 15$) and the bifacial nodule point-production strategy version 1 for quartz points ($N = 22$).

Returning to the course-grained (morphological as opposed to technological) data on cross-sections (Figure 11) and exploring their relationships with the use of raw materials, we found that at all three sites knappers made, or attempted to make, points with lenticular cross-sections from all the raw materials in their assemblages (Figure 14). At Apollo 11 ($N = 24$) equal numbers of lenticular pieces ($N = 2$, 8.3%) were produced on quartzite, quartz and local fine-grained rocks. At Hollow Rock Shelter ($N = 64$) most lenticular pieces were made from quartzite ($N = 15$, 23.4%) or silcrete ($N = 11$, 17.2%), with only five (7.8%) of the pieces on quartz. At Umhlatuzana ($N = 86$), on the other hand,

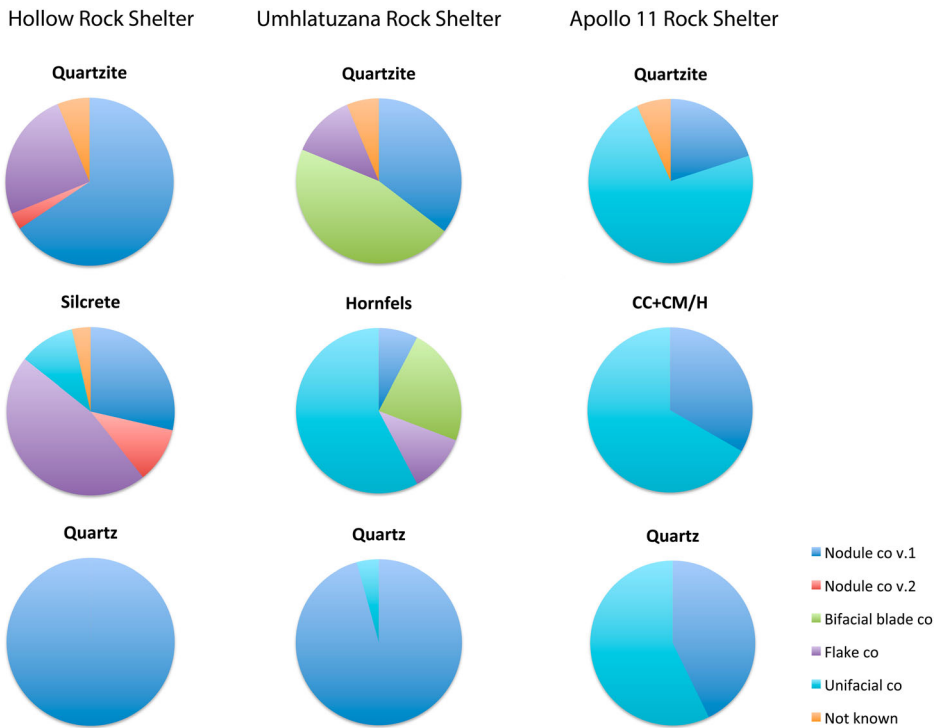


Figure 13. Frequencies of each point-production strategy in relation to rock type for each site. The diagram is based on the numbers given in Table 7. White: bifacial nodule strategy 1; grey background with white dots: bifacial nodule strategy 2; light grey: bifacial blade strategy; dark grey: bifacial flake strategy; checkered grey and white: unifacial strategy; white background with black dots: not known.

quartz was the preferred material for the production of pieces with lenticular cross-sections ($N = 22$, 25.6%) followed by quartzite ($N = 17$, 19.8%). Here, only two (2.3%) hornfels pieces have lenticular cross-sections (Figure 14).

