Southern African Field Archaeology
2023 Vol. 18: Article 2667
Research report (peer-reviewed): Received August 2023; Revised October 2023; Published October 2023
DOI: https://doi.org/10.36615/safa.18.2667.2023

ISSN 1019-5785
ISSN 2789-1844

A PRELIMINARY REPORT OF THE EXCAVATION AT SPITZKLOOF D ROCKSHELTER, NAMAQUALAND, SOUTH AFRICA

Courtneay Hopper [a, b, c, *] & Genevieve Dewar [a, b, d]

[a]Department of Anthropology, University of Toronto Scarborough, M1C-1A4, Toronto, Canada
[b]School of Environment, University of Toronto, M5T-1P5, Toronto, Canada
[c]Department of Anthropology, University of British Columbia, V6T-1Z1, Vancouver, Canada
[d]Rock Art Research Institute, School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand, Private Bag 3, Wits 2050, Johannesburg, South Africa
Corresponding author email: courtneay.hopper@ubc.ca

ABSTRACT

This paper describes the first excavations of Spitzkloof D rockshelter located in the semi-arid desert of northern Namaqualand, South Africa. The site is in a dry river valley 30 km south of the Orange River, which currently acts as a lifeline for pastoralists with mixed sheep and goat herds. A surface survey of the site revealed pottery, lithics, domesticate remains, ostrich eggshell (OES) fragments and jewellery, glass beads and iron fragments. The stratigraphy is complex reflecting multiple occupations with six layers consisting of large hearths, ash deposits, and multiple pits, some with potential votive (faunal) offerings in their base. Faunal analysis reveals a broad subsistence strategy consisting of low-intensity sheep-keeping combined with the hunting of wild species found on the landscape today. The presence of *Equus zebra*, a locally extinct water obligate species, suggests occupation during a climatic period that was more humid than today. Radiocarbon dates from the upper layers confirm a Little Ice Age occupation between AD 1667-1936, when the region was cooler and wetter, and a peak in radiocarbon dates indicates a population pulse in the region. Glass trade beads, iron implements, OES beads, as well as fish remains and a limpet shell, potentially indicate that the people occupying Spitzkloof D were part of an extensive trade/interaction network. Future analysis will include increasing sample sizes through continued excavation, detailed lithic analysis, and further radiocarbon dating.

Keywords: Namaqualand, Later Stone Age, Little Ice Age, interaction, hunter-herders

1. Introduction

Recent excavations at Spitzkloof D in Namaqualand, South Africa (Fig. 1), were conducted to examine rare herder archaeological residues noted during a surface survey. Although herders have an enduring presence in the region (e.g., Lander & Russell 2018; Lombard & Badenhorst 2019; Lombard et al. 2021), and Namaqualand is a suggested western gateway for the earliest introduction of sheep to the rest of the country at 2105±65 BP (OxA-386) (Sealy & Yates 1994; Coutu et al. 2021), archaeological evidence confirming their presence in the region is rare. Only four research projects have been conducted in Namaqualand so far (Webley 1992; Dewar 2008; Orton 2012; Steele et al. 2016; Dewar & Stewart 2022) while the Archaeology Contracts Office (ACO) has conducted salvage excavations at numerous sites, primarily in the coastal mining areas of the region (Halkett & Hart 1997; Halkett 2001; Orton & Halkett 2006; Halkett & Dewar 2007). To date, there have only been a handful of sites containing domesticate remains, with Jakkalsberg and Spoegrivier Cave providing the largest samples (e.g., Webley 1992; Brink & Webley 1996; Webley 2002). The excavation and analysis of Spitzkloof D rockshelter contributes to this record by offering new data to a region with large temporal and spatial gaps as well as situating its significance within the broader context of Namaqualand archaeology.

2. Environmental background of Namaqualand

Namaqualand falls within the winter rainfall zone (WRZ) of western southern Africa, which stretches from southwestern Namibia to Cape Agulhas and extends inland to the western margin of the Great

Escarpment (Chase & Meadows 2007). The Namaqualand coastal desert receives >66% of its precipitation during the austral winter months with an average annual rainfall of 150 mm, ranging from ~50 mm in the north and up to ~300 mm in the south (Cowling et al. 1999; Chase & Meadows 2007; MacKellar et al. 2007). Namaqualand's average annual temperature is 17°C but there are marked seasonal and diurnal extremes ranging from −6°C to 35°C (Cowling et al. 1999; Dewar 2008).

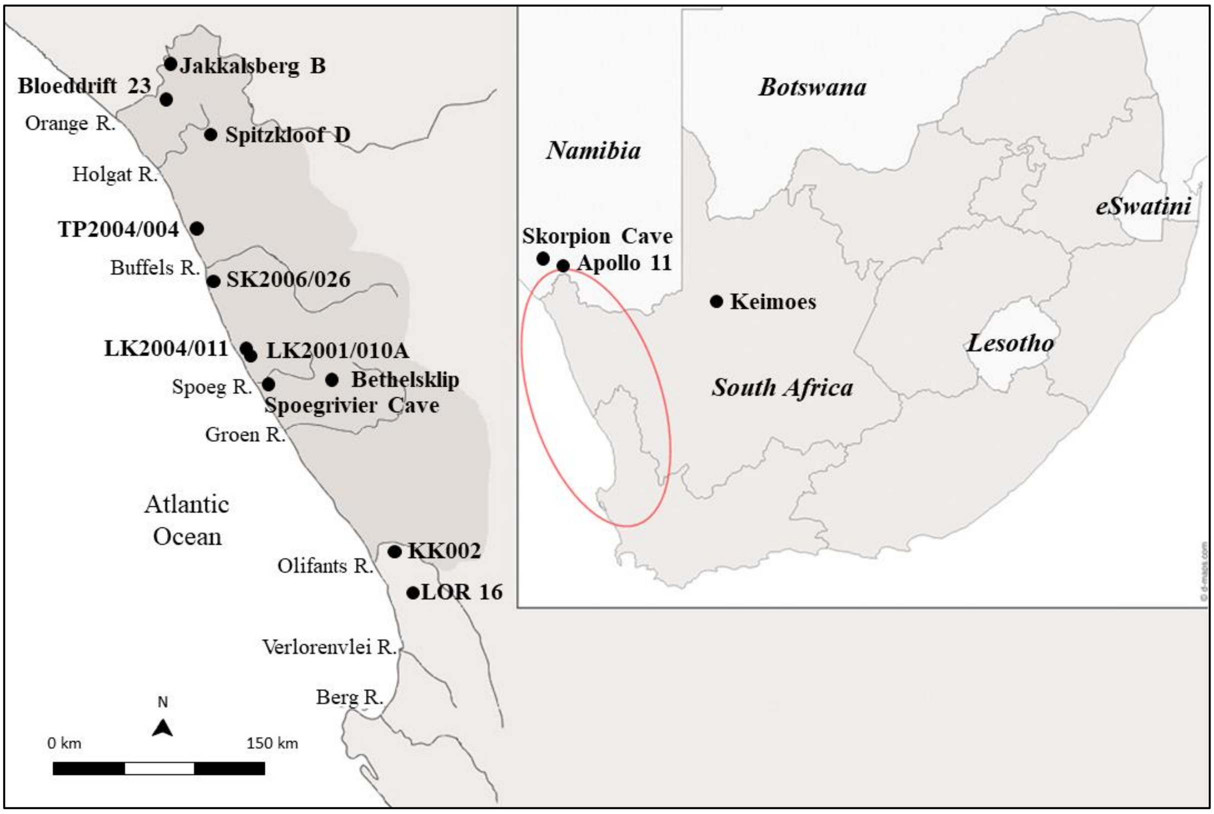

Figure 1. Map of southern Africa (inset), with the red oval indicating where the enlarged portion of the map is focused. This enlarged area shows Namaqualand (darker shade) and the approximate location of sites mentioned in the text.

Namaqualand (Fig. 1) is bounded by the only flowing rivers in the region, the Orange-Gariep River in the north and the Olifants River to the south. Although there are six perennial rivers in the region, they are typically dry throughout the year leaving around 200 km in between with no continuous/reliable water source. Coastal fogs contribute much needed precipitation, but local flora and fauna consist of arid adapted, non-obligate water drinking, species (Rutherford et al. 2006; Dewar 2008). The vegetation is predominated by dwarf leaf-succulent shrubs and classified within the Namaqualand Coastal Duneveld floral unit of the Succulent Karoo Biome (Rutherford et al. 2006). Members of the family Asteraceae and Aizoaceae are particularly prominent, as are Euphorbiaceae. The dominant vegetation type is Strandveld, which includes many low succulents predominated by Mesembryanthemacae. Although trees are rare, they can be found in the dry riverbeds and include *Vachellia karroo* (*Acacia karroo*) and *Rhus viminalis* (Acocks 1979). The wild fauna of archaeological interest consists of ostrich (*Struthio camelus*), tortoises (*Chersina angulate* and *Psammobates tentorius*) and small to medium/large ungulates, including steenbok (*Raphicerus campestris*), klipspringer (*Oreotragus oreotragus*), grey duiker (*Sylvicapra grimmia*), springbok (*Antidorcas marsupialis*), and gemsbok (*Oryx gazella*) (Dewar, 2008). Domesticate fauna in the region today includes sheep (*Ovis aries*), goats (*Capra sp.*), cattle (*Bos taurus*), donkeys (*Equus asinus*), and dogs (*Canis lupus familiaris*).

3. Location and excavation

Spitzkloof D rockshelter is in the Spitzkloof River valley ~40 km east from the Atlantic Ocean and ~30 km south of the Orange River (Fig. 1). Spitzkloof D (28°51'47.40" S, 17° 4'39.16" E) is ~250 m northeast from the shelters Spitzkloof A and B, which contain archaeological materials dating to the

Middle and Later Stone Ages (Dewar & Stewart 2012, 2016a, b; Dewar et al. 2023) and are eroded from a folded outcrop of quartzite from the Stinkfontein subgroup (Frimmel 2003). About 4 m in front of Spitzkloof D, and ~3 m below the shelter's mouth, is a dry tributary of the Holgat River (Fig. 2).

Figure 2. Photograph facing northeast of Spitzkloof D with the dry tributary of the Holgat River in the foreground (scale bar=1 m).

The drip-line of Spitzkloof D is 8 m long and the shelter is 5 m deep. During the initial surface survey conducted in 2017, 457 artefacts were recorded and mapped over 7 m^2 of the shelter floor. These surface finds included potsherds, lithics, ostrich eggshell (OES) beads, as well as both wild and domesticate faunal remains. These initial findings suggested that Spitzkloof D was a herder site and thus future excavations were planned.

