Afr Archaeol Rev (2020) 37:251–270
https://doi.org/10.1007/s10437-020-09378-7

ORIGINAL ARTICLE

Cooking, Serving, and Storage: Ceramic Vessel Function and Use Contexts at Schroda

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Published online: 15 May 2020

Abstract Foods and foodways are closely connected to social processes and activities. The functions of ceramic vessels in transporting, storing, processing, and serving food are tied to these social processes. Vessel functions can thus provide direct evidence of social activities. This article presents the results of a functional analysis of ceramic vessels from Schroda, a tenth- to eleventh-century farming settlement located in the middle Limpopo Valley, South Africa. Physical attributes such as vessel form, size, surface treatment, and sooting are considered in conjunction with ethnographic sources and comparative archaeological data to identify vessel functions and how these might relate to different activity areas across the site. Continuity and change in vessel use between the site's Zhizo- and Leokwe-phase deposits are also discussed.

Résumé Les aliments et les habitudes alimentaires sont étroitement liés aux processus et aux activités sociaux. Les fonctions des récipients en céramique dans le transport, le stockage, la transformation et le service des aliments les lient à ces mêmes processus sociaux. Les fonctions des navires peut ainsi fournir une preuve directe des activités sociales. Cet article présente les résultats d'une analyse fonctionnelle des récipients en céramique de Schroda, une colonie agricole du dixième au onzième siècle située dans la vallée du Limpopo, en Afrique du Sud. Les attributs physiques tels que la forme, la taille, le traitement de surface et la suie des navires sont pris en compte conjointement avec des sources ethnographiques et des données archéologiques comparatives afin d'identifier de manière provisoire l'utilisation des navires et leurs relations éventuelles avec différentes zones d'activité du site. La continuité et le changement d'utilisation de navires entre les gisements de phases Zhizo et Leokwe sur le site sont également étudiés.

Keywords South Africa · Limpopo Valley · Early farming communities · Iron Age · Zhizo/Leokwe · Pottery function · Foodways

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Introduction

Ceramic assemblages have been an integral part of the broad archaeological studies of foodways (e.g., Arthur 2014; Fuller 2005; Knight and Rojas 2015; Wilson and Rodning 2002). These studies examine how the everyday use of ceramics in transporting, storing, processing, and serving food is closely connected to social processes and activities (e.g., Counihan and Van Esterik 2012; Germov and Williams 2008). Vessel functions, in the context of the uses of different vessels in any given assemblage, have been used as direct evidence to explore the various dimensions of such social activities (e.g., Arthur 2003; Ashley 2010; Blitz 1993; Fowler

2006; Huffman 1972; Jones 1999; Kooiman 2016; Lesure 1998; Sinopoli 1991; Van der Lith 1960).

Schroda (Fig. 1) presents an ideal context in which to study the social role of ceramics, specifically to understand the shift in regional dynamics that took place in the middle Limpopo Valley starting around AD 1000 (Huffman 2000). Prior to this change, communities who produced "Zhizo" ceramics had settled the area for almost a century, and the trade with the southeast African coast seem to have played a prominent role in their local sociopolitical organization (Huffman 2000, 2007a; Pikirayi 2001; Sinclair et al. 2012). The relatively large quantity of glass trade beads and elephant ivory from the Zhizo deposits at Schroda suggest that the site played a significant role in the distribution of trade goods into and out of the interior (Hanisch 2002; Plug and Voigt 1985; Robertshaw et al. 2010).

Around AD 1000, producers of "K2" ceramics settled in the middle Limpopo Valley. Coastal trade intensified, but both trade and regional socioeconomic influence shifted from Schroda to the site of K2 (Huffman 2000, 2009; Wood 2012; see also Fouché 1937; Gardner 1963; Robinson 1966). This shift was taking place at the beginning of changes in climate—from a drier to a wetter phase (Smith et al. 2007)—which resulted in more intensive agriculture than was previously possible. As a result of these changes, some Zhizo communities relocated to eastern Botswana (Denbow 1983, p. 213). Others remained in the area where they gradually incorporated some K2 stylistic elements into their ceramic designs. These Zhizo communities—who are now referred to as "Leokwe" because of the change in ceramic style—seem to have co-existed with K2 communities in the middle Limpopo Valley for the next 200 years. However, the nature of the relationship between these two groups is not yet fully understood (Calabrese 2007, p. 221; Huffman 2009, 2014; Vogel and Calabrese 2000). Schroda continued to be settled throughout the early K2/Leokwe period and was probably abandoned sometime before AD 1100 (Antonites 2018).

Archaeological Background

Edwin Hanisch (1980, 2002) excavated Schroda from 1975 to 1982 (Fig. 2), focusing on the southern part of the site. The excavations covered six areas, associated with domestic life, communal refuse disposal, craft production, and ceremonial activities.

