



# Hunting and the Social Lives of Southern Africa's First Farmers

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## Abstract

Perspectives on human–animal relationships are changing in archaeology and related disciplines. Analytical models that distinguish foraging from food production remain popular, but scholars are beginning to recognize greater variability in the ways people understood and engaged with animals in the past. In southern Africa, researchers have observed that wild animals were economically and socially important to recent agropastoral societies. However, archaeological models emphasize cattle keeping and downplay the role of hunting among past farming groups. To address this discrepancy and investigate human–wild animal interactions over the last ~ 2000 years, we examined zooarchaeological data from 54 southern African Iron Age (first and second millennium AD) farming sites. Diversity and taxonomic information highlights how often and what types of animals people hunted. Comparisons with earlier and contemporaneous forager and herder sites in southern and eastern Africa show that hunting for social and economic purposes characterized the spread of farming and rise of complex societies in southern Africa. The long-term cultural integration of wild animals into food-producing societies is unusual from a Global South perspective and warrants reappraisal of forager/farmer dichotomies in non-Western contexts.

**Keywords** Human–animal relationships · Subsistence economies · Social zooarchaeology · African Iron Age · Food production · Hunter-gatherers

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## Introduction

Understanding the ways that people and animals related to each other in the past is central to many archaeological research foci, from domestication and the symbolic and ritual roles of animals to human evolution and broader concepts of humanity. Yet, how scholars think about human–animal relationships is changing. Enlightenment-era perspectives (see Ritvo 1985) that draw distinct lines between culture (people and their products) and nature (everything else) have long been influential in archaeology. As a result, Western approaches to organizing the world are disproportionately represented in global narratives of the past. On the other hand, a growing interest in Indigenous philosophies and multispecies ethnographies highlights continuity among humans and other animals, plants, and non-living features of the natural world (Arthur 2018; Descola 2014; Haraway 2006; Ingold 2000b; Knight 2020; Nadasdy 2007; Wilkie 2015). These new perspectives call for a reconsideration of older archaeological models for interpreting human–animal interactions in pre-19th century societies.

Although zooarchaeologists increasingly consider relational ontologies when studying animal bones from hunter-gatherer and horticulturalist sites (Boyd 2017; Crabtree 1995; Hill 2013; Overton and Hamilakis 2013; Russell 2011; Ryan and Crabtree 1995; Whitridge 2017), perspectives on larger-scale processes related to animal husbandry have remained heavily reliant on concepts of ownership and non-human species as consumable resources. Rooted in ways of understanding human history that emphasize rapid social and economic transitions, or revolutions (e.g., “Neolithic” or “Urban,” after Childe 1936), many overarching narratives on food production have emphasized stark cultural divisions among foragers who depended on wild game and farming/herding societies who relied on domesticated animals (e.g., Bellwood 2023; Braidwood 1960). In contrast, a growing body of anthropological and archaeological literature shows greater diversity in the ways that human groups of all scales understood and interacted with the natural world than has often been considered (e.g., Birch 2018; Ingold 1987, 1994; Politis 2009; Stépanoff and Vigne 2018; Viveiros De Castro 1998). Although these studies broaden perspectives on variability in the past, most have focused on people without domesticated animals in Eurasia and the Americas. Relationships among food producers and wild animals in other world regions—including many parts of Africa—remain understudied.

Southern Africa (Angola, Botswana, Eswatini, Lesotho, Malawi, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe) is especially interesting for thinking about people’s diverse relationships with animals because of its long (~2000-year) history of interactions among foragers, herders, and farmers (Denbow 2017), as well as the ongoing coexistence of wild megafauna and domestic cattle, sheep, and goats (Carruthers et al. 2008; Matowanyika 1991). Despite this complex socioecological landscape, strict social dichotomies among Holocene Later Stone Age (ca. 11,000 BC–AD 1650) foragers and Iron Age (ca. AD 300–1400) Bantu-speaking farmers have shaped the ways many scholars thought about and studied past human–animal relationships over the last 40+ years. The

foundational ethnographic and rock art research of Lewis-Williams (1980, 1987, 1997; Lewis-Williams and Dowson 1990), for example, emphasized the significance of wild species such as eland, elephant, and lion in the symbolic and ritual lives of recent San and Later Stone Age (LSA) groups. On the other hand, much of the anthropological and archaeological literature on Holocene farmers has stressed the cultural centrality of livestock (Barker 1978, 1992; Comaroff and Comaroff 2018; Ferguson 1985; Hall 1987; Huffman 2001; Whitelaw 2015). This is summed up well by Comaroff and Comaroff (1990, p. 195) who argued that cattle tied food and exchange economies together and embodied the social lives of 19th-century Tswana-speaking agropastoralists in South Africa. Although some scholars also acknowledged the economic (Badenhorst 2015; Pwiti 1991) and social (Brunton et al. 2013; Thorp 1984) importance of hunting at individual Holocene farming sites in southern Africa, an emphasis on cattle has continued to limit broader discussions of the ways Holocene Bantu-speaking groups understood and engaged with wild animals.

Ideological differences concerning wild and domestic animals must have influenced forager and farmer hunting strategies in the past, but so far this issue has not been explicitly addressed in southern Africa. In eastern Africa, anthropologists and archaeologists have argued that pastoralists and hunter-gatherers targeted different types of wild animals (i.e., herders ate only hooved mammals and birds, whereas hunter-gatherers included reptiles and mammals with fingers and claws in their diets) as a way of constructing and maintaining social identities (Galaty 1982; Marshall 1990; Marshall and Stewart 1994; Marshall et al. 2011; Newman 1970). Although it is possible that similar ideas differentiated LSA from Holocene farmer hunting strategies in southern Africa, some scholars argue that recent food-producing communities do not conceptually distinguish between wild and domestic animals and hunt a wide range of wild game to facilitate a multitude of social and economic roles (Chirikure 2019; De Luna 2016). According to them, this diversified approach to wild animal use has characterized Bantu-speaking farming societies for thousands of years and is not fundamentally different from local foraging strategies. However, to date, no regional quantitative studies have compared taxonomic patterns among Holocene LSA and farmer hunting strategies through time. Analysis of published faunal data from archaeological sites across the region provide an ideal opportunity for examining these questions empirically and beginning to think about the world-views that shaped the spread of food production and the rise of complex societies in southern Africa.

To understand the ways hunting and wild animals were incorporated into the social and economic lives of Holocene farmers, we compiled and analyzed published archaeological faunal data from 54 Iron Age sites in Botswana, Mozambique, South Africa, Zambia, and Zimbabwe. Taxonomic frequencies (relative percentages of distinct taxa within individual assemblages) reveal how often Holocene farmers hunted different types of wild animals. Diversity indices (the number and distribution of distinct taxa in zooarchaeological assemblages) and ubiquity measures (proportions of sites that preserve distinct taxa) show the overall breadth and regional distribution of wild fauna that farmers captured and killed in the past. We compared this information to taxonomic data from LSA and Pastoral Neolithic (ca. 1300

BC–AD 700) sites in southern and eastern Africa to investigate how farmer hunting strategies related to other foraging and food-producing groups. Ethnographic and historical observations among recent Bantu-speaking groups, as well as site-specific zooarchaeological research in the region, provide contextual information for interpreting the types of subsistence and non-subsistence activities that influenced the deposition of animal bones at Holocene farming sites.

By addressing questions about the antiquity and cultural roles of hunting and wild animal use among farmers in southern Africa over the last 2000 years, our study contributes to ongoing discussions in anthropology and archaeology about the geographic and temporal variability of human–animal relationships globally. We begin by summarizing the archaeology of foraging, herding, and farming communities in southern and eastern Africa, followed by a review of hunting and wild animal use among recent Bantu-speaking farmers in southern Africa.

## **Subsistence Economies and Cultural Diversity in Holocene Southern and Eastern Africa**

Holocene southern and eastern Africa share many aspects of their cultural histories, providing a basis for broad zooarchaeological comparisons. Although our study focuses on the Holocene, both regions were occupied by deeply rooted Later Stone Age hunter-gatherer groups beginning as early as 40,000 years ago in southern Africa (Mitchell 2002, pp. 112–119) and >46,000 in eastern Africa (Ambrose 1998). Recent genetic (Lipson et al. 2022) and material (Miller and Wang 2022) evidence shows that southern and eastern African LSA groups also shared long-distance social and economic links at points in the past. Neolithic herders first appeared in both regions during the mid and later Holocene (Ambrose 2001; Sadr 2003), followed by Bantu-speaking agropastoralists (associated with the African Iron Age) with ancestral roots in western and central Africa (Huffman 1982; Phillipson 2005, pp. 165–213). Despite these parallels, however, the histories of early herders in southern and eastern Africa differ considerably.

### **Neolithic Herders**

In eastern Africa, Neolithic herders preceded Iron Age farmers by as much as three millennia. Herding groups were sufficiently numerous to be materialized in conspicuous mortuary sites in northern Kenya by ca. 3000 BC (Hildebrand et al. 2018), and at pastoralist settlement sites in southern Kenya and northern Tanzania nearly 2000 years later (Ambrose 2001; Grillo et al. 2018; Lane 2013). Known as the Southern Settlement phase (ca. 1300 BC–AD 700) of the Pastoral Neolithic (PN), this period was characterized by mobile herders with distinctive ceramic and lithic repertoires who depended mainly on cattle, sheep, and goats (Ashley and Grillo 2015; Goldstein 2021; Marshall et al. 2011). Although they also hunted, there is little direct evidence of cultivation at PN sites (but see Prendergast et al. 2021, Shoemaker et al. 2019). Scholars have argued that specialized pastoralism developed in eastern Africa

as a response to fluctuating rainfall patterns, grassland productivity, and hunter-gatherer relations throughout the mid and later Holocene (Marshall 1990; Marshall and Hildebrand 2002). This emphasis on livestock and mobility in response to environmental variability among eastern African PN groups was not observed among early herders in southern Africa.

The earliest pottery and domesticated animals (mostly sheep) were introduced to southern Africa by Neolithic herders around the BC/AD transition (Sadr 2008a, 2013; Smith 2008). Although there was no well-defined pastoral phase in southern Africa, aDNA evidence shows some genetic contributions from eastern African PN groups (Henn et al. 2008; Skoglund et al. 2017). Scholars largely agree that these early herders were Khoe speakers (Sadr 2003), but there is broad disagreement about who the Khoekhoen were and how livestock entered the region. Some have argued that Khoe-speaking herders were the descendants of eastern African PN groups who migrated into southern Africa with their sheep in the later Holocene (Blench 2009; Ehret 2008; Fauvelle-Aymar 2008; Güldmann 2008; Henn et al. 2008; Skoglund et al. 2017; Smith 2006). Others contended that domestic animals were introduced to local Khoe-speaking foragers from northern regions and later diffused south via local exchange networks and/or small-scale movements of people (Deacon 1984; Kinahan 1994 1996; Klein 1986; Lander and Russell 2020; Sadr 2004, 2008b, 2015). Feeding this confusion, zooarchaeologists have yet to provide convincing evidence for a heavy reliance on domestic animals that can be easily distinguished from forager economies during this period (Dusseldorp 2016; Russell and Lander 2015; Sadr and Plug 2001).

## Iron Age Farmers

Iron Age populations associated with Urewe ceramics and evidence for iron production arrived in eastern Africa a little over ~ 2000 years ago (Ashley and Grillo 2015; Collett and Robertshaw 1980; Soper 1971a, b). These early farmers integrated animal husbandry and plant cultivation into a more settled lifestyle than nearby PN herders. However, whereas zooarchaeological research on Iron Age animal economies was relatively robust in southern Africa, eastern African faunal data were sparse (but see Culley et al. 2021; Prendergast et al. 2016).

Using linguistic, historical, and archaeological evidence, scholars have associated the expansion of Bantu-speaking agropastoral communities from central and eastern Africa with the spread of specialized food-producing economies into southern Africa during the early first millennium AD (Phillipson, 1975, 1976, 1977; Russell et al. 2014; Vansina 1995). Evidence of changing social and economic systems over time provides a chronological framework for sub-dividing southern African farming (i.e., Iron Age) sites into two broad categories (after Mitchell 2002, pp. 259–379; Pwiti 1996): early (EFC) and later (LFC) farming communities. EFC sites date primarily to the first millennium AD and were associated with distinctive pottery styles (Fagan 1966), mixed forager-farmer subsistence strategies at some sites (Badenhorst 2010; Plug 1979, 1989, 1997; Turner 1987a, b; van Zyl et al. 2013) and metallurgy during later periods (Chirikure 2007; Fagan 1969; Vogel 1976). Archaeologists

have observed evidence from around the turn of the millennium of increasing settlement sizes and densities, stone-walled architecture, Indian Ocean and transcontinental trade, and the intensification of mining and smelting activities as well as domestic goods manufacture at many LFC sites (Chirikure 2007; Chirikure et al. 2013; Klehm 2017; Moffett and Chirikure 2016; Shenjere-Nyabezi and Pwiti 2021). These changes coincided with ceramic shifts and have been broadly linked to social stratification and the rise of complex societies in parts of southern Africa. Based on changing faunal, architectural, and site distribution data, archaeologists have argued that the accumulation of large numbers of cattle by individual people shifted the distribution of power in favor of more hierarchical political forms over time (Barker 1992; Garlake 1973; Hall 1987; Huffman and Hanisch 1987).

Much of the zooarchaeological literature emphasizes the role of domestic stock at EFC and LFC sites. Scholars have linked evidence of cattle, sheep, and goats to feasting (Magoma et al. 2018), inequality (Barker 1992; Brain 1974; Hall 1987; Thorp 1995), gender relations (Badenhorst 2010; Huffman 2001), and intensive hunting (Badenhorst 2010, 2011). Based in part on observations among more recent farming communities, some zooarchaeologists also argued that wild animals constituted a backup meat source when access to domestic stock was restricted due to low social status, disease (e.g., trypanosomiasis), and/or risk management in marginal environments at EFC and LFC sites (Badenhorst 2015; Manyanga et al. 2000; Plug 1997, 2000; Plug and Badenhorst 2006; Pwiti 1996). However, other studies have shown that hunting played a more dynamic role among some ancient farming societies. Research at Khami (Thorp 1984), Ratho Kroonkop (Brunton et al. 2013), and sites in the Limpopo Valley (Badenhorst 2015) provides evidence that farmers hunted carnivores, dassies, hares, reptiles, and birds for ritual, political, and agricultural purposes. Archaeologists have also linked megafauna (elephant, rhinoceros) hunting at southern African farming sites to Indian Ocean and transcontinental exchange networks (Badenhorst et al. 2011b; Boeyens and van der Ryst 2014; Coutu et al. 2016; Pwiti 1991; Reid and Segobye 2000; Voigt 1981).

We build on these foundational studies—particularly those that go beyond questions of survival—to investigate regional human–animal interactions among southern African farming communities. In the following section, we review wild animal use among recent Bantu-speaking farmers in southern Africa to provide analogical frameworks for thinking about people’s motivations for hunting in the archaeological past. According to Wylie (1982, 1985, 1988, 1989, 2002), relational analogies like these allow archaeologists to incorporate relevant information from multiple sources into process-sensitive scenarios that can be interrogated using archaeological data. This approach is in explicit contrast to simple comparisons that might replicate the present.

## Hunting Among Recent Bantu Speakers

Our review of the ethnographic and historical literature on wild game use among Bantu-speaking farmers in southern Africa shows that food, crafting, trade, and ritual and symbolic practices all influenced hunting decisions (see Andersson

1856; Elton 1872; Larson 1989; Livingstone 1861; Marks 1977, 1979; Morton and Hitchcock 2014). In general, hunting for food was cited most frequently and often involved large numbers of ungulates weighing <10,000 kg, crafting and trade with wild fauna (e.g., carnivores and megafauna) was slightly less common and not associated with intensive hunting, and the use of ritual taxa (e.g., pangolins and pythons) was relatively rare. These findings provide useful reference points for interpreting zooarchaeological patterns observed among Holocene farming sites.

### Subsistence Hunting

The taxonomic families Suidae (warthogs and bushpigs), Bovidae (small, medium, and large antelopes), and Equidae (zebras) were the primary targets for subsistence hunting among recent Bantu-speaking hunters in southern Africa. In parts of Zimbabwe, large meat feasts that included zebra, buffalo, and other ungulates followed hunts undertaken to mark the passage of Shona boys into men (Elton 1872). Feasts involving numerous large and medium-sized ungulates were also documented among Tswana speakers in Botswana (Livingstone 1861, pp. 21–22), and Bisa hunters in Zambia regularly hunted buffalo, warthog, impala, and zebra for food (Marks 1977). Ground-dwelling fowl (order Galliformes), including guineafowl, francolins, and partridges, were also hunted and consumed in parts of Botswana (Andersson 1856, p. 40) and Zambia (Marks 1979).