Apollo 11 has no pieces with diamond-shaped cross-sections and this type of cross-section, as well as wedge-shaped and triangular cross-sections, is absent from the Hollow Rock Shelter assemblage. The Umhlatuzana assemblage has four pieces with a diamond-shaped cross-section (4.2%), all of which were produced on quartzite. At both Apollo 11 and Umhlatuzana knappers used mostly quartzite (Apollo 11 $N = 2$, 8.3%; Umhlatuzana $N = 16$, 18.6%), but sometimes also local fine-grained rocks (Apollo 11 $N = 1$, 4.2%; Umhlatuzana $N = 5$, 5.8%) to produce pieces with wedge-shaped cross-sections. Quartzite was mostly used to produce pieces with triangular cross-sections at both Apollo 11 ($N = 8$, 33.3%) and Umhlatuzana ($N = 5$, 5.8%). At Apollo 11, the knappers also produced a few such pieces on quartz ($N = 2$, 8.3%) and one (4.2%) on a local fine-grained material, as at Umhlatuzana (hornfels $N = 1$, 1.2%), where no quartz pieces with triangular cross-sections were recorded (Figure 14).

Pieces with semi-circular cross-sections were produced at all three sites. At Apollo 11, quartz was used for two (8.3%) and quartzite for one (4.2%) of these. All rock types were used for such pieces at both Hollow Rock Shelter and Umhlatuzana. At Hollow Rock Shelter, equal proportions of pieces with semi-circular cross-sections were made from

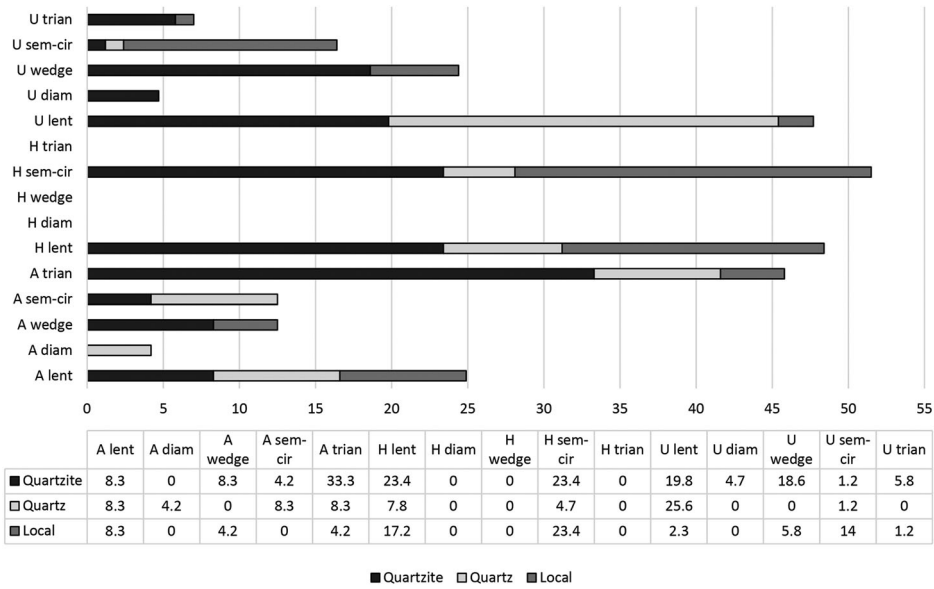


Figure 14. Frequencies of cross-sections represented in each assemblage in relation to raw material. Note that similar cross-sections, such as lenticular and lenticular-irregular or semi-circular and dislocated semi-circular, have been conflated. Cross-sections of fragments are not always clearly identifiable, thus only pieces with secure cross-section identifications are included here. Abbreviations used: A Apollo 11 Rock Shelter; H Hollow Rock Shelter; U Umhlatuzana Rock Shelter; lent lenticular; diam diamond-shaped; sem-cir semi-circular; trian triangular.

quartzite and silcrete (N = 15, 23.4% each), with three (4.7%) from quartz. At Umhlatuzana, hornfels dominates this category with 12 pieces (14%) and this site yielded only one piece (1.2%) made of quartzite and one (1.2%) of quartz (Fig. 14).

