






Stone Age archaeology of the Riet River dongas, Free State, South Africa

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ABSTRACT

Recent research on the Middle Stone Age of southern Africa's central interior underscores the pivotal role played by this region in the emergence and cultural evolution of African *Homo sapiens*. In the central interior, specifically the Grassland and Savanna Biomes of South Africa's Free State Province, the earliest southern African *Homo sapiens* fossil originates from the site of Florisbad. Despite this, archaeological data remain sparse, hindering efforts to integrate cultural evidence and hominin fossil records into a coherent regional synthesis. Addressing this gap requires the development of a robust technological and geochronological reference framework for the Free State region. Here, we present results from an archaeological survey of the Riet River donga systems, where erosional incisions into alluvial terraces have exposed extensive lithic assemblages and occasional associated Florisian fauna. Our survey identified archaeological sites spanning the Earlier to Later Stone Age, across 32 dongas. These findings provide an essential foundation for establishing a technological framework, facilitating the development of an archaeological narrative for the open landscapes of the central interior and enabling comparative analysis with other regions across southern Africa.

Keywords: Pleistocene; South Africa; Riet River; Free State; Stone Age

1. Introduction

The Middle Stone Age (MSA) is an archaeological period spanning from ~350 ka to ~30 ka that saw the emergence of *Homo sapiens* in Africa (Deino et al. 2018; Bergström et al. 2021; Bader et al. 2022). The permanent expansion of *H. sapiens* into a diverse range of ecosystems (Roberts & Stewart 2018) brought about major cultural advancements, including hafted lithic technology, the habitual use of fire for food consumption and tool making, and the development of symbolic thought (e.g., Schmidt et al. 2013, Wadley 2015; Shipton et al. 2018; Larbey et al. 2019). Many of these innovations have been primarily documented in cave and rock-shelter contexts within the later MSA of southern Africa's Fynbos Biome. However, recent research indicates that the semi-arid and arid interior regions, particularly the Savanna Biome of the Kalahari Basin, played a central role in the earlier emergence of some of these behaviours (Wilkins 2021; Lukich & Ecker 2022; Ecker et al. 2023).

In the central interior of South Africa, the Grassland Biome of the Free State Province (henceforth Free State) has been at the forefront of palaeoanthropology since the early days of scientific research in southern Africa with the discovery in 1932 of the Florisbad cranium, now considered a basal *H. sapiens* fossil (Dreyer 1935; Grün & Stringer 2023 and references therein). This region has also produced

among the first examples of Earlier Stone Age (ESA) and early MSA lithic technocomplexes (Goodwin & van Riet Lowe 1929; van Hoepen 1930; Meiring 1956; Clark 1974), as well as stratified evidence of industries that are now defined as pre-Howiesons Poort (pre-HP), Howiesons Poort (HP), post-Howiesons Poort (post-HP), and early Later Stone Age (LSA) occupations (e.g., van Hoepen 1932; Dreyer 1938; Wells et al. 1942; Malan 1952). Research has showed that the Grassland Biome provided the stage for the evolution of the Florisian Land Mammal Age, which indicates the existence of less seasonal, well-watered grasslands during the Pleistocene, especially around lakes and along riverbeds in an otherwise semi-arid landscape (Brink 1987, 1988, 2016; Brink & Lee-Thorp 1992; Codron et al. 2008; Toffolo et al. 2015, 2017; Scott et al. 2019). Considering that sheltered sites are rare because the local geology does not favour cave formation (Loock & Grobler 1988; Holmes & Barker 2006), human groups mainly settled at open-air sites in these grassland environments; a pattern documented by early surveys along the Modder and Riet Rivers (Goodwin & van Riet Lowe 1929).

Over the past two decades, several open-air sites in the western Free State grasslands – particularly within the Modder River catchment – have been the focus of detailed archaeological investigations. These studies have documented stratified occupations dated to both the Late Pleistocene (Wroth et al. 2022; Richard et al. 2022a, 2023; Bousman et al. 2023) and the Holocene (van Aardt et al. 2016; Toffolo et al. 2023). In contrast, other major river systems in the region have received considerably less attention, remaining largely unexplored in terms of both their archaeological record and their geomorphological and chronological frameworks (e.g., Riet River, Vet River, Sand River; de Ruiter et al. 2011). This provides the impetus for the current study.

Our team is currently addressing this gap through the project PalaeoEcology and OPen-Landscape adaptations of Pleistocene humans in South Africa (PEOPLE), which seeks to reconstruct patterns of human occupation in the Free State during the Middle and Late Pleistocene. Following a renewed survey of the Modder River in 2022 and 2023 (Cuartero Monteagudo et al. 2025), and similar research in other open landscapes of South Africa (e.g., Shaw et al. 2019; Hallinan 2021; Will et al. 2024), a systematic survey of the Riet River was carried out in 2024 to document artefacts and fossil occurrences within dongas, which are erosional gullies in alluvial terraces that often expose stratified Pleistocene deposits. This paper presents the results of the first comprehensive archaeological survey of the Riet River (henceforth Riet) donga systems and discusses their significance within the broader archaeological and chronological framework of South Africa's lithic technocomplexes.

2. Regional setting

The Riet is a meandering river that flows ~300 km through the southwestern Free State in a southeast-northwest orientation from its headwaters north of Smithfield to its confluence in the Vaal River near Douglas, in the Northern Cape (Fig. 1). The Riet is one of the few rivers flowing in the semi-arid western Free State, and its catchment, covering roughly 14 000 km², includes both the Grassland Biome (Dry Highveld Grassland Bioregion) and Nama-Karoo Biome (Upper Karoo Bioregion) in the Free State, whereas in the Northern Cape it comprises the Savanna Biome (Eastern Kalahari Bushveld Bioregion) (Mucina & Rutherford 2006). The valley of the Riet is broad along most of its upper course and it becomes narrow immediately upstream of Kalkfontein Dam and until Jacobsdal, where it is constrained by several dolerite hills and sills. It has been suggested that these hard barriers may prevent the erosion of alluvial terraces located immediately downstream, thus favouring the preservation of archaeological sites, as observed along the Modder River (Toffolo 2024). To date, no geomorphological work has been conducted in the Free State portion of the Riet River catchment to understand the succession and age of its alluvial terraces. Claassen (2018) identified the alluvial terraces of the Riverton Formation between Koedoesberg Drift and De Kalk, in the Northern Cape stretch of the river. The sedimentary facies feature a variety of particle sizes that represent different flow regimes of the river over time, similar to the alluvial deposits of the Modder River at Erfkroon (Tooth et al. 2013; Lyons et al. 2014; Bousman et al. 2023), although absolute ages are not available and thus the two sequences cannot be matched. Ongoing research conducted by our group is aimed at establishing the allostratigraphic sequence of the Riet in the Free State and determining the age and formation processes of its sedimentary facies, especially with regard to the archaeological occurrences.

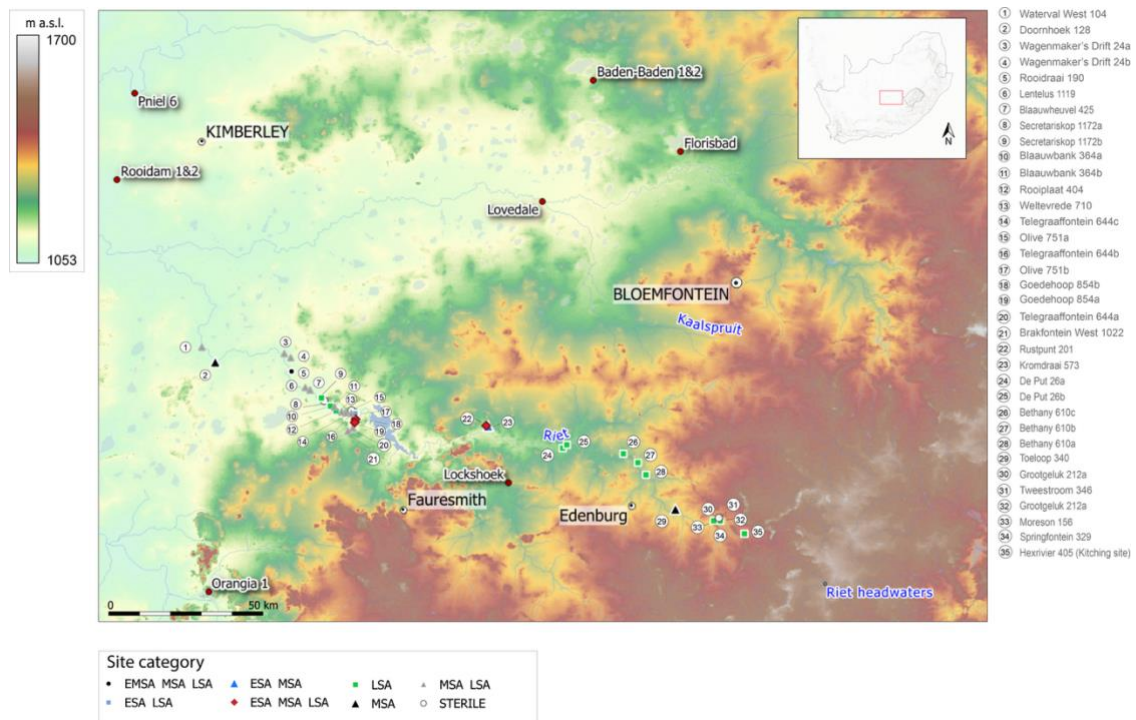


Figure 1. Map of the surveyed dongas in the Riet River catchment. Source: United States Geological Survey; Shuttle Radar Topography Mission 1-arc second Global, National Geospatial-Intelligence Agency (NGA), USGS Earth Resources Observation and Science (EROS), retrieved from NASA Earthdata.

As for other rivers in the Free State (e.g., the Modder River), the alluvial terraces of the Riet are in many places incised by dongas. Early surveys by C. van Riet Lowe in the 1920s identified several surface scatters of Fauresmith artefacts, including the type locality of the technocomplex at Brakfontein (van Riet Lowe 1927; Goodwin & van Riet Lowe 1929). In more recent years, Berger and Brink (1996) found a human patella, Florisian fossils, and a small assemblage of MSA artefacts at a donga located on the bank of the Riet, 20 km south of Reddersburg (presumably Hexrivier 405 in the topographic map). Additional surveys were conducted by J.S. Brink and L. Rossouw in search of palaeontological sites, but the results were never published. With regard to later periods, LSA sites and burials have been documented at several localities along the river (e.g., Goodwin & van Riet Lowe 1929; van Riet Lowe 1931; Wells & Gear 1931; Humphreys & Maggs 1970; Maggs 1971; Cameron 2019).

3. Methods

The survey was conducted between Modderrivier and the area to the south of Reddersburg, thus covering ~160 km of the river course (Fig. 1) by a team composed of Benoit Longet (lithic specialist of MSA industries) and Jacob Dintwe Maine (General Assistant at the Florisbad Quaternary Research Station, National Museum Bloemfontein). Dongas were selected following the guidelines of Cuartero Monteagudo et al. (2025) for the Modder River. Dongas were identified using satellite images in Google Earth, where such barren erosional features stand out compared to the surrounding grassland, including when they are covered in vegetation. Of all the identified dongas, we selected for survey those that showed deep incisions in Google Earth (using the historical imagery and lighting functions), as well as some of the shallow dongas. Dongas were then matched to a property name as they appear in the cadastral units of the topographic map of South Africa (<https://htonl.dev.openstreetmap.org/ngi-tiles/#6/-28.621/24.625>). No significantly deep dongas were identified to the southeast of Reddersburg or downstream of Modderrivier, and for that reason those stretches of the river were not surveyed. Uneroded areas between dongas were not surveyed because the grasslands of the western Free State are characterised by a Holocene layer of windblown sand (e.g., Lyons et al. 2014; Wroth et al. 2022) that makes surface artefact identification difficult during survey. Dongas were surveyed on foot after obtaining permission from the respective landowners, during the months of June and July 2024. The actual degree of erosion was verified on the ground and in some cases, it showed the limitations of the

Google Earth functions with regard to the identification of deep incisions, which in some cases turned out to be shallower than expected.

Each of the figures presenting aerial views of the study region utilise data sourced from Google Earth (web) (National Oceanic and Atmospheric Administration, DigitalGlobe, 2013: <http://www.google.com/earth/index.html>, accessed November 2024). The data presented herein are based on field observations, the identification of clusters of artefacts, and the definition of their stratigraphic position. Boundaries of clusters were marked by GPS points (GPSmap 60CSx & Maps.me), which were taken every ten metres and reported into a GIS software (QGIS v. 3.36). The surface area was calculated by the software through the creation of polygons. GIS analyses were conducted in QGIS with human assistance (e.g., polygons were manually plotted). We define a cluster as an accumulation of artefacts over 100 m² and with more than 10 artefacts per square metre. Clusters not fitting this definition were only spatially recorded without further description. In the field, a randomly selected 1 m² sample was analysed in the highest part of the cluster/slope. A value is provided for each observed and described sample. This value is then extrapolated to represent the overall concentration. In addition to the sample, the entire concentration area was thoroughly surveyed, enabling the characterisation of diagnostic artefacts found within the site. The most notable and diagnostic elements within the cluster were documented and photographed. The lithics were described using the terminology formalised by and translated from Inizan et al. (1994), as well as Boëda (1994, 2013) and Conard et al. (2004), particularly for cores (including *Levallois*), which were recognised and described using general criteria. The artefacts were studied directly on site and left in their original position following previous research (Shaw et al. 2019; Hallinan 2021; Cuartero Monteagudo et al. 2025); no objects were collected. Cultural attribution is based on the technocomplexes proposed by Lombard et al. (2022) and their typo-technological features. Chronological attribution can only be tentative as many of the technocomplexes are based on dated sites located on the coast of South Africa. Nevertheless, they provide a means to quickly situate assemblages based on general criteria and *fossiles directeurs* (Shaw et al. 2019; Hallinan 2021, 2022; Cuartero Monteagudo et al. 2025). Additionally, it is essential to consider our assemblages as palimpsests produced by multiple occupations. In some cases, a few diagnostic elements are present, allowing a more precise attribution.

To complement our survey results and make available unpublished legacy collection data, curated by the National Museum Bloemfontein, we also studied materials collected in the 1990s by J.S. Brink and L. Rossouw that are currently stored at the Florisbad Quaternary Research Station. These collections include mainly Florisian fauna, which was the focus of previous surveys, and a small number of lithic artefacts from dongas to the east of Kalkfontein Dam. The analysis of the artefacts was conducted using the same typological criteria as for the artefacts observed during the survey. The faunal material is currently under study and will be published separately.

4. Results and discussion

We identified 56 dongas with the potential for deep stratigraphic sequences, of which 35 were surveyed on foot, covering a total area of 15.5 km² (Table 1). Additional landscape views of each site are available in an online repository (Longet & Toffolo 2025). Amongst these 35 dongas, 162 clusters of artefacts were identified ranging from the ESA to the LSA. Additionally, more than a hundred smaller concentrations were recorded and are considered as isolated finds (clusters under 100 m² and/or with less than 10 artefacts/m²). We analysed 16 samples including a total of 535 lithic artefacts, allowing for a general chronological attribution from the ESA to the MSA following the general descriptors and *fossiles directeurs* provided by the list of Lombard et al. (2022: 173): “the general characteristics for the different technocomplexes in the southern African Stone Age sequence”; not only were the diagnostic typological elements considered (e.g., handaxes, often attributed to the Acheulean), but also the association of artefacts (e.g., small handaxes, triangular blanks, and Levallois-like methods), which can refine the cultural attribution. When specific artefacts are observed (e.g., a Lovedale-like point), we refer to the specific contexts in which these features have been identified in order to propose an attribution. The latter is based on published literature that provides a well-dated cultural and stratigraphic framework. Property names and numbers as displayed in the cadastral units of the topographic map are used throughout the text to facilitate the identification of the surveyed dongas.