Although we found that small, medium, and large ungulates and (to a lesser degree) wild fowl were preferred, Morton and Hitchcock (2014, after Barrow 1806, pp. 393–394; Campbell 1822, pp. 68, 186) noted that some Tswana-speaking groups in the Kalahari and former Transvaal also occasionally ate hyenas, lions, leopards, giraffes, rhinoceros, and elephants. Others noted that farming groups in northern Botswana sometimes ate elephant, hippopotamus, and ostrich meat (Andersson 1856, p. 415; Larson 1989).

### Craft Production and Trade

Scholars frequently reference both craft production and trade as incentives for hunting. We lump these two activity types together because many of the same animals, namely megafauna and carnivores, were associated with both. In the Kalahari and former Transvaal, Morton and Hitchcock (2014) noted that Tswana-speaking groups made a wide range of clothing and footwear, personal adornments, tools, and weapons from wild animal parts. The taxa involved were equally diverse—including some bovids, suids, and zebras—but small, medium, and large carnivores, megafauna (elephant, rhino, hippo, and giraffe), porcupines, and ostriches were emphasized. Andersson (1856, pp. 203, 414–415) also observed Bantu speakers around Lake Ngami in northern Botswana making clothing and tools from ostrich skins and hippo teeth.

In some cases, we found that southern African farming groups used animal products—primarily skins—to define and reinforce social and political structures. For instance, in Zimbabwe, Shona-speaking traditional healers wore cheetah and leopard

skins to signal spiritual potency (Manyanga and Pangeti 2017). Quin (1959) noted that black-backed jackal skins were used to make blankets for Sepedi chiefs in South Africa, who also wore spotted hyena and leopard hides as symbols of power. Similarly, South African Venda chiefs wore lion and leopard skins, while medicine men used wildcat skins and hyena tails in their healing rituals, and warriors wore the remains of meerkats, mongoose, squirrels, leopards, and elephants to signal their affiliation with certain age-sets (Stayt 1931, pp. 11, 72).

Although megafauna were sometimes eaten and used in crafting, the most important reason for hunting elephant, rhinoceros, hippopotamus, and giraffe was to obtain their tusks, horns, and skins for trade with other African groups, across the Indian Ocean via the Swahili Coast, and eventually with European colonists (Andersson 1856, pp. 203, 473; Carruthers et al. 2008; Morton and Hitchcock 2014). Farmers also exchanged lion, leopard, and cheetah hides, as well as ostrich feathers and skins, within Africa and abroad (Andersson 1856, pp. 262, 473; Morton and Hitchcock 2014).

## Ritual and Medicine

Recent hunters in Botswana, South Africa, and Zimbabwe targeted various mammalian, avian, and reptilian species for their magical or medicinal powers. Baiyewu (2016, p. 172) and Stayt (1931, p. 80) observed Sepedi, Zulu, Tsonga, and Venda tribes in South Africa hunting pangolins to control severe weather events, provide physical and spiritual fortification against evil, to make love charms, and for cleansing rituals. Shona hunters from Zimbabwe also captured pangolins to give as tribute to chiefs because of their mystical powers (Manyanga and Pangeti 2017), and aardvarks were given to Bisa leaders for spiritual purposes in Zambia (Marks 2017, pp. 62–63, 97, 145–146). Morton and Hitchcock (2014) noted that Tswana speakers in the Kalahari and former Transvaal incorporated parts of aardvarks, pangolins, baboons, and secretary birds into various charms and medicines. Sepedi (Quin 1959) and Venda (Stayt 1931, p. 87) healers in South Africa used baboon bones for making and administering traditional medicines. Some Zulu groups also used monkey skulls and bones in traditional healing practices (Raum 1973, p. 259). Stayt (1931, p. 73) observed Venda medicine men mixing the powdered flesh of eagles with human and cattle parts to imbue younger warriors with bravery in future battles. The fat of hamerkops, rock pythons, and monitor lizards, fat and skins of dassies and otters, peacock feathers, tortoise flesh, and the feet of bateleur eagles were used by Zulu spiritual healers to create medicine for driving away storms (Berglund 1976, p. 63). Python fat was used to install Zulu leaders (Krige 1965, p. 255) as well as in medicines to protect against witchcraft (Krige 1965, p. 169) and lightning (Krige 1965, p. 312; Raum 1973, p. 235). Zulu healers consumed stones found in crocodile stomachs to make them swim faster (Berglund 1976, p. 155). In southeastern Botswana, some snake species were captured and killed by Kglata groups for use in rainmaking rituals (Schapera 1971, pp. 35–41) and by Tloka groups to make various medicines (Grivetti 1976).

Below, we outline the broad theoretical and interpretive perspectives underpinning our investigation of subsistence, craft/trade, and ritual-based hunting among Holocene southern African farmers, followed by a description of the specific datasets and methods used.

## Theoretical and Interpretive Frameworks

Arguments for greater nuance in human–animal relations emphasize temporal and geographic variability in the ways societies understood and interacted with the natural world. In the North American Arctic (Bodenhorn 1990), Amazon rainforest (Fausto 2007; Politis 2009; Viveiros De Castro 1998), Kalahari Desert (Guenther 2019), and northern (Ingold 1987; 2000a; Pedersen 2001; Willerslev 2007) and southern (Bird-David 1990) Asia, anthropologists have documented diverse ideologies and cosmologies sometimes referred to as “animism,” which extend personhood to certain non-human animals. In southern Africa, fluid boundaries between shamans in trance and wild animals are documented ethnographically as well as depicted in Later Stone Age rock art (Dowson 2007; Lewis-Williams 1980, 1987, 1997; Lewis-Williams and Dowson 1990; Parkington 2003). Many recent farming groups also used wild animal totems—including eland (Shava), elephant (Nzou), lion (Shumba), baboon (Soko Mukanya), eagle (Hungwe), and crocodile (Mokoena) among others—to identify themselves (Bullock 1931, 1950; Manyanga and Pangeti 2017). This incorporation of non-human species into recent human societies raises important questions about the ways zooarchaeologists interpret faunal remains recovered from LSA and Holocene farming sites in the region.

Recent zooarchaeological research demonstrates the value of faunal data for answering questions about people’s worldviews and perspectives on human–animal relations in the past. For example, in the Americas, scholars have argued that the deposition of symbolic or bundled taxa in pits associated with feasting events (Kelly 2000; Kelly and Kelly 2007; Pauketat et al. 2002) and ceremonial offerings (Alaica 2018; Wallis and Blessing 2015) provides unique insights into people’s social and spiritual relationships with different animal communities. Zooarchaeologists working in Eurasia have also cited evidence of intentional non-human burials and cremations to argue that people afforded personhood and/or symbolic meaning to certain animals in the past (Crabtree 1995; Losey et al. 2011; Reshef et al. 2019).

Although most “social” zooarchaeological studies (after Russell 2011) rely on depositional information from pre-defined ritual contexts, broad patterns of faunal diversity can also provide broad comparative perspectives for understanding variability in human–animal relationships over time and among social groups. Researchers have used taxonomic diversity data to compare aspects of community and personal identity, social status, and worldview among different cultural groups at sites in Kenya (Marshall 1990; Marshall and Stewart 1994; Marshall et al. 2011), England (Ashby 2002; Gidney 2000; King 1984), Iberia (Grau-Sologestoa 2017), and the Levant (Lev-Tov and McGeough 2007). Prior to our study, similar approaches had not been applied to faunal assemblages in southern Africa. However, Manyanga and Pangeti (2017) recently argued that zooarchaeological interpretations of hunting

among southern African farming communities should engage the variety of wild animals present in assemblages as a reflection of peoples' cultural preferences.

## Data and Analytical Methods

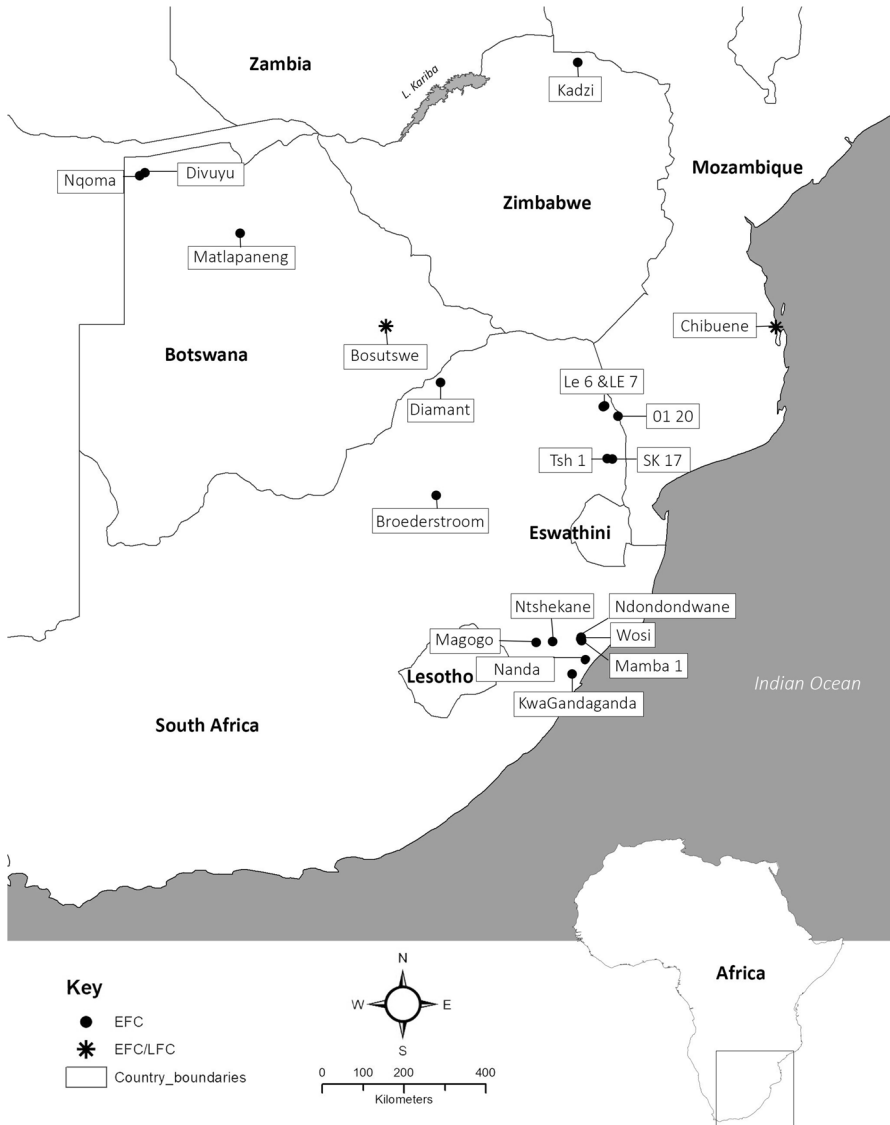
We used taxonomic data from 20 EFC (Table 1; Fig. 1; Supplemental Table S1) and 34 LFC (Fig. 2; Supplemental Table S2) faunal assemblages to examine hunting patterns among the earliest food producers in southern Africa. We emphasize that this type of meta-analysis would not have been possible without the careful, primary research of zooarchaeologists—including E. Voigt, I. Plug, S. Badenhorst, and M. Manyanga—at individual sites. We attributed animal bones recovered from archaeological contexts dated to the first millennium AD and/or that preserved Early Iron Age pottery to the EFC period. We attributed fauna from contexts dated to the second millennium AD and/or that preserved Middle or Late Iron Age pottery to LFCs. Of the sites studied, only Bosutswe and Chibuene provided data from both phases.

To contextualize EFC and LFC faunal patterns, we also examined taxonomic data from 12 Holocene southern African LSA (Fig. 3; Supplemental Table S3), seven Holocene eastern African LSA (Fig. 4; Supplemental Table S4), and five eastern African PN (Fig. 4; Supplemental Table S5) faunal assemblages. We considered southern African LSA sites only from regions where Holocene farmers also settled. We also selected LSA sites in eastern Africa based on geographic proximity to PN herders. These datasets provided reference points for interpreting relationships among Holocene southern African farmers and diverse animal communities in the past. In general, LSA forager sites have been characterized by a highly diverse range of hunted animals, including primates, carnivores, birds, and reptiles (Badenhorst and Parsons 2015; Badenhorst et al. 2019; Dusseldorp 2016; Jones and Brandt 2022; Jones and Tibesasa 2022). Alternatively, archaeologists and anthropologists have argued that many archaeological and ethnographic eastern African pastoralist groups restricted their hunting to certain types of animals, primarily ungulates and birds (Galaty 1982; Marshall and Stewart 1994; Newman 1970).

Large, well-contextualized bone assemblages attributed to southern African herders were few and far between. Those that did exist preserved very few domestic animal bones, making it difficult to determine whether the assemblages could be attributed to LSA groups who owned a few sheep or pastoralists who relied mainly on

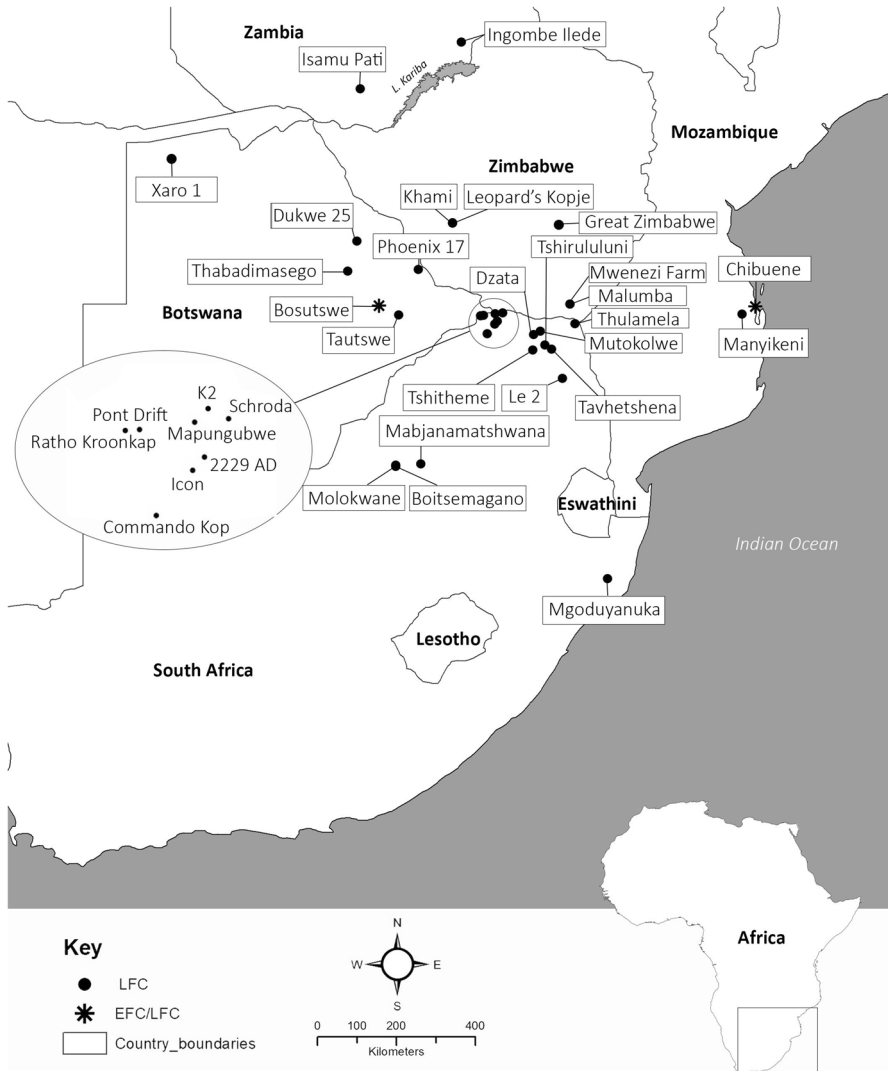
**Table 1** Sites in southern and eastern Africa that are included in the analysis

Period	Region	Number of sites	Age range
Early Farming Community	Southern Africa	20	AD 300–1000
Later Farming Community	Southern Africa	34	AD 550–1950
Later Stone Age	Southern Africa	12	11,000 BC–AD 1650
Later Stone Age	Eastern Africa	7	11,000 BC–AD 1450
Pastoral Neolithic	Eastern Africa	5	1300 BC–AD 700



