Afr Archaeol Rev (2024) 41:119–138
https://doi.org/10.1007/s10437-023-09567-0

ORIGINAL ARTICLE

Chicumbane Connections: Lower Limpopo Valley During the First Millennium AD

Anneli Ekblom · Michel Notelid · Anders Lindahl · Ezekia Mtetwa

Accepted: 30 October 2023 / Published online: 30 November 2023

Abstract The discussion of the transition to farming in southern Africa and the formation of Early Iron Age society, referred to in Mozambican archaeology as the Early Farming Communities (EFC), is complicated by the lack of surveys in key areas of intensive contacts. This article presents the results of excavations at the EFC site Chicumbane in the eastern lower Limpopo Valley, dated 500–800 AD. The variation of ceramic styles in terms of decoration and shape suggests predominantly interior influences (Gokomere and Zhizo facies), but there are also decoration elements similar to what is found on the coast. A wide variety of ceramic technologies were used in terms of clay sources, temper, and ways of building the pot. Here, we reconstruct possible social interactions based on these differences. Together with the other artifact categories, such as slag, metal, and shell beads, the results show some aspects of regional interactions among Early Farming Communities. The combined ceramic analyses suggest a mix of traditions by female potters who, through marriage, moved between regions, bringing new ways of decorating, tempering, and building pots.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10437-023-09567-0.

A. Ekblom (✉) · M. Notelid · E. Mtetwa
Department of Archaeology and Ancient History, Uppsala University, Uppsala, Sweden
e-mail: anneli.ekblom@arkeologi.uu.se

A. Lindahl
Department of Anthropology and Archaeology, University of Pretoria, Pretoria, South Africa

A. Lindahl
Department of Geology, Lund University, Lund, Sweden

Resúmé Le débat sur la transition vers l'agriculture en Afrique australe et la formation des sociétés de l'Age du Fer Ancien, appelée dans l'archéologie mozambicaine les Sociétés Agricoles Ancien (EFC), est compliqué par le manque d'enquêtes dans les zones clés où il y a eu des mouvements ou des contacts intensifs. Cet article présente les résultats de fouilles sur le site EFC de Chicumbane, dans le nord de la vallée du Limpopo, au Mozambique, datant de 500 à 800 après JC. La variation des styles céramiques en termes de décoration et de forme suggère des influences essentiellement intérieures (Gokomere and Zhizo faciés), mais on retrouve également des éléments de décoration similaires à ceux que l'on retrouve sur la côte. Une grande variété de technologies céramiques, en termes de sources d'argile, de tempérament et de manières de construire le pot, ont été utilisées et nous reconstituons ici les interactions sociales possibles en fonction de ces différences. Avec les autres catégories de trouvailles, telles que les scories, le métal et les perles de coquillage, les résultats donnent un aperçu des premières relations communautaires agricoles dans la région. Les analyses céramiques combinées suggèrent un mélange de traditions à travers et les connexions, façonnées à mesure que les potières par mariage se déplaçant entre les régions apportaient de nouvelles façons de décorer, de tempérer et de construire des pots.

Keywords Southern Africa · Limpopo Valley · Early Iron Age · Early Farming Community · Ceramic analyses

Introduction

This article analyzes the material culture of the Chicumbane site, one of the few Early Farming Community (EFC) sites excavated in the lower Limpopo Valley. Ceramic typology is presented based on shape and decorative elements. Fabric characteristics and chemical elements are analyzed to assess variations in technology and the selection of clays. The Chicumbane site is compared with other sites in the Limpopo Valley, and we also discuss the individualities of ceramic production and style from a potter's perspective. We also discuss briefly other find categories such as slag, iron, and shell beads.

Numerous surveys and archaeological excavations have been carried out in the middle Limpopo Valley, which has allowed us to trace the development of ceramic-using groups and expressions of food production, e.g., domesticated plants and animals (cf. Antonites, 2018; Calabrese, 2000; Chirikure et al., 2014; Huffman, 2000, 2007; Walker, 1995). It has also allowed us to trace the negotiations between Later Stone Age (LSA) hunter-gatherer communities and emerging farming societies in the Limpopo Valley and with the increasing centralization of settlements in the late first and early second millennium (Forssman, 2016, 2017; Forssman et al., 2018; Hall & Smith, 2000; Thorpe, 2010; van Doornum, 2005). However, the lower Limpopo Valley has been sparsely surveyed and constitutes a research gap in understanding the emergence and formation of farming communities (Lander & Russell, 2018). For this reason, surveys were carried out in the Chicumbane area to locate sites with stratified layers and evidence of EFC materials. Our aim was to explore the ceramic sequence and establish a chronology for this area.

During the last centuries BC, lithic-producing communities in Bambata Cave, in Limpopo Basin, were making thin-walled ceramics (Sadr & Simpson, 2006; Walker, 1995; see also Huffman, 2005, 2021 and discussion in Sadr, 2008). From ca. 300 AD, thick-walled pottery with more homogenous pottery styles, evidence of iron making and domesticates (cattle and sheep/goat and cereals) appear across southern Mozambique, Zimbabwe, and northern South Africa, referred to here as the Early Farming Community complex (EFC), synonymous to Early Iron Age (Huffman, 2007; Lander & Russel, 2018; Mitchell, 2002; Russell et al., 2014; Sadr, 2008). In southern Mozambique, several EFC sites have been located on the coast (Cruz e Silva, 1980; Kohtamäki, 2014; Morais, 1988; Sinclair et al., 1993). However, there has been a lack of surveys along the Limpopo River. Therefore, our knowledge of the eastern part of Limpopo Valley remains limited, especially for the EFC period.

Across the Mozambique border, in present-day South Africa, Meyer (1984) surveyed early farming community-type sites in the northern parts of the Kruger National Park, identifying both LSA and EFC sites (see also Korfmann et al., 1986; Plug, 1989). Dated to 800 AD, Hapi Pan yielded cattle bones with EFC ceramics (Plug, 2000). On the Zimbabwe side, Manyanga (2006) excavated the EFC site, Mwenezi farm, from which we also have an essential archaeobotanical record (Jonsson, 1998). In addition, mixed ceramic and lithic assemblages have been located in the Dombozanga area, c. 80 km northwest of Limpopo Valley (Thorp, 2010). On the Mozambique side, rescue archaeology was carried out by Duarte (1976) in connection with the construction of the Massingir Dam. EFC ceramics have been reported along the Elephant River near Massingir (Bicho et al., 2018a; Ekblom et al., 2015; Macamo & Machava, 2011; Macamo & Risberg, 2007). In addition, the LSA site of Txina Txina is found near Massingir Dam (Bicho et al., 2018b; Raja, 2020). Surveys and palaeoecological studies were carried out through research projects between 2006 and 2018, and these led to the location of EFC ceramics in Licenga (Adamowicz, 2017; Ekblom et al., 2015). The Chicumbane site was first surveyed in 2015 as part of the same project. This site is key to understanding the formation of the EFC on the Mozambique side of the Limpopo River and the possible connections between interior and coastal expressions of the EFC.

The appearance of thick-walled ceramics in the Limpopo Valley has predominantly been explained by the migration of Bantu-speaking peoples southwards (cf. Huffman, 1989, 2000, 2007; see also Phillipson, 1977; Russell et al., 2014), where pottery styles are regarded as cultural expressions of discretely bounded ethnic groups. Such approaches have been widely criticized (see Lane, 1994/1995; Hall, 1983; Pikirayi, 2007; Sadr, 2008). Guided by this critique, we prefer to explain variations in decorations and technology as the result of ongoing negotiations of identity and belonging from the side of the potters (cf. Kohtamäki, 2014; Pikirayi & Lindahl, 2013; Sadr, 2008; Sadr & Simpson, 2006; and for similar approaches elsewhere on the continent Ashley, 2010; Esterhuysen, 2008; Wynne-Jones, 2007, 2016). With the increasing homogenization of styles across the region, the "traditions" and facies (cf. Huffman, 2007) were mimicked locally by potters who copied popular styles while at the same time using their knowledge and preferences in the use of clays and pot-making.

Site Description

Chicumbane (Site 244) (E22.52.417 and S31.56.105) is located 1.5 km south of the Chicumbane intersection of the Pafuri and Vilanculos road, near the house of *hosi* (chief) Rodriguez Maluleque. Several other sites have been surveyed in the larger Chicumbane area, all with Late Farming Community-style pottery (Fig. 1b). The Chicumbane site is situated on a river terrace (145 m asl) raised above the Limpopo floodplain 2 km west of the Limpopo River. A gentle slope leads down to a smaller depression, which may once have been a meander of the Limpopo River (Fig. 1b). We were alerted to the site by Gabriel Maluleque in 2015 after a pit had been dug to extract soil for building material, revealing plenty of ceramics (Fig. 2a) (Notelid & Ekblom, 2018). The Chicumbane site was further excavated in 2016 with students and staff from Eduardo Mondlane University.

Two 2-×-1-m trenches were opened up for excavation (Tr 3 and 4), and one 2-×-2-m trench (Tr 1; Fig. 2a). In addition, two new 1-×-1-m test pits (TP4–5) were excavated, and the surface was sampled in thirteen 1-×-1-m squares (S1–13) to demarcate the site's boundary. Very few finds were found in test pits 4 and 5 and the 1-×-1-m squares. Thus, the site does not extend immediately to the west. There is a homestead with buildings east of the construction pit, and this area could not be investigated. Early Farming Community-type sherds are found in a construction pit nearby (Site 117, Fig. 1b). Generally, the sediments consist of clayey fine silt with high organic content (loam). These typical riverine deposits are incredibly hard when dry.

The stratigraphy of Trench 3 is critical to understanding the stratigraphy of the site (Fig. 2b). Its lowest layer is a natural Luvisol, sterile reddish-brown clayey silt which is present across the site (layer 3, Fig. 2b). A cultural layer is present at 45–30 cm, a dark brown clayey silt with plenty of archaeological material (layer 2c, Fig. 2b). The base of this cultural layer is dated to 420–570 AD (95.4%), while the top of the same layer is dated 540–595 AD (68.2%) (Table 1). Above this layer lies a gray-brown silt, which still has archaeological material but in low quantities (layers 2 a–b, Fig. 2b).

