Journal of Archaeological Science: Reports 67 (2025) 105358

Contents lists available at ScienceDirect

Journal of Archaeological Science: Reports

journal homepage: www.elsevier.com/locate/jasrep

First technological approach to a late Holocene pottery assemblage from the Marshill site in the Eastern Cape, South Africa☆

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ARTICLE INFO

Keywords:
Modelling strategies
Microstructural analysis
Thin section
Technology
Clays
Later stone age

ABSTRACT

Marshill rockshelter is an archaeological site in the Stormberg, in the foothills of the Maloti-Drakensberg mountain range. Between 2020 and 2024, we conducted a series of small test trench excavations to establish a chronostratigraphic framework and to begin the analysis of cultural material recovered from the deposits. This paper offers a preliminary analysis of a small but crucial ceramic collection that was uncovered during the excavations from 2020 to 2023. In this assemblage, we have identified surface strategies (smoothing, spatulating and burnishing), the use of kilns with controlled atmospheres, two main modelling methods (coils and moulding), and three types of textural classes that coincide with three thin section fabrics. In the context of southern African archaeology, some of the characteristics identified for Marshill's pottery assemblage find similarities with other excavated sites in the broader region (e.g., vegetal matter in some of Marshill's sherds).

1. Introduction

This paper presents the first technological pottery results from the site of Marshill Rockshelter located in the Stormberg area of the Eastern Cape Province in South Africa. In 2018, we started a prospection survey and excavation project to investigate the history of the site from the Middle Stone Age through to the historical times (de la Peña and Witelson, 2020).

The Stormberg region is located in the SW piedmont of the Maloti-Drakensberg range and lies within the grassland and afroalpine grassland biomes. There is a remarkably steep altitudinal gradient ranging from 700 to over 2000 m above sea level (masl). The area is bounded by the river basins of the Kraai River in the north and the Kei River to the south (Figs. 1 and 2).

The area has received intermittent archaeological research over time. This includes the late 19th century ethnographic and archaeological work by British born geologist, Edward John Dunn, who was employed by the Cape Colony between 1871 and 1886. During this time, Dunn recorded several archaeological assemblages including lithics, pottery, rock paintings, beads and pigments from across South Africa including the Stormberg region. Currently, these assemblages are curated at the Pitts River Museum in the United Kingdom (Dunn, 1880; Dunn, 1931; Parsons, 2013). During the 1960s and 1970s, Lee and Woodhouse (1970) focussed on the recording of rock art which produced a rich photographic archive for the Stormberg and more recently, Witelson (2023) and Challis and Sinclair-Thomson (2022) have revisited some of the rock art sites and have offered an in-depth analysis and interpretation of the art.

Within the wider region, several sites have been identified and excavated revealing a complex landscape including Middle Stone Age, Later Stone Age and Iron Age communities. In the Caledon River valley for example, the site of Rose Cottage Cave offers a *long durée* of Middle Stone Age and Later Stone Age occupation (Wadley, 1997). The ceramic assemblage at Rose Cottage Cave was analysed by Thorp (1997). Further to the west and at the base of the Stormberg mountain range, the site of Grassridge rock shelter stands out (Ames et al., 2020 for a recent synthesis). Other important sites are around MacClear (e.g. Strathalam Opperman, 1996). Marshill Rockshelter can therefore be placed as part of a broader history of human occupation in a region that has received a long but intermittent tradition of archaeological research in southern African (Fig. 2).

☆ This article is part of a special issue entitled: 'Scientific Analysis on Pottery Finds from Africa' published in Journal of Archaeological Science: Reports.

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https://doi.org/10.1016/j.jasrep.2025.105358
Received 8 March 2025; Received in revised form 9 August 2025; Accepted 11 August 2025
Available online 15 August 2025

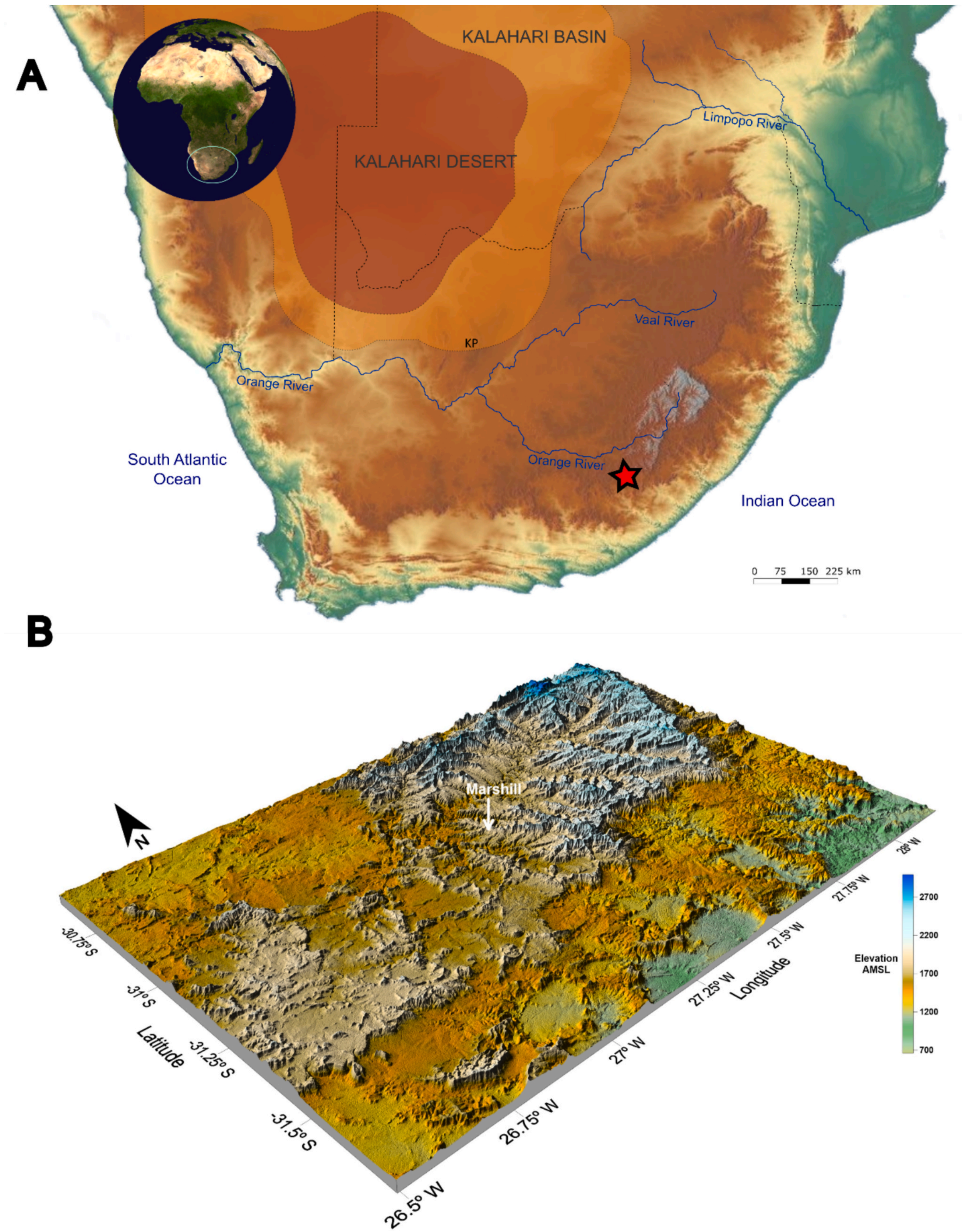

Fig. 1. A. The Stormberg area in southern Africa. B Marshill rockshelter located in a digital model of terrain. The digital model of the terrain was retrieved from https://lpdaac.usgs.gov/ maintained by the NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC).