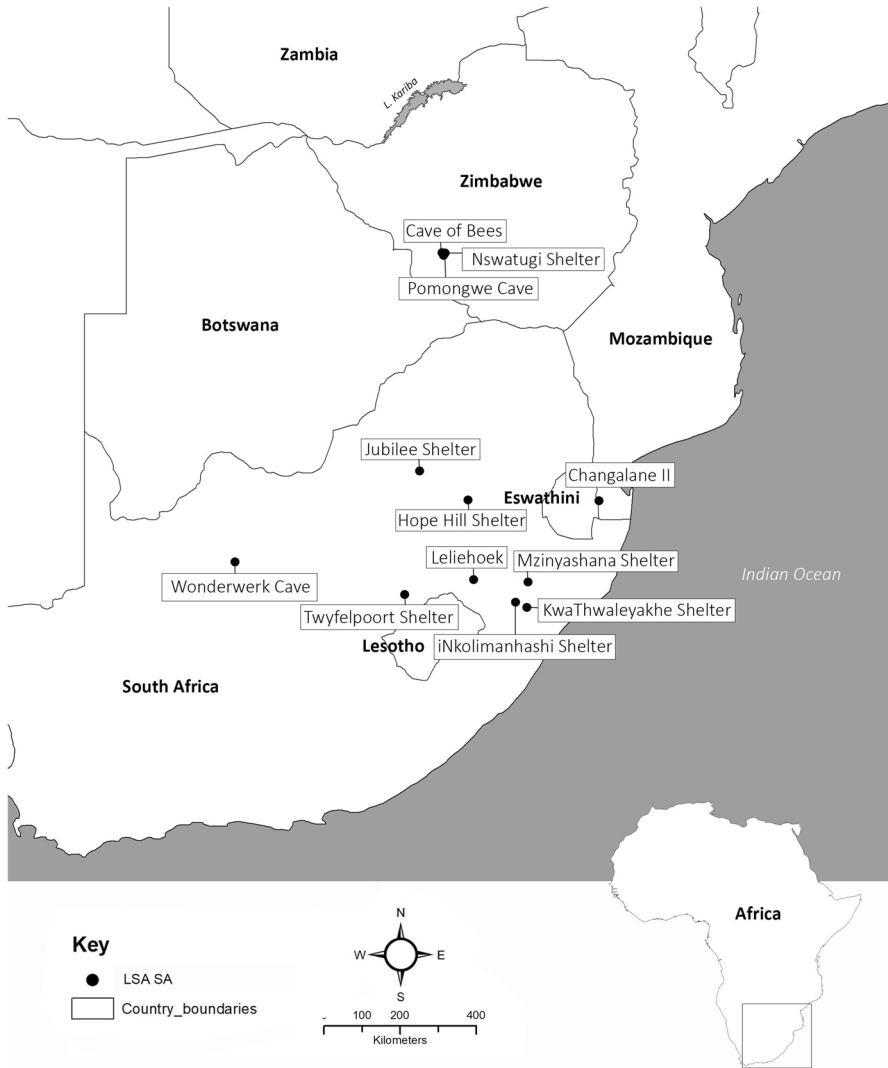
**Fig. 1** Map of EFC sites in southern Africa, created by R. Kapumha

hunting (see Dusseldorp 2016). In either case, the faunal assemblages looked similar enough to make separation based on basic economic system impossible. Many sites attributed to Khoekhoen herders were also located in the Namaqualand region of Namibia and the Western Cape of South Africa (Sadr 2003, 2008a), where Bantu-speaking farmers did not settle (but see Lander and Russell 2018). Faunal data from Iron Age farming sites in eastern Africa were also limited and not included in this analysis.



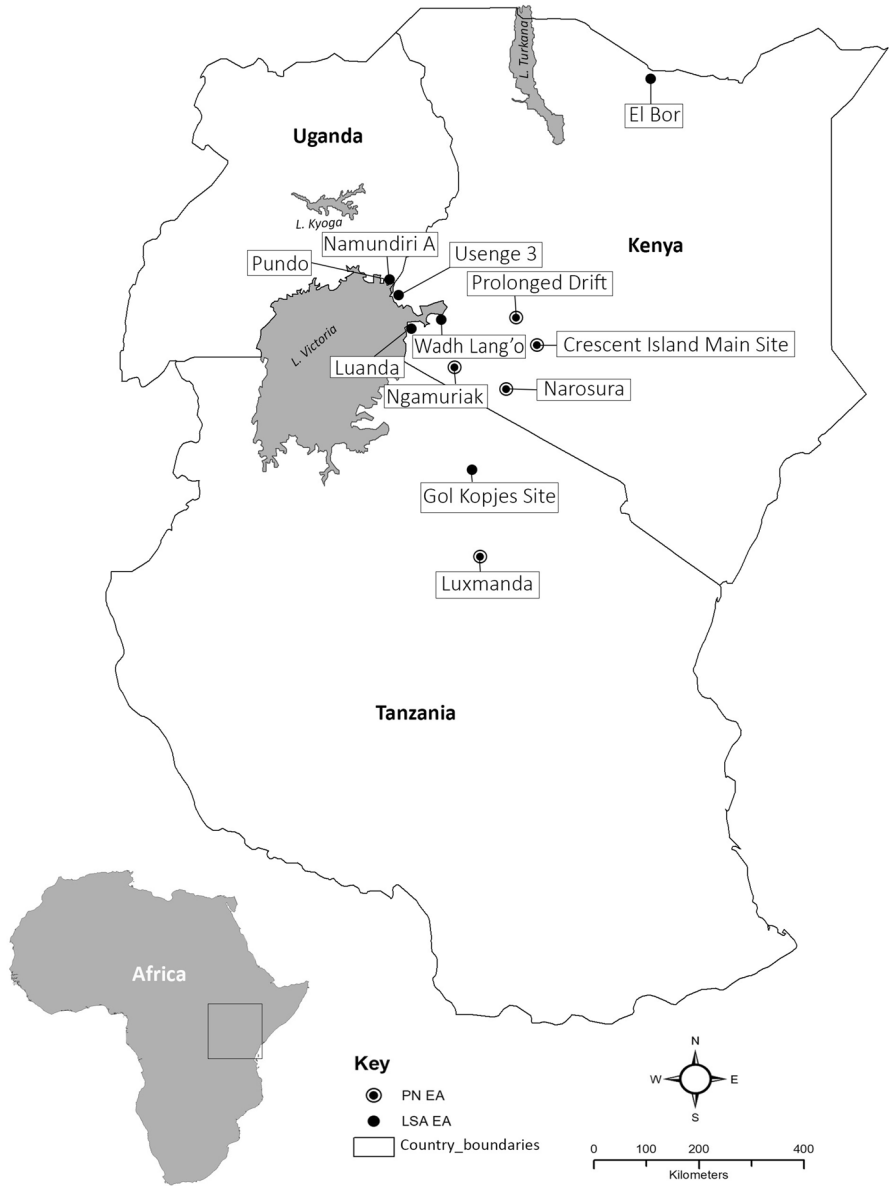
**Fig. 2** Map of LFC sites in southern Africa, created by R. Kapumha

To capture the most complete picture of past hunting strategies possible, we only considered assemblages with both mammalian and non-mammalian taxonomic information. We also restricted our analyses to assemblages with total identifiable fauna >200 NISP (number of identifiable specimens) and/or >40 MNI (minimum number of individuals) to avoid over-interpreting small datasets. The only exception was the southern Africa LSA site of Leliehoek. NISP and MNI values were not available for the site, but Esterhuysen et al. (1994) reported 19.6 kg of unidentifiable animal bone from the site. This suggested that the assemblage was large enough for interpretation and comparison at a broad level.



**Fig. 3** Map of LSA sites in southern Africa, created by R. Kapumha

Still, these limitations on the faunal data from Leliehoek allowed us to include the site only in analyses that used presence/absence data. Following Badenhorst (2003; Badenhorst et al. 2011a) and Plug et al. (2003), we excluded potentially intrusive taxa such as shrews, bats, rodents <2 kg, small reptiles, and amphibians from faunal counts. We also omitted shell (e.g., turtle, mollusk, crustacean, and ostrich eggshell) and ivory fragments because they can artificially inflate NISP measures (see Steele and Klein 2009). Taphonomic factors—such as bone weathering, which can lead to the recovery of certain types of animal bones and not others—could also have influenced observed faunal patterns. To help mitigate



**Fig. 4** Map of LSA and PN sites in eastern Africa, created by R. Kapumha

such effects, we tried to include only zooarchaeological assemblages recovered from well-defined contexts with minimal evidence for differential preservation (per the primary authors). However, variability in the ways authors report bone weathering and contextual data made it difficult to compare such factors among sites.

## Taxonomic Frequencies

After compiling the data, we compared frequencies of domestic and wild animal bones by NISP and MNI at all 54 EFC and LFC sites. This provided regional insights into the prevalence of hunting among southern African farming groups over the last ~2000 years.

To better understand the various roles that hunting played at EFC and LFC sites, we measured and compared frequencies of wild animal bones associated with certain types of activities. Using interpretive insights gained from the ethnographic present, we assigned wild animal bones from EFC and LFC sites to three broad categories of activities: subsistence, craft production (e.g., clothing, tools, and weapons) and trade, and ritual (e.g., charms and medicines) (Table 2). Our review of hunting among recent Bantu speakers in southern Africa indicated that many taxa, such as dassies and hares, were hunted and used for various purposes. We therefore focused our analysis on animals that were more closely linked to only one of the three stated activity classes. For instance, people rarely hunted leopards for food but regularly targeted them for their skins to make clothing or to facilitate exchange with other groups (Manyanga and Pangeti 2017; Quin 1959; Stayt 1931, p. 11). Pythons, on the other hand, were primarily used to create traditional medicines and charms (Berglund 1976, p. 63; Krige 1965, pp. 169, 255), rather than everyday objects.

## Diversity Indices

We calculated diversity indices for all 78 EFC, LCF, LSA, and PN faunal assemblages to compare the range of animals hunted by southern and eastern African farmers, foragers, and herders during the Holocene. Diversity indices are ecological measures used by zooarchaeologists and paleoecologists to examine aspects of past human–environment interactions, including resource specialization (Faith 2008; Grayson and Delpech 2002, 2006), dietary breadth (Jones 2004; Jones and Brandt 2022; Jones et al. 2018; Nagaoka 2001; Schmitt and Lupo 1995; Stiner 2001), and the effects of climatic fluctuations on past animal populations (Blois et al. 2010; Grayson 2000; Grayson et al. 2001). For this study, we focused on species richness (*S*; the number of distinct taxa identified in a single faunal assemblage) and evenness

**Table 2** Types of animals associated with subsistence and non-subsistence hunting among ethnographic Bantu-speaking communities in southern Africa











Subsistence	Craft and trade	Ritual
Suids	Carnivores	Primates
Zebras	Megafauna	Pangolins
Bovids	Porcupines	Aardvarks
Galliformes	Ostriches	Raptors
	Small birds	Pythons
		Monitor lizards
		Crocodiles

(*I-DI*; the distribution of taxa within a faunal assemblage) to investigate the range of animals that people hunted in the past.

The primary analytical factors that could have artificially influenced diversity measures in this study included variability in sample sizes and specificity of taxonomic identifications. Faith and Du (2018, after Grayson 1984) noted that larger faunal assemblages often correlated with more identified taxa (higher richness) at archaeological sites. In this study, sample sizes ranged from 284 to 15,297 by NISP and 41 to 782 by MNI, suggesting similar issues could have altered our findings. Lau and Kansa (2018) also argued that inter-analyst variation during primary faunal identifications can make it difficult to compare zooarchaeological datasets. The level of identification assigned to small, medium, and large bovid species varied among faunal reports in this study, likely due to differences in access to and use of robust comparative skeletal collections among zooarchaeologists. This, too, would have significantly influenced inter-site diversity comparisons.

To address these challenges, we condensed all identified fauna into 10 broad taxonomic groups that are common across southern and eastern Africa: Primates (monkeys and apes), Carnivora (carnivores), Ungulata <1000 kg (small, medium, and large hooved mammals), Ungulata >1000 kg (megafauna), Rodentia >2 kg (medium and large rodents), Hyracoidea (dassies/hyraxes), Lagomorpha (hares), Tubulidentata (aardvarks) and Pholidota (pangolins), Aves (birds), and Reptilia (reptiles) (Fig. 5). Our review of hunting among ethnographic and historic southern African farmers—which suggested that certain types of animals were hunted for specific purposes (see *Hunting among Recent Bantu Speakers*)—informed these groupings. By condensing the fauna in this way, we were able to compare taxonomic data between assemblages of varying sizes and degrees of identification. We investigated relationships among sample sizes and average *S*-values at all sites to test the effectiveness of this strategy. In addition to facilitating taxonomic comparisons, such a simplification of diverse faunal datasets also obscured more detailed taxonomic information, thereby reducing the resolution of our analyses. Given the broad aims and scope of this study, however, we deemed this approach useful for comparing wild animal diversity patterns at a subcontinental scale.

Presence/absence data from all 78 assemblages were used to calculate *S*-values, allowing us to compare diversity patterns among faunal assemblages reported by MNI, NISP, or both. We then compiled richness measures by archaeological group. Higher average *S*-values indicated more diverse hunting approaches, and vice versa. We compared *S*-values and wild animal bone frequencies by NISP and MNI to evaluate whether the amount of wild fauna recovered from sites correlated with the overall diversity of animals identified. We also investigated potential relationships between environment and hunting by mapping *S*-values for all assemblages onto White's (1983) vegetation map of Africa. Although the environmental data were recent and generalized and the scale and scope of this study limited our ability to examine socioecological relationships at a site-specific scale, this approach offered a baseline reference for identifying correlations among taxonomic diversity and broad vegetation patterns. It is possible that environmental changes over the last 2000 years could have impacted people's relationships with wild animals. However, to examine links among past environment, climate, and people would require more

<b>Taxonomic group</b>	<b>Wild taxa identified at EFC and LFC sites</b>
 Primates	Baboon, vervet monkey
 Carnivora	Bat-eared fox, black-backed jackal, caracal, cheetah, civet, clawless otter, genet, honey badger, leopard, lion, meerkat, mongoose, serval, side-striped jackal, spotted hyena, wild cat
 Ungulata <1000 kg	Blesbok, buffalo, bushbuck, bushpig, duiker, eland, hartebeest, impala, klipspringer, kudu, lechwe, nyala, oribi, reedbuck, rhebok, roan, sable, sitatunga, steenbok, suni, tsessebe, warthog, waterbuck, wildebeest, zebra
 Ungulata >1000 kg	Elephant, giraffe, hippopotamus, rhinoceros
 Rodentia >2 kg	Cane rat, porcupine, springhare
 Hyracoidea	Bush and rock dassie
 Lagomorpha	Scrub and rock hare
 Tubulidentata and Pholidota	Aardvark, pangolin
 Aves	Crow, Egyptian goose, francolin, guineafowl, ibis, kori bustard, lappet-faced vulture, ostrich, quail, secretary bird, yellow-billed duck
 Reptilia	Crocodile, monitor lizard, python, terrapin, tortoise

**Fig. 5** Wild taxa identified at EFC and LFC sites by taxonomic group

high-resolution, regional-scale palaeoecological data than were available at the time of this study. We should also mention that the amount and accuracy of EFC and LFC radiocarbon dates varied highly from site to site, making it difficult to confidently examine diachronic patterns beyond the two-phase framework.

To calculate taxonomic evenness for all EFC, LFC, LSA, and PN sites, we applied the unbiased Simpson Index ( $D'$ ) because it is better suited to deal with sample size variability than other diversity measures (after Faith and Du 2018). Unbiased Simpson Indices calculate the likelihood that two randomly selected bones from an assemblage would belong to the same taxonomic group, thereby highlighting the overall distribution of different animals in an assemblage. We calculated and compared  $1-D'$ -values for all sites, by NISP and MNI, using the following formula:

$$D' = \sum \left( \frac{n_i(n_i - 1)}{N(N - 1)} \right)$$

where  $n_i$  equals the abundance of taxon  $i$  and  $N$  equals the total number of taxa in an assemblage.  $1-D'$ -values range from 0 to 1. Measures closer to 0 suggest that people practiced a more diversified hunting strategy that targeted different animals evenly. Evenness values closer to 1 indicate a more specialized approach to hunting that focused more on certain taxa than others.