Excavation began in July 2019 by establishing a 4 m^2 grid in an 'L' shape (Fig. 3). The four squares were excavated following the single context recording system (Museum of London Archaeology Service 1994), where context (stratigraphic unit) changes were based on colour, texture, and inclusions, while 3 cm spits were used for thicker contexts. Each square or excavation unit had its own context number (Table 1), where excavation unit H10 contained contexts beginning with 10xx, excavation unit H11 contained contexts beginning with 11xx, H12 contained contexts beginning with 12xx, and G12 contained contexts beginning with 13xx. Furthermore, to ensure that context numbers never overlapped, they started in the thousands. Sediment volume was measured using black 10 L buckets to the nearest 10% of a bucket. Sediments were sieved through 1.5 mm mesh to collect small artefacts. The majority of the archaeological material was sorted on-site and the rest was sorted with the help of Dolores Jacobs in the Department of Archaeology at the University of Cape Town. The deepest excavation unit, G12, was excavated to 38 cm without reaching bedrock. The following is a description of the stratigraphic sequence.

Layer 1

This layer consists of one context of surface material with an average depth across the site of 9.5 cm (Table 1). This red brown sandy silt layer with small angular inclusions consisted primarily of windblown sand, plant material, and sheep dung. There is evidence for one major rockfall event partially impacting excavation unit H12 (Fig. 3). In excavation unit H10, layer 1 contains a large modern hearth with remnants of ash and charcoal (hearth 1) in its western side. In H11, this layer consists of red gritty sand with botanical remains, roof spall inclusions, and loose ashy sediment. Excavation unit H12 also contains red sand, but with charcoal flecks likely blown over from hearth 1. In excavation unit G12 there are also old newspaper fragments. Overall, pottery, OES fragments and beads, four beads (three made of glass and one made of a currently unknown material), and faunal remains were noted in this layer.

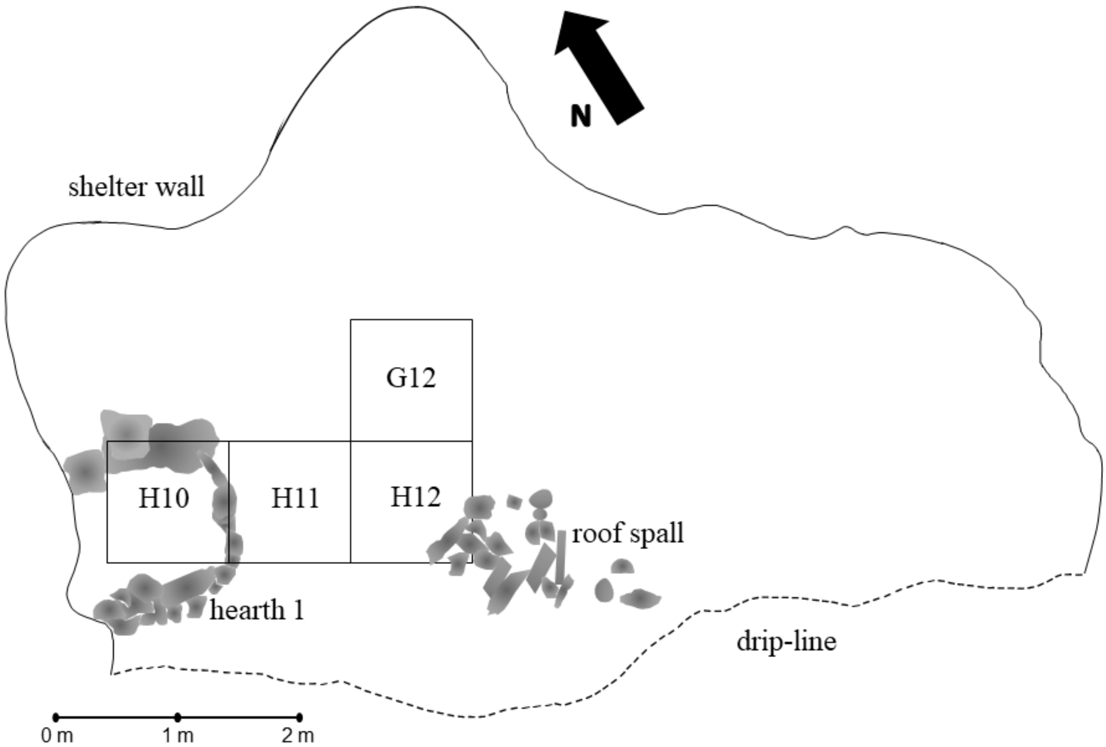

Figure 3. Site plan of Spitzkloof D showing the location of the excavation grid and surface features.

Table 1. Excavated contexts from Spitzkloof D and their associated Munsell colours.

Layer	Contexts excavated
1	1 (7.5YR 4/6, 7.5YR 4/4)
2	1000, 1001, 1003, 1005 (7.5YR 3/4, 7.5YR 5/2), 1100, 1102 (7.5YR 5/2, 7.5YR 3/4), 1200 (7.5YR 4/3, 7.5YR 4/2), 1300, 1304, 1340 (7.5YR 3/1, 7.5YR 3/3, 7.5YR 4/2, 7.5YR 4/3, 7.5YR 5/2, 7.5YR 7/1)
3	1302, 1303, 1305, 1306, 1309, 1318, 1319, 1320, 1321, 1322, 1333, 1341, 1342, 1343, 1350, 1360 (7.5YR 6/2, 7.5YR 7/1, 7.5YR 7/2, 7.5YR 8/2, 7.5YR 4/2, 7.5YR 4/2, 7.5YR 4/3, 7.5YR 5/3, 10YR 2/1)
4	1307, 1308, 1325, 1326, 1327, 1330 (7.5YR 4/2, 7.5YR 4/3, 7.5YR 5/2, 7.5YR 4/6, 7.5YR 8/1, 7.5YR 7/2)
5	1336, 1337, 1338, 1339 (7.5YR 3/2, 7.5YR 3/3, 7.5YR 4/3)
6	1006, 1103, 1201, 1323 (10YR 4/3, 7.5YR 4/2, 7.5YR 5/2)

Rodent burrow(s)

There is extensive burrowing below the surface material in excavation units H10, H11, and G12. In excavation unit H10 the burrow underlies hearth 1 in the NE and consists of grey ash very rich in plant material and bone. This burrow continues into the NW quad of H11. There is also a large rodent burrow (possible continuation of the burrow in excavation unit H10 and H11) located in the NE and NW sections of G12 that encompasses an area from just below layer 1 and extending into unexcavated sediment along the east wall. In G12, the burrow consists of grey ash with black charcoal flecks and contains angulate tortoise bone and OES beads. Although faunal remains and cultural material were found throughout the burrow, sieved, and sorted, it likely contains a mix of material from different time periods that was not analysed any further. Notable finds in this layer are two iron spears/knives (lying flat at the interface of layer 1 and the burrow) as well as other pieces of unidentifiable iron.

Layer 2

This layer begins directly under the burrow in the northern and eastern sections of G12, in the NE quad of H10, and the NW quad of H11 (Table 1). In excavation unit H12 this layer directly underlies layer 1. In excavation unit H10, this layer includes hearth 2, present everywhere in the excavation unit except for the NW quad and 5 cm in from the west side of the NE quad. Charcoal was collected from hearth 2 for radiocarbon dating. Immediately below this hearth is a charcoal spit containing very light grey ash with some bone and OES fragments. This excavation unit also has a second small hearth feature (hearth 3) shaped like a small, rounded bowl (10x10 cm) with heat degraded sandstone rocks at the southern edge.

In excavation unit H11, layer 2 is quite homogeneous consisting of two contexts (Table 1). The first context lies immediately below the rodent burrow in the NW and below layer 1 in the rest of the excavation unit. At its greatest depth, this layer extends down 12 cm along the eastern side of the northern wall. It consists of fine brown ashy deposits with very little anthropogenic material and likely corresponds to the ash layer from hearth 2 in H10. This context also contains one bead made of unknown material. The second context in this excavation unit consists of red fine sandy silt with a few small inclusions and very few artefacts.

In H12 there is only one context in layer 2 (Table 1). The upper 9 cm consisted of ashy grey silt containing small bovid remains, OES beads, and lithics. The ash in this context is likely from hearth 2. There is also a line of rocks that cuts through the NE quad in this context that appears purposefully built to perhaps act as a seating area. The lower 6 cm of this context contains loose silty sand with small rock inclusions, OES beads, and a large cluster of bones in the NE and NW.

Layer 3

This layer is found exclusively in excavation unit G12, which has the most complex stratigraphy (Fig. 4), and it consists of an infill of the most recent large cut directly under the burrow in G12. The infill material consists of numerous contexts (Table 1) and all were laid down before the burrow was created. The sediment in this layer is remarkably variable, ranging from light pinky grey to black, with some unresolved cuts and fills due to rodent burrowing activity (Fig. 4; Table 1) that made it difficult to follow during excavation. There are at least five distinct pits dug and purposely infilled with ash, charcoal, and bone. Further complicating the stratigraphy is that each pit, except for the one on the far NE corner of the excavation unit (1309), is cut into by another. The oldest pit, context 1309, contains potential votive (faunal) offerings in its base but they have yet to be excavated. One charcoal sample from this excavation unit in context 1302 was submitted for radiocarbon analysis.

Layer 4

This layer consists of four contexts (Table 1) which are truncated by layer 3 (Fig. 4). Layer 4's eastern edge cuts into layer 5 (not shown in Fig. 4) and it is overlain by the burrow. This layer is another large purposely infilled pit and consists of ashy sand (10YR 2/1), brown silty sand, many small gypsum inclusions, and mottled pinky grey ash (Table 1) containing faunal bones (mostly tortoise), charcoal, and OES. A bone sample was collected for radiocarbon dating from context 1327 in 2022 with results pending.

Layer 5

This layer contains four contexts from excavation unit G12 that have been cut on their western side by layer 4 (Table 1). This layer consists of dark brown to burnt orange silty sediment (Table 1), with small rock inclusions, and it contains no cultural material.