The oldest layer in Trench 1 is the reddish-brown clayey silt, which is mainly sterile (40–50 cm depth) (layer 3, Fig. 2d). Above, it is a 5-cm stratum of brown-gray clayey silt (Fig. 2b). A large pit (feature 5, layer 7), at least 1 m in diameter, cuts through this profile with a dark gray-brown humic silt filling. Large fragments of pottery, daga, and other materials and several smaller features are found here. It is overlaid by a 20-cm-thick layer of gray-brown clayey silt with chunks of daga (layer 6). The circumference of layer 6 is c. 1.5 m in diameter, and it is very rich in archaeological material. The upper layer (0–40 cm) consists of gray-brown silt and contains archaeological materials (layer 2 a). The ^{14}C dates in feature 5 are reversed, with the 35-cm-depth date (595–670 AD, 95.4%) being younger than the date at 70 cm depth (650–690 AD (68.2%). The pit has most likely been dug through the earlier cultural layer represented in Trench 3 (Fig. 2b). As the pit was then covered over with soil, materials from the cultural layer came to be deposited on top of the pit (layer 6, Fig. 2c). The spread of the same vessels between Trench 1 and other trenches, confirms this hypothesis. Though the uppermost part of this sequence has been disturbed in recent times, the low amount of modern material found in Trench 1 and the range of ^{14}C dates suggest that the construction of feature 5 took place in the first millennium and before 770 AD.

Trench 2, located on a steeper slope, has a complex stratigraphy (Fig. 2b). The reddish-brown clayey silt (layer 3 a–b) is sterile at a depth of 70 cm but with increased density of finds upwards in the profile. The transition to the superimposed brown-gray

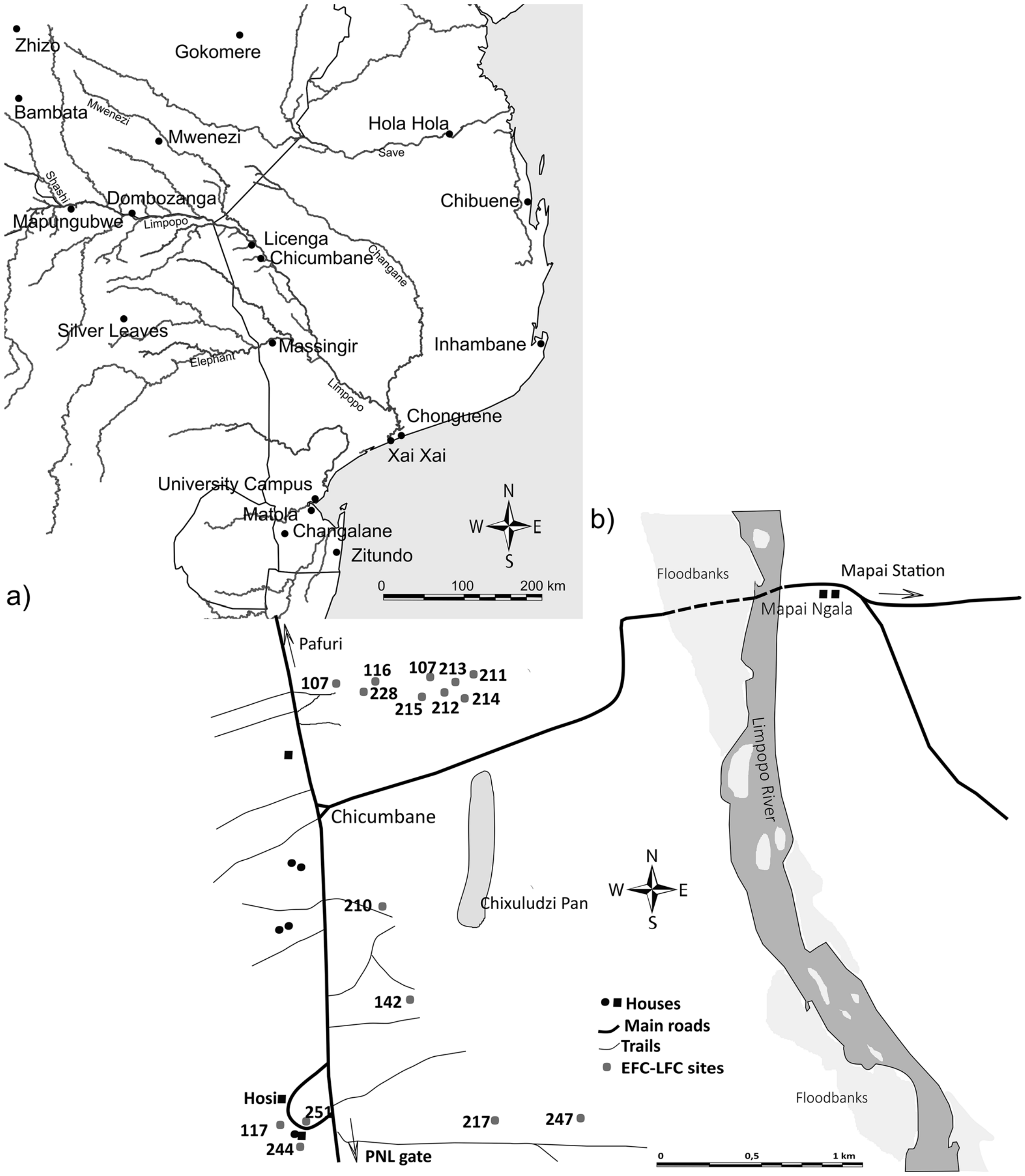

Fig. 1 **a** Map over the larger region and Limpopo Valley with some of the known EFC sites and type sites discussed in the text; **b** Chicumbane area with surveyed EFC sites and the Chicumbane site 244 shown in the left corner

clayey silt (layer 2b), rich in finds, dates to 690–890 AD (95.4%). This layer is interrupted by bands of dark gray and light gray fine silt (layer 4), which is present in this trench's walls. This layer is tentatively interpreted as a flooding layer. It is overlayered by a gray-brown silt, also relatively rich in finds (layer 2a). This is superseded by a light gray silt (layer 1).

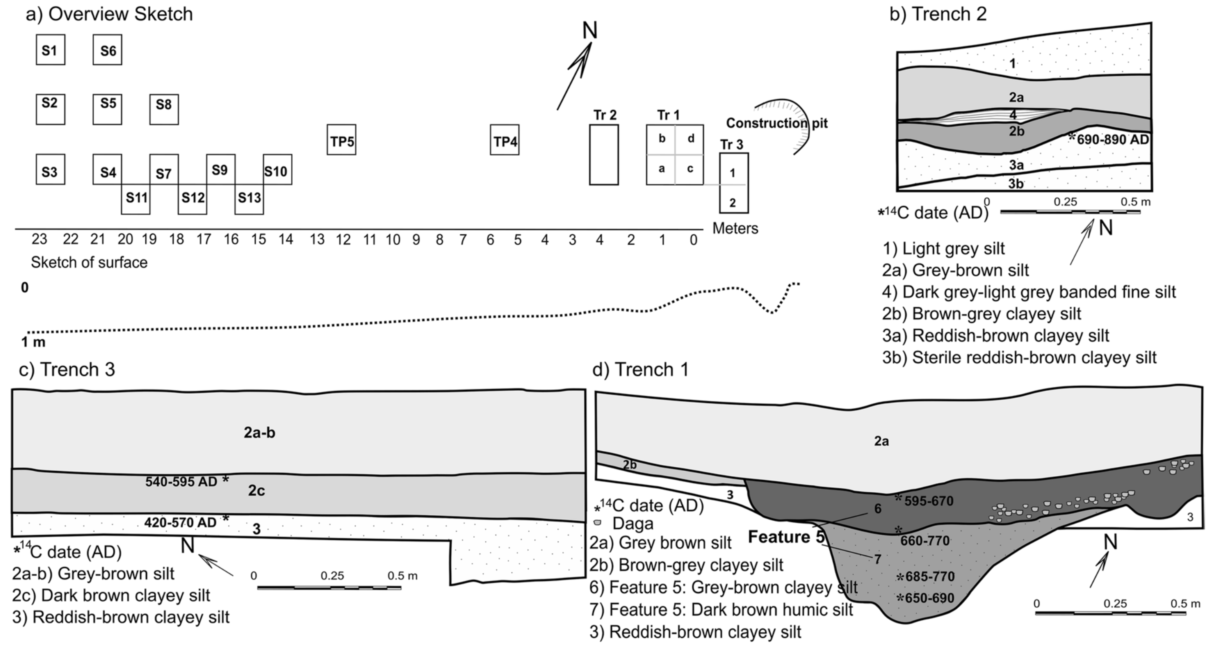

Fig. 2 **a** Sketch plan over the location of trenches (Tr 1–3), test pits (TP 4–5), and surface sampling areas (S1–13); **b** stratigraphy of Trench 2, north wall and the location of a possible flooding layer (layer 4); **c** stratigraphy of Trench 3, east wall with calibrated ^{14}C dates (*); **d** stratigraphy of Trench 1, north wall, and feature 5 (layers 6 and 7)

Ceramics

A total of 23.5 kg sherds (1267 pieces) were retrieved from the excavations. Eighty-nine percent of the diagnostic fragments were jars, with comb stamping as a predominant decoration element (35% of the decorated fragments), followed by line incision/ broad line incision (21/10%) and crosshatching (17%)

Table 1 ^{14}C dates (bold text shows dates used in the text and graphs)

Number	Context: material	Date	Cal. AD 68.2%	Cal. AD 95.4%
Trench 3				
Ua-52987	35 cm depth, layer 2 c: charcoal	1508 ± 25	**540–595**	430–490 (12.3%), 530–620 (83.1%)
Ua-52898	45 cm depth, layer 2 c: charcoal	1554 ± 29	420–500 (50.9%), 510–550 (17.3)	**420–570**
Trench 2				
Ua-54559	70 cm depth, layer 3 a: charcoal	1219 ± 2 8	720–740 (5.8%), 760–870 (62.4%)	690–750 (17.2%), 760–890 (78.2%) **(690–890)**
Trench 1				
Ua-52899	35 cm depth, layer 6 charcoal	1396 ± 29	625–665	**595–670**
Ua-54560	40 cm depth, layer 6: charcoal	1294 ± 29	670–715 (44.1%), 740–765 (24.1%)	**660–770**
Ua-54561	60 cm depth, feature 5, layer 5: charcoal	1263 ± 2 9	685–755 (60.4%), 760–770 (7.8%) **(685–770)**	660–780 (88.8%), 790–870 (6.6%)
Ua-54562	70 cm depth, feature 5, layer 5: charcoal	1339 ± 29	**650–690**	640–720 (84.1%), 740–770 (11.3%)