### Taxonomic Ubiquity

Taxonomic ubiquity measures—often used to examine spatial patterning among zooarchaeological assemblages at individual sites (Lyman 1994; Lyman and Wolvertson 2023)—were calculated to compare the proportions of EFC and LFC sites that preserved the bones of different types of animals. This analysis tested the regional extent to which people hunted certain animal populations. As we did for diversity measures, we measured ubiquity using basic presence/absence data for each of the 10 taxonomic groups (see Table 2) because it allowed us to compare taxonomic information among sites of varying sizes and identification detail. Taxonomic ubiquity was measured using the following formula:

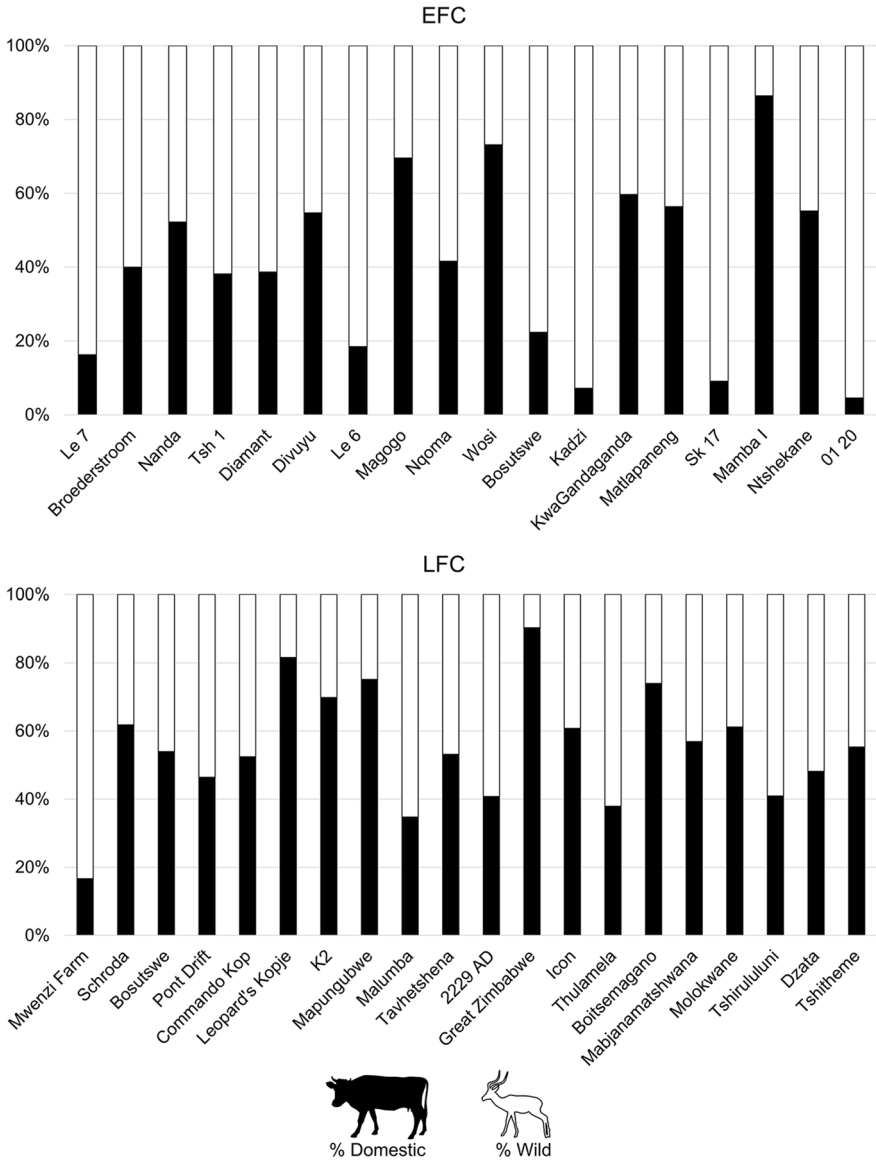
$$X_A/X_Y = X_{A/Y}$$

$X_A$  represents the number of sites from phase  $X$  with taxon  $A$ ,  $X_Y$  represents the total number of sites from phase  $X$ , and  $X_{A/Y}$  represents the percentage of sites from phase  $X$  that contain taxon  $A$ . By examining taxonomic ubiquity measures among EFC and LFC sites, we tested whether regional hunting patterns changed in accordance with social and economic transformations in southern Africa over the last ~2,000 years. We also tracked taxonomic ubiquity among southern African LSA sites to contextualize Holocene farmer hunting patterns in the region.

### Diversified Hunting at Holocene Farming Sites

We observed wild animal bones in varying frequencies at all EFC and LFC sites (Fig. 6; Supplemental Fig. S1). However, the number of sites with >50% wild fauna decreased slightly over time, from 10 of 18 (55.6%) by MNI and 7 of 17 (42.2%) by NISP during the EFC period to 7 of 20 (35.0%) by MNI and 8 of 26 (30.8%) by NISP in the LFC.

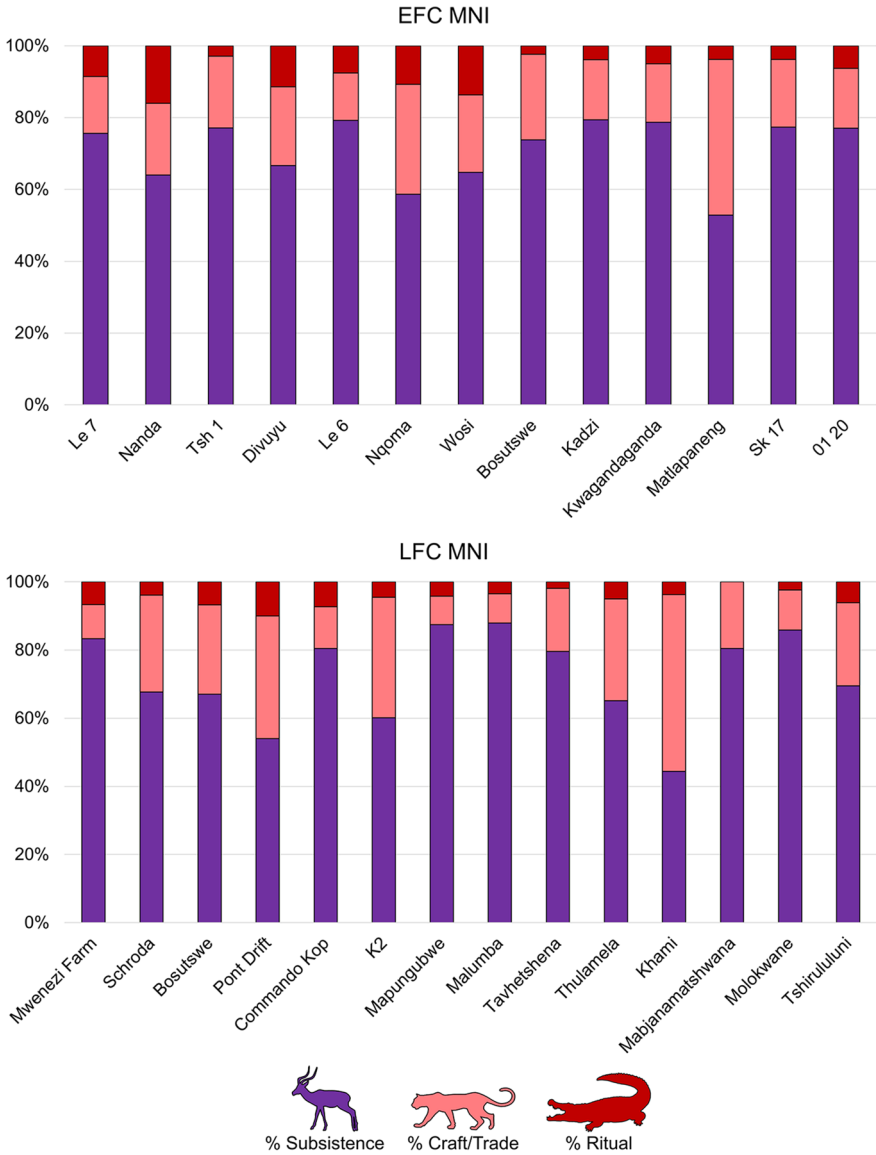
Proportions of wild animals hunted for subsistence versus non-subsistence purposes showed consistent patterns across EFC and LFC sites (Fig. 7; Supplemental Fig. S2). All sites, but one, preserved evidence of taxa attributed to all three categories (food, craft production/trade, and ritual); Mabjanamatshwana did not preserve bones specifically associated with ritual activities. Subsistence taxa dominated all assemblages. Bones linked to craft production and trade were the second most prevalent group identified at EFC and LFC sites. Ritual animals were the least



**Fig. 6** Domestic versus wild animal bone frequencies at EFC and LFC sites by MNI; sites ordered by earliest reported radiocarbon dates. See Supplemental Figure S1 for a comparison by NISP

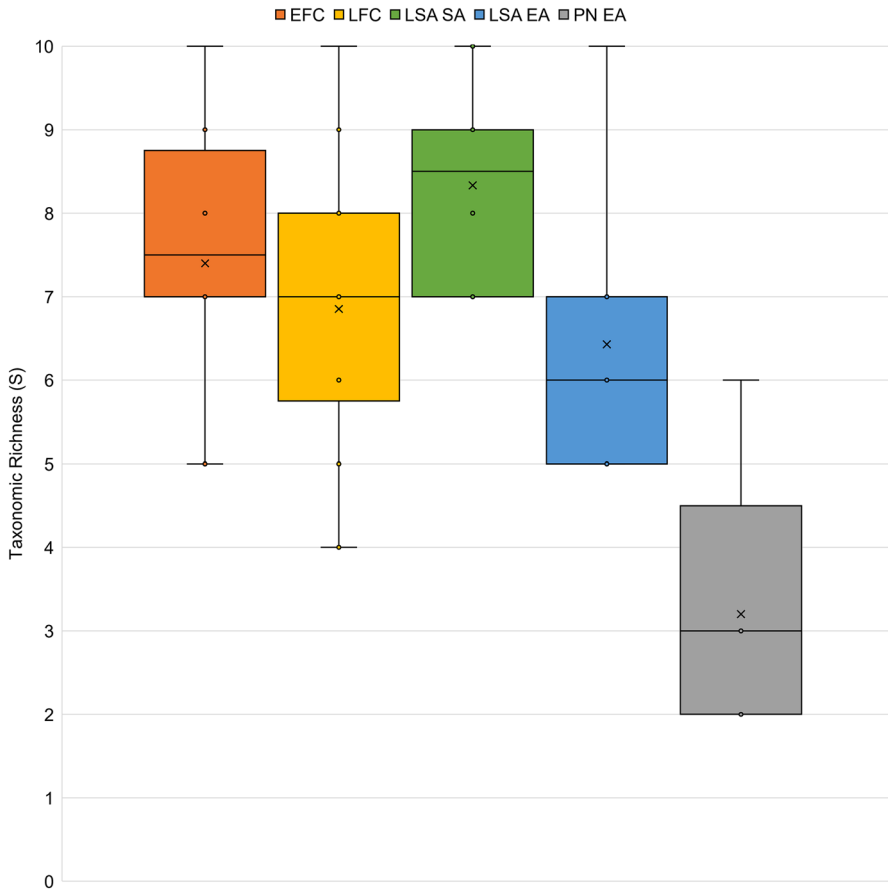
represented, in all cases. These patterns were slightly more pronounced during the LFC than earlier.

Variability in average taxonomic richness measures was noted among EFC, LFC, southern and eastern African LSA, and eastern African PN assemblages (Fig. 8; see Supplemental Information Tables S1–S6 for site-specific



**Fig. 7** Frequencies of wild taxa attributed to subsistence, craft/trade, and ritual activities by MNI; sites ordered by earliest reported radiocarbon dates. See Supplemental Fig. S11 for comparison by NISP

information). *S*-values were similar among EFC (mean=7.4, median=7) and LFC sites (mean=6.85, median=7), with only slightly lower average values in later periods. Taxonomic richness measures associated with southern African farmers also were comparable to those from southern (mean=8.33, median=8.5) and

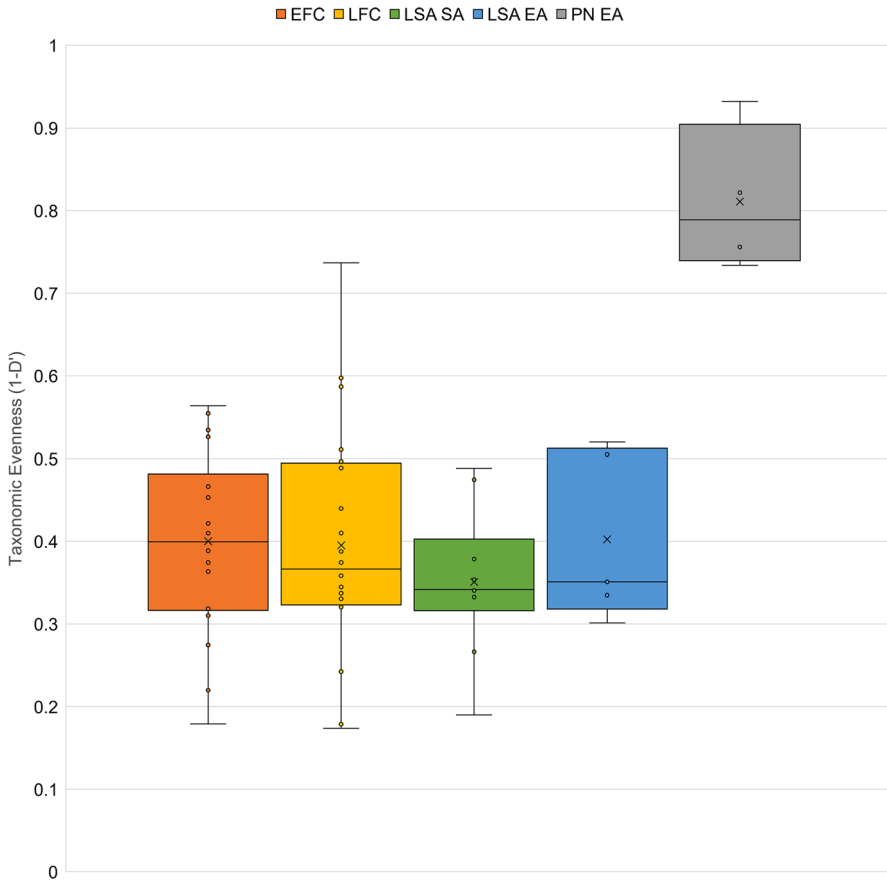


**Fig. 8** Taxonomic richness (calculated using NISP and MNI presence/absence data) values by archaeological group; EFC = 20 assemblages, LFC = 34 assemblages, LSA SA (southern Africa) = 12 assemblages, LSA EA (eastern Africa) = 7 assemblages, PN EA (eastern Africa) = 5 assemblages

eastern (mean=6.43, median=6) African LSA sites, but they were much higher than average eastern African PN  $S$ -values (mean=3.2, median=3).

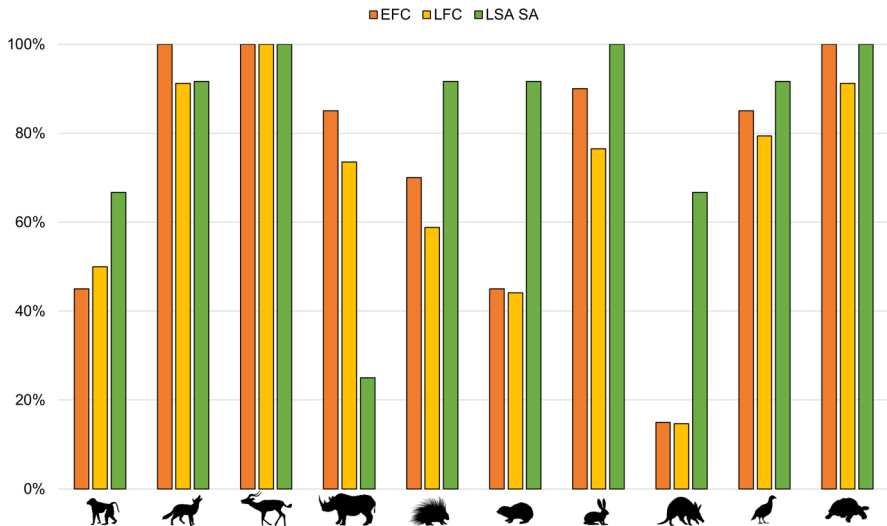
Sample sizes did not strongly correspond with  $S$ -values (Supplemental Fig. S3), indicating that controlling for maximum richness was an effective strategy for limiting the distorting effects of variable sample sizes. Richness measures also did not show clear geographic clustering along environmental axes among farmer, forager, or herder assemblages (Supplemental Figs. S4–S8), and they had weak positive correlations with wild animal bone frequencies at EFC and LFC sites (Supplemental Figs. S9–S10). These findings suggest that environmental context and overall reliance on hunting did not significantly influence the range of animals that farmers chose to hunt in the past.