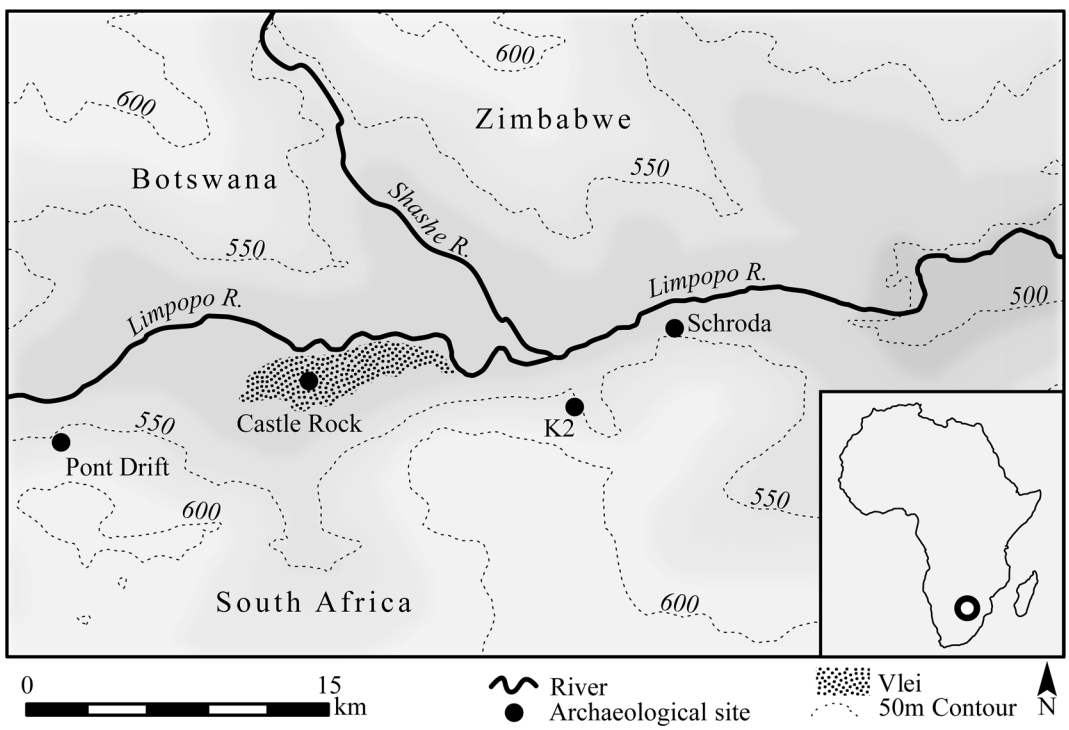

Fig. 1 Location of Schroda and other sites mentioned in the text

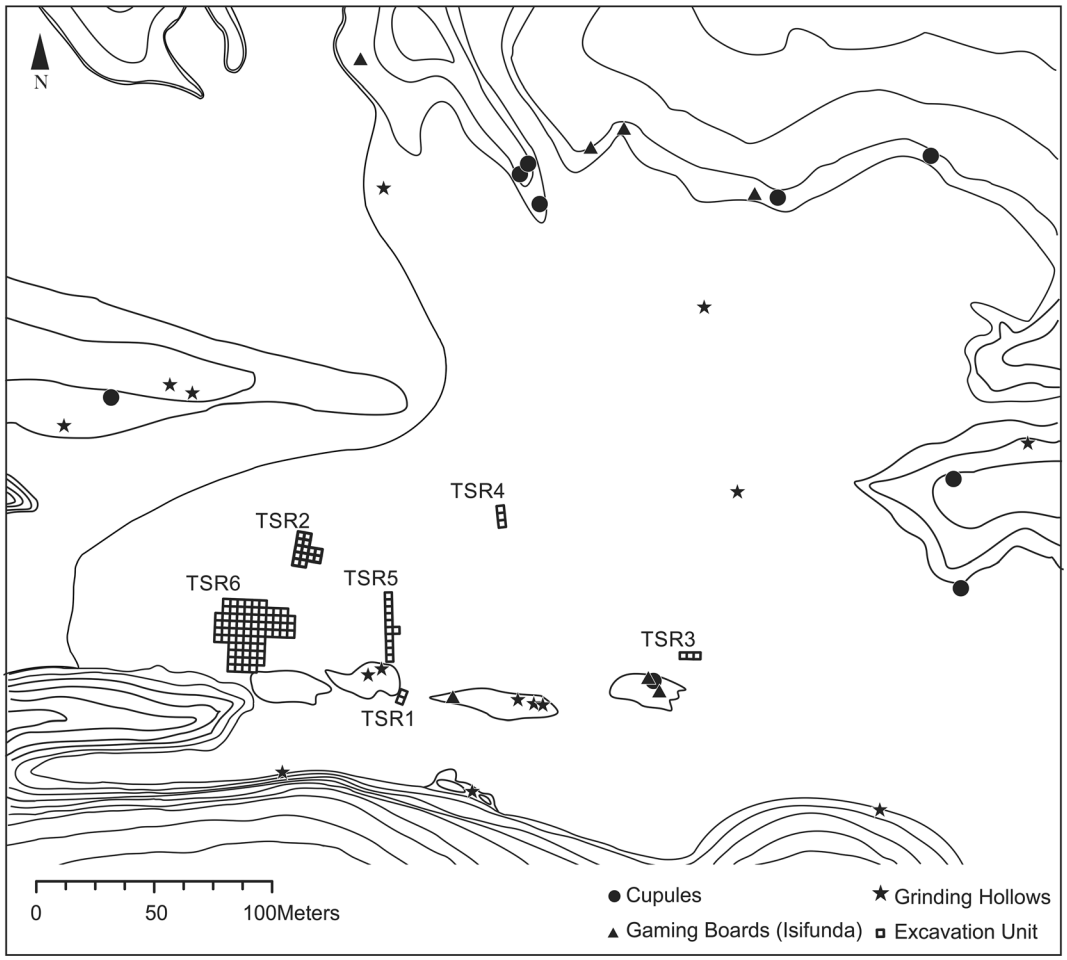

Fig. 2 Schroda site map showing the location of excavated areas TSR1–6 (Antonites 2018)

Hanisch referred to the excavated units as "Area 1–6" (henceforth, TSR1–6). Previous stylistic and radiocarbon analyses determined two occupation phases, namely Zhizo and Leokwe (Calabrese 2000, 2007; Calabrese and Vogel 2000). The occupation sequence was recently refined to the extent that most excavated deposits can now be linked to one of the two phases (Antonites 2018). Both Zhizo and Leokwe are represented in TSR2, TSR5, and TSR6, but TSR3 and TSR4 belong to the earlier Zhizo horizon. The archaeological deposits of TSR1 are too small and cannot be placed in a specific occupation phase. Hence, it is excluded from further discussion. It is against this refined chronological backdrop and settlement history that the ceramic functional analysis was undertaken to compare ceramic use between Zhizo and Leokwe horizons, and also across the site, as well as to shed light on depositional contexts and identify the possible activity areas.

In terms of the food sources linked to the ceramic vessels, previous research determined that subsistence was based on plants (sorghum, beans, wild fruits, and seeds) and animal products. Suitable land for crop cultivation lies within ten minutes' walk from the site, while smaller gardens may have been kept on-site (Hanisch 1980, p. 225). Water was available within one kilometer from the Limpopo River. People herded cattle, sheep, and goats, with a slight emphasis on small stock. A wide variety of wild animals were hunted, gathered, and snared (Raath 2014). During the earlier Zhizo phase, livestock was kept in small enclosures spread out among the households. They may even have been kept in an area away from the central living space. At some point during the Zhizo phase, the arrangement changed to a series of smaller livestock enclosures in a central location around which residences/houses were arranged. Nevertheless, some animal enclosures

continued to be located between the residences (Hanisch 1980, p. 222).

Morphological Aspects Recorded

The functional analysis focused on the morphological characteristics—such as vessel shape, size, and surface treatment—that could shed light on vessel functions and relate the archaeological ceramics to past foodways (e.g., Blitz 1993; Hally 1986; Pauketat 1987; Skibo 2013). It should, however, be pointed out that in Eastern Bantu-speaking societies, ceramics are more than functional food containers. They are also deeply imbued with symbolic meanings and play an important role in maintaining social order (e.g., Armstrong et al. 2008; Aschwanden 1982).

In what follows, the range of vessel types from Schroda is first presented, along with a consideration of the activities in which each type was used. Comparative ethnographic, ethnoarchaeological, and archaeological studies are then used to assign possible functions to the vessels (e.g., Fowler 2006; Henrickson and McDonald 1983; Huffman 1972; Lesure 1998; Mills 1999; Van der Lith 1960; Van Waarden 2018; Wilson and Rodning 2002).

Vessel shape often equates to vessel function based on certain use-related design expectations and limitations (Henrickson and McDonald 1983; Rice 1987). For example, cooking vessels tend to be "short and squat with a large basal surface for efficient heat transfer, but usually with a somewhat restricted mouth to prevent rapid evaporation from boiling foods" (Henrickson and McDonald 1983, p. 631). Their smooth contours allow even heating and thermal stress when placed over an open fire. A high-necked vessel, on the other hand, may constrain access to contents but enable more controlled pouring of liquids (Rice 1987). The distribution and combinations of different vessel forms may reveal contexts related to specific activities (e.g., storage, cooking, and serving of food).

The methodology used to determine vessel shape follows Calabrese (2007, p. 52–55). Analysis distinguished between seven general vessel types (Fig. 3). Variation within groups was consolidated to produce meaningful vessel form categories. Relative frequencies of vessel rim and neck sherds were used as a measure of relative use/discard. Despite the possible influence of vessel use life and use location on these frequencies (e.g., Nelson 1991; Schapiro 1984), "they nevertheless provide the best estimate available for the relative frequency with which different morphological types were used and broken" (Hally 1986, p. 276).

Vessel size can also relate to function and reveal different food-related social activities (e.g., Ashley 2010; Fowler 2006; Huffman 1972; Lindahl and Matenga 1995; Mills 1999; Van der Lith 1960; Wilson and Rodning 2002). In turn, changes in vessel size and form may signal "changes in the foods themselves, the transmission of knowledge about foods, and the social contexts of food preparation and serving" (Mills 1999, p. 100). The combination of vessel form and rim diameter thus aids in the identification of different cooking and consumption activities and how these may have changed over time.

Although rim diameters are not necessarily appropriate measures of vessel volume, they do provide relative size estimates. Because of their shape, diameters of bowls are more reliable proxies for determining vessel volume than those of recurved jars (Mills 1999). The fragmented nature of the Schroda ceramic assemblage prevented the recording of body diameters for volume estimation, and only rim diameters are reported here. The relative vessel size was based on the rim diameter, measured with a rim chart that is divided into 1-cm increments. The Zhizo and Leokwe ceramics were formed by hand. Therefore, some of the similar-sized vessels tend to show close but slightly variable diameters. Only rim sherds with at least 5% of the total rim diameter were included in the analysis.

Surface finishing adds a dimension to how people presented their ceramics and can inform on the social contexts of consumption (Ashley 2010; Lesure 1998; Mills 2007). More elaborate surface treatments are usually reserved for vessels used in contexts of high social visibility (e.g., Fowler 2006; see also Armstrong et al. 2008). Certain surface treatments, such as burnishing, also have a functional element in that it reduces permeability and porosity and thereby aids in more effective heating and preventing the soaking up of liquids (Orton et al. 1993; Rice 1987; Skibo 2013). Untreated or textured ceramic surfaces, on the other hand, increase thermal shock resistance and provide a better grip when handling, especially when wet (Rice 1987; Skibo 2013). Differences between the types of ceramics that show surface finishing may thus relate to specific food-related social activities or depositional contexts. Here, surface finishing includes decorative motifs, burnishing, and smoothing (see Sinopoli 1991, p. 227–229, for technical definitions).

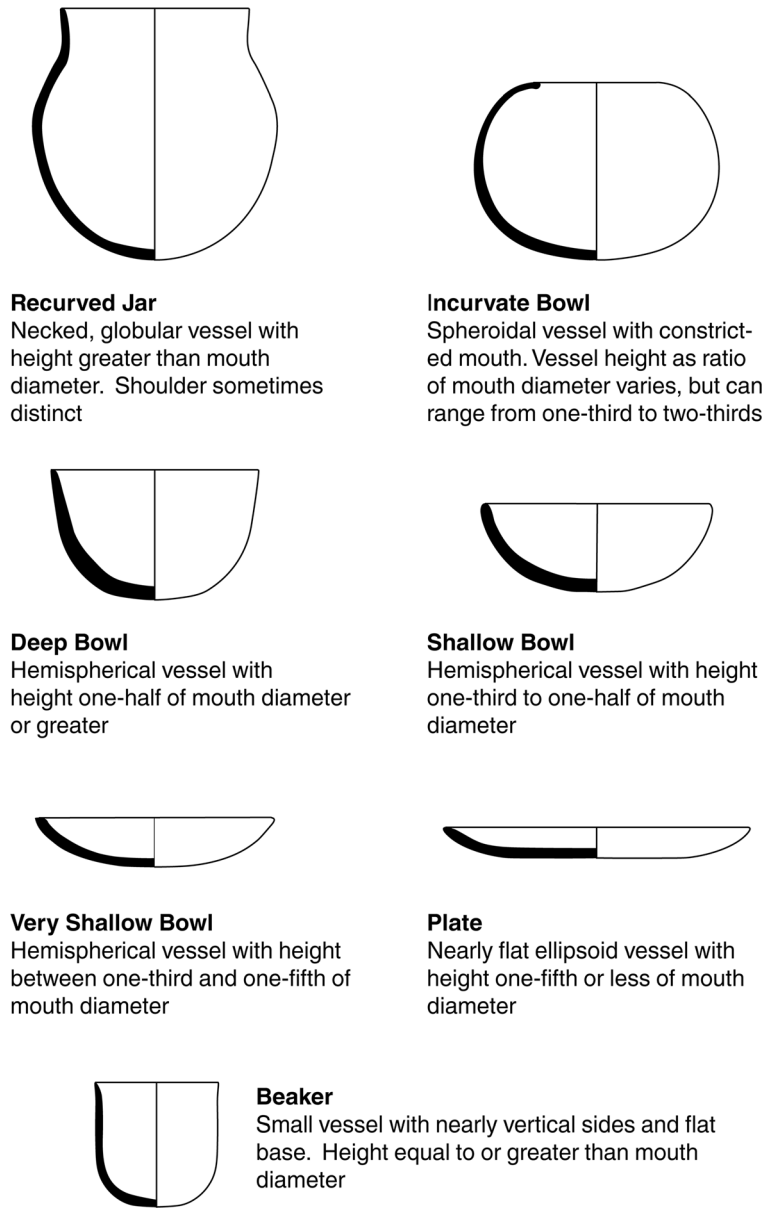

Fig. 3 Vessel types represented at Schroda (adapted from Calabrese 2007, p. 52–55)