1.1. Aims of current project at Marshill rockshelter

The current project aims to investigate the history at Marshill, lying uniquely at a higher altitude in the grassland biome, and to explore the occupational and mobility patterns of the people who once inhabited the site from the Middle Stone Age through to the more recent past. Part of this investigation involves the understanding of the site's particular location (environmental, geological and climatic) in relation to other excavated sites and linking these, where possible, to some of the rock paintings documented there.

Between 2020 and 2024, we conducted a series of small test trench excavations in order to establish a chronostratigraphic framework and to begin the analysis of cultural material recovered from the deposits. This paper offers a preliminary analysis of the ceramic assemblage recovered from the 2020 to 2023 excavations. Here, we first offer a general overview of the current state of knowledge for pottery assemblages in southern African archaeology and introduce the site of Marshill before presenting on the results of a technological trace analysis of the pottery assemblage recovered.

1.2. Southern Africa pottery assemblages from 2000 years ago (BP)

The first pottery appears just before 2000 years ago (BP) on the drier western half of southern Africa, before the arrival of Bantu-language speaking agriculturalists along the summer-rainfall zone in the eastern half of the subcontinent (Sadr, 2008, Lander and Russell, 2018). The significance for their early appearance has for many decades been subject to debate amongst southern African archaeologists (Deacon, 1984, Kinahan, 1996; Webley, 1992, Russell, 2004, Jerardino and Maggs, 2007, Orton, 2012, Jerardino et al., 2014, Russell and Lander, 2015). The debate revolves around whether pottery and livestock (without agriculture) arrives as a local indigenous innovation or as part of a migration package with early first-millennium Khoe-speaking pastoralists (Smith, 1990, 2008, 2014; Sadr, 2003, 2008, 2013, 2014). Interpretations of the archaeology differ and are guided by how to identify two different subsistence groups in the archaeological record with pottery being one of the main markers to distinguish between the two (Russell and Lander, 2015). Both form and style in ceramic analyses have been used to argue either side of the debate (Sadr and Sampson, 2006; Smith, 2008).

Early pottery assemblages found along the western coastal strip of southern Africa are often characterised as thin-walled, mineral-tempered, mostly undecorated and well fired with the majority being coil-built (Fig. 3). Vessels generally take the form of bag-shaped pots or jars and may include spouts or lugs (Lander and Russell, 2018). Reddish or black coil-built vessels with shoulder lugs were first documented by early European travellers rounding the Cape coast of southern Africa from the 16th century onwards and have been attributed to historical Khoe-speaking pastoralists (Bollong et al., 1997). In the eastern part of South Africa Mazel (1992a) identified earlier pre-agriculturalist ceramic assemblages mainly thin-walled and grit-tempered from sites such as Collingham Shelter (AD 125–228), Driel Shelter (AD 249–356) and Mhlwazini Shelter (383–211 BCE) in the Drakensberg and at kwaThwaleyakhe Shelter (before AD 694–888) in the central Thukela River Basin of the KwaZulu-Natal Province in South Africa (Fig. 2 and Fig. 3, number 5). How this pottery arrived ahead of the settlement of Bantu-language speaking farmers is at present unclear as conventionally the spread of herding (without agriculture) has not been historically situated within the KwaZulu-Natal region. In the central interior of South Africa, fibre-tempered pottery, mostly with inclusions of grass, are reported at both open air and rockshelter sites including Haaskraal, Glen Elliot, Zaayfontein and Blydefontein (Sampson and Vogel, 1996; Sadr and Sampson, 2006) (Fig. 2 and Fig. 3, number 4). This pottery is described as coarse and often taking the form of bowls. The occurrence of these fibre-tempered wares, both as thin-walled and undecorated (Class B) and as thick-walled and decorated (Class A) persist well into

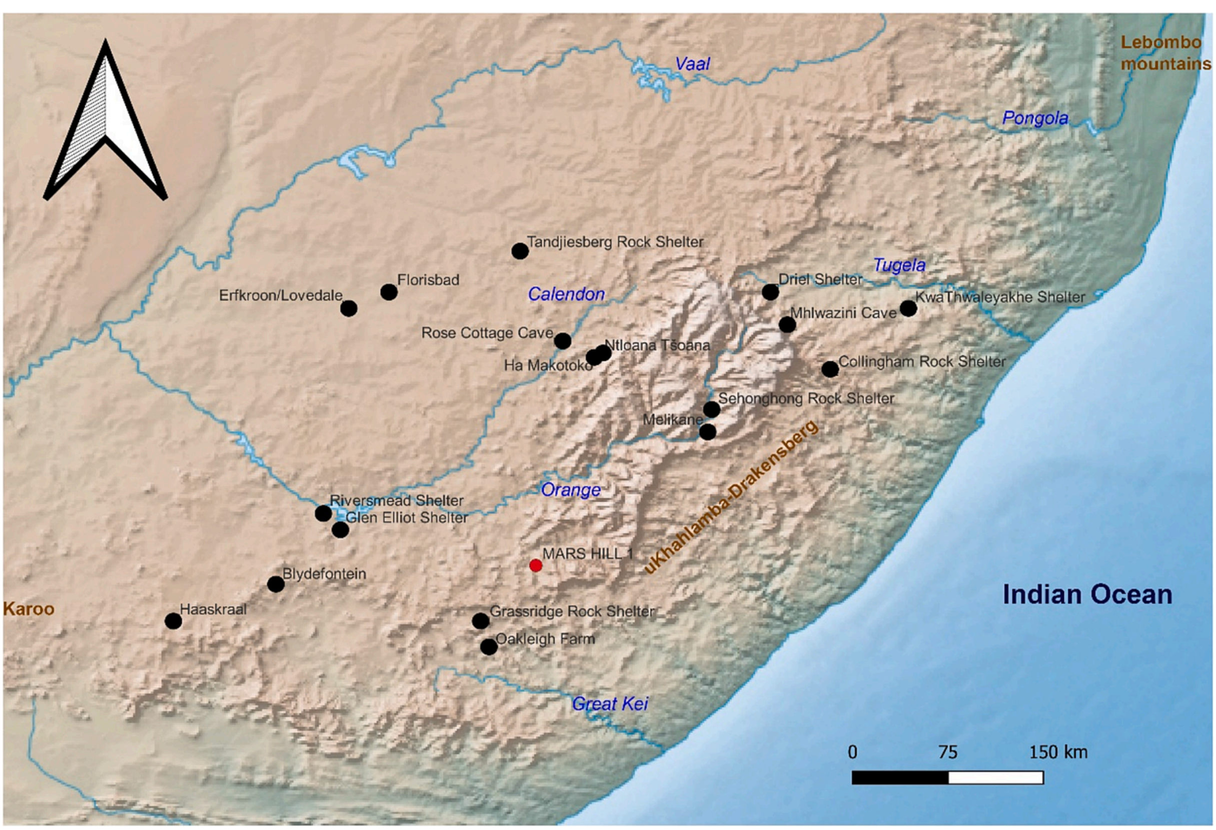

Fig. 2. Map with the main sites mentioned in this article.

