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Detailed Recovery Methods Show the Complexity of Ancient Mortuary Practices in Later Stone Age Hunter-Gatherers of Southern-Central Africa

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ABSTRACT This article examines mortuary practices by terminal Pleistocene and Holocene hunter-gatherers from Malawi and eastern Zambia in southern-central Africa, with a focus on the evidence for secondary burial and postmortem body manipulation over the past ~16,000 years. Published regional archaeological literature documents widespread but variable reports of incomplete or isolated remains from these contexts. While pre-burial body exposure, post-burial manipulation, and/or secondary burial with selective removal or interment of certain body parts are possible explanations, inconsistent recovery and reporting of archaeological contexts and bone modifications makes it challenging to fully exclude taphonomic processes. The social significance of such practices in regional hunter-gatherer lifeways is also undertheorized because most remains were reported in appendices as element lists that focus on population characteristics. Here, we report human remains recovered between 2016 and 2019 through detailed archaeological excavations from five rock shelters in Malawi, which provide a way to investigate burial practices with high-resolution data sets. We recovered remains from 19 individuals, 16 of whom are represented only by isolated elements. Individuals found in primary burials have evidence for pre-burial loss or post-burial removal of elements that are not readily explained by non-anthropogenic processes. We interpret some of these patterns as likely evidence of mortuary treatments involving posthumous exposure, manipulation, and/or curation of body parts.

Keywords: mortuary practices; hunter-gatherers; Africa

En este artículo se examinan las prácticas mortuorias de los cazadores-recolectores de Malawi y el este de Zambia en el centro-sur de África durante el Pleistoceno terminal y el Holoceno. Particularmente nos concentramos

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en la evidencia de entierro secundario y manipulación de cuerpos *post-mortem* durante los últimos ~16,000 años. La literatura arqueológica regional publicada documenta muchos entierros incompletos o aislados de diversas formas en estos contextos. La exposición del cuerpo antes del entierro, manipulación del cuerpo después del entierro, entierro secundario con remoción selectiva de restos óseos y/o entierro de ciertos partes del cuerpo son explicaciones posibles. Sin embargo, la recuperación y las modificaciones de los huesos en los informes de hallazgos arqueológicos son inconsistentes y eso dificulta la exclusión total de los procesos tafonómicos de los contextos de restos humanos. La importancia social de tales prácticas en los modos de vida regionales de los cazadores-recolectores también es poco teorizado, ya que la mayoría de los restos y hallazgos se describen en apéndices que se centran en las características de la población y solo hay listas de los elementos óseos. Aquí informamos sobre los restos humanos recuperados entre 2016 y 2019 a través de excavaciones arqueológicas detalladas de cinco refugios rocosos en Malawi, que proporcionan una manera de investigar las prácticas funerarias usando un conjunto de datos de alta resolución. Recuperamos restos de diecinueve individuos, dieciséis de los cuales están representados sólo por elementos aislados. Individuos encontrados en entierros primarios tienen evidencia de remoción de elementos óseos antes de ser enterrados o después del entierro que no se explican fácilmente a través de procesos no antropogénicos. Interpretamos que algunos de estos patrones son posibles evidencias de tratamientos mortuorios que involucran exposición póstuma, manipulación y/o curación de partes del cuerpo.

Keywords: prá cticas mortuorias; cazadores-recolectores; África

Introduction

Mortuary archaeology allows us to look at how people in the past handled and disposed of the bodies of their dead in a ritualized fashion (Nilsson Stutz 2016). The practices related to the treatment and burial of the deceased can be viewed as deeply entangled, with a wide range of emotional responses to death, including love, anxiety, fear, grief, loss, and standardized behaviors directed by cultural norms and traditions. The nature and materiality of the corpse may also play a significant role in thinking about the responses of the living. The cadaver, ambiguous by its very nature, located between subject and object, is often described as an object with different degrees of personhood depending on the culture, time period, and the identity of the dead itself (Cerezo-Román 2015; Kristeva 1980; McClelland and Cerezo-Román 2016; Nilsson Stutz 2003, 2016).

What people do with the human remains as part of mortuary rituals varies depending on the culture and time period. While some people decide to cremate their loved ones, other groups bury their dead, then reopen the graves for a variety of reasons, and perform secondary mortuary treatments. The use of relics, token burials, and curation of human remains as part of secondary mortuary rituals in past societies has been well documented in many cultures around the world and throughout time (e.g., Chapman et al. 2017; Chávez 2018; Edlich-Muth 2020; Kjellström 2020; Loston 2007; Stratouli et al. 2010). While finding isolated bones in secondary deposits of human remains in archaeological sites is not unusual, such finds are not typically at the center of the research. Furthermore, archaeological identification of secondary mortuary practices is challenging because not all the behaviors associated with their creation and performance leave archaeological traces, osteobiographies are not easily reconstructed from isolated elements, and generally, the archaeological visibility of these practices is low. In some cases, the traces that remain may resemble unintentional or non-anthropogenic disturbance.

While understandable from the perspective of prioritizing data-rich features, the bias in mortuary archaeology toward primary burials inhibits understanding of the full repertoire of past behaviors. Secondary deposits of human remains in the form of isolated findings are often not analyzed, quickly ignored, and discarded as disturbances without further exploration. In many cases, isolated findings of human remains and human remains in secondary deposits are a product of bioturbation and taphonomic processes, but in other instances, they could be the product of human behavior, secondary mortuary burial deposit, and part of the archaeological record that should not be ignored.

In this article, we explore how mortuary rituals and the social significance of diverse practices were incorporated into the lifeways of Later Stone Age (LSA) foragers of Malawi and eastern Zambia. This region and time period have long been described as containing human remains in both primary inhumations and secondary deposits from archaeological rock shelters but with little bioarchaeological attention dedicated to why this may be. This is a missed opportunity to understand the underlying diversity and complexity of the forager social and ritual world across Africa and beyond. Unlike with earlier work, most of the remains described in this study were

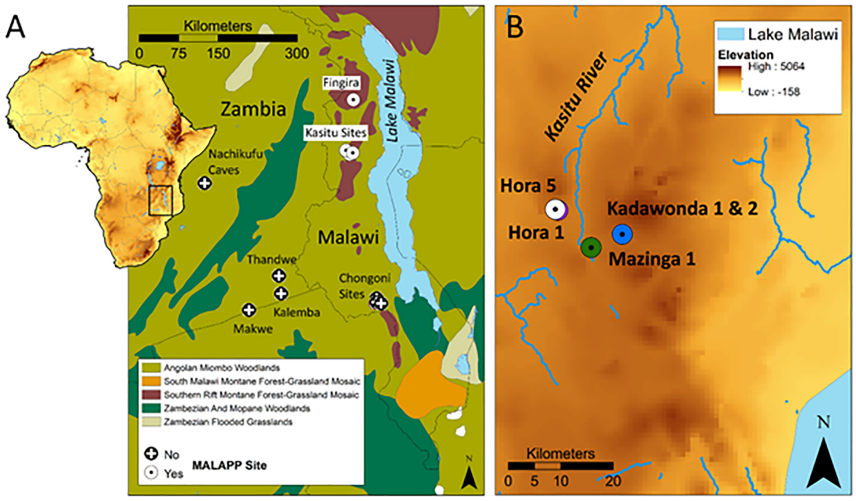

Figure 1. Locations of sites mentioned in the text. (A) Boxed area on the small map of Africa. (B) Detail of the Kasitu Valley. African countries and water bodies shapefiles from Natural Earth. Ecoregions from The Nature Conservancy. Topography from SRTM, a product of NASA. Circles with crosses or dots of different colors represent locations of rock shelters with remains of human foragers.

recovered using high-resolution excavation techniques and documentation. This enables the first assessment of the diversity of mortuary practice in the region, including the potential role of secondary mortuary treatment.

Between the 1950s and 1970s, LSA human remains were recovered from nine rock shelter sites in eastern Zambia and Malawi (Fig. 1) and published as site reports or dissertations (Clark 1956, 1973; Mgomezulu 1978; Phillipson 1976; Sandelowsky 1972; also see Supplementary Materials). These include general descriptions of recovery methods, preliminary counts of elements, and a small number of conventional radiocarbon ages. As was commonplace at the time, bioarchaeological research was limited to basic osteological reporting and largely confined to appendices (Buikstra 1991).

Excavations at five rock shelters in the Kasitu Valley of the Mzimba District of northern Malawi between 2016 and 2019 by the Malawi Ancient Lifeways and Peoples Project (MALAPP) have been finer in detail and offer new information that we articulate with older records to reveal considerable variation in regional LSA mortuary practice and a far more extensive bioarchaeological record than was previously known. Our two research questions are as follows: (1) What are the different ways of treating the bodies at each site? (2) What do these mortuary rituals suggest about social memory and the use of space across the landscape, as well as the role of human remains in these processes?

We first examine the immediate questions of where remains were deposited (which sites contain them), how they manifest in the archaeological record (from isolated elements in secondary deposits to primary inhumations), and the quality of the evidence for deliberate association with other objects within or as part of the grave feature. We also consolidate information about the minimum number of individuals, the evidence for variation in how they were treated in the perimortem period, and how these variables may relate to other factors such as the ontogenetic ages and biological sexes of the deceased. Drawing from published literature and analyses of newly recovered remains, we use spatial analysis together with taphonomic indicators, such as element part representation, fragmentation, and modification, to explore the evidence for how human remains arrived at these sites and what happened to them during and after deposition. By comparing the quality of evidence from recently excavated sites and "legacy" collections (i.e., those excavated decades ago prior to contemporary documentation methods and often with incomplete contextual information; King 2016), we are able to assess the relationship between recovery practices, data quality, and ability of the bioarchaeologists to "see" diverse ancient mortuary practices.