The presence of surface carbon deposition or soot is a good indicator of vessel exposure to fire (Skibo 1992, 2013) and can thus inform on cooking practices. In addition, the relationship between decorated vessels and sooting is also considered meaningful. Southern African ethnographic and ethnoarchaeological studies have shown that cooking vessels can often be distinguished from serving vessels based on their decoration types, with the former displaying a "simpler" set of decorations (if decorated at all) than the latter (Van der Lith 1960, p. 46–104; also see Huffman 1972; Ndoro 1996). Server/storage vessels usually have more elaborate decorations, while bowls used for cooking are generally undecorated. Given the small number of sooted vessel fragments recorded in the Schroda assemblage, only tentative observations on vessel types used for cooking are presented.

Results

A total of 3359 diagnostic ceramic sherds were included in this study. Of these, I analyzed 2320 sherds (TSR2, 3,

4, and 6), while the data for the sherds from TSR5 were collected from Calabrese (2007, appendix B).

Vessel Shape

The recurved jar is the most common vessel form at Schroda (Table 1). Neck profiles range from almost straight to highly recurved (Fig. 4a). Incurvate bowls are ubiquitous and also show variation in rim angle (Fig. 4b). Large numbers of shallow bowls and smaller numbers of deep bowls occur throughout the deposits. Very shallow bowls and plates are rare, while beakers and beaker bowls—typical of K2 ceramic assemblages—are absent from the sample. The proportions of recurved jars remain constant throughout all of the excavation units and occupation phases at Schroda (Table 1). These, coupled with their similar size ranges, indicate a consistent usage and breakage pattern. TSR3 has a slightly more pronounced presence of recurved jars (71%), relative to the other deposits at Schroda (57–66%). The distribution of bowl sub-types shows a higher degree of variation. During the Zhizo phase, there is a variation in bowl proportions across the excavation units (Table 1; Fig. 5). TSR3 and TSR4, for example, show higher proportions of very shallow and deep bowls. In contrast, shallow bowls make up more than half of the bowl assemblage at TSR5. There is some variation across the Leokwe deposits as well. Incurvate bowls are more numerous at TSR6, while shallow bowls continue to dominate at TSR5. A wider range of bowl sub-types is present at TSR2 and TSR6, compared with TSR5. At TSR5, where the deep archaeological deposit presents a continuous occupation record across both Zhizo and Leokwe phases, there is an almost identical distribution of bowl sub-types and recurved jars.

Vessel Size

Not all vessel sub-categories had representative samples, which limits the comparison between the different deposits. Recurved jars and shallow and incurvate bowls have a sufficient number of samples to show some pattern. The small sample size of deep bowls only allows for very general observations, while the number of very shallow bowls is too small for meaningful analysis. Recurved jars show a comparable orifice size range across all excavated deposits (Table 2; Fig. 6), with size variations possibly related to the variation in rim angle in the assemblage (Fig. 4a). The vessel with the largest rim diameter (40 cm) is from the Leokwe deposit at TSR6. There is considerable spatio-temporal variation in shallow bowl sizes (11–41 cm; Fig. 7). Some of the bowls are quite small, but they show a fair degree of overlap within the size ranges (Table 2). Very large vessels (> 35 cm) are only present at TSR6 (Leokwe), but there are smaller ones at both TSR4 (Zhizo) and TSR6 (Leokwe). The mean size of shallow bowls (20 cm) in these two deposits is also similar. Vessels

Table 1 Number and frequency of vessel shapes from Schroda†

Vessel form	TSR2 Zhizo *n* (%)	TSR2 Leokwe	TSR3 Zhizo	TSR4 Zhizo	TSR5* Zhizo	TSR5* Leokwe	TSR6 Zhizo	TSR6 Leokwe
Recurved jar	69 (58)	235 (59)	150 (71)	437 (58)	517 (58)	816 (62)	61 (66)	365 (57)
Bowl	50 (42)	164 (41)	60 (29)	318 (42)	367 (42)	490 (38)	32 (34)	274 (43)
Plate	–	–	–	–	n/a	n/a	–	2 (< 1)
Beaker	–	–	–	–	n/a	n/a	–	–
Bowl sub-types								
Incurvate	22 (53)	62 (50)	21 (42)	71 (31)	153 (42)	203 (41)	15 (50)	132 (57)
Shallow	17 (40)	46 (37)	18 (36)	89 (39)	198 (53)	283 (57)	14 (47)	77 (34)
Deep	3 (7)	12 (10)	8 (16)	57 (25)	14 (4)	8 (1.5)	1 (3)	16 (7)
Very shallow	–	4 (3)	3 (6)	13 (5)	2 (1)	1 (< 1)	–	4 (2)
Indeterminate**	8 (–)	40 (–)	10 (–)	87 (–)	n/a	n/a	2 (–)	45 (–)

† The count excludes potsherds from test trenches

*Obtained from Calabrese (2007, p. 79)

**The indeterminate bowls are not included in the sample percentage calculation

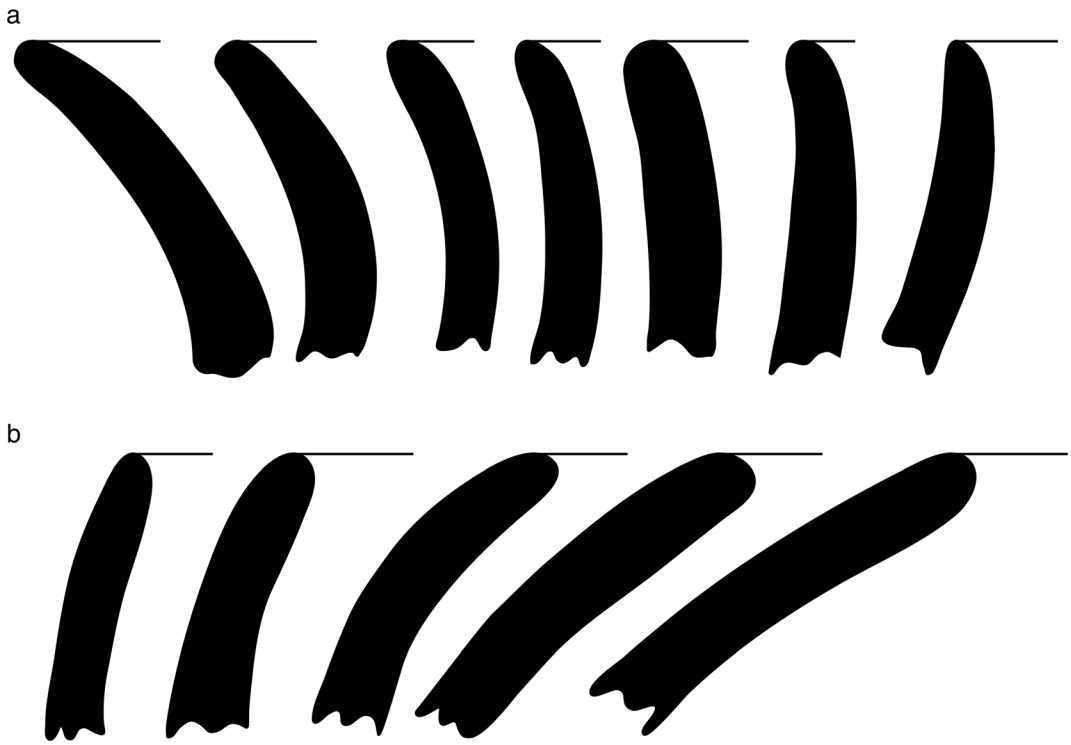

Fig. 4 Variation in **a** recurved jar and **b** incurvate bowl profiles, not drawn to scale

from TSR2 and TSR3 were excluded from further analysis due to a tiny number of samples ($n = 23$ and $n = 9$, respectively, see Table 2). The incurvate bowl sherds from TSR3, TSR4, and TSR6 occur in quantities that were sufficient for comparison (Table 2). The vessels with very large orifice diameters (29–41 cm) are present in all Schroda deposits, except at TSR2. Vessels with smaller orifice diameters (8–12 cm) are only present at TSR4 (Zhizo) and TSR6 (Leokwe). Incurvate bowls with the largest orifice diameter occur in the Leokwe deposit at TSR6. This deposit also has the largest range of vessel sizes (Table 2; Fig. 8). For deep bowls, only the sample from TSR4 produced reliable numbers, which shows a wide range of rim diameters (11–