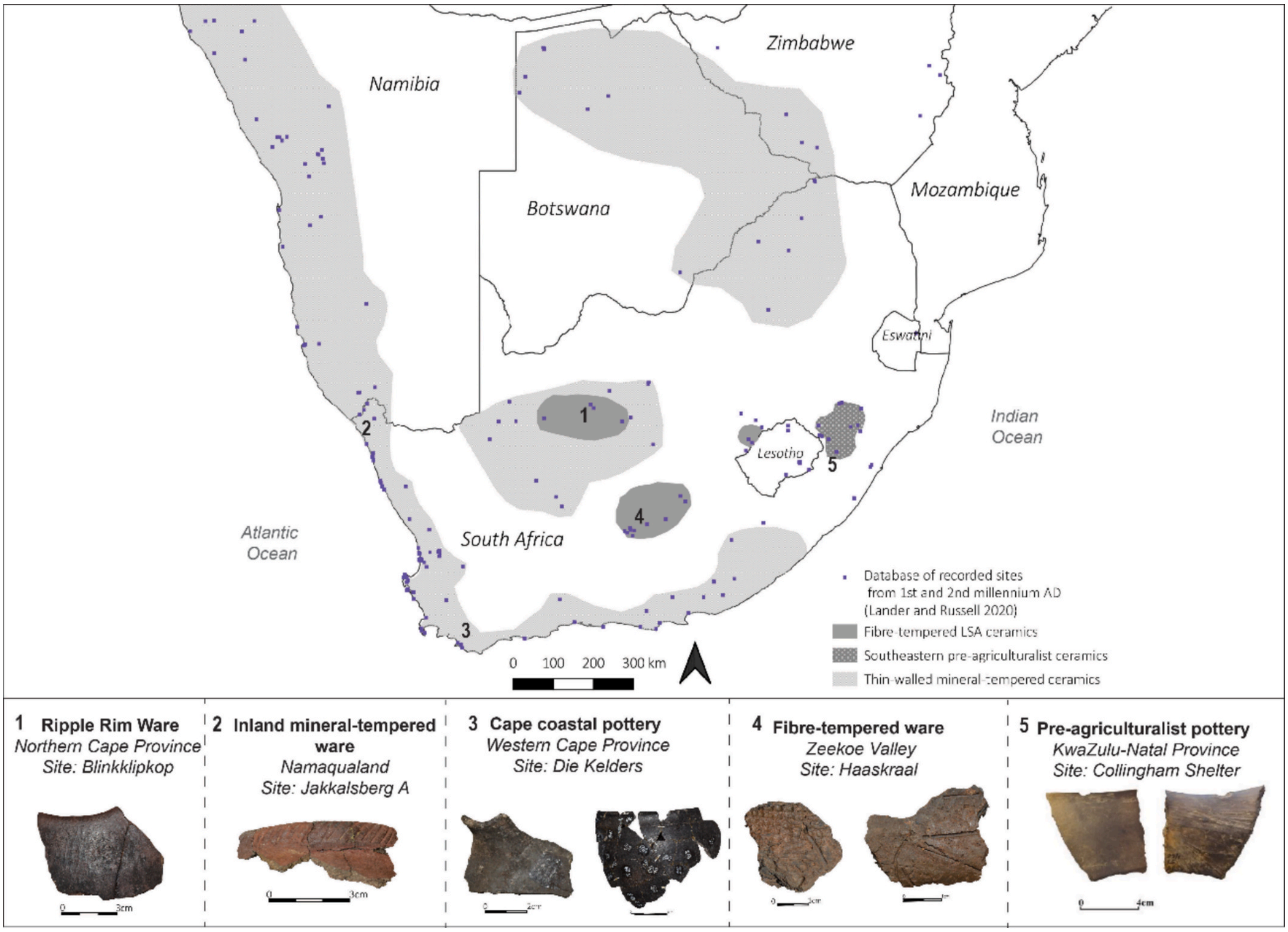

Fig. 3. Distribution of early pre-agriculturalist pottery in southern Africa. Data from Lander and Russell (2020). Photographs taken by Lander in 2019.

the latter parts of the second millennium AD (Sampson and Vogel, 1996) (Fig. 3). In the Stormberg, Derricourt (1977) described a pottery assemblage from an inland rockshelter at Oakleigh Farm as being similar to the stamped-impressed fibre-tempered ceramics (Class A ceramics) recovered from sites in the Upper Karoo (Sampson, 1988; Sampson and Vogel, 1996). The pottery dates to the later parts of the second millennium AD. Fibre- tempered pottery has also been identified from sites in the Caledon River Valley (Free-State Province), where Thorp (1997; Thorp, 2000) analysed assemblages from Rose Cottage Cave (AD 1320–1421) and Tandjiesberg Rockshelter (AD 1179–1273). Ethnographic and historical records indicate that these grass-tempered wares were of local manufacture made by hunter-gatherer communities (Sadr and Sampson, 2006).

Just after the first appearance of pottery, evidence is found for early agriculturalist ceramic wares on the eastern side of southern Africa at around 1800 year ago (BP) (Lander and Russell 2018). The pottery is associated with the spread of early Bantu-language speaking cultivators and livestock-owners in what is termed the Iron Age period in southern African archaeology. The pottery is distinct from thin-walled ware in that assemblages are thick-walled and often highly decorated (Huffman 2007). In Southern Africa, sites of this period appear along the eastern Indian Ocean coastline but also further to the north and inland in KwaZulu-Natal, North-West, Limpopo and Mpumalanga provinces of South Africa. The archaeology of the Free-State and Lesotho however indicate that farmers did not settle there until much later during the latter parts of the second millennium AD. The style of early farmer ceramic ware varies through time and space but it is suggested to maintain broad stylistic similarities based on decorative motif and form (Huffman, 2007). During the second millennium AD, evidence of expanding global trade networks and the growth in political complexity characterise the southern African landscape. During the latter parts of this period archaeologists and historians trace ethnic identities of past communities back through written records and oral traditions. Pots are produced in abundance during this time and demonstrate wide diversity with both thick-walled and thin-walled wares. Ethnographic and typological studies of these assemblages have been linked for example to present-day linguistic and cultural groups such as the Venda, Tswana, and Nguni groups (Huffman, 2007; Hall, 2012).

1.3. Marshill rockshelter

Marshill is a large rock shelter in the Clarence formation formed by the lateral erosion of a meander. It is nearly 100 m in length and around 20–30 m in breadth. The site has experienced different rock fall episodes over time some of which were caused by natural falls whilst others have been anthropically driven. The most recent episode of rock falling was from the blasting that took place during the second Anglo-Boer war.

There are several stone-walled livestock enclosures most of which have been constructed using the fallen pieces of blasted rock. The age of these structures are potentially linked to the period, dating after the Second Anglo-Boer War (1899–1902).

Beginning in 2020, a total of four excavation campaigns (2020, 2022, 2023, and 2024) were conducted. Three test trenches opened at the site provide evidence of an intricate stratigraphical sequence dating from the

Middle Stone Age to historical times. The site also contains rock paintings with different image-making phases through time, including the contact period rock art. The ceramic assemblage was excavated during the 2020, 2022 and 2024 campaigns from test trenches A and B (Figs. 4, 5 and 6).