Table 2 Shapes and decoration elements

Shape	Vessel part	Comb stamping	Fine comb stamping	Crosshatching	Fluted	BLI	Line incision	Impression/grooves/punctuates	Triangles	Red slip	Undecorated	No	Gram
Bowl/jar	R	9		7			2	2			13	32	287
	Bo			1			1	5		2	980	988	14,783
Jar	R-Ne	11		5	2	3		2			4	34	658
	R-Ne-Sh	15		10			1	1			4	31	4190
	Ne	18	5	7		5	12	2			28	77	554
	Ne-Sh	8	5			6	3				12	33	850
	Ne-Sh-Bo	2		2							11	4	200
	Sh	3			1	2	6	1			11	28	622
	Sh-Bo					2	10				1	13	693
Bowl	R-Bo	6	1	3		2	8	3	1		10	27	635
SUM		71	11	35	3	20	43	16	1	2	1074	1267	23,472
% of total		6	1	3	0	2	3	1	0	0	85		
% of decorated		35	5	17	1	10	21	8	0	1			

R rim, *Ne* neck, *Sh* shoulder, *Bo* body

(Table 2). The range of variation in ceramic types is noticeable. Below, the main ceramic categories are grouped based on shape, decoration, and size. Ceramic vessels and other finds are referred to below and are shown in the figures by their find numbers (Fnr).

Category A (Fig. 3a) Large vessels (rim diameter 49–50 cm) with a characteristic sinuous profile and with thickened and outward flaring rims (Zhizofacies type, cf. Huffman, 2007). All vessels have parallel bands of oblique comb stamping on the rim with oblique bands on the neck-shoulder of either comb stamping or parallel lines. Some pots have appliques on the shoulder, with the remaining body undecorated. A single line incision marks the transition from neck to shoulder in a few cases. The larger vessels typically have a thick wall (up to 2.4 cm). One pot (Fnr 624) had a relatively thin wall (1.2 cm). This vessel was located at the base of the pit in Trench 1 (feature 5) and may have been deposited intact. Similar fragments were found both in the surface layers and at the base of feature 5 (Fnr 155), counting a minimum of between three to five vessels.

Category B (Fig. 3b) Medium size vessels (rim diameter 19–24 cm) with crosshatching on the rim and no other decoration. Wall thickness varies between 0.6 and 1 cm and rim profile and construction are variable. Fnr 610 was found at the base of feature 5 and was essentially intact in its upper parts. It has an uncharacteristic sinuous profile, with a narrow neck of 19 cm in diameter and a flared rim with shoulders protruding to shape a vessel 40 cm in diameter in its widest part. Despite its size, this vessel type is thin-walled, with a 0.5–1-cm thickness. Other crosshatched vessels were less curvaceous with a characteristic straight-backed neck and small thickening of the rim, such as in Fnr 604. In one case, Fnr 627, the rim is decorated with only diagonal lines but otherwise with a similar arrangement as the crosshatched vessels.

Category C (Fig. 3c) Medium size vessels, 19–28 cm in diameter and with a Zhizo facies-type profile and thickened and outward flaring rims (cf. Huffman, 2007). All vessels have parallel bands of oblique comb stamping on the rim with either oblique bands of comb stamping on the neck-shoulder or parallel lines (e.g., similar arrangement as category A but smaller in size). This is the most common decorated type, with several smaller fragments occurring across the site. Here, only three examples are shown. Fnr 625 (28 cm/diameter) has a slightly atypical profile with a longer neck than in other vessels. Its rim is decorated with comb stamping, and the comb stamping on the neck forms a lozenge pattern. Fnr 612 (23 cm/diameter) has the characteristic thickened rim with comb stamping but with oblique and parallel line incisions on the neck. Fnr 504 is similar but with the line incision only present at the base of the neck.

Category D (Fig. 3d) This vessel type was rare. Fnr 302 was found as a loose find on the surface and has a similar shape as Fnr 610 but with decorations defined by a band of short oblique lines and parallel lines. One other fragment with similar decoration, possibly belonging to the same pot, was analyzed (petrography) using a thin section (see below).

Category E (Fig. 3e) Small vessels (9–14.5 cm in diameter) with predominantly thickened rims and the following motifs: stamped rims, line incisions, or undecorated. Here, a few examples are shown. In the case of Fnr 512, the full shape could be reconstructed into a small vessel (14.5 cm in diameter) with a stamped and thickened rim and sinuous profile. Fnr 528 is a similar vessel but with an even smaller diameter (9.5 cm). Fnr 62 is 9.5 in diameter, also with a sinuous shape but with a longer neck than other vessels and the absence of a thickened rim. Fnr 460b has small minute impressions/punctuates at the base of the neck and an atypical profile with a less defined rim and short neck. Its diameter is 14 cm. Fnr 477 has a thickened rim with comb stamping and is similar in profile to other stamped ware but with a diameter of 14 cm. The last example is Fnr 634, a very small jar (6.5 cm in diameter at the neck). Though its rim is missing, the shape can be reconstructed. It has a short neck with a marked and protruding shoulder. The neck has a parallel line incision on the shoulder, a rare example of triangular impressions.

Category F (Fig. 3f) This category consists of smaller cups (6–9.5 cm in diameter), all with a bowl shape, mostly undecorated as in the case of Fnr 297 and Fnr 299. Some have decorations on the rim, crosshatching as in 608–609, or lines as in Fnr 676.

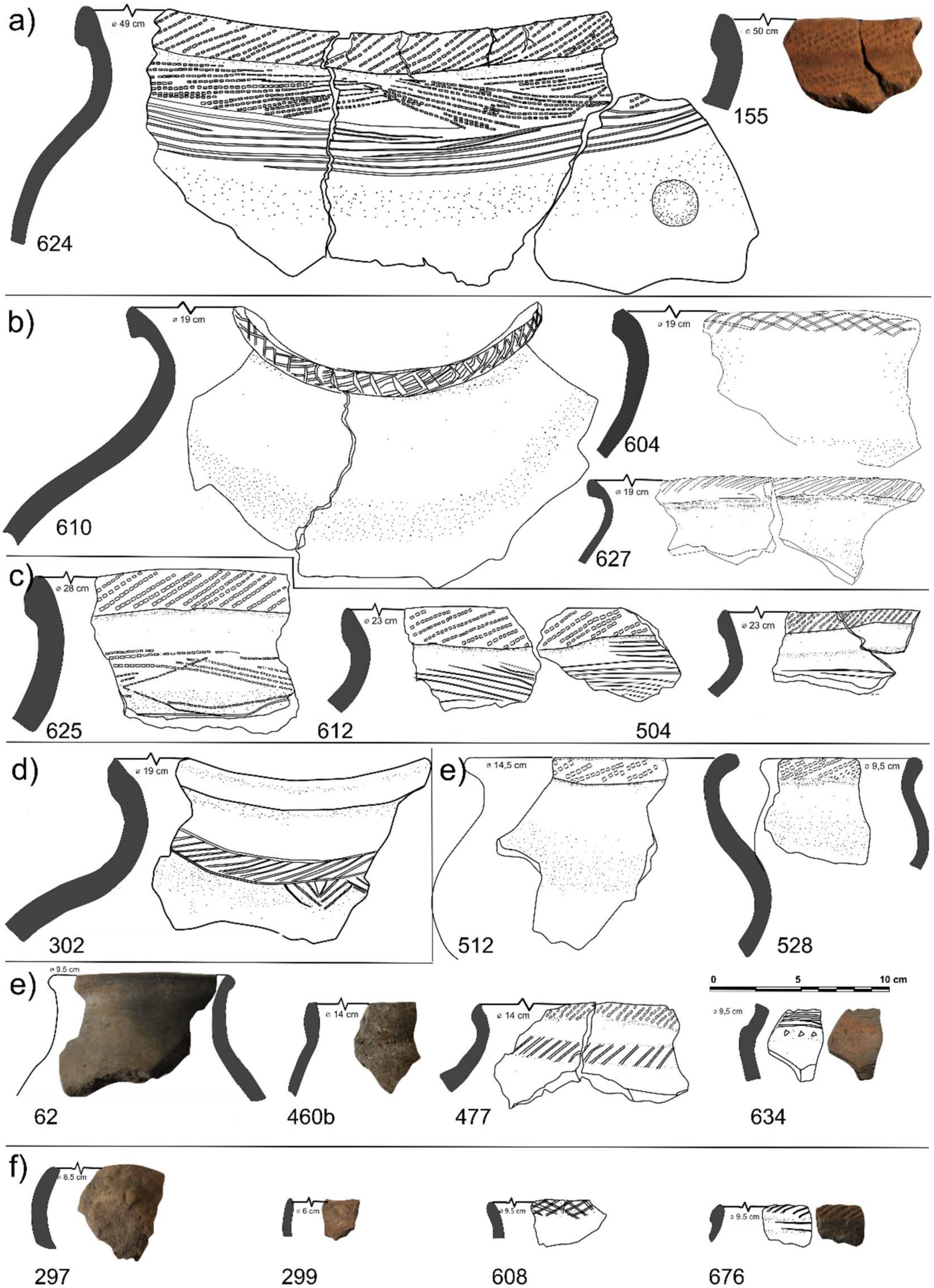

Fig. 3 Illustration of ceramic categories a–f, discussed in the text. Ceramics are numbered based on their find numbers (Fnr)

The number of different types of rims suggests the presence of a minimum of four cups.