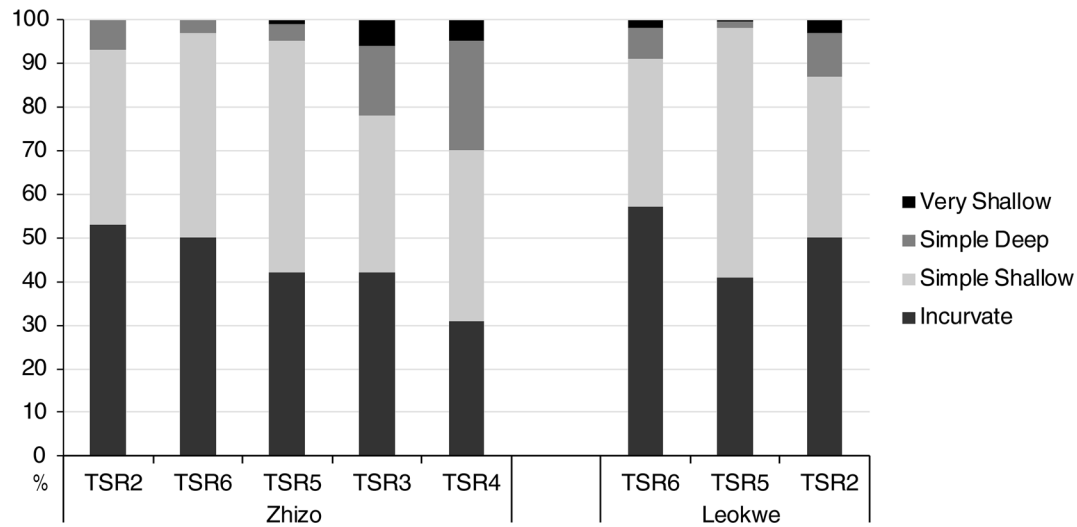

Fig. 5 Proportions of bowl sub-types from Zhizo and Leokwe deposits at Schroda

Table 2 Summary statistics for vessel rim diameters from Schroda

Area	*n*	Mean	Std Dev	Min	Max	Range	Variance	Std Err	CV	Median
Recurved jar										
TSR2 Zhizo	20	17.03	4.85	10	27	17	23.49	1.08	28.47	16.25
TSR3 Zhizo	34	18.68	4.98	10	31	21	24.77	0.85	26.65	17.5
TSR4 Zhizo	152	18.19	3.80	8	28	20	14.47	0.31	20.91	18
TSR6 Zhizo	20	18.27	4.67	10	28	18	21.78	1.04	25.53	19
TSR2 Leokwe	45	18.75	4.49	10	27	17	20.14	0.67	23.93	19
TSR6 Leokwe	95	18.89	5.41	8.5	40	31.5	29.31	0.56	28.68	19
Shallow bowl										
TSR2 Zhizo	12	25.75	7.64	17	40	23	58.39	2.21	29.67	24.5
TSR3 Zhizo	9	23.78	5.60	15	30	15	31.44	1.87	23.58	25
TSR4 Zhizo	55	20.06	5.23	11	35	24	27.40	0.70	26.09	20
TSR6 Zhizo	6	18.83	3.19	15	22	7	10.17	1.30	16.93	19.5
TSR2 Leokwe	11	22.36	4.88	15	30	15	23.85	1.47	21.84	25
TSR6 Leokwe	45	20.54	5.98	8	39	31	35.87	0.89	29.15	20
Incurvate bowl										
TSR2 Zhizo	6	21.83	6.64	15	30	15	44.16	2.71	30.44	20
TSR3 Zhizo	13	20.65	4.80	13	30	17	23.06	1.33	23.25	20
TSR4 Zhizo	39	18.31	5.93	8	32	24	35.14	0.95	32.38	17
TSR6 Zhizo	10	20.40	4.30	15	30	15	18.49	1.36	21.08	20
TSR2 Leokwe	19	19.00	5.60	8	25	17	31.33	1.28	29.46	20
TSR6 Leokwe	58	19.38	7.24	8	40	32	52.39	0.95	37.35	19
Deep bowl										
TSR2 Zhizo	1	20.00	–	20	20	0	–	–	–	20
TSR3 Zhizo	3	19.00	6.56	12	25	13	43.00	3.79	34.51	20
TSR4 Zhizo	41	20.12	4.87	11	29.5	18.5	23.68	0.76	24.19	20
TSR6 Zhizo	1	20.00	–	20	20	0	–	–	–	20
TSR2 Leokwe	6	22.16	6.74	12	30	18	45.37	2.75	30.39	25
TSR6 Leokwe	8	24.31	7.71	15	35	20	59.50	2.73	31.73	22
Very shallow bowl										
TSR4 Zhizo	3	20.50	6.88	13	26.5	13.5	47.25	3.97	33.53	22
TSR6 Leokwe	2	17.50	6.36	13	22	9	40.50	4.50	36.37	17.5
Plate										
TSR6 Leokwe	2	23.00	2.82	21	25	4	8.00	2.00	12.30	23

30 cm). Very large deep bowls (> 30 cm) are present in the TSR2 and TSR6 Leokwe deposits.

Surface Finishing

Decoration

At Schroda, decoration mainly occurs on recurved jars and a small number of bowls (Raath 2014, p. 73–84). The most predominant decoration techniques are comb-stamping and incision, while bead and bangle impressions are also present (Calabrese 2007; Hanisch 1980; Raath 2014; see Fig. 9). Although scarce, decorated bowls ($n = 23$) were made during both Zhizo and Leokwe phases. They are found in all deposits, except TSR2 (Leokwe) and TSR6 (Zhizo). Decorated bowls may have been used in specific contexts; however, it is unclear whether these contexts included food-related activities. No further analyses were attempted because of the small sample size. A large number of decorated

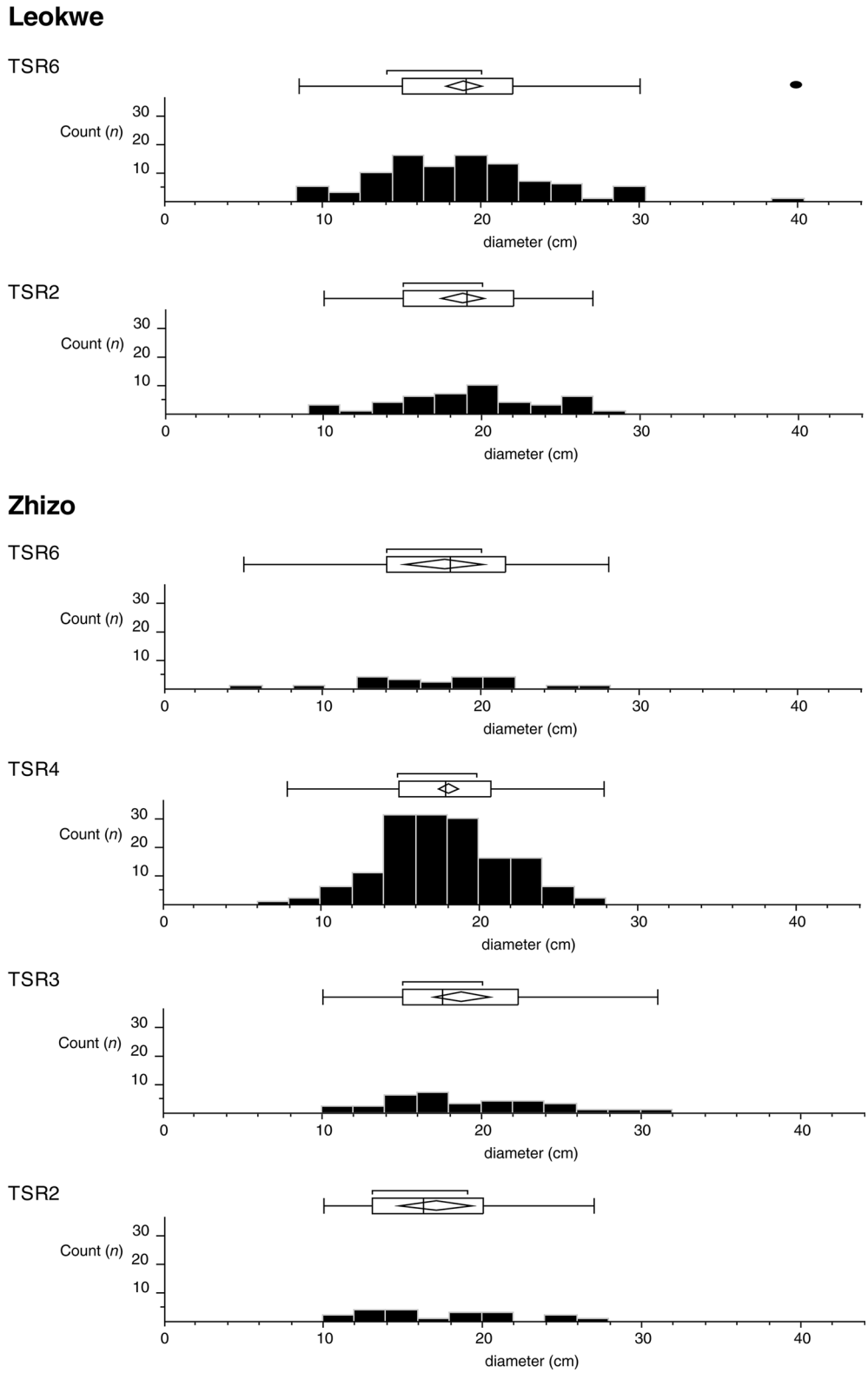

Fig. 6 Histogram of rim diameters for Zhizo and Leokwe recurved jars from Schroda