We sent 12 samples to Oxford and Poznan laboratories. For each laboratory, we sent three bones and three charcoal samples. The bone remains were pieced plotted, but the charcoal's spatial location is presented through their plan (as these pieces are difficult to locate *in situ* during excavation). Plan 6 is deeper than plan 3. Nonetheless, all charcoals compared in this manuscript come from the same layer and the same plan. Thus, four charcoals from the ACE layer (Plans 3 and 6) and two charcoals from the ACU layer (Plan 1). The results ages from both laboratories are not ordered stratigraphically from either of the laboratories compared, and none of the plans within ACE (Table 1). ACU is an older layer than ACE; thus, the dates from ACU should be older than ACE. Moreover, the dates within ACE (again, for both laboratories) do not show consistency regarding stratigraphic position, as the dates coming from ACE layer plan 6 should be older than plan 3. The bone samples, for both laboratories, did not have enough collagen; therefore, we show here only the results for the charcoal (Table 1). The different dates are probably due to radiocarbon measurements, rather than sedimentary mixing, because in this part of the sequence, there was no mixing recorded, and the ACE layer is a clear combustion feature.

2. Material and methods

The methodology used in Marshill's pottery analysis is intended to provide an approximation of the manufacturing processes by investigating the structure and composition of the clay vessels. We used a combination of macro and micro-structural analyses as well as performing a thin section petrographic analysis to identify mineralogical content.

Using a Leica M80 stereo microscope with an EZ-350 camera, the macro-trace analysis focused on the qualitative characteristics generated during the forming or modelling strategies (Roux, 1994; Forte, 2014; Forte, 2020; Forte et al., 2020). Other features such as surface treatments and macroscopic identification of textural groups were analysed. This involved an in-depth study of the topography of the sherd surface and its clay matrix to pinpoint potential faults when building the vessel. Observations about fractures and stress lines as well as other features such as colour, brightness, grain size, antiplastic and microtopography were documented during this process. The study of the clay matrix focused on the identification of colour variations and various factors of the antiplastics (Capel and Delgado, 1978; Velde and Druc, 1999; Dorado Alejos, 2022).

To identify the possible sinterization or vitrification of clays during the firing process as well as raw material selection strategies and organic and inorganic inclusions, we conducted a microstructural analysis of the assemblage following Tite and Maniatis (1975) and others (Tite et al., 1982; Freestone, 1982; Freestone and Middleton, 1987). A Coxem Model EM-30AXP Scanning Electron Microscope was used which has a Low vacuum system meaning that samples did not need to be coated in 15 kV operating conditions in Secondary Electron.

The mineralogical analyses was conducted on a sample of four sherds and studied with plane polarised light and crossed nicols, described following the modified system advanced by Whitbread (1995, 2016). Grouping the samples according to their main features of inclusions, matrix and porosity (expressed as c:f:v) with 10 μm serving as the limit between large and fine grain was also performed (Whitbread, 1995: 371). The distribution of the grain size and the orientation of the components were estimated visually following the guidelines of Bullock et al. (1985), applying the same technique for the identification of the frequency category according to Matthew et al. (1997).

Finally, concerning the sample studies, we first made a preliminary analysis of all the pieces from 2020, 2022 and 2023 campaigns (see Table SM1). A more in-depth analysis of a selection of pottery sherds from the 2020 excavation was conducted. (Table 2).

3. Results

A total of 99 pottery sherds were recovered between 2020 and 2022–2023. 27 sherds were excavated from test trench A and 36 from test trench B. A further 36 small fragments were recovered from the surface and surface clearings. Six additional sherds were also recovered from the BAR layer located below the radiocarbon dated layers of ACE and ACU. It is possible that some of the pottery may have travelled down through the deposit, however radiocarbon dates from the ACE and ACU layers suggest that the ceramic assemblage dates between and after the 11th–13th centuries AD (Table 1).

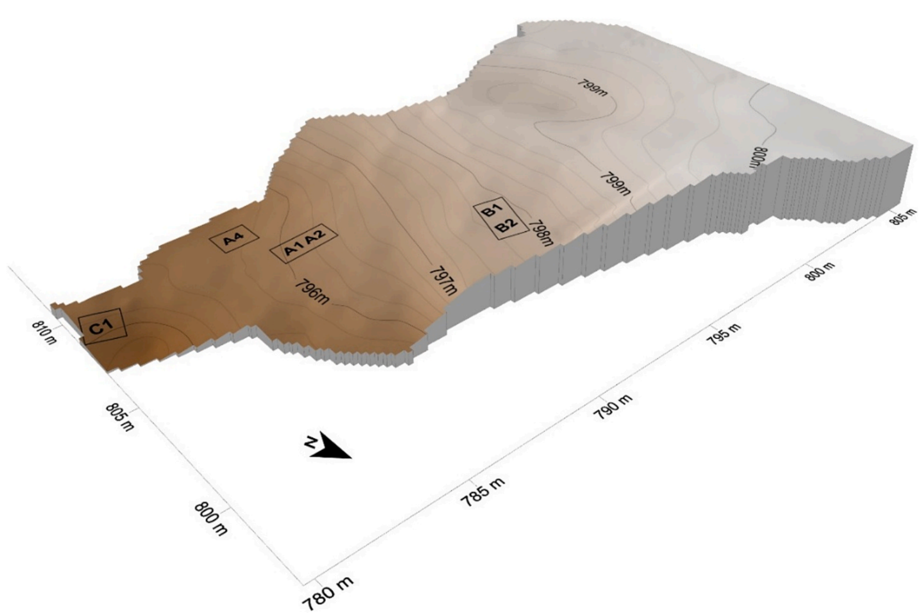

Fig. 4. Topography of the upper area of Marshill rockshelter. The archaeological material of this article is coming from squares A1, A2, B1 and B2. Topography P. de la Peña and F. Colino.

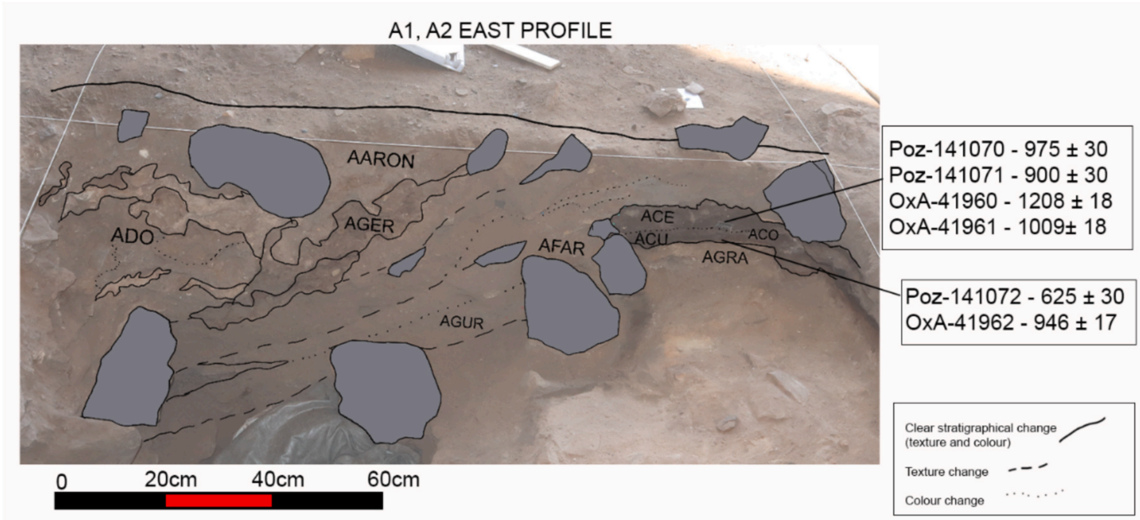

Fig. 5. East profile of test trench A (A1 and A2 squares) and radiocarbon dates of Ace and Acu layers.

