Southern African Field Archaeology
2026 Vol. 21: Article 4510
Research report (peer-reviewed): Received September 2025; Revised February 2026; Published June 2026
DOI: https://doi.org/10.36615/safa.21.4510.2026

ISSN 1019-5785
ISSN 2789-1844

The Holocene Later Stone Age at Charé Rock Shelter, Namibia

Theodore P. Marks [a, b, *], **Dominic Stratford** [c, d, e], **George M. Leader** [b, d, f, g], **Kaarina Efraim** [h, i] **& Eugene Marais** [b]

[a]Department of Integrated Sciences, The New Orleans Center for Creative Arts, New Orleans, LA, 70117, USA
[b]Gobabeb Namib Research Institute, P.O. Box 953, Walvis Bay, 13013, Namibia
[c]School of Geography, Archaeology, and Environmental Studies, University of the Witwatersrand, Braamfontein, Johannesburg, 2050, South Africa
[d]Department of Anatomical Sciences, Renaissance School of Medicine, Stony Brook University, Stony Brook, NY, 11794, USA
[e]Department of Anthropology, Stony Brook University, Stony Brook, NY, 11794, USA
[f]Department of Sociology and Anthropology, The College of New Jersey, Ewing, NJ, 08618, USA
[g]Department of Anthropology, University of Pennsylvania, Philadelphia, PA, 19104, USA
[h]Department of Anthropology and Archaeology, University of Pretoria, Private Bag X20, Hatfield, 0028, South Africa
[i]National Museum of Namibia, P.O. Box 147, Windhoek, 302230, Namibia
**Corresponding author email: tmarks@nocca.com*

ABSTRACT
Charé rock shelter lies approximately 10 km from the north-eastern corner of the Namib Desert's Sand Sea. The site was excavated in 1971 by Beatrice Sandelowsky but was never fully published. In 2023, the site was revisited to assess the deposit and its potential for future excavation. This paper presents an updated report on the following: (1) the geological and geomorphological context of Charé; (2) previously recovered material culture; (3) preliminary assessment of the stratigraphy; (4) the material culture recovered from a new test pit; and (5) radiocarbon dates from three charcoal pieces distributed through the exposed deposit. Noteworthy is a Later Stone Age (LSA) lithic assemblage produced primarily on clear quartz sourced from the immediate vicinity. We contextualise Charé within the Namibian LSA with a view to stimulating the investigation of variability in the technological and subsistence behaviours of LSA populations in the region during the Late Pleistocene and Holocene.

Keywords: Namibia, Later Stone Age, rock shelter, geology, geomorphology

1. Introduction

Charé rock shelter lies 10 km east of the northwest corner of the Namib Desert's Sand Sea (23°35.849' S, 015°53.800' E; Fig. 1) on the originally named Kromhoek (Farm 416) property. The shelter has also been called 'Cha-re' and 'Cha re'. The large rock shelter opens to the west, providing ample protection from both the southern and eastern winds. The shelter also stays cooler than the surrounding hills and makes a particularly attractive place to rest during the summer months. The mouth of the shelter extends approximately 54 m across and the drip line extends over about 5 m from the back of the shelter. The geographical and geological context of Charé is particularly interesting. The site's proximity to resources across a diverse geological and geomorphological terrain including the Tsondab River and Flats, the !Khuiseb River, the Great Escarpment, the Central Plateau, and the Namib Desert make it a strategically important point for hunter-gatherer occupation and as a source of lithic raw material. Beatrice Sandelowsky visited the rock shelter in 1971 and excavated a test pit, but does not provide details on the assemblage or methods (Sandelowsky 2004). As part of her preliminary investigation, two layers in the site were radiocarbon dated to between five and eight thousand years (ka) (Sandelowsky 2004), though the dates' association with the site's stratigraphy and artefact assemblages is unclear.

Sites in the Namib like Charé are valuable for providing insights into larger questions regarding the Later Stone Age (LSA) in southern Africa. These questions focus on understanding adaptive strategies in arid landscapes, shifts in technological organisation from the Late Pleistocene through the Holocene, LSA land-use and mobility patterns, and the adoption of pastoralist economies in the Late Holocene. For these reasons, our team decided to reinvestigate Charé for the first time in more than 50 years. A small test pit was excavated and yielded an assemblage of lithics, ceramics, ostrich eggshell (OES) beads and a copper ornament. Here, we present preliminary results stemming from our first visit to the site, including: the geological and geomorphological context of the shelter; appraisal of the sediments and site stratigraphy; descriptions of the lithic and non-lithic artefacts yielded from the excavation; preliminary analysis of the lithic assemblage; and three new radiocarbon dates.

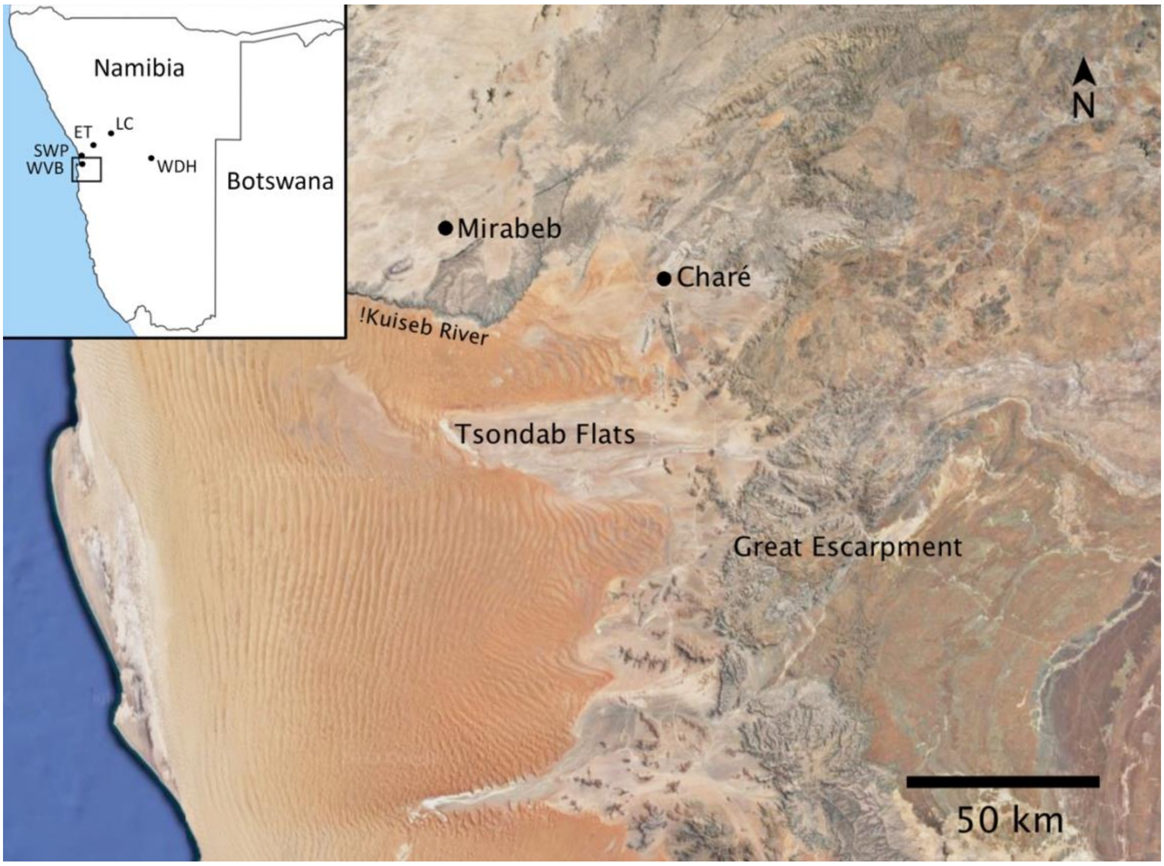

Figure 1. Map of the region showing the Charé rock shelter location in relation to the Sand Sea and escarpment, and within Namibia (top left panel; ET: Erb Tanks, LC: Leopard Cave, SWP: Swakopmund, WVB: Walvis Bay, WDH: Windhoek).

2. Shelter context: Geology, geomorphology, and sediments of the landscape

Charé rock shelter (Fig. 2) occupies the base of the western slope of a large north-west-dipping mica-schist syncline located in the Southern Marginal Zone of the Damara Mobile Belt (Becker & Ledru 2016). The host rocks are characterised by clastic and carbonate sedimentary units associated with the rifting and filling of the Khomas Rift (Porada 1985). Specifically, the shelter is hosted within rocks attributed to the Samara Formation (Hoffmann 1983) of the Kudis Subgroup and Swakop Group, which formed between 800 and 630 million years ago, possibly during the break-up of supercontinent Rodinia, and folding associated with the collision of the Kalahari and Congo cratons (Becker & Ledru 2016). The metamorphic schists and carbonates of this formation have been interpreted as representing a shallow marine platform sequence following global glaciation (Hoffmann 1989). The lithology of the Samara Formation is important to the shelter formation, geogenic site formation processes, and raw material availability for lithic industries. The shelter formed in gently deformed dark calcareous quartz-mica schists with thin, discontinuous, light marble lenses. Sharply overlying the schists is a sequence of finely bedded micaceous calcarenite underlying light, massive dolomite and grey calcite marble. Metamorphosis of the local host rocks has led to the formation of abundant and variable quartz forms that pervade the host rock in veins and nodules, often with striking clarity.