Evenness values also varied among archaeological groups (Fig. 9, Supplemental Fig. S11). Average  $1-D'$ -values from EFC and LFC sites were similar to those



**Fig. 9** Taxonomic evenness values calculated using MNI by archaeological group; EFC = 18 assemblages, LFC = 20 assemblages, LSA SA (southern Africa) = 10 assemblages, LSA EA (eastern Africa) = 5 assemblages, PN EA (eastern Africa) = 4 assemblages. See Supplemental Information Figure S10 (Online Resource 1) for a comparison by NISP

from southern and eastern African LSA sites but considerably lower than PN sites in eastern Africa. Although this general pattern remained mostly the same, EFC, LFC, and LSA evenness values calculated by MNI were significantly lower than those using NISP. This may have been due to the large numbers of bovid bones reported at many sites that were assigned only to size class. These bones inflated overall NISP counts for ungulates weighing < 1000 kg, thereby causing the assemblages to seem less evenly distributed. On the other hand, indeterminate bovid bones did not impact MNI counts in the same way because zooarchaeologists did not attempt to attribute them to individual animals. This differential effect was not observed among eastern African PN sites because those assemblages tended to be far less diverse and heavily favored ungulates weighing < 1000 kg.



**Fig. 10** Taxonomic ubiquity measures for EFC, LFC, and southern African LSA (LSA SA) sites; symbols represent taxonomic groups as described in Fig. 5

Although all taxonomic groups were present at EFC and LFC sites, the ubiquity of different taxonomic groups varied (Fig. 10). Carnivores, ungulates <1000 kg, megafauna, rodents >2 kg, hares, birds, and reptiles were found at most, if not all, sites from either period. Primates and dassies, on the other hand, were slightly less prevalent and pangolins and aardvarks were least common. No major differences were observed between EFC and LFC phases. However, inter-taxa distributions varied among farmers and foragers. Whereas dassie and pangolin/aardvark bones were much more common among Holocene foragers than farmers, far fewer southern Africa LSA sites preserved megafauna bones compared to EFC and LFC sites.

Taphonomic factors could have contributed to some of the patterns described here. For instance, higher degrees of bone weathering can disproportionately preserve the more robust bones of larger animals (medium and large bovids, suids, zebras, and megafauna) compared to those from smaller taxa (dassies, rodents, hares, and birds). If this were true for some of the assemblages included here, then we would have expected artificially reduced diversity measures among certain sites. However, given the large number of sites studied and the overall consistency of the taxonomic patterns observed among archaeological groups, it seems unlikely that such factors significantly altered our results.

In the following sections, we discuss the ways regional taxonomic patterns associated with diversified hunting practices among Holocene farming communities in southern Africa related to people's interactions with animals in the past. In doing so, we explore the unique worldviews that shaped the EFC and LFC archaeological records.

## Discussion

Our overall findings highlight a widespread pattern of diversified hunting strategies among southern African farmers ca. AD 300 to 1950. From a regional perspective, wild versus domestic taxonomic frequencies indicate that hunting was important during both EFC and LFC phases, with a slightly greater regional emphasis on animal husbandry during the second millennium AD. However, proportions of wild animal bones differ significantly among sites from similar time periods. For instance, non-domestic taxa comprise 84.6% (by MNI) of all identifiable bones from the Mwenezi Farm LFC site (ca. AD 650–1800; Man-yanga 2001, p. 65) compared to 0.5% from Great Zimbabwe (ca. AD 1300–1450; Brain 1974). This suggests that wild animals were of varying economic importance to Holocene southern African farmers (see below, Why Did EFC and LFC Hunters Hunt?).

Given that animals commonly associated with subsistence hunting (e.g., warthogs, zebra, and impala) dominated (> 50%) all EFC and LFC wild faunal assemblages, it is possible that socioeconomic variability influenced people's reliance on wild game. However, mostly consistent frequencies of taxa associated with craft production (e.g., carnivores), trade (e.g., megafauna), and ritual activities (e.g., pangolins and pythons) at EFC and LFC sites—independent of sample size and proportion of wild animal bones—demonstrate that hunting was also deeply integrated into the cultural systems of early farming groups. Evidence of a less restricted, more generalized approach to wild animal use among southern African farmers, relative to specialized herders in eastern Africa, complement these findings and suggest that the ways Holocene farmers understood themselves in relation to the natural world influenced how they approached hunting (see below, The Hunter-Farmers of Southern Africa).

Although basic taxonomic diversity patterns at southern African EFC, LFC, and LSA sites suggest similarities in the ways people engaged with the natural world, differences in the regional distribution of certain types of animals could provide insights into the specific motivations that drove either group to hunt. Taxonomic ubiquity measures show that Holocene foragers and farmers widely targeted carnivores, ungulates <1000 kg, rodents >2 kg, hares, birds, and reptiles. However, evidence of a greater emphasis on megafauna and less focus on pangolin/aardvark hunting among EFC and LFC hunters compared to Holocene foragers could reflect the different commercial, ritual, and dietary requirements of either group.

In the following sections, we discuss the zooarchaeological literature on wild animal use at individual EFC and LFC sites in relation to regional faunal patterns. These examples provide contextual information for interpreting the diverse social and economic motivations that shaped the faunal records of later Holocene farmers in southern Africa. We then consider how findings from this study inform ongoing discussions about the cosmological worldviews that shaped the archaeological record of early food producers in southern Africa.

## Why Did EFC and LFC Hunters Hunt?

Previous zooarchaeological research in southern Africa has emphasized a diversity of economic and social reasons for hunting among Holocene farming communities. Some zooarchaeologists have discussed wild animals as a supplementary meat source for farmers when access to domestic stock was restricted at individual sites or groups of sites due to low social status or disease (e.g., trypanosomiasis) (Manzanga 2001; Plug 1997, 2000). Our study reinforces these findings, showing that wild taxa associated with subsistence hunting among ethnographic Bantu-speaking groups (e.g., zebras, bovids, and warthogs) were common at all EFC and LFC sites in the region. Frequencies of wild versus domestic animal bones indicate that people's reliance on game meat decreased only slightly over time, from a regional perspective. However, high synchronic variability in the amount of wild animal bones suggests that the dietary importance of hunting varied widely from site to site. Differences in the availability of cattle, sheep, or goats—and thus requirements for wild meat—could have influenced these patterns, but the extent to which people hunted because they had to is difficult to test without detailed site-level socioeconomic or local paleoenvironmental (i.e., disease “barriers,” see Gifford-Gonzalez 2000, 2017) information. Evidence for non-food-related wild taxa and high taxonomic diversity across EFC and LFC sites, on the other hand, aligns with other faunal studies at individual farming sites that highlight hunting motivations beyond necessity.

Zooarchaeologists have linked wild animal bones to various non-subsistence-related economic activities at Holocene farming sites across southern Africa. Morton and Hitchcock (2014) suggested that farmers in Botswana and South Africa used parts of elephants, rhinoceroses, lions, and leopards for creating a wide range of clothing and adornments to symbolize and reinforce the status and authority of community leaders at LFC sites. Based on ethnographic observations, Thorp (1984) also argued that hunters at Khami killed cheetahs, civets, genets, leopards, lions, servals, and wild cats for their skins and gave them as tribute to chiefs. Other scholars have attributed elephant ivory at farming sites in Botswana (Reid and Segobye 2000), South Africa (Coutu et al. 2016), and Zimbabwe (Pwiti 1991; Voigt 1981) to Indian Ocean and transcontinental trade and local exchange networks across Africa (Chirikure 2017; Pwiti 2005). Some researchers have also suggested that rhinoceros' horns and leopard skins were traded (Badenhorst et al. 2011b; Boeyens and van der Ryst 2014; Pwiti 1991; Voigt 1981), but this has been difficult to test because many of these materials do not preserve archaeologically. The prevalence of animal bones related to craft production and trade (e.g., megafauna and carnivores) at all EFC and LFC sites we examined indicates that hunting for commercial and symbolic purposes was a common and widespread practice among Holocene farmers over the last ~2000 years.

Recent Bantu speakers in southern Africa also occasionally ate the meat of large animals like elephant and hippopotamus. However, the ubiquity of megafauna bones at farming sites suggests this was not the only reason that people hunted these animals in the past. Although foragers would have acquired all (or almost all) of their meat from wild sources, evidence of LSA megafauna hunting is rare in southern Africa. Animals weighing over 1000 kg can be dangerous to pursue and many hunts

end in failure (Lupo and Schmitt 2016). It is therefore no surprise that Holocene hunter-gatherers would have preferred to target smaller, less-menacing taxa such as antelope, dassies, or tortoises. Although EFC and LFC hunters would have faced the same risks, elephant, rhinoceros, hippopotamus, and giraffe bones were commonly identified at Holocene farming sites. Because farmers do not necessarily depend on wild meat to the same degree that foragers do, non-subsistence-related economic factors (i.e., crafts and trade) likely motivated people to repeatedly go after dangerous and elusive large game animals in the past.

Scholars have also explicitly discussed the integration of wild animals into the ritual systems of farmers at two sites in southern Africa. In a pioneering study at Khami—a large stone-walled site in Zimbabwe—Thorp (1984) argued that the bones of certain taxa, including aardvark, hare, dassie, and jackal, resulted from ritual activities performed by n’angas (traditional healers). At the Ratho Kroonkop hilltop site in the Shashe-Limpopo Confluence Area of South Africa, Brunton et al. (2013) also attributed a highly diverse, wild-dominated faunal assemblage that included various small mammal, bird, and reptile species to rain-control rituals practiced by farming communities. Evidence of spiritually and symbolically significant animals (e.g., primates, pangolins, pythons, and crocodiles) at all but one Holocene farming site (Mabjanamatshwana) indicates that Khami and Ratho Kroonkop were not cultural outliers. Instead, our findings show that hunting for ritual purposes represented a small, but important component of regional EFC and LFC hunting strategies. In further support of this argument, reliably low (<16% of all hunted taxa by MNI) “ritual” taxonomic frequencies are consistent with expectations—based on ethnographic observations—that the numbers of wild animals needed for rituals would have been less than for other subsistence and non-subsistence-related economic activities.

As with megafauna, variability in the distribution of two ritually significant taxa—pangolins and aardvarks—at EFC, LFC, and LSA sites in southern Africa could reflect differences in farmer versus forager hunting motivations. Pangolins and aardvarks are identified at nearly 70% of Holocene forager sites in southern Africa. However, less than 20% of all EFC and LFC sites preserve bones from these animals. Pangolin and aardvark hunting at LSA sites likely reflects dietary factors, perhaps in addition to ritual hunting (Plug 1996), because of how easily these animals can be located and captured (Hitchcock et al. 1996; Soewu and Sodeinde 2015). Although farmers could just as readily have hunted pangolins and aardvarks for meat, our findings suggest this was not common. It is possible that intensive hunting reduced pangolin and aardvark populations at settled farming sites (see Badenhorst 2015), thereby resulting in fewer instances of people hunting them. However, our analyses do not show a reduction in overall pangolin/aardvark hunting patterns over time. Taxonomic ubiquity measures also indicate that other demographically vulnerable animals like carnivores and reptiles were widely hunted at both EFC and LFC sites. Coupled with evidence of low-level ritual hunting across southern Africa, these findings provide evidence that Holocene farmers chose to target pangolins and aardvarks for primarily symbolic reasons, rather than subsistence.

The types of wild animals identified at EFC and LFC sites indicate that hunting for non-dietary purposes was common practice among Holocene farmers. However,

it should be noted that some taxa were likely targeted for multiple purposes; mega-fauna, for instance, could have been hunted to facilitate trade and sociopolitical relations but also eaten in some cases (Andersson 1856; Larson 1989). Farmers likely also hunted many bovid species for meat, as well as to make tools and clothing (Morton and Hitchcock 2014). Small mammals (e.g., medium and large rodents, dassies, and hares) and tortoises were possibly captured for food—as argued for some LSA foragers in eastern Africa (Jones and Brandt 2022; Jones et al. 2018; Prendergast et al. 2016; Roberts et al. 2020) and recent San groups in the Kalahari Desert (Kent 1993; Lee and Yellen 1976; Yellen 1991)—as well as to protect crops (Badenhorst et al. 2016) and for ritual use (Morton and Hitchcock 2014). This inclusion of wild animals into many different aspects of Holocene farming societies not only speaks to the complexity of EFC and LFC lifeways but also provides evidence that Holocene farmers integrated the natural world into their cultural and ideological identities in ways not often discussed among food-producing societies in Africa.

### The Hunter-Farmers of Southern Africa

Our study is the first subcontinental analysis of zooarchaeological data aimed at understanding relationships among the hunting decisions and belief systems of early food producers in southern Africa. Comparative studies of recent and archaeological herder and hunter-gatherer groups in eastern Africa provide conceptual precedent for this type of analysis. In eastern Africa, anthropologists have argued that by avoiding certain types of wild game (namely those with claws or fingernails) some recent pastoralist groups differentiated themselves from nearby foragers, thereby constituting oppositional identities (Galaty 1982, p. 6; Newman 1970). Given the recent arrival of Maasai and other pastoralist groups to eastern Africa (Spear 1981, pp. 33–43), ideological continuity among ethnographic and archaeological herders was not presumed. However, Marshall (1990) hypothesized that the overall lack of non-domestic fauna at Elmenteitan PN sites in southwest Kenya—where millions of wildebeest and zebra migrate each year and hunting opportunities would have been great—indicates that past herding groups also limited their affiliation with wild animals to differentiate themselves from nearby hunter-gatherers. Diversity data summarized here supports these arguments, showing that LSA foragers hunted a much wider range of wild taxa than PN herders (who primarily targeted ungulates and birds) in eastern Africa. Conversely, our findings do not demonstrate fundamentally different hunting strategies among later Holocene farmers and foragers in southern Africa.

Considered alongside previous ethnographic and iconographic research in the region, comparatively high taxonomic diversity among LSA, EFC, and LFC sites emphasizes the incorporation of people and animals into inclusive, integrated worldviews. Lewis-Williams (1980, 1987) has argued, based on contemporary San mythology, that LSA rock art images of shamans in trance turning themselves into animal forms (e.g., jackals and lions to protect settlements, or elands and elephants during healing or rainmaking ceremonies) illustrate fluid boundaries between Holocene hunter-gatherer groups and wild animals. Although the literature on southern

African forager ritual and symbolism does not often dwell on the interplay among behaviors and belief systems outside shamanism and rock art (Dowson 2007; Guenther 2019; Lewis-Williams 1997; Lewis-Williams and Dowson 1990; Low 2014), regional faunal patterns here associate integrated perspectives on human/animal boundaries with highly diversified hunting approaches among LSA groups.

Less attention has been paid to understanding the ways early farmers in the region related to the natural world. However, scholars have argued that the widespread use of totems to define individual and group identities indicate the inclusion of wild animals in the cultural systems of pre- and post-colonial farming communities (Boeyens and van der Ryst 2014; Galaty 2014; Larson 1989; Manyanga and Pangeti 2017). Our findings do not specifically denote wild animal totems in the past, but the overall diversity and types of taxa identified at EFC and LFC sites show that wild animals likely played a dynamic role in spirit mediation and structuring farmer relations with the natural world over the last ~ 2000 years.

It is unclear whether these patterns reflect syncretism among Holocene farmer and forager perspectives or distinct traditions that look similar zooarchaeologically. For example, diversified approaches to wild animal use among EFC and LFC identities could have developed as farmers moved south into unfamiliar landscapes and interacted with local LSA groups. Alternatively, integrated perspectives on the natural world among Holocene farmers might link back to western Africa, where Bantu languages originated (Philippson and Grollemund 2019). More faunal data from mid- and later Holocene farming sites in western, central, and eastern Africa are needed to assess this hypothesis. Regardless of how southern African farmer worldviews developed, however, findings from this study align with changing ways that some archaeologists have been thinking about forager/food producer cultural dichotomies in southern Africa—specifically regarding calls to dismantle them.

Discussions around economic fluidity among southern African cultural groups can be traced back to the “Kalahari debates” of the 1980s and 1990s. Centered on questions about whether recent San groups represented perpetual foragers who relied on wild foods since the Pleistocene (Sadr 1997; Smith 1996), ongoing conversations about hunter-gatherer continuity in southern Africa have highlighted problems with the rigidity of traditional anthropological and archaeological subsistence-based cultural categories (Forssman 2022; Horsburgh et al. 2016; Plug 2018). Disagreements about the ways archaeologists should characterize the introduction and spread of domesticated animals in southern Africa have also drawn specific attention to the shortcomings of terms like ‘herder’ and ‘forager’ (Sadr 2015; Smith 2006).

Similar conversations about how archaeologists define “farmers” in southern Africa have suggested that broad-spectrum hunting for social and economic purposes crosscut the spread of specialized food production and the rise of complex societies in southern Africa. De Luna (2016), for example, combined historical, ethnographic, linguistic, and archaeological evidence to argue that later Holocene Botatwe communities practiced a fluid form of subsistence that involved agriculture, livestock management, gathering, hunting, and fishing in central and southern Zambia between AD 500 and 1700. She contends that people’s dynamic relationships with wild plants and animals helped so-called food-producing groups adapt to changing social and environmental conditions over time.