Fig. 6. West profile of B1 and B3 squares, area B.

The pottery assemblage is highly fragmented and generally adiagnostic with six rim sherds and a few red burnished sherds from layers AGUR and ABAC. Much of the assemblage is undecorated with medium to thin walls with an average thickness of 7 mm (Table SM1).

3.1. *Textural analysis and identification of macro-traces in selected sample*

Treatments such as smoothing (Fig. 7B.1 and 2), spatulate (Fig. 7B.3 and 4) and burnishing (Fig. 7B.7 and 8) can be observed from the pottery assemblage (for treatments that have various functionalities see Schiffer 1990). There is a preeminence of a more careful treatment on the inside of the vessel which could possibly be related the use of vessels for holding semi-liquids and liquids. In this case, burnishing is oriented close to the pores in order to give it a greater 'anti-adherence' (Díaz Bonilla, 2022: 49-53). This treatment may also increase resistance to thermal shock and improve heat distribution across surfaces during the cooking of food (Schiffer and Skibo, 1989). We also observed the imprints of various vegetal elements which draws attention to the lack of treatment of some of the pottery productions.

Based on the surface colours of the sherds, we identified the use of a largely reductive firing process in the assemblage. This suggests that the pottery makers used well-defined firing strategies possibly using kilns with a reductive environment. These characteristics are well illustrated in some of the vessel surfaces from the ADO level, (e.g. Fig. 7B.5 and 6). The dark greyish colours of these sherds reveal specific firing skills that we can relate to structures made in kiln-like pits or on the surface, with or without ephemeral architectural structures around them. Although they leave little or no traces in the archaeological record, we can find some ethnoarchaeological and experimental references (Rye and Evans, 1976; May and Tuckson, 1982; Gosselain, 1995; Livingstone Smith, 2007) and experimental (Calvo Gálvez, 1992). These characteristics suggest that temperatures for firing would have reached no more than 700 °C. Likewise, the generalised presence of vascular and striated pores in the core areas of the matrices would indicate from a technological perspective to not exceeded caloric values (Berducou, 1990; Oakley and

Table 1
Radiocarbon dates from Area A and sum of probabilities of the Layers ACE and ACU located at the site of Marshill, calibrated with shcal20.14c, using Calib 8.1.0 software (Hogg et al., 2020).

Id	Year campaign	Trench	Layer	Plan	Material	Weight (grs)	Laboratory reference	Date BP	1 σ (Cal AD)	2 σ (Cal AD)
CH2	2020	A	C.F. ACE	3	Charcoal	0.234	OxA-41960	1208 ± 18	775–959	774—968
CH4	2020	A	C.F. ACE	6	Charcoal	0.580	OxA-41961	1009 ± 18	996–1032	993–1116
CH1	2020	A	C.F. ACE	3	Charcoal	0.145	Poz-141070	975 ± 30	1026–1026	997–1157
CH6	2020	A	C.F. ACU	1	Charcoal	0.172	OxA-41962	946 ± 17	1041–1153	1035–1157
CH3	2020	A	C.F. ACE	6	Charcoal	0.248	Poz-141071	900 ± 30	1050–1213	1042–1219
CH5	2020	A	C.F. ACU	1	Charcoal	0.281	Poz-141072	625 ± 30	1301–1394	1296–1398
CH2, CH4, CH1, CH3	2020	A	SumACE	3, 6	Charcoal	–	OxA-41960, OxA-41961, Poz-141070, Poz-141071		775—1162	774—1217
CH5, CH6	2020	A	SumACU	1	Charcoal	–	OxA-41962, OxA-41962		1041—1394	1035—1397
CH1 to CH6	2020	A	SumTotal	1, 3, 6	Charcoal	–	OxA-41960, OxA-41961, Poz-141070, OxA-41962, Poz-141071, OxA-41962		775–1389	774–1397

Table 2
Potsherds analysed in depth for this study.

ID	Year	Layer	Plan	Analyses
102 (MARS20-03)	2020	Aaron	5	Macroscopy, Thin Section, SEM
BK7	2020	Aaron	2	Macroscopy, SEM
BK10	2020	Aaron	4	Macroscopy, Thin Section, SEM
BK29	2020	Ado	2	Macroscopy, SEM
416	2020	Ado	2	Macroscopy, Thin Section, SEM
SV621	2020	Afo	1	Macroscopy, SEM
BK21	2020	Ace	5	Macroscopy, Thin Section, SEM
BK21*	2020	Ace	5	Macroscopy
BK21	2020	Ace	5	Macroscopy
BK18	2020	Ace	3	Macroscopy, SEM
BK39	2020	Acu	1	Macroscopy, SEM

Jain, 2002; Padilla Fernández, 2019).

Different modelling strategies were also identified in the analysis (Fig. 7C). Macro-traces observed on some of the samples could be linked to the use of a coil method to form the vessel (Fig. 7C, 1 to 4). These strategies generate the preferential orientation of the clays in a circular pattern as well as with the voids. Other sherds in the assemblage could be related to the mould strategy, although this occurs in smaller frequencies. This modelling strategy is defined by the parallel orientation of the tempering agents (Fig. 7C, 5 to 8). Some pores can also be oriented parallel to the clay pellets formed between the different clay contributions. These marks tend to be chaotic and are the result of the different layers of clay that the potters added during the modelling process, which is why they do not present such a defined pattern as the previous coil method group.

Based on the macroscopic analysis, three different groups corresponding to different types of fabrics were observed for the pottery at the site (Fig. 8A).

The first group is characterised by a high concentration of organic material (possibly grass) with tempering agents that generate imprints in the matrix. This is complimented by the addition of small quartz fragments (<0.5 mm) and a ceramic matrix that is not highly compacted. The second group is characterised by a slightly more compact matrix and the presence of little to no organic inclusions. There are the inclusions of small quartz fragments (<1 mm) which have been homogeneously distributed throughout the clay matrix. The third group can be described as a more compact matrix with no organic material and small (<0.5 mm) and well-organised quartz lenses. These three groups co-occur in the more recent layers of Aaron, Ado, Afo and in the earlier layers of Ace and Aco.

3.2. Microstructural analysis

Results from the microstructural analysis indicate the low structural changes suffered by the matrices during the firing process as no degree of sintering was observed (Fig. 8B). These same patterns can be observed in the sequence where the pottery assemblage must have been fired below 750 °C (Fig. 8B, 1, 2, 4, 7, 8, 9, 15 and 16). An important characteristic detected in the sample was the presence of high concentrations of vegetal matter which will need to be further investigated for specific identification (Fig. 8B, 3, 10–13).

Overall, we noted that certain ceramic productions are maintained over time, as in the case of the vessel with a high organic material. The addition of possible grass could potentially be related to production strategies that are aimed at generating a more porous ceramic container used for possibly either the transpiration of contents or for reduced weight and portability. Some of the grass tempered sherds suggest a poor manufacture with little compactness indicated by macropores in the clay matrix. The detail of the burnishing in which the preferential orientation and the close pore that the application of these surface treatments is visible in Fig. 8B, 14.