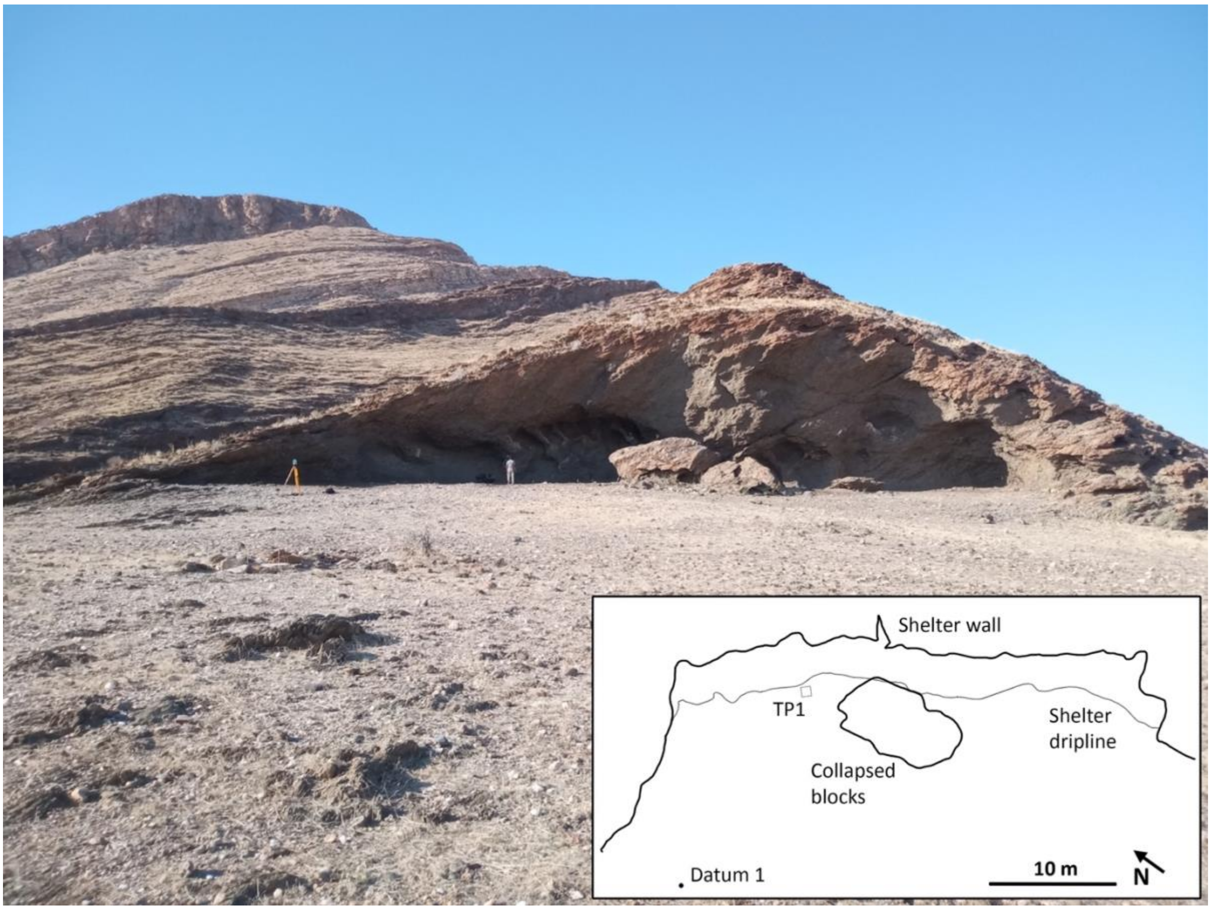

Figure 2. Charé rock shelter in 2023. Photograph taken looking east. See person for scale. Note the north-dipping mica-schist of the host rock, and in the background, the overlying metamorphosed carbonates described in the text. Also note the rubble-strewn broad apron extending from the shelter. The lower right panel presents a schematic of the outline of the shelter and location of the test pit (TP1) in plan perspective as surveyed with a total station (the total station situated over Datum 1 is visible in the main image near the left margin of the shelter).

Charé has a shallow, crescent-shaped 54-m-wide mouth that opens to the west and is elevated above the locally eroded, extensive calcrete terraces capping the Namib Desert and Kalahari sands (Fig. 3). One hundred metres to the north of the shelter, an ephemeral stream is fed by a spring that emerges 500 m upslope of the shelter from a NE-SW oriented fault. The dripline rises a maximum of 10 m above the floor of the shelter. The shelter floor is a narrow, flat strip with a maximum width of five metres covered by the dripline. The poorly developed overhang of the dripline is a consequence of the nature of the host schist, which, despite being strongly lithified, is friable and structurally incompetent. The rate of dripline withdrawal is unknown but may be relatively slow (e.g., Viles 2008). Two large roof collapse boulders occupy the centre of the shelter floor just under and outside the dripline (Figs 2 & 3). Beyond the dripline, the ground gently slopes westwards in a broad rubble-strewn apron, comprising an unsorted mix of mica-schist clasts, marble tablets, sand and abundant lithics (Fig. 3). The morphology of the base of the shelter is largely unknown. In the southern end of the shelter, and in various areas of the apron, schist bedrock rises and outcrops from the deposits. The limited exposure of decayed schists at the bottom of test pit 1 (TP1), below the dripline, suggests the base is irregular and may indicate the possibility of deposits exceeding 1 m in depth.

The broad spectrum of lithologies represented in the area of the shelter and the wide shelter opening has significant implications for the composition of the shelter's sediments and the diagenesis of sedimentary components in the relatively open-system setting. The open nature of the shelter and its accessibility to a range of fauna provides the opportunity for significant biogenic and anthropogenic post-depositional modification of sediments and archaeological structures. Many of the potentially contributing sedimentary components, and depositional and post-depositional processes, are visible in the surface-exposed sediments and are further exemplified in the TP1 profile. The shelter has accumulated a wide range of sediments from multiple sources. Ongoing sedimentological and microstratigraphic analyses will clarify the sources of the different contributors.