Layer 6

This is the oldest layer and contains four contexts (Table 1). In H10, the sediment consists of brown and tan sand amongst degraded rocks. There are considerably fewer artefacts and mostly tortoise in the faunal assemblage. In excavation unit H11, the sediment consists of silty red/brown sediment with angular roof spall inclusions and fine roots throughout, and it contains considerably fewer artefacts. The faunal assemblage consists of mostly medium/large sized bovids. In excavation unit H12, this layer consists of loose brown sediment with many large (up to 30 cm long) roof spall inclusions. The rocks in this context become white and friable upon trowelling and are easily broken, which may be a sign that the rocks were exposed to heat. Again, there are very few artefacts, and the faunal assemblage consists of two small/medium bovid ribs. In G12, this layer consists of fine light brown silty sediment.

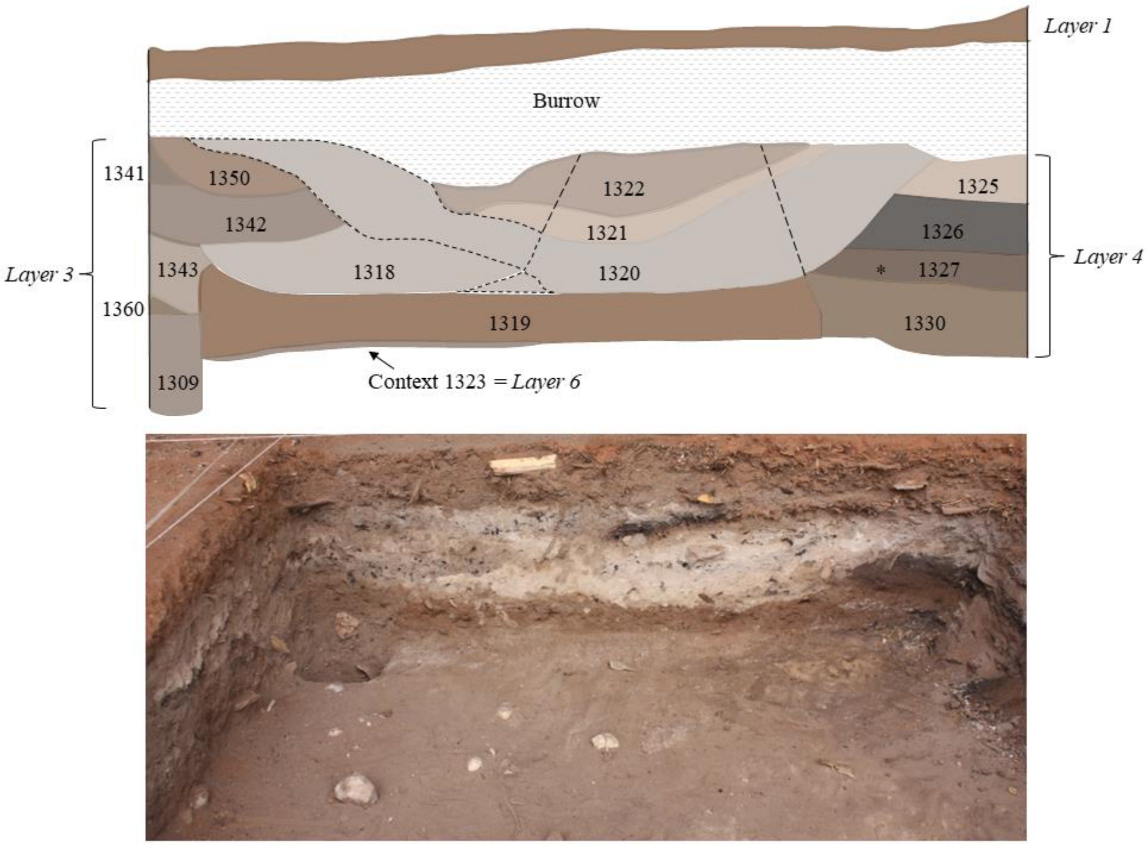

Figure 4. Section drawing (top) and photograph (bottom) of excavation unit G12 north wall. Colours correspond to their Munsell colour recorded during excavation (*=location of radiocarbon dating sample taken in 2022). Dashed lines refer to contexts that are not fully resolved due to rodent activity.

4. Methods and analyses

All radiocarbon dates were measured at the University of Oxford's Radiocarbon Accelerator Laboratory. All dates were calibrated using OxCal 4.4 (Bronk Ramsey 2009) and the ShCal20 curve (Hogg et al. 2020).

Faunal remains were identified by comparison with specimens housed in the reference collection at the Faunal Lab at the University of Cape Town. Each fragment was identified to its lowest possible taxon with unidentified elements contributing to the total number of specimens (NSP). The element, side, end, proportion, age at death, and sex were identified for each bone, when possible. The results are presented as number of identified specimens (NISP) while the minimum number of individuals (MNI) was calculated using the most common element present accounting for size and age (juvenile vs. adult). Anthropogenic (e.g., cutmarks), geogenic (e.g., weathering), and biogenic (e.g., root etching) modifications were noted, when present (Behrensmeyer 1978; Johnson 1985; Lyman 1994).

Bovid size classifications follow Brain's (1981) and Klein's (1976) categorisations, where small bovids (Bov size class I) are 4.5-23 kg, small/medium bovids (Bov size class II) are 23-84 kg, medium/large bovids (Bov size class III) are 85-295 kg, and large bovids (Bov size class IV) are 296-900 kg. Faunal material that could be identified as potentially mammal was categorised following the same live weight categorisation as for the bovids above. Small mammals include the species that are <4.5 kg (hyrax and hare), while micromammals consist primarily of vlei rats and shrews. The fragmentation ratio of the total faunal assemblage was calculated using the total number of specimens in the faunal assemblage divided by its total weight (NSP/g). Observations on the faunal material from the rodent burrow(s) are not reported here.

The diversity of the species is assessed using species richness, recorded as the number of taxa (NTAXA), while evenness, or diet breadth, is recorded using the unbiased Simpson's Index (1-D', D'=$\Sigma((ni(ni-1)/(N(N-1)))$. Accordingly, where D' refers to the probability that two individuals randomly selected from a sample will belong to the same species, and where n_i is the abundance of taxon i, and where N is the total number of individuals (species, NTAXA) (Faith & Du 2018). The unbiased Simpson's index represents the probability that two random samples will belong to the same taxon. D' values range from 1/NTAXA, when all taxa are equally abundant, to 1 when an assemblage is predominated by a single taxon. It is presented as 1-D' so as evenness increases, the value increases to 1. It is a measure of heterogeneity that is sensitive to richness, particularly rare taxa, and evenness (Lyman 2008; Faith & Du 2018; Faith & Lyman 2019). To compare the results of the diet to previously published data and to increase the sample size, the evenness of the taxa is presented by ungulate size class (1-4), small mammals, and fish based on MNI. For example, an MNI of three duiker and two springboks would contribute five individuals to the MNI category ungulate size 2. Additionally, two adult steenbok and a juvenile size one bovid would contribute three individuals to the MNI category for ungulate size 1. When categories consist of two size classes (Bov1/Bov2), each MNI category was allocated 0.5 following the method presented by Faith (2008). As NISP and MNI are both measures of taxonomic abundance that scale to each other in a predictable manner, either measure will reflect the data (Grayson 1984; Faith 2008). We used MNI due to the fragmentation of the assemblage which preferentially biases the identification of smaller species, making large animals effectively appear rare. Following Faith (2008), the comparative samples (layers) must have a total MNI of at least four individuals.

The Diet Breadth Model in Optimal Foraging Theory predicts that high evenness or diet breadth reflects a highly mobile population typically associated with reduced availability or encounter rates with high-ranking species (Kelly 2013). Low evenness, or a narrow diet, reflects high encounter rates with high-ranked species, effectively ignoring low-ranked species when encountered. This typically results in a less mobile settlement system with abundant prey.

We then use $\chi 2$ statistics to test for differences between layers based on standardised residues (less than -2 to >2). We also expect a strong negative correlation between evenness and NTAXAprey, and MNIprey. Sites with low evenness (lower mobility) should produce higher NTAXAprey and MNIprey, as the site is occupied for a longer period. We test this assertion using Pearson's correlation coefficient.

For the non-ornamental OES fragments, approximate number of eggs (ANE) was recorded according to Collins & Steele (2017). ANE was calculated to provide an indication of how many ostrich eggs accumulated within a specific archaeological layer by dividing the weight of OES fragments by the 'typical' weight of an empty ostrich eggshell (Kandel 2004; Dewar 2008; Orton 2008). OES beads were measured with digital callipers recording bead diameter, aperture, and thickness, wherever possible. To obtain bead diameter, multiple measurements were taken around the perimeter of the bead. OES bead preforms were assigned a manufacturing stage, following Kandel & Conard's (2005) and Orton's (2008) classification stages, as they provide different information on the production phases. Glass bead sizes are measured in the same manner as OES beads.

Preliminary analysis has divided the stone assemblage into either formal tools or waste. The latter includes pieces which lack deliberate retouch, as well as the class of trimmed flakes which show signs of random utilisation rather than secondary retouch. Formal tools have been defined as pieces which have been deliberately modified to a standardised form by secondary retouch. Lithic analysis is ongoing, and only the assemblage from the surface of layer 1 has been analysed (by Kyra Pazan) and is included in this paper.

Other material culture, such as the glass trade beads and the iron spears/knives, the latter of which appear to have been manufactured using folding and cold working, are currently awaiting full analysis by specialists.

5. Results

Chronology and settlement

Radiocarbon dates from charcoal features (Table 2) in layers 2 and 3 are younger than expected but older than the artefacts on the surface (e.g., the newspaper fragment). They both reflect a late Little Ice Age (LIA) period (AD 1300-1850) occupation when Namaqualand was cooler and wetter than today (Dewar 2008; Dewar & Orton 2013; Dewar & Stewart 2016b).

Table 2. Radiocarbon dates obtained on charcoal from Spitzkloof D.

Layer	Excavation unit	Spit	Context	Lab number	Material	Uncalibrated years bp	Calibrated age (95.4% prob.)
2	H10	1	1000	OxA-41064	Charcoal	200±16	AD 1667-1936
3	G12	3	1302	OxA-41063	Charcoal	176±16	AD 1675-?

Faunal remains

Table 3 shows the NISP and MNI of the faunal remains. The assemblage NSP consists of 9369 bone fragments weighing 9.44 kg. Of those, 4979 or 53.1% were identified to species or class size. This assemblage is diverse and has relatively high faunal identification but is still fragmented (NSP/g=9.9). Overall, the assemblage is largely predominated by tortoises, micromammals, and bovids. Based on the assemblage and site location, the small bovids are likely steenbok, but some may also be klipspringer. Fragmentary post cranial remains of small/medium bovids are likely domesticated sheep but could also be grey duiker or springbok, medium/large bovids are likely gemsbok, while large bovids are probably eland (*Taurotragus oryx*) or domestic cattle. Other species identified at the site include baboon (*Papio ursinus*), mountain zebra (*Equus zebra*), hyrax (*Procavia capensis*), porcupine (*Hystrix africaeaustralis*) small carnivores, snakes, a bird, and a fish. The eland and mountain zebra are locally extinct species.