3.3. Petrographic analysis

Regarding the petrographic analyses (thin section) three main fabrics were identified:

- Fabric 1: coarse fraction of heterometric quartz and plagioclase (c:f:v 10μ = 55:30:15) (Fig. 9a–d). The fine fraction has brownish tones with plane polarised light and slightly more intense cross polarised light, partially isotropic and with scarce birefringence. This is more intense on the surface due to the profuse treatment applied. The coarse fraction has been defined as quartz and plagioclase, with a spherical morphology and subangular edges, generally smaller than 0.5 mm in size. They are homogeneously distributed in the matrix and chaotically oriented. Small iron-rich pellets, defined as opaque, are observed. Finally, the pores are true chambers in the nuclear areas and outwardly smaller.
- Fabric 2: A very abundant coarse fraction of quartz with presence of plagioclase, augite and olivine (c:f:v 10μ = 65:15:20) (f Fig. 9 e-l). The fine fraction has brownish tones with plane polarised light and slightly more intense cross polarised light, partially isotropic and with scarce birefringence. It is characterised by heterometric materials, smaller than 0.25 mm, with rounded/subrounded morphology and rounded edges. The coarse fraction is oriented obliquely and parallel to the vessel surfaces. The voids are elongated in the central

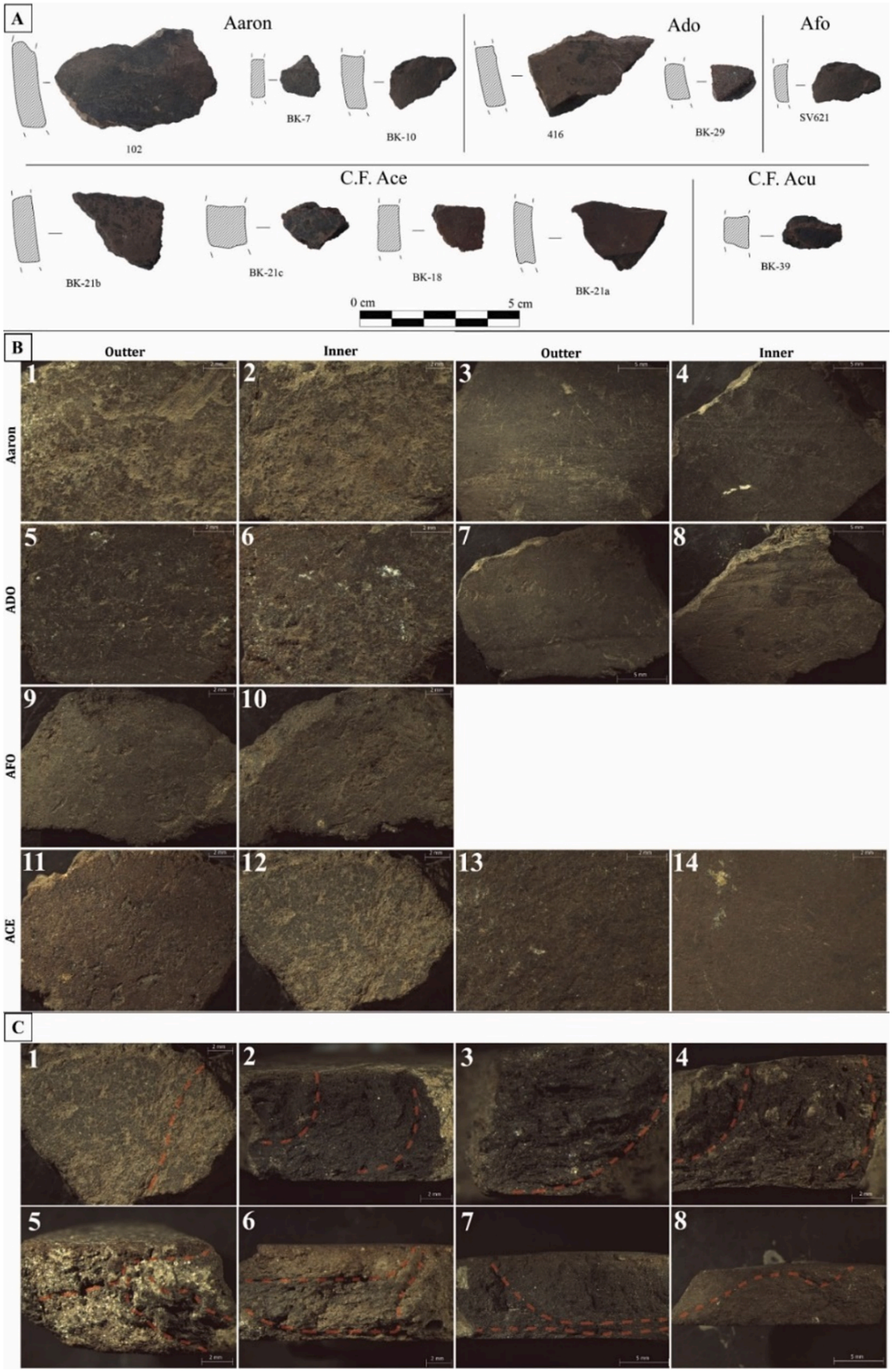

Fig. 7. A. The ceramic sample studied. B. Surface treatments C. Forming strategies. (1–4) coils examples: 1 and 2 (ACE BK18), 3 AFO (SV-621), 4 AARON (MARS20-1, BK10); 5–8 mould examples: 5 and 6. Ado (Bk29), 7 Aaron (Mars20-3), 8 Ace (MARS20-4).