Table 1. List of the surveyed dongas and their coordinates.

Donga	Catchment	Coordinates	Surface area (m ²)	Archaeology	Figure no.	Type of artefacts
Bethany 610a	Eastern	29°37'07"S 25°57'15"E	884 000	LSA	27-28	Lithics
Bethany 610b	Eastern	29°39'00"S 25°58'31"E	295 500	LSA	1	Lithics
Bethany 610c	Eastern	29°35'34"S 25°54'46"E	866 150	LSA	1	Lithics and fauna
Blaauwbank 364a	Western	29°27'49"S 25°06'52"E	176 100	LSA	28	Lithics
Blaauwbank 364b	Western	29°27'58"S 25°07'29"E	323 100	MSA/LSA	28	Lithics
Blaauwheuveld 425	Western	29°25'12"S 25°03'29"E	623 200	MSA/LSA	23-24; 28-29	Lithics and fauna
Brakfontein West 1022	Western	29°32'02"S 25°09'43"E	181 500	MSA/LSA	1	Lithics
De Put 26a	Western	29°34'38"S 25°44'50"E	155 000	LSA	1	Lithics
De Put 26b	Western	29°34'05"S 25°45'30"E	73 000	LSA	1	Lithics and fauna
Doornhoek 128	Western	29°20'32"S 24°47'54"E	210 000	MSA	1	Lithics
Goedeheop 854a	Western	29°29'51"S 25°10'51"E	382 000	ESA/MSA/LSA	4-5	Lithics
Goedeheop 854b	Western	29°30'27"S 25°10'43"E	118 000	ESA/MSA/LSA	4-6	Lithics
Grootgeluk 212a	Eastern	29°46'35"S 26°09'53"E	254 000	LSA	1	Lithics
Grootgeluk 212b	Eastern	29°46'32"S 26°10'42"E	334 000	LSA	1	Lithics and fauna
Hexrivier 405	Eastern	29°48'44"S 26°14'39"E	73 000	LSA	1	Lithics and fauna
Kromdraai 573	Eastern	29°31'05"S 25°32'43"E	695 000	ESA/MSA	9-10	Lithics
Lentelus 1119	Western	29°24'41"S 25°02'42"E	705 000	MSA/LSA	21-22; 27-29	Lithics
Moreson 156	Eastern	29°46'32"S 26°09'38"E	340 000	LSA	27-29	Lithics and fauna
Olive 751a	Western	29°28'29"S 25°10'18"E	270 000	Sterile	1	N/A
Olive 751b	Western	29°28'58"S 25°10'50"E	937 000	ESA/LSA	1	Lithics
Rooidraai 190	Western	29°22'02"S 25°00'25"E	829 000	ESA/MSA/LSA	18-20	Lithics
Rooiplaat 404	Western	29°28'34"S 25°07'42"E	442 000	LSA	27-28	Lithics
Rustpunt 201	Eastern	29°31'01"S 25°32'24"E	543 000	ESA/MSA/LSA	7	Lithics
Secretariskop 1172a	Western	29°26'54"S 25°05'45"E	1 136 000	Sterile	1	N/A
Secretariskop 1172b	Western	29°26'26"S 25°05'21"E	1 136 000	LSA	1	Lithics
Springfontein 329	Eastern	29°46'25"S 26°10'52"E	413 000	Undetermined	1	Lithics
Telegraaffontein 644a	Western	29°31'24"S 25°10'29"E	391 000	MSA/LSA	1	Lithics
Telegraaffontein 644b	Western	29°28'48"S 25°09'20"E	187 000	MSA/LSA	1	Lithics
Telegraaffontein 644c	Western	29°29'03"S 25°10'10"E	95 000	MSA/LSA	1	Lithics
Toeloop 340	Eastern	29°44'41"S 26°03'17"E	465 000	MSA	25-26	Lithics
Tweestroom 346	Eastern	29°46'10"S 26°10'22"E	317 000	Sterile	1	N/A
Wagenmaker's Drift 24a	Western	29°19'15"S 24°59'17"E	303 000	MSA/LSA	13-15	Lithics
Wagenmaker's Drift 24b	Western	29°19'52"S 25°00'18"E	926 000	MSA/LSA	16-17	Lithics
Waterval West 104	Western	29°18'10"S 24°45'47"E	97 000	MSA/LSA	11-12	Lithics and fauna
Weltevrede 710	Western	29°28'41"S 25°08'39"E	423 000	MSA/LSA	1	Lithics

The western catchment of the Riet, downstream of Kalkfontein Dam, exhibits the highest concentration of erosional features and includes 22 dongas (Fig. 2): Waterval West 104, Doornhoek 128, Wagenmaker's Drift 24 (a, b & c), Rooibraai 190, Lentelus 1119, Blaauwheuvel 425, Secretariskop 1172 (a & b), Blaauwbank 364 (a & b), Rooiplaat 404, Weltevrede 710, Telegraaffontein 644 (a, b & c), Olive 751 (a & b), Goedehoop 854 (a & b), and Brakfontein West 1022. The eastern catchment, upstream of Kalkfontein Dam, shows fewer occurrences, with 13 surveyed dongas (Fig. 3): Rustpunt 201, Kromdraai 573, De Put 26 (a & b), Bethany 610 (a, b & c), Toeloop 340, Grootgeluk 212 (a & b), Moreson 156, Tweestroom 346, and Hexrivier 405.

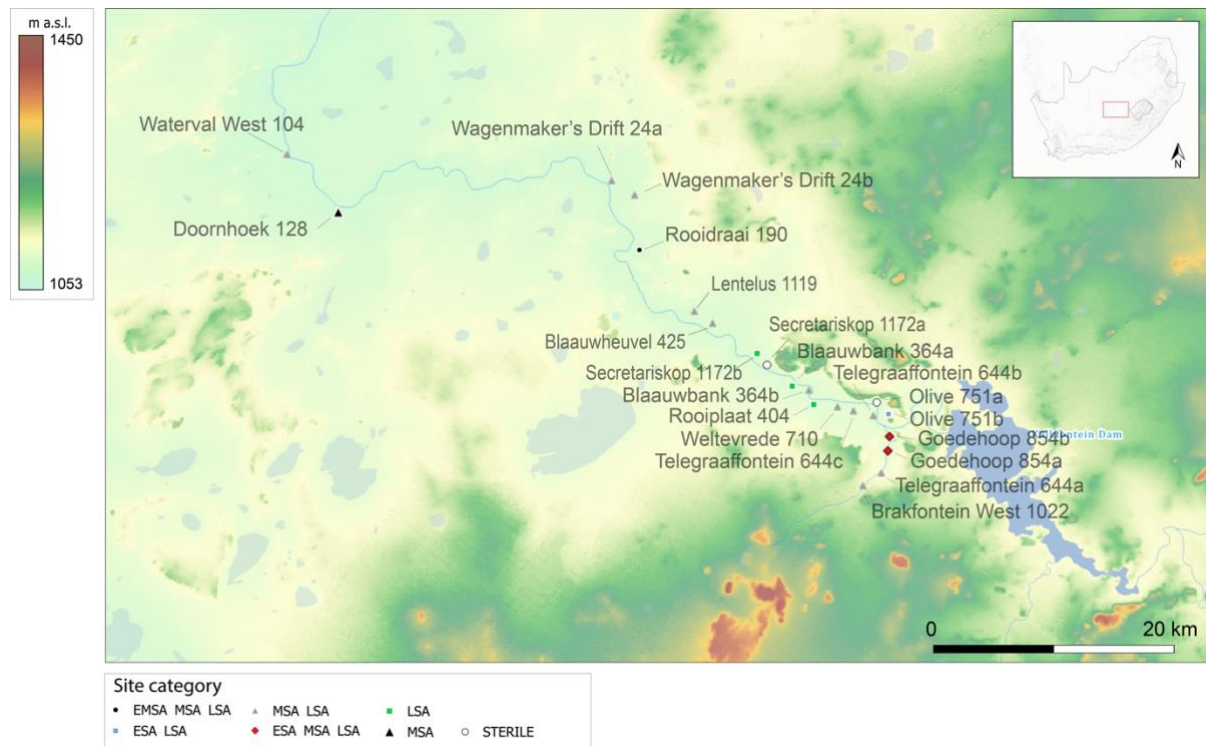


Figure 2. Map of the surveyed dongas located to the west of the Kalkfontein Dam. Source: United States Geological Survey; Shuttle Radar Topography Mission 1-arc second Global, National Geospatial-Intelligence Agency (NGA), USGS Earth Resources Observation and Science (EROS), retrieved from NASA Earthdata

ESA sites

Goedehoop 854a: The Goedehoop dongas do not cut directly into the Riet terraces but rather, through sediments accumulated by a seasonal stream joining the Riet from the south (Figs 1 & 2). This locality has another distinctive feature due to its layout, as the dongas are protected to the east by dolerite hills, which prevent flooding from the Riet. This might explain the preservation of sedimentary deposits featuring archaeological material consistent with ESA occupations. Similarly, artefact abundance may be linked to the availability of hornfels (raw material) at dolerite/shale contact zones nearby.

On the right bank of this seasonal stream, an important cluster of artefacts ($N=78/m^2$) was observed covering around $33\,375\,m^2$ (Fig. 4; Table 2). Artefacts are scattered on a surface at the top of the alluvial sequence deposited by the stream. Shale and hornfels bedrock are unconformably covered by alternating layers of alluvial gravels and silty clays, the latter characterised in places by large calcrete nodules that show evidence of rolling. The artefacts rest at the top of the last gravel deposit and are buried by a layer of orange sand towards the edge of the donga.

This assemblage includes elongated blanks, flakes, and cores (Fig. 5). Additionally, it includes a significant number of bifaces. Blades have dimensions >10 to 20 cm with rectilinear profiles. This is the direct consequence of minimum preparation of distal convexities (Inizan et al. 1994). This feature is also observed by hinge *Levallois* flakes (Fig. 5i). Triangular elements are rare, but not absent. Two cores are characterised by traits consistent with Victoria West methods for flake production (Boëda

2013; Li et al. 2017). Bladelet cores were observed, showing a structure organised by two opposing surfaces while blanks are detached by unipolar convergent modalities from one platform (Fig. 5s). Retouch seems important on the edges of large blades while handaxes show some morphological diversity (Fig. 5).

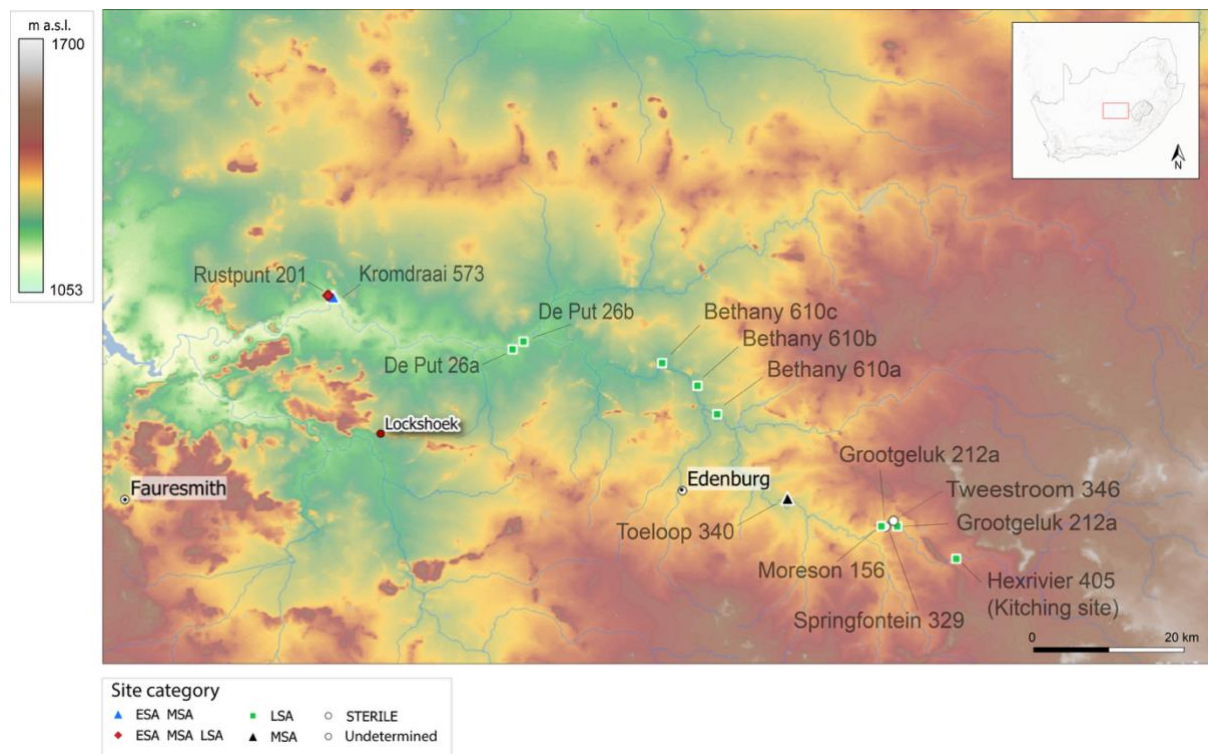


Figure 3. Map of the surveyed dongas located to the east of the Kalkfontein Dam. Source: United States Geological Survey; Shuttle Radar Topography Mission 1-arc second Global, National Geospatial-Intelligence Agency (NGA), USGS Earth Resources Observation and Science (EROS), retrieved from NASA Earthdata.

This cluster shows similarities with the one found at Goedehoop 854b (see below), although the stratigraphic position, as well as the technological features, display many differences. While these assemblages might belong to the same technocomplex, artefacts from Goedehoop 854a present much older elements and might reflect a different phase, or the mixing of artefacts from the ESA and MSA in a palimpsest surface buried by orange sands only in relatively recent times. From a general perspective, associations with handaxes, large cutting tools (LCTs), blade and triangular blank production strongly suggest an attribution to Fauresmith industries, defined for the first time only a few kilometres from this donga (Goodwin & van Riet Lowe 1929). This proposition should only be tentative as those industries are only partially defined and still display some variability (Herries 2011; Underhill 2011; Chazan 2015; Lombard et al. 2022). The Victoria West reduction strategy could indicate a palimpsest of older and more recent occupations, highlighting a temporal range from the ESA to the MSA.

- Attribution: ESA, Fauresmith, palimpsest to MSA.

Goedehoop_854b: A small cluster of artefacts ($N=26/m^2$) was found on the same bank of the seasonal stream, 1300 m to the north of Goedehoop 854a. The sedimentary context (Fig. 4) exhibits recurrent characteristics observed in many dongas during this survey, i.e., deposits comprise a light brown sandy-clay matrix with small, calcium-carbonate nodules. The overlying levels consist of orange sand, while the underlying level, which also contains artefacts, comprises gravels and grey sediments. Artefacts are weathered, indicating either a prolonged exposure period prior to embedding, or transport, or a combination of these processes. Additionally, these elements exhibit differential patinas, suggesting a mixture of multiple deposits.