Background

The bioarchaeological record prior to recent study

Recent analyses of ancient DNA (aDNA) from 11 ancient individuals from Malawi and eastern Zambia

show that terminal Pleistocene and Holocene forgers in the region were genetically distinct from Bantu-speaking people who occupy the region today (Lipson et al. 2022; Skoglund et al. 2017). The ancestry of these ancient foragers forms a three-way cline between both ancient and living foragers in eastern, central, and southern Africa. This cline was established after ~50,000 years ago, but by ~20,000 years ago, populations in the region had become more regionally differentiated. This emphasizes the significance of Malawi and eastern Zambia as ancient crossroads for population interactions and their subsequent role as loci for population differentiation. Because mortuary practice is heavily embedded in cultural norms and traditions, understanding variation in the treatment of the dead may offer unique insight into the emergence of different cultural identities in tandem with biological divergence. However, although Malawi and eastern Zambia have a substantial bioarchaeological record of LSA foragers, there has been little investigation into spatiotemporal variation in mortuary treatment (Supplementary Materials).

In this article, we define primary inhumation as a feature where the individual was deposited as a complete body and the body decomposed in situ (Duday 2009; Knüsel and Schotsmans 2022). Secondary inhumation deposits refer to those with human remains that are isolated, incomplete, and/or unarticulated, indicating relocation to a secondary location after initial decomposition or disarticulation elsewhere. Surveyed reports include variable descriptions of both types, including at least 45 individuals from nine sites (17 children, 24 adults, and four with unreported age-at-death). Eighteen individuals from seven of these sites have enough contextual evidence to suggest skeletal elements were part of burial features comprising multiple elements from the same individual, although the degree of completeness and commingling is highly variable. For the other individuals, either context was not described or described as isolated remains. We also note that associated worked bone objects and parts of faunal remains for five individuals from four sites were reported as potential burial objects, which may offer additional insight into variation in mortuary practice (Table 1).

We discuss all radiocarbon dates in this article in calibrated years B.P., calibrated in Oxcal 4.4 using the SH20 calibration curve (Hogg et al. 2020). Date ranges for human remains recovered prior to 2016 were based on conventional radiocarbon dating of associated charcoal and only reported for Chencherere II (Clark 1972), Fingira (Sandelowsky 1972), Mtuzi (Mgomezulu 1978), and Kalemba, Makwe, and Thandwe (all in Phillipson 1976). These placed all remains in the middle to late Holocene, except for one individual from the terminal Pleistocene at Kalemba. Although recent aDNA work (Lipson et al. 2022; Skoglund et al. 2017) has largely corroborated this general age division through direct ages on individuals from Fingira (~6,000–2,500 years cal. B.P.), Chencherere II (~5,000 years cal. B.P.), and Kalemba (~5,000 years cal. B.P.), only three individuals reported in earlier literature from the region have been directly dated: SK-5, an adult female from Kalemba (5,285–4,975 years cal. B.P.); Hora 1, an adult male from the Hora 1 site (HOR-1 site, 9,090–8,770 years cal. B.P.); and Hora 2, an adult female from the HOR-1 site (8,175–7,944 years cal. B.P.)(Clark 1956). All other direct dates on human remains are from individuals who were more recently recovered or cannot be identified as the same individuals from earlier reports. In total, 10 ancient foragers from Malawi (four from Fingira, four from HOR-1, and two from Chencherere II) and one from Kalemba in Zambia have published aDNA results (Lipson et al. 2022; Skoglund et al. 2017).

Patterns in mortuary practice based on early research

Initial excavation reports emphasized complete burials and/or clusters of human remains. However, many more individuals are represented by isolated remains. At Chencherere II, careful study of the faunal remains by Crader (1984a) revealed 21 additional fragmentary human elements from at least seven more individuals than reported by Clark (1973), raising the minimum number of individuals (MNI) from one to eight. Of the entire sample of 47 LSA individuals from the region published to date (the 45 reported prior to MALAPP, plus the two infants recovered by MALAPP in 2019), it is notable that only six (four from HOR-1, one from Fingira, and one from Chencherere II) were represented by any remains in clear articulation in a primary inhumation burial. All other individuals were represented by commingled, isolated, and/or fragmentary elements, with the MNI calculated in the original reports on the basis of repeated elements, spatial location within the site, and/or ontogenetic ages (Table 2).

This total record comprising mainly fragmentary and/or isolated remains (Table 2) could be a consequence of preservation or recovery bias, including post-depositional taphonomic disturbance unrelated to mortuary behavior. However, early excavation reports do describe original observations that some sets of remains appeared intentionally clustered or patterned by element in ways suggesting some degree of postmortem body exposure, secondary burial, and/or manipulation of primary burials (Table 1). For

Table 1. Age and sex distribution, burial type and supporting evidence, associated objects, and current repositories of ancient hunter-gatherer individuals based on human remains from Malawi and eastern Zambia based on remains recovered and reported prior to 2016. Sites listed north (top) to south (bottom) for Malawi and Zambia, respectively. NR = not reported.

Site	Country	Year of Recovery	Infant < 1 year	Young Child 1–5 Years	Older Child 6–19 Years	Young Adult 17–30 Years	Adult 30+ Years	Indet.	NR	Sex*	Burial Type	Contextual Evidence for Secondary/Manipulated	Burial Objects	Repository	Reference
Fingira Rock Shelter	Malawi	1966	0	5	3	0	2	6	0	Indet. (14) M (2)	P (1) F/U (15)	N/A	None	Natural History Museum, London, United Kingdom	Sandelowsky 1972
Hora 1	Malawi	1950	0	0	0	1	1	0	0	M (1) F (1)	P (1) PS (1)	"... with the exception of heel bones and three other bones of the ankle of the right foot, all the other bones of the feet were missing. The left fibula was missing and only the broken shaft of the right one was present. A number of the bones of the hands were also missing. The heelbone of the right foot was found where the knee cap should have been—thus suggesting that it had been placed there intentionally. It would appear, therefore, that the body had been subjected to some exposure before burial took place ..." (107)	"... upper jaw (palate) of a small antelope, probably a bush buck, which had been placed under the right shoulder blade. ... Two of the lumbar vertebrae of burial No. 1 rested on a percussion flaked stone axe, but whether this can be taken to be a true association or not is uncertain." (107)	University of Cape Town, South Africa; Natural History Museum, London, United Kingdom	Clark 1956
CBTS (DZ40)	Malawi	1976	1	0	0	0	0	0	0	Indet. (1)	P (1)	N/A	None	National Repository, Nguludi, Malawi	Mgomezulu 1978
Mtuzi (DZ126)	Malawi	1976	0	0	0	4	1	0	1	M (6)	S (3)	"Skulls 1 and 3b were completely separated from the rest of their post-cranial [sic] and were found facing down ... Skulls 2 and 3a, although each with a spinal column leading to it, also faced down while their identifiable post-cranial faced up. The rib-cage of 'Burial 2' was squashed over the pelvis. 'Burial 1' had all the long limb bones put together like pieces of wood in a pile, 30 cm. from the [s]kull." (103)	"... bone point, probably used as an arrow or link shaft ..." (234)	National Repository, Nguludi, Malawi	Mgomezulu 1978

(*continued*)

Table 1. (Continued)

Site	Country	Year of Recovery	Infant < 1 year	Young Child 1–5 Years	Older Child 6–19 Years	Young Adult 17–30 Years	Adult 30+ Years	Indet.	NR	Sex*	Burial Type	Contextual Evidence for Secondary/Manipulated	Burial Objects	Repository	Reference
Chencherere II	Malawi	1972	0	1	4	1	0	2	0	Indet. (7) M (1)	P (1) F/U (7)	N/A	"... small, finely pointed bone awl near the right arm ..." (Clark:9)	National History Museum, London, United Kingdom	Clark 1972; Crader 1984
Nachikufu Caves	Zambia	1948	0	0	0	0	0	0	1	Indet. (1)	U (1)	N/A	None	Unknown	Clark 1950
Thandwe	Zambia	1970	0	1	0	0	2	0	0	Indet. (1) M (1) F (1)	P (1) S (1) F/U (1)	"It appears that the skeleton was partly disarticulated or dismembered before burial. One femur was broken and the two halves widely separated. The facial region of the skull, together with the maxilla, was missing, but the mandible was present. The atlas and axis vertebrae were found articulated with the skull but separated from the rest of the vertebral column." (50)	"Over the feet of this [elderly individual] skeleton were placed two fragments of warthog skulls, each retaining a pair of tusks. Over the tibiae was set another such fragment with a single massive tusk." (50)	Livingstone Museum, Livingstone, Zambia	Phillipson 1976
Kalemba	Zambia	1971	1	0	1	2	0	1	0	Indet. (3) F (2)	P (1) S (3) F/U (1)	SK-2 (adult F): only a skull and cervical vertebrae present; SK-4 (child 7–8 years): "The skull had evidently been broken before burial and the pieces were separated."; SK-5 (adult F): "The pit was lined with three pieces of a human pelvis and one skull fragment. In the area thus demarcated were placed, one at each end, the two halves of a mandible. Between these was a pile of vertebra and rib fragments, a few bits of shattered long-bone, and two pieces of the temporal." (125)	None	Livingstone Museum, Livingstone, Zambia	Phillipson 1976
Makwe	Zambia	1966	0	0	0	0	0	0	3	Indet. (3)	F/U (3)	N/A	None	Livingstone Museum, Livingstone, Zambia	Phillipson 1976

*Sex estimates are reported only for adult individuals with sufficiently complete morphology; later corroborated with aDNA on the two adults from Hora 1 (Skoglund et al. 2017) and one adult from Kalemba (Lipson et al. 2022)

**Burial type is as per original excavator interpretation. P = primary; P/S = primary with postdepositional manipulation; S = secondary; F/U = fragmentary but unspecified; U = unspecified

Table 2. Minimum number of elements from 43 (minimum) individuals from seven sites excavated prior to 2016. Individual element data were not reported from the Changoni Bible Training School or for the Nachikufu Caves, so they are not included here, but individuals from these sites do appear as part of a total MNI of 45 in Table 1.