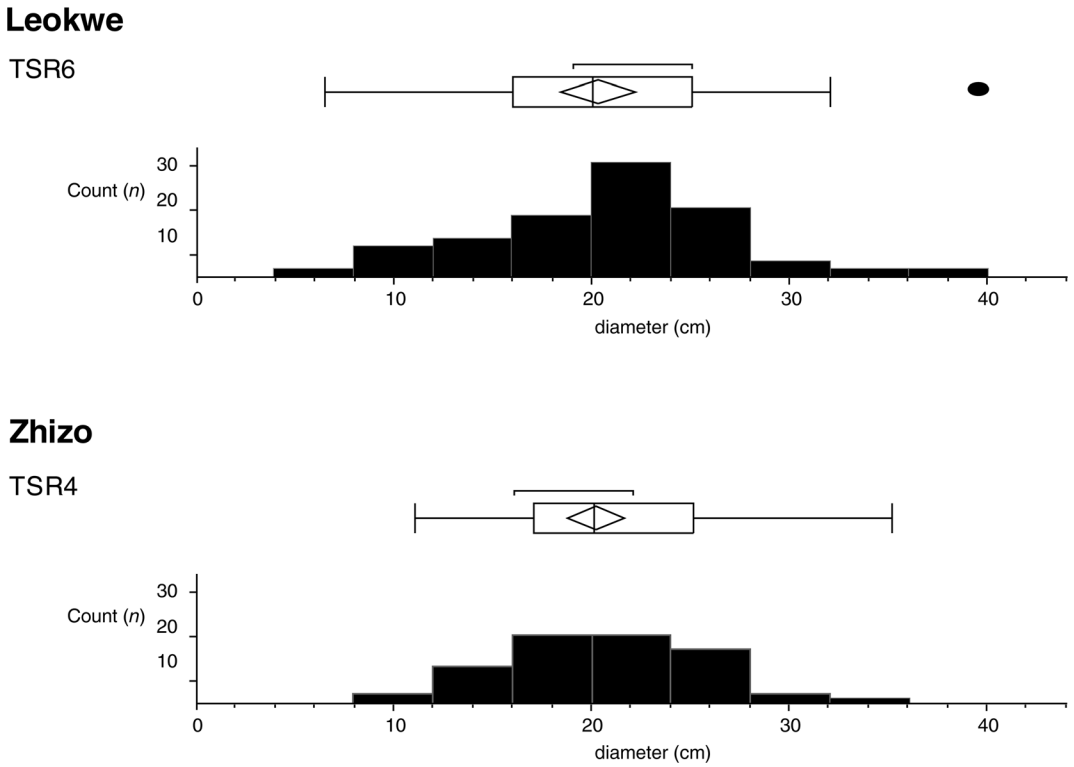

Fig. 7 Histogram of rim diameters for Zhizo and Leokwe shallow bowls from Schroda

fragments were also present, but their small volumetric size prevented shape identification.

Approximately 74% of recurved jars from Zhizo and 66% from Leokwe deposits are decorated (Table 3). The general pattern suggests a slight decline in the frequency of decorated recurved jars over time. However, these changes may also relate to specific use contexts, such as food preparation versus serving and consumption areas. Unfortunately, conflating all decoration categories inevitably resulted in the loss of those subtle differences in decoration motif that may have signaled different use contexts (Fowler and Greenfield 2009).

Smoothing and Burnishing

In addition to incised and impressed decorations, about 50% of recurved jars from Zhizo and Leokwe contexts have visible surface treatment in the form of burnishing and smoothing (Table 4). TSR6 (Leokwe) is the only context in which this figure rises to 60%, with particular attention paid to smoothing the vessel surface. Recurved jars from TSR2 (Zhizo) show a particularly low rate of surface modification (33%). The incurvate bowls have a high incidence of surface treatment in both Zhizo and Leokwe deposits (Table 5). However, such treatment seems to be more prevalent in the Zhizo than that in the Leokwe assemblages. Burnished vessels are especially numerous in the Zhizo deposits at TSR4 and TSR6 (between 56 and 60%), while much lower at TSR2 (18%). There is a clear difference in the proportion of burnished and smoothed incurvate bowls during the Zhizo phase; the higher the incidence of burnished bowls, the lower the incidence of smoothing, and vice versa.

For shallow bowls, all deposits, except TSR2 (Zhizo), have above 60% occurrence of surface treatment (Table 5). The data from TSR2 show that, at least for the Zhizo phase, burnishing and smoothing were not standard treatments on these vessels. The high incidence of burnishing on shallow bowls in TSR4 (Zhizo) stands in sharp contrast to that seen at TSR6's Leokwe layers. Although both assemblages show the broadest range of vessel sizes for each occupation phase (Fig. 7), the proportion of burnishing differs substantially. In both contexts, burnishing occurs regardless of the size range.

The samples for deep and very shallow bowls are small (Table 5), and thus, only a few general observations can be made. During the Zhizo phase, burnishing

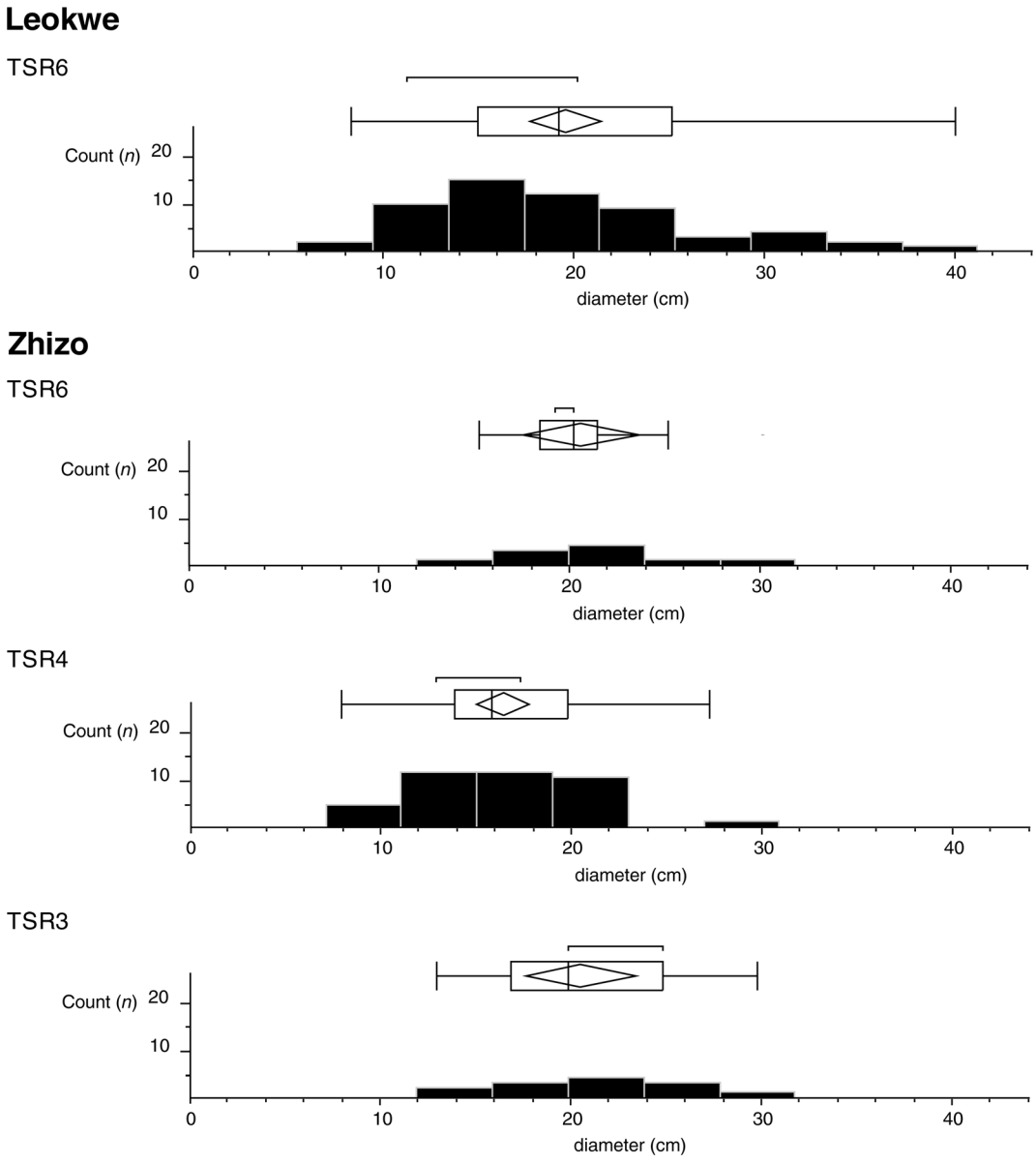

Fig. 8 Histogram of rim diameters for Zhizo and Leokwe incurvate bowls from Schroda

seems to occur more frequently than smoothing on deep bowls. Smoothing of deep bowl surfaces, on the other hand, becomes a more frequent application during the Leokwe phase. The absence of smoothed and burnished vessels from the Zhizo levels at TSR2 suggests that such surface treatments were not standard applications to deep bowls during this time. The surfaces of very shallow bowls from Zhizo contexts seem more likely to have been modified compared with those from Leokwe deposits.