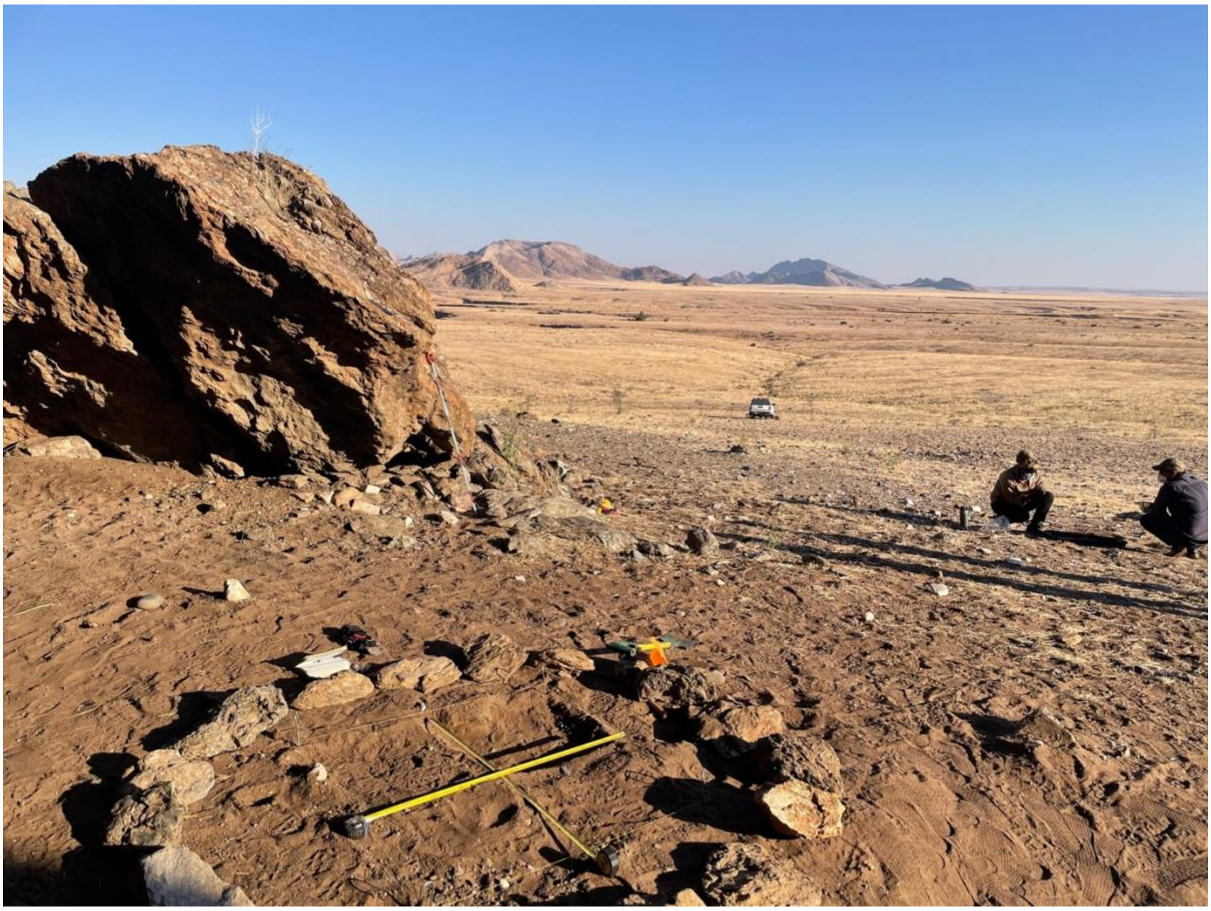

Figure 3. The west-facing view from Charé across the rubble-strewn apron descending gently to the grassy plains of Kalahari sands and calcrete terraces. Note the 1 m test pit (divided into 50x50 cm quadrants) in the foreground. The surveyed position of the test pit is shown in Figure 2 as TP1.

Geogenically, autogenic clastic components include local contributions of silt to sand-sized platy particles derived from the decay of the mica-schist host rock, and clasts of weathering schist and tablet-shaped fragments of metamorphosed carbonates. Chemical autogenic contributions include secondary Ca-derived precipitates from the calcareous schists and nearby carbonates. Allogenic geogenic contributions include aeolian sands of Kalahari and Namib Desert derivation. The well-developed calcretes nearby indicate an abundance of calcium on the landscape and may promote preservation of faunal remains on site (including shell).

Biogenically, historical use of the shelter as a kraal and contemporary use by endemic fauna, including zebra and oryx, and owls, contribute potentially significant volumes of faecal matter and micromammal remains, respectively. Despite being emptied of dung by the current landowner, large slabs of compressed dung can be found on the shelter floor and apron. Anthropogenically, a typical suite of clastic components is present (Stratford 2023), including inorganic and organic remains representative of the behaviours of the occupants. Artefacts collected from the shelter floor by landowners include leather, ceramics, lithics, ostrich eggshell beads and bone tools. Additionally, artefacts observed across the shelter and apron include tabular marble grindstones, hammerstones, and vast numbers of clear quartz lithics (described below). The floor and apron of the shelter have been significantly disturbed by various agents in recent times. As a result, footprints, wallowing or rolling pits, and grass mats are frequent.

3. Excavation and analytical methods

A 1 m^2 test pit was laid out just below the dripline and only the southwest 50x50 cm quadrant was selected for excavation due to time constraints (Fig. 3). Owing to the difficulty in distinguishing natural strata in the small test pit, trowels were used to excavate arbitrary 10 cm levels (hereafter referred to as spits) to a depth of 90 cm. Each spit had a volume of approximately 0.025 m^3, for a total of 0.225 m^3 of sediment excavated from the test pit. Decayed, fragmented bedrock was encountered at about 70 cm depth below the surface, and at 90 cm depth, *in situ* consolidated bedrock was reached. As a test pit, artefacts were not piece-plotted using the total station, but artefacts were recovered from sediments that were sieved using a 2.5 mm mesh.

A Nikon Nivo 5C total station was used to document the floor plan of the shelter, the dripline, large boulders that have collapsed in the central portion of the shelter, spit depths, and the location of the test pit (Fig. 2). The total station coordinates were generated using a local grid with the primary datum (D1) being given the coordinates x=100.000, y=100.000, z=100.000.

To quantify and analyse the material from the test pit assemblage, we took a mass analysis approach to expediently recover data for this preliminary assessment (Ahler 1989; Andrefsky 2005). Materials, including fragmentary bone and ostrich eggshell, were weighed. The lithic assemblage was first sorted broadly into cores, tools, and debitage following Andrefsky's classifications. Debitage here refers to unretouched/unutilised flakes, as well as flake fragments and shatter. Debitage was first sorted into material less than 20 mm in maximum dimension, and then into 10 mm size classes, e.g., 20 to 30 mm, 30 to 40 mm, etc. The proportion of cortex on each piece of debitage was recorded only for pieces greater than 20 mm in maximum dimension. Cortical coverage was estimated visually as a percentage of the dorsal surface area including the striking platform when applicable. Debitage pieces were then separated by raw material, counted, and weighed. Cores were sorted by type (including multidirectional, unidirectional, and centripetal forms) and then into size classes before counting and weighing (e.g., Andrefsky 2005).

Formal lithic tools, informal utilised flakes, and retouched flakes, pottery, OES beads, and other isolated finds, however, were described on an individual basis. Lithic tools were sorted into size classes as above, classified, measured, counted, and weighed. Beads were counted and sorted into classes based on Orton's (2008) stages of manufacture. These classes include roughly shaped blanks (Stage I), partially drilled blanks (Stages II and III), fully drilled but unrounded beads (Stages IV and V), and finished beads (Stage VII).

Three pieces of charcoal were sampled for dating during the excavations; sample 'Charcoal 1' (UGAMS-65752) was taken from spit 2 (depth 10-20 cm), 'Charcoal 2' (UGAMS-65753) was taken from a concentration of charcoal in spit 5 (depth 40-50 cm), and 'Charcoal 3' (UGAMS-65754) was taken from spit 8 (depth 70-80 cm). Samples were processed for AMS radiocarbon dating at The University of Georgia Centre for Applied Isotope Studies and were calibrated following Hogg et al. (2020) using the SHCal20 model.

4. Results

Stratigraphy, sediments, and dates of the test pit (TP1)

Sandelowsky (2004) first reported the stratigraphy of the Charé rock shelter, however the location of the excavation pit or its maximum depth is not known. In her brief schematic stratigraphy, Sandelowsky presented five units in addition to a surficial 'dung floor'. Below the dung floor, the upper two units comprised one 'vegetation layer', and an underlying 'lenses of ash' unit. None of these upper three units were visible in the profile exposed in TP1 (Fig. 4), which reached a maximum depth of 90 cm below the surface. It is possible that these units may have been removed when dung layers were recently removed from the site, or that these units were preserved in a different area of the shelter. Below these three units, Sandelowsky (2004) notes a 'dark brown layer' overlying a 'weathered mica schist and dune sand' unit, which overlies the 'mica schist bedrock'. We recognise these three lower stratigraphic divisions of Sandelowsky (2004) in TP1, and we provide preliminary descriptions of the sediments. It is likely that the main body of the TP1 profile correlates with the 'dark brown layer', within which we recognise no formal sub-units, but do identify some stratigraphic features that may be indicative of changes in depositional environment, occupation and post-depositional process – further excavation is needed to clarify the nature and lateral extent of these features before a formal stratigraphy of this unit is proposed. At this point, we propose a cautious approach to defining the stratigraphy of this site based on stratigraphic features and the distribution of ceramics in relation to the obtained radiocarbon dates. Towards the bottom of the profile, a wedge of sandy, decayed, artefact-poor mica schist (likely equivalent to Sandelowsky's 'weathered mica schist & dune sand' unit) thins to the north and contacts a fragmented, friable, irregular *in situ* mica schist shelter base (equivalent to Sandelowsky's 'mica schist bedrock' unit) that seems to deepen to the north. The upper contact of the wedge has been dispersed and is obscured by a nearby burrow (Fig. 4).

Generally, the main body ('dark brown layer') of the deposit can be characterised as matrix-supported, of grey-brown colour, poorly consolidated, single-grained and massive. No significant changes in matrix texture, colour or composition, or sedimentary contacts were visible. The matrix is consistently composed of a range of sediments, from platy micaceous coarse sand aggregates to silt-sized particles with a significant ashy component contributing to the grey colour of the sediments. The matrix also includes:

- Angular, subangular and subrounded quartz grains
- <2 mm clear quartz shards
- Highly fragmented grassy vegetation
- Microcharcoal

Clasts are poorly sorted, less than 5 cm (in maximum dimension), dispersed, and have an isotropic or roughly planar fabric. Clasts include:

- Angular to subangular variably-shaped schist particles
- Subangular quartz chunks
- Occasional sub-rounded quartz pebbles
- Clear quartz shards
- Fragmentary tablets and rounded pebbles of marble
- Rounded and subangular charcoal chunks
- Aggregated dung clumps
- Highly fragmented trabecular and cortical burned and unburned bone, some of which is fragmented *in situ*.