Category G (Fig. 4g) This category includes all the bowls, representing only 10% of the total assemblage with various sizes and decorations. Fnr 25 is an undecorated bowl with a profile sloping gently toward the base. The matching fragments 158 and 206 were found in Trench 1 and Trench 2, respectively, in the surface layer and belong to the same vessel. This bowl is 19 cm in diameter and has an irregular shape with a gently sloping profile. The lip of the rim of this vessel has oblique parallel line impressions, while the neck has faint flutes. Fnr 185 is very similar in decoration to

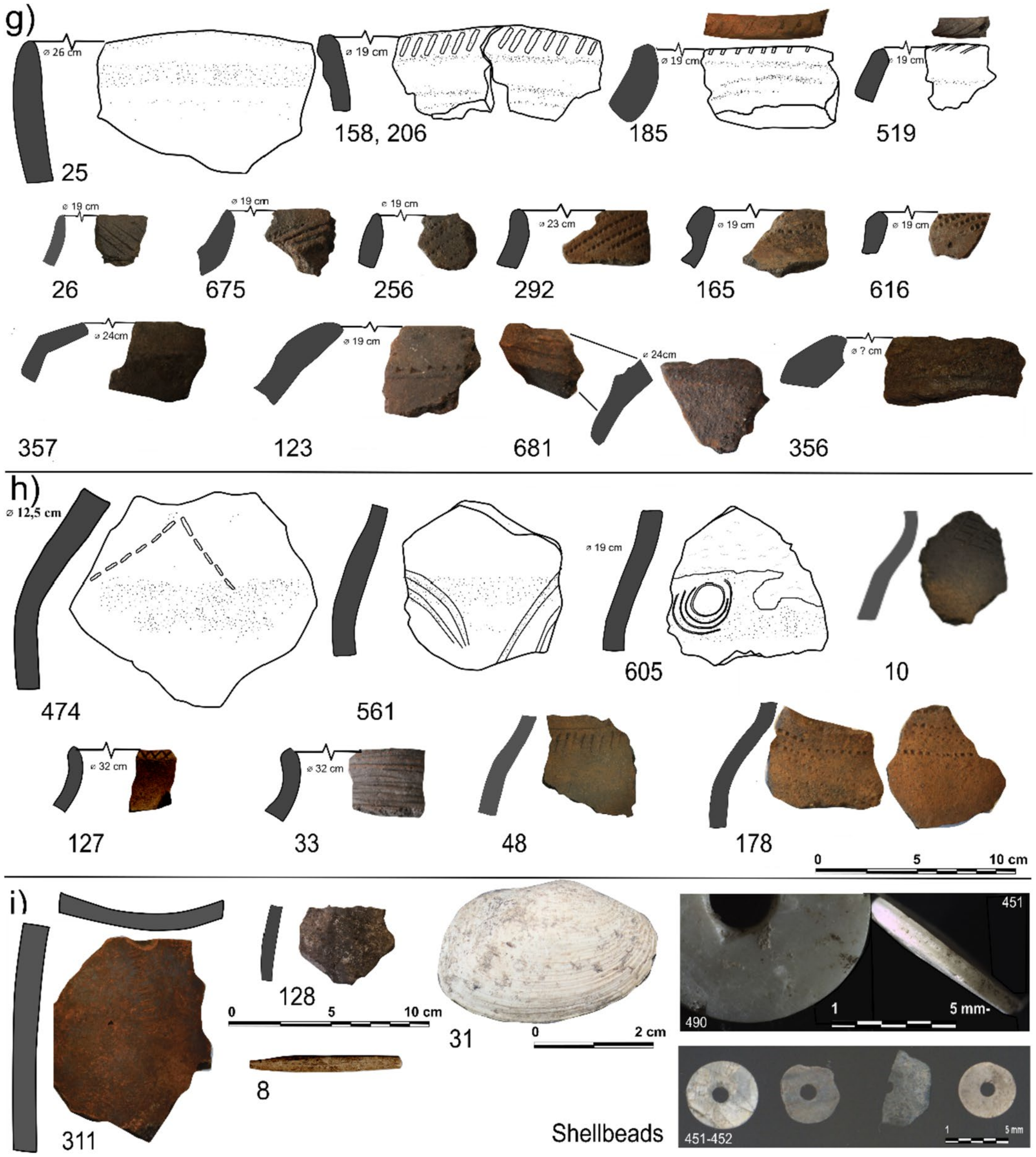

Fig. 4 Illustration of ceramic categories g–i, discussed in the text, and also other find categories such as a bone needle (*x*), a marine *Tellina* shell (*y*), and a selection of shell beads (*z*) with an inset detailed image showing the structure of the beads. Ceramics and other finds are numbered based on their individual find numbers (Fnr)

Fnr158 and 206, with oblique parallel line impressions on the lip of the rim and flutes on the neck, but the profile here is different with a marked shoulder. This sherd was sampled for thin-section analyses (see below). Fnr 519 has a similar arrangement on the rim with oblique, slightly longer line impressions, and a possible flute on the neck. Several decorated vessel types only occurred as fragments. Among these are Fnr 26 and 675, each with parallel oblique line incisions and Fnr 256 and 292 with oblique parallel comb stamping. Thickened rims with parallel lines of comb stamping occur in Fnr165 and 616. A few bowls had inverted rims. This includes Fnr 357 with a faint line incision at the base of the rim (the actual rim part is broken off). Fnr 123 also has an inverted rim with a band of triangle impressions at the base of the rim and also a vertical line (only faintly seen). Fnr 681 had an inverted rim decorated with two flutes; here, the actual cusp of the rim was broken off. Meanwhile, Fnr 356 had oblique parallel comb impressions immediately under the rim confined by a single flute at the base of the rim (a petrographic analysis of this sherd was carried out; see Table 2).

Category H (Fig. 4h) Jars with a mix of rare motifs are all grouped here in the same category. Vessel 474 is a neck-shoulder decorated with lines of elongated impressions forming an inverted V. The shoulder of Fnr 561 is decorated with a rounded, broad line incision, while Fnr 306 has a rounded concentric circle motif. The crossed incised oblique lines of Fnr 10 occur only in one other vessel. Fnr 127 has both rim and neck intact but is a small sherd with crosshatching on the rim. Vessels with solely line incisions are rare, but one nice example is Fnr 33, which is the rim and neck of a small jar (14 cm in diameter). The decoration of Fnr 48 consists of a band of short oblique lines on the shoulder bordered by a single parallel line at the base of the neck. Similar decoration motifs occur in a few other examples (and variants with more irregular short lines). The last vessel exemplified in this group has a more common motif, "fine comb stamping," occurring in different combinations of parallel and oblique lines. Illustrated here are two fragments from the same vessel, Fnr 178. Similar fine-comb stamping also appears in the Late Farming Community sites near the Chicumbane site.

Category I (Fig. 4i) The last category consists of two atypical vessels with walls with straight-necked profiles. Fnr 311 is brightly red (oxidized), thin-walled, and about 10 cm in diameter, decorated by a vertical line of nail impressions. It was found as a loose find. Fnr 128 is a small jar with a very fine wall (0.4 mm) and impressions found in Trench 1 at 35–40 cm depth.

Other Finds

Daub occurred in almost all contexts. Possible retouched lithics were collected, but none had a clear retouch, and they are not shown here. In total, 28 beads were recovered from feature 5. All beads were inspected under a stereo microscope. All have clear growth layers, identifying them as shell beads (cf. Miller et al., 2018; see Fig. 4i). Fragments of *Achatina* shell (land snail) are also common in feature 5, and, most likely, the shell beads have been produced from *Achatina* shell. In feature 5, an intact marine shell was also recovered (Fnr 31). The closest candidate is the marine bivalve *Tellina* (Fig. 4i, 31). Two bone needles were also found on the site, one of which is shown here (Fnr 8). Both were similar, about 6 cm in length and 0.8 cm in diameter, with no visible openings or scars (Fig. 4i, 8). Iron slag, metal, and tuyères were retrieved in a few cases, and detailed analysis was made on a few selected pieces (see below). The preservation of bones was relatively good, and the assemblage included large wild herbivores and possible domesticated cattle. The osteological material is currently under analysis and is not presented here.

Analyses

Ceramic Composition

Thin sections, 0.03 mm thick, from eight vessel fragments and one piece of a tuyère were analyzed in a polarizing microscope. The samples were selected to represent a broad range of above-defined category groups. The limited number of analyzed vessels does not represent the whole assemblage but is still representative of the individual pieces selected.

A Nikon NIS Elements Br Imaging Software (ver. 3.10) was used to estimate the composition of grain sizes and the coarseness of the paste. The individual grains in the fractions coarse silt (> 0.02 mm),

Table 3 Results from lipid analyses

Fnr (category)	hg/g	C18:0/C16:0	GR	C17 gr/C18r	Fs (unsat.)	Cholesterols	AFFS	Terp
227 (undec with residue)	0.018	22(28)32	Sp.17	-	16:1;18:1; 20:1	-	18	D/
264 (Cat I, Fig. 4i)	Sp	-	-	-	-	-	-	-
311 (Cat. A, large shellstamp.)	Sp	-	-	-	-	-	-	-
421 (Cat. E, cups)	Sp	-	-	-	-	-	-	-

fine sand (> 0.063–0.2 mm), medium sand (> 0.2–0.63 mm), and coarse sand (> 0.63–2 mm) were marked. For each grain size fraction, the number of grains and the percentage area have been calculated and normalized. (see OSM 1). A fluorescence agent was applied on a cross-section of the sherd and then photographed under a UV-light stereo microscope to assess the building method (Lindahl & Pikirayi, 2010).

A portable XRF analyzer (pXRF) (Thermo Scientific Niton XL3t 970 GOLDD +) was used on the same ceramic sherds and a tuyère fragment. Freshly cut cross-sections of the sherds were measured thrice for 6 min using the 8-mm-measurement radius. The pXRF measures 37 elements, excluding the lighter elements from sodium (see OSM 1). Though the results of the pXRF analyzer are not as exact as laboratory analyses, in particular for light elements and elements that occur only in very small amounts, it is appropriate for our purposes as it is non-destructive and since we are making a broad internal comparison between the sherds and on the major elements (Shackley, 2011).

Lipid Analyses

Lipid analyses were carried out by the Archaeological Research Laboratory (Stockholm University) to address content and use. The first sherd was an undecorated bodysherd, selected as it had visible residue on the wall (Fnr 227). In addition, a fragment of the large stamped jars, category A (Fnr 264), a representative sherd of category E (e.g., the small cups, Fnr 421), and an anomalous gourd-like vessel (Fnr 311, Fig. 4i) were sent for lipid analysis.