In layer 1, based on the NISP, micromammals (elephant shrew, Brants's whistling rat), and tortoises (*Chersina angulata* and *Psammobates tentorius*) are the most common, followed by steenbok and small/medium bovids including duiker and possible sheep (Table 3). In layer 2, the species list is predominated by the tortoises followed by micromammals, small bovids (klipspringer, steenbok), medium/large bovids (likely gemsbok) and small/medium bovids including duiker and sheep (distal phalanx), plus a probable sheep (two teeth and long bone epiphysis). Additionally, eland, mountain zebra, and both an adult and juvenile baboon, were identified. The most abundant species in layer 3 are tortoises, micromammals, and small mammals (hyrax) but there are also two pedal bones belonging to a mountain zebra. Interestingly, although 40 km from the Atlantic Ocean (Fig. 1), there is one fragmentary limpet shell (*Cymbula granatina*). In layer 4, tortoises and micromammals are again the most common with the addition of steenbok and mountain zebra. There are no faunal remains in layer 5, while in layer 6, the most common elements belong to the tortoises, micromammals, small carnivores (bat-eared fox), and small/medium bovids (sheep and/or springbok), but there is also one tooth belonging to a mountain zebra and a small fish vertebra.

To evaluate the hunting strategy only the anthropogenically introduced species (ungulates, tortoises, and small mammals) were used to calculate NTAXAprey, MNIprey, and unbiased Simpson's evenness index (1-D') for each layer (Table 3). Focusing on just the ungulates, all layers produced unbiased Simpson's evenness values above 0.75, indicating a relatively broad diet. People were primarily encountering size 2 and 3 ungulates with some access to size 4 eland (Table 4). Diet Breadth Theory (Kelly 2013) indicates that this is a high level of mobility (Faith & Lyman 2019). Statistically evaluating the evenness values reveals they are indeed the same ($\chi 2$=3.1, df=12, p=0.99), reflecting a consistent use of the local niche. Comparing the evenness index value against NTAXAprey and MNIprey produced very strong negative correlations (r=-0.94 and -0.83, respectively), supporting our expectations that sites with lower evenness indices would produce higher NTAXAprey and MNIprey.

When including the small species that would be added to a broadening diet (tortoises and small mammals), the evenness index values remain relatively consistent except in layers 2 and 6 which drop to 0.63 and 0.59, respectively, indicating a narrower diet or longer periods of occupation focusing on one food category – tortoises; however, the evenness values and therefore the hunting strategy, and use of the local niche, remains statistically the same ($\chi 2$=12.4, df=20, p=0.90). There is also a moderately negative correlation coefficient between evenness (ungulates 1-4, tortoise, and small mammals) and NTAXAprey and MNIprey (r=-0.74 and -0.77 respectively).

Table 3. Spitzkloof D number of identified specimens (NISP) and minimum number of individuals (MNI), listed by species in taxonomic order, where S=small, M=medium and L=large (*=where the species do not increase the MNI as they could belong to the named species in their size class).

Species	**Layer 1**		**Layer 2**		**Layer 3**		**Layer 4**		**Layer 6**	
	NISP	**MNI**	**NISP**	**MNI**	**NISP**	**MNI**	**NISP**	**MNI**	**NISP**	**MNI**
Elephant shrew (*Elephantulus edwardii*)	1	1	1	1	-	-	-	-	-	-
Baboon (*Papio sp.*) juvenile	-	-	1	1	-	-	-	-	-	-
Baboon (*Papio sp.*) adult	1	1	2	1	-	-	-	-	-	-
Bat-eared fox (*Otocyon megalotis*)	-	-	-	-	-	-	-	-	1	1
Carnivore (jackal-sized)	1	1	1	1	-	-	-	-	-	-
Mountain zebra (*Equus zebra*)	-	-	3	1	2	1	2	1	1	1
Hyrax (*Procavia capensis*)	4	2	14	1	1	1	-	-	-	-
Sheep (*Ovis aries*)	-	-	1	1	-	-	-	-	-	-
Ovicaprid sp. (probable sheep)	2	1	3	1	-	-	-	-	-	-
Common (Grey) duiker (*Sylvicapra grimmia*)	2	1	11	1	-	-	-	-	-	-
Springbok (*Antidorcas marsupialis*)	-	-	1	1	-	-	-	-	-	-
Klipspringer (*Oreotragus oreotragus*)	-	-	5	1	-	-	-	-	-	-
Steenbok (*Raphicerus campestris*) juvenile	-	-	1	1	-	-	-	-	-	-
Steenbok (*Raphicerus campestris*) adult	5	1	11	1	-	-	3	1	-	-
Eland (*Taurotragus oryx*)	-	-	1	1	-	-	-	-	1	1
Gemsbok (*Oryx gazella*)	1	1	3	1	-	-	-	-	-	-
S bovid (Bov I)	10	*	43	*	5	1	1	*	3	1
S (Bov I) to S/M (Bov II) bovid adult	2	*	1	*	2	*	1	*	-	-
S (Bov I) to S/M (Bov II) bovid juvenile	1	1	-	-	-	-	-	-	-	-
S/M bovid (Bov II) juvenile	-	-	-	-	1	1	-	-	-	-
S/M bovid (Bov II) adult	6	*	19	*	4	1	-	-	4	1
S/M (Bov II) to M/L (Bov III) bovid juvenile	-	-	1	1	-	-	-	-	-	-
S/M (Bov II) to M/L (Bov III) bovid adult	1	*	5	*	-	-	-	-	-	-
M/L bovid (Bov III) adult	3	*	26	*	3	1	-	-	2	1
M/L bovid (Bov III) juvenile	-	-	2	1	-	-	-	-	-	-
M/L (Bov III) to L (Bov IV) bovid	-	-	5	*	-	-	-	-	-	-
L bovid (Bov IV)	-	-	1	*	-	-	-	-	-	-
Brants's whistling rat (*Parotomys brantsii*)	11	1	48	9	2	1	2	1	3	2
Cape porcupine (*Hystrix africaeaustralis*)	4	1	-	-	-	-	-	-	-	-
Micromammal	117	4	105	5	19	1	5	1	4	1
S mammal	20	*	50	1	10	*	2	1	4	1
M mammal	-	-	1	*	1	*	-	-	-	-
L mammal	4	1	6	*	5	1	2	1	2	*
S fish	-	-	-	-	-	-	-	-	1	1
M raptor	-	-	1	1	-	-	1	1	-	-
S snake	2	1	18	1	4	1	1	1	-	-
M snake	3	1	22	1	5	1	-	-	-	-
L snake	-	-	2	1	-	-	-	-	-	-
Angulate tortoise (*Chersina angulata*)	101	2	902	9	118	2	8	1	82	10
Tent tortoise (*Psammobates tentorius*)	26	1	49	1	-	-	7	1	1	1
Tortoise	88	1	2056	10	91	1	133	*	507	*
Land snail (*Trigonephrus sp*)	2	2	2	1	-	-	1	1	-	-
Granite limpet (*Cymbula granatina*)	-	-	-	-	1	1	-	-	-	-
Unidentified fragments	340	-	2560	-	324	-	273	-	893	-
NTAXAprey	**8**		**11**		**7**		**5**		**8**	
Total MNIprey	**13**		**34**		**10**		**6**		**17**	
Unbiased Simpson's evenness index (1-D') for ungulates 1-4	0.85		0.77		0.87		1.0		0.9	
Unbiased Simpson's evenness index (1-D') for ungulates 1-4, small mammals, and tortoises	0.86		0.63		0.89		0.93		0.59	

Overall, anthropogenic, biogenic, and geogenic modifications of bone are rare or absent (Table 5) with no evidence for cut marks, percussion marks, puncture marks, acid etching, or root etching.

Heat alteration is present on 51% of the faunal sample (Table 5) with bones being scorched (18.8%; superficial burning), charred (14%; blackened), and calcined (17.7%; whitened) indicating that these bones were in close contact with fire for varying lengths of time, or at variable heat (Lyman 1994). Calcined bone occurs only with anthropogenic prolonged fires under high temperatures. Scorched and charred bone can occur either in a bush fire or due to a short exposure in an anthropogenic fire (David 1990). Most bones were entirely burnt indicating that they had been defleshed when thrown into the fire, likely as food waste rather than being lost during cooking. This likely contributed to the fragmentation of the assemblage as the crystalline structure of bone is damaged when heated.

Table 4. Minimum number of individuals (MNI) of prey species per category per layer.

Category	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5
Tortoise	4	20	3	2	11
Small mammal	3	2	1	1	1
Ungulate size 1	1.5	3	1	1	1
Ungulate size 2	2.5	4.5	2	0	1
Ungulate size 3	1	3.5	2	1	2
Ungulate size 4	1	1	1	1	1

Table 5. Modifications identified on bone from Spitzkloof D. Number of bones with modification/% of bones with modification based on the NISP.

Layer	NISP	Scorched	Charred	Calcine	Gnawed	Spiral fracture	Irregular fracture
1	416	7/1.7	8/1.9	25/6.0	-	4/1	3/0.7
2	3520	72/2.1	50/1.4	26/0.7	1/0.03	2/0.06	6/0.2
3	273	21/7.7	13/4.8	14/5.1	-	-	-
4	169	12/7.1	10/5.9	10/5.9	-	-	-
5	-	-	-	-	-	-	-
6	601	1/0.2	-	-	-	-	-
Layer	**NISP**	**Weathered**					
		Stage 0	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**	**Stage 5**
1	416	397/95.4	9/2.2	7/1.7	3/0.7	-	-
2	3520	3519/99.9	-	1/0.03	-	-	-
3	273	-	-	-	-	-	-
4	169	-	-	-	-	-	-
5	-	-	-	-	-	-	-
6	601	-	-	-	-	-	-

Following Behrensmeyer's (1978) six stages of weathering, most bones show no signs of weathering and the ones that do are from layer 1 and layer 2. In layer 1, nine show cracking parallel to the fibre structure (stage 1), seven show flaking along the bone edges on the outermost concentric thin layers (stage 2), and three show patches of rough, homogeneously weathered compact bone (stage 3). In layer 2, only one bone shows flaking along the bone edges on the outermost concentric thin layers (stage 2). The infrequency of weathering damage and carnivore/rodent gnawing suggest that the faunal remains were probably covered soon after deposition, preventing these taphonomic factors from drastically affecting the bone. Although, burning and fragmentation could be masking evidence for cut marks, percussion notches, and gnawing.