Occasionally, minor calcium carbonate precipitation, as localised laminations and nodules, has formed on the lower surface of clasts. Minor consolidation of sediments was noted in the top 5 cm of the test pit but no structural differences were identified that indicate local horizontal calcification or significant compression associated with discrete surface development and intact burial.

In the wedge of sandy decayed mica schist overlying the base of the shelter ('weathered mica schist and dune sand'), sediments are loose and single grained with a noticeable increase in the proportion and grain size of yellow sands that support the fragmented, unsorted, isolated, subangular to subrounded, abundant schist clasts. Occasionally, clasts retain a north-dipping planar fabric, and become more frequent and larger closer to the contact with the *in-situ* shelter base.

Three notable stratigraphic features are exposed in the main upper division ('dark brown layer') of the TP1 profile:

1. Two, horizontal to gently north-dipping, areas of dispersed charcoal. The upper is thin, ephemeral and rests irregularly on a zone of clast-rich sediments at about 45-55 cm. The lower, thicker, more concentrated area of charcoal contains larger pieces and is immediately beneath the clast-rich zone
2. A clast-rich zone that extends horizontally across the profile and contains a notably high proportion of larger isotropically-organised schist clasts (up to 6 cm in maximum dimension)
3. A large burrow at a depth of 52 cm filled with clast-poor, ashy-grey sands.

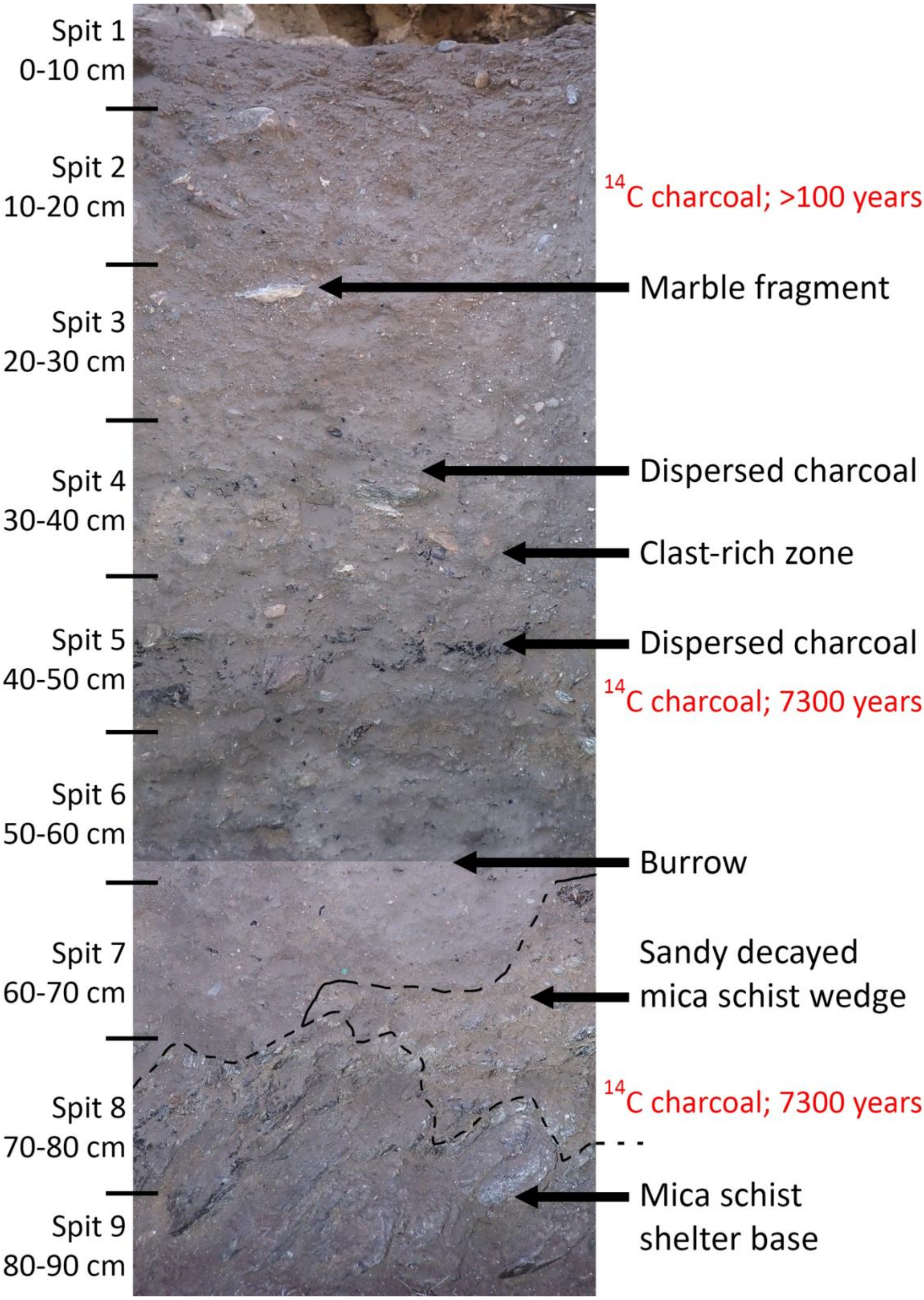

Figure 4. Eastern profile of TP1. Spit numbers and depths are shown on the left vertical axis. Each spit is 10 cm deep. Stratigraphic features are presented on the right side of the profile and discussed in the text together with radiocarbon dates in red text. The upper dashed line represents the upper limit and morphology of the sandy decayed mica schist wedge, most of the upper contact of which has been disturbed by the nearby burrow. The lower dashed line illustrates the contact with the irregular base of the shelter. Note the steeply north dipping stratification of the *in-situ* schist at the base of the profile. Also note that the abrupt colour change at approximately 58 cm depth is a photographic artefact resulting from image stitching, not a stratigraphic contact.

Three accelerator mass spectrometry (AMS) radiocarbon dates were obtained from charcoal fragments recovered *in situ* from TP 1. The uppermost sample, from spit 2 (10-20 cm) returned an age of 130±20 years bp (median probability 88 years cal. BP; UGAMS-65752; SHCal20), while samples from spits 5 (40-50 cm) and 8 (70-80 cm) returned ages of 6.47±0.03 ka bp and 6.41±0.03 ka bp, respectively (median probability 7.36 ka cal. BP and 7.3 ka cal. BP; UGAMS-65753 & 65754; SHCal20) (Fig. 4). The lower two ages are consistent with Sandelowsky's (2004) published dates of ca. 5-8 ka BP. The anomalously young date from the top of the sequence most likely indicates disturbance of the top few centimetres, probably associated with the recent clearance of the dung layer or bioturbation. Further excavation and dating samples are needed to firmly establish the lower extent of the disturbed portion of the sequence.

Lithic technology

The artefacts recovered from Sandelowsky's original excavation are presently stored at the National Museum of Namibia in Windhoek. To the best of our knowledge, no formal analysis was completed after the initial excavation. Unfortunately, at the present time, we have not yet had the opportunity to study these collections in detail, and so the analysis that follows here focuses exclusively on the materials we recovered from the 2023 excavation. As an important caveat, owing to the small sample size and evidence of vertical mixing in the test pit, we here consider the lithics from all spits together as a single assemblage. Future research on the collections will endeavour to understand diachronic and spatial variability at Charé in much more detail.

The lithic raw materials at Charé (Table 1) are dominated by a variety of very high-quality clear quartz. Varying grades of knappable quartz are common in the immediate vicinity of the site, and people seem to have foraged abundant small clasts released from the host rock that had been rolled and/or wind-eroded. Landscape weathering processes leave behind clasts that are very homogenous and glassy with relatively few internal flaws. These clasts are ideal sources of raw material for manufacturing the microlithic blade technology commonly seen through all the spits at Charé (Fig. 5). People may also have knapped clear quartz directly from veins and nodules in the host rock.

Figure 5. Backed crescents were produced on clear quartz.

Table 1. Summary of lithic counts from Charé by lithic class, raw material, and size class.