After filing away the outer 0.5 mm, the inside of the sherd was sampled using a tile cutter, and the resulting powder was washed using a solution of 3.0 ml chloroform and methanol, 2:1 (v:v) in an ultrasound bath for 30 min. To release the lipids, the sample was centrifuged and treated with 60–100 µl bis (trimethylsilyl)-trifluoracetamid with 10% (v) chlorotrimethylsilane at 70 °C for 20 min (Gregg & Slater, 2010; Papakosta et al., 2015). The sample was mixed with 0.5 ml n-hexan and analyzed using an HP 6890 Gascromatograph and then an MSD ChemStation (Isaksson et al., 2010). Of the analyzed sherds, only the sherd with visible residue contained lipids (Table 3). These results will be discussed further below.

Table 4 Analyzed slag and metal

Fnr	Weight (gr)	Type of analyses	Description
55	23.5	Thin-section and ICP analyses	Slag with fine pores, concave-convex shape, and a dense upper surface imprint of sand grains on the bottom surface, similar to 793, slag from smithing
152	13.2	Macroscopic analyses	Slag with fine pores, a dense upper surface imprint of sand grains on the bottom surface, weakly magnetic, similar to 204
204	10.2	Macroscopic analyses	Slag with compact/fine pores, a dense upper surface imprint of sand grains on the bottom surface, magnetic, similar to 152
228	7.3	Thin-section and ICP analyses, probe	Iron, rust-brown, heavy, and magnetic
668	41.1	Thin-section and ICP analyses, microsond	Two fragments of slag with compact/fine pores, possible sand imprint, weakly magnetic
793	13.5	Macroscopic analyses	Slag with fine pores, concave-convex shape, a dense upper surface imprint of sand grains on the bottom surface, similar to 55

Table 5 ICP-AES and ICP-MS chemical analyses of slag and metal

Sample from Fnr	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	Cr_2O_3	P_2O_5	SrO	BaO
55 slag	16.5	0.19	1.61	84.4	0.02	0.09	0.82	0.01	< 0.01	0.01	0.06	< 0.01	0.01
668 metal	22.8	0.12	0.78	79	0.09	0.37	0.82	< 0.01	0.07	0.01	0.12	< 0.01	0.01

Analyses of Slag and Metal

Five pieces of slag and one piece of iron metal were selected for analysis, representing different steps in the metalworking process (Table 4). The samples were analyzed at the geoarchaeological unit, Arkeologerna, Uppsala. As a first step, the samples were cut, and the fresh surfaces were studied in a stereomicroscope to select material for further study. All slag fragments had a concave-convex shape and imprint of sand on their surface linked to the secondary preparation of iron. One slag sample and one metal piece were selected for thin-section analysis using a Zeiss Axioskop 40A polarization microscope (up to 500×).

The chemical elements of the selected piece of slag (Fnr 55) and the metal fragment (Fnr 668) were studied using ICP-AES and ICP-MS (Table 5, see list of all tested elements in OSM 2). The metal fragment (Fnr 668) was also analyzed using a probe (Ogenhall, 2016), see results in OSM 3).

Results

Ceramic Groups

Some category A vessels (Fnr 372, 288, 293, 625, and 605) had been tempered with chamotte, clearly visible in visual inspection. For category B, in a few of the crosshatched vessels (i.e., vessel 604), the tempering of quartz could be identified visually. The thin-section and petrographic analyses show that the main elements are feldspar (both plagioclase and alkali feldspars) and quartz. A few rare grains of amphiboles/pyroxenes and epidote occur, all are very small. Grains of basaltic rock are found in the tuyère (Fnr 279). In two other vessels (Fnr 10 and 26), there are several grains with a so-called graphic texture, an intergrowth of quartz, and mostly alkali feldspar (Fig. 5c). One small such grain is also found in the sample from vessel Fnr 356.

For each grain size fraction, the number of grains has been estimated to percent, distinguishing three main groups. One group had 20–25% of grains with equal representation of different grain fractions. The other group had a low amount of coarse silt, 11.8–11.1%, and a high amount of coarse silt fraction grains (16–15.6%; OSM 1). The combined use of a fluorescence agent and UV-light stereo microscopy distinguished forming techniques in a few cases. In several sherds, pores are extended parallel to the outer surfaces (Fig. 5a), indicating that the potter formed these vessels through a pulling method (see Lindahl & Pikirayi, 2010). Other vessels have the pores dispersed diagonally over the cross-section (Fig. 5b), suggesting a coiling method (see also Table 6).

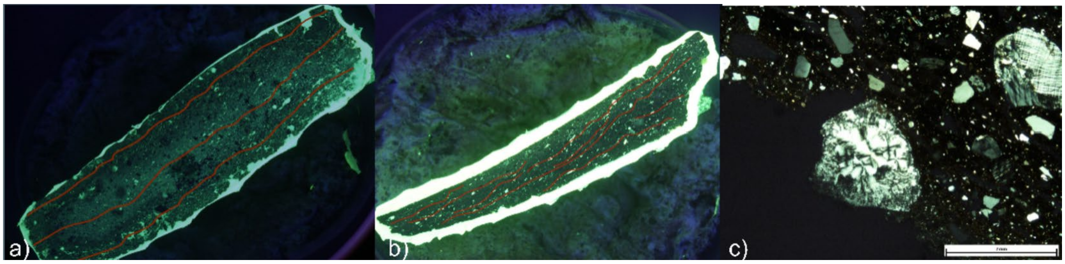

Fig. 5 **a** Fnr 170 crosssection, pores parallel to the vessel walls indicate that the pot has been formed using the "pulling" method; **b** pores running diagonally from one vessel wall from the coiling method; **c** a polarized light micrograph of Fnr 26 showing granophyric intergrowths of quartz and mostly alkali feldspar

Table 6 Main chemical groups, tempering, and grain concentration of analyzed sherds and main groups based on the combination of the above

FNR (TR, depth); group	Description	Method; temper	Chemical composition; inclusion
10 (Tr 3: 30–35); 1	Jar: irregular crosshatching (category H, Fig. 4q); partly oxidized	Pulling; possible temper	High values of SiO_2 and low values of Al_2O_3; with granophyric grains (20–22%)
26 (Tr 3: 20–25); 1	Jar: oblique broad line incision (category H, Fig. 4e); fully oxidized	Pulling; possible temper	High values of SiO_2 and low values of Al_2O_3; with granophyric grains (20–22%)
48 (Tr 1: 20–25); 2	Jar: band of short oblique grooves confined by a single parallel line above grooves (category H, Fig. 4t); fully oxidized	Coiling; temper?	Medium amounts of both SiO_2 and Al_2O_3 (11–12%)
102 (Tr 1: 5–10); 1	Jar: comb stamping on shoulder (category A, see example in Fig. 3a); fully oxidized w. sintered rim	Pulling; temper?	High values of SiO_2 and low values of Al_2O_3 (18.50)
170 (Tr 1: 5–10); 2	Cup: small undec. (category E) sooty from use	Pulling (Fig. 5a); temper?	Medium amounts of SiO_2 and Al_2O_3 (16–15,6%)
185 (Tr 1: 10–15); 2	Jar: oblique parallel line impressions on rim, flutes on neck (category G, see Fig. 4c); fully oxidized	Method not known; grog temper	Medium amounts of SiO_2 and Al_2O_3 (11–12%)
356 (Tr 3: 30–35); 1	Bowl: inverted rim w. bands of oblique comb stamping, possibly single flute at rim base (category G, Fig. 4l); sooty from use	Pulling; presence of temper cannot be determined	High values of SiO_2 and low values of Al_2O_3; with granophyric grains (16% grains (high amount of course sand)
373 (Tr 1: 30–35); 2	Jar: band of short oblique lines confined by parallel lines (similar to or part of 302) (category D, see illustration in Fig. 3i); fully oxidized	Method unknown; temper unknown	Medium amounts of SiO_2 and Al_2O_3 (16–15.6 (high amount of course silt fraction)
279 (Tr 1: 10–15); 3	Tuyère; sintered		Low SiO_2 and high Al_2O_3; with grains of basaltic rock (8.8%)
499; (Tr 1, 66); 3	Line incision; sintered (no thin-section analyses)	Method ?; temper?	Low SiO_2 and high Al_2O_3
447 (Tr 1 35–40); 3	Comb stamping; sintered (no thin-section analyses)	Method ?; temper?	Low SiO_2 and high Al_2O_3

The most common elements in the ceramics, as shown in the pXRF analyses, occur naturally in the clay fraction. Silicon and aluminum oxides (SiO_2 and Al_2O_3) are ubiquitous, as are iron oxides (Fe_2O_2/Fe_2O_3). Other common elements also occurring as oxides are calcium (CaO), potassium (K_2O), and titanium (TiO_2), including magnesium (MgO), and phosphorus (P_2O_5). The ceramics can be separated into three main groups based on the ratio between the SiO_2 and Al_2O_3, the presence of minerogenic inclusion, and the representation of grains in the course fraction (see OSM 1 and summary in Table 6). One group (1) includes Fnr 10 (a jar with crosshatched rim, Fig. 4h), Fnr 26 (a pot with an oblique broad line incision on the neck, Fig. 4g), and Fnr 356 and 102 (both decorated with comb stamping, but the former is a bowl with inverted rim and possibly fluting at the base of the rim (see 4 g). These are similar in chemical composition (high values of SiO_2 and low values of Al_2O_3) but vary in the representation of grains from 20–22% (Fnr 10, 26) to 16% (Fnr 356). All sherds in this group had been built by the pulling method. The presence of grains with graphic texture distinguishes several of these sherds. These minerals are common in the Lebombo mountain range (Manninen et al., 2008). The minerals may be present naturally in some clays, having been transported by tributaries to the Limpopo (one likely tributary is the Kopo Kopo River, which runs up from an outcrop of the Lebombo range into the Limpopo). Grains with graphic texture were observed in Fnr 356 but not in Fnr 102, with a high amount of coarse sand suggesting a tempered clay. In these cases, though pots were decorated using comb stamping, probably from the same source of clay and built by the method of pulling, different methods of tempering were used, and the pots were also shaped in different forms, one being a jar and the other a bowl (bowls are otherwise rare as discussed above).