	Eastern Zambia			Central Malawi		Northern Malawi		
Body Region	Kalemba	Makwe	Thandwe	Mtuzi	Chencherere II	Hora 1	Fingira Rock Shelter	TOTAL
HEAD								
Cranium	29	0	13	14	1	2	30	**89**
Maxilla	0	0	3	0	0	0	0	**3**
Mandible	2	0	2	4	0	1	4	**13**
Hyoid	0	0	0	0	0	0	3	**3**
Tooth	32	4	25	84	39	48	74	**306**
SHOULDER								
Scapula	0	0	3	1	2	4	9	**19**
Clavicle	0	0	2	2	3	3	3	**13**
NECK/CHEST/BACK								
Sternum	0	0	1	0	1	1	2	**5**
Manubrium	0	0	0	0	0	0	1	**1**
Vertebra	8	0	4	2	27	39	97	**177**
Rib	2	0	3	2	27	25	3	**62**
PELVIS								
Pelvis	1	0	5	2	7	3	8	**26**
Sacrum	0	0	1	0	0	0	0	**1**
ARM								
Humerus	0	0	4	2	2	4	6	**18**
Radius	0	1	5	2	2	3	3	**16**
Ulna	1	0	4	1	5	4	2	**17**
WRIST								
Carpal	0	0	3	9	16	8	15	**51**
HAND								
Metacarpal	0	0	7	11	10	4	18	**50**
Manual element	0	0	0	0	0	1	0	**1**
LEG								
Femur	1	0	5	3	3	4	5	**21**
Patella	0	0	2	1	0	0	4	**7**
Tibia	1	0	4	3	2	4	5	**19**
Fibula	1	0	3	2	3	3	2	**14**
ANKLE								
Tarsal	0	0	6	8	10	11	40	**75**
FOOT								
Metatarsal	0	0	2	1	10	2	28	**43**
Metatarsal or Philangeal	0	0	0	0	0	0	28	**28**
Pedal Element	0	0	0	0	0	3	0	**3**
WRIST/ANKLE UNSPECIFIED								
Carpal/Tarsal	0	0	0	6	0	0	0	**6**
HAND/FOOT UNSPECIFIED								
Phalanx	1	0	11	15	57	5	92	**181**
TOTAL	**79**	**5**	**118**	**175**	**227**	**182**	**482**	**1,268**

example, at HOR-1, in northern Malawi, Clark (1956:107) describes the conditions of recovery of the adult female skeleton: "with the exception of the heel bones and three other bones of the ankle of the right foot, all the other bones of the feet were missing. The left fibula was missing and only the broken shaft of the right one was present. A number of the bones of the hands were also missing. The heelbone of the right foot was found where the knee cap should have been-thus suggesting that it had been placed there intentionally" (Fig. 2).

At Mtuzi, in the central part of Malawi, six individuals are represented by fragmentary crania with a small quantity of fragmented postcranial elements but considered by Mgomezulu (1978) to have been clustered within three graves. Mgomezulu (1978:103) writes that "'Burial 1' had all the long limb bones put together like pieces of wood in a pile, 30 cm. from the [*sic*] Skull." At Kalemba in eastern Zambia, Phillipson (1976:125) indicates there are "four separate human burials" and specifies three as secondary burials (Table 1). At Thandwe, Phillipson (1976:50) describes evidence based on the arrangement and fragmentation of elements that "the skeleton was partly disarticulated or dismembered before burial" (Table 1).

Figure 2. Hora 2 adult female in situ prior to removal, reproduced from Clark (1956:Figure VI) and enhanced for clarity using Photoshop version 24.1.1. (A) Missing left fibula. (B) Right calcaneus displaced to the position of the left knee. Photo credit: Society of Malawi.

The use of stones as part of mortuary practice adds additional information about regional variation and may also have facilitated identifying the locations of existing burials as foragers reoccupied the same sites. At Thandwe, an elderly female was interred with a large triangular rock that Phillipson (1976:50) interprets as a marker stone. Overlying this burial were the commingled remains of an elderly male and a child aged two to three years at death, both of which were also subsequently covered by a stone slab. Clark (1973:9) also describes a "pile of stones resting in a shallow depression dug into the rotten granite" floor of Chencherere II, into which the body of an adult male was interred. Sandelowsky (1972:120–122) reports that for the adult male burial from Fingira, "Stones lay above the fractures of the right shoulder, arm and leg as well as above two breaks in the bones of the left leg."

Combining previous and new research

Taken together, these observations open the possibility of broader variation in mortuary treatment than previously considered, including primary and secondary inhumations. Furthermore, osteological analysis (Table 1) revealed individuals in inferred secondary inhumations span all age and both sex categories. They also show that for some individuals, there was community investment in these interments, including the use of stones that could have deterred scavengers but also may have served as markers. The well-described and disproportionate representation of cranial elements inside commingled burial features at Kalemba and Mtuzi (Table 2) is consistent with original excavator interpretations that there was some degree of body manipulation (Mgomezulu 1978; Phillipson 1976). Recovery of remains from different layers (e.g., Kalemba) or with thousands of years of separation between directly dated individuals (e.g., Fingira) also shows that the same places were used for mortuary practice over periods of time that far exceed individual living memory. At this time, the associated archaeological record is too coarsely resolved to know if this represents local continuity in cultural practice or simply convergence on the solution of rock shelters as receptacles for the dead.

Understanding ancient mortuary practices in LSA foraging communities requires shifting attention away from clear primary inhumations to a more balanced approach where secondary burial deposits of human remains, as well as isolated bones, are also analyzed and considered important aspects of the bioarchaeological record. This is important for our area of study and any site that presents secondary deposits of human remains. At any rock shelter site with complex formation history, fragmentation and commingling of remains may be the result of unrelated human activities at the site such as pit-digging, trampling, or campfires. Non-anthropogenic taphonomic processes may have also played a role (e.g., sediment compaction, bone dissolution, and/or bioturbation) (Haglund and Sorg 2002; Pokines et al. 2022). It is also possible that secondary burial deposits and body manipulation may have been an important aspect of postmortem treatment in Late Pleistocene and Holocene foragers of southern-central Africa prior to ~2,000 years ago that has largely gone undescribed. With the exception of Crader's (1984a) work at Chencherere II and possibly the lists of elements from Finigra in the appendix of Sandelowsky's (1972) dissertation, most collections have not undergone careful study of faunal assemblages to identify isolated human elements. Human remains may therefore be present, in isolated and/or highly fragmented form, at sites that do not report them—or they may be more numerous than realized at sites where clear primary inhumations have also been recovered. If so, then this would change the archaeological conceptualization of the mortuary landscape as it was experienced by LSA foragers by increasing the number of localities ancient foragers used as repositories for their dead and adding nuance about specific kinds of treatments.

Although foragers may well have used other localities outside of shelters as mortuary places, these places were not preserved or have not yet been located. Therefore, here we focus on rock shelter deposits by providing new data about element representation, MNI, spatial relationships, and taphonomic variables from five recently excavated rock shelter sites in the Kasitu Valley of the Mzimba District of Malawi.

Study Area, Sites, and Methods

The Kasitu Valley of Malawi separates the eastern highlands of the Viphya Plateau from plains that grade west into the Luangwa Valley of Zambia (Fig. 1). It is characterized by Zambezian miombo open woodland interspersed with edaphic grasslands known as dambos (DeBusk 1998; Wright et al. 2024). Prominent local landmarks are the Kasitu River, a perennial water source at the foothills of the highlands, and Mount Hora, a granite-gneiss inselberg that rises 110 m from the plain to 1,716 m above sea level (AMSL).

Two of the excavated rock shelters (HOR-1 and HOR-5) are located near the base of the inselberg, at 1,470 m and 1,503 m AMSL, respectively. HOR-1 was first excavated by Clark in 1950 (Clark 1956) and again by MALAPP in 2016, 2017, 2018, and 2019. HOR-5 was excavated by Sandelowsky in 1966 (Sandelowsky 1972) and again by MALAPP in 2018. A third site, Mazinga 1, or MAZ-1 (1,401 m AMSL), was excavated by MALAPP in 2017, 2018, 2019, 2022, and 2023 and is located at the foothills of the highlands, where the Luwelezi stream flows into the Kasitu River. The Kadawonda 1 and 2 (KAD-1 and KAD-2) sites, excavated by MALAPP in 2017, are part of a complex of rock shelters formed in a small outcrop in the upper Luwelezi catchment, at 1,709 m AMSL. Full descriptions of cultural sequences, stratigraphy, and chronology are presently underway, so for the purposes of this analysis, we used broad age categories such as "Holocene" and "Pleistocene" and refer to published ages for the sites for more specific information. As analysis is ongoing, only remains recovered through the 2019 excavation seasons are reported here. Excavation strategies, site recording, and processing of recovered materials were the same across all sites and included recovery and analysis of all finds larger than 3 mm and, in the case of HOR-1, larger than 1 mm (Supplementary Methods).