Lithic class	Raw material	0-20 mm	20-30 mm	30-40 mm	40-50 mm	50-60 mm	60-70 mm	70-80 mm	Total
Blade	Chalcedony	-	-	-	1	-	-	-	1
	Crystal quartz	-	23	3	-	-	-	-	26
	Unknown	-	1	-	-	-	-	-	1
Blade total		**-**	**24**	**3**	**1**	**-**	**-**	**-**	**28**
Core	Crystal quartz	6	25	4	1	-	-	-	36
	Milky quartz	2	1	-	3	-	1	-	7
Core total		**8**	**26**	**4**	**4**	**-**	**1**	**-**	**43**
Debitage (incl. flakes, fragments, and shatter)	Chalcedony	2	-	-	-	-	-	-	2
	Crystal quartz	1452	142	17	9	-	-	-	1620
	Grey chert	2	-	-	-	-	-	-	2
	Milky quartz	-	60	14	5	1	1	-	81
	Quartzite	3	3	3	-	-	-	-	9
	Smoky quartz	-	5	1	-	-	-	-	6
	Unknown	8	1	-	-	-	-	-	9
	Yellow/red chert	1	-	-	-	-	-	-	1
Debitage total		**1468**	**211**	**35**	**14**	**1**	**1**	**-**	**1730**
Tool	Chalcedony	1	-	-	-	-	-	-	1
	Crystal quartz	5	7	5	-	-	-	1	18
	Milky quartz	-	-	1	1	-	1	-	3
	Unknown	2	-	-	-	-	-	-	2
Tool total		**8**	**7**	**6**	**1**	**-**	**1**	**1**	**24**
Grand total		**1484**	**268**	**48**	**20**	**1**	**3**	**1**	**1825**

Milky quartz does appear to have been targeted as a material of secondary importance as well, making up approximately 28% by count and 46% by weight of the lithic material greater than 20 mm in maximum dimension (Fig. 6). Large decortication flakes are relatively common in the milky quartz assemblage, as people likely knapped off the poorer quality outer layers of hydrothermal vein quartz to get to the more homogenous, glassy material inside. A few tools (n=3) are nevertheless also manufactured on milky quartz (Fig. 7). These milky quartz tools tend to be substantially larger in average mass compared to clear quartz (23.3 g versus 4.9 g, respectively). This may suggest a strategy for employing large chunks of milky quartz to manufacture heavy-duty tools like denticulates and large scrapers, while clear quartz was preferred for producing small, delicate tools like microblades and backed crescents.

Figure 6. Flakes produced on clear quartz from spit 5 (40-50 cm).

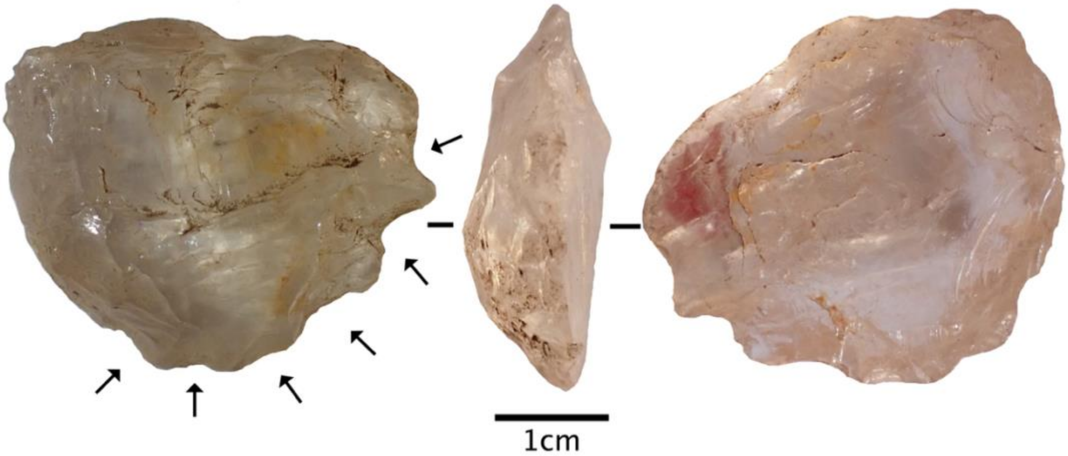

Figure 7. A denticulated scraper on milky quartz where the arrows indicate the areas of retouch.

Raw materials other than varieties of quartz are represented in only very small amounts in the spits at Charé (Fig. 8). These include isolated pieces of silcrete, grey and brown chert, chalcedony, and other yellow, red, cream, pink, and black coloured cherts.

Evidence of microlithic tool production at Charé is abundant throughout the excavated spits, as well as on the surface in and around the rock shelter (Table 2). Throughout all the spits, clear and milky quartz debitage predominates the lithic assemblage, making up about 95% of the lithics by count and 70% of the total lithics by mass. Overall, the lithic assemblage is characteristically microlithic, with small pieces less than 20 mm in maximum dimension and less than 1 g in mass making up about 86% of the material by count and 36% of the material by mass (Fig. 9). Larger pieces of debitage across the range of size classes up to 70 mm in maximum dimension are present but comparatively uncommon.

Figure 8. Non-quartz flakes and debris.

Table 2. Summary of the lithic material from all TP1spits.

Lithic class	Type	Count (n)	Total mass (g)
Blade	Blade	28	39
Blade total		**28**	**39**
Core	Centripetal	3	69
	Multidirectional	35	525
	Unidirectional	5	38
Core total		**43**	**632**
Flakes	Flake (all types)	264	1215
Flakes total		**264**	**1215**
Debitage	Fragment/shatter	1466	738
Debitage total		**1466**	**738**
Tool	Backed crescent	4	4
	Denticulate	4	34
	Notched	1	11
	Other retouch	15	113
Tool total		**24**	**162**
Grand Total		**1825**	**2786**

Cortex is generally characterised by a 'frosted' appearance, as opposed to a well-developed river cortex. Within the debitage greater than 20 mm, 73% of the artefacts (by count) have no cortex remaining on the dorsal side of the flake, about 19% had partial cortex, and only about 2% of the material has full cortical coverage. On a further 6% of the lithics, it is not possible to determine the presence or absence of cortex.

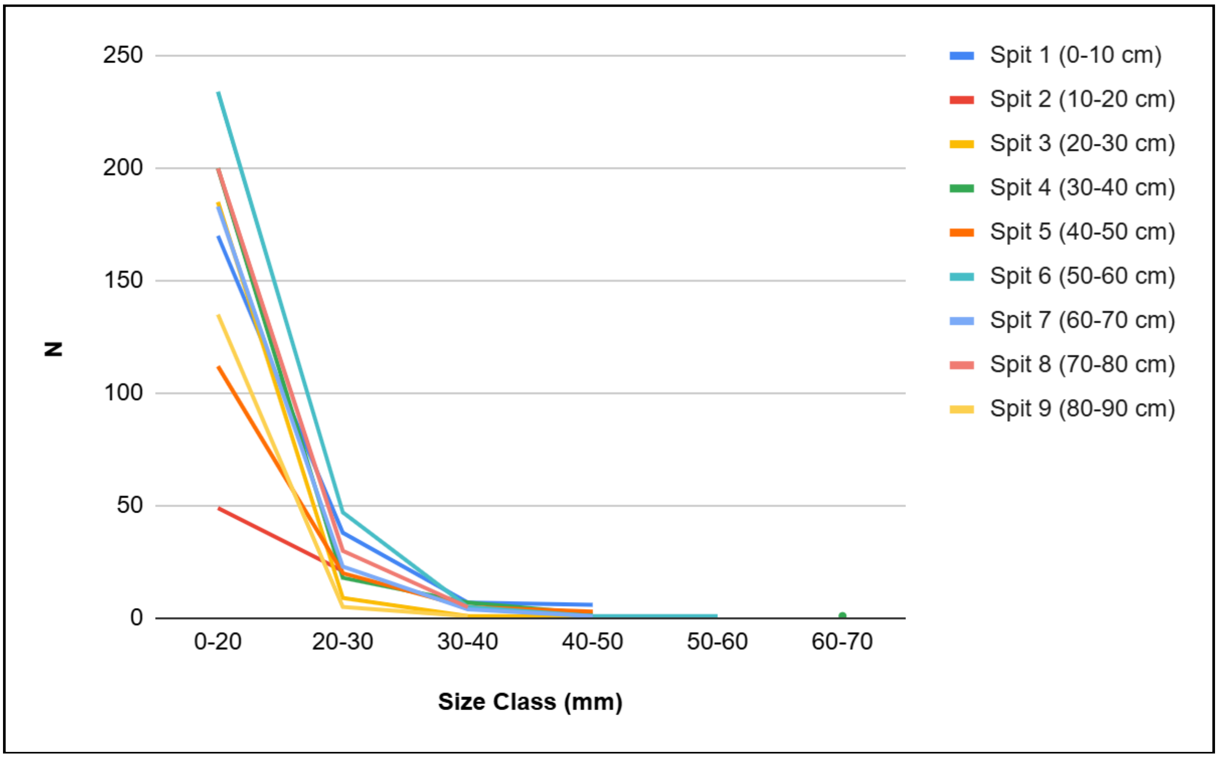

Figure 9. Size classes of lithic artefacts by count per spit at Charé.

A variety of cores (n=43) are represented in the assemblage from Test Pit 1 at Charé. Overall, they tend to be very small, averaging only 14.7 g in mass with individual specimens ranging from 2-194 g. All cores are exclusively made on quartz, with 84% knapped on clear quartz clasts and the remaining 16% on milky quartz. Milky quartz cores are more massive on average than clear quartz cores, at 20.8 g[1] versus 8.7 g, respectively. In addition, it is notable that none of the milky quartz cores show evidence of blade production techniques. This and other evidence (see below) may indicate a preference for using milky quartz to produce larger flake tools in comparison to clear quartz.