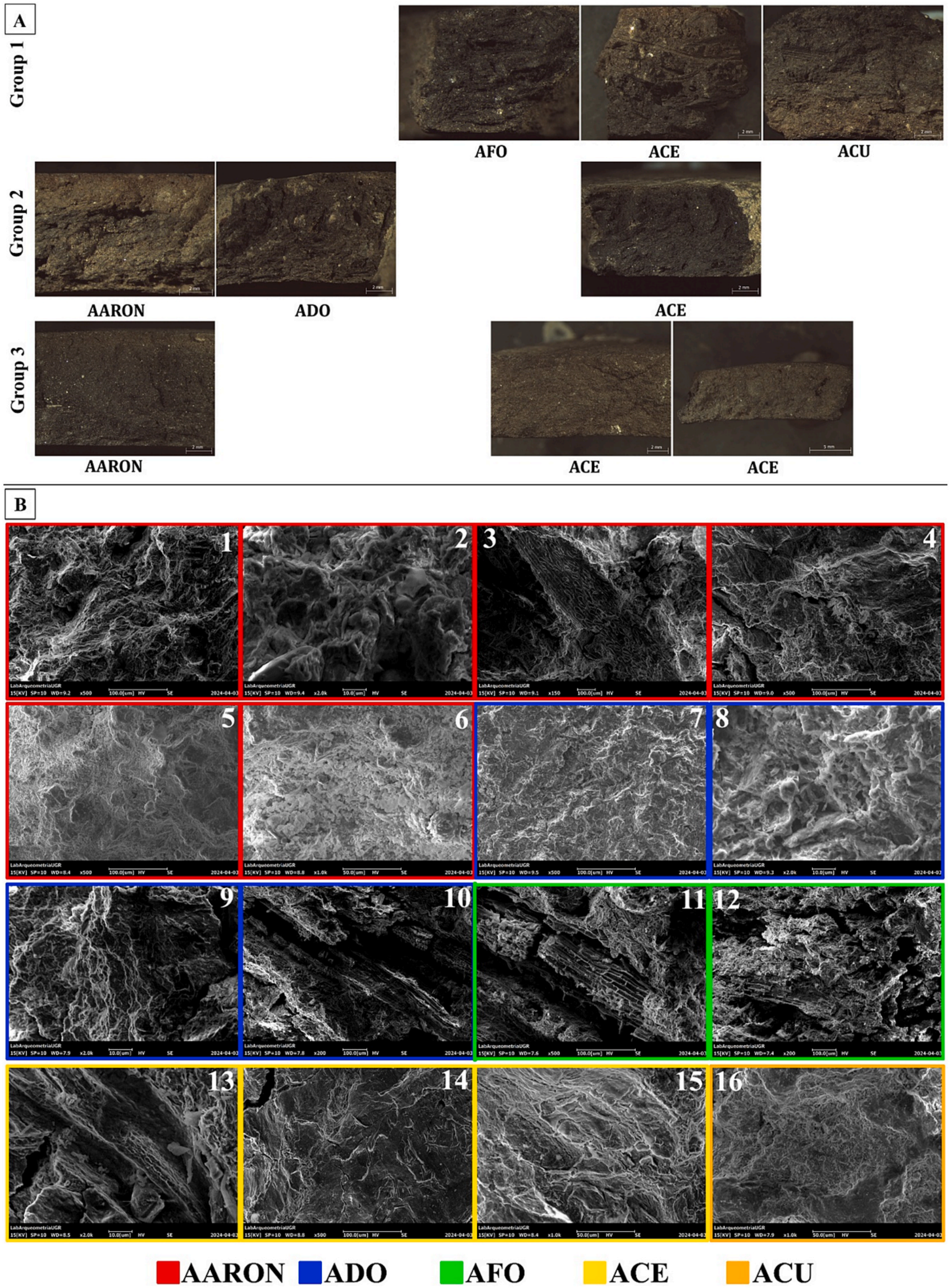

Fig. 8. A. Macroscopic groups. B. SEM images per layer by colour codes.

zones and generate some chambers of up to 1 mm. Towards the outer zones these voids become smaller.

- Fabric 3: quartzite and small Fe-enriched pellets (c:f:v 10μ = 30:35:35) (Fig. 9m–p). The fine fraction is orange-brown with plane light, and orange with crossed nicols, is anisotropic and has a medium birefringence, between orange to brownish beige tones. The coarse fraction has been defined as quartzites and small iron-enriched clay pellets, which have a high sphericity and may contain small quartz. In general, the coarse fraction has a grain size of less than 0.25 mm (except for some accessory elements up to 2 mm), high sphericity and rounded/sub-rounded edges, with an orientation parallel to the walls. The voids are large in the central areas with chambers between 1 and 2 mm.

4. Discussion

4.1. *Macro and microstructural analysis*

Based on the macro and microstructual analysis of the pottery assemblage from Marshill Rockshelter, we summarise our main findings based on surface treatment, firing and modelling strategies as well as textural classes below.

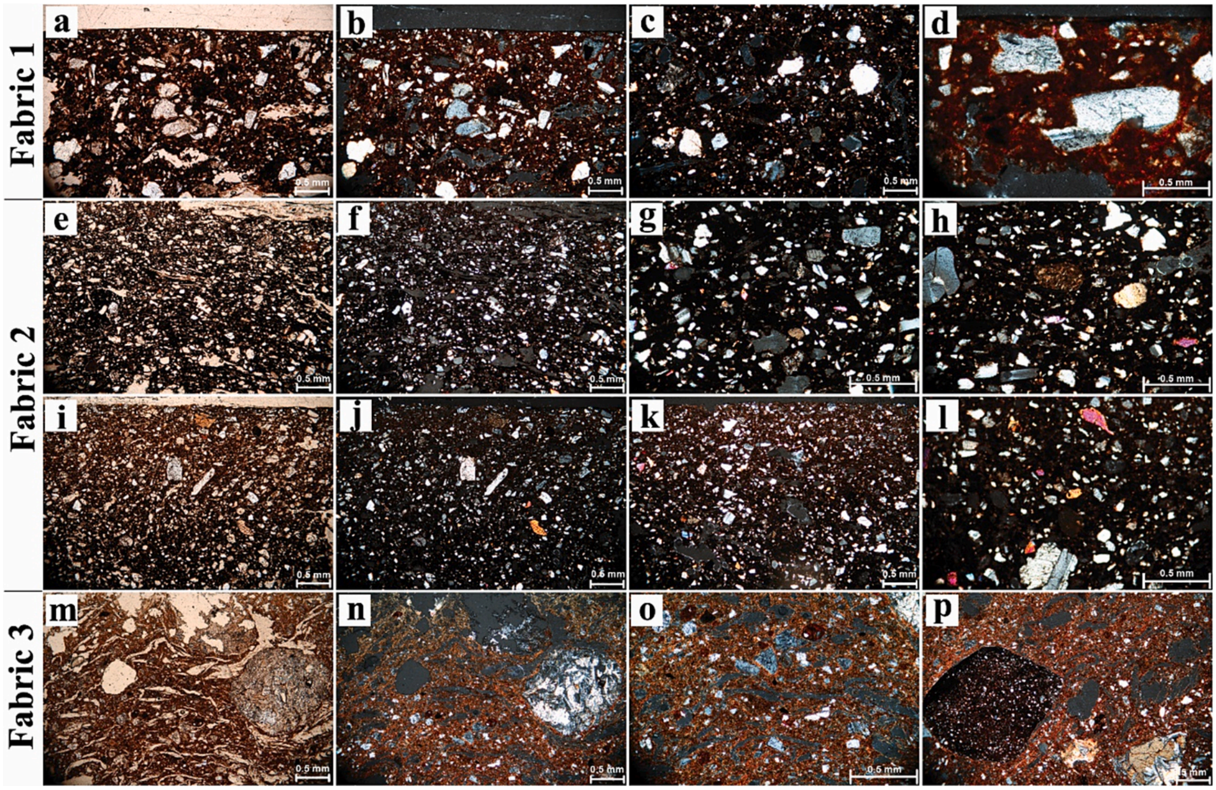

Fig. 9. Figure caption for fabrics figure. Fabric 1. Mars20-1 (Aaron layer), with plane polarized light (a) and crossed nicols (b-d); Fabric 2. MARS20-2 (Ado layer), with plane polarized light (e) and crossed nicols (f-h) and sample MARS20-3 (Aaron layer), with plane polarized light (i) and crossed nicols (j-l); Fabric 3. MARS20-4 (Ace layer), with plane polarized light (m) and crossed nicols (n-p).

Surface treatment: three types of surface treatments have been identified for the pottery assemblage at the site: smoothing, spatulate and burnishing. For some of the sherds we have identified that the inner part of the vessels have a more curated treatment indicating the use of containers for the storing of liquids or semi-liquid substances (Schiffer and Skibo 1989). The treatment with burnishing on the some of the sample can potentially also be related to a thermal function by increasing resistance to temperature changes and improving overall heat distribution during the cooking of foods. This strategy has been observed in ceramic productions from other regions in Africa and across the world (Rice 1987).