The data generated in our examination of the human remains were analyzed using SPSS 24 and Microsoft Office Excel 2016. The variables recorded during the study of the deposits consisted of three main types: biological data, posthumous treatment of the body, and archaeological context. J.C-R. recorded biological data that includes estimations of sex, age-at-death, pathological conditions, and trauma. J.C.T. recorded further taphonomic attributes such as degree of matrix coverage, fossilization, and microscopic bone surface modifications. The variables documented for the posthumous treatment of the body and archaeological context include (a) body manipulation and treatment; (b) spatial analysis, deposit type, and context; and (c) associated objects.

The human skeletal remains consisted of primary inhumations, bones found in a burned charcoal and ash feature, and isolated remains. The degree of fragmentation and fossilization of the remains limited analytical observations, particularly clinical diagnoses of pathological conditions and the frequency and etiology of traumas and cut marks. The protocols for osteological data collection were based primarily on those of Buikstra and Ubelaker (1994) and subsequent revisions (Arizona State Museum 2018; Cunningham et al. 2016). Skeletal data collection consisted of documenting metric and morphological observations of remains. For each individual and isolated remains, a detailed skeletal inventory was generated, which included recording the presence of elements and their conditions. These analyses allow for interpretations of body completeness at the moment of burial and the number of individuals represented in each deposit (refer to supplement for details on the methods that were used to estimate the age-at-death, sex, trauma, and pathologies). After bioarchaeological identification, the spatial positions of all elements were plotted in ArcGIS versions 8+ in plan and three-dimensional view. Methods for obtaining MNI estimates based on spatial and ontogenetic data are provided in the supplement.

We analyzed the posthumous treatment of the bodies using primary and secondary data. The primary data were generated by analyzing the practices performed directly or indirectly on the body as evidenced in the human skeletal remains (e.g., burning, cut marks, grave items). Secondary data were collected from basic contextual information (e.g., spatial associations, orientations and positions of the remains, chronologies, field observations about sedimentary context) and publications. Body manipulations were analyzed to reconstruct the ritual practices done to the deceased individuals. The intentional deposits that contain human bone were classified as either burials or non-burials, as well as whether they were in burned features or in secondary or mixed contexts (Knüsel 2014; Knüsel and Schotsmans 2022; Roksandic 2001).

Results

Human remains recovered by MALAPP across the five sites represent a minimum number of 19

individuals, which together with the two adults reported by Clark (1956) total 21 individuals from the Kasitu Valley sites (Table 3; Supplementary Data Set). Here, we detail new results from HOR-1, HOR-5, and MAZ-1 and in the discussion combine them with results reported prior to initiation of MALAPP. Table 3 also includes isolated elements from two additional sites for which there is currently insufficient context to reconstruct mortuary practices in spatial detail because there is only one from each site: the crown of an upper right maxillary molar from a child aged ≥2.5 to ≤4.5 years from KAD-1 and a manual distal phalanx from a child ≤5 years from KAD-2 (Fig. 1).

HOR-1 is to date the only reported site in the Kasitu Valley containing primary inhumations (Table 3). The first two individuals are the adults recovered by Clark in 1950, which he designated as "Hora Burial 1" (directly dated to ~9,200 years ago) and "Hora Burial 2" (directly dated to ~8,100 years ago); both were found to preserve ancient DNA (Lipson et al. 2022; Skoglund et al. 2017a). Bioarchaeological and contextual details of Hora 1 and Hora 2 from published literature are provided in the supplement. MALAPP excavations between 2016 and 2019 resulted in the recovery of three additional inhumations. One was represented by a concentration of burned adult human bone, here designated "Hora 3," that may represent a primary deposit within an ash feature. The feature, but not the remains within them, dates to ~9,500 years ago, as reported by Lipson et al. (2022), and will be described in detail together in a separate publication. The other two inhumations were primary burials of infants ("Kahora 1" and "Kahora 2"),

Table 3. Minimum number of individuals identified from five sites in the Kasitu Valley.

Site	Individual	Age at Death	Sex	Sex Determination	aDNA Individual	Context	Chronological Age	Reference
HOR-1	Hora 1	30–50 yrs	M	Morph, aDNA	I2966	Burial (primary)	9, 124–8, 972 cal BP (direct enamel)	Clark 1956; Lipson et al. 2022; Skoglund et al. 2017
HOR-1	Hora 2	20–30 yrs	F	Morth, aDNA	I2967	Burial (primary with missing major elements)	7, 960–8, 170 Cal BP (direct collagen)	Clark 1956; Skoglund et al. 2017
HOR-1	Hora 3	18–50 yrs	F	N/A	N/A	Burial (primary in a burned feature)	~9500 Cal BP (indirect, charcoal)	Lipson et al. 2022
HOR-1	Hora 4	≥14 yrs	Indet	N/A	N/A	Isolated Element	Pleistocene	This paper
HOR-1	Hora 5	≥14 yrs	Indet	N/A	N/A	Isolated Element	Pleistocene	This paper
HOR-1	Horal 6	≥14 yrs	Indet	N/A	N/A	Isolated Element (potential disturbed burial)	Pleistocene (intrusive into)	This paper
HOR-1	Hora 7	≥14 yrs	Indet	N/A	N/A	Isolated Element	Holocene	This paper
HOR-1	Kahora 1	0–3 mths	M	aDNA	I19528	Burial (primary with missing major elements)	~14,000 Cal BP (indirect, charcoal)	Lipson et al. 2022
HOR-1	Kahora 2	7.5±3 mths	M	aDNA	I19529	Burial (primary with missing major elements)	~16,000 Cal BP (indirect, charcoal and snail shell)	Lipson et al. 2022
HOR-1	Kahora 3	2–7.5 yrs	Indet	N/A	N/A	Isolated Element	Pleistocene	This paper
HOR-1	Kahora 4	0–6 mths	Indet	N/A	N/A	Isolated Element	Pleistocene	This paper
HOR-1	Kahora 5	2–7.5 yrs	Indet	N/A	N/A	Isolated Element	Pleistocene	This paper
HOR-1	Kahora 6	Infant/Child	Indet	N/A	N/A	Isolated Element	Holocene	This paper
HOR-1	Kahora 7	0–6 mths	Indet	N/A	N/A	Isolated Element	Holocene	This paper
HOR-5	HOR-5 Individual 1	≥4.5 and ≤7.5±3 mths	Indet	N/A	N/A	Isolated Element	Holocene	This paper
HOR-5	HOR-5 Individual 2	0–6 mths	Indet	N/A	N/A	Isolated Element	Holocene	This paper
HOR-5	HOR-5 Individual 3	≥12 yrs	Indet	N/A	N/A	Isolated Element	Holocene	This paper
KAD-1	KAD-1 Individual 1	≥2.5 yrs and ≤4,5 yrs	Indet	N/A	N/A	Isolated Element	Holocene	This paper
KAD-2	KAD-2 Individual 1	≤5 yrs	Indet	N/A	N/A	Isolated Element	Holocene	This paper
MAZ-1	MAZ-1 Individual 1	>14 yrs	Indet	N/A	N/A	Isolated Element	Holocene	This paper
MAZ-1	MAZ-1 Individual 2	0–6 mths	Indet	N/A	N/A	Element Cluster (potential disturbed or secondary burial)	Pleistocene (intrusive into?)	This paper

previously only reported in terms of their chronology and aDNA (Lipson et al. 2022). Here, we describe the bioarchaeological details of Kahora 1 and Kahora 2 for the first time (Table 3, Fig. 3, Supplementary Data Set).

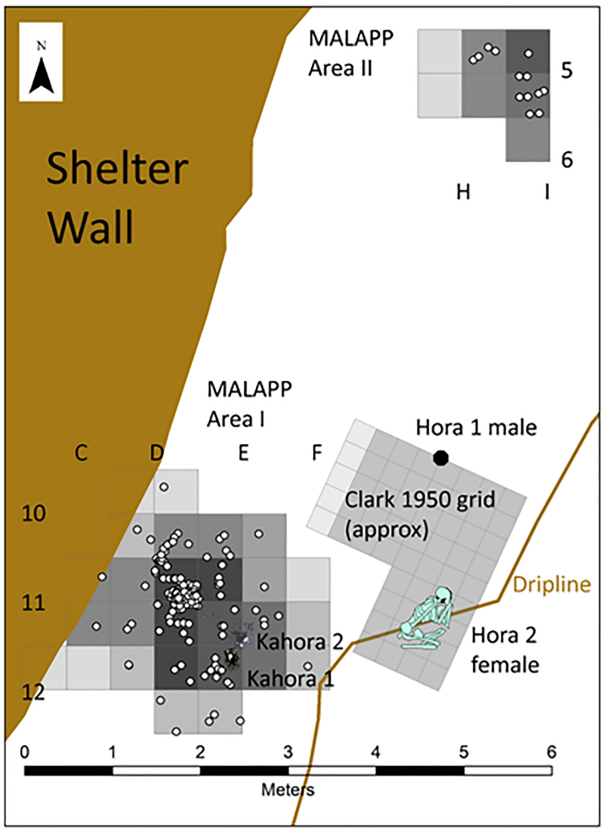

Figure 3. Plan view of the HOR-1 site showing locations of the Hora 1 and Hora 2 skeletons recovered by Clark, reconstructed location of his excavation grid relative to the MALAPP grid, positions of the Kahora 1 and Kahora 2 infant burials, and positions of all other human remains (white dots). Deeper excavations are darker in shading. The cluster in the deepest part is the concentration of burned bone designated as Hora 3.