The other group (2) has medium amounts of SiO_2 and Al_2O_3 and includes Fnr 48 (jar with a band and of short oblique grooves on the shoulder made through pulling), Fnr 185 (jar with grooved rim with possible flutes on the neck), and Fnr 373 (jar with band of short oblique lines confined by parallel lines). This group also includes a fragment of a small cup (Fnr 170) made by coiling. In all these cases, the total grains/area range is 11–16%, suggesting that tempering has been added. Meanwhile, the chemical composition of Fnr 499 and 447 is characterized by a low SiO_2 and a high Al_2O_3, thus representing a different clay source (group 3). Both of these sherds were decorated by comb stamping (both being highly sintered rims), one of which was made using the coiling method. These were not analyzed through thin-section analyses.

Lipid Results

Of the sampled ceramic sherds, only one (Fnr 227) had lipid traces but in low numbers. These traces most likely represent the most recent use of the pot (Craig et al., 2013). The amount of C18:0/C16 can be linked with traces of terrestrial animals, also supported by the presence of cholesterol (Charters et al., 1997; Olsson & Isaksson, 2008). The presence of alkaloids can be linked with oil-rich vegetables (also supported by the possible presence of campesterol). There are traces of ω-(o-alkylphenyl). These are fatty acids (with 18 carbon atoms) present in vegetable oils of different kinds.

Slag

The thin-section analysis of the slag, Fnr 55, shows the presence of olivine crystallized to a low degree and present as long lamellas (Fig. 6). Wüstite appears as drops or as dendrites in a glass medium. The chemical analyses suggest a high content of iron oxide (84 wt% Fe_2O_3) (OSM 2). At the same time, the amounts of silica (present as SiO_2) and aluminum (present as Al_2O_3) are low, and even more so phosphorous and manganese. Fnr 668, also a piece of slag, showed a very similar composition as Fnr 55 in the thin-section analyses (though more heterogeneous in its composition). Both are also similar in their chemical composition and possibly originated from the same source (Fig. 5). The composition of both pieces of slag with olivine, wüstite, and glass, and a fine-grained composition is the result of a fast-cooling process in the open air.

The piece of iron, Fnr 228, was analyzed in a thin section and through microsond (OSM 3). Though the piece is highly corroded, the

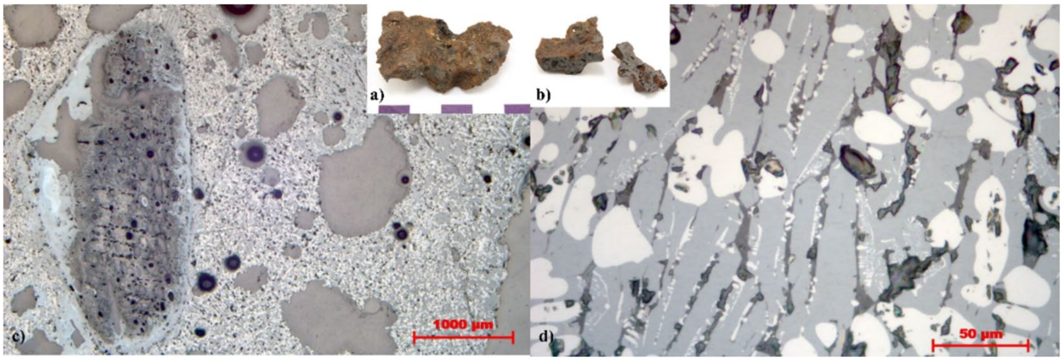

Fig. 6 Fnr 55: **a** the original slag fragment; **b** cross-sections; **c** a low magnification thin section showing a piece of charcoal embedded in the slag, and (**d**) high magnification, the latter showing the olivine present as lamellas and the wüstite appearing as drops or in a dendritic form

remaining ferritic (or pure) iron is present only as lamellas (Fig. 7). Meanwhile, a yellow-pink iron-carbon compound appears more corrosion-resistant. Microsond analyses showed this compound to be cementite (Fe_3C), a bi-product of slow cooling from carbon steel (defined as a form of steel with a high carbon content (in this case, 6.7 wt%)). Chemical analyses show a high content of iron and the presence of manganese oxide (0.1–0.44%), calcium (1.43–13.4%), aluminum (as high as 5.13%), and also some vanadium (V). The same elements are well represented in the chemical analyses of Fnr 228 and constitute a significantly different chemical signature from the analyzed slags. The significance of these differences can only be assessed through a comparison with slags and metal from the broader region.

Discussion

Until now, this important stretch of the Limpopo River was unknown archaeologically. The goal of the Chicumbane study is to understand the EFC formation and later cultural developments in and around the Limpopo Valley at the end of the first millennium AD (Antonites, 2018; Calabrese, 2000; Chirikure et al., 2014; Huffman, 2007).

The range of decoration, in terms of elements and position on the ceramic vessels, as well as shape and size, are enormously varied in Chicumbane. The site is small, concentrated in one pit, and with cultural layers of limited extent. Though the layers are partly disturbed, the decoration styles and the range of dates give a date of ca. 500–800 AD. The comb stamping (35% of decorated fragments) is similar to

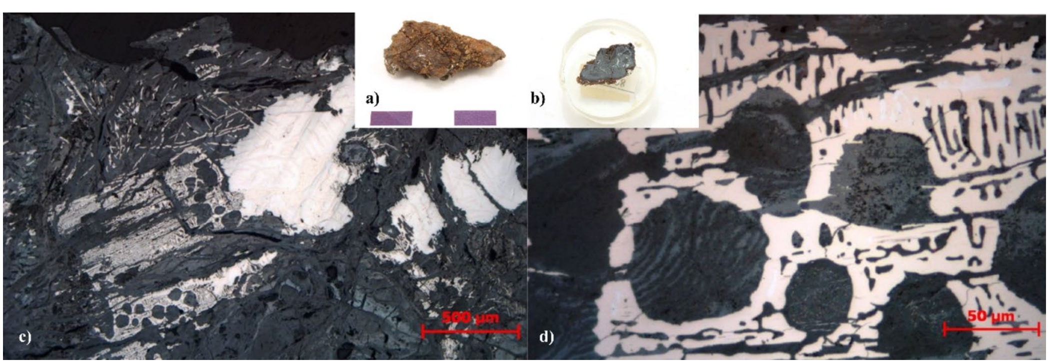

Fig. 7 Fnr 228 showing (**a**) the iron fragment with attached quartz grains; **b** the cross-section; **c** low magnification showing the white ferruginous iron lamellas interspersed by white–pink cementite; **d** high magnification, olivine lamellas, and drop-shaped or dendritic wüstite

the Gokomere facies (550–750 AD) found in south central Zimbabwe (Huffman, 2007, p. 138). The predominance of jars with a sinuous profile and out-flaring rim is more similar to the later evolvement of the Gokomere facies, namely the Zhizo facies (750–1050 AD), while the multiple bands of decoration are similar to the earlier Gokomere facies. What we find in Chicumbane is an intermediate variety. The Zhizo facies is found across southwestern Zimbabwe, northern South Africa (including Mapungubwe), and parts of Botswana and Mozambique.

There appears to have been some form of creolization of interior and coastal ceramic styles in Chicumbane. The Chicumbane material has some decorative elements (such as flutes and broad-line incisions) with affinities to the Kwale branch and Mzonjani facies (450–750 AD). Similar ceramics have earlier been reported near Licenga, just north of Chicumbane (Ekblom et al., 2015; Fig. 1). The facies are, in turn, related to the earlier coastal EFC tradition—Silver Leaves (in Mozambique and referred to further north as Matola), also associated with Kwale found along the coast in Mozambique, Tanzania, and Kenya. However, the elements characterizing these early EFC traditions, such as fluted rims, beveled rims, and space motifs, are still very few in the Chicumbane assemblage. In Huffman's (2007) classification, the Kwale-Mzonjani facies developed into the Garonga facies. Such ceramics are reported by Huffman (2007) from sites in Kruger National Park, just west of our area (Fig. 1). Huffman (2007, p. 131) dates the Garonga facies to 750–900 AD, although it is still to be securely dated and defined. The decoration elements associated with these two facies are the crosshatched rims (representing 17% of all ceramics) and the bands of parallel line incisions/broad line incisions (representing 21% and 10% of all ceramics, respectively). The latter decorative elements can also occur in the Gokomere and later Zhizo facies. Jars dominate both these ceramic facies but with less pronounced out-flaring rims than in the Zhizo facies. The Chicumbane site possibly provides a clue to defining the Garonga facies further and exploring whether this is a fusion of coastal and interior styles.

The Goronga facies have been associated with a southern movement of Bantu-speaking farmers through a coastal movement (named the Kwale branch). Meanwhile, the Gokomere and Zhizo facies have been associated with a southern inland movement of Bantu-speaking farmers (named the Nkope Branch). All the above-named facies and branches are grouped under the so-called Kwale Tradition (cf. Huffman, 1989, 2000, 2007; see also discussion in Phillipson, 1977; Russell et al., 2014). Here, we do not make assumptions about migrations, as we do not know if residents in Chicumbane were Bantu-speaking farmers or if they had adopted a material culture associated with the EFC complex. The shapes and decorative elements found in the broader region could also have been adopted through contacts and exchanges (see similar discussion in Kohtamäki, 2014; Pikirayi & Lindahl, 2013; Sadr & Simpson, 2006). Two thin-walled ceramic sherds (cf. Sadr, 2008; Sadr & Sampson, 2006) were also found; one as a loose find (Fnr 311), and the other in the upper layer of (Trench 1, Fnr 128; see Fig. 4i). These sherds were completely atypical of the wider Chicumbane assemblage and could constitute a forager ceramic style (cf. Sadr, 2008). Neither of these vessels is securely dated. They were found as loose finds in the upper layer of Trench 1, which may be mixed.