Chirikure (2019) echoed this idea, arguing that the incorporation of wild and domestic animals into a unified cultural system was a central feature of southern African Bantu-speaking farming societies throughout the later Holocene. Our study supports and builds on these arguments by emphasizing the widespread importance of hunting for sustaining Holocene farmer economic, social, political, and ritual systems. This resilience of “forager”-like lifeways among “farmer”-like groups in southern Africa questions the validity of longstanding archaeological frameworks that emphasize strict ideological divisions among food-producing and food-foraging societies in non-Western contexts globally.

## Conclusions

By emphasizing the integration of natural and cultural systems among Bantu-speaking agropastoralists, we situate African data and perspectives—which were conspicuously lacking, previously—within global debates about the ways food producers relate to wild animals. A greater emphasis on Indigenous philosophies and relational ontologies among foraging societies, mostly in Eurasia and the Americas, underscores the need for more comprehensive models for defining cultural diversity in the archaeological record. Although evidence that wild animals were important to early food producers is not a necessarily a new finding (e.g., Schibler 2017; Zvelebil and Rowley-Conwy 1984), previous studies emphasizing the importance of hunting among early farmers in northern Europe and other regions contrast with the ways African food producers are often portrayed archaeologically. In southern Africa, the significance of cattle to the identities, ideologies, and economic systems of Bantu-speaking societies has long overshadowed people’s relationships with hunting. As a result, the roles of wild animals were considered only on a site-by-site basis and not integrated into larger considerations of who early farmers were and how they understood the world.

According to Enlightenment-era models that emphasize the economic significance of animals for defining major cultural transitions in human history, we would have expected decreasing engagement with wildlife as societies became increasingly reliant on domestic stock. Our data, however, demonstrate that wild animals remained integral to farmer lifeways despite changing settlement patterns and group dynamics associated with cattle husbandry during the second millennium AD. Thus, at a very broad level, our findings suggest that the adoption of and reliance on food-producing activities did not preclude people from maintaining complex, inclusive ideas about themselves and the world around them. By casting doubt on older perspectives that sharply divide culture (people, crops, and cattle) from nature (wild plants and animals) among food producers, this study extends the geographic and conceptual scopes of ongoing debates about pre-Victorian belief systems. In doing so, our findings support the notion that neolithization is not synonymous with ideological homogenization.

## Future Directions

Despite the contributions of this study to southern African archaeology and beyond, questions remain about how people's perspectives on and interactions with wild animals related to meaning at different scales in the past. Of particular interest is whether the overall patterns documented here reflect ideological uniformity among Holocene farmers or overgeneralize a wide range of variable belief systems. To address this issue and examine the roles hunting and wild animals played in local people's daily lives requires additional faunal studies from a range of site types and contexts (i.e., burials, feasting pits, and refuse middens) across the region. Zooarchaeological studies that emphasize context and taphonomy will provide especially important information for interpreting the ways people manipulated and interacted with wild animal remains at a personal level. This information, considered regionally, will help build a clearer, more coherent picture of EFC and LFC lifeways. In addition to more context-specific data, an overall lack of faunal information from Holocene farmer sites in eastern Africa and pre-Bantu herder sites in southern Africa preclude broader investigations into the geographic and temporal variability of EFC and LFC hunting and worldviews. The integration of these types of datasets would improve the overall strength and scope of this study.

Outside southern Africa, our use of comparative faunal diversity and taxonomic patterns to interpret past human–animal relations provides conceptual and methodological precedent for similar studies elsewhere. Evidence that cultural beliefs influenced the ways people interacted with animals in disparate regions in Africa suggests that hunting variability should also map on to geographic and cultural diversity in other world regions. By conducting large-scale comparative investigations into human–animal relations, like this one, scholars could provide useful datasets for interrogating questions about the ways human belief systems and economic strategies relate at different spatial and temporal scales. However, the quality and availability of published faunal data limit opportunities for these types of studies.

In southern Africa, we benefitted from over 30 years of rigorous zooarchaeological research and reporting by scholars at institutions like the Ditsong: National Museum of Natural History (formerly Transvaal Museum) in South Africa. This work provides a critical mass of data for investigating past hunting patterns at a subcontinental scale. However, variability in the ways some faunal data were presented—for example, reporting certain taxa (i.e., mammals) and not others or publishing only narrative explanations of faunal assemblages without quantitative tables—limited the number of datasets that we were able to include. To address this issue future faunal reports and studies that include faunal data should strive to include the following information: quantitative data on all taxa recovered (i.e., mammals, birds, reptiles, amphibians, and fish), NISP and MNI measures by taxa and context, contextual information (e.g., stratigraphic and chronological relationships) for all bones, taphonomic information (e.g., bone weathering and carnivore gnawing) for all bones, and detailed identification methods (e.g., who

made the identifications? What comparative collections were used?). Systematically publishing faunal information in this way will help create opportunities for more impactful, large-scale faunal studies in future. In the long run, the contribution of raw zooarchaeological datasets to open context repositories—when scholars are ready—would also greatly benefit zooarchaeology in Africa.

In addition to its intellectual contributions, the analysis of published material also helps mitigate practical challenges currently faced by many archaeologists working in Africa and elsewhere. For example, a lack of funding for new projects and increasingly unstable academic employment (Brami et al. 2023; Cramb et al. 2022)—impacting lab access and paid research time—for many early career researchers can make it difficult to obtain, analyze, and publish new archaeological datasets. By maximizing datasets that are already available, studies like this one offer a feasible way to contribute new and important archaeological findings without necessarily relying on external support.

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## Declarations

**Conflict of interest** The authors declare that they have no conflict of interest.

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## References

- Alaica, A. K. (2018). Partial and complete deposits and depictions: Social zooarchaeology, iconography and the role of animals in Late Moche Peru. *Journal of Archaeological Science: Reports* **20**: 864–872.
- Ambrose, S. H. (1998). Chronology of the Later Stone Age and food production in East Africa. *Journal of Archaeological Science* **25**: 377–392.
- Ambrose, S. (2001). East African Neolithic. In Peregrine, P. N., and Ember, M. (eds.), *Encyclopedia of Prehistory: Volume 1: Africa*, Springer, Boston, pp. 97–109.
- Andersson, C. J. (1856). *Lake Ngami; or, Explorations and Discoveries During Four Years' Wanderings in the Wilds of Southwestern Africa*, Dix, Edwards and Company, New York.
- Arthur, K. H. (2018). *The Lives of Stone Tools: Crafting the Status, Skill, and Identity of Flintknappers*, University of Arizona Press, Tucson.

- Ashby, S. P. (2002). The role of zooarchaeology in the interpretation of socioeconomic status: A discussion with reference to medieval Europe. *Archaeological Review from Cambridge* **18**: 37–59.
- Ashley, C. Z., and Grillo, K. M. (2015). Archaeological ceramics from eastern Africa: Past approaches and future directions. *Azania: Archaeological Research in Africa* **50**: 460–480.
- Badenhorst, S. (2003). The archaeofauna from iNkolimahashi Shelter, a Later Stone Age shelter in the Thukela Basin, KwaZulu-Natal, South Africa. *Southern African Humanities* **15**: 45–57.
- Badenhorst, S. (2010). Descent of Iron Age farmers in southern Africa during the last 2000 years. *African Archaeological Review* **27**: 87–106.
- Badenhorst, S. (2011). Measuring change: Cattle and caprines from Iron Age farming sites in southern Africa. *South African Archaeological Bulletin* **66**: 167–172.
- Badenhorst, S. (2015). Intensive hunting during the Iron Age of southern Africa. *Environmental Archaeology* **20**: 41–51.
- Badenhorst, S., and Parsons, I. (2015). Fauna from five Later Stone Age sites in the Bushmanland region of South Africa. *Annals of the Ditsong National Museum of Natural History* **5**: 1–10.
- Badenhorst, S., Plug, I., and Boshoff, W. S. (2011a). Faunal remains from test excavations at Middle and Late Iron Age sites in the Limpopo Valley, South Africa. *Annals of the Ditsong National Museum of Natural History* **1**: 23–31.
- Badenhorst, S., Sinclair, P., Ekblom, A., and Plug, I. (2011b). Faunal remains from Chibuene, an Iron Age coastal trading station in central Mozambique. *Southern African Humanities* **23**: 1–15.
- Badenhorst, S., Ashley, C., and Barkhuizen, W. (2016). A consideration of garden hunting by Iron Age farmers in the Limpopo Valley and surrounding regions of southern Africa. *Annals of the Ditsong National Museum of Natural History* **6**: 18–25.
- Badenhorst, S., Mitchell, P., Arthur, C., and Capelli, C. (2019). Late Holocene fauna from Moshebi's Shelter, a Later Stone Age site in Lesotho. *Southern African Humanities* **32**: 83–107.
- Baiyewu, A. O. (2016). Ethnozoological survey of the traditional uses of Temminck's Ground Pangolin (*Smutsia temminckii*, Smuts 1832) within South African tribal communities falling in the species distributional range. Unpublished Magister Technologiae: Environment Management thesis, Department of Environmental, Water and Earth Sciences, Tshwane University of Technology, Pretoria.
- Barker, G. (1978). Economic models for the Manekweni Zimbabwe, Mozambique. *Azania: Journal of the British Institute in Eastern Africa* **13**: 71–100.
- Barker, G. (1992). Animals as wealth in the African Iron Age: The origins of status? *Anthropozoologica* **16**: 47–52.
- Barrow, J. (1806). *A Voyage to Cochinchina in the Years 1792 and 1793*, T. Cadell and W. Davies Press, London.
- Bellwood, P. (2023). *First Farmers: The Origins of Agricultural Societies*, John Wiley and Sons, Hoboken.
- Berglund, A.-I. (1976). *Zulu Thought-Patterns and Symbolism*, Swedish Institute of Missionary Research, Uppsala.
- Birch, S. E. P. (ed.) (2018). *Multispecies Archaeology*, Routledge, New York.
- Bird-David, N. (1990). The giving environment: Another perspective on the economic system of gatherer-hunters. *Current Anthropology* **31**: 189–196.
- Blench, R. (2009). Was there an interchange between Cushitic pastoralists and Khoisan speakers in the prehistory of southern Africa and how can this be detected? *Sprache und Geschichte in Afrika* **20**: 31–49.
- Blois, J. L., McGuire, J. L., and Hadly, E. A. (2010). Small mammal diversity loss in response to late-Pleistocene climatic change. *Nature* **465**: 771–774.
- Bodenhorn, B. (1990). "I'm not the great hunter, my wife is": Inupiat and anthropological models of gender. *Études/Inuit/Studies* **14**: 55–74.
- Boeyens, J. C., and van der Ryst, M. M. (2014). The cultural and symbolic significance of the African rhinoceros: A review of the traditional beliefs, perceptions and practices of agropastoralist societies in southern Africa. *Southern African Humanities* **26**: 21–55.
- Boyd, B. (2017). Archaeology and human–animal relations: Thinking through anthropocentrism. *Annual Review of Anthropology* **46**: 299–316.
- Braidwood, R. J. (1960). The agricultural revolution. *Scientific American* **203**: 130–152.
- Brain, C. K. (1974). Human food remains from the Iron Age at Zimbabwe. *South African Journal of Science* **70**: 303–309.

- Brami, M., Emra, S., Muller, A., Preda-Bălănică, B., Irvine, B., Milić, B., et al. (2023). A precarious future: Reflections from a survey of Early Career Researchers in archaeology. *European Journal of Archaeology* **26**: 226–250.
- Brunton, S., Badenhorst, S., and Schoeman, M. H. (2013). Ritual fauna from Ratho Kroonkop: A second millennium AD rain control site in the Shashe-Limpopo confluence area of South Africa. *Azania: Archaeological Research in Africa* **48**: 111–132.
- Bullock, C. (1931). Totemism among the Mashona tribes. *Man* **31**: 184–187.
- Bullock, C. (1950). The origin and nature of Totemism among the Mashona. *South African Journal of Science* **47**: 113–117.
- Campbell, J. (1822). *Travels in South Africa: Second Journey, Vol. 1*, Francis Westley Press, London.
- Carruthers, J., Boshoff, A., Slotow, R., Biggs, H. C., Avery, G., Matthews, W., et al. (2008). The elephant in South Africa: History and distribution. In Scholes, R. J., and Mennell, K. G. (eds.), *Elephant Management: A Scientific Assessment for South Africa*, Witwatersrand University Press, Witwatersrand, pp. 23–83.
- Childe, V. G. (1936). *Man Makes Himself*, Watts, London.
- Chirikure, S. (2007). Metals in society: Iron production and its position in Iron Age communities of southern Africa. *Journal of Social Archaeology* **7**: 72–100.
- Chirikure, S. (2017). Documenting precolonial trade in Africa. In Spear, T. (ed.), *The Oxford Research Encyclopedia of African History*, Oxford University Press, Oxford, pp. 1–23.
- Chirikure, S. (2019). Gathering and hunting farmers; farming gatherers and hunters: So, what? *African Archaeological Review* **36**: 161–167.
- Chirikure, S., Manyanga, M., Pikirayi, I., and Pollard, M. (2013). New pathways of sociopolitical complexity in southern Africa. *African Archaeological Review* **30**: 339–366.
- Collett, D. P., and Robertshaw, P. T. (1980). Early iron age and Kansyore pottery: Finds from Gogo Falls, South Nyanza. *Azania: Journal of the British Institute in Eastern Africa* **15**: 133–145.
- Comaroff, J. G., and Comaroff, J. L. (1990). Goodly beasts, beastly goods: Cattle and commodities in a South African context. *American Ethnologist* **17**: 195–216.
- Comaroff, J. G., and Comaroff, J. L. (2018). "How beasts lost their legs": Cattle in Tswana economy and society. In Galaty, J. G., and Bonte, P. (eds.), *Herders, Warriors, and Traders: Pastoralism in Africa*, Routledge, New York, pp. 33–61.
- Coutu, A. N., Whitelaw, G., Le Roux, P., and Sealy, J. (2016). Earliest evidence for the ivory trade in southern Africa: Isotopic and ZooMS analysis of seventh–tenth century AD ivory from KwaZulu-Natal. *African Archaeological Review* **33**: 411–435.
- Crabtree, P. J. (1995). The symbolic role of animals in Anglo-Saxon England: Evidence from burials and cremations. In Ryan, K., and Crabtree, P. J. (eds.), *The Symbolic Role of Animals in Archaeology*, Museum of Archaeology and Anthropology, University of Pennsylvania, Philadelphia, pp. 20–26.
- Cramb, J., Ritchison, B. T., Hadden, C. S., Zhang, Q., Alarcón-Tinajero, E., Chen, X., et al. (2022). The changing profile of tenure-track faculty in archaeology. *Advances in Archaeological Practice* **10**: 371–381.
- Culley, C., Janzen, A., Brown, S., Prendergast, M. E., Shipton, C., Ndiema, E., et al. (2021). Iron Age hunting and herding in coastal eastern Africa: ZooMS identification of domesticates and wild bovids at Panga ya Saidi, Kenya. *Journal of Archaeological Science* **130**: 105368.
- Deacon, J. (1984). Later Stone Age people and their descendants in southern Africa. In Klein, R. G. (ed.), *Southern African Prehistory and Palaeoenvironments*, A. A. Balkema, Rotterdam, pp. 221–329.
- De Luna, K. M. (2016). *Collecting Food, Cultivating People: Subsistence and Society in Central Africa*, Yale University Press, New Haven.
- Denbow, J. (2017). Interactions among precolonial foragers, herders, and farmers in southern Africa. *Oxford Research Encyclopedia of African History*, retrieved 22 July 2023, from <https://oxfordre.com/africanhistory/view/https://doi.org/10.1093/acrefore/9780190277734.001.0001/acrefore-9780190277734-e-71>.
- Descola, P. (2014). Beyond nature and culture. In Harvey, G. (ed.), *The Handbook of Contemporary Animism*, Routledge, London, pp. 77–91.
- Dowson, T. A. (2007). Debating shamanism in southern African rock art: Time to move on. *South African Archaeological Bulletin* **62**: 49–61.
- Dusseldorp, G. L. (2016). Faunal assemblage structure suggests a limited impact of the introduction of domestic stock on Later Stone Age subsistence economies in South Africa. *African Archaeological Review* **33**: 363–383.
- Ehret, C. (2008). The early livestock raisers of southern Africa. *Southern African Humanities* **20**: 7–35.