Cores with multidirectional flake removals are the most common type, with 35 examples recovered in the sample. The average mass of multidirectional cores is close to the average for cores as a whole, at about 15 g, and cores range in size from less than 20 mm to about 70 mm in maximum dimension. Cortex is present on 40% of the multidirectional cores. This suggests people were frequently employing small clasts of clear quartz that had been scoured by aeolian processes and which likely derive from surface gravels in the vicinity of Charé (see below for further discussion). Unidirectional microblade cores are much less common, with only five examples recovered. These pieces show a somewhat more restricted size range from about 20 to 40 mm in maximum dimension and a small mass, averaging 7.6 g per core. In one example, a clear quartz flake was itself used as a core, with three removals struck in parallel on the ventral face. Finally, three examples of microlithic centripetal cores were also recovered from Charé, with a size range from 30 to 50 mm in maximum dimension and an average mass of 23 g. There is, however, no evidence of these cores being employed to produce miniature *Levallois* flakes as was seen at the site of Erb Tanks, approximately 150 km to the northwest of Charé (Marks 2018). Notably, we did not recover any cores that show features consistent with the bipolar reduction strategies commonly associated with the southern African LSA (e.g., Mitchell 2000; Ambrose 2002). While the high proportion of shatter and fragments in the assemblage suggests it is likely that a bipolar technique was employed to reduce such small cores (see Eren et al. 2013), we cannot, at this point, determine this conclusively.

Formal tools and retouched flakes are relatively uncommon in the assemblage (n=24). Tools range from 4 to 8 mm backed crescents to large, retouched flakes. Flakes tend to be retouched along the lateral margins, with most showing straight to slightly convex edge shapes and from 12 to 52 mm of total retouched edge length per flake. Intensive, steep retouch and light (non-invasive) shallow retouch are about equally represented in the tool assemblage, indicating that some pieces were resharpened while others were likely discarded after a brief period of use. Denticulation is seen on four examples, with these pieces tending to be somewhat larger and more massive than other tool types.

Four examples of very small, backed crescents characteristic of the LSA Wilton industry (e.g., Deacon 1984) were found throughout the layers at Charé. These pieces are all knapped on clear quartz and range from 10-20 mm in length, 4-8 mm in width, and only 2-3 mm in thickness. These tools are commonly interpreted as more or less standardised and replaceable pieces intended for mounting with mastic in a series on bone or wood armatures and employed variously as cutting tools, sickles, drills, arrow tips, and barbs for spears (e.g., Mitchell 1988; Goldstein & Shaffer 2017; Groman-Yaroslavski et al. 2020). None of the backed crescents we recovered at Charé show evidence of use wear, mastic residue, or additional retouch, and therefore may represent pieces discarded or lost before use.

Finally, 28 examples of unretouched microblades made on clear quartz were also recovered from the test pit. This, however, is likely a significant underestimation of the total number of blades in the assemblage since many pieces with blade-like proportions are less than 20 mm in length and therefore grouped with the debitage and analysed *en masse*. As a likely focus of microlithic reduction strategies, these small pieces will be a target of further detailed analysis. The blades that were studied, however, vary from 20 to 50 mm in length and from less than 1 to about 4 g in mass. About 29% preserve some cortex on the dorsal surface, which suggests they originate from relatively early in the sequence of blade reduction.

[1] One outlier weighing 194 g was removed from the milky quartz core sample for this comparison.

Based on these characteristics and the dates, the materials recovered from Charé so far appear to be most closely linked with the Wilton technocomplex known from throughout southern Africa after ca. 7.8 ka. The number of formal tools is low, however, and it is possible that the assemblage may be more associated with the final Later Stone Age or ceramic final Later Stone Age (cf. Lombard et al. 2022). However, it is important to emphasise the overlap between the components of these late industries and the difficulty in making a definitive attribution to a particular technocomplex based on a relatively small sample size. Furthermore, the relatively late dates most likely preclude the Robberg technocomplex and our sample lacks any of the distinctive components typical of most Oakhurst assemblages (e.g., adzes, endscrapers, or polished bone tools) (Lombard et al. 2022). Therefore, a Wilton attribution seems to be the most parsimonious identification.

In summary, the lithics at Charé paint a picture of intensive core reduction and tool manufacture occurring on site throughout the entire period of occupancy at the shelter and which is of a manner broadly typical for LSA assemblages in this part of Namibia (Sandelowsky 1977; McCall et al. 2011; Marks 2018). It is worth noting that the excavated assemblage described here is only a tiny fraction of a total assemblage of lithics likely numbering in the hundreds of thousands that can be seen in and around the shelter. Further research will focus on a detailed understanding of variability through time in comparison to other sites.

Non-lithic artefacts

Ostrich Eggshell: From 5 to 32 g of fragmentary ostrich eggshell (OES) was recovered from each of the excavated layers at Charé. Some of this material undoubtedly results from the consumption of ostrich eggs at the shelter, but, as at many other LSA sites in the Namib, OES was also used for the production of ornaments and containers (Sandelowsky 1977; McCall et al. 2011; Wadley 2012; Marks 2018). Forty OES beads in various stages of production were recovered from each spit in the test pit (Fig. 10; Table 3). These data suggest that bead manufacture occurred on-site throughout the period of occupation of Charé, and appears to follow the manufacturing strategy that Orton (2008) termed ‘pathway 1’, where bead blanks are drilled before trimming and rounding.

Finished beads are of a highly standardised shape and size, averaging 4.36 mm in diameter (SD=0.95), with the substantial majority about 4 mm in diameter and with a 2-3 mm perforation through the centre. However, three slightly larger (6-8 mm) finished beads were also observed in the assemblage. Unfinished beads included pieces that had been roughly shaped before drilling (stage I), partially drilled pieces without full perforation of the shell (stage II), completely drilled but untrimmed pieces (stage III), drilled and trimmed but unrounded pieces (stage V), and finished beads (stage VII).

Copper: A single thin copper ring was recovered from spit 2 (10-20 cm depth) (Fig. 10). The piece is approximately 11 mm in diameter, 2 mm wide, and 1 mm thick, with sharpened ends coming together to make a small opening. This piece is of unknown function but may have been an ornament of some kind.

Pottery: Two small sherds of low-fired, grit-tempered pottery were recovered from spit 3 (20-30 cm) and 6 (50-60 cm). Both pieces show smoothing on the interior surface, with the outer surface left rough. The piece from spit 3 (20-30 cm) (Fig. 10) shows three rows of 4 mm long punctate decoration. The age and specific classification of this pottery is currently unclear, and it is important to consider that decorated ceramic LSA pottery is highly variable and stylistically localised (Sadr 2008). With that caveat, we tentatively suggest that it likely corresponds to Sadr and Sampson’s (2006) ‘thin’ ware category (Sadr & Sampson 2006; Sadr 2008), dating to no earlier than 1.8 ka based on comparisons to similar decorated wares known from northern Namibia (Vogelsang & Eichhorn 2011). Pottery from this period in Namibia is associated with either the onset of the southern African Neolithic (Sadr 2003), the migration of Khoe pastoralists into the region (e.g., Smith 2022), or through both processes (Sadr 2015). Given the much older radiocarbon dates from elsewhere in the spit, it is very likely that the pottery in spit 6 (50-60 cm) is intrusive and indicates some degree of vertical movement of artefacts within the stratigraphic profile, potentially as part of burrow fills.

Ground stone: Two small fragments of ground stone appeared in spits 3 (20-30 cm) and 4 (30-40 cm). Both examples are made of basalt or dolerite, a raw material that likely would have had to have been transported to the site from other regions of the Namib, further to the northwest. Though each fragment is small, neither shows evidence of being used for processing ochre or other pigments. Their use is therefore unknown, but they may have played a role in processing grass seeds or other subsistence activities.

Bone: Faunal remains from Charé are well preserved but highly fragmented and have not yet been subjected to detailed identification or analysis. From 5 to 20 g of bone fragments were recovered from each spit in the test pit, for a total of 91 g. At this point, we can only say that the bones represent a range of unknown small to medium-sized animals. The pieces tend to show sharp, unrounded, greenstick fractures, indicating they have not been heavily eroded by transport or weathering processes. It is therefore likely that this material represents debris from marrow extraction activities. However, further identification and taphonomic analysis of faunal remains will be a priority for future research at Charé.

Leather: No leather artefacts were recovered *in situ* from Test Pit 1. Several years ago, however, the landowner found a leather object lying on the surface within the rock shelter (Fig. 11). The object is approximately 30 cm long and roughly cone-shaped, with leather stitching on one of the sides and what appears to be the remains of a carrying strap. We have tentatively identified the object as either a sheath or a small quiver, but we are not aware of any similar pieces to provide a comparison. Its function, therefore, remains unclear. As a surface find, the age is also unknown. Owing to its relatively good preservation, it is possible that it was originally buried and uncovered when the dung floor at the site was cleared by workmen in the early 2000s.