OES fragments

Table 6 shows the ANE per layer, calculated by dividing the weight of OES fragments per layer by the average weight of 259 g (Dewar 2008), 238±37 g (Kandel 2004), and 248.6±21.8 g (Orton 2008) of an empty OES (Collins & Steele 2017). In total, there are approximately 17 ostrich eggshells in the assemblage with the highest numbers in layer 2 and the lowest number of eggs in layer 4 (Table 6).

Table 6. OES weight and the corresponding approximate number of whole eggshells per layer.

Layer	Weight (g)	Approximate number of eggshells (ANE)		
		g/259 g (Dewar 2008)	g/238±37 g (Kandel 2004)	g/248.6±21.8 g (Orton 2008)
1	1291.21	5	4.7-6.4	4.8-5.7
2	2246.27	8.7	8.2-11.2	8.3-9.9
3	389.84	1.5	1.4-1.9	1.4-1.7
4	97.26	0.4	0.4-0.5	0.4
5	-	-	-	-
6	245.25	1	0.9-1.2	0.9-1.1
Total	**4269.83**	**16.6**	**15.6-21.2**	**15.8-18.8**

OES beads

There are 28 finished OES beads, in addition to 32 OES bead preforms (Table 7). The unbroken complete beads (n=19) have a mean external diameter of 5.98±1.90 mm while ranging from 3.68-9.69 mm, a mean aperture of 2.10±0.69 mm while ranging from 0.91-3.40 mm, and a mean thickness of 1.48±0.29 mm while ranging from 0.68-1.92 mm. The largest number of OES beads was found in excavation unit H11, whereas they were least frequent in excavation units H10 and H12. At Spitzkloof D, there is almost an equal number of preforms in relation to finished beads (Table 7). This suggests that OES beads may have been manufactured during the occupations in layer 1, 2, 3 and 6.

Table 7. Number of OES bead preforms by layer and stage of production following Kandel and Conard's (2005) and Orton's (2008) classification stages.

Layer	Complete beads (n)	Broken beads (n)	Preforms by stage (n)									
	11 VIIa IIb	12 VIIa VIIb	1 I -	2 - -	3 IIa Iib	4 Iia Iib	5 IIIa IIIb	6 IIIa IIIb	7 Iva Ivb	8 Iva Ivb	9 Va Vb	10 Va Vb
1	2	1	-	7	2	5	-	2	-	-	-	-
2	14	6	1	5	-	3	-	3	-	-	-	-
3	2	1	-	-	-	1	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
6	1	1	1	-	-	1	-	1	-	-	-	-
Total	**19**	**9**	**2**	**12**	**2**	**10**	**-**	**6**	**-**	**-**	**-**	**-**

Figure 5 and Table 8 show the relationship between OES bead diameter and aperture in each layer and they reveal two distinct bead groupings. One group contains beads less than 6 mm in diameter (group 1) with smaller apertures, and the second group contains beads ≥8 mm in diameter (group 2) with larger apertures. A Mann-Whitney Test for equal medians between the group 1 and group 2 diameters and apertures showed this difference to be significant (p[same med.] diameter=0.003 and p[same med.] aperture=0.005).

Figure 6 (and Table 8) shows the relationship between OES bead thickness and aperture for each layer. Orton (2008) found that a relationship between increasing aperture diameter and decreasing thickness is an indication of use-wear. When considering all the beads at Spitzkloof D, we do not see a statistically significant association between increasing aperture and decreasing thickness (Pearson's correlation coefficient p[uncorr]=0.43). Although, Figure 6 does suggest a possible trend if the beads from group 2 (Fig. 5) are removed (circled in Fig. 6). Removing those beads from the Pearson's correlation coefficient calculation (p[uncorr]=0.06)) gives a moderate correlation (-0.49) indicating that as aperture increases, thickness does decrease, but in a non-significant relationship (i.e., a trend instead of a statistically significant association).

Non-OES trade beads

Layers 1 and 2 contain four glass trade beads and one of unknown material (Table 9). Following Wood's (2011) glass bead size and length categories, the two beads from excavation units H10 and G12 fall into the minute size category, whereas the other two glass beads fall into the small size category. The glass beads from H12 and H11 are considered short and the beads from H10 and G12 are considered standard length (Wood 2011). Visual comparison with Kinahan's (2000) illustrated beads from the Namibian coast suggests an age of between the eighteenth and early twentieth centuries. That the beads at Spitzkloof D come from layers that date to at least AD 1667 and between AD 1667 and AD 1936 further supports this conclusion.

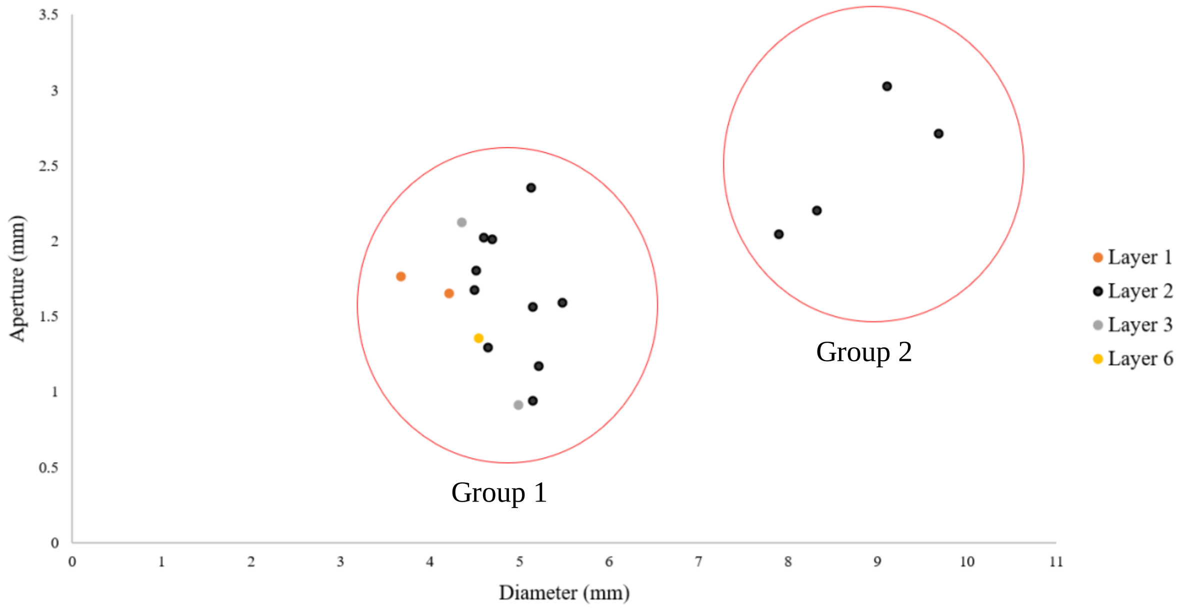

Figure 5. Scatterplot comparing OES bead diameter to aperture from Spitzkloof D by layer, where group 1 beads are <6 mm and group 2 beads are ≥8 mm.

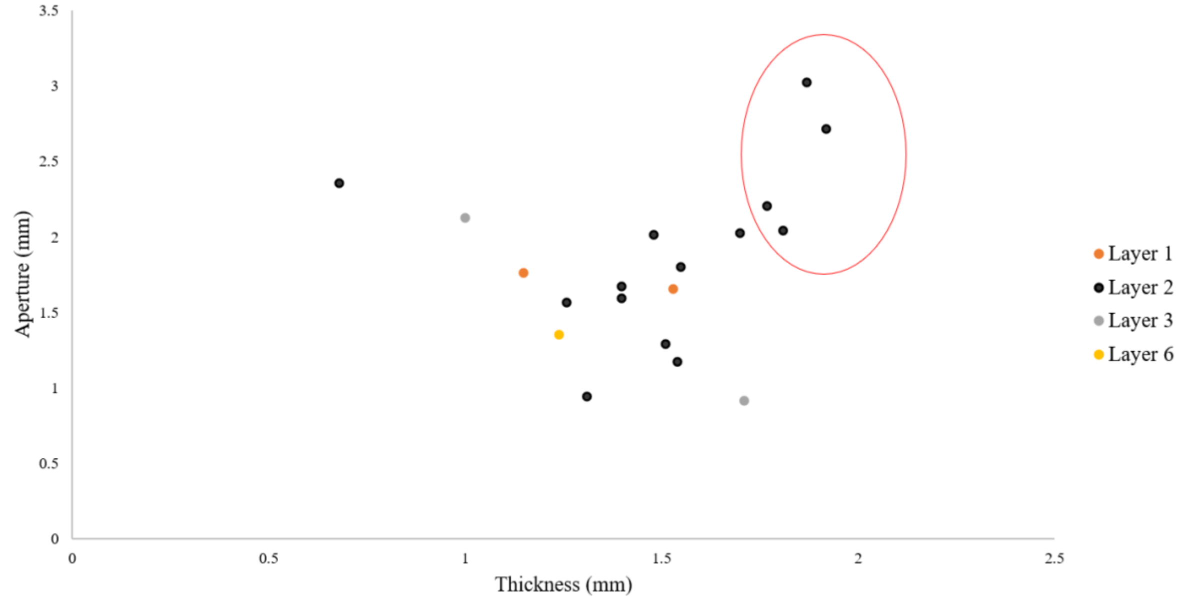

Figure 6. Scatterplot comparing OES bead thickness to aperture from Spitzkloof D by layer (group 2 beads encircled in red).

Pottery

Ceramics were found in all four of the excavated units, and in layers 1, 2, and 6. There are a total of 68 potsherds weighing 192 g, including one lug and two rims, but with no decoration evident on any of the sherds. The temper for all sherds consists of fine-grained sand, with 62 black, six red, and three sherds having an outer black with red inner colour. Most sherds show evidence of partial oxidation and/or burning that suggests the vessels were used for cooking in a hearth. The average sherd thickness is 6.18±1.26 mm, ranging from 3.07-11.88 mm. Layer 1 contained 12 sherds (17.6%), layer 2 contained 55 (80.9%), and layer 6 contained one sherd (1.5%). Overall, the sherds are friable and small with 91.4% weighing less than 10 g (the single largest sherd weighed 13.5 g).