Surface Carbon Deposition

Sooting occurred on burnished, smoothed, and plain surfaces in Zhizo and Leokwe deposits. It is represented on both recurved jars and bowls in approximately equal proportions in all assemblages (Table 6), but none of the bowl sub-types was particularly prone to sooting. The sample is too small at this stage to test whether certain vessel sizes were preferred for use over open fires. All of the sooted and most of the possibly sooted bowls from both Zhizo and Leokwe contexts were undecorated.

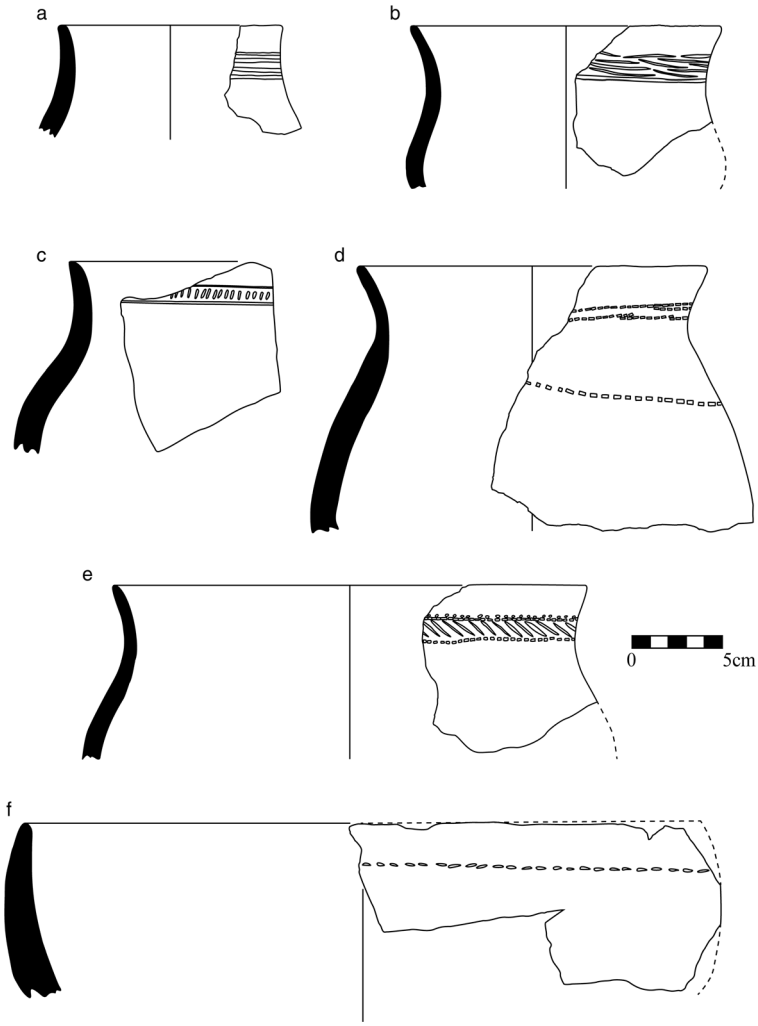

Fig. 9 Selection of decorated vessels from Schroda. **a** Recurved jar with horizontal incised lines on the central neck. **b** Recurved jar with a band of diagonal incisions on the central neck. **c** Recurved jar with a band of stabbing on the central to lower neck. **d** Recurved jar with multiple bands of comb-stamping on the central neck spaced above a single band of comb-stamping on the shoulder. **e** Recurved jar with bands of incision bordered by comb-stamping on the lower neck. **f** Shallow bowl with single band of punctates on the shoulder

Determining Vessel Use

Recurved Jars

Recurved jars are the most common vessel form at Schroda and show a comparable size range across all excavated deposits. A recurved jar—with a diameter of around 40 cm—from TSR6 represents an exceptionally large and uncommon vessel size. Stationary or low-use vessels are less likely to break and are therefore usually less represented in the archaeological record (see Shott 1996). This huge vessel could have been used as a large wet or dry storage vessel, with the larger orifice diameter allowing for easier filling of contents

Table 3 Number and frequency of decorated and undecorated recurved jars from Zhizo and Leokwe deposits at Schroda (data for TSR5 not available)

Recurved jars	TSR2 Zhizo *n* (%)	TSR2 Leokwe	TSR3 Zhizo	TSR4 Zhizo	TSR6 Zhizo	TSR6 Leokwe
Decorated	59 (77)	190 (68)	153 (77)	426 (74)	49 (66)	290 (63)
Undecorated	18 (23)	88 (32)	47 (23)	150 (26)	25 (34)	173 (37)

Table 4 Number and frequency of burnished, smoothed, and untreated recurved jars, bowls, and plates from Zhizo and Leokwe deposits at Schroda (excludes vessels with possible signs of burnishing; data for TSR5 not available)

Vessel form/surface treatment	TSR2 Zhizo *n* (%)	TSR2 Leokwe	TSR3 Zhizo	TSR4 Zhizo	TSR6 Zhizo	TSR6 Leokwe
Recurved jars (burnished)	9 (13)	53 (23)	28 (16)	124 (27)	12 (20)	92 (25)
Recurved jars (smoothed)	14 (20)	68 (29)	67 (39)	103 (22)	21 (34)	141 (39)
Recurved jars (none)	46 (67)	114 (48)	76 (45)	234 (51)	28 (46)	132 (36)
Bowls (burnished)	8 (16)	66 (40)	28 (43)	189 (54)	19 (59)	92 (34)
Bowls (smoothed)	14 (28)	37 (23)	23 (35)	51 (15)	5 (16)	83 (30)
Bowls (none)	28 (56)	61 (37)	14 (22)	108 (31)	8 (25)	99 (36)
Plate (burnished)	–	–	–	–	–	2 (100)
Plate (smoothed)	–	–	–	–	–	–
Plate (none)	–	–	–	–	–	–

and access. Storage vessels may have been covered by an upturned bowl or by a piece of skin tied around the neck of the jar (Henrickson and McDonald 1983; Van der Lith 1960, p. 61–63).

Because of their high decoration rate, recurved jars were the most visible vessel type in the assemblages. They were probably used as beer serving vessels in public settings (Fowler 2006; Ndoro 1996; Van der Lith 1960; see Van Waarden and Mosothwane 2013 for their use as sour milk server and storage ware). The social role of beer is well known (Quin 1959; McAllister 1993; Stayt 1968), especially "on occasions expressing and fostering social solidarity that tie people together and reinforce hospitality and communality in everyday life" (Haaland 2012, p. 333). Decoration is, however, not limited to beer pots. Vessels that perform other functions—water pots, cooking pots, and food servers—were also decorated, albeit less elaborately

Table 5 Number and frequency of burnished, smoothed, and untreated bowl sub-types from Zhizo and Leokwe deposits at Schroda (excludes vessels with possible signs of burnishing; data for TSR5 not available)

Bowl sub-type/surface treatment	TSR2 Zhizo *n* (%)	TSR2 Leokwe	TSR3 Zhizo	TSR4 Zhizo	TSR6 Zhizo	TSR6 Leokwe
Incurvate (burnished)	4 (18)	22 (33)	7 (32)	40 (56)	9 (60)	51 (39)
Incurvate (smoothed)	10 (45)	14 (21)	7 (32)	14 (19)	3 (20)	35 (27)
Incurvate (none)	8 (37)	30 (46)	8 (36)	18 (25)	3 (20)	46 (34)
Shallow (burnished)	1 (6)	21 (46)	6 (29)	58 (58)	8 (57)	21 (27)
Shallow (smoothed)	3 (18)	9 (20)	10 (48)	16 (16)	2 (14)	27 (35)
Shallow (none)	13 (76)	16 (34)	5 (23)	26 (26)	4 (29)	29 (38)
Deep (burnished)	–	5 (42)	4 (50)	39 (64)	1 (100)	6 (38)
Deep (smoothed)	–	5 (42)	3 (38)	4 (7)	–	6 (38)
Deep (none)	3 (100)	2 (16)	1 (12)	18 (29)	–	4 (24)
Very shallow (burnished)	–	–	1 (33)	9 (69)	–	1 (25)
Very shallow (smoothed)	–	1 (25)	1 (33)	3 (23)	–	–
Very shallow (none)	–	3 (75)	1 (34)	1 (8)	–	3 (75)
Indeterminate (burnished)	3 (38)	18 (45)	10 (91)	43 (42)	1 (50)	13 (29)
Indeterminate (smoothed)	–	–	–	–	–	15 (33)
Indeterminate (none)	5 (62)	22 (55)	1 (9)	59 (58)	1(50)	17 (38)

Table 6 Number of sooted vessels from Zhizo and Leokwe deposits at Schroda (excludes ceramics with clear post-depositional fire exposure; data for TSR5 not available)

Vessel type/sooted	`TSR2 Zhizo	TSR2 Leokwe	TSR3 Zhizo	TSR4 Zhizo	TSR6 Zhizo	TSR6 Leokwe
Recurved jars (sooted)	0	1	1	0	0	6
Recurved jars (possibly sooted)	1	1	1	0	2	9
Recurved jars (unknown)	68	233	169	461	59	350
Bowls (sooted)	1	1	1	0	4	3
Bowls (possibly sooted)	1	2	0	0	4	8
Bowls (unknown)	48	161	64	348	24	263

(Lindahl and Matenga 1995, p. 32–33; Ndoro 1996; Van der Lith 1960, p. 46–104; see also Antonites 2013; Fowler 2006).