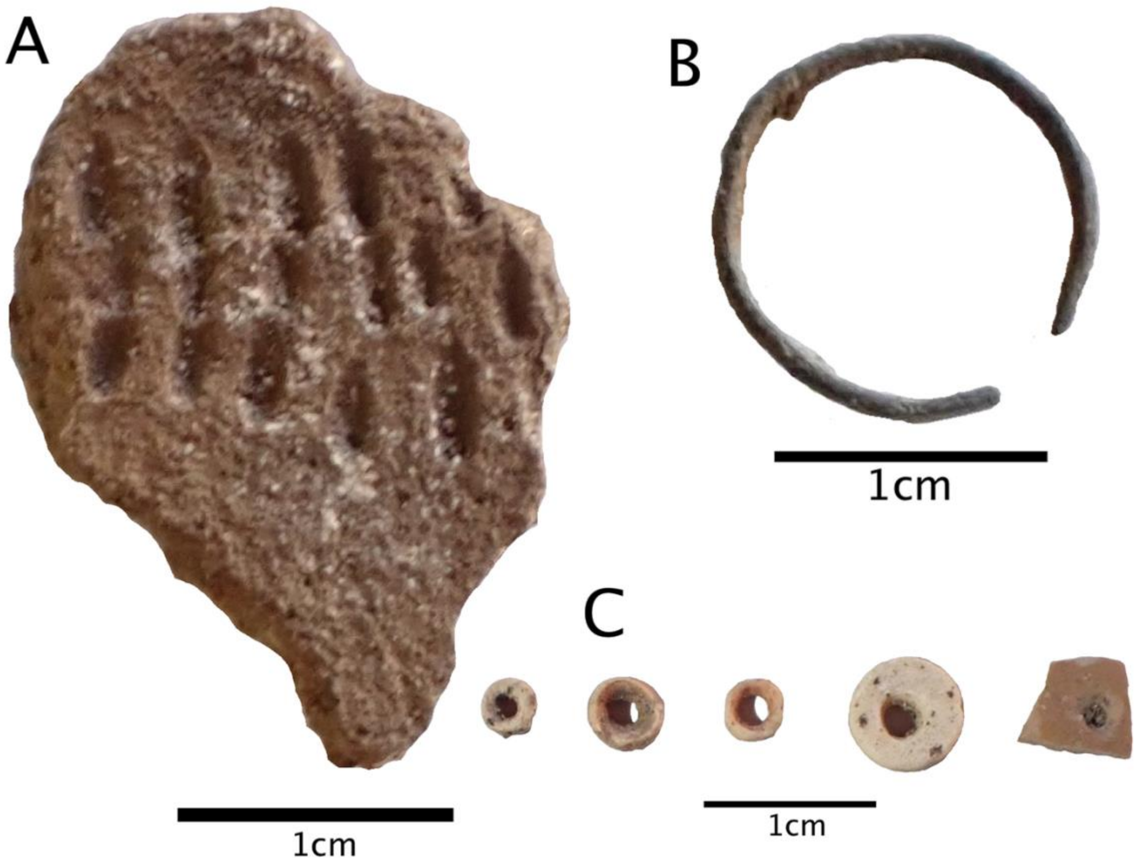

Figure 10. Artefacts from Chare; punctated ceramic (a), copper ring (b), and OES beads in several stages of production (c).

Table 3. Stages of OES bead manufacture at Charé following Orton's (2008) classification scheme. In each stage (I, II, etc.) of manufacture, the letter (a) denotes a complete bead or bead blank, while (b) denotes a fragment.

Spit No. & Depth (cm)	I	IIb	IIIa	IIIb	Vb	VIIa	VIIb	Total
1 (0-10)	-	-	1	-	-		-	**1**
2 (10-20)	-	-	-	-	-	3	1	**4**
3 (20-30)	-	-	1	1	-	4	-	**6**
4 (30-40)	-	-	1	-	-	4	-	**5**
5 (40-50)	-	-	1	1	-	4	-	**6**
6 (50-60)	-	-	2	-	-	4	-	**6**
7 (60-70)	-	-	-	-	-	3	-	**3**
8 (70-80)	1	-	-	-	1	1	1	**4**
9 (80-90)	-	1	1	1	-	2	-	**5**
Total	**1**	**1**	**7**	**3**	**1**	**25**	**2**	**40**

Figure 11. Leather sheath or small quiver (left) discovered by the property owner in the early 2000s on the shelter's surface. A close-up view of the stitching is visible in the right image.

5. Discussion and conclusions

From the exposed test pit reported here, we can tentatively correlate the three lower units identified in Sandelowsky's (2004) Charé schematic stratigraphy to the sediments exposed in the test pit. The stratigraphic features exposed in the profile and nature of the sediments are indicative of mixed deposits, e.g., dispersed charcoal and vegetation, absence of stratification, clasts with isotropic fabrics, burrows, high degrees of particle fragmentation, and rounded particles. This is not surprising given the wide range of bioturbative processes observed on the shelter floor, and it may be that the deposits have seen long-term, multigenerational post-depositional modification. Even if there has been significant mixing of sediments (the extent of which we do not yet know), we consider the presence of two samples of charcoal dating to the early Holocene as being indicative of the artefacts being of a similar age. In the future, systematic dating of materials throughout the sequence will clarify the stratigraphic coherence of the deposits. Although no clear combustion features are visible in the TP1 profile and bioturbation has seemingly homogenised sediments extensively, subtle, potentially remnant, stratigraphic features may suggest the potential for better preservation in other areas of the shelter. Discerning relative proportions of geogenic, biogenic and anthropogenic inputs through the sequence, or autogenic versus allogenic geogenic inputs, may be challenging given the probability of dispersion of at least the matrix-sized components in the deposits. Sedimentological and microstratigraphic analyses will help determine the finer scale processes at work in the shelter, and it may be worth applying a broad geochemical sampling method to help identify undetected stratigraphic contacts (e.g., Reidsma et al. 2021).

AMS radiocarbon dates suggest lower areas contain older components, but the presence of ceramics below a 7.3 ka sample location may suggest vertical movement of sediments. That said, discrete charcoal lenses are present at various points in the sequence, so it may be that vertical movements are localised. Better preserved deposits may be present within the narrow area inside the dripline. Deeper and older deposits may also be preserved if the shelter base dips westwards, away from the dripline. Further excavations will clarify the nature and lateral extent of the visible stratigraphic features and explore the depth, integrity and formation history of the deposits. The subsurface bedrock of the shelter at Charé is likely irregular in shape, and we believe that future, more extensive excavations at the site may yet reveal deeper, more intact layers.

If our dates of 7.3 ka and Sandelowsky's previous dates of 5-8 ka represent the age of some deposits at the shelter, the main phase of occupation at Charé appears to occur during a relatively humid period of the Holocene in the Namib extending from roughly 7 to 8 ka, and prior to the onset of regional hyper-arid conditions at ca. 5 ka that continued until the Late Holocene (Srivastava et al. 2006). Based on a large sample of radiocarbon dates taken from sites throughout the country, Kinahan (2022) suggests that human occupations nevertheless persisted in the central Namib after ca. 5 ka but may have started to aggregate around isolated granitic inselbergs with comparatively reliable water sources. In this regard, the group/s occupying Charé demonstrate an intentionality in their choice of location, near an abundant lithic raw material source, at least an ephemeral water source, and with beneficial views of the local landscape.

In terms of patterns of raw material exploitation, most of the lithic collections at Charé are knapped on clear quartz, with only small amounts of other raw materials present. It is notable that retouched flakes and denticulates at Charé tend to be larger than the average size for the collections as a whole, and relatively more of these larger tools are produced on milky quartz as opposed to the more common clear quartz. These 'heavy-duty' macrolithic tools suggest that not all LSA lithics over the Holocene in the Namib can be neatly categorised as microlithic or 'mode 5' (cf. Ossendorf 2017; Kinahan 2022). This is an important point to keep in mind for future research in the region.

We hypothesise that the large amounts of debitage and relatively low retouch rates at Charé can probably be explained by the high local availability of good quality quartz lithic raw material (e.g., Andrefsky 1994). Furthermore, it is likely that most of the formal tools manufactured on site were eventually transported and discarded during foraging trips elsewhere on the landscape. At present, however, we currently lack the sample size and analytical resolution to draw more detailed conclusions surrounding raw material economy and lithic technological organisation at Charé. Re-analysing

Sandelowsky's original collections and conducting a finer-grained analysis of the new collections may yield better data to address this in the future.