Kahora 1 infant burial

This individual was recovered near the start of the 2019 MALAPP excavation season and was first reported by Lipson et al. (2022). The only remains from this individual exported from Malawi were the right petrous for aDNA and ^{14}C analysis (no collagen was recovered). We estimated the age-at-death for this individual to be birth ± three months (omnibus skeletal estimate) based on the degree of epiphyseal fusion and dental development (a crown had formed on the mandibular left second deciduous incisor but the root had not developed) (AlQahtani et al. 2010; Buikstra and Ubelaker 1994). Pathologies or trauma were not possible to document. Genetic sex was determined as male (Lipson et al. 2022).

The individual is nearly complete except for the missing lower right tibia and fibula, as well as most of the manual and pedal elements. The spatial distribution of elements indicates a tightly flexed position with the head to the south and potentially slightly raised above the body based on the distribution of crushed cranial fragments on top of the left shoulder and thorax region (Fig. 4). Most elements were in anatomical position, but the right arm had experienced greater postmortem movement at the joints and was located to the west of the thorax in association with a series of right ribs in anatomical position. Our interpretation is that the individual was initially placed on the left side and decomposed in situ. Then, through the process of decomposition, the right side of the body collapsed to bring the right arm elements and right ribcage over to the left side of the body as the soft tissue and ligaments decomposed and the skeletal elements were displaced (Knüsel and Schotsmans 2022). This is further supported by the fact that the

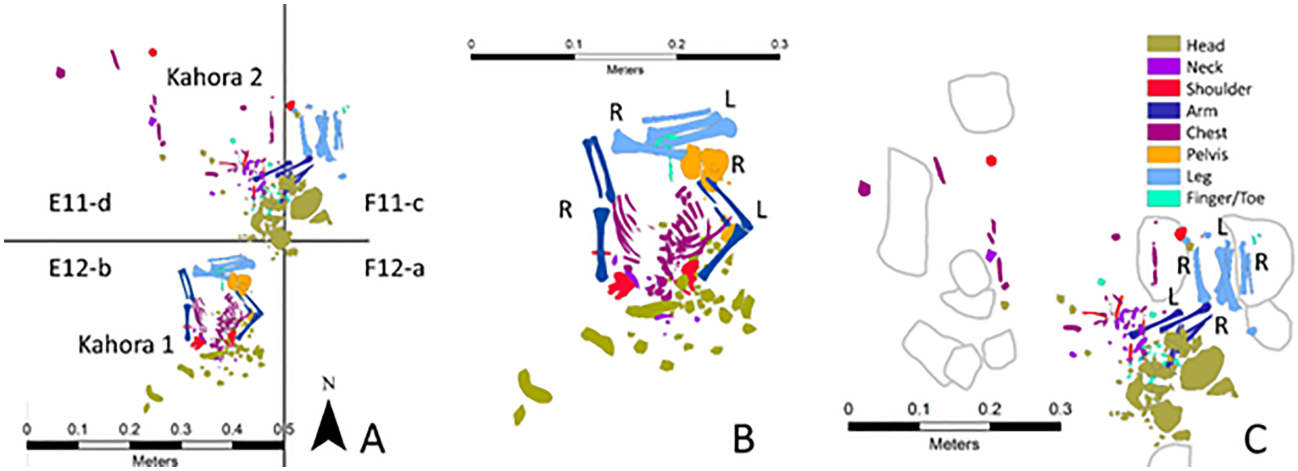

Figure 4. Plan view of the Kahora 1 and 2 primary inhumations (A), noting that Kahora 2 is nearly 70 cm lower in the sediments than Kahora 1. (B) A close-up of the distribution of body regions for Kahora 1 and (C) the same for Kahora 2. Gray outlines in (C) are rocks found in the region ~10 cm below the remains.

right humerus was slightly elevated above the other remains and was therefore the first major element to be discovered after the hemimandibles.

The individual was discovered in situ and located adjacent to the eroding edge of the previous year's excavation in 2018. We considered if it might be possible that the right tibia, fibula, and most pedal elements could have been lost to disturbance or erosion between excavation seasons or during section cleanings. However, all section cleanings and disturbed/collapsed profile materials were also sieved and completely sorted for both the 3-mm and 1-mm sieve and did not result in the recovery of these elements. This attention to detailed excavation, sieving, and sorting resulted in the recovery of some ray elements, which were difficult to identify more specifically because those in the sieve were out of anatomical context, and the morphology was less clearly defined because of the very young age-at-death of the individual. Those we did find were well preserved and unfragmented, raising the possibility of other explanations for missing elements beyond taphonomy.

We did not identify any objects that appeared to be intentionally placed within the burial or as a part of the feature. No burial pit outline or coloration was apparent, although the individual must represent a primary burial to be so complete and well articulated. While there was insufficient collagen to provide a direct ^{14}C date, antiquity was estimated to be ~14,000 years cal. B.P. based on associated radiocarbon dating of charcoal and giant land snail shell from within the burial fill (Lipson et al. 2022: Table S4). Although the burial may therefore be younger than ~14,000 years old, it cannot be younger than ~9,500 years old, as it lay entirely below an intact cemented ash feature (Lipson et al. 2022:Supplementary Data).

Kahora 2 infant burial

This individual was fairly complete in terms of skeletal representation but fragmentary. Age-at-death was estimated to be 7.5 ± 3 months (omnibus skeletal age estimate) based on bone growth, development, and dental eruption patterns. The maxillary right and left first incisors and maxillary second right incisors have developed crowns, but the roots have not started to develop. The maxillary canines and molars also are present, but it was challenging to evaluate their exact degree of development because of poor preservation (AlQahtani et al. 2010; Buikstra and Ubelaker 1994). While teeth were observed in the mandible, the degree of development cannot be identified with precision because of obscuring bone. Genetic sex was determined to be male (Lipson et al. 2022). No trauma or pathological changes were observed based on the initial field review. The spatial distribution of elements indicates a primary inhumation on the right side with the head to the south, in a flexed and potentially slightly upright position, which then experienced postmortem disturbance (Fig. 4). Paired elements (radius and ulna and tibia and fibula) were tightly associated, and it is possible that the knees were touching the elbows and the individual was in a curled position. The forearms were directly under the collapsed vault of the cranium, with the cervical vertebrae and broken clavicle fragments extending to the west. However, most of the ribs and vertebrae were missing, with only some fragments of the left scapula and mostly left ribs recovered. The left lower limb was bent at an angle, and the right femur was not in anatomical position with the right tibia and fibula, while both innominates and the right scapula were missing entirely.

Although the elements were fragmentary, the spatial distribution suggests postmortem disturbances resulting in loss of elements from the back and pelvic region of the skeleton. Three possibilities could be explored that can contribute to the lack of thoracic and pelvic elements from an infant of this age-at-death in all the surrounding sediments: (1) poor preservation due to enhanced microbial decomposition within the abdomen and/or soil pH; (2) absence through natural disturbances such as moving water, stratigraphic sloping, insect activity, or carnivore activity; or (3) intentional or unintentional disturbance and removal by humans. The first option is unlikely because bones of similar size and density (ribs from the left side, vertebral arches, and centra from other parts of the vertebral column) from this individual were preserved and recovered in situ. Therefore, preservation was unlikely to be affected by soil pH, microbial decomposition, or exposure to water, including through wet-sieving, especially for larger elements like the ilia. Thoracic elements that are present were recovered 10 to 30 cm away from the parts of the skeleton that were in general articulation, and no other remains from the wide excavated area around and below these could be attributed to this individual. The alternative hypotheses are that the removal of elements more likely occurred instead through carnivore scavenging or other natural factors that mechanically displaced parts of the skeleton or postmortem manipulation by humans. This burial deposit was dated by association to a minimum of ~16,000 years cal. B.P. using giant land snail shell

fragments from the feature fill (Lipson et al. 2022: Table S4). As with Kahora 1, the minimum stratigraphic age is ~9,500 years cal. B.P.

HOR-1 isolated remains

We identified 55 additional fragments of human bone and 12 fragments of potential human bone from HOR-1 in addition to elements assigned to inhumations (Table 4). Most of these were isolated elements, with only minimal clustering apparent (Fig. 5). Among the isolated fragments, the most common represented elements were the cranial vault, fingers, and unspecific long bone fragments. Conservatively, the MNI is nine individuals with developmental ages of ≥14 years (4), 2–7.5 years (2), 0 to 6 months (2), and ≤14 years (1) (Table 1, Table 4). These were calculated on the basis of repeating elements, ontogeny, their occurrence in either Area I or Area II of the excavation (Fig. 3, Fig. 5), spatial distance from articulated individuals of the same developmental age, and/or broad chronological associations (e.g., Holocene vs. Pleistocene).