On average, 50% of recurved jars from Schroda had surface finishing. In most cases, smoothing occurred more frequently than burnishing. The preference for smoothed rather than burnished recurved jars, coupled with their high decoration rate, suggests a very different approach to surface treatment compared with the bowl sub-categories. Vessels with roughened surfaces provide a more secure grip, which is particularly applicable to water transport vessels (Rice 1987, p. 232). Certain forms of incised and impressed decoration fulfill a similar function. Some of the recurved jar profiles noted during this study and recorded by Hanisch (1980, p. 19–21) seem appropriate for use in water transport. Such vessels, with narrow necks and smaller orifice diameters, would limit spillage while being carried. Recurved jars are, of course, ideally suited for transporting and serving liquids, since their everted necks allow for easy pouring (Huffman 1972; Van Waarden 1987; Wilson and Rodning 2002). Nevertheless, there are also ethnographic studies that have documented the use of incurvate bowls (with smaller orifice diameters) for water transport and storage (e.g., Van der Lith 1960, p. 70–72).

Sooting occurred on both decorated and undecorated recurved jars. Most of the decorated vessels with soot were of "simple" stylistic types and correspond to ethnographic descriptions of cooking vessels (e.g., Ndoro 1996). Recurved jars with more restricted orifice diameters may have been used to heat food or liquids since this profile type slows down the rate of evaporation (Henrickson and McDonald 1983).

Shallow Bowls

Shallow bowls are generally interpreted as vessels used to serve or mix foods. Their wide orifice diameters and low vessel heights generally allow easier access to contents (Henrickson and McDonald 1983; Lesure 1998). Their overall abundance at Schroda is also consistent with such a function since serving bowls tend to break at a higher rate than most other vessel forms (Lesure 1998). At Schroda, there is considerable variation in shallow bowl sizes and may possibly reflect size differences between gender and age groups (Van der Lith 1960, p. 63–67). Smaller shallow bowls probably served as individual eating bowls. Those larger than 35 cm are often associated with the food service for larger groups at feasting events (Lesure 1998; Mills 2007). Many of these bowls could also have been used as lids for recurved jars and incurvate bowls, which may further explain the variation in shallow bowl sizes across the deposits (Henrickson and McDonald 1983; Quin 1959). It is also interesting to note the recorded use of similar-sized bowls as washbasins among Venda-speakers in South Africa (Van der Lith 1960, p. 72). In those instances, men's washbasins are decorated (usually burnished) on both the interior and exterior, while women and children use smaller and less elaborately decorated versions. Shallow bowls could thus have been used in ways unrelated to cooking and serving.

Incurvate Bowls

Incurvate bowls are ubiquitous throughout the Schroda deposit and have a wide rim diameter distribution. The variation in orifice diameter probably has to do with the control of evaporation during cooking and access to contents (e.g., Pauketat 1987). In ethnographic studies,

incurvate bowls with larger orifice diameters tend to correspond to cooking, storage, water transport, and beer brewing vessels (Lindahl and Matenga 1995, pp. 39–47; Van der Lith 1960, appendix 10). Thus, the likelihood that these vessel shapes served multiple functions is high. Schroda's incurvate vessels have a high rate of surface finishing, of which 50–80% are either burnished or smoothed. In most areas, burnishing occurred more frequently than smoothing. The labor devoted to either technique suggests that the display of some of these vessels was important (see Van Waarden 1987). Recent local ethnographies document the use of this particular vessel shape, often highly decorated, in transporting and serving beer (e.g., Fowler 2006; Van der Lith 1960, p. 74–94). Evidence of sooting was also noted in this vessel shape, and they may have been used for both cooking and beer storage/serving in the past (e.g., Huffman 1972; Lindahl and Matenga 1995, p. 39–47; Van der Lith 1960, p. 49–61).

Deep Bowls

Deep bowls are uncommon and have a wide range of size distribution (11–35 cm). Bowls at the smaller end of the size range (11–15 cm) could have been drinking cups, but these are too rare to have been the predominant vessels used in the consumption of beverages (cf. Lesure 1998). Large deep bowls seemed inappropriate as drinking vessels and were probably used to serve food. Vessel sizes above 30 cm are few and may represent serving bowls for communal eating. In more recent years, deep bowls were used to serve specific cereal dishes among Zulu groups (Fowler 2006), and their low frequencies at Schroda could reflect a more specific function. The high walls of deep bowls could also indicate their use to cook liquids or semi-liquids (such as stews and porridge) or used for dishes that required frequent stirring or mixing (Henrickson and McDonald 1983; Wilson and Rodning 2002; Van Waarden 1987). Some of the Schroda vessels were burnished or smoothed, and some showed evidence of sooting. Both characteristics are indicative of cooking and serving functions.

Very Shallow Bowls and Plates

Low numbers of very shallow bowls were recorded. This may have been influenced by the fragmentary nature of the assemblage. Both smoothing and burnishing were recorded on some of the vessels, but sooting is absent. Very shallow bowls may simply be a variation of the shallow bowls discussed above and thus possibly fulfilled a serving role. They may also have been used as lids for recurved jars and incurvate bowls. Alternatively, their low numbers could indicate a low use rate or usage in very specific contexts only. Plates are extremely rare, and only two were recorded from TSR6 (Leokwe). Both vessels were burnished and showed no sign of sooting. They were probably used to serve non-liquid foods, and, because of their scarcity, this may have been limited to specific serving contexts only. Traditional South African flat-surfaced serving ware includes wooden plates and grass mats (Quin 1959). Although such wooden plates and mats do not survive in the archaeological record of the Limpopo Valley, similar materials may have been used for food serving/eating in the past.

Beaker Bowls and Beakers

The absence of beaker bowls and beakers in the ceramic assemblages included in this study is difficult to interpret. These two vessel types are typically associated with K2 (Meyer 1998; Schofield 1948) and TK2 (T. Huffman pers. comm.) assemblages. Hanisch (1980, p. 123) reported six undecorated beaker bowls and twelve beakers from Schroda, which came from both Zhizo and Leokwe contexts. Calabrese (2007, p. 75–82), on the other hand, does not mention any such vessels from his analysis of the TSR5 ceramics. A previous analysis of the Schroda burial goods identified two beaker-like vessels (Antonites 2016). However, these could also be described as small-sized deep bowls (or cups) and do not fit Hanisch's description of beaker bowls or beakers. These discrepancies likely relate to the inconsistency in the identification criteria and subcategorization of vessels between the three analysts.

Beaker bowls and beakers are apparently present in the Zhizo deposits at Schroda and the nearby site of Pont Drift, according to Hanisch (1980, p. 256) and Raath (2014, p. 93). In contrast, Calabrese (2007, p. 103) explains their gradual appearance (and those of spouted vessels) at Castle Rock as part of broader ceramic changes associated with Leokwe deposits. However, the vessels from Castle Rock are probably from the recently identified TK2 (Huffman 2007b), rather than Leokwe deposits (T. Huffman pers. comm.). Nevertheless, beakers and beaker bowls have been reported in

Gokomere assemblages—the stylistic predecessor to Zhizo—and sporadically in Zhizo assemblages in Zimbabwe (Huffman 1974, p. 107; Robinson 1965, 1966; Van Waarden 2018). These vessel shapes may be present in Zhizo assemblages in the middle Limpopo Valley, albeit in small quantities, before contact with K2 users. More Zhizo- and Leokwe-phase ceramic assemblages need to be studied to systematize the identification of beaker bowls and beakers in the Limpopo Valley. This would give us a better understanding of their distribution and use throughout the occupation phases at Schroda, and the changes that may have occurred as a result of interactions with the K2 population.

Discussion

Interpreting Vessel Use

The Zhizo and Leokwe assemblages from Schroda seem homogenous, perhaps a reflection of the way vessel shapes were grouped for this study. The broad patterns seen between Zhizo and Leokwe vessel types correspond to the trends seen in the multi-modal stylistic analyses, which incorporated form, decoration, and decoration placement (Raath 2014, p. 53–92). Those stylistic differences, "noted from Zhizo to Leokwe, while clearly reflecting the influence of [K2] ceramics…seem at the same time to reflect profound retention of pre-[K2] intrusion identity" (Calabrese 2007, p. 197). Thus, changes in surface treatment and decoration motifs appear slightly more evident than changes in vessel forms during the initial shift from Zhizo to Leokwe, shortly after AD 1000. There is continuity in vessel shape, though with limited incorporation of new vessel forms over time. The slight changes between the different excavated areas at Schroda seem to be related to different depositional (or use) contexts, rather than specific functional changes, or direct K2 influences, a point further elaborated below.

There is a wide variety of vessel sizes present at Schroda, likely related to the amount of food prepared and consumed, and by implication, the size of the group served. Large vessels, such as those from the Zhizo deposit at TSR4 and the Leokwe deposit at TSR6, were probably used for cooking for and serving larger consumption groups (see Mills 1999; Schapiro 1984). However, only a few of these larger vessels were recorded and using more regular-size vessels to cater for a large group may have been more common (Blitz 1993). Vessel size variation in and between use contexts can also signal a wide range of food-related activities, including different storage and preparation needs. Vessels in the upper end of the size range—like the very large recurved jar from the Leokwe horizon at TSR6—were likely low-use (i.e., specific occasion) or stationary vessels, such as those used for food/beverage storage (Huffman 1972; Shott 1996).