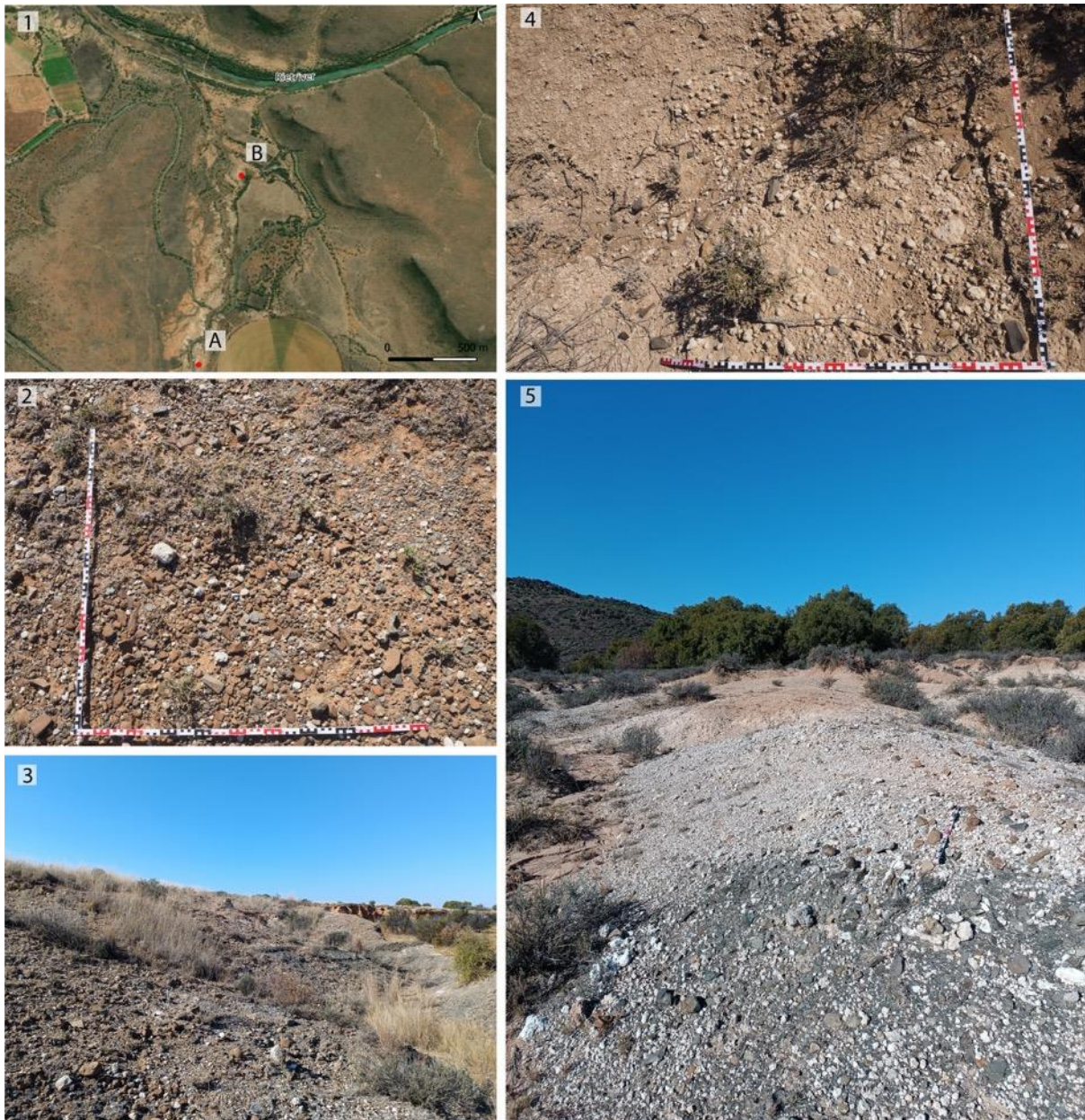


Figure 4. 1: Location of the samples of Goedehoop 854; 2: sample of cluster A; 3: landscape and location of the sample of cluster A; 4: sample of cluster B; 5: landscape and location of cluster B – Riet River survey 2024.

Table 2. Count of artefacts in 1 m² from Goedehoop 854.

Goedehoop 854 typology	854a (N=78)	854b (N=26)
Blade core	1	-
Blade indet.	9	3
Core fragment	2	2
Fragmented blank & debris	61	16
Fragmented tool	1	-
Handaxe	1	-
<i>Levallois</i> blade	-	1
<i>Levallois</i> blank	-	3
Preferential <i>Levallois</i> flake	1	1
Pseudo- <i>Levallois</i> point	1	-
SP inclined or parallel core	1	-
Victoria West core	1	-



Figure 5. Artefacts from Goedehoop 854a.

This cluster was observed on a surface area of 3200 m² (Figs 4 & 6; Table 2). The typo-technological features suggest an attribution to the end of the ESA or to the MSA. The blanks are represented by blades and flakes obtained through *Levallois* methods. In addition, the size of these artefacts is important, particularly for blades (>10 cm in length). Another feature in this assemblage is expressed by the high frequency of edge modifications. While some of these are most probably related to taphonomic processes and show, in some cases, a double patina (Fig. 6g), others might be related to human modifications of artefact edges to produce tools, displaying a diversity of scrapers (Fig. 6p, s). A few LCTs were also observed across the cluster area. Although a mix of deposits is suspected to be at the origin of the cluster, some of these elements (large blades and LCTs) remain consistent with the cultural and technological frameworks observed in this region, particularly regarding the Fauresmith technocomplex. This occurrence is consistent with the regional context as Fauresmith sites have been documented in the central interior (Herries 2011; Underhill 2011).

It is interesting to note that Goedehoop is located along the same seasonal stream that produced the Brakfontein type locality of the Fauresmith technocomplex, about 5 km to the south in present-day Telegraaffontein 644 and Brakfontein West 1022, on the other side of the tar road that connects Koffiefontein and Fauresmith. Our survey of these two properties was successful in locating the LSA

site mentioned by van Riet Lowe (1927) based on hand-drawn maps reported by Underhill (2012), but not the Fauresmith site, presumably because all surface artefacts such as handaxes and long blades were collected in the past or were covered by encroaching vegetation. Therefore, Goedehoop might provide a parallel to what was sampled by C. van Riet Lowe one hundred years ago.

- Attribution: Fauresmith to MSA, marine isotope stage (MIS) 13 to early MIS 5.



Figure 6. Artefacts from Goedehoop 854b.

Kromdraai 573 and Rustpunt 201: Kromdraai and Rustpunt are rich in ESA and MSA artefacts (Figs 7-10), although the ESA sedimentary deposits are not preserved or are significantly eroded. The ESA cluster of Kromdraai ($N=66/m^2$) was observed at the top of one of the largest dongas (Figs 7-9). This cluster covered a surface of 370 m². These artefacts are embedded within a light brown sandy clay cemented by a pedogenic calcrete (Fig. 7). The assemblage displays a diverse typological composition of handaxes and cleavers (Fig. 9). Blanks are scarce and when observed they show an elongated profile and rectilinear edges. Cores are represented by inclined and parallel cores (Conard et al. 2004). Except for one *Levallois* core (bipolar recurrent), other cores are characterised as Victoria West cores (Boëda 2013; Li et al. 2017). Different types of patina on the blanks and the *Levallois* cores, and on the handaxes and Victoria West cores, might suggest multiple occupations.

- Attribution: ESA.

MSA sites

Kromdraai 573 and Rustpunt 201: While the clusters at Kromdraai are clearly distinguishable from one another, one low-density cluster observed at Rustpunt was characterised by mixed assemblages of MSA and ESA industries (Fig. 8). This cluster displayed the presence of a few handaxes associated with scrapers, *Levallois* blades, and preferential flakes, and it might suggest multiple occupations (Fig. 8).

In addition, one MSA cluster at Kromdraai was identified and sampled (Fig. 7; Table 3). This cluster A was observed in the lowest part of the donga, near the riverbed (Fig. 7). Artefacts appear in a deposit composed of compact grey to light-brown silt with a high density of carbonate nodules (Fig. 7). This deposit is at the base of a succession of five sedimentary layers. From top to bottom, a succession of three sandy layers, ranging from light brown to dark brown, overlies an orange layer. Below the latter, one can observe a grey silty-sand layer containing a significant concentration of carbonate nodules, within which the artefacts are found. These artefacts were found in a small scatter of ~370 m² and show a high concentration ($N=52/m^2$). This cluster is mainly composed of elongated blanks with convergent edges, and inclined and parallel cores (Conard et al. 2012). Some of the blanks are partly obtained via *Levallois* methods (Boëda 2013). Some products indicate the maintenance of convexities during blade production by the extraction of thick, *débordant* and overshot blanks. All inclined and parallel cores display a structure organised by hierarchical surfaces; both *Levallois* and discoid methods were recognised (Fig. 10n, p, q). Tools present a diversity of typological elements among them. Two blanks are particularly interesting (Fig. 10a, b): one unifacial point and one Lovedale-like point (Wroth et al. 2022). The Lovedale-like point might suggest a cultural attribution to the Lovedale industry, dated to ~77-69 ka at Lovedale (LOV6; Wroth et al. 2022) and to ~96-65 ka in the pre-HP at Rose Cottage Cave (layer LEN; Harper 1997; Valladas et al. 2005; Pienaar et al. 2006), although extensive technological studies of the Lovedale and Rose Cottage Cave assemblages are still ongoing and may provide new data in the future. These technical solutions are also observed at Bushman Rock Shelter (in phase 21), but also at Mwulu's Cave (Tobias 1949; Porraz et al. 2015; de la Peña et al. 2019). Moreover, some caution should be taken as only one artefact of this type was observed while the association of other artefacts are technologically coherent with technocomplexes observed during MIS 5 (Bader et al. 2022; Lombard et al. 2022).

- Attribution: pre-Howiesons Poort, MIS 5.

Waterval West 104: At Waterval West, clusters (3) only occur the northern part of the donga (Fig. 11; Table 4), whereas the southern portion contains very eroded deposits or those covered by vegetation. The stratigraphic sequences show a succession of several deposits: a silty deposit in the upper part, a highly oxidised deposit in the lower part, and, below this, a series of lighter colour deposits where the artefacts are found. These artefacts are generally embedded in an orange to brown silty matrix with small, carbonate nodules up to 2 cm in size.

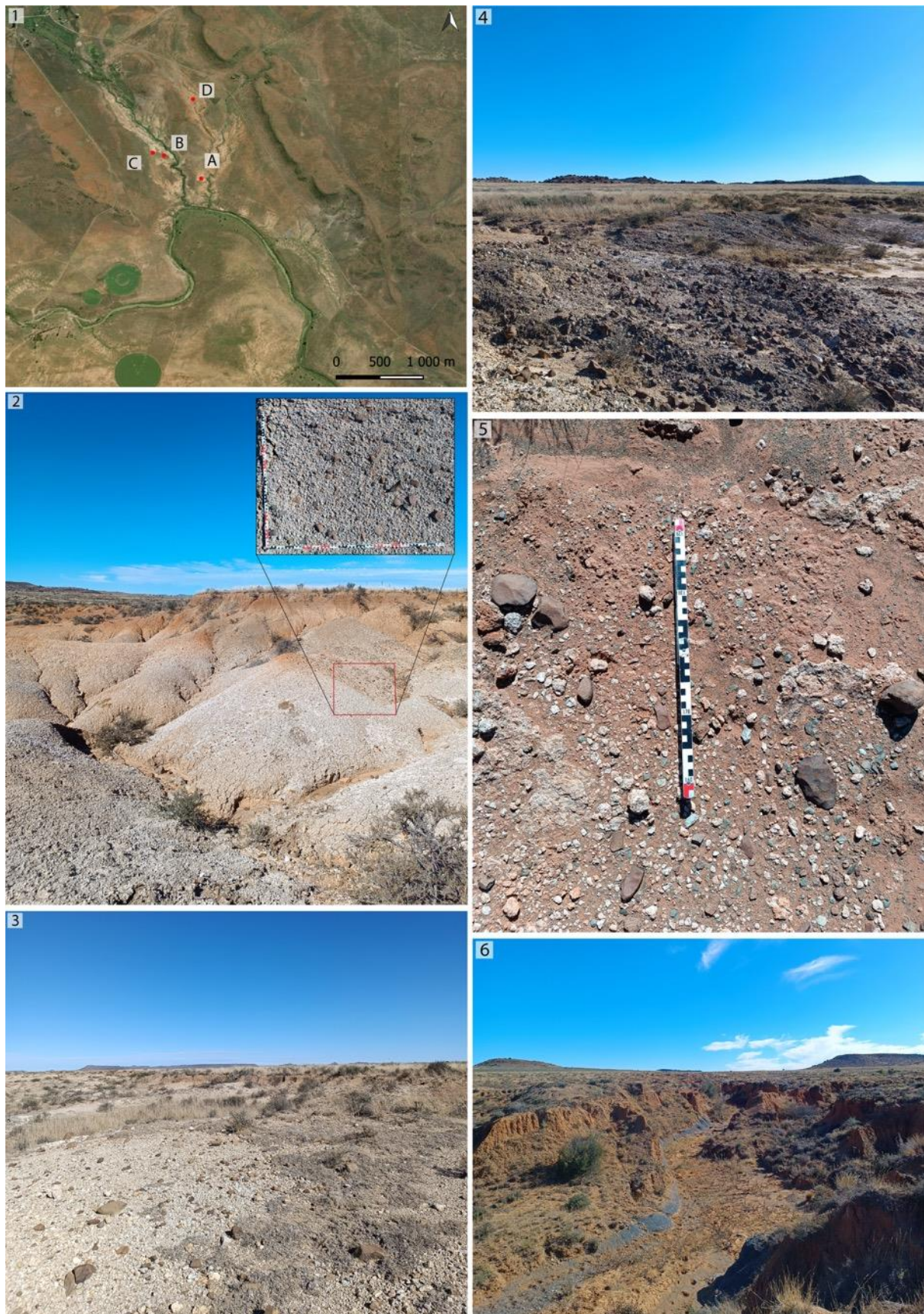


Figure 7. 1: Location of the clusters of Kromdraai 573 and Rustpunt; 2: Kromdraai MSA cluster A; 3: Rustpunt MSA cluster B; 4: Rustpunt ESA cluster C; 5: Kromdraai ESA cluster D; 6: donga associated with ESA cluster D.