Discussion and conclusion

Notwithstanding a still small sample size, our comparative data enable us to start integrating the Apollo 11 Still Bay point assemblage with available inter-regional results and interpretations about the Still Bay technocomplex. Vogelsang *et al.* (2010) were cautious with their interpretation of the MSA 2 assemblage at Apollo 11 as Still Bay. Our analyses substantiate their reading. Whereas Still Bay assemblages may vary in some aspects across space and through time (Archer *et al.* 2015, 2016), the MSA 2 point assemblage from Apollo 11 falls within the known morphometric range of Still Bay points (Figures 8 and 9), with no statistically significant differences in the three shape ratios compared to Hollow Rock Shelter and Umhlatuzana.

Goodwin and van Riet Lowe (1929) defined the Still Bay type fossil as having a lenticular cross-section. We found that at all three sites in our analysis, points had lenticular and semi-circular cross-sections. Compared to Hollow Rock Shelter and Umhlatuzana, Apollo 11 had relatively fewer lenticular pieces (Figure 11). Pieces with lenticular cross-sections are the only category present at all three sites made on all three raw material types (quartzite, quartz and local rocks; Figure 14). We suggest that this shows the general, inter-regional intent of the knappers to produce thin, bifacial points regardless

of raw-material constraints. Technologically, we associate lenticular cross-sections with the bifacial nodule point-production strategy 1 (phases 2-4) and bifacial nodule point-production strategy 2 (phase 2). The bifacial nodule point-production strategy 1 was used extensively to produce Still Bay points at Hollow Rock Shelter and Umhlatuzana and is the only one thus far reported for the Blombos assemblage (Villa *et al.* 2009).

The use of the bifacial nodule point-production strategy 1 approach at all the Still Bay sites we have thus far analysed, as well as at Blombos and Diepkloof (Villa *et al.* 2009; Porraz *et al.* 2013), indicates a potentially inter-regional shared convention for Still Bay point production (Högberg and Lombard 2016a). This interpretation implies that, despite the complexities inherent in the sharing of knowledge-transfer systems within and between groups (Högberg and Lombard 2016a), during the Still Bay society was potentially organised in a way that facilitated knowledge transmission about conventions of how to make a point and that these shared conventions were applied across regions, including Apollo 11.

The most parsimonious interpretation for such widespread knowledge transmission across bioregions and/or rainfall zones would be that it was accomplished through exchange networks amongst neighbouring hunter-gatherer groups of adjacent bioregions, as opposed to the long-distance movement of individuals or groups across the landscape. When knowledge-transfer systems are thought of in this manner, it becomes evident that key knapping principles for the production of Still Bay points could have been transferred across long distances through chains of short-distance interactions (for a fuller discussion see Högberg and Lombard 2016a).

In our technological analysis, we distinguish between semi-circular and dislocated semi-circular cross-sections (Figure 4). Dislocated semi-circular cross-sections are associated with phases 3 and 4 of the bifacial flake point-production strategy as observed at Hollow Rock Shelter and Umhlatuzana, but are absent at Apollo 11. However, they are also relevant for the identification of phase 3 pieces made according to the unifacial point-production strategy, which was used by knappers at all three sites. Semi-circular cross-sections also define phase 4 points produced with the unifacial point-production strategy (Table 3, Figures 4 and 5). Whereas complete, finished bifacial points with lenticular cross-sections might be the type fossil for the Still Bay, all previously fully described Still Bay point assemblages also include unifacial points (Minichillo 2005; Wadley 2007; Villa *et al.* 2009; Högberg and Larsson 2011; Porraz *et al.* 2013; Högberg and Lombard 2016a), although these are often neglected during formal analyses (e.g. Villa *et al.* 2009; Archer *et al.* 2016).