Even though it is based on a small subsample only, the macroscopic and thin-section analyses of the sherds suggest that the ceramics were made from several different clay sources and varied tempering materials (or none) using different ways of forming the vessels. The thin-section and XRF analyses also suggest that alternate tempering methods were used even where the clay source and method of forming the vessels were the same. Similarly, the pulling and coiling methods of building pots seem to have been individualized by the potter and did not correspond to a particular decoration, vessel shape, or clay source. Though we need fabric and elemental analyses of the wider assemblage, the few pots analyzed show great variability in ceramic production practices during the EFC. Ethnographic evidence reveals that variations in clay can also be a function of the natural variation of inclusions in the clay sources. In 2016, we interviewed one of the few active potters in the Chicumbane area. The woman, Ndjakandjaka Vilanculos (who now sadly passed away), explained that she took the clay from the Limpopo River but did not temper it because it already had coarse fractions. Thus, some of the analyzed pots with larger grains may have been naturally tempered, while the temper seems to have been deliberately added for others. This illuminates the potters' skills in prospecting the landscape for high-quality clays and their ability to improvise when clay sources needed tempering.

Although the lipid analysis gave poor results, the results from one of the analyzed pots, sample 227, are highly significant. There are traces of ω-(o-alkylphenyl) fatty acids (with 18 carbon atoms) present in a few vegetable oils. This is most likely oleic acid (18:1), present in the local tree mafura, *Trichilia emetica* (Nhicimbi, 2020). The contents have been heated up in the vessel, and there is also the presence of lipids from a compound (abietan diterpenes) that in temperate regions is associated with pine trees and sage. In Southern Africa, one of the few plants containing this substance is the herb *Plectranthus,* which belongs to the mint family (Lamiaceae) and is available locally. Interestingly, this plant has anti-malarial properties (Onguene et al., 2013) and may have been added to the fire to deter mosquitos.

When it comes to metal production, the high carbon content found in the analyzed samples is a function of secondary smithing in an open hearth, typical of the bloomery metal technology common in Africa (Miller & van der Merwe, 2004; Mtetwa, 2017). Iron from the furnace absorbed carbon during the smithing phase, turning the metal into steel. The tuyère fragments recovered from the site would have been used for smithing purposes, to blow blasts of air into the fire for high temperatures (Serneels & Perret, 2003). The iron used for the secondary smithing was produced elsewhere. The Zimbabwe and South African highland regions are notable for the abundance of mining and metalworking sites, especially in the second millennium CE (Miller et al., 2001). In Chicumbane, secondary production occurred within a domestic space, as noted elsewhere in the near region (Mtetwa, 2017).

In summary, looking at the ceramics, there is evidence of “creolization” of the interior Gokomere-Zhizo and coastal Mzonjani facies. However, the coastal elements are few, and there is very limited direct evidence for exchange and connections with the coast, located 370 km east. The one concrete indication of coastal contact is the presence of the marine bivalve *Tellina*.

More studies on fabric analyses and elements (and content analyses) are needed on the larger assemblage of Chicumbane and other EFC sites to map these local specificities and connections. The ceramic analyses suggest a mix of traditions and a rich repertoire of decorative elements with individualized ways of procuring clays and making pots. This is particularly interesting as the depositions in the pit took place during a relatively short time. We are assuming here that the linkages between cattle, bridewealth, and women’s movement between households, as observed in the historical period, were already in place. In this case, potters, whom we infer to have been mostly women, were moving between families and different areas, bringing new ways of decorating, tempering, and building pots to the Chicumbane site.

Even though the technology was individualized, some categories of pots appear to have been more standardized than others in shape and decoration. One example comes from the large jars (50 cm in diameter) with comb stamping (category A), which, despite variations in the composition of motifs, have a very standardized form. We suggest that the degree of standardization was linked to the pottery function, understood to be more about the social context of vessel use than the contents of the vessel. The placement of the large category A pots at the base of the pit (of which one is possibly an entire vessel) and accompanying larger vessels may be interconnected. Vessels used for ceremonial or ritualized occasions were made more carefully to signal a standardized EFC pot. For vessels used in everyday contexts, there could have been more experimentation and room for the potters to express their identities and preferences.

Conclusion

The Limpopo Valley was a main connection route between the interior and the coast and different influence areas regarding ceramic traditions. However, the knowledge of the lower Limpopo Valley has been limited due to a lack of archaeological field surveys. This article presents the ceramic assemblage from the Chicumbane archaeological site, dated ca. 500–800 AD. Pieces of iron and slag suggest smithing activities in an open hearth; evidence of primary production has not been found. The decoration and shapes of ceramics are intermediate between the inland Gokomere and its later expression, the Zhizo facies (dating 550–750 AD and 750–1050 AD, respectively). However, the ceramics also have some affinities with the coastal styles associated with the Mzonjani facies (450–750 AD) and Garonga facies (750–900 AD). As such, the Chicumbane site is somewhat of a missing link—as it shows the intermixing and evolvement of pottery styles, which have previously been interpreted as belonging to two different and separate spheres of influence (an interior and a coastal one). Here, we have explained these differences as ongoing negotiations of identity and belonging. The thin-section and pXRF analyses show a variety of clay sources, tempers, and building methods, even within ceramic groups with the same decoration elements and shape. Thus, the combined ceramic analyses suggest a mix of traditions through networks and connections, shaped as female potters moving between regions and households brought new ways of decorating, tempering, and building pots.

Acknowledgements This research was funded through the Swedish Research Council dnr 2012-1063. Our work was carried out under the licence of the National Directorate of Cultural Heritage, Mozambique and the National Administration of Conservation Areas. The park management of Limpopo National Park and the rangers have always been very supportive of our work. We are indebted to Gabriel Maluleque, who guided us to the site, and the traditional leader Rodriguez Maluleque, who gave us the local authorisation to excavate and organised the required ceremonies before excavations. We are greatly indebted to the Folta Sidume family, who allowed us to excavate their backyard, and to the children for giving us the kind permission to excavate on their playing ground and assisting us in various ways. In 2015, surveys were supported by the participation of student Michael Muchanga, Eduardo Mondlane University (UEM). The 2017 excavations were supported by Décio Muianga, lecturer at UEM who organised for students from UEM to join us in the field and who also took the time to join us in the field. The UEM archaeology students Amós Paulo Caliate, Abelo de José Perreira, Enio José Tembe, Jacira Nhatsave, Mísia Isabel Paula, and Shelia Machava all contributed to the results of this paper by joining our excavations.

Author Contribution Anneli Ekblom analyzed the ceramics and produced the illustrations. Anneli Ekblom and Michel Notelid produced the majority of the text. Michel Notelid supervised and planned the excavations and surveys. Anders Lindahl carried out the thin-section and XRF analyses and contributed text to this section. Ezekia Mtetwa advised on the interpretation of the metallurgical analyses and added text in this section. All the authors reviewed the final version of the manuscript.

Funding Open access funding provided by Uppsala University.

Data Availability The datasets generated during and/or analyzed during the current study are available through Zenodo: https://zenodo.org/record/6676301#.YrHjlUZBw2w.

References

Adamowicz, L. (2017). *Building climate resilience assessment of Limpopo Basin in Mozambique. Environmental impact assessment for the archaeological and cultural heritage resources: Establishment of baseline, potential impacts, mitigation measure and management plan*. Patrimoz.

Antonites, A. R. (2018). A revised chronology for the Zhizo and Leokwe horizons at Schroda. *African Archaeological Review, 27*, 223–246.

Ashley, C. (2010). Towards a socialised archaeology of ceramics in Great Lakes Africa. *African Archaeological Review, 27*, 135–163.

Bicho, N., Cascalheira, J., Haws, J., & Gonçalves, C. (2018a). Middle Stone Age technologies in Mozambique: A preliminary study of the Niassa and Massingir regions. *Journal of African Archaeology, 16*, 60–82.

Bicho, N., Cascalheira, J., André, L., Haws, J., Gomes, A., Gonçalves, C., et al. (2018b). Portable art and personal ornaments from Txina-Txina: A new Later Stone Age site in the Limpopo River Valley, southern Mozambique. *Antiquity, 92*(363), 1–7.

Calabrese, J. A. (2000). Interregional interaction in Southern Africa: Zhizo and Leopard's Kopje relations in Northern South Africa, southwestern Zimbabwe and eastern Botswana, AD 1000 to 1200. *African Archaeological Review, 17*(4), 183–210.

Charters, S., Evershed, R. P., Quye, A., Blinkhorn, P. W., & Reeves, V. (1997). Simulation experiments for determining the use of ancient pottery vessels: The behaviour of epicuticular leaf wax during boiling of leafy vegetable. *Journal of Archaeological Science, 24*, 1–7.

Chirikure, S., Manyanga, M., Pollard, A. M., Bandama, F., Mahachi, G., & Pikirayi, I. (2014). Zimbabwe culture before Mapungubwe: New evidence from Mapela Hill, south-western Zimbabwe. *PLoS ONE, 9*(10), e111224. https://doi.org/10.1371/journal.pone.0111224

Craig, O. E., Saul, H., Lucquin, A., Nishida, Y., Taché, K., Clarke, L., et al. (2013). Earliest evidence for the use of pottery. *Nature, 496*, 351–354.

Cruz e Silva, T. (1980). A preliminary report on an early Iron Age site: Matola IV/68. In R. E. Leakey & B. A. Ogot (Eds.), *Proceedings of the 8th Pan-African congress of prehistory and quaternary studies* (pp. 349–350). International Louis Leakey Memorial Institute for African Prehistory.

Duarte, R. T. (1976). *A Expansão Bantu e o Povoamento do Sul de Moçambique: Algumas Hipóteses*. Secção de Arqueologia. Universidade Eduardo Mondlane.

Ekblom, A., Notelid, M., & Sillén, P. (2015). Archaeological surveys in the lower Limpopo Valley, Limpopo National Park. *South African Archaeological Bulletin, 70*, 201–208.

Esterhuysen, A. B. (2008). Ceramic alliances: Potter and the history of Kekana Ndebele in the old Transvaal. In N. Swanepoel, A. B. Esterhuysen, & P. Bonner (Eds.), *Five hundred years discovered: Southern African precedents and prospects* (pp. 197–214). Wits University Press.

Forssman, T. (2016). Blurring boundaries: Forager–farmer interactions in the Middle Limpopo Valley. In K. Sadr, A. Esterhusyen, & C. Sievers (Eds.), *Papers from the 2014 PanAfrican Archaeological Association Congress* (pp. 143–164). Wits University Press.

Forssman, T. (2017). Foragers and trade in the middle Limpopo Valley, c. 1200 BC to AD 1300, Azania. *Archaeological Research in Africa, 52*(1), 49–70.