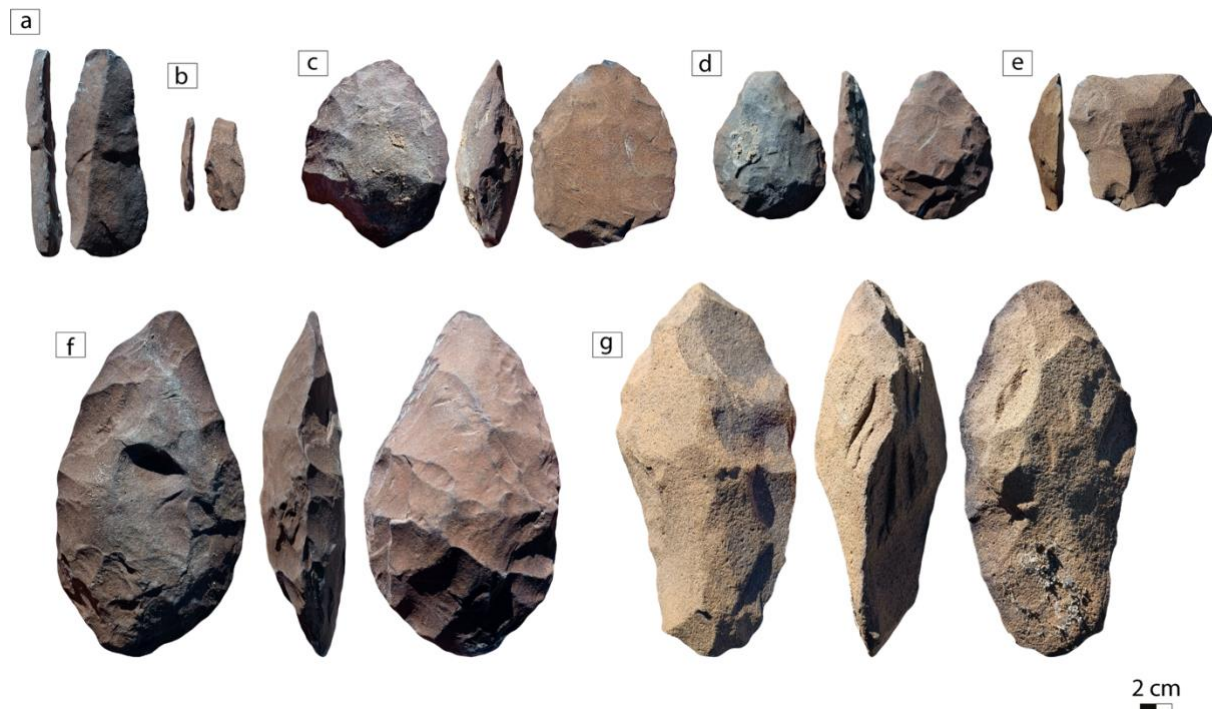


Figure 8. ESA artefacts from Rustpunt 201.

Three clusters (A, B, and C) were sampled. Cluster C is the largest with around 30 artefacts per square metre in a surface area of approximately 2000 m², whereas clusters B and A comprise less than 20 artefacts per square metre in surface areas of 400 m² and 1000 m², respectively. Except for two artefacts in cluster B (Fig. 12j, k), artefacts present fresh edges. These clusters exhibit mainly an MSA component with an abundance of *Levallois* features (Boëda 2013). The lineal *Levallois* method is represented by cores, blades and flakes. Discoid methods and other inclined and parallel cores are also represented. The triangular component shows some variability but is well represented with cores and blanks. In addition, faunal remains were observed *in situ* (Fig. 11).

- Attribution: MSA, early MIS 5.

Wagenmaker's Drift 24a: Two main clusters of artefacts were observed in this donga (Table 5). Cluster A (Figs 13 & 15a-i) is the richest (N=29/m²), with artefacts scattered over 460 m² and distributed in two dongas with an eroded part in the middle. The artefacts are embedded in a matrix of light-brown, fine sands containing numerous centimetre-sized carbonate nodules (Figs 13 & 14). The overlying sedimentary deposits show a different appearance, with a composition that is more oxidised, dark brown/red in colour, and lacking carbonate nodules. Artefacts retrieved in this cluster show a strong MSA component with an abundance of blades obtained through *Levallois* methods (Fig. 15c-e), probably recurrent and lineal as indicated by cores (Fig. 15b, i). *Levallois* flakes are also observed, while the triangular component is observed only in one element (Fig. 15a) that shows an elongated and thin profile with rectilinear edges. This in turn might support the cultural MSA attribution. Possible edge modifications were also observed.

Cluster B (Figs 13 & 15j-q) covers 610 m² and was found 150 m to the northwest of cluster A. The sampled artefacts (N=18/m²) were recovered in a similar sedimentary context. The cluster is less dense with less than 20 artefacts per square metre (Table 5). This deposit exhibits clear traits of MSA technology (i.e., *Levallois* components, blanks and cores; Lombard et al. 2022). However, the technology is in contrast with what was observed in cluster A. Blade technology is less well represented with a greater emphasis on *Levallois* flakes. In addition, edge modifications show an interesting semi-abrupt inverse and alternating retouch pattern (Inizan et al. 1994).



Figure 9. ESA artefacts from Kromdraai 573.

Table 3. Count of artefacts in 1 m² from MSA cluster of Kromdraai 573.

Kromdraai 573 typology	N=66
Blade	5
Bladelet	3
<i>Débordant</i> blade	3
Debris	52
Discoïd core	1
<i>Levallois</i> flake	1
<i>Levallois</i> point	1



Figure 10. MSA artefacts from Kromdraai 573.

Both clusters were probably accumulated during the second part of MIS 5. While the blade/triangular association is observed already in early MSA assemblages, it is not observed in the Free State before MIS 5 (Kuman et al. 1999). The lack of handaxes and the presence of edge modifications might also provide an indication for a maximum attribution to MIS 5. Some authors propose general definitions with constraining industries, which might suggest that cluster A belongs to MIS 4-3 techno-cultural trajectories (Conard et al. 2012; Porraz et al. 2013, post-HP type Claude; Lombard et al. 2022). However, data for the Free State are scarce and the comparison with post-MIS 5d industries of other regions must be conducted with great caution, especially in this phase of regionalisation of the

industries. In any case, the data presented in this report are from surface analysis without a precise chronology.

- Attribution: MSA, second part of MIS 5 to MIS 3.

Table 4. Count of artefacts in 1 m² from Waterval West 104.

Waterval West 104 typology	Cluster A (N=11)	Cluster B (N=18)	Cluster C (N=31)
Blade core (type c, Boëda 2013)	-	1	-
Bladelet	-	2	3
Bladelet bipolar core	-	-	1
Blank	-	-	1
Cortical blank	2	-	1
<i>Débordant</i>	1	-	-
<i>Débordant</i> from inclined or parallel core	1	2	2
Debris	3	7	1
Elongated blank	-	1	-
Endscraper	-	1	-
Fragmented blank	-	-	13
Fragmented core	-	-	2
Inclined or parallel core	-	1	1
<i>Levallois</i> flake	-	1	-
Lineal <i>Levallois</i> core	-	-	1
Natural backed blade	1	-	-
Overshot blade	1	-	-
Preferential <i>Levallois</i> flake	-	-	4
Proximal bladelet	1	-	-
Pseudo- <i>Levallois</i> point	-	2	-
Typo- <i>Levallois</i> triangular	1	-	1

Wagenmaker’s Drift 24b: The sedimentary deposits in this area are extensively eroded and stratigraphic sequences are rarely preserved. However, different clusters of artefacts have been observed (Fig. 16; Table 6). In cluster A, artefacts are embedded in a hard, white, carbonate-rich deposit with a chalky appearance. These deposits are deeply incised from the northeast to the southeast, creating a small channel that joins a vlei (shared with Wagenmaker’s Drift 24a), which in turn discharges into the Riet River. Artefacts in cluster B were found in a light brown silty clay with a high density of carbonate nodules. In this area, when it is preserved, the upper sedimentary layer is composed of a red/orange oxidised sand, on top of which a lighter brown sandy deposit can be observed (Fig. 16). At the base of this deposit, a third cluster of artefacts (C) was observed and analysed.

All clusters present MSA features but each shows specific traits that set them apart. Considering that these clusters represent multiple occupations, all of them are technologically homogeneous. Artefacts retrieved in cluster A were scattered on a surface of ~7600 m² (N=21/m²). This cluster displays a substantial proportion of elements related to *Levallois* blade production and elongated blanks (Fig. 17). This is suggested by the presence of blades, sub-products (e.g., *débordant*, *Levallois* pseudo-point), and cores obtained with the recurrent unipolar convergent method. Preparation of these cores presents two structures: from two platforms on a flake, or a peripheral platform on a *volume utile* (Fig. 17f-g; see Boëda 2013). Flake production is also observed through the presence of flakes and inclined and parallel cores (Fig. 17c-d, h). Both blanks and cores show convergent removal directions, which results in a *déjeté* feature and the presence of backed blanks (Fig. 17d, h). No diagnostic elements were recognised in this assemblage. The absence of triangular elements and the low frequency of edge modifications could suggest an attribution to the early MSA technocomplex of this region (Kuman et al. 1999).

Cluster B is denser (N=27/m²) but also the smallest of the three with artefacts scattered over 4500 m² (Fig. 16; Table 6). It displays different production intentions with an abundance of triangular elements while blades and flakes are still represented. Cores are almost absent in this cluster, while the blanks and maintenance blanks suggest unipolar convergent exploitations (Fig. 17a-u). Another feature is the

representation of edge modifications on every triangular and elongated blank. While we cannot exclude the presence of multiple occupations, and not considering the frequency of edge modifications, the association of *Levallois* production, triangular elements, and blade production is expected from at least the first half of MIS 5 (Wurz 2000; Thompson et al. 2010; Tryon & Faith 2013; Douze et al. 2015). Cluster C (Fig. 16) was found scattered over 5340 m² and included only a few weathered artefacts (N=11/m²) with large flakes, *Levallois* components and evidence of blade production (Fig. 17v-x).

- Attribution: early MSA/MSA, MIS 8 to MIS 5.

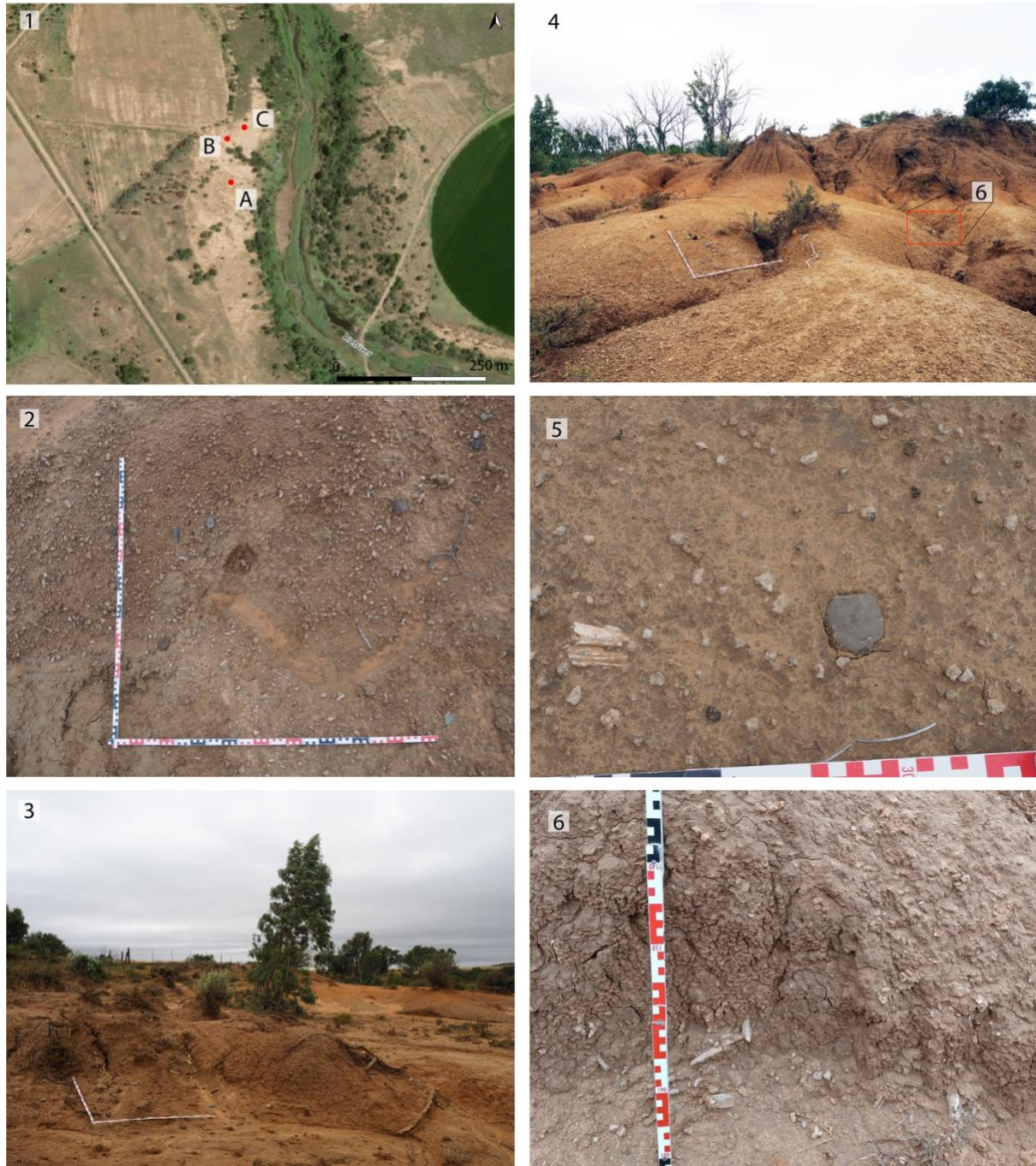


Figure 11. 1: Location of the samples of Waterval West 104; 2: sample of cluster A; 3: landscape and location of the sample of cluster B; 4: landscape and location of the sample of cluster C; 5: fauna found in cluster B; 6: fauna found in cluster C.

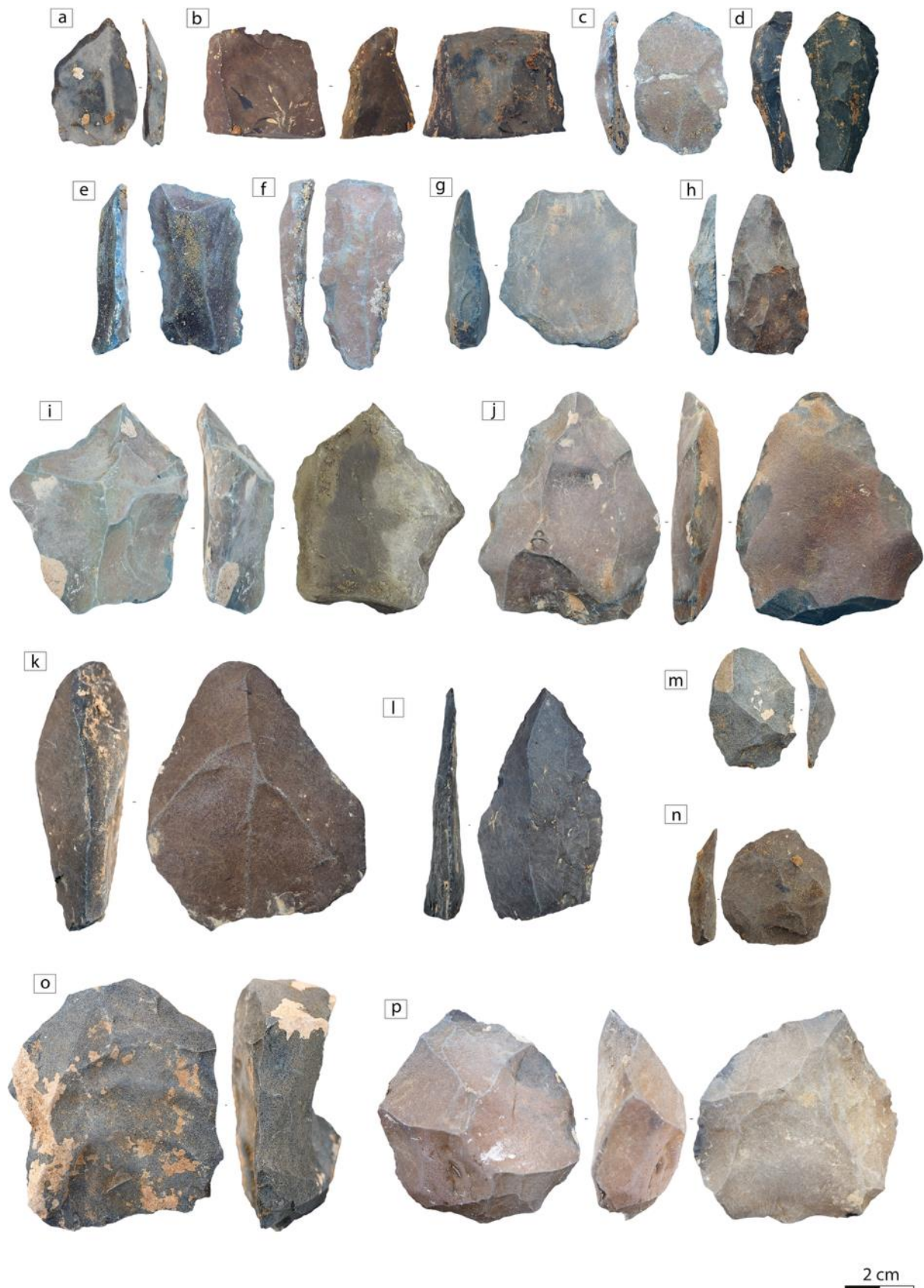


Figure 12. Artefacts from Waterval West clusters; a to f: cluster A; g to k, m: cluster B; o and p: cluster C; l and n: cluster D.