Table 8. Stratigraphic layer, diameter, aperture, and thickness of OES beads from Spitzkloof D.

Layer	Diameter (mm)	Aperture (mm)	Thickness (mm)
1	4.22	1.65	1.53
1	3.68	1.76	1.15
2	5.15	1.56	1.26
2	5.48	1.59	1.40
2	5.22	1.17	1.54
2	4.65	1.29	1.51
2	9.69	2.71	1.92
2	5.13	2.35	0.68
2	4.52	1.80	1.55
2	5.15	0.94	1.31
2	4.60	2.02	1.70
2	4.70	2.01	1.48
2	4.50	1.67	1.40
2	9.11	3.02	1.87
2	8.33	2.20	1.77
2	7.90	2.04	1.81
3	4.36	2.12	1.00
3	4.99	0.91	1.71
6	4.55	1.35	1.24

Table 9. Stratigraphic layer, outside diameter, aperture, thickness, translucency, and colour of non-OES beads from Spitzkloof D.

Layer (excavation unit)	Material	Diameter (mm)	Aperture (mm)	Thickness (mm)	Translucency	Colour
1 (H11)	Unknown	2.65	0.95	2.32	N/A	N/A
1 (G12)	Glass	2.43	0.74	2.14	Opaque	Brown
1 (H10)	Glass	2.48	0.76	2.44	Opaque	Yellow
1 (H12)	Glass	3.24	1.24	1.61	Opaque	Very dark blue/black on brown
2 (H11)	Glass	2.73	0.81	1.80	Opaque	Brown

Lithics

Lithic analysis is ongoing, so the data presented here provide an initial characterisation of the assemblage on the surface of layer 1. Table 10 summarises the raw material trends from the surface of layer 1. Milky quartz was the dominant raw material compromising 69% of the assemblage, followed by quartzite at 20.4%. Other materials including clear quartz (4.3%), silcrete (2.2 %), and sandstone (1.1%) are far less frequent. Flakes (Table 11) are the most common lithic class overall, comprising 58.2% (n=54) of the stone artefacts found on the surface of layer 1. There is also one bladelet and two blades in the assemblage. Overall, the surface assemblage looks like a late Holocene ad hoc quartz flake industry, a common feature on the west coast during the last 2000 years (Orton 2012).

Table 10. Spitzkloof D lithic raw material trends for the surface of layer 1.

Raw material	Number of pieces (n)	Percentage (%)
Milky quartz	64	68.8
Quartzite	19	20.4
Clear quartz	4	4.3
Sandstone	1	1.1
Silcrete	2	2.2
Other	3	3.2
Total	**93**	**100**

6. Discussion

The complex stratigraphy and range of cultural remains in the Spitzkloof D deposit confirm repeated occupation of the site into the historic period, which is not unexpected as modern herders use the valley today. The radiocarbon dates from the upper layers (Table 2) suggest an occupation during the end of the LIA, a cool and wet period with a peak in radiocarbon dates interpreted as a population boom in

Namaqualand (Dewar 2008; Dewar & Orton 2013). Sheep and probable sheep, iron, glass beads, ad hoc lithics, and pottery suggest that the entire excavated deposit likely dates to within the last 2000 years (Sealy & Yates 1994; Dewar 2008; Orton 2012; Coutu et al. 2021).

Table 11. Spitzkloof D lithic class distributions for the surface of layer 1.

Lithic artefact class	Material	Number (n)	Percentage (%)
Broken flake	Milky quartz	15	16.2
	Quartzite	5	5.3
	Clear quartz	3	3.2
	Other	2	2.2
	Sandstone	1	1.1
	Total	26	28.0
Whole flake	Milky quartz	16	17.3
	Quartzite	5	5.4
	Silcrete	2	2.2
	Clear quartz	1	1.1
	Total	24	26.0
Flaked piece	Quartzite	3	3.2
	Milky quartz	1	1.1
	Total	4	4.3
Core	Milky quartz	8	8.6
	Quartzite	2	2.2
	Total	10	10.8
Core reduced piece	Milky quartz	2	2.2
	Total	2	2.2
Core on flake	Milky quartz	2	2.1
	Quartzite	1	1.1
	Total	3	3.2
Bladelet	Milky quartz	1	1.1
	Total	1	1.1
Broken blade	Milky quartz	1	1.1
	Total	1	1.1
Blade	Quartzite	1	1.1
	Total	1	1.1
Shatter	Milky quartz	14	15.0
	Quartzite	2	2.1
	Total	16	17.1
Unknown	Milky quartz	4	4.0
	Other	1	1.1
	Total	5	5.1
Total		**93**	**100**

The species identified at the site are typical of the region today except for mountain zebra and eland, which are locally extinct but present on the Namibian side of the Orange River. The mountain zebra is a water obligate species, suggesting the region was more humid and that it supported grasses when occupied. While eland has not been positively identified in this valley before, mountain zebras were present at the end of the last glacial maximum (LGM ~17 kcal BP), another cool and wet period (Dewar & Stewart 2012, 2017; Dewar et al. 2023). The presence of a single marine shell (*C. granatina*) and one fish vertebra suggest people were highly mobile, or that they had trading connections with people at the coast and/or the Orange-Gariep River 30-40 km away. For example, a cluster of sites at Jakkalsberg is 30 km due north on the Orange River and has produced assemblages abundant with fish and sheep (Brink & Webley 1996; Halkett 2001).

Although sheep and probable sheep bones were identified (awaiting ZooMS confirmation), it appears that the people occupying the site relied heavily on a range of wild bovid species for daily subsistence (Table 3). Unless the unidentified small/medium and medium/large bovid bones are sheep and cattle, which is possible, this pattern suggests that the sheep were not the primary source of meat and they may have been kept for milk (dairy herd) or as a form of social risk reduction (a form of reciprocal gift exchange) to maintain social ties within a highly mobile and often spatially separated community (Hopper & Dewar 2022).

The hunting strategy remains the same across all layers reflecting an opportunistic use of the local niche, typical of sites from the LIA along the Namaqualand coast (Dewar 2008). People primarily encountered or preferentially hunted/slaughtered size 2 and 3 ungulates but also broadened the diet with the contribution of small mammals and tortoises (Tables 3 & 4). Evaluating the diet breadth using just the ungulates produced unbiased Simpson's evenness values (1-D') that consistently reflect a highly mobile hunting strategy (>0.75) that, as predicted, has a strong negative correlation with NTAXAprey and MNIprey (Table 3). When the full range of prey species (ungulates, small mammals, and tortoises) are included in the evenness index, layer 2 (0.63) and layer 6 (0.58) present a narrower diet, reflecting longer visits focusing on a particular resource – tortoises. As Morin et al. (2021) have recently shown, tortoises are a highly ranked species, with very high caloric returns, and should always be taken when encountered; however, while these are robust sample sizes, the hunting strategy remains statistically the same as the general pattern above. There are also between 15 and 21 ostrich eggshells in the deposit with ~9 in layer 2 alone, which could also have contributed to the diet before becoming raw material for flasks, beads, and/or pendants. For example, there are two OES flask mouth fragments in layer 2 and one in layer 1. Ostriches are ubiquitous to the Namaqualand coastal desert and their shells are found across the landscape (Dewar 2008).

The high frequency of heat-altered bone and low evidence for carnivore activity suggests that the bulk of the macrofauna were brought to the site anthropogenically; however, the micromammals are likely to have been deposited by birds of prey or small carnivores as they lack the intense modifications (acid etching, lack of postcranial elements) present when consumed by humans (Dewar & Jerardino 2007).

Cultural material

The OES assemblage at Spitzkloof D does show evidence of bead manufacturing (Table 6) with 32 ostrich eggshells in early bead-manufacturing stages (1 to 6). Figure 5 reveals two groupings of beads, group 1 contains beads from layers 1, 2, 3, and 6 that are less than 6 mm in diameter, and group 2 contains beads from layer 2 that are 8 mm or greater in diameter. These groupings do not seem to be based on time periods since beads from all bead-containing layers are contained in group 1, but the group 2 beads come exclusively from layer 2. Although layers 1 and 2 date to within the last 2000 years, these layers do not contain the largest beads, a trait which has been suggested to relate to herders (Jacobson 1987a, b; Smith et al. 1991, 2001); however, others emphasise the variability in bead sizes after 2000 years (e.g., Kandel & Conard 2005; Dewar 2008; Miller 2016; Miller & Sawchuk 2019), which is reflected in the OES bead assemblage from Spitzkloof D and the contemporary sites along the coast (Fig. 5). Instead, the bimodal distribution in OES beads observed at Spitzkloof D may either indicate more than one person was making beads (multiple trading partners), or that these beads came from or were destined for two or more different items of personal ornamentation.

Figure 6 and Table 8 present bead aperture diameter compared to bead thickness. This was explored because Orton (2008) found that in Namaqualand, when bead aperture increases in size due to wear, thickness is reduced. Although a few of the beads with the largest apertures are the thinnest, which is what was expected (a negative trend), five beads with the largest apertures (from layer 2) represent the thickest beads (circled in Fig. 6). Interestingly, four of the five beads are the same ones that make up group 2 in Figure 5, suggesting that the beads in group 2 are different from those in group 1 (Fig. 5), and that they could represent a single item of jewellery.

Another potential explanation for the variation in bead thickness, especially since none of the beads with the largest apertures show any outward expressions of wear or evidence for being burnt (shown to delaminate eggshell layers), is the environmental conditions experienced by the female ostrich before laying (Knight 1995). Research on archaeological shell has shown that there is a relationship between OES thickness and humidity (Ecker et al. 2015) where ostriches that breed in very arid environments tend to have a thicker eggshell to protect the embryo from drying out, versus where ostriches breed in more humid environments that leads to a thinner shell to increase gas exchange. In modern birds, Stein and Badyaev (2011) found that these changes can occur rapidly within a single season. If this was the case at Spitzkloof D, then the fact that the thickest beads occur in layer 2 may suggest some drier periods within an overall slightly wetter period in the region than today. Alternatively, these thicker shells may have been collected elsewhere or traded in as finished beads.