Forssman, T., Seiler, T., & Witelson, D. (2018). A pilot investigation into forager craft activities in the middle Limpopo Valley, Southern Africa. *Journal of Archaeological Science Reports, 19*, 287–300.

Gregg, M. W., & Slater, G. F. (2010). A new method for extraction, isolation and transesterification of free fatty acids from archaeological pottery. *Archaeometry, 52*(5), 833–854.

Hall, M. (1983). Tribes, tradition and numbers: The American model in Southern African Iron Age ceramic studies. *South African Archaeological Bulletin, 38*, 51–57.

Hall, S. L., & Smith, B. (2000). Empowering places: Rock shelters and ritual control in farmer-forager interactions in the Northern Province. *Southern African Archaeology Society Goodwin Series, 8*, 30–46.

Huffman, T. N. (1989). Ceramics, settlements, and Late Iron Age migrations. *African Archaeological Review, 7*, 155–182.

Huffman, T. N. (2000). The Central Cattle Pattern and interpreting the past. *Southern African Humanities, 13*, 19–35.

Huffman, T. N. (2005). The stylistic origin of Bambata and the spread of mixed farming in southern Africa. *Southern African Humanities, 17*(1), 57–79.

Huffman, T. N. (2007). *Handbook to the Iron Age: The archaeology of pre-colonial farming societies in southern Africa*. University of KwaZulu-Natal Press.

Huffman, T. N. (2021). Bambata pottery and Western Bantu: Re-interpreting the Early Iron Age in southern Africa. *Southern African Humanities, 34*(1), 1–17.

Isaksson, S., Karlsson, C., & Eriksson, T. (2010). Ergosterol (5, 7, 22-ergostatrien-3β-ol) as a potential biomarker for alcohol fermentation in lipid residues from prehistoric pottery. *Journal of Archaeological Science, 37*, 263–3268.

Jonsson, J. (1998). *Early plant economy in Zimbabwe*. Ph.Lic. dissertation. Uppsala University.

Kohtamäki, M. (2014). *Transitions: A landscape approach to social and cultural changes in southern Mozambique, 5000 BC-1000 AD*. Ph.D. dissertation. Uppsala University.

Korfmann, M., Liesegang G. & Smolla, G. (1986). Afrika-Kartenwerk: Beiheft. Ser. S., Südafrika, Beiheft zu Blatt 15, *Historische Geographie - Südafrika* (Moçambique, Swaziland, Republik Südafrika). Gebrüder Borntraeger.

Lander, F., & Russell, T. (2018). The archaeological evidence for the appearance of pastoralism and farming in southern Africa. *PLoS ONE, 13*(6), e0198941.

Lane, P. (1994/1995). The use and abuse of ethnography in the study of the Southern African Iron Age. *Azania, 29/30*, 50–64.

Lindahl, A., & Pikirayi, I. (2010). Ceramics and change: An overview of pottery production techniques in northern South Africa and eastern Zimbabwe during the first and second millennium AD. *Archaeological and Anthropological Sciences, 2*, 133–149.

Macamo, S., & Machava, B. (2011). An archaeological analysis of pottery from Massingir. *The South African Archaeological Bulletin, 66*, 113–120.

Macamo, S., & Risberg, J. (2007). The archaeology of Massingir, Gaza Province, Southern Mozambique. In G. Pwiti, C. Radimilahy, & F. Chami (Eds.), *Settlements, economies and technology in the African past* (pp. 67–82). Dar es Salaam University Press.

Manninen, T., Eerola, T., Mäkitie, H., Vuori, S., Luttinen, A., Sénvanao, A., et al. (2008). The Karoo volcanic rocks and related intrusions in southern and central Mozambique. In Y. Pekkala, T. Lehto, & H. Mäkitie (Eds.), *GTK consortium geological surveys in Mozambique 2002–2007* (pp. 211–250). Geological Survey of Finland.

Manyanga, M. (2006). *Resilient landscapes: Socioenvironmental dynamics in the Shashi-Limpopo basin, southern Zimbabwe c. AD 800*. Ph.D. dissertation. Uppsala University.

Meyer, A. (1984). A profile of the Iron Age in the Kruger National Park. In M. Hall, G. Avery, D. M. Avery, M. L. Wilson, & A. J. B. Humphreys (Eds.), *Frontiers: African archaeology today* (pp. 215–227). British Archaeological Reports.

Miller, D., & van der Merwe, N. J. (2004). Early metal working in sub-Saharan Africa: A review of recent research. *Journal of African History, 35*(1), 1–36.

Miller, D., Killick, D., & Van der Merwe, N. J. (2001). Metal working in the northern Lowveld, South Africa AD 1000–1890. *Journal of Field Archaeology, 28*(3–4), 401–417.

Miller, J. M., Sawchuk, E. A., Reedman, A. L. R., & Willoughby, P. R. (2018). Land snail shell beads in the Sub-Saharan archaeological record: When, where, and why? *African Archaeological Review, 35*, 347–378.

Mitchell, P. (2002). *The archaeology of southern Africa*. Cambridge University Press.

Morais, J. M. (1988). *The early farming communities of southern* Mozambique. Ph.D. dissertation. Swedish Board of National Antiquities.

Mtetwa, E. (2017). *Technology, ideology and environment: The social dynamics of iron metallurgy in Great Zimbabwe, AD 900 to the present.* Ph.D. dissertation. Uppsala University.

Nhicimbi, H. Y. (2020). Quantitative and qualitative assessment on the suitability of seed oil from water plant (Trichilia emetica) for soap making. *Saudi Journal of Biological Sciences, 27*(11), 3161–3168.

Notelid, M., & Ekblom, A. (2018). Farming communites and landscape: Lower Limpopo Valley. In A. Ekblom, C. Isendahl, & K.-J. Lindholm (Eds.), *The resilience of heritage: Cultivating a future of the past. Essays in honour of Professor Paul J.J. Sinclair* (pp. 207–224). Uppsala University.

Ogenhall, E. (2016). *Slagg och järn från Moçambique Arkeometallurgiska analyser av material från Chicumbane Gabriel, Moçambique, Afrika*. Arkeologerna.

Olsson, M., & Isaksson, S. (2008). Molecular and isotopic traces of cooking and consumption of fish at an Early Medieval manor site in eastern middle Sweden. *Journal of Archaeological Science, 35*(3), 773–780.

Onguene, P. A., Ntie-Kang, F., LikowoLifongo, L., Ndom, J. C., Sippl, W., et al. (2013). The potential of anti-malarial compounds derived from African medicinal plants, Part I: A pharmacological evaluation of alkaloids and terpenoids. *Malaria Journal, 12*(449), 1–25.

Papakosta, V., Smittenberg, R. H., Gibbs, K., Jordan, P., & Isaksson, S. (2015). Extraction and derivatization of absorbed lipid residues from very small and very old samples of ceramic potsherds for molecular analysis by gas chromatography–mass spectrometry (GC–MS) and single compound stable carbon isotope analysis by gas chromatography–combustion–isotope ratio mass spectrometry (GC–C–IRMS). *Microchemical Journal, 123*, 196–200.

Phillipson, D. W. (1977). The spread of Bantu Languages. *Scientific American, 236*, 106–114.

Pikirayi, I. (2007). Ceramics and group identities: Towards a social archaeology in southern African Iron Age ceramic studies. *Journal of Social Archaeology, 7*(3), 286–301.

Pikirayi, I., & Lindahl, A. (2013). Ceramics, ethnohistory, and ethnography: Locating meaning in southern African Iron Age ceramic assemblages. *African Archaeological Review, 30*(4), 455–473.

Plug, I. (1989). Aspects of life in the Kruger National Park during the Early Iron Age. *South African Archaeological Society Goodwin Series, 6*, 62–68.

Plug, I. (2000). Overview of Iron Age fauna from the Limpopo valley. In M. Lesley & T. Maggs (Eds.), *African naissance: The Limpopo Valley 1000 years ago* (pp. 117–126). South African Archaeological Society Goodwin Series 8.

Raja, M.I.M. (2020). A geoarqueologia da jazida da idade da pedra superior de Txina-Txina, Massingir, Moçambique. Ph.D. dissertation. Algarve University, Algarve.

Russell, T., Silva, F., & Steele, J. (2014). Modelling the spread of farming in the Bantu-speaking regions of Africa: An archaeology-based phylogeography. *PLoS ONE, 9*(1), e87854. https://doi.org/10.1371/journal.pone.0087854

Sadr, K. (2008). An ageless view of first millennium AD southern African ceramics. *Journal of African Archaeology, 6*(1), 103–129.

Sadr, K., & Sampson, C. G. (2006). Through thick and thin: Early pottery in southern Africa. *Journal of African Archaeology, 4*(2), 235–252.

Serneels, V., & Perret, S. (2003). Quantification of smithing activities based on the investigation of slag and other material remains. *Archaeometallurgy in Europe, 1*, 469–478.

Shackley, M. S. (2011). An introduction to X-ray fluorescence (XRF) analysis in archaeology. In M. S. Shackley (Ed.), *X-ray fluorescence spectrometry (XRF) in Geoarchaeology* (pp. 7–44). Springer.

Sinclair, P., Morais, J. M. F., Adamowicz, L., & Duarte, T. (1993). A perspective on archaeological research in Mozambique. In T. Shaw, P. Sinclair, B. Andah, & A. Okpoko (Eds.), *The archaeology of Africa: Food, metals and towns* (pp. 409–431). Routledge.

Thorp, C. (2010). Induna Cave, south-eastern Zimbabwe: a 'contact period' assemblage in a changing social landscape. *Southern African Humanities, 22,* 113–147.

van Doornum, B.L. (2005). *Changing places, spaces and identity in the Shashe-Limpopo Region of Limpopo Province, South Africa*. Ph.D. dissertation. University of Witwatersrand.

Walker, N. J. (1995). *Late Pleistocene and Holocene hunter-gatherers of the Matopos: An archaeological study of change and continuity in Zimbabwe*. Ph.D. dissertation. Uppsala University.

Wynne-Jones, S. (2007). It's what you do with it that counts: Performed identities in the East African coastal landscape. *Journal of Social Archaeology, 7*(3), 325–345.

Wynne-Jones, S. (2016). *A material culture: Consumption and materiality on the coast of precolonial east Africa*. Oxford University Press.