Table 5. Count of artefacts in 1 m² from Wagenmaker’s Drift 24a.

Wagenmaker’s Drift 24a typology	Cluster A (N=29)	Cluster B (N=18)
Cortical blank	-	2
Debris	-	9
Fragmented blank	14	-
<i>Levallois</i> blank indet.	2	-
<i>Levallois</i> core lineal centripetal	1	-
Off-axis blade indet.	8	-
Off-axis <i>débordant</i> flake	3	1
Preferential <i>Levallois</i> blade	-	1
Preferential <i>Levallois</i> flake	-	4
Semi cortical blank	-	1
Typo- <i>Levallois</i> point	1	-



Figure 13. 1: Location of the samples of Wagenmaker’s Drift 24a; 2: landscape and location of the sample of cluster A; 3: landscape and location of the sample of cluster B; 4: matrix of light brown fine sands (sandy-silty) containing numerous centimetre-sized carbonate nodules of cluster A.

Rooidraai 190: This donga covers a large surface area of 0.9 km² and is one of the richest in artefacts (Fig. 18; Table 7). MSA artefacts were observed in two main clusters with different sedimentary contexts. Cluster A was located at the top of the donga in a sandy orange/brown sediment (Fig. 19), composed of 48 artefacts per square metre on a surface of ~1750 m², whereas cluster B was found at the bottom of the slope of a dolerite hill (Figs 20 & 21), and was composed of 40 artefacts per square metre on a surface of ~1650 m².



Figure 14. The Wagenmaker's Drift 24a donga.

Cluster A features a set of blanks obtained primarily from inclined and parallel cores. These cores most often display the discoïd method with hierarchised surfaces, while the blanks show *Levallois* debitage, particularly for the flakes. Blades are also present in this cluster but are not diagnostic. Cluster B shows a different setting where triangular elements are the main technological component of the assemblage. Cores are less represented while debris is abundant. Hornfels cobbles are also abundant, which is consistent with the local geology characterised by a dolerite/shale contact zone. Both clusters exhibit an abundance of cores, particularly cluster B, which is directly associated with hornfels cobbles. These might suggest that Rooidraai is a production site, during the MSA but also in later periods (already observed in Goodwin & van Riet Lowe 1929: plate XXXVII). The association of these different elements – *Levallois* flakes and blades in cluster A, and *Levallois* triangular blanks in cluster B – might suggest an attribution of cluster A to the early MSA technocomplex; cluster B may be part of industries that fall within the first half of MIS 5.

- Attribution: early MSA/MSA, MIS 8 to early MIS 5.

Lentelus 1119: The Lentelus dongas yielded a few LSA artefacts (discussed below in the LSA site section). To the north of the dongas, dolerite hills surround a small depression that acted as a sediment trap, preserving a sedimentary sequence located just a few metres from the eroded area (Fig. 21). This sequence revealed a small, isolated concentration of MSA artefacts ($N=29/m^2$; Fig. 22; Table 8). The artefacts are found in a scatter of $\sim 2200 m^2$. The deposit consists of orange/red sandy sediments containing some dolerite cobbles and a few pebbles. It should be noted that the artefacts show significant weathering.

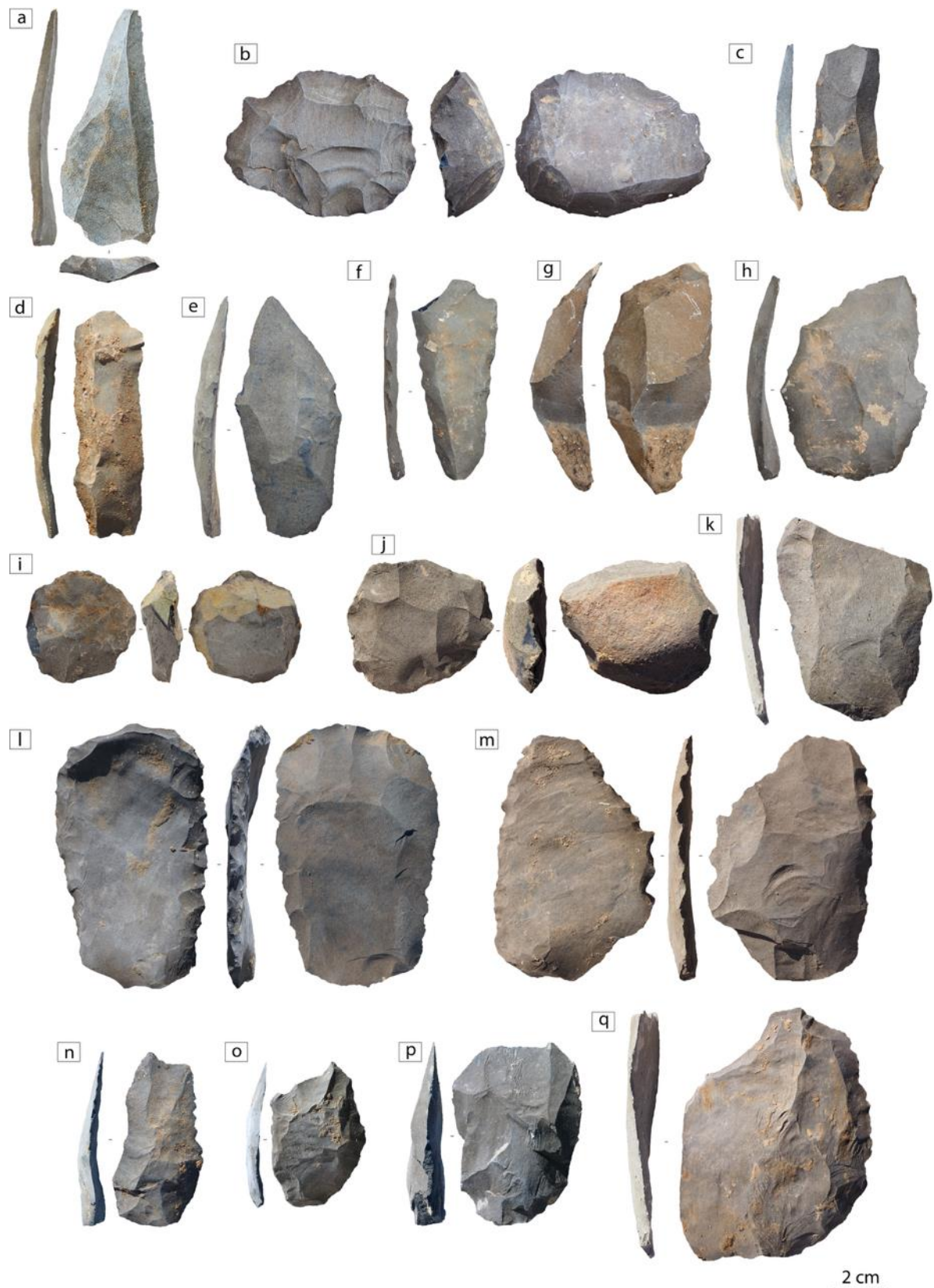


Figure 15. Artefacts from the Wagenmaker's Drift 24a donga; a to i: cluster A; j to q: cluster B.

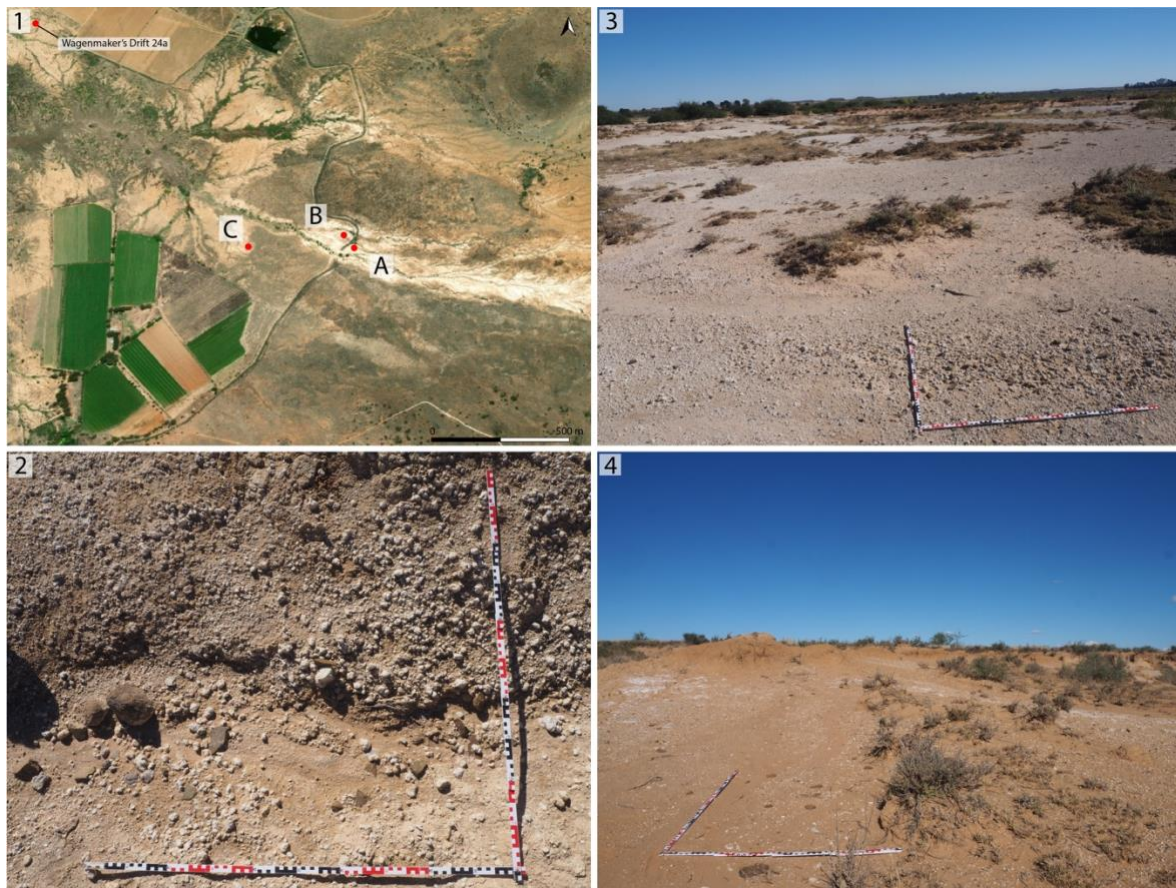


Figure 16. 1: Location of the samples of Wagenmaker’s Drift 24b; 2: sample of cluster A; 3: landscape and location of the sample of cluster B; 4: landscape and location of the sample of cluster C.

Table 6. Count of artefacts in 1 m² from Wagenmaker’s Drift 24b.

Wagenmaker’s Drift 24b typology	Cluster A (N=21)	Cluster B (N=27)	Cluster C (N=11)
Blade	4	2	2
Blank	2	-	7
Blank from inclined or parallel core	1	-	-
Core on flake	1	-	-
<i>Débordant</i>	1	-	-
Debris	7	14	-
Dolerite pebble	3	-	-
Fragmented blank	-	7	-
Fragmented point	-	1	-
Inclined or parallel core	2	-	-
<i>Levallois</i> blade core	-	-	1
<i>Levallois</i> point	-	1	-
Notched on blank	-	-	1
Typo- <i>Levallois</i> flake	-	2	-

This assemblage highlights a technologically coherent set of blades, flakes, and points, produced using recurrent *Levallois* methods. Tools are represented by side scrapers made on elongated blanks (Fig. 22a-b, d; Table 8). The cores suggest recurrent unipolar convergent exploitation from a structure organised by two opposed, hierarchically arranged surfaces (i.e., parallel core). Most of the *Levallois* criteria were observed, while the convexity management might suggest a reinitialisation of the sequences that allow us to attribute this element to a *Levallois* classification (Boëda 1994, 2013). This small assemblage is very similar to what was observed in cluster A at Wagenmaker’s Drift 24b and might be similar, chronologically.

- Attribution: early MSA/MSA, MIS 8 to first half MIS 5.



Figure 17. Artefacts from the Wagenmaker's Drift 24b dongas; a to h: cluster A; i to u: cluster B; v to x: cluster C.

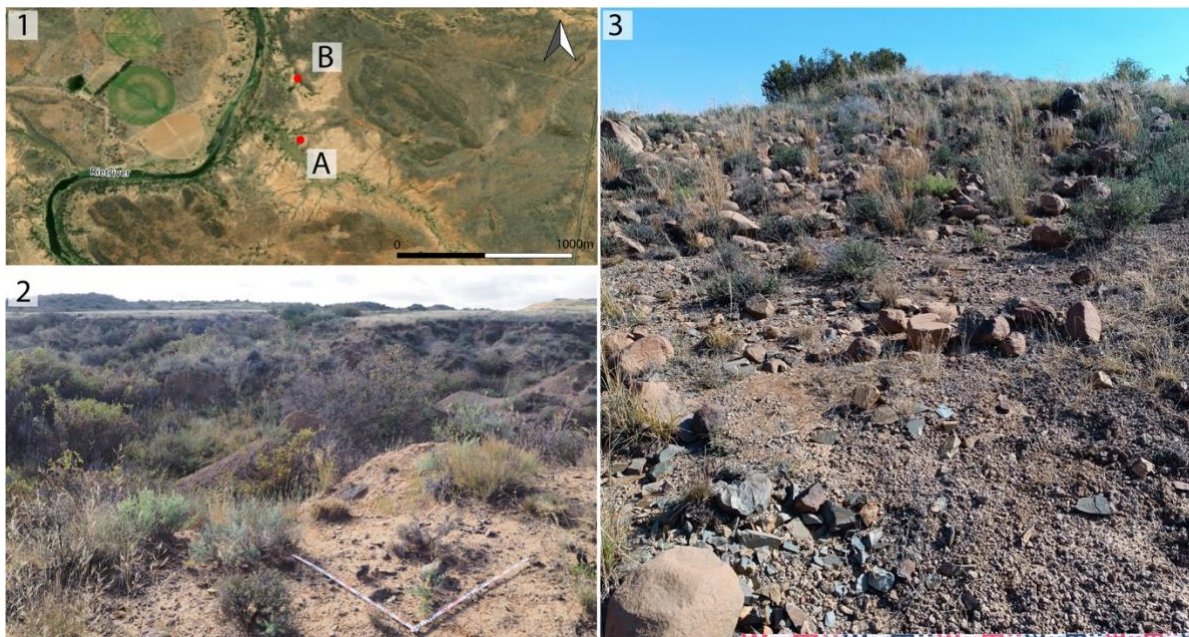


Figure 18. 1: Location of the samples of Rooidraai 190; 2: landscape and location of the sample of cluster A; 3: landscape and location of the sample of cluster B.