The combined evidence for vessel decoration, burnishing, and smoothing indicates variation in surface treatment among different vessel shapes. The majority of recurved jars were decorated with impressed and incised motifs and had smoothed surfaces. Some recurved jars were burnished, but this technique was mainly reserved to enhance the appearance of bowls—especially shallow and incurvate ones. The elaborately treated vessels were probably used to serve food and drinks in contexts of high social visibility. Such contexts would likely have involved the serving of sour milk and/or alcoholic beverages in decorated recurved jars such as grain and marula (*Sclerocarya birrea*) beer as well as ilala palm (*Hyphaene coriacea*) wine (Grivetti 1979; Junod 1962; Quin 1959; Stayt 1968; Van Waarden and Mosothwane 2013). The near absence of small drinking bowls or cups could indicate the use of gourds for drinking, or it could be that those drinking vessels were passed around rather than used individually. This would explain the fewer numbers of such vessels in circulation and their scarcity in the archaeological record.

Several bowls were burnished on both the interior and exterior, to improve long-term liquid storage, cooking methods, and vessel use life (Henrickson and McDonald 1983; Rice 1987; Skibo 2013). Open bowls with interior burnishing may have played an important visual role in certain consumption practices (Fleisher 2010). Alternatively, such treatment may also reflect the use of these bowls for purposes other than food-related activities such as washbasins, as recent ethnographic studies in the region indicate. It is not clear whether the Schroda vessels with burnishing on both sides were used in similar contexts. The additional surface modifications on burnished recurved jars and incurvate bowls indicate that these vessels may have been used in highly specialized serving contexts, perhaps reserved for specific people, dishes, or beverages.

The presence of similar vessel shapes with both plain and elaborate surface treatment implies multiple use

contexts. For example, such plain vessels may have been used primarily in private contexts, whereas the decorated ones were intended for use in public spaces. In addition, preliminary observations on sooting patterns show no preference for specific vessel shapes used over an open fire. A few shallow bowl sherds displayed burning on the rim and were probably placed upside down over another vessel and used as a lid—either as a simmering technique or to keep cooked food warm. The low incidence of sooting may also relate to specific surface treatments, such as covering the cooking vessels with fresh dung to protect the surface from the flames (Quin 1959, p. 134), removal of sooting deposits through post-depositional alterations (Beck et al. 2002), and post-excavation treatment (e.g., washing).

What is clear from the data presented is that the same vessel forms were used for a range of purposes. That is, there was no vessel specialization evident during the two occupation phases at Schroda. Since cooking and serving ware are more prone to accidental breakage and thermal shock, their fragments tend to dominate ceramic assemblages (Lindahl and Matenga 1995, p. 102). However, this is not particularly useful when trying to identify activity areas. Because many of the vessel shapes may have been used in various food-related activities, it is important to consider combinations of physical attributes within the whole assemblage of archaeological remains to determine different activity areas.

Ceramic Vessels and Activity Areas

In terms of using the ceramic data to understand depositional contexts or activity areas, some preliminary observations can be made. The Zhizo deposit at TSR2 had low proportions of burnished shallow and incurvate bowls. None of the deep bowl surfaces was modified, and recurved jars were minimally altered with incised and impressed decorations. Vessels with untreated or plain porous surfaces indicate use in private contexts for serving, storage, and cooking in a domestic set-up. Previous studies have indeed found these plain ceramics in a domestic (or household) context—a hut and courtyard floor complex—in association with portable grinding stones for plant processing (Hanisch 1980, p. 181; Raath 2014, p. 251).

The material culture patterns from the Leokwe levels at TSR2 are very similar to the Zhizo ones (Raath 2014). However, there is a slightly more diverse vessel repertoire in the Leokwe levels where shallow bowls, for example, show a higher incidence of burnishing than other vessel forms. However, the general similarities between the Zhizo and Leokwe deposits, such as low incurvate bowl surface treatment and presence of portable grinding stones (Raath 2014, p. 354), point to the continuation of TSR2 as a household space during the Leokwe occupation phase.

TSR3 and TSR4 (both Zhizo deposits) have the largest variety of different vessel shapes, and these may have been spaces where a diversity of food-related activities took place (see Blitz 1993). The proportion of unburnished vessels at TSR3 is high, suggesting a similar pattern of household activities as TSR2. The presence of an intentional animal burial in the bottom layers of TSR3 (Hanisch 1980, p. 91–94) does hint at a household/domestic ritual component in this area. At TSR4, the presence of grinding stones (Raath 2014) and different bowl sizes point to a diverse set of food-related activities and reinforce the inference that this unit was a domestic context. In addition, the stylized female clay figurines found in this deposit may be related to household rituals (Wood 2002). Moreover, the ceramic assemblage of TSR4 has a small group of serving bowls as well as incurvate bowls with small orifice diameters—the latter being more indicative of serving or storage than cooking (see Pauketat 1987). The proportions of shallow bowls in TSR4 are very similar to those at TSR2 and TSR3. However, more than half of the shallow and incurvate bowls in TSR4 are burnished. This is more than double that of the other two units, and the number is significantly higher than that of the Leokwe deposits. It, therefore, seems that a large proportion of the ceramic assemblage in TSR4 was related to highly visible social activities, which would be peculiar for a household context. Perhaps the patterns seen at TSR4 represent refuse accumulation from a range of household and communal activities, or refuse from households with higher status or rank who would have hosted people and ceremonies more frequently than others.

Judging by the large proportion of shallow serving bowls, TSR5 was evidently an area associated with consumption activities during the Zhizo occupation. Evidences of a cooking hut as well as worked bone objects, ivory working debris, and metal slag suggest that the serving of food here relates to either special domestic or crafting activities (Hanisch 1980; Raath 2014). The almost identical distributions of bowl subtypes and recurved jars across TSR5's Zhizo and

Leokwe deposits confirm continuity in the use of space regarding food-related activities. Incorporating size and surface treatment data from these deeply stratified deposits promises to shed more light on the serving contexts in this part of the site.

Although the proportion of ceramics analyzed from TSR6 is small, a few observations can be made. The percentage of bowl sub-types in the Zhizo deposit at TSR6 is very similar to other domestic contexts, such as TSR2, but the Zhizo level of TSR6 has more recurved jars than the other domestic contexts. Half of the bowl assemblage is of the incurvate variety, although the function of these vessels can be quite varied. The proportions of shallow and incurvate bowls are comparable to those seen at TSR4. The associated material culture from the small Zhizo deposit (see Raath 2014, p. 300) does not shed any light on the use-context of this unit.

Many of the vessel types present in the later Leokwe deposit at TSR6 have large-sized specimens. These vessels might only have been used on special occasions or for specific purposes that involved cooking for and serving large numbers of people (Lindahl and Matenga 1995; Mills 1999; Van der Lith 1960). The different sizes of shallow bowls (11–41 cm; Fig. 7) may relate to different kinds of activities and events that reflect the participation of different social groups. The potential storage vessels, in the form of incurvate bowls with small openings, may have been used to keep foodstuffs during these events/activities. During the Leokwe phase, large-scale crafting activities and ceremonial events, such as rites-of-passage rituals and burials, did take place at and around TSR6 (Antonites 2016; Calabrese 2007; Raath 2014; Van Schalkwyk and Hanisch 2002). The presence of storage and very large vessels suggests that such activities/events were accompanied by sizable public provisioning of food and drink (Table 2; Figs. 6, 7, and 8).

Conclusion

Determining vessel functions is difficult at Schroda because the ceramic remains were not necessarily found in situ as primary refuse. Therefore, this type of analysis cannot establish the exact uses of archaeological vessels. However, it can suggest general functional classes and be used as an independent data set for comparison to other archaeological evidence. Variation in vessel shape, size, and surface treatment in both occupation phases at Schroda reflect different depositional contexts and activity areas. There does not appear to be any large-scale shifts in ceramic use from the Zhizo to Leokwe phases. The vessel morphology and size indicate similar ceramic uses across the two phases. In other words, the ceramic data suggests that food and beverage preparation, storage, and consumption patterns may not have experienced any major change between the Zhizo and Leokwe phases. This study has set the stage for developing a new research strategy that would allow a better understanding of the depositional contexts at Schroda and a more nuanced view of changes in foodways across different occupation phases in the Limpopo Valley between ca. AD 900 and 1100.

Acknowledgments The management and staff of the Ditsong National Museum of Cultural History in Pretoria provided access to and assistance with the Schroda collection. Rod McIntosh, Anne Underhill, William Honeychurch, Alexander Antonites, and Steve Victor gave feedback and assistance during various stages of the project. Thanks also to the two reviewers whose suggestions improved the article and will benefit future research.

Funding Information The project was financially supported by the Augusta Hazard Research Fund and Michael Coe Research Fund of the Yale University Council on Archaeological Studies, and a J. F. Enders Research Grant and the G.W. Leitner Program in International and Comparative Political Economy, both at Yale University.

Compliance with Ethical Standards This article does not contain any studies with animals performed by any of the authors.

Conflict of Interest The author declares no conflict of interest.

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