All the potsherds at Spitzkloof D, except for one in layer 6, come from layers 1 and 2 which are also the sheep and probable sheep bearing layers. None of the sherds from Spitzkloof D are decorated but since Orton (2012) suggests that non-rim sherds are adiagnostic, it is impossible to accurately characterise this assemblage as containing only undecorated pottery. The two rim sherds identified in the assemblage are both undecorated. Based on Sadr & Smith's (1991) pottery classification, the single lug found in layer 2 can be identified as either incised lugged ware or undecorated lugged ware. Lugged ware is easily suspended and is believed to have been used by herders in response to the need for greater mobility (Orton 2012), although foragers also used lugged pottery (Bollong et al. 1997); however, as this sherd was recovered from layer 2, which also contains probable sheep, it does suggest an occupation by people who were keeping sheep or at least by people who had access to them.

Although lithic analysis is ongoing, Tables 10 and 11 reveal that the assemblage consists of informal or expedient artefacts of mostly quartz flakes. In northern and central Namaqualand, the sites of SK400, KV502, and DP2004/014, which date to between AD 1326 and AD 1718, also lack a significant number of formal/retouched tools with milky quartz predominating (Dewar 2008). Elsewhere, in the Middle Orange River region, lithic assemblages also become less formal between 2000- and 120-years BP (Beaumont & Boshier 1974; Beaumont et al. 1995; Parsons 2004). Informal quartz tool industries are also seen at Bloeddrift 23 in northern Namaqualand (Smith et al. 2001), Skorpion Cave in southern Namibia (Kinahan & Kinahan 2003), Apollo 11 in southern Namibia (Wendt 1972), and the Elands Bay sites from 1000 BP onwards (Orton 2006). These Late Holocene toolkits, with relatively low acquisition and replacement costs, are believed to be connected to highly mobile herding people, where curating stone may be cumbersome (cf. Orton 2012).

Trade and interaction at Spitzkloof D

Although the trade beads (Table 8) and iron implements are awaiting further analysis, they point to an occupation by people who were connected not only to the coast but also more broadly with Iron Age agro-pastoral Bantu groups living further north-east (Elphick 1985). Despite historical (e.g., Thom 1952; Goodwin 1956; Elphick 1985) documentation suggesting that herders had a robust trade network, exchanging livestock for metal spear points, metal jewellery, OES and glass beads, there is little archaeological evidence for this in Namaqualand. Thus, finding iron implements and glass beads adds much needed evidence for trade and social interaction in the region.

Although a relatively rare find in Namaqualand, glass trade beads are important as they can be used to identify regional and foreign trade networks as well as social and economic change (Comaroff & Comaroff 2006). While the four glass beads may have been left by Europeans, it is more likely they were left by local people since the area is very remote and there are no farms in the region. These four glass beads (Table 9) are significant as they add ~35% more beads to the total Namaqualand collection – there are only three other published sites in Namaqualand which contain a total of 11 glass beads. Five come from Bethelsklip (Webley 1986), six from KK002 (Orton 2014), and a final glass trade bead comes from LK2001/010A (Orton 2012). Little is known about the specifics of the glass bead trade in Namaqualand but ethnohistorical documents suggest that these beads were highly prized (e.g., Smith & Pheiffer 1992; Comaroff & Comaroff 2006). In Namibia, Kinahan's (2000) research found that the regional trade in glass beads, likely initially coming from European seafarers, was controlled by wealthy herders until the mid-nineteenth century when British colonialists had set up permanent settlements that disrupted these regional trade networks (Kinahan 2000).

Spitzkloof D also contains two iron implements with one likely being a spearhead (at the interface of the burrow layer). This is also a rare find in Namaqualand with, to our knowledge, only four other archaeological sites containing iron implements. These include one iron rod at KK002 (Orton 2014), one iron arrowhead at LOR 16 (Miller et al. 1998), and seven small iron fragments as well as one iron bead at Jakkalsberg B (Miller & Webley 1994; Webley 1997). Although analysis is ongoing it does appear that the pieces from Spitzkloof D were manufactured using folding and cold working (an indigenous method) as opposed to hot-working with a bloomery furnace, for example, and thus they were likely sourced through indigenous trade networks which are known to have traded goods over hundreds of kilometres (e.g., Orton et al. 2011; Orton 2014; Stewart et al. 2020).

7. Conclusions

The preliminary results from the first excavation of Spitzkloof D rockshelter in northern Namaqualand identified six deeply stratified layers which consist of large hearths, ash deposits, and multiple pits with one having potential votive (faunal) offerings in its base. Faunal analysis reveals a consistently broad, highly mobile subsistence strategy consisting of possible low-intensity sheep-keeping and consumption of wild species during the LIA, a climatic period somewhat more humid than today. Accounting for the small species, the diversity evenness index indicates that layers 2 and 6 may have seen longer occupations with narrower diets focusing on tortoises, although they are statistically the same as the other faunal signatures. Radiocarbon dating, pottery, and lithic characteristics, as well as probable sheep remains are suggestive of herder occupation during the accumulation of at least the two most recent layers. Glass trade beads and iron implements, along perhaps with fish and limpet shell remains, hint that the people occupying Spitzkloof D were part of an extensive trade/interaction network within Namaqualand that also reached further north and west. Future work will focus on increasing sample sizes through continued excavation, a detailed study of the lithics and the trade items including the glass beads and iron implements, and additional sampling for radiocarbon dating.

Acknowledgements

The authors would like to thank Hugo Pinto for assisting with excavation and the identification of the complex stratigraphy, and Louisa Hutten, Deano Stynder, and Delores Jacobs from the University of Cape Town's Department of Archaeology for their help with artefact sorting, curation, and faunal identification, as well as Michelle Cameron, Max Friesen, and Teresa Steele for their comments and suggestions on an earlier draft of this paper. Hopper would also like to acknowledge the following organisations which provided funding for this fieldwork in South Africa: The National Geographic Society Early Career Grant (GR-000044937), Archaeology Student Research Fellowship administered by the Archaeology Center at the University of Toronto, and the Research Travel Grant administered by the School of Graduate Studies at the University of Toronto. Finally, we thank Jayson Orton, Tim Forssman, and Matt Lotter for their insightful feedback on this paper.

References

Acocks, J. 1979. The flora that matched the fauna. Bothalia, 12(4): 673-709.

Beaumont, P., Smith, A. & Vogel, J. 1995. Before the Einiqua: The archaeology of the frontier zone. In: Smith, A. (ed.) Einiqualand: Studies of the Orange River Frontier: 236-264. Cape Town: UCT Press.

Beaumont, P.B. & Boshier, A.K. 1974. Report on test excavations in a prehistoric pigment mine near Postmasburg, Northern Cape. The South African Archaeological Bulletin, 29(113): 41-59.

Behrensmeyer, A.K. 1978. Taphonomic and ecologic information from bone weathering. Paleobiology, 4(2): 150-162.

Bollong, C.A., Sampson, C.G. & Smith, A.B. 1997. Khoikhoi and Bushman pottery in the Cape Colony: Ethnohistory and Later Stone Age ceramics of the South African interior. Journal of Anthropological Archaeology, 16(3): 269-299.

Brain, C.K. 1981. The Hunters or the Hunted? An Introduction to African Cave Taphonomy. Chicago: University of Chicago Press.

Brink, J. & Webley, L. 1996. Faunal evidence for pastoralist settlement at Jakkalsberg, Richtersveld, Northern Cape Province. Southern African Field Archaeology, 5(2): 70-78.

Bronk Ramsey, C. 2009. Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1): 337-360.

Chase, B. & Meadows, M. 2007. Late Quaternary dynamics of southern Africa's winter rainfall zone. Earth-Science Reviews, 84(3-4): 103-138.

Collins, B. & Steele, T.E. 2017. An often overlooked resource: Ostrich (*Struthio* spp.) eggshell in the archaeological record. Journal of Archaeological Science: Reports, 13: 121-131.

Comaroff, J. & Comaroff, J.L. 2006. Beasts, banknotes and the colour of money in colonial South Africa. Archaeological Dialogues, 12(2): 107-132.

Coutu, A.N., Taurozzi, A.J., Mackie, M., et al. 2021. Palaeoproteomics confirm earliest domesticated sheep in southern Africa ca. 2000 BP. Scientific Reports, 11(1): 1-11.

Cowling, R., Esler, K. & Rundel, P. 1999. Namaqualand, South Africa – an overview of a unique winter-rainfall desert ecosystem. Plant Ecology, 142: 3-21.

David, B. 1990. How was this bone burnt? In: Solomon, S., Davidson, I. & Watson, D. (eds.) Problem Solving in Taphonomy: Archaeological and Paleontological Studies from Europe, Africa and Oceania: 65-79. Queensland: University of Queensland.

Dewar, G. 2008. The Archaeology of the Coastal Desert of Namaqualand, South Africa: A Regional Synthesis. British Archaeological Reports. Oxford: John and Erica Hedges Ltd.

Dewar, G. & Jerardino, A. 2007. Micromammals: When humans are the hunters. Journal of Taphonomy, 5(1): 1-14.

Dewar, G., Mackay, A. & Stewart, B.A. 2023. Spitzkloof A Rockshelter, South Africa. In: Beyin, A., Wright, D., Wilkins, J., et al. (eds) The Handbook of Pleistocene Archaeology of Africa: Hominin Behaviour, Geography, and Chronology: 1677-1690. Cham: Springer Nature.

Dewar, G. & Orton, J. 2013. Subsistence, settlement and material culture on the central Namaqualand coastline. In: Jerardino, A., Malan, A. & Braun, D. (eds) The Archaeology of the West Coast of South Africa: 109-123. Oxford: Archaeopress.

Dewar, G. & Stewart, B.A. 2012. Preliminary results of excavations at Spitzkloof Rockshelter, Richtersveld, South Africa. Quaternary International, 270: 30-39.

Dewar, G. & Stewart, B.A. 2016a. Paleoenvironments, sea levels, and land use in Namaqualand, South Africa, during MIS 6-2. In: Stewart, B. & Jones, S. (eds) Africa During Stages 6-2: Population Dynamics and Palaeoenvironments: 195-212. New York: Springer Press.

Dewar, G. & Stewart, B.A. 2016b. Early maritime desert dwellers in Namaqualand, South Africa: A Holocene perspective on Pleistocene peopling. The Journal of Island and Coastal Archaeology, 12(1): 44-64.

Dewar, G. & Stewart, B.A. 2022. AMEMSA, Adaptations to Marginal Environments in the Middle Stone Age: Archaeology in South Africa. Available from: https://amemsa.org/ (Accessed: 2023).

Ecker, M., Botha-Brink, J., Lee-Thorp, J.A, et al. 2015. Ostrich eggshell as a source of palaeoenvironmental information in the arid interior of South Africa: A case study from Wonderwerk Cave. In: Runge, J. (ed.) Changing Climates, Ecosystems and Environments Within Arid Southern Africa and Adjoining Regions: 95-115. London: Taylor & Francis Group.