Table 7. Count of artefacts in 1 m² from Rooidraai 190.

Rooidraai 190 typology	Cluster A (N=48)	Cluster B (N=40)
Blade	6	3
Blade core	-	2
Bladelet	3	-
Blank	-	3
Cortical blank	2	-
<i>Débordant</i>	5	-
Debris	7	21
Elongated <i>Levallois</i> blank	6	-
Flake core	-	2
Fragmented blank	7	-
Inclined or parallel core	3	-
Off-axis <i>débordant</i>	3	-
Pebble (dolerite)	6	9

Blaauwheuvél 425: Only the southeastern donga produced artefacts of MSA and LSA technology (Table 9). Similarly to other dongas, MSA artefacts were found in layers of coarse orange sand including small, carbonate nodules (Fig. 23). The amount of erosion in this area is extensive, but some of the upper sand layers seem to be preserved (Fig. 23). Artefacts in the scatter are characterised by an orange patina and are weathered (Fig. 24a). The cluster is composed of 35 artefacts per square metre and covers a surface of ~1400 m².

These artefacts are part of a technologically coherent set that is indicative of *Levallois* production. These products display diverse morphologies, based on the observation of flakes, elongated (i.e., blades) and triangular elements (Fig. 24). *Levallois* methods were observed based on a diversity of blanks, but only flake and triangular *Levallois* cores were found. Flakes and elongated products reveal the presence of lineal and recurrent *Levallois* methods. Typological tools are rarely observed, and edge modifications are scarce. Similarly to sites described above (e.g., Waterval West 104), this assemblage presents features that might fit in the general technological framework of the first half of MIS 5.

- Attribution: MSA, early MIS 5.

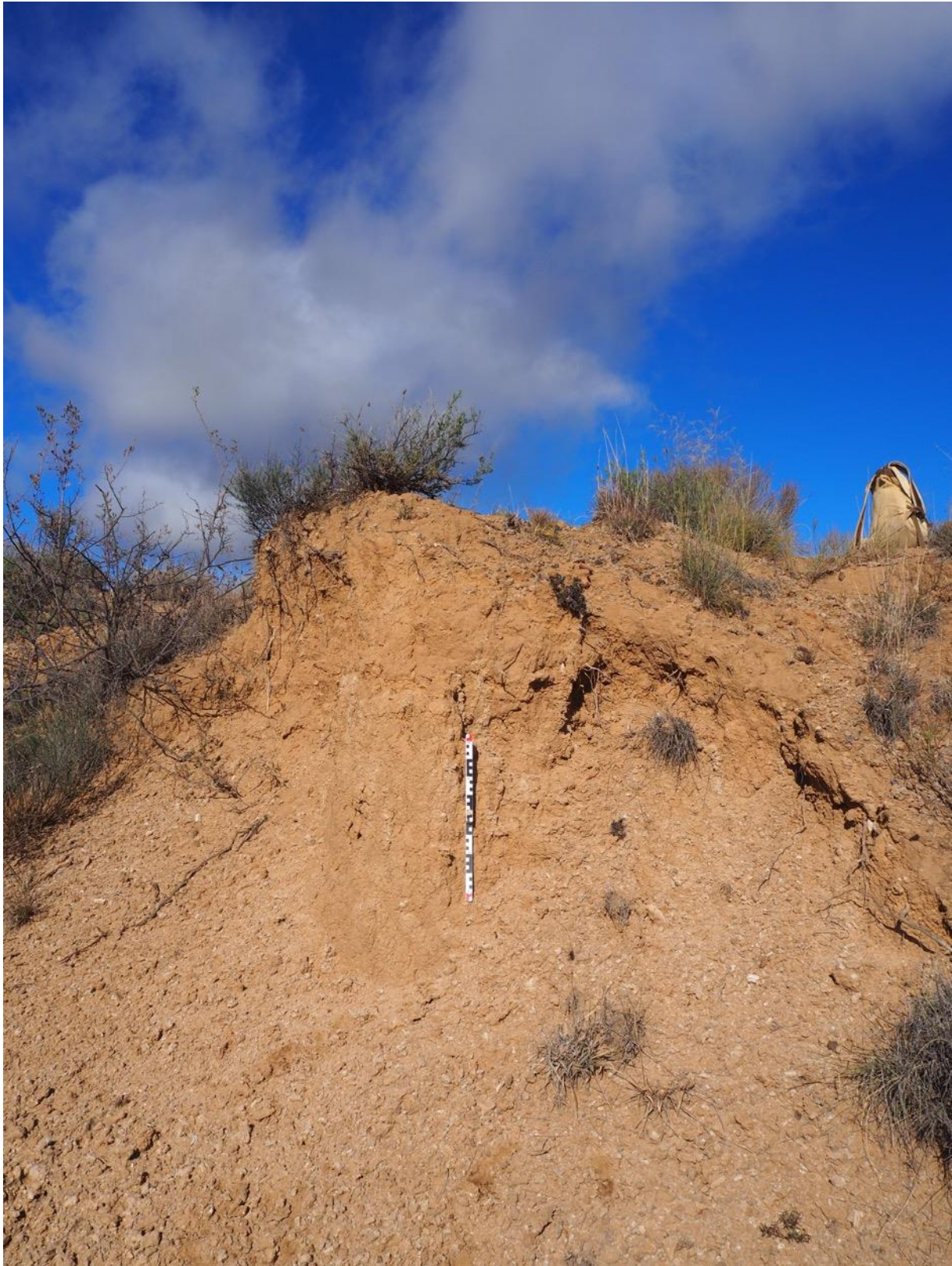


Figure 19. Sedimentary context of cluster A at Rooidraai 190.

Toeloop 340: In this donga of 0.35 km², a small cluster of artefacts (N=44/m²) was found spread over ~1000 m² (Fig. 25; Table 10). Artefacts were embedded in a white/grey deposit composed of numerous carbonate nodules. This deposit is located between an underlying layer characterised by a light brown (orange/pinkish) silty sediment, and an overlying layer composed of orange (dark brown) sands. Artefacts were observed in this carbonate-rich layer, whereas the underlying layer is sterile and the

upper layer only shows a few LSA artefacts (e.g., a grinding stone). Artefacts present fresh edges with a very light patina suggesting minimal weathering of the artefacts at the time of their discard.

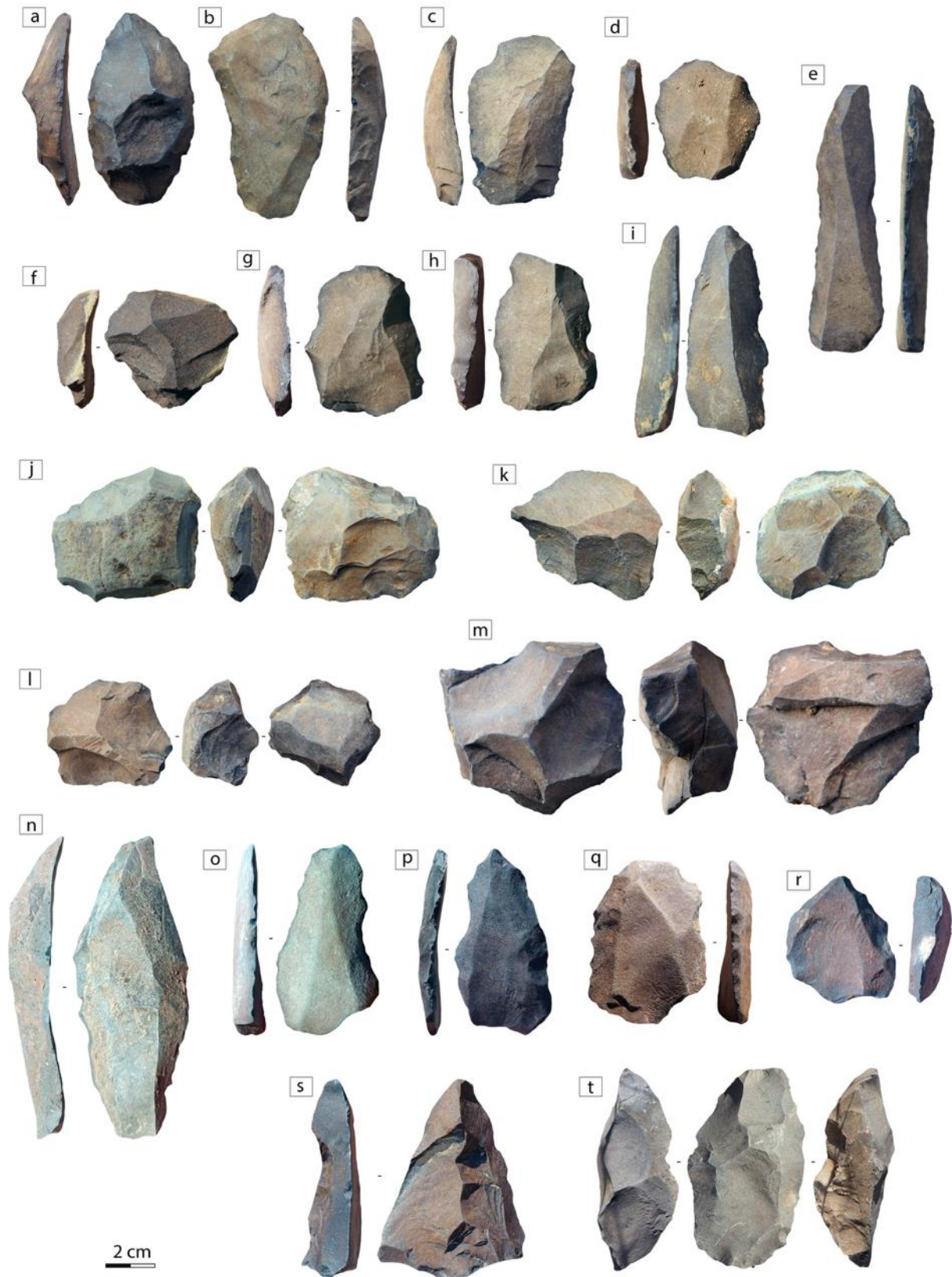


Figure 20. Artefacts from the Rooidraai 190; a to i: cluster A; j to k: cluster B.

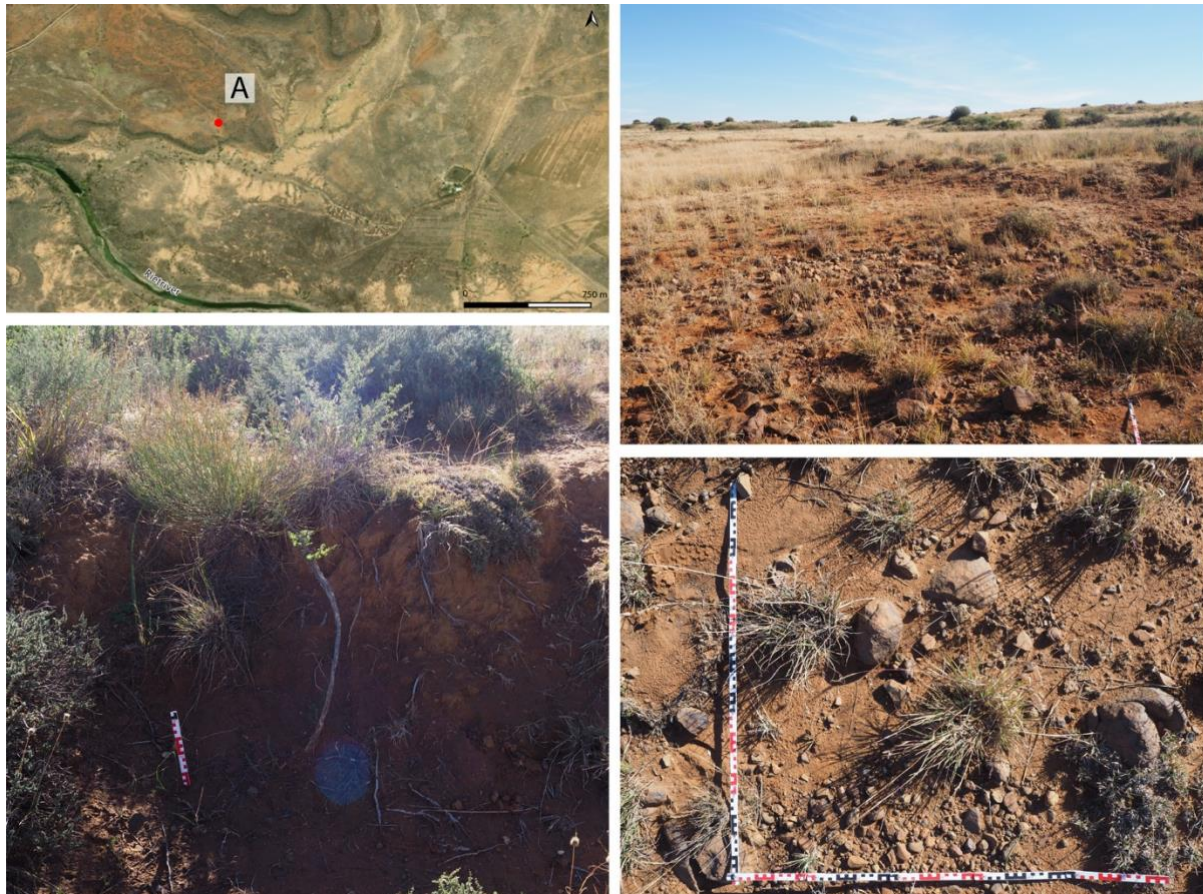


Figure 21. Location, landscape and section of the sample of cluster A of Lentelus 1119.

Table 8. Count of artefacts in 1 m² from Lentelus 1119.

Lentelus 1119 typology	N=29
Blade	1
Blank	3
Core	3
Debris	10
Fragmented blank	8
Inclined or parallel core	1
Side-scraper	3

This assemblage displays a production strategy geared toward elongated blanks and it is composed of large triangular blades, mainly unifacial points and scrapers, which indicate a high frequency of edge modifications focused on the convergence (Fig. 26) – consistent with the production intentions. Most of the diagnostic blanks as well as one parallel core indicate the use of *Levallois* methods (Fig. 26a, c, f, k, m-n). The second core observed in this assemblage is on quartzite and indicates blade production through a frontal debitage. The structure also indicates a volumetric conception and management of convexities, and the core is organised with one dedicated platform being used to detach elongated blanks with unipolar convergent modalities (Fig. 26l).

Some of these elements are reminiscent of the Tongati and Ndwedwe tools found in the Sibudan of the BM-BSp layers of Sibhudu Cave (Conard et al. 2012). This industry is dated to ~58 ka and corresponds to the post-Howiesons Poort (Will et al. 2014). This parallel might suggest that the Toeloop assemblage falls within a similar chronological framework, preceding the final phase of the MSA. Authors advise against using this classification as these tools are not to be considered as *fossiles directeurs* because they are “also found in small numbers [...] in several layers [...] predating the Still Bay” (Conard et al. 2012: 196) – even more so because only part of the technological repertoire of these industries is

observed at Toeloop. In addition, Toeloop is not dated by absolute methods and Sibhudu is located nearly 1000 km to the east. The limitation of relative dating also stems from the regional variability observed through different contexts from MIS 5 to the Holocene. In the case of the Free State, data are scarce and do not provide a sufficient reference for comparison. Thus, Toeloop might be a key site for the understanding of the end of the MSA in this area.

- Attribution: MIS 4-3, post-Howiesons Poort.