Intriguingly, one of the isolated unidentified fragments bears a cut mark (Fig. 7A), although the fragment is not morphologically diagnostic beyond being part of a long bone. While most faunal specimens in the assemblage are from ungulates, which have distinctive cortical and trabecular bone qualities, body size and morphology make it likely, but not certain, that this cut-marked fragment was human.

HOR-5 bioarchaeological summary

We identified 12 isolated human elements from the site of Hora 5 (HOR-5). This site was first excavated by Sandelowsky in 1967 and did not report any human remains from an estimated sediment volume of ~1.4 m^3 (Sandelowsky 1972:239). Sandelowsky (1972) described all bones from the site as "only minute pieces and splinters," none of which could be identified. In 2018, MALAPP excavated ~1.0 m^3 of sediment and recovered numerous faunal remains that are currently under analysis. The human remains consist of two fragments of a deciduous incisor, an indeterminate molar crown, a rib fragment, and eight phalanges (Table 5).

Together, these newly reported remains indicate the presence of at least one adult and two non-adults. Individual 1 is represented by a well-preserved incisor (root ¼ developed) and is estimated to have been an individual older than ≥4.5 and ≤7.5 ± 3 months at death (AlQahtani et al. 2010). The molar crown, located just over a meter to the north and closer to the surface, is also tentatively assigned to Individual 1 because it has the same ontogenetic age and stratigraphic provenience in the upper layer dated to the Late Holocene based on charcoal fragments (2,946–2,777 cal. B.P., 2,800 ± 20, UGAMS-37844; 2,840–2,720 cal. B.P., 2,660±20, UGAMS-37846; Fig. 6B). The incisor was located ~70 cm away horizontally and ~20 cm above a cluster of infant manual and pedal phalanges representing Individual 2, which, together with the rib fragment, have an ontogenetic age of zero to six months at death and are in a layer with an associated charcoal age of 4,950 ± 20 (5,718–5,588 cal. B.P., UGAMS-37845), in the Middle Holocene. The overlap in the ranges of age-at-death and the possibility of bioturbation between layers makes it possible that all the infant remains belong to a single individual, but the spatial and chronological differences suggest that at least two are present. The adult remains (Individual 3) consist of two intermediate manual phalanges and a proximal manual phalanx recovered from the upper layer (Fig. 6). A site plan and profile showing locations of the human remains in situ at HOR-5 is shown in Figure 6. All elements except one part of the incisor were recovered from the sieve, so all spatial locations can only be ascertained to within a 0.5-m × 0.5-m × 0.05-m volume of sediment.

A notable aspect of the HOR-5 assemblage is the presence of anthropogenic modifications to all the non-dental remains. Both the infant and the adult remains were carbonized, and all three adult phalanges also exhibit marks consistent with stone tool modification (Fig. 7). J.C.T. examined all modifications under a 10–40× binocular zoom microscope and applied criteria from published literature and experience with experimental taphonomic assemblages to assess if marks might be recent (post-excavation) modifications, natural bone features such as vascular grooves, if they may have occurred post-depositionally within the sediments, or if they were more likely by agent(s) that modify bone in the perimortem period (Fernández-Jalvo and Andrews 2016; Supplementary Materials). Although all three elements have marks with some attributes suggestive of cut mark morphology (e.g., V-shaped, subparallel grooves with microstriations), their spatial associations with fracture propagation, together with discrete patches of microstriations, make them more consistent with percussion marks from a directed impact to the bone (Blumenschine et al. 1996).

MAZ-1 bioarchaeological summary

Mazinga 1 (MAZ-1) was first excavated in 2017 by MALAPP. Thirty-three isolated human elements and four potential human elements were recovered from 4 m^3 of sediment excavated between 2017 and 2019

Table 4. Summary of isolated elements from HOR-1 (the site), organized by individual (Hora 4, Kahora 3, etc.).

	INDIVIDUAL										
REGION— Bone	Hora 4	Hora 5	Hora 6	Hora 7	Kahora 3	Kahora 4	Kahora 5	Kahora 6	Kahora 7	Unassigned	TOTAL
HEAD											
Cranial	0	1	0	0	0	0	0	0	0	0	**1**
Cranial — Frontal	0	0	0	0	5	0	0	0	0	0	**5**
Cranial — Temporal — Mastoid	0	1	0	0	0	0	0	0	0	0	**1**
Cranial — Parietal	0	0	0	0	1	0	0	0	1	0	**2**
Hemimandible	0	0	0	0	1	0	0	0	1	0	**2**
Tooth — Incisor — Maxillary	0	0	0	0	0	0	1	0	0	0	**1**
Tooth — Canine — Maxillary	0	1	0	0	1	0	0	0	0	0	**2**
Tooth — Incisor — Mandibular	0	0	0	0	0	0	0	0	1	0	**1**
Tooth — Molar — Mandibular — Deciduous	0	0	0	0	1	0	0	0	0	0	**1**
Tooth — Molar	0	1	0	0	0	0	0	0	0	0	**1**
NECK											
Vertebra — Cervical	0	0	0	0	0	0	0	0	1	0	**1**
CHEST/UPPER BACK											
Rib	0	1	0	0	1	0	0	0	0	0	**2**
Vertebra — Thoracic	0	0	0	0	0	0	0	0	2	0	**2**
ARM											
Humerus	0	1	0	0	1	0	0	0	0	0	**2**
Radius	0	0	0	0	0	0	0	0	2	0	**2**
HAND											
Metacarpal	0	0	0	0	1	0	0	0	0	0	**1**
Phalanx — Manual — Proximal	0	0	0	0	1	0	0	0	0	4	**5**
Phalanx — Manual — Intermediate	0	0	0	0	2	0	0	0	1	1	**4**
Phalanx — Manual Distal	0	1	0	0	0	0	0	0	0	0	**1**
LEGS											
Femur	0	0	0	0	0	0	0	0	1	0	**1**
Tibia	1	0	0	0	0	0	0	0	0	0	**1**
FOOT											
Metatarsal	0	0	1	0	0	1	0	0	1	0	**3**
Phalanx — Pedal — Proximal	0	0	0	0	0	0	0	0	1	0	**1**
Phalanx — Pedal — Distal	0	1	0	0	0	0	0	0	0	1	**2**
REGION NONSPECIFIC											
Vertebra	0	0	0	0	0	0	0	0	1	0	**1**
Long-Bone Fragment	2	1	0	0	0	0	0	0	0	2	**5**
Phalanx	0	0	0	0	0	0	0	0	0	1	**1**
Phalanx — Indeterminate — Intermediate	0	0	0	0	0	0	0	0	0	1	**1**
Phalanx — Indeterminate — Distal	0	0	0	0	0	0	0	0	1	0	**1**
TOTAL	**3**	**8**	**1**	**1**	**14**	**2**	**1**	**1**	**12**	**12**	**55**

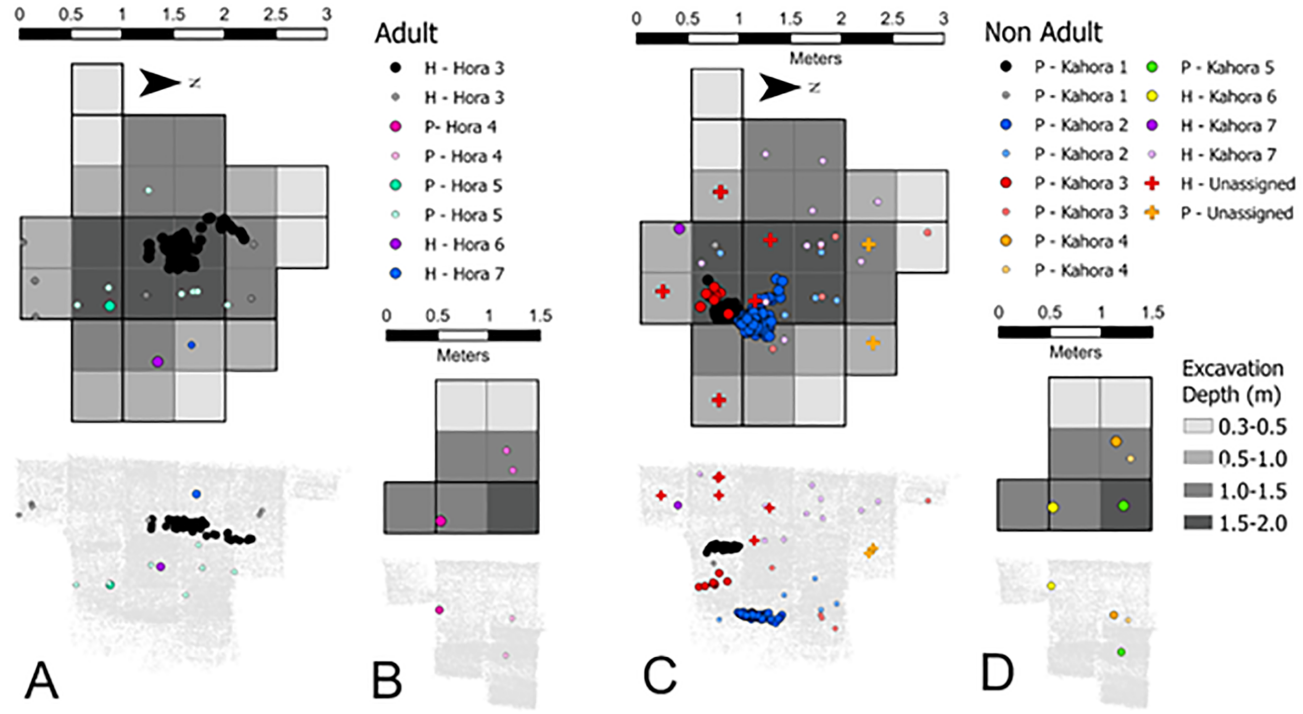

Figure 5. Plan (top) and profile (bottom) views of the locations of adult (A = Area I; B = Area II) and non-adult (C = Area I; D = Area II) remains at HOR-1. Profiles are viewed to the west; scales same as plan view. P = Pleistocene; H = Holocene. Dark/larger and light/small dots are fragments definitely/probably from that individual (e.g., large, dark aqua dots in panel A are adult remains assigned to Individual Hora 5 and small, light aqua dots in panel A are probable in assignment to that same individual). Light gray stippled background indicates all finds plotted in the excavation as non-human remains (e.g., lithics, shells, faunal remains, bone not identifiable to taxon). The tops of the profiles of Areas I and II are of similar absolute elevation. Refer to Figure 3 for their true relative horizontal relationship.