Firing strategies: macroscopic analysis reveal dark-grey to black surfaces for the majority of the assemblage and may suggest that the pot makers used kilns with controlled atmospheres (e.g. Gosselain, 1995; Livingstone Smith 2007). The low levels of sintering observed from the microscopic analysis suggest that firing temperatures did not exceed 750 °C. This coincides with common values observed for pre-industrial ceramics (Tite, 1999).

Modelling strategies: two main modelling methods are identified and which both co-occur in the same layers at Marshill. These include the coil and moulding methods. The coil building technique has been extensively documented and are known from early Later Stone Age ceramic assemblages in archaeological contexts in southern Africa. The coexistence of both techniques could indicate the participation of different groups of artisans or the adaptation of techniques according to specific production needs (Arnold, 1985). In several regions of sub-Saharan Africa, the coil method remains a predominant technique, with local variants depending on access to raw materials and technical knowledge transmitted through generations (Gosselain, 1998). In contexts such as the Sahel and the Congo Basin, hybrid methods have been identified where the base of the vessel is shaped by moulding and the walls are built by successive coils (Mayor, 2010). In southern Africa, Lawton (1965) describes the use of this moulding method amongst the Swazi, Mpondo and Nguni groups. For example, the "Mpondo build their vessels with rolls of clay formed into rings, placed one on top of the other" (ibid: 79). This combination of techniques allows greater control over the final form of the vessel and optimises the structural strength of the pottery which could have similarities with some of the productions identified at Marshill.

Textural classes: three types of textural groups were found in the assemblage. Of particular interest is group 1, containing high concentrations of organic matter, possibly grass mixed with smaller quartz particles. The use of organic material is indicative of the need to generate more porous and lighter ceramic in order to facilitate the transportation of liquids or alternatively to improve the transpiration of the contents. For example, in West Africa the inclusion of grass during the modelling process generates characteristic surface textures that facilitate handling and thermal efficiency of the material (Livingstone Smith, 2007). This type of technological adaptation has also been identified in studies on pre-colonial ceramics in Mali and Burkina Faso, where the integration of plant fibres into clay provides greater resistance to thermal shock (Huysecom et al., 1996). In the case of Marshill Rockshelter, the presence of plant impressions could suggest that the occupants of the shelter may have held similar practices.

4.2. Context of Marshill's pottery assemblage on the southern African landscape

In the context of southern African archaeology some of the characteristics identified for Marshill pottery assemblage find similarities with other excavated sites in the broader region. The surface colouration of many of the early and later ceramic wares are often described as grey-black or black in appearance. For example, in the northern Drakensberg of the KwaZulu-Natal Province, the site of Collingham Shelter excavated by Mazel (1992b) produced a small assemblage of grey to black sherds that are thin-walled and grit-tempered. This pottery was recovered from layers dating to the second and third centuries AD, around eight centuries earlier than those recovered from Marshill. The inclusion of vegetal matter in some of Marshill's sherds are distinct and perhaps find similarities to assemblages described by Garth Sampson (Sampson, 1988, 2010; Sampson et al., 1989) and others (Bollong et al., 1993; Sadr and Sampson, 1999). For example, the site of Haaskraal, an inland rock shelter situated in the Zeekoe Valley of the Karoo, provides evidence for the earliest use of this pottery dating to cal. 48 BC – AD 326 (Hart, 1989, Sampson, 2010). However, rockshelter and open-air sites excavated and surveyed in the Caledon River Valley (Wadley, 1997; Thorp, 1997; Thorp, 2000), Upper Karoo (Sampson, 1988) and in the Stormberg region of the Eastern Cape Province (Derricourt, 1977) indicate the use of fibre-tempered ware up into the latter parts of the second millennium AD. As fibre-tempered pots have been ethnographically and historically observed as a hunter-gatherer item (Sadr and Sampson, 2006), it would be tempting to postulate that Marshill's fibre-tempered vessels may be of similar authorship. We remain cautious however of assigning a particular subsistence group to the assemblage at this stage. As Pikirayi and Lindahl (2013: 455) caution us – "ceramic assemblages are context specific, and archaeologists are cautioned against making generic statements on the basis of similarities of vessel shape and decoration motif" (Pikirayi and Lindahl, 2013, pp 455). A further comparative analysis of this assemblage with pottery assemblages recovered from other sites within the vicinity using a Chaîne opératoire approach could demonstrate to be useful. It remains open as to whether the potters were indeed the occupants of Marshill rock shelter or whether pottery may have travelled through different social networks to reach the Stormberg site. This will also require a further in-depth analysis of other associated types of material culture recovered from the same layers as the pottery in order to begin tacking multiple stands of evidence.

5. Conclusion

The technological study of the Marshill pottery assemblage provides important clues into the production of ceramics from 8th-14th century. This study forms part of a larger research question to understand the history of occupation at Marshill and its wider connection to different groups of people at different times on the landscape. This paper forms part of the first step in tackling these questions.

CRediT authorship contribution statement

A. Dorado-Alejos: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **F. Lander:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Formal analysis, Data curation, Conceptualization. **P. de la Peña:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We are grateful to all the people who have helped Paloma de la Peña on the excavation campaigns, especially all the archaeologists and volunteers at Marshill Rock Shelter. We are also immensely grateful to the people in Stomberg who helped with all excavation campaigns: Thembalani (Kiki) Stofile, Wendy Twezu, Nozipho Mnguyana, Hughes and Charlotte van Heerden, Kossie and Wilma Slabaart, Dannie and Regina Schoeman, Nellie and Hanie van Heerden, Ben Maclennan and Gill Warren-Brown. We also thank Fernando Colino and Viola Schmid for their help on Figs. 1 and 2 included in this paper and Carmen Aguilera Carnerero for the review of some sections. Paloma de la Peña has a Ramón y Cajal Research contract (RYC2020-029506-I) at the Universidad de Granada (Spain) funded by European social fund and the Agencia Estatal de Investigación (Spain). This investigation was funded by the project: "*Investigacion sobre la variabilidad del comportamiento cultural de la Middle Stone Age: una comparacion de Border Cave y Marshill rockshelter (Sudáfrica)*". (PID2022- 141600NB-I00). Proyectos de Generación de Conocimiento- Ministerio de Ciencia, Innovación y Universidades (Spain). We are grateful to all the editors for their kind invitation. This research was possible thanks to the cooperation of the ONG Guías de Espeleología y Montaña, with support from Canal de Isabel II. The export permit from the South African Heritage Agency for the material and radiocarbon dating was ID 201175 and the excavation permit was ID 13971. The pottery analyses were carried out thanks to the support of the projects "Propuesta para preparación de nueva solicitud a las próximas convocatorias María de Maeztu de la Unidad Científica de Excelencia «Archaeometrical Studies: Inside the artefacts & ecofacts» de la Universidad de Granada" (QUAL21-13), funded by the Andalusian Plan for Research, Development and Innovation, and the project 'Mejora de la investigación y externalización del Laboratorio de Arqueometría «Antonio Arribas Palau» Dpto. de Prehistoria y Arqueología, Universidad de Granada" (EQC2018-004880-P) of the Spanish Ministry of Science, Innovation and Universities.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jasrep.2025.105358.

Data availability

Data will be made available on request.

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