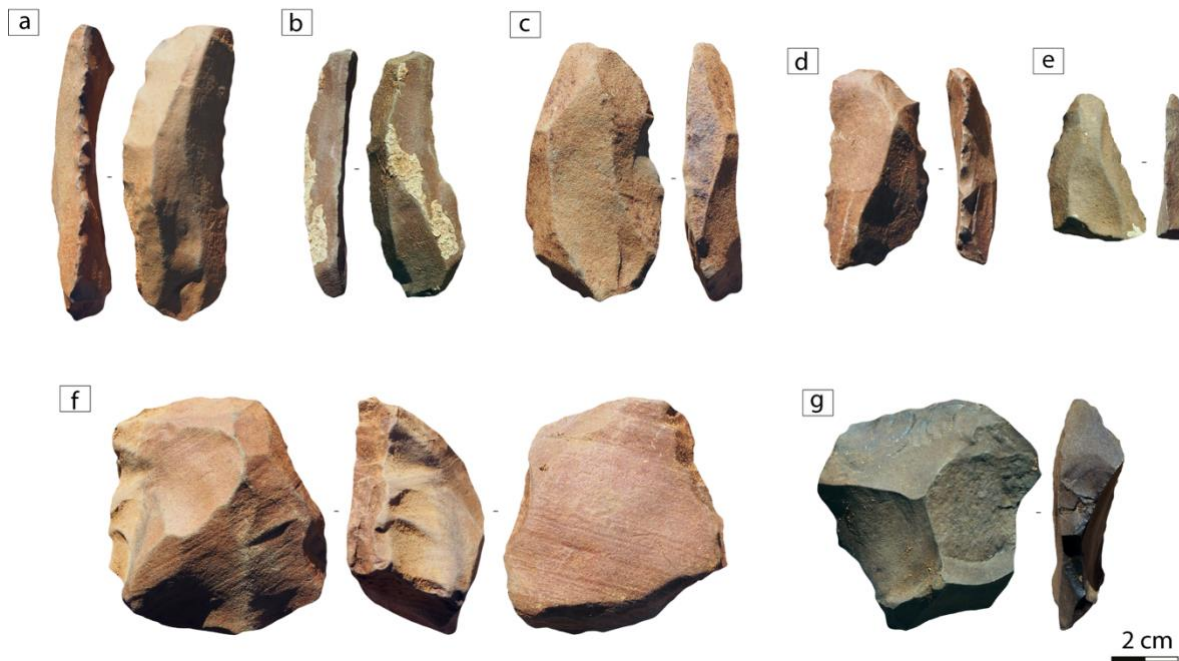


Figure 22. Artefacts from Lentelus 1119.

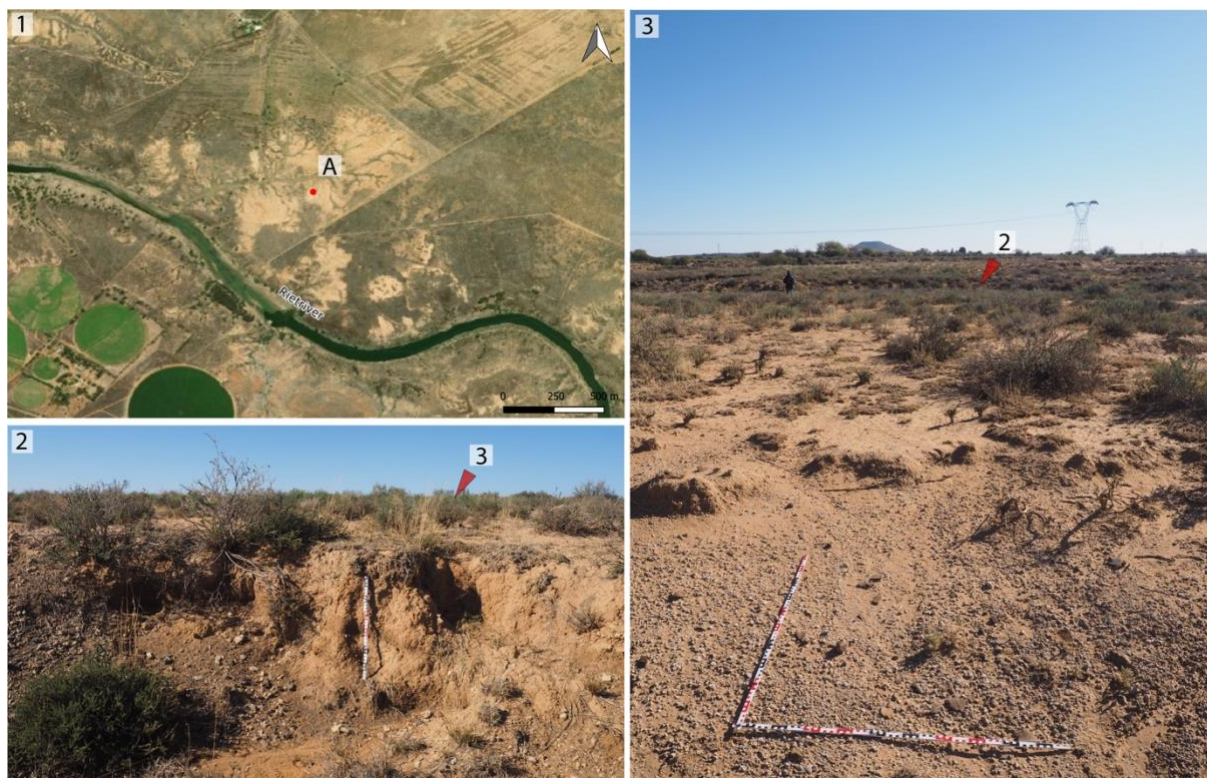


Figure 23. 1: Location of the sample of Blaauwhevel 425; 2: view of the section of cluster A; 3: landscape of the sample of cluster A.

Table 9. Count of artefacts in 1 m² from Blaauwheuvél 425.

Blaauwheuvél 425 typology	N=35
Blade or <i>Levallois</i> blade	3
Blank	7
<i>Déborderant</i>	2
Fragmented blank	11
<i>Levallois</i> lineal core	1
<i>Levallois</i> maintenance flake	1
<i>Levallois</i> point core	1
Off-axis <i>déborderant</i>	4
Polyhedral core	1
Preferential <i>Levallois</i> flake	1
Triangular blank	2
Victoria West core	1

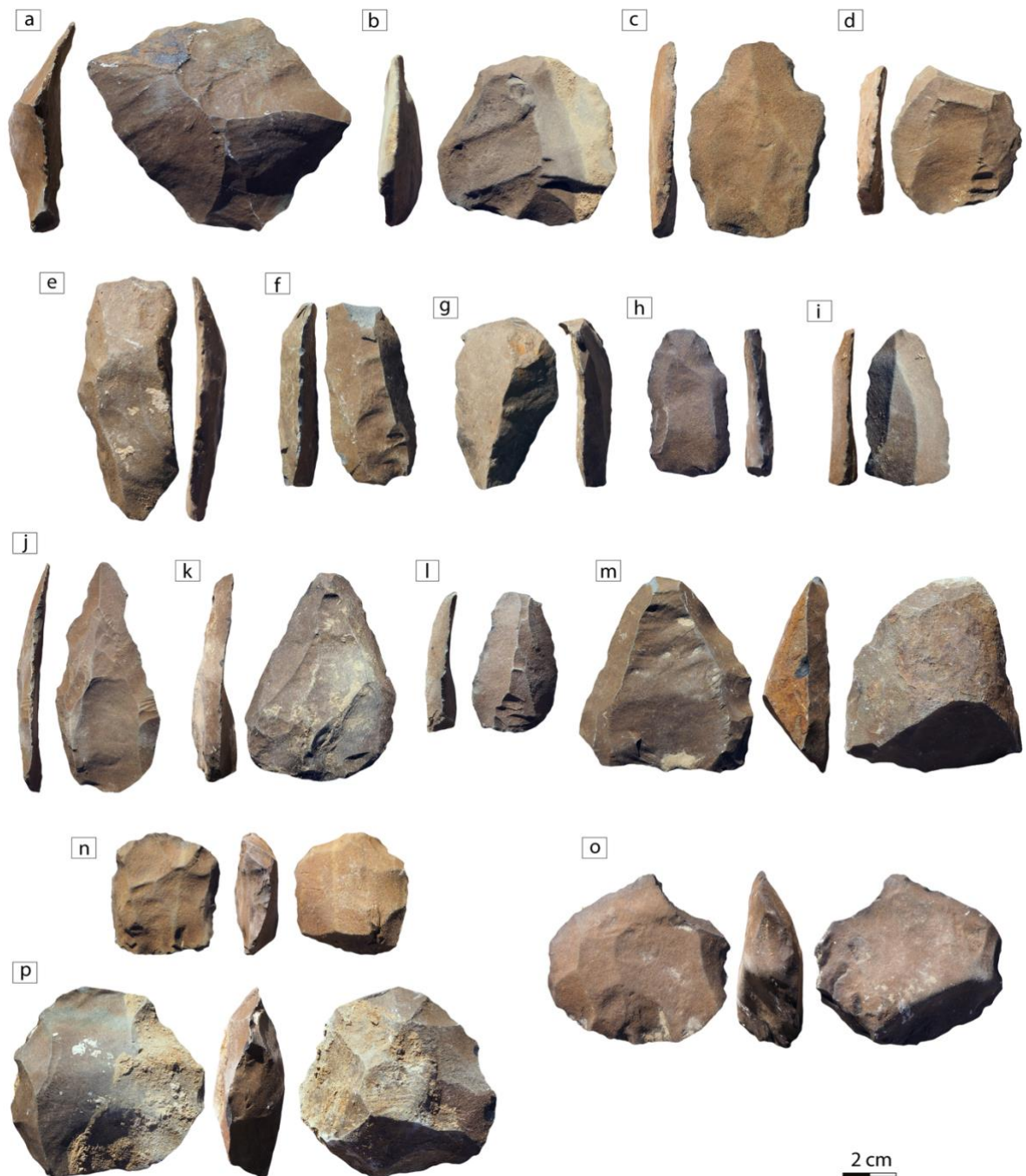


Figure 24. Artefacts from Blaauwheuvél 425.

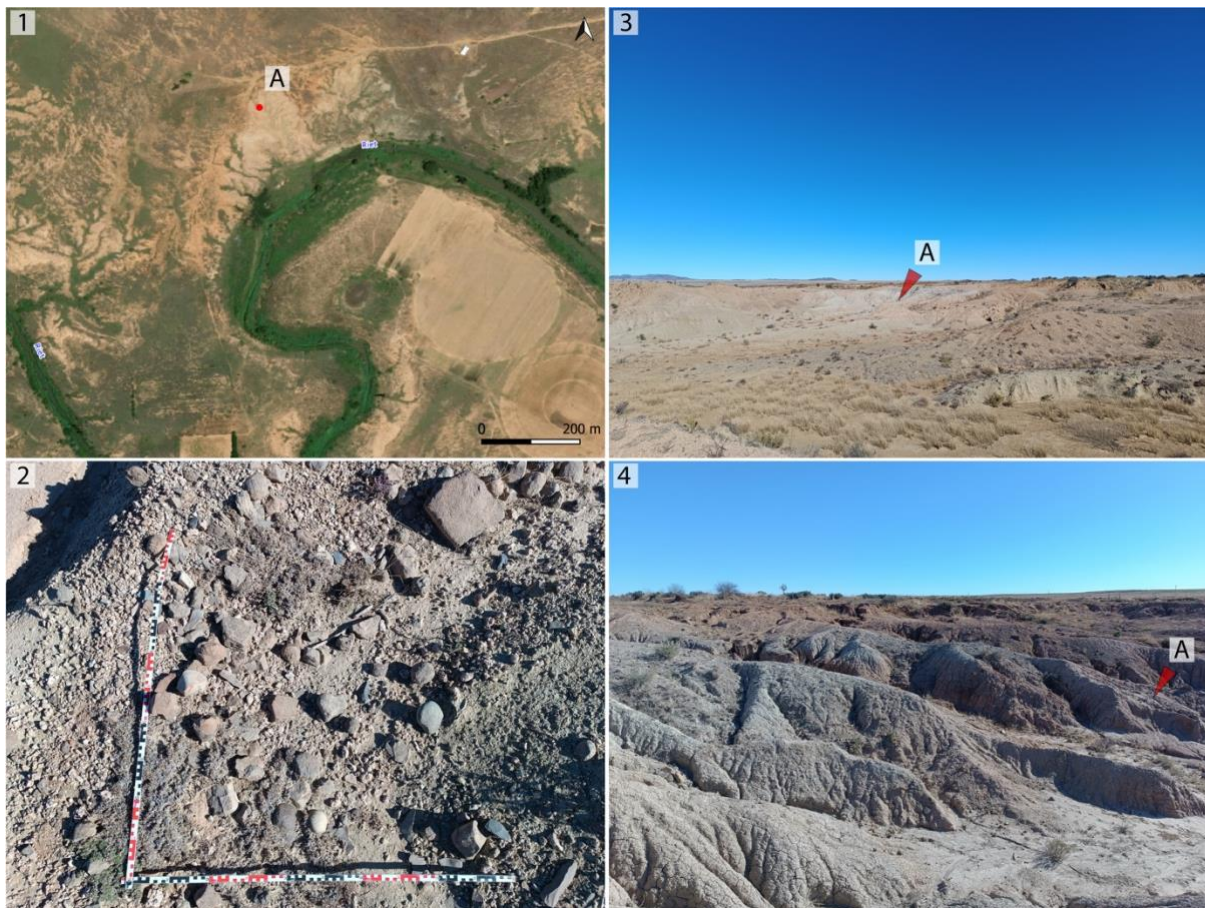


Figure 25. 1: Location of the samples of Toeloop 340; 2: location of the sample of cluster A; 2 & 3: view from cluster A. Photo credit: LB; map source: Google Earth (web). Free State region, South Africa. 29°44'40"S 26°03'17"E, NOAA, DigitalGlobe 2013. <http://www.google.com/earth/index.html> > (Accessed November, 2024).

Table 10. Count of artefacts in 1 m² from Toeloop 340.

Toeloop 340 typology	N=44
Blank	16
Core	1
Elongated blank – tool	4
Pebble	23

Other archaeological sites

Other dongas produced MSA artefacts, although clusters are often poor. We do note the presence of MSA artefacts at Blaauwbank 364b, Brakfontein West 1022, Telegraaffontein 644a and b, Weltevrede 710, and Telegraaffontein 644c (e.g., isolated *Levallois* blanks including blades, flakes, and triangular elements, as well as parallel and inclined cores). Archaeological sites are abundant downstream from the Kalkfontein Dam, which could be the result of a more intensive incision process directly linked to the dam. When associated with sedimentary deposits, the most recurrent layer that contains MSA artefacts is a grey/white carbonate-rich layer with clay or fine sands. In some cases, this carbonate-rich layer is orange in colour. In addition, in rare cases, these MSA artefacts are observed in a grey coarse sand with rounded pebbles and angular gravels which are more generally associated with ESA or Fauresmith deposits (e.g., Goedehoop).