Table 5. Summary of isolated elements from HOR-5 organized by individual. Only fragments with a definite (rather than probable) assignment as human are included.

	INDIVIDUAL			
REGION— BONE	HOR-5 Indiv. 1	HOR-5 Indiv. 2	HOR-5 Indiv. 3	TOTAL
HEAD				
Tooth — Incisor — Maxillary — Deciduous	2	0	0	2
Tooth — Molar	1	0	0	1
CHEST/UPPER BACK				
Rib	0	1	0	1
HAND				
Phalanx — Manual — Proximal	0	2	1	3
Phalanx — Manual — Intermediate	0	0	2	2
Phalanx — Manual — Distal	0	1	0	1
FOOT				
Phalanx — Pedal — Distal	0	2	0	2
TOTAL	3	6	3	12

(Table 6); sorting of materials excavated in 2022 and 2023 is still underway. A site plan and profile showing locations of the human remains we report here in situ is shown in Figure 8.

Remains from at least one individual older than 14 years (Individual 1) and one infant between zero and six months (Individual 2) are present (Table 5). Individual 1 is represented by a charred and fragmented distal humerus with a curved and oblique-angled break on the shaft that is typical of bones broken while they were in a fresh state (Villa and Mahieu 1991). Only 20% of the bone surface was free from adhering matrix and therefore available for examination of modifications, but none were identified.

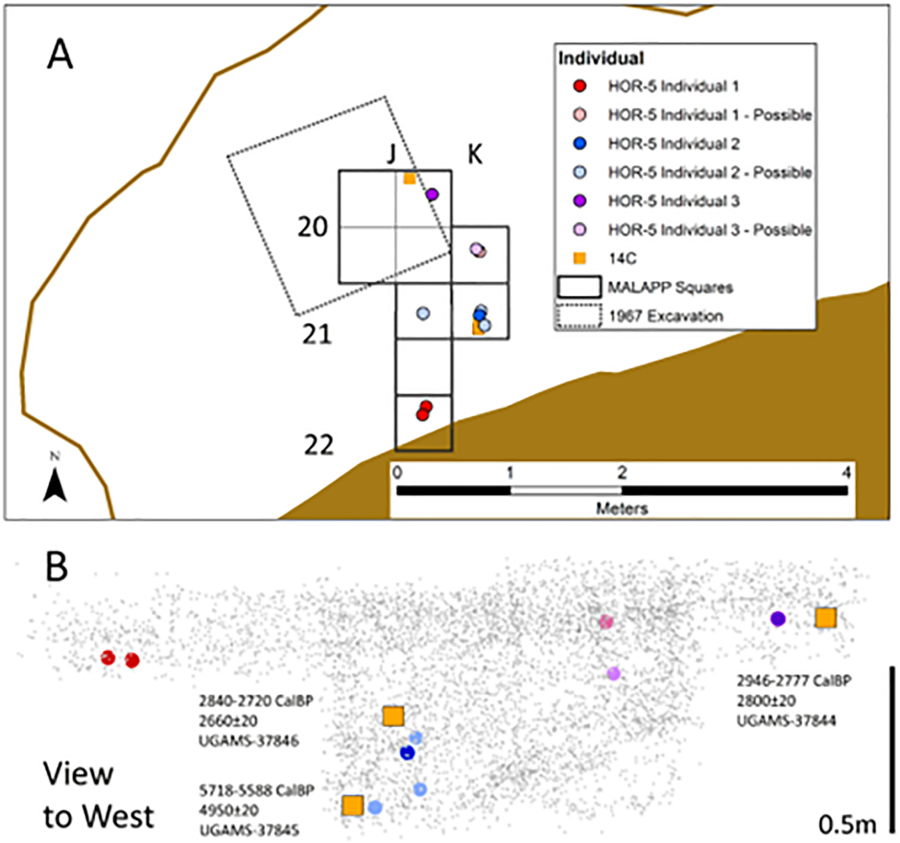

Figure 6. Plan (A) and (B) profile views of MALAPP excavations and recovered remains by individual, relative to a digitized plan of the HOR-5 site from Sandelowsky (1972:224). Individuals are different colors. Dark colors represent elements used to generate the MNI and/or other elements known from articulation and/or refitting to be from the same individual. Light colors represent elements potentially from the same individual on the basis of ontogenetic age and stratigraphic location only (e.g., red dots identify the presence of the HOR-5 Individual 1 and pink dots are only potentially from the HOR-5 Individual 1). The profile view in (B) uses small black dots to represent plotted finds that are not human remains. These define the shape of the excavation and the overall density of finds.

Attempts to obtain a direct ^{14}C age were unsuccessful given insufficient collagen. A land snail shell found in situ within 10 cm of the humerus and at the same depth returned an age of 9,010 ± 30 (10,234–9,916 cal. B.P.; UGAMS-39314). If the humerus represents a disturbed burial, then additional dates are required to more precisely ascertain the chronological age of deposition. All other adult remains from the Holocene layers of this excavation are designated provisionally as "Individual 1—Possible" because of their adult status, but there is no clear spatial clustering or clear pattern by anatomical region (Fig. 8). In the Pleistocene layers, there is a cluster of vertebral fragments together with a single manual intermediate phalanx from an infant aged zero to six months at death. Unlike the faunal remains from this depth, the human remains are not fossilized and their surfaces are not heavily encrusted. This taphonomic difference in the condition of bone surfaces between human and faunal remains suggests that the human remains are part of an intrusive Holocene burial. Another manual intermediate phalanx found approximately 1 m away and at a similar depth may be from the same individual. At MAZ-1, Holocene human elements tend to be more common toward the eastern margin of the excavation, which also is where the humerus was found. This may be further evidence of a disturbed burial outside the excavation margin. An alternative explanation is that these elements were part of a secondary burial, which may also explain the fragmentation and burning treatments.

Discussion

By combining burial information from older publications with more recent excavations using fine-detailed recovery methods, we show that mortuary practices among LSA communities in Malawi and eastern Zambia may be more complex than previously reported and that secondary burial and postmortem manipulation should not be ignored as a possible explanation for fragmentary and isolated remains. This seems

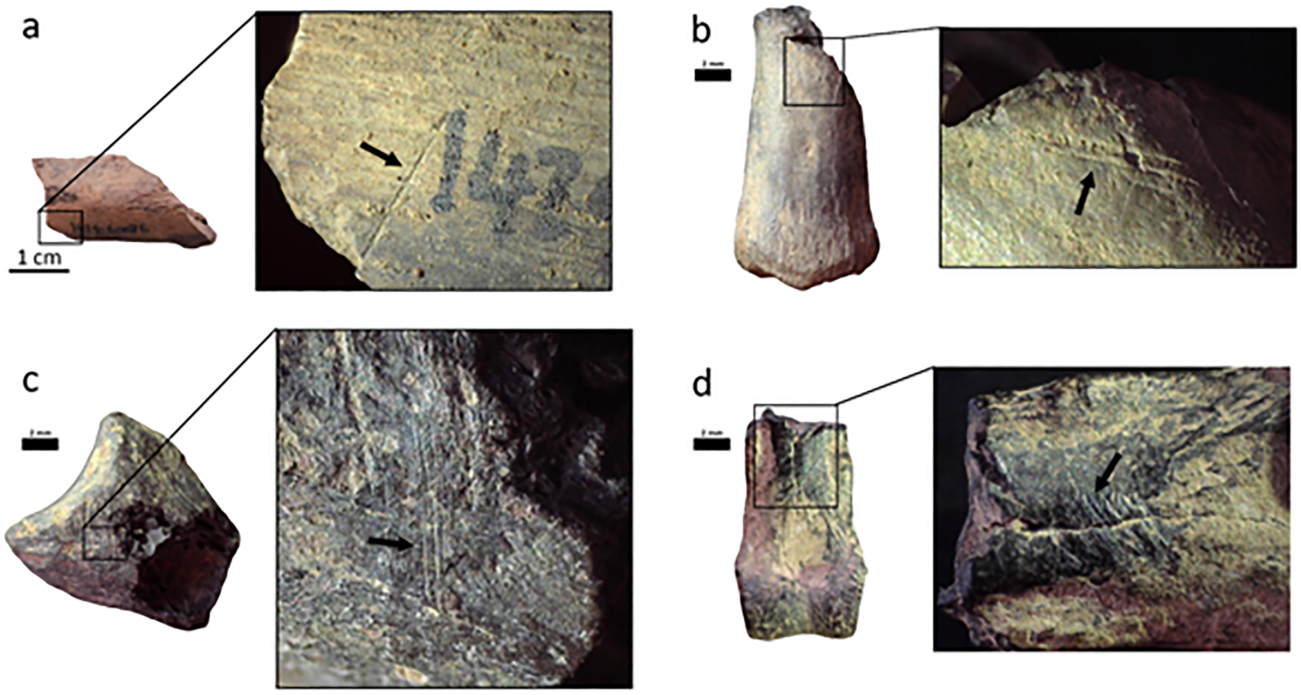

Figure 7. Stone tool–marked elements from HOR-1 and HOR-5. (a) 60086 Long bone fragment from HOR-1 Pleistocene layers. (b) 54639 Intermediate manual phalanx from HOR-5. (c) 53693 Proximal manual phalanx from HOR-5. (d) 54638 Intermediate manual phalanx from HOR-5. Macro images are taken at 20· and closeup images are at 50· unless otherwise specified.