Elphick, R. 1985. Khoikhoi and the Founding of White South Africa. Johannesburg: Ravan Press.

Faith, J. & Lyman, R.L. 2019. Paleozoology and Paleoenvironments: Fundamentals, Assumptions, Techniques. New York: Cambridge University Press.

Faith, J.T. 2008. Eland, buffalo, and wild pigs: Were Middle Stone Age humans ineffective hunters? Journal of Human Evolution, 55(1): 24-36.

Faith, J.T. & Du, A. 2018. The measurement of taxonomic evenness in zooarchaeology. Archaeological and Anthropological Sciences, 10(6): 1419-1428.

Frimmel, H. 2003. Port Nolloth group including the Stinkfontein and Hilda subgroups. In: Johnson, M (ed.) The Catalogue of South African Lithostratigraphic Units: 25-37. Pretoria: South African Committee for Stratigraphy.

Goodwin, A.J.H. 1956. Metal working among the early Hottentots. The South African Archaeological Bulletin, 11(42): 46-51.

Grayson, D. 1984. Quantitative Zooarchaeology: Topics in the Analysis of Archaeological Faunas. New York: Academic Press.

Halkett, D. 2001. A report on archaeological excavations on the Orange River floodplain between Jakkalsberg and Sendelingsdrift: Richtersveld, Cape Town. Unpublished CRM report. Available from: https://sahris.sahra.org.za/sites/default/files/heritagereports/9-2-066-0034-20010901-ACO_0.pdf

Halkett, D. & Dewar, G. 2007. Mitigation of archaeological sites within the Buffels Marine and Koingnaas complexes, Namaqualand, July to October 2006. Unpublished CRM report.

Halkett, D. & Hart, T. 1997. An Archaeological Assessment of the Coastal Strip, and a Proposed Heritage Management Plan for: De Beers Namaqualand Mines, Vol. 1. Unpublished CRM report.

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.

Hopper, C. & Dewar, G. 2022. Later Stone Age herd management strategies in western South Africa: Evaluating sheep demographics and faunal composition. Journal of Anthropological Archaeology, 66: 101414.

Jacobson, L. 1987a. More on ostrich eggshell bead size variability: The Geduld early herder assemblage. The South African Archaeological Bulletin, 42(146): 174-175.

Jacobson, L. 1987b. Size variability of ostrich eggshell beads from central Namibia and its relevance as a stylistic and temporal marker. The South African Archaeological Bulletin, 42(145): 55-58.

Johnson, E. 1985. Current developments in bone technology. In: Schiffer, M. (ed.) Advances in Archaeological

Method and Theory: 157-235. New York: Academic Press.
Kandel, A.W. & Conard, N.J. 2005. Production sequences of ostrich eggshell beads and settlement dynamics in the Geelbek Dunes of the Western Cape, South Africa. Journal of Archaeological Science, 32(12): 1711-1721.
Kelly, R. 2013. The Lifeways of Hunter-gatherers: The Foraging Spectrum, Second Edition. Cambridge: Cambridge University Press.
Kinahan, J. & Kinahan, J.H.A. 2003. Excavation of a late Holocene cave deposit in the southern Namib Desert, Namibia. Cimbebasia, 18: 1-10.
Kinahan, J. 2000. Cattle for beads: The archaeology of historical contact and trade on the Namib coast. Doctoral Thesis. Uppsala: University of Uppsala.
Klein, R.G. 1976. The mammalian fauna of the Klasies River mouth sites, Southern Cape Province, South Africa. The South African Archaeological Bulletin, 31(123/124): 75.
Knight, M. 1995. Drought-related mortality of wildlife in the southern Kalahari and the role of man. African Journal of Ecology, 33(4): 377-394.
Lander, F. & Russell, T. 2018. The archaeological evidence for the appearance of pastoralism and farming in southern Africa. PloS ONE, 13(6): e0198941.
Lombard, M. & Badenhorst, S. 2019. A case for springbok hunting with kite-like structures in the northwest Nama Karoo Bioregion of South Africa. African Archaeological Review, 36(3): 383-396.
Lombard, M., Lotter, M. G., van der Walt, J., et al. 2021. The Keimoes kite landscape of the trans-Gariep, South Africa. Archaeological and Anthropological Sciences, 13: 1-22.
Lyman, R. 2008. Quantitative Paleozoology. Cambridge: Cambridge University Press.
Lyman, R. 1994. Vertebrate Taphonomy. Cambridge: Cambridge University Press.
MacKellar, N.C., Hewitson, B.C. & Tadross, M.A. 2007. Namaqualand's climate: Recent historical changes and future scenarios. Journal of Arid Environments, 70: 604-614.
Miller, D., Manhire, T., Yates, R., et al. 1998. Metalwork found in Late Stone Age contexts in the Western and Southern Cape. Southern African Field Archaeology, 7: 106-110.
Miller, D.E. & Webley, L. 1994. The metallurgical analysis of artefacts from Jakkalsberg, Richtersveld, Northern Cape. Southern African Field Archaeology, 3: 82-93.
Miller, J.M. 2016. Variability in ostrich eggshell beads from the Middle and Later Stone Age of Africa. Doctoral Thesis. Edmonton: University of Alberta.
Miller, J.M. & Sawchuk, E.A. 2019. Ostrich eggshell bead diameter in the Holocene: Regional variation with the spread of herding in eastern and southern Africa. PLoS ONE, 14(11): 1-19.
Morin, E., Bird, D., Winterhalder, B., et al. 2021. Deconstructing hunting returns: Can we reconstruct and predict payoffs from pursuing prey? Journal of Archaeological Method and Theory, 29(2): 561-623.
Museum of London Archaeology Service. 1994. Archaeological Site Manual, Third Edition. London: City of London Archaeological Trust.
Orton, J. 2006. The Later Stone Age lithic sequence at Elands Bay, Western Cape, South Africa: Raw materials, artefacts and sporadic change. Southern African Humanities, 18(2): 1-28.
Orton, J. 2008. Later Stone Age ostrich eggshell bead manufacture in the Northern Cape, South Africa. Journal of Archaeological Science, 35(7): 1765-1775.
Orton, J. 2012. Late Holocene archaeology in Namaqualand, South Africa: Hunter-gatherers and herders in a semi-arid environment. Doctoral Thesis. Oxford: University of Oxford.
Orton, J. 2014. The late pre-colonial site of Komkans 2 (KK002) and an evaluation of the evidence for indigenous copper smelting in Namaqualand, southern Africa. Azania, 49(3): 386-410.
Orton, J. & Halkett, D. 2006. Mitigation of archaeological sites within the Buffels marine and Koingnaas complexes, Namaqualand, November to December 2005, Cape Town. Unpublished CRM Report. Available from: https://sahris.sahra.org.za/sites/default/files/heritagereports/9-2-066-0004-20060201-ACO_0.pdf
Orton, J., Klein, R.G., Mackay, A., et al. 2011. Two Holocene rock shelter deposits from the Knersvlakte, southern Namaqualand, South Africa. Southern African Humanities, 23: 109-150.
Parsons, I. 2004. Stone circles in the Bloubos landscape, Northern Cape. Southern African Humanities, 16: 59-69.
Rutherford, M.C., Mucina, L. & Leslie, W. 2006. Biomes and bioregions of southern Africa. In: Mucina, L. & Rutherford, M. (eds) The Vegetation of South Africa, Lesotho and Swaziland: 31-51. Pretoria: South African National Biodiversity Institute.
Sadr, K. & Sampson, C.G. 1999. Khoekhoe ceramics of the Upper Seacow River Valley. The South African Archaeological Bulletin, 54(169): 3.
Sadr, K. & Smith, A.B. 1991. On ceramic variation in the south-western Cape, South Africa. The South African Archaeological Bulletin, 46(154): 107-114.
Sealy, J. & Yates, R. 1994. The chronology of the introduction of pastoralism to the Cape, South Africa. Antiquity,

68: 58-67.
Smith, A.B., Halkett, D., Hart, T., et al. 2001. Spatial patterning, cultural identity and site integrity on open sites: Evidence from Bloeddrift 23, a pre-colonial herder camp in the Richtersveld, Northern Cape Province, South Africa. The South African Archaeological Bulletin, 56(173): 23-33.
Smith, A.B. & Pheiffer, R. 1992. Col. Robert Jacob Gordon's notes on the Khoikhoi 1779-80. Annals of the South African Cultural History Museum, 5(1): 1-56.
Smith, A.B., Sadr, K., Gribble, J., et al. 1991. Excavations in the south-western Cape, South Africa, and the archaeological identity of prehistoric hunter-gatherers within the last 2000 years. The South African Archaeological Bulletin, 46(154): 71-91.
Steele, T.E., Mackay, A., Fitzsimmons, K.E., et al. 2016. Varsche Rivier 003: A Middle and Later Stone Age site with Still Bay and Howiesons Poort assemblages in Southern Namaqualand, South Africa. PaleoAnthropology, 100-163.
Stein, L.R. & Badyaev, A. V. 2011. Evolution of eggshell structure during rapid range expansion in a passerine bird. Functional Ecology, 25(6): 1215-1222.
Stewart, B.A., Zhao, Y., Mitchell, P.J., et al. 2020. Ostrich eggshell bead strontium isotopes reveal persistent macroscale social networking across late Quaternary southern Africa. Proceedings of the National Academy of Sciences, 117(12): 6453-6462.
Thom, H. 1952. Journal of Jan van Riebeeck, Three Volumes. Cape Town: A.A. Balkema.
Webley, L. 1986. Pastoralist ethnoarchaeology in Namaqualand. The South African Archaeological Bulletin, Goodwin Series, 5: 57-61.
Webley, L. 1992. The history and archaeology of pastoralist and hunter-gatherer settlement in the north-western Cape, South Africa. Doctoral Thesis. Cape Town: University of Cape Town.
Webley, L. 1997. Jakkalsberg A and B: The cultural material from two pastoralist sites in the Richtersveld, Northern Cape. Southern African Field Archaeology, 6: 3-19.
Webley, L. 2002. The re-excavation of Spoegrivier Cave on the west coast of South Africa. Annals of the Eastern Cape Museums, 2: 19-49.
Wendt, W.E. 1972. Preliminary report on an archaeological research programme in South West Africa. Cimbebasia, B21: 1-61.
Wood, M. 2011. A glass bead sequence for southern Africa from the 8th to the 16th century AD. Journal of African Archaeology, 9(1): 67-84.