Relatively little is known about the subsistence practices of early to middle Holocene humans in the Namib; data from a limited number of other sites in the region suggest a broad resource base ranging from small hyrax to large antelope, as well as a diverse set of plant foods, but our understanding of how these patterns varied spatiotemporally remains poor (e.g., Sandelowsky 1977; Vogelsang & Eichorn 2011; Pleurdeau et al. 2012; Ossendorf 2017; Kinahan 2022). The current dates from Charé suggest that much of the sequence pre-dates the ca. 2 ka appearance of pastoralism and of dairying by ca. 5000 years in this region of southern Africa (Kinahan 1991, 2022; Guillemard 2020). However, the presence of pottery suggests that a significant transition to new economic modalities may be captured at some point in the upper portion of the Charé sequence.

Future analyses and further excavation, as well as identification of the faunal material, may yet reveal shifts in the kinds of plants and fauna being exploited or the appearance of domesticated animals. At this point, the hypothesis that lithic tool forms and other aspects of material culture did not change markedly during Late Holocene periods of economic change in the Namib cannot be rejected (Kinahan 1991, 2022; Smith & Jacobson 1995; Pleurdeau et al. 2012). As previously discussed earlier in this paper, this may suggest that food-producing practices such as pastoralism and dairying were incorporated into long-term subsistence patterns based on hunting and gathering and are archaeologically poorly represented. Further research on sites in the Namib, such as Charé, will undoubtedly help resolve some of these long-standing questions.

Acknowledgments
The authors would like to thank the landowners, Boseman and Yuri Davids, for allowing us access to the site and their efforts to preserve the site. In addition, the authors thank Professor Alex Schoeman for her advice regarding description and attribution of the ceramic artefacts. This research was conducted with permission from the National Commission on Research, Science and Technology of Namibia (Permit RPIV01042026) and the National Heritage Council of Namibia (Permit 13/2023).

References

Ahler, S.A. 1989. Mass analysis of flaking debris: Studying the forest rather than the trees. In: Henry, D. & Odell, G. (eds) Alternative Approaches to Lithic Analysis: 85-118. Washington, DC: Archaeological Papers of the American Anthropological Association.

Ambrose, S. 2002. Small things remembered: Origins of early microlithic industries in Sub-Saharan Africa. In: Elston, R. & Kuhn, S. (eds) Thinking Small: Global Perspectives on Microlithic Technologies: 9-29. Washington, DC: Archaeological Papers of the American Anthropological Association.

Andrefsky, W. 1994. Raw-material availability and the organization of technology. American antiquity, 59(1): 21-34.

Andrefsky, W. 2005. Lithics: Macroscopic Approaches to Analysis. Second Edition. Cambridge: Cambridge University Press.

Becker, T. & Ledru, P. 2016. The Hakos-Rostock Nappe Complex: A case study of alpine-type thrust tectonics within the Southern Margin Zone of the Damara Orogen, Namibia. Communications of the Geological Survey of Namibia, 17: 17-50.

Deacon, J. 1984. Later Stone Age peoples and their descendants in southern Africa. In: Klein R.G. (ed.) Southern African Prehistory and Paleoenvironments: 221-328. Rotterdam: Balkema.

Eren, M.I., Diez-Martin, F. & Dominguez-Rodrigo, M. 2013. An empirical test of the relative frequency of bipolar reduction in Beds VI, V, and III at Mumba Rockshelter, Tanzania: Implications for the East African Middle to Late Stone Age transition. Journal of Archaeological Science, 40 (1): 248-256.

Goldstein, S.T. & Shaffer, C.M. 2017. Experimental and archaeological investigations of backed microlith function among Mid-to-Late Holocene herders in southwestern Kenya. Archaeological and Anthropological Sciences, 9(8): 1767-1788.

Groman-Yaroslavski, I., Chen, H., Liu, C., et al. 2020. Versatile use of microliths as a technological advantage in the miniaturization of Late Pleistocene toolkits: The case study of Neve David, Israel. PLoS ONE, 15(6): e0233340.

Guillemard, I. 2020. Equating language, genes and subsistence? The appearance of herding in southern Africa. Azania: Archaeological Research in Africa, 55(1): 97-120.

Hoffmann, K.H. 1983. Lithostratigraphy and facies of the Swakop Group of the southern Damara Belt, SWA/Namibia. In: Miller, R. (ed.) Evolution of the Damara Orogen of South West Africa/Namibia: 43-63. Special Publication of the Geological Society of South Africa.

Hoffmann, K.H. 1989. New aspects of lithostratigraphic subdivision and correlation of late Proterozoic to early Cambrian rocks of the southern Damara Belt, and their correlation with the central and northern Damara Belt and the Gariep Belt. Communications of the Geological Survey of Namibia, 5: 59-67.

Hogg, A.G., Heaton, T.J., Hua, Q., et al. 2020. SHCal20 Southern Hemisphere calibration, 0–55,000 years cal BP. Radiocarbon, 62(4): 759-778.

Kinahan, J. 1991. Pastoral Nomads of the Namib Desert: The People History Forgot. Windhoek: Namibia Archaeological Trust.

Kinahan, J. 2022. Namib: The archaeology of an African Desert. Windhoek: University of Namibia Press.

Lombard, M., Bradfield, J., Caruana, M.V., et al. 2022. The Southern African Stone Age sequence updated (II). The South African Archaeological Bulletin, 77(217): 172-212.

Marks, T.P. 2018. Bedtime for the Middle Stone Age: Land use, strategic foraging, and technological organization and the end of the Pleistocene in the Namib Desert, Namibia. Doctoral Thesis. Iowa City: University of Iowa.

McCall, G.S., Marks, T.P., Thomas, J.T., et al. 2011. Erb Tanks: A Middle and Later Stone Age Rock Shelter in the Central Namib Desert, Western Namibia. Paleoanthropology, 2011: 398-421.

Mitchell, P. 1988. The late Pleistocene early microlithic assemblages of southern Africa. World Archaeology, 20(1): 27-39.

Mitchell, P. 2000. The organization of Later Stone Age lithic technology in the Caledon Valley, Southern Africa. African Archaeological Review, 17: 141-176.

Orton, J. 2008. Later Stone Age ostrich eggshell bead manufacture in the Northern Cape, South Africa. Journal of Archaeological Science, 35 (7): 1765-1775.

Ossendorf, G. 2017. Two Holocene Later Stone Age stratigraphies from the Sesfontein area, northwestern Namibia. Azania: Archaeological Research in Africa, 52(2): 233-266.

Pleurdeau, D., Imalwa, E., Détroit, F., et al. 2012. ‘Of sheep and men’: Earliest direct evidence of caprine domestication in southern Africa at Leopard Cave (Erongo, Namibia). PLoS ONE, 7(7): e40340.

Porada, H. 1985. Stratigraphy and facies in the Upper Proterozoic Damara Orogen, Namibia, based on a geodynamic model. Precambrian Research, 29(1-3): 235-264.

Reidsma, F.H., Sifogeorgaki, I., Dinckal, A., et al. 2021. Making the invisible stratigraphy visible: A grid-based, multi-proxy geoarchaeological study of Umhlatuzana Rockshelter, South Africa. Frontiers in Earth Science, 9: 664105.

Sadr, K. 2003. The Neolithic of southern Africa. The Journal of African History, 44: 195-209.

Sadr, K. 2008. An ageless view of first millennium AD southern African ceramics. Journal of African Archaeology, 6: 103-129.

Sadr, K. 2015. Livestock first reached southern Africa in two separate events. PLoS ONE, 10: e0134215.

Sadr, K. & Sampson, C.G. 2006. Through thick and thin: Early pottery in southern Africa. Journal of African Archaeology, 4: 235-252.

Sandelowsky, B.H. 1977. Mirabib – an archaeological study in the Namib. Madoqua, 1977(4): 221-253.

Sandelowsky, B.H. 2004. Archaeologically Yours. A Personal Journey into the Prehistory of Southern Africa/Namibia. Windhoek: Kuiseb-Verlag.

Smith, A.B. 2022. First people: The lost history of the Khoisan. Johannesburg: Jonathan Ball Publishers.

Smith, A.B., & Jacobson, L. 1995. Excavations at Geduld and the appearance of early domestic stock in Namibia. The South African Archaeological Bulletin, 50(161): 3-14.

Srivastava, P., Brook, G.A., Marais, E., et al. 2006. Depositional environment and OSL chronology of the Homeb silt deposits, Kuiseb River, Namibia. Quaternary Research, 65(3): 478-491.

Stratford, D. 2023. Site formation processes in caves and rockshelters. In: Efthymia, N. & Rehren, T. (eds) Encyclopedia of Archaeology. Second Edition: 35-43. Cambridge: Academic Press.

Viles, H. 2008. Weathering and breakdown of mica schist on sand ramps, Cunene Valley, NW Namibia: Implications for understanding the tempo of geomorphic change. Geophysical Research Abstracts, 10: 07477.

Vogelsang, R. & Eichhorn, B. 2011. Under the Mopane Tree: Holocene Settlement in Northern Namibia. Köln: Heinrich Barth Institut.

Wadley, L. 2012. Revisiting Later Stone Age collections from Big Elephant Shelter, Namibia. The South African Archaeological Bulletin, 67(195): 101-107.