Table 6. Summary of isolated elements from MAZ-1 organized by individual. Only fragments with a definite (rather than probable) assignment as human are included.

	INDIVIDUAL			
REGION — BONE	MAZ-1 Indiv. 1	MAZ-1 Indiv. 2	Unassigned	TOTAL
HEAD				
Cranial — Occipital	1	0	0	**1**
Tooth — Molar — Maxillary	1	0	0	**1**
Tooth — Premolar/Molar	1	0	0	**1**
NECK				
Vertebra — Cervical	0	2	0	**2**
CHEST/UPPER BACK				
Rib	1	0	0	**2**
Vertebra — Thoracic	1	1	0	**1**
LOWER BACK				
Vertebra — Lumbar	0	8	0	**8**
ARM				
Humerus	1	0	0	**1**
Ulna	1	0	0	**1**
HAND				
Phalanx — Manual — Proximal	0	0	1	**1**
Phalanx — Manual — Intermediate	1	2	0	**3**
Phalanx — Manual — Distal	3	0	0	**3**
FOOT				
Metatarsal	2	0	0	**2**
Phalanx — Pedal — Proximal	1	0	0	**1**
REGION NONSPECIFIC				
Vertebra	0	3	0	**3**
Long-Bone Fragment	2	0	0	**2**
TOTAL	**16**	**16**	**1**	**33**

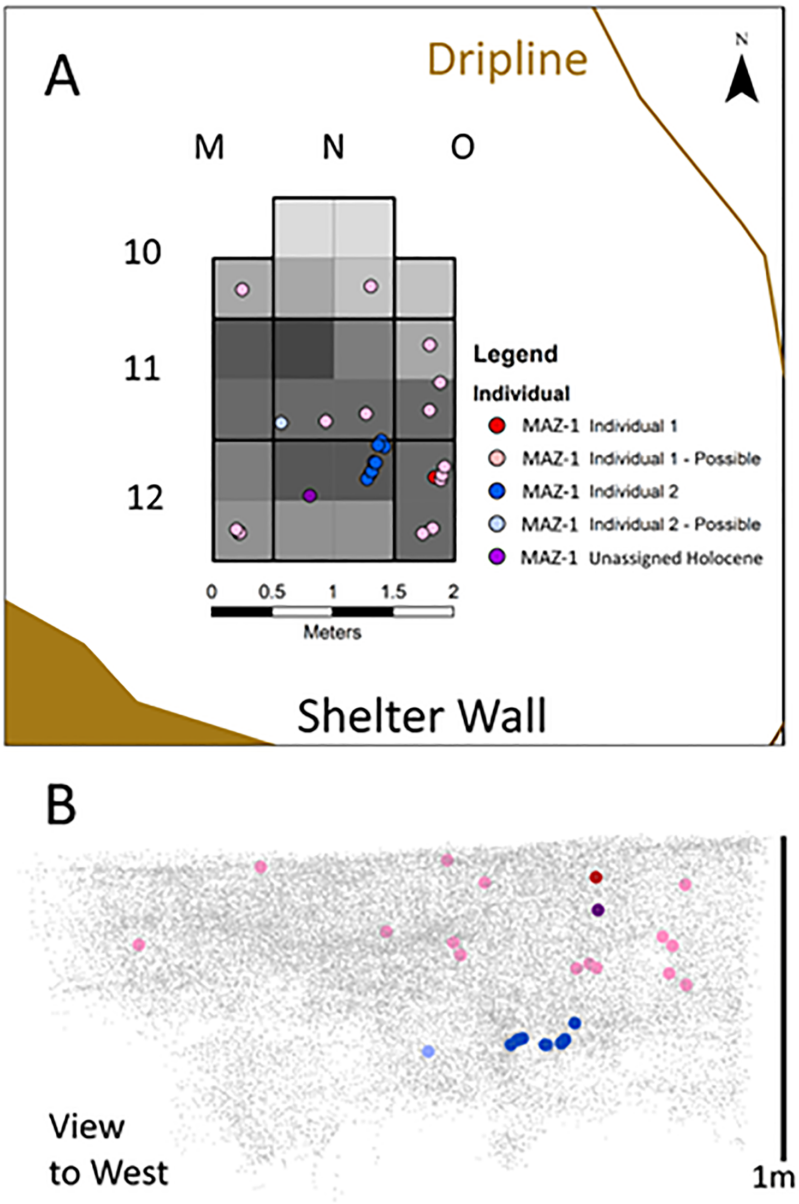

Figure 8. Plan (A) and (B) profile views of MALAPP excavations and recovered remains by individual. Dark colors represent elements used to generate the MNI and/or other elements known from articulation and/or refitting to be from the same individual. Light colors represent elements potentially from the same individual on the basis of ontogenetic age and stratigraphic location only (e.g., red dots identify the presence of the MAZ-1 Individual 1 and pink dots are only potentially from the HOR-5 Individual 1). The profile view in (B) uses small black dots to represent plotted finds that are not human remains. These define the shape of the excavation and the overall density of finds.

especially plausible (but not excluding other lines of evidence) if the skeletal elements present displacement of possible anthropogenic origin (e.g., bone piles, calcaneus placed on the area of the patella) and cut marks and breaks suggest some sort of body manipulation. Here, we center on the decedents, the deposits, how the individuals were treated, and the social significance of the place. Based on some ethnographic records (Woodburn 1982) and previously known practices of primary inhumation during the LSA in south-central Africa, burials were a regular part of the bioarchaeological record of the broader region. Even more broadly, archaeologists working at many sites in South Africa have found primary inhumations in rock shelters (Hall 2000; Parkington et al. 1980; Pearce 2008). Here, we add to the discourse by presenting new bioarchaeological evidence from the Kasitu Valley documenting the occurrence of (1) possible intentional removal/displacement of remains via exposure prior to burial and/or reopening of primary burials; (2) over-representation of certain skeletal elements among the isolated remains, suggesting possible intentional

curation and inclusion in the sites; and (3) clear modification of some remains in the form of cut marks.

Removal/displacement of remains

At HOR-1, the primary adult burials (Hora 1 and Hora 2) and the infant burials (Kahora 1 and Kahora 2) were placed in the grave as complete bodies and decomposed in situ based on the osteological and archaeological evidence. However, at least three of the four primary inhumations also show evidence of body manipulation. For example, the missing lower right tibia and fibula of Kahora 1 do not appear to be the result of taphonomy or post-depositional processes because a thorough excavation of the surrounding area combined with highly precise recovery methods failed to recover any evidence of these remains while other elements were relatively well preserved, even for infant remains. In the Kahora 2 infant burial, partially articulated limbs were not in anatomical position, there was displacement of shoulder and vertebral elements many tens of centimeters away from their original points of articulation with the other remains, and most of the lumbar and pelvic elements were missing. As with Kahora 1, the surrounding excavation encompassed an area large enough and deep enough (at least 50 cm horizontally in all directions and 15 cm vertically below the remains) to indicate that the missing elements were not simply displaced slightly away from the main mortuary feature.

In the case of the Hora 2 adult female burial, Clark (1956:107) makes a strong case for postmortem manipulation by documenting the numerous missing hand bones, the absence of the left fibula (which should have been protected as the individual was lying flexed on their left side), and the near-complete absence of the feet with the exception of the calcaneus and three other ankle bones of the right foot. Furthermore, the right calcaneus was moved to the left patella position, as documented in the in situ photograph published by Clark and reproduced in Figure 2. While Clark (1956:107) interpreted this as evidence that the body had been subjected to "some exposure before burial took place," the corollary is that the individual's bones were manipulated after the body decomposed by reopening the grave.

The adult male Hora 1 was also missing hand bones, although there is no known surviving photograph of the individual in situ to assess if element loss was potentially attributable to non-mortuary practices such as fragmentation in the ground, coarse recovery methods, transport, or curation. While small hand bones and foot bones are more easily displaced by rodents and/or affected by formation processes (Haglund and Sorg 2002; Pokines et al. 2022), this would not be the case with entire elements and major long bones such as Hora 2's missing feet and fibula. If a carnivore had accessed this element and removed it while the body was in situ, there would not be undisturbed long bones in articulation on top. Considering formation processes, taphonomy, and placement of all primary burials at HOR-1, a plausible explanation is that body manipulation regularly occurred at the site through repositioning and removal of skeletal elements.

At minimum, we must consider whether the missing elements (particularly of the long bones) from the Hora 2 and Kahora 1 primary inhumations result from intentional anthropogenic disturbance and removal. Although the sample size is small