- Elton, F. (1872). Journal of an exploration of the Limpopo River. *Journal of the Royal Geographical Society of London* **42**: 1–49.
- Esterhuysen, A. B., Behrens, J., and Harper, P. (1994). Leliehoek Shelter: A Holocene sequence from the eastern Orange Free State. *South African Archaeological Bulletin* **49**: 73–78.
- Fagan, B. M. (1966). Early Iron Age pottery in eastern and southern Africa. *Azania: Journal of the British Institute in Eastern Africa* **1**: 101–109.
- Fagan, B. M. (1969). Early trade and raw materials in south central Africa. *Journal of African History* **10**: 1–13.
- Faith J. T. (2008). Eland, buffalo, and wild pigs: Were Middle Stone Age humans ineffective hunters? *Journal of Human Evolution* **55**: 24–36.
- Faith, J. T., and Du, A. (2018). The measurement of taxonomic evenness in zooarchaeology. *Archaeological and Anthropological Sciences* **10**: 1419–1428.
- Fausto, C. (2007). Feasting on people: Eating animals and humans in Amazonia. *Current Anthropology* **48**: 497–530.
- Fauvelle-Aymar, F. X. (2008). Against the 'Khoisan paradigm' in the interpretation of Khoekhoe origins and history: A re-evaluation of Khoekhoe pastoral traditions. *Southern African Humanities* **20**: 77–92.
- Ferguson, J. (1985). The bovine mystique: Power, property and livestock in rural Lesotho. *Man* **20**: 647–674.
- Forssman, T. (2022). An archaeological contribution to the Kalahari Debate from the middle Limpopo Valley, southern Africa. *Journal of Archaeological Research* **30**: 447–495.
- Galaty J. G. (1982). Being "Maasai," being "people of cattle": Ethnic shifters in East Africa. *American Ethnologist* **9**: 1–20.
- Galaty, J. G. (2014). Animal spirits and mimetic affinities: The semiotics of intimacy in African human/animal identities. *Critique of Anthropology* **34**: 30–47.
- Garlake, P. S. (1973). *Great Zimbabwe*, Thames and Hudson, London.
- Gidney, L. (2000). Economic trends, craft specialisation and social status: Bone assemblages from Leicester. In Rowley-Conwy, P. (ed.), *Animal Bones, Human Societies*, Short Run Press, Exeter, pp. 170–178.
- Gifford-Gonzalez, D. (2000). Animal disease challenges to the emergence of pastoralism in sub-Saharan Africa. *African Archaeological Review* **17**: 95–139.
- Gifford-Gonzalez, D. (2017). "Animal disease challenges" fifteen years later: The hypothesis in light of new data. *Quaternary International* **436**: 283–293.
- Goldstein, S. T. (2021). Lithic technological organization of the "Elmenteitan" early herders in southern Kenya: Implications for mobility, exchange, and climatic resilience. *Journal of Anthropological Archaeology* **61**: 101259.
- Grau-Sologestoa, I. (2017). Socio-economic status and religious identity in medieval Iberia: The zooarchaeological evidence. *Environmental Archaeology* **22**: 189–199.
- Grayson, D. K. (1984) *Quantitative Zooarchaeology*, Academic Press, Orlando.
- Grayson, D. K. (2000). Mammalian responses to middle Holocene climatic change in the Great Basin of the western United States. *Journal of Biogeography* **27**: 181–192.
- Grayson, D. K., and Delpech, F. (2002). Specialized early Upper Paleolithic hunters in southwestern France? *Journal of Archaeological Science* **29**: 1439–1449.
- Grayson, D. K., and Delpech, F. (2006). Was there increasing dietary specialization across the Middle-to-Upper Paleolithic transition in France? In Conard, N. J. (ed.), *When Neanderthals and Modern Humans Met*, Kerns Verlag, Tübingen, pp. 377–417.
- Grayson, D. K., Delpech, F., Rigaud, J.-P., and Simek, J. F. (2001). Explaining the development of dietary dominance by a single ungulate taxon at Grotte XVI, Dordogne, France. *Journal of Archaeological Science* **28**: 115–125.
- Grillo, K. M., Prendergast, M. E., Contreras, D. A., Fitton, T., Gidna, A. O., Goldstein, S. T., et al. (2018). Pastoral Neolithic settlement at Luxmanda, Tanzania. *Journal of Field Archaeology* **43**: 102–120.
- Grivetti, L. E. (1976). *Dietary Resources and Social Aspects of Food Use in a Tswana Tribe*, unpublished Ph.D. dissertation, Department of Geography, University of California, Davis.
- Guenther, M. (2019). *Human-Animal Relationships in San and Hunter-Gatherer Cosmology, Volume I, Therianthropes and Transformation*, Palgrave Macmillan, Cham.
- Güldmann, T. (2008). A linguist's view: Khoe-Kwadi speakers as the earliest food-producers of southern Africa. *Southern African Humanities* **20**: 93–132.

- Hall, M. (1987). Archaeology and modes of production in pre-colonial southern Africa. *Journal of Southern African Studies* **14**: 1–17.
- Haraway, D. (2006). Encounters with companion species: Entangling dogs, baboons, philosophers, and biologists. *Configurations* **14**: 97–114.
- Henn, B. M., Gignoux, C., Lin, A. A., Oefner, P. J., Shen, P., Scozzari, R., et al. (2008). Y-chromosomal evidence of a pastoralist migration through Tanzania to southern Africa. *Proceedings of the National Academy of Sciences* **105**: 10693–10698.
- Hildebrand, E. A., Grillo, K. M., Sawchuk, E. A., Pfeiffer, S. K., Conyers, L. B., Goldstein, S. T., et al. (2018). A monumental cemetery built by eastern Africa's first herders near Lake Turkana, Kenya. *Proceedings of the National Academy of Sciences* **115**: 8942–8947.
- Hill, E. (2013). Archaeology and animal persons: Toward a prehistory of human-animal relations. *Environment and Society* **4**: 117–136.
- Hitchcock, R. K., Yellen, J. E., Gelburd, D. J., Osborn, A. J., and Crowell, A. L. (1996). Subsistence hunting and resource management among the Ju/'hoansi of northwestern Botswana. *African Study Monographs* **17**: 153–220.
- Horsburgh, K. A., Moreno-Mayar, J. V., and Gosling, A. L. (2016). Revisiting the Kalahari debate in the highlands: Ancient DNA provides new faunal identifications at Sehonghong, Lesotho. *Azania: Archaeological Research in Africa* **51**: 295–306.
- Huffman, T. N. (1982). Archaeology and ethnohistory of the African Iron Age. *Annual Review of Anthropology* **11**: 133–150.
- Huffman, T. N. (2001). The Central Cattle Pattern and interpreting the past. *Southern African Humanities* **13**: 19–35.
- Huffman, T. N., and Hanisch, E.O. M. (1987). Settlement hierarchies in the Northern Transvaal: Zimbabwe ruins and Venda history. *African Studies* **46**: 79–116.
- Ingold, T. (1987). *The Appropriation of Nature: Essays on Human Ecology and Social Relations*, University of Iowa Press, Iowa City.
- Ingold, T. (1994). From trust to domination: An alternative history of human-animal relations. In Manning, A., and Serpell, J. (eds.), *Animals and Human Society: Changing Perspectives*, Routledge, London, pp. 1–22.
- Ingold, T. (2000a). Making culture and weaving the world. In Graves-Brown, P. (ed.), *Matter, Materiality, and Modern Culture*, Routledge, London, pp. 50–71.
- Ingold, T. (2000b). Totemism, animism, and the depiction of animals. In Ingold, T., *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*, Routledge, London, pp. 111–131.
- Jones, E. L. (2004). Dietary evenness, prey choice, and human-environment interactions. *Journal of Archaeological Science* **31**: 307–317.
- Jones, M. B., and Brandt, S. A. (2022). 20,000 years of small game hunting in southern Somalia. *Quaternary International* **634**: 14–26.
- Jones, M. B., and Tibesasa, R. (2022). Kansyore fisher-hunter-gatherers abandoned the northeastern Lake Victoria shoreline during an arid period in the middle Holocene: A reconsideration of dates from western Kenya with new radiometric and faunal evidence from the Namundiri A shell midden, eastern Uganda. *Journal of African Archaeology* **20**: 137–155.
- Jones, M. B., Brandt, S. A., and Marshall, F. (2018). Hunter-gatherer reliance on inselbergs, big game, and dwarf antelope at the Rifle Range site, Buur Hakaba, southern Somalia ~20,000–5,000 BP. *Quaternary International* **471**: 55–65.
- Kelly, L. S. (2000). *Social Implications of Faunal Provisioning for the Cahokia Site: Initial Mississippian, Lohmann Phase*, unpublished Ph.D. dissertation, Department of Anthropology, Washington University, St. Louis, MO.
- Kelly, L. S., and Kelly, J. E. (2007). Swans in the American Bottom during the emergent Mississippian and Mississippian. *Illinois Archaeology* **15**: 112–141.
- Kent, S. (1993). Sharing in an egalitarian Kalahari community. *Man* **28**: 479–514.
- Kinahan, J. (1994). A new archaeological perspective on nomadic pastoralist expansion in south-western Africa. *Azania: Archaeological Research in Africa* **29**: 211–226.
- Kinahan, J. (1996). Alternative views on the acquisition of livestock by hunter-gatherers in southern Africa. *South African Archaeological Bulletin* **51**: 106–108.
- King, A. C. (1984). Animal bones and the dietary identity of military and civilian groups in Roman Britain, Germany and Gaul. In Blagg, T. F. C., and King, A. C. (eds.), *Military and Civilian in Roman Britain: Cultural Relationships in a Frontier Province*, British Archaeological Reports 136, Oxford, pp. 187–217.

- Klehm, C. E. (2017). Local dynamics and the emergence of social inequality in Iron Age Botswana. *Current Anthropology* **58**: 604–633.
- Klein, R. G. (1986). The prehistory of Stone Age herders in the Cape Province of South Africa. *Goodwin Series* **5**: 5–12.
- Knight, J. (ed.) (2020). *Animals in Person: Cultural Perspectives on Human-Animal Intimacies*, Routledge, New York.
- Krige, E. J. (1965). *The Social System of the Zulus*, Shuter and Shooter, Pietermaritzburg.
- Lander, F., and Russell, T. (2018). The archaeological evidence for the appearance of pastoralism and farming in southern Africa. *PLoS One* **13**: e0198941.
- Lander, F., and Russell, T. (2020). A southern African archaeological database of organic containers and materials, 800 cal BC to cal AD 1500: Possible implications for the transition from foraging to livestock-keeping. *PLoS One* **15**: e0235226.
- Lane, P. (2013). Trajectories of pastoralism in northern and central Kenya: An overview of the archaeological and environmental evidence. In Bollig, M., Schnegg, M., and Wotzka, H. P. (eds.), *Pastoralism in Africa: Past, Present and Future*, Berghahn Books, New York, pp. 104–144.
- Larson, T. J. (1989). History and social organization of the Bayeyi of Ngamiland. *South African Journal of Ethnology* **12**: 23–26.
- Lau, H., and Kansa, S. W. (2018). Zooarchaeology in the era of big data: Contending with interanalyst variation and best practices for contextualizing data for informed reuse. *Journal of Archaeological Science* **95**: 33–39.
- Lee, R. B., and Yellen, J. E. (1976). The Dobe-/Du/da environment: Background to a hunting and gathering way of life. In Lee, R. B., and Devore, I. (eds.), *Kalahari Hunter-Gatherers: Studies in the !Kung San and Their Neighbours*, Harvard University Press, Cambridge, pp. 27–46.
- Lev-Tov, J., and McGeough, K. (2007). Examining feasting in Late Bronze Age Syro-Palestine through ancient texts and bones. In Twiss, K. C. (ed.), *The Archaeology of Food and Identity*, Occasional Paper 34, Center for Archaeological Investigations, Southern Illinois University, Carbondale, pp. 85–111.
- Lewis-Williams, J. D. (1980). Ethnography and iconography: Aspects of southern San thought and art. *Man* **15**: 467–482.
- Lewis-Williams, J. D. (1987). A dream of eland: An unexplored component of San shamanism and rock art. *World Archaeology* **19**: 165–177.
- Lewis-Williams, J. D. (1997). The mantis, the eland and the meerkats. *African Studies* **56**: 195–221.
- Lewis-Williams, J. D., and Dowson, T. A. (1990). Through the veil: San rock paintings and the rock face. *South African Archaeological Bulletin* **45**: 5–16.
- Lipson, M., Sawchuk, E. A., Thompson, J. C., Oppenheimer, J., Tryon, C. A., Ranhorn, K. L., et al. (2022). Ancient DNA and deep population structure in sub-Saharan African foragers. *Nature* **603**: 290–296.
- Livingstone, D. (1861). *A Popular Account of Missionary Travels and Researches in South Africa*, John Murray Press, London.
- Losey, R. J., Bazaliiskii, V. I., Garvie-Lok, S., Germonpré, M., Leonard, J. A., Allen, A. L., Katzenberg, M. A., and Sablin, M. V. (2011). Canids as persons: Early Neolithic dog and wolf burials, Cis-Baikal, Siberia. *Journal of Anthropological Archaeology* **30**: 174–189.
- Low, C. (2014). Khoe-San ethnography, ‘new animism’ and the interpretation of southern African rock art. *South African Archaeological Bulletin* **69**: 164–172.
- Lupo, K. D., and Schmitt, D. N. (2016). When bigger is not better: The economics of hunting megafauna and its implications for Plio-Pleistocene hunter-gatherers. *Journal of Anthropological Archaeology* **44**: 185–197.
- Lyman, R. L. (1994). Quantitative units and terminology in zooarchaeology. *American Antiquity* **59**: 36–71.
- Lyman, R. L., and Wolverson, S. (2023). Quantification in zooarchaeology and palaeoethno (archaeo) botany. In Pollard, A. M., Armitage, R. A., and Makarewicz, C. A. (eds.), *Handbook of Archaeological Sciences*, John Wiley and Sons, Hoboken, pp. 1211–1225.
- Magoma, M., Badenhorst, S., and Pikirayi, I. (2018). Feasting among Venda-speakers of South Africa: The Late Iron Age fauna from Mutokolwe. *Anthropozoologica* **53**: 195–205.
- Manyanga, M. (2001). *Choices and Constraints: Animal Resource Exploitation in South-Eastern Zimbabwe c. AD 900–1500*, Studies in African Archaeology Vol. 18, Department of Archaeology and Ancient History, Uppsala University, Uppsala.

- Manyanga, M., and Pangeti, G. (2017). Precolonial hunting in southern Africa: A changing paradigm. In Manyanga, M., and Chirikure, S. (eds.), *Archives, Objects, Places and Landscapes: Multidisciplinary Approaches to Decolonised Zimbabwean Pasts*, African Books Collective, Oxford, pp. 277–294.
- Manyanga, M., Pikirayi, I., and Ndoro, W. (2000). Coping with dryland environments: Preliminary results from Mapungubwe and Zimbabwe phase sites in the Mateke Hills, south-eastern Zimbabwe. *Goodwin Series* **8**: 69–77.
- Marks, S. A. (1977). Hunting behavior and strategies of the Valley Bisa in Zambia. *Human Ecology* **5**: 1–36.
- Marks, S. A. (1979). Profile and process: Subsistence hunters in a Zambian community. *Africa* **49**: 53–67.
- Marks, S. A. (2017). *Large Mammals and a Brave People: Subsistence Hunters in Zambia*, Routledge, Abingdon-on-Thames.
- Marshall, F. (1990). Origins of specialized pastoral production in East Africa. *American Anthropologist* **92**: 873–894.
- Marshall, F., and Hildebrand, E. A. (2002). Cattle before crops: The beginnings of food production in Africa. *Journal of World Prehistory* **16**: 99–143.
- Marshall, F., and Stewart, K. (1994). Hunting, fishing and herding pastoralists of western Kenya: The fauna from Gogo Falls. *Archaeozoologia* **7**: 7–27.
- Marshall, F., Grillo, K., and Arco, L. (2011). Prehistoric pastoralists and social responses to climatic risk in East Africa. In Miller, N. K., Moore, K. M., and Ryan, K. (eds.), *Sustainable Lifeways: Cultural Persistence in an Ever-changing Environment*, University of Pennsylvania Press, Philadelphia, pp. 39–74.
- Matowanyika, J. Z. Z. (1991). *Indigenous Resource Management and Sustainability in Rural Zimbabwe: An Exploration of Practices and Concepts in Common Lands*, Ph.D. dissertation, Department of Geography, University of Waterloo, Canada.
- Miller, J. M., and Wang, Y. V. (2022). Ostrich eggshell beads reveal 50,000-year-old social network in Africa. *Nature* **601**: 234–239.
- Mitchell, P. J. (2002). *The Archaeology of Southern Africa*, Cambridge University Press, Cambridge.
- Moffett, A. J., and Chirikure, S. (2016). Exotica in context: Reconfiguring prestige, power and wealth in the southern African Iron Age. *Journal of World Prehistory* **29**: 337–382.
- Morton, F., and Hitchcock, R. (2014). Tswana hunting: Continuities and changes in the Transvaal and Kalahari after 1600. *South African Historical Journal* **66**: 418–439.
- Nadasdy, P. (2007). The gift in the animal: The ontology of hunting and human-animal sociality. *American ethnologist* **34**: 25–43.
- Nagaoka, L. (2001). Using diversity indices to measure changes in prey choice at the Shag River Mouth site, southern New Zealand. *International Journal of Osteoarchaeology* **11**: 101–111.
- Newman, L. (1970). *The Ecological Basis for Subsistence Change Among the Sandawe of Tanzania*, National Academy of Sciences, Washington, DC.
- Overton, N. J., and Hamilakis, Y. (2013). A manifesto for a social zooarchaeology: Swans and other beings in the Mesolithic. *Archaeological Dialogues* **20**: 111–136.
- Parkington, J. (2003). Eland and therianthropes in southern African rock art: When is a person an animal? *African Archaeological Review* **20**: 135–147.
- Pauketat, T. R., Kelly, L. S., Fritz, G. J., Lopinot, N. H., Elias, S., and Hargrave, E. (2002). The residues of feasting and public ritual at early Cahokia. *American Antiquity* **67**: 257–279.
- Pedersen, M. A. (2001). Totemism, animism and North Asian indigenous ontologies. *Journal of the Royal Anthropological Institute* **7**: 411–427.
- Phillipson, G., and Grollemund, R. (2019). Classifying Bantu languages. In Van de Velde, M., Bostoen, K., Nurse, D., and Phillipson, G. (eds.), *The Bantu Languages*, Taylor and Francis, London, pp. 335–354.
- Phillipson, D. W. (1975). The chronology of the Iron Age in Bantu Africa. *The Journal of African History* **16**: 321–342.
- Phillipson, D. W. (1976). Archaeology and Bantu linguistics. *World Archaeology* **8**: 65–82.
- Phillipson, D. W. (1977). The spread of the Bantu language. *Scientific American* **236**: 106–115.
- Phillipson, D. W. (2005). *African Archaeology, Third Edition*, Cambridge University Press, Cambridge.
- Plug, I. (1979). Namakala and Nanga: Faunal report on two Early Iron Age sites, Zambia. *South African Archaeological Bulletin* **34**: 123–126.
- Plug, I. (1989). Aspects of life in the Kruger National Park during the Early Iron Age. *Goodwin Series* **6**: 62–68.