Most pieces in the Apollo 11 assemblage and some of the Umhlatuzana pieces have triangular cross-sections (Figure 14), which are absent from the Hollow Rock Shelter assemblage. Technologically, triangular cross-sections can result from using either the bifacial flake or the unifacial point-production strategies during phases 2 and 3. At Umhlatuzana, point knapping resulting in triangular cross-sections was mostly done on quartzite, with one piece on a local rock (Figure 14). Quartzite likewise dominates the pieces with triangular cross-sections at Apollo 11, but knappers also used quartz and local materials to produce pieces with this attribute. We suggest that the observed differences in Still Bay point cross-sections and point-production strategies reflect regional variation in technological expressions.

Our analysis of point-production strategies has thus far revealed that the approaches followed at Apollo 11 were rather conservative, following only two of the strategies that were also recorded at other sites. This is in contrast with what happened at Hollow Rock Shelter and Umhlatuzana, where knappers practised at least four strategies at each site. These strategies included some shared conventions, but also some regionally distinctive ways of shaping their Still Bay points (Högborg and Lombard 2016a). The paucity of point-production approaches followed at Apollo 11 could be an artefact of a still small sample size or may indicate a so-called founder effect, where variation is diminished when a small group becomes spatiotemporally isolated from a larger population (similar to its biological correlate; Gould 2002).

Archer *et al.*'s (2016) plotting of the major axes of variation between seven Still Bay assemblages, grouped by modern rainfall zones (as indicated in Figure 1), suggested two separate site groups, one to the northeast represented by Umhlatuzana and Sibudu (both in the summer rainfall zone) and one to the southwest represented by Blombos (in the year-round rainfall zone) and Hollow Rock Shelter, Diepkloof, Dale Rose Parlour and Clanwilliam Dam East (all in the winter rainfall zone; Archer *et al.* 2016: 61–62, Table 1 and Figure 1). Whereas Archer *et al.* (2016: 66) found 'highly significant differences in point shape' and the use of raw materials between their northeastern and southwestern assemblages, our data seem to provide a more nuanced scenario.

We are able to demonstrate subtle differences and similarities in each of the examples we have worked with in each of the modern rainfall zones. Because we have only been able to examine a single dated assemblage in each zone, we refrain from suggesting overarching demographic models at this stage of our exploration. Consistent with Archer *et al.*'s (2016) findings, we too find the points from Hollow Rock Shelter to be somewhat wider, thicker and longer compared to those from Apollo 11 and Umhlatuzana. However, the shape ratio standard deviations for the complete and almost complete point assemblages are almost identical at all three sites in our study (Figure 9 above), with no statistically significant differences between the individual ratios or TCSA values amongst the assemblages.

Sackett (1982, 1986) discuss artefact shape as linked to shared traditions. The morphometric similarities we see in Still Bay points, despite their knappers having performed a range of production strategies, might indicate shared traditions in what 'constitutes a point to be a point' (cf. Mackay *et al.* 2014). White and Dibble (1986) argue that variations in the mental template held by individual members of the same group might result in assemblage variation. Technological style as a distinctive way an artefact is made represent shared (or not shared) ways of doing things as well as ways of giving such objects value in society (Wobst 1977, 1999; Hodder 1982; Lemonnier 1993; Wurz 2010). In this sense, similarities and variations in shape/size and Still Bay point-production strategies might indicate shared, as well as not shared, traditions (e.g. Högborg and Lombard 2016a).

Previous research teams reached different conclusions about the homogeneity (Mackay *et al.* 2014) or lack thereof (Archer *et al.* 2016) in the demography of the groups who produced Still Bay points (see Högborg and Lombard 2016a for further discussion). Without knowing much more about the socio-historical context/s in which Still Bay points were made and used, these interpretations remain speculative (Thackeray and Kelly 1988). Nevertheless, most researchers seem to agree that the particulars inherent in these point

assemblages might ultimately be used ‘to identify cultural affiliation amongst contemporaneous bifacial point producing groups, and the geographic context within which this may be appropriate’ (Archer *et al.* 2016: 69). We propose, however, that more comprehensive, detailed comparative work and more well-dated Still Bay sequences from different regions are needed to use point materiality with confidence to identify and distinguish between groups through time and across the vast southern African landscape 70,000 to 80,000 years ago.

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