LSA sites

While the main goal of the survey was to find ESA and MSA deposits, many LSA artefacts were observed. Out of 35 surveyed dongas, 27 contain LSA artefacts (Figs 1, 27-29; Table 1). LSA clusters are numerous and often include grinding stones, circular scrapers, large transversal scrapers, and carinated endscrapers of the Oakhurst technocomplex but also, typological elements of other Holocene

technocomplexes (Figs 27-28, 30; Deacon 1982; Ryano et al. 2017; Guillemard & Porraz 2019; Thomas 2022). Though blades and bladelets are abundant, without any other associated artefacts, they are rarely diagnostic. In most cases, the clusters are scattered on top of, or embedded in, oxidised sands from orange to red in colour. In some cases, these sedimentary deposits are composed of carbonate nodules whereas the matrix is made of oxidised sands (i.e., Rooibraai 190, Rooiplaat 404, Bethany 610a, Grootgeluk 212 a & b).

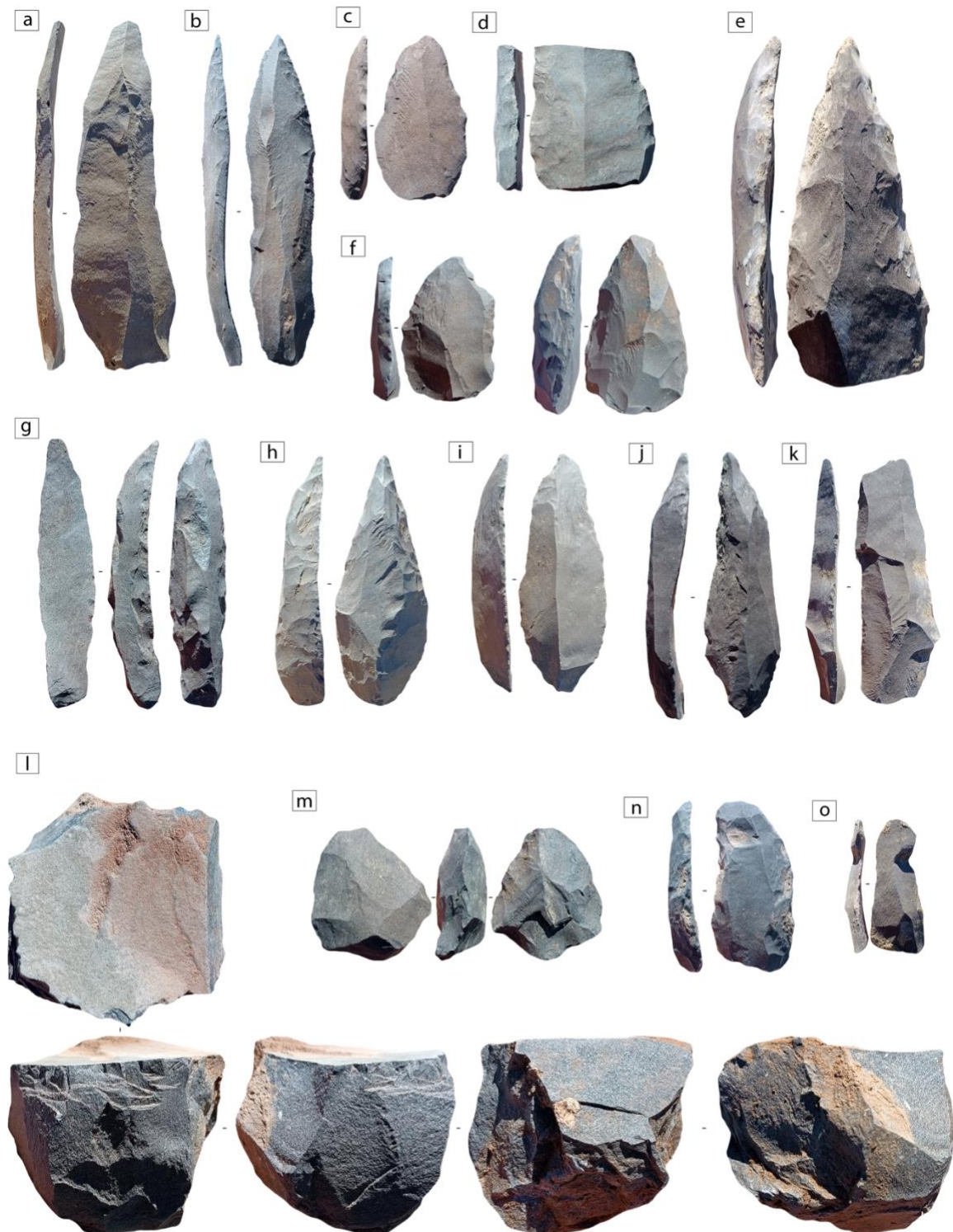


Figure 26. Artefacts from Toelooop 340.

While organic materials (i.e., bones and teeth; Fig. 30) were observed in a few dongas (Wagenmaker's Drift 24b, Rooiplaat 404, Telegraaffontein 644b, Olive 751a, De Put 26a and b, Bethany 610c, Grootgeluk 212b, Hexrivier 405), in only rare cases did we observe these elements in association with LSA artefacts (Grootgeluk 212b and Rooiplaat 404 – in these dongas, carinated endscrapers and one *piece esquillée* were associated with bones).

A few dongas produced clusters that provide chronological information and that are characterised by a good state of preservation. At Bethany 610a, some elements (Figs 27 & 28) might suggest the presence of industries either related to the Wilton technocomplex or the later LSA, as some of the *fossiles directeurs* of these material cultures were recognised (i.e., thumbnail scrapers, backed tools, blades and bladelets; Guillemard & Porraz 2019; Lombard et al. 2022). At Moreson 156, the attribution may be more ambiguous, as carinated endscrapers, thumbnail scrapers, and bladelet productions coexist. In the case of multiple occupations, the LSA component is quite clear. Except for the presence of V-shaped scrapers, the abundance of duckbill endscrapers, circular scrapers, concavo-convex scrapers or adzes are consistent with the Oakhurst technocomplex (Ryano 2014).

5. Summary and future directions

Of the 35 surveyed dongas, only three yielded no archaeological material. Overall, artefacts attributable to the ESA, MSA, and LSA are well represented in the survey area. Although sedimentary contexts are often poorly preserved, several localities – particularly in the western portion of the catchment – appear promising for future absolute dating efforts. In contrast, the eastern sector of the catchment produced fewer substantial sites.

ESA occurrences are rare, though their presence is noteworthy given the absence of Middle Pleistocene sediments and associated lithic industries in the neighbouring Modder River basin (Cuartero Monteagudo et al. 2025). MSA sites are more frequent and are generally better preserved, while LSA material is abundant with many clusters observed in stratified contexts. Lithic raw material sourcing is beyond the scope of this paper, yet we do note that the vast majority of the observed artefacts is made on hornfels, followed by dolerite and quartzite (especially for handaxes), and quartz (in particular for LSA artefacts).

The lithic material (N=177) obtained during the surveys conducted in the early 1990s, by J.S. Brink and L. Rossouw, includes circular scrapers, carinated end-scrapers and thumbnail scrapers (Fig. 31). This attests solely to the presence of lithic artefacts associated with the LSA in the area to the east of Hexrivier 405 (29°48.72S, 26°13.84E), thereby confirming our own observations. Remarkably, the Hexrivier donga, which in the 1990s produced numerous Florisian fossils including a human patella (Berger & Brinks 1996), was rather poor in faunal remains.

The ongoing survey programme initiated in 2022 (Cuartero Monteagudo et al. 2025) will develop a regional technological reference framework for the Free State. This framework will facilitate comparisons with adjacent regions and is essential for addressing a range of key research questions pertaining to the archaeology of the late Middle Pleistocene and Late Pleistocene of southern Africa. Within the broader context of research on the earliest human populations, from the patterns of dispersal to the evolutionary processes of *H. sapiens*, as well as the history of technological change, this study focused mainly on the technological characteristics of these phases in this region, i.e., on the Fauresmith and early MSA industries on one hand, and the regionalisation phenomenon in later periods on the other hand. Furthermore, only a few early MSA assemblages are associated with *H. sapiens* fossils in South Africa (e.g., Border Cave, Klasies River Mouth, Pinnacle Point, Florisbad; Kuman et al. 1999; Feathers 2002; Marean et al. 2004, 2007; Grün 2006), whereas the earliest known association between assemblages and modern humans date from 233 ka to 147 ka in eastern Africa (McDougall et al. 2005; Clark et al. 2003, Vidal et al. 2022). In addition, while the early MSA may be considered a distinct period (Conard et al. 2016), the industries and the associated technocomplex(es) that define it remain poorly described, particularly in the central interior (Lombard et al. 2022). Only a small number of industries emerging during the early MSA are consistently described (Volman 1984; Porat et al. 2010; Wilkins 2013; Conard et al. 2016; Bader et al. 2022; O'Driscoll & Mackay 2024). Although these

industries are commonly characterised by a combination of blade and flake production with triangular elements also frequently noted, and by a wide chronological span, it remains unclear whether this variability indicates distinct technocomplexes, either on a regional scale or across Africa more broadly. The present study is partly motivated by the challenge of accurately characterising these industries in southern Africa.



Figure 27. LSA artefacts from Bethany 610a (a to e, k, l, g), Moreson 156 (f, i to h, m to o), Lentelus 1119 (p to s, u) and Rooiplat 404 (t, v).



Figure 28. LSA clusters from Bethany 610a (1 & 2), Moreson 156 (3 & 4), Lentelus 1119 (5 & 6), Blaauwheuvcl 425 (7) and Blaauwbank 364a (8 & 9).



Figure 29. LSA artefacts from Blaauwheuvcl 425a (a, b), Blaauwbank 364 (c to o), and Weltevrede 710 (p, q).

Although the early MSA, debatably, may be considered as a technocomplex (Lombard et al. 2022), the status of the Fauresmith is far more ambiguous (Archer et al. 2023). If it is often presented as a technocomplex, its definition revolves around the association of typo-technological features: LCTs, relatively small handaxes, lower frequency of bifaces at the assemblage level, marginally trimmed

points, large blades and triangular production, and the presence of *Levallois* (Herries 2011; Chazan 2015). Its chronological extent is not strictly defined and may vary according to regional contexts. Within this framework, the terminal or latest expressions of the Fauresmith may align with the earliest manifestations of the MSA. However, the Fauresmith classification within the broader chrono-cultural framework remains unresolved, largely due to terminological disagreements, the absence of reliable ages except for a few sites (Wilkins & Chazan 2012; Chazan et al. 2020; Richard et al. 2022b), but also as its status of transitional industries that express a certain variability among the assemblages. Some scholars categorise the Fauresmith within the ESA, others place it at the onset of the early MSA, and yet others interpret it as representing a transitional phase between the two (Beaumont & Vogel 2006; Underhill 2011; Herries 2011; Wilkins et al. 2017; Chazan et al. 2020; Kuman et al. 2020).



Figure 30. Faunal remains at Blaauwheuveld 425 (1), Moreson 156 (2 & 3), and Lentelus 1119 (4).

The Free State provides an important opportunity to characterise these industries, particularly given the historical occurrence of these technocomplexes in the region and their original definition through the type site near the town of Fauresmith. Following these considerations, research questions may be directed toward clarifying the nature of technological relationships and evolutionary connections between the Fauresmith and early MSA industries.

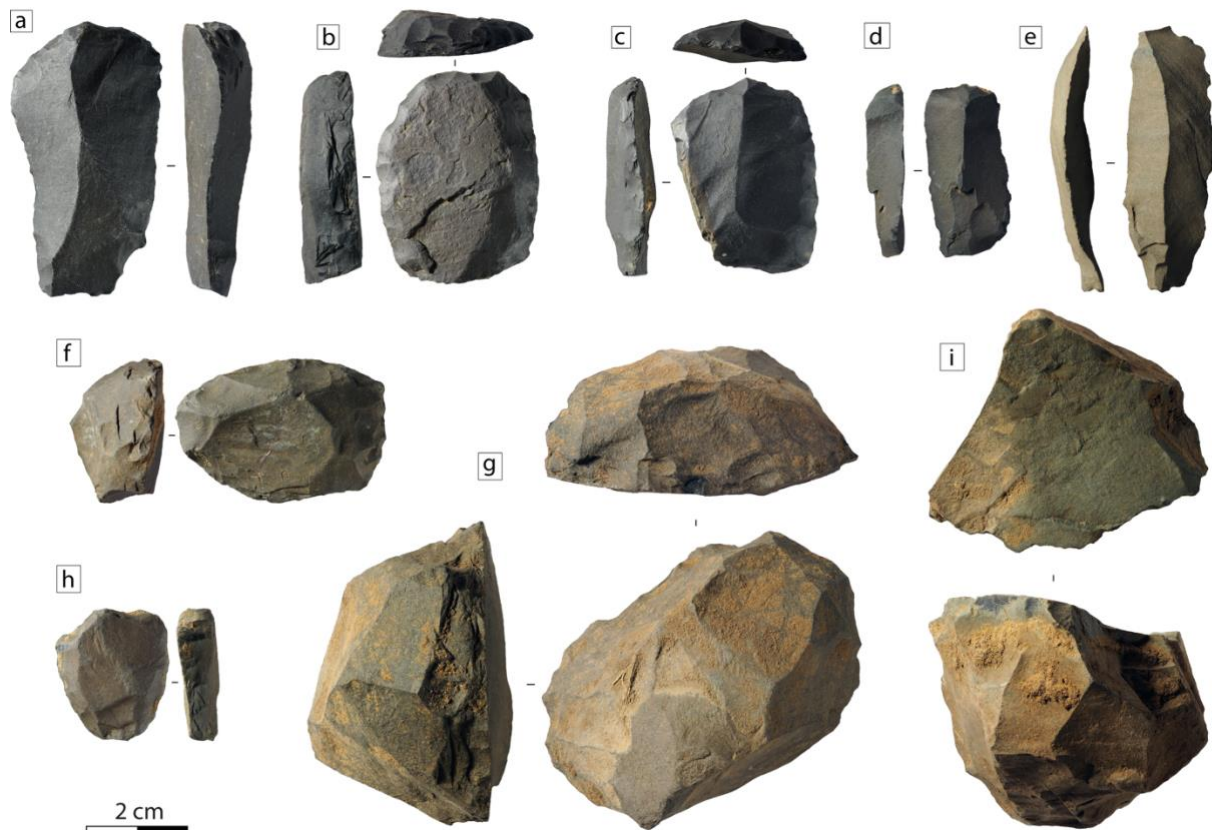


Figure 31. Representative LSA artefacts from the 1990s surveys by the National Museum Bloemfontein.

The second line of inquiry of this study concerns, on the one hand, the characterisation of the industries from the first half of MIS 5, particularly those oriented towards blade and triangular blank production (e.g., ‘generic’ MSA) as observed at numerous sites from this period (e.g., Member 4WA at Border Cave, Blombos Cave phase M3, Pinnacle Point 13B, MSA II of Klasies River Mouth, etc.); and on the other hand, the definition of industries linked to the regionalisation phenomenon, where this can be observed (e.g., Still Bay). The renewed interest in these periods and their associated technocomplexes is reinforced by ongoing technological studies at the sites of Florisbad and Baden-Baden 2, which will contribute to the development of a technological reference framework for the MSA in the Free State.

6. Conclusions

The Riet River survey highlighted the archaeological potential of the Free State, not only for Pleistocene technocomplexes but also for Holocene contexts. This potential is underscored by abundant lithic assemblages identified within alluvial terraces, as well as the likelihood of further sites concealed beneath recent aeolian sands, especially outside visibly eroded areas. Notably, the Riet terraces yielded ESA assemblages, indicating greater antiquity compared to deposits along the Modder River. Future research will prioritise geoarchaeological characterisation of these sedimentary contexts and the establishment of a robust regional absolute chronology. Such efforts will enhance understanding of lithic technocomplexes and clarify the spatiotemporal patterns of human occupation in South Africa’s central interior.

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