- Plug, I. (1996). The hunter's choice: Faunal remains from Maqonqo Shelter, South Africa. *Southern African Humanities* **8**: 41–52.
- Plug, I. (1997). Early Iron Age buffalo hunters on the Kadzi River, Zimbabwe. *African Archaeological Review* **14**: 85–105.
- Plug, I. (2000). Overview of Iron Age fauna from the Limpopo Valley. *Goodwin Series* **8**: 117–126.
- Plug, I. (2018). Reply to Horsburgh et al. 2016: 'Revisiting the Kalahari debate in the highlands.' *Azania: Archaeological Research in Africa* **53**: 98–113.
- Plug, I., and Badenhorst, S. (2006). Notes on the fauna from three Late Iron Age mega-sites, Boitsemagano, Molokwane and Mabjanamatshwana, North West Province, South Africa. *South African Archaeological Bulletin* **61**: 57–67.
- Politis, G. (2009). *Nukak: Ethnoarchaeology of an Amazonian People*, Left Coast Press, Walnut Creek, CA.
- Prendergast, M. E., Rouby, H., Punnwong, P., Marchant, R., Crowther, A., Kourampas, N., et al. (2016). Continental island formation and the archaeology of defaunation on Zanzibar, eastern Africa. *PLoS One* **11**: e0149565.
- Prendergast, M. E., Grillo, K. M., Gidna, A. O., and Mabulla, A. Z. (2021). Grinding-stone features from the Pastoral Neolithic at Luxmanda, Tanzania. *Antiquity* **95**: 1–9.
- Pwiti, G. (1991). Trade and economies in southern Africa: The archaeological evidence. *Zambezia* **18**: 119–129.
- Pwiti, G. (1996). Settlement and subsistence of prehistoric farming communities in the mid-Zambezi Valley, northern Zimbabwe. *South African Archaeological Bulletin* **51**: 3–6.
- Pwiti, G. (2005). Southern Africa and the east African coast. In Stahl, A. B. (ed.), *African Archaeology: A Critical Introduction*, Wiley-Blackwell, Hoboken, NJ, pp. 378–391.
- Quin, P. J. (1959). *Foods and Feeding Habits of the Pedi with Special Reference to Identification, Classification, Preparation and Nutritive Value of the Respective Foods*, Witwatersrand University Press, Johannesburg.
- Raum, O. F. (1973). *The Social Functions of Avoidances and Taboos among the Zulu*, De Gruyter, Berlin.
- Reid, A., and Segobye, A. K. (2000). An ivory cache from Botswana. *Antiquity* **74**: 326–331.
- Reshef, H., Anton, M., Bocquentin, F., Vardi, J., Khalaily, H., Davis, L., Bar-Oz, G. and Marom, N. (2019). Tails of animism: A joint burial of humans and foxes in Pre-Pottery Neolithic Motza, Israel. *Antiquity* **93**: 1–8.
- Ritvo, H. (1985). Animal pleasures: Popular zoology in eighteenth-and nineteenth-century England. *Harvard Library Bulletin XXXIII*: 239–279.
- Roberts, P., Prendergast, M. E., Janzen, A., Shipton, C., Blinkhorn, J., Zech, J., et al. (2020). Late Pleistocene to Holocene human palaeoecology in the tropical environments of coastal eastern Africa. *Palaeogeography, Palaeoclimatology, Palaeoecology* **537**: 1–18.
- Russell, N. (2011). *Social Zooarchaeology: Humans and Animals in Prehistory*, Cambridge University Press, Cambridge.
- Russell, T., and Lander, F. (2015). 'What is consumed is wasted': From foraging to herding in the southern African Later Stone Age. *Azania: Archaeological Research in Africa* **50**: 267–317.
- Russell, T., Silva, F., and Steele, J. (2014). Modelling the spread of farming in the Bantu-speaking regions of Africa: An archaeology-based phylogeography. *PLoS One* **9**: e87854.
- Ryan, K., and Crabtree, P. J. (eds.) (1995). *The Symbolic Role of Animals in Archaeology*, Museum of Archaeology and Anthropology, University of Pennsylvania, Philadelphia.
- Sadr, K. (1997). Kalahari archaeology and the Bushman debate. *Current Anthropology* **38**: 104–112.
- Sadr, K. (2003). The Neolithic of southern Africa. *The Journal of African History* **44**: 195–209.
- Sadr, K. (2004). Feasting on Kasteelberg? Early herders on the west coast of South Africa. *Before Farming* **3**: 167–183.
- Sadr, K. (2008a). Invisible herders? The archaeology of Khoekhoe pastoralists. *Southern African Humanities* **20**: 179–203.
- Sadr, K. (2008b). An ageless view of first millennium AD southern African ceramics. *Journal of African Archaeology* **6**: 103–130.
- Sadr, K. (2013). The archaeology of herding in southernmost Africa. In Mitchell, P., and Lane, P. J. (eds.), *The Oxford Handbook of African Archaeology*, Oxford University Press, Oxford, pp. 644–655.
- Sadr, K. (2015). Livestock first reached southern Africa in two separate events. *PLoS One* **10**: e0134215.
- Sadr, K., and Plug, I. (2001). Faunal remains in the transition from hunting to herding in southeastern Botswana. *The South African Archaeological Bulletin* **56**: 76–82.

- Schapera, I. (1971). *Rainmaking Rites of Tswana tribes*, African Social Research Documents Vol. 3, African Studies Centre, Cambridge.
- Schibler, J. (2017). Zooarchaeological results from Neolithic and Bronze Age wetland and dryland sites in the central alpine foreland: Economic, ecologic, and taphonomic relevance. In Albarella, U., Rizzetto, M., Russ, H., Vickers, K., and Viner-Daniels, S. (eds.), *The Oxford Handbook of Zooarchaeology*, Oxford University Press, Oxford, pp. 83–98.
- Schmitt, D. N., and Lupo, K. D. (1995). On mammalian taphonomy, taxonomic diversity, and measuring subsistence data in zooarchaeology. *American Antiquity* **60**: 496–514.
- Shenjere-Nyabezi, P., and Pwiti, G. 2021. Ancient urban assemblages and complex spatial and socio-political organization in Iron Age archaeological sites from southern Africa. In Cesar Fortes-Lima, C., Mtetwa, E., and Schlebusch, C. (eds.), *Africa, the Cradle of Human Diversity: Cultural and Biological Approaches to Uncover African Diversity*, Brill, Leiden, pp. 111–147.
- Shoemaker, A., and Davies, M. I. (2019). Grinding-stone implements in the eastern African Pastoral Neolithic. *Azania: Archaeological Research in Africa* **54**: 203–220.
- Skoglund, P., Thompson, J. C., Prendergast, M. E., Mittnik, A., Sirak, K., Hajdinjak, M., et al. (2017). Reconstructing prehistoric African population structure. *Cell* **171**: 59–71.
- Smith, A. B. (1996). The Kalahari Bushmen debate: Implications for archaeology of southern Africa. *South African Historical Journal* **35**: 1–15.
- Smith, A. B. 2006. *Excavations at Kasteelberg, and the origins of the Khoekhoen in the Western Cape, South Africa*, Cambridge Monographs in African Archaeology 66, British Archaeological Reports International Series, Cambridge.
- Smith, A. B. (2008). Pastoral origins at the Cape, South Africa: Influences and arguments. *Southern African Humanities* **20**: 49–60.
- Soewu, D. A., and Sodeinde, O. A. (2015). Utilization of pangolins in Africa: Fuelling factors, diversity of uses and sustainability. *International Journal of Biodiversity and Conservation* **7**: 1–10.
- Soper, R. (1971a). A general review of the Early Iron Age of the southern half of Africa. *Azania: Journal of the British Institute in Eastern Africa* **6**: 5–37.
- Soper, R. (1971b). Early Iron Age pottery types from East Africa: Comparative analysis. *Azania: Journal of the British Institute in Eastern Africa* **6**: 39–52.
- Spear, T. (1981). *Kenya's Past: An Introduction to Historical Method in Africa*, Longman Publishing Group, New York.
- Stayt, H. A. (1931). *The Bavenda*, Oxford University Press, Oxford.
- Steele, T. E., and Klein, R. G. (2009). Late Pleistocene subsistence strategies and resource intensification in Africa. In Hublin, J. J., and Richards, M. P. (eds.), *The Evolution of Hominin Diets: Integrating Approaches to the Study of Palaeolithic Subsistence*, Springer, Dordrecht, pp. 113–126.
- Stépanoff, C., and Vigne, J.-D. (eds.) (2018). *Hybrid Communities: Biosocial Approaches to Domestication and Other Trans-species Relationships*, Routledge, London.
- Stiner, M. C. (2001). Thirty years on the "broad spectrum revolution" and Paleolithic demography. *Proceedings of the National Academy of Sciences* **98**: 6993–6996.
- Thorp, C. R. (1984). A cultural interpretation of the faunal assemblage from Khami Hill Ruin. In Hall, M., Avery, G., Avery, D. M., Wilson, M. L., and Humphreys, A. J. (eds.), *Frontiers: Southern African Archaeology Today*, BAR Publishing, Oxford, pp. 266–276.
- Thorp, C. R. (1995). *Kings, Commoners, and Cattle at Zimbabwe Tradition Sites*, National Museums and Monuments of Zimbabwe, Harare.
- Turner, G. (1987a). Early Iron Age herders in northwestern Botswana: The faunal evidence. *Botswana Notes and Records* **19**: 7–23.
- Turner, G. (1987b). Hunters and herders of the Okavango Delta, northern Botswana. *Botswana Notes and Records* **19**: 25–40.
- Vansina, J. (1995). New linguistic evidence and 'the Bantu expansion.' *Journal of African History* **36**: 173–195.
- van Zyl, W. J., Badenhorst, S., Taljaard, E., Denbow, J. R., and Wilmsen, E. N. (2013). The archaeofauna from Xaro on the Okavango Delta in northern Botswana. *Annals of the Ditsong National Museum of Natural History* **3**: 49–58.
- Viveiros De Castro, E. (1998). Cosmological deixis and Amerindian perspectivism. *Journal of the Royal Anthropological Institute* **4**: 469–488.
- Vogel, J. O. (1976). The Early Iron Age (AD 500–1100) in the Victoria Falls region, Zambia. *Current Anthropology* **17**: 764–765.

- Voigt, E. A. (1981). The faunal remains from Schroda. In Voigt, E. A. (ed.), *A Guide to Archaeological Sites in the Northern and Eastern Transvaal*, Transvaal Museum, Pretoria, pp. 55–60.
- Wallis, N. J., and Blessing, M. E. (2015). Ritualized deposition and feasting pits: Bundling of animal remains in Mississippian period Florida. *Cambridge Archaeological Journal* **25**: 79–98.
- White, F. (1983). *The Vegetation of Africa: A Descriptive Memoir to Accompany the UNESCO/AETFAT/UNSO Vegetation Map of Africa*, UNESCO, Paris.
- Whitelaw, G. (2015). Economy and cosmology in the Iron Age of KwaZulu-Natal. *Azania: Archaeological Research in Africa* **50**: 423–424.
- Whitridge, P. (2017). The government of dogs. In Bantus, M. R., and Baires, S. E. (eds.), *Relational Engagements of the Indigenous Americas: Alterity, Ontology, and Shifting Paradigms*, Lexington Books, Lanham, pp. 21–40.
- Wilkie, R. (2015). Multispecies scholarship and encounters: Changing assumptions at the human-animal nexus. *Sociology* **49**: 323–339.
- Willerslev, R. (2007). *Soul Hunters: Hunting, Animism, and Personhood Among the Siberian Yukaghirs*, University of California Press, Berkeley.
- Wylie, A. (1982). An analogy by any other name is just as analogical: A commentary on the Gould-Watson dialogue. *Journal of Anthropological Archaeology* **1**: 382–401.
- Wylie, A. (1985). The reaction against analogy. *Advances in Archaeological Method and Theory* **8**: 63–111.
- Wylie, A. (1988). ‘Simple’ analogy and the role of relevance assumptions: Implications of archaeological practice. *International Studies in the Philosophy of Science* **2**: 134–150.
- Wylie, A. (1989). Archaeological cables and tacking: The implications of practice for Bernstein’s ‘Options beyond objectivism and relativism.’ *Philosophy of the Social Sciences* **19**: 1–18.
- Wylie, A. (2002). *Thinking From Things: Essays in the Philosophy of Archaeology*, University of California Press, Berkeley.
- Yellen, J. E. (1991). Small mammals: !Kung San utilization and the production of faunal assemblages. *Journal of Anthropological Archaeology* **10**: 1–26.
- Zvelebil, M., and Rowley-Conwy, P. (1984). Transition to farming in northern Europe: A hunter-gatherer perspective. *Norwegian Archaeological Review* **17**: 104–128.

## Bibliography of Recent Literature

- Breyer, T., and Widlok, T. (eds.) (2018). *The Situationality of Human-Animal Relations: Perspectives from Anthropology and Philosophy, Vol. 15*, transcript Verlag, Bielefeld.
- Fraser, L. M. (2016). A zooarchaeological study of four Iron Age sites in north-eastern Botswana. Masters in Archaeology thesis, Department of Anthropology and Archaeology, University of Pretoria, Pretoria.
- Gifford-Gonzalez, D. (2011). East African pastoralism: Routes, outcomes, questions. In: Jousse, H., and Lesur, J. (Eds.), *People and Animals in Holocene Africa: Recent Advances in Archaeozoology*, Reports in African Archaeology, Africa Magna, Frankfurt, pp. 29–44.
- Goldstein, S. T., Crowther, A., Henry, E. R., Janzen, A., Katongo, M., Brown, S., et al. (2021). Revisiting Kalundu Mound, Zambia: Implications for the timing of social and subsistence transitions in Iron Age southern Africa. *African Archaeological Review* **38**: 625–655.
- House, M. (2020). *Straight From the Cow’s Mouth: Investigating Procurement and Management Strategies in Cattle Supplied to Great Zimbabwe Using a Multi-Isotopic Approach*, Ph.D. dissertation, Department of Archaeology, University of Cape Town, Cape Town.
- Janzen, A., Balasse, M., and Ambrose, S. H. (2020). Early pastoral mobility and seasonality in Kenya assessed through stable isotope analysis. *Journal of Archaeological Science* **117**: 105099.
- Kohtamäki, M., and Badenhorst, S. (2017). Preliminary results from recent Iron Age excavations in southern Mozambique. *South African Archaeological Bulletin* **72**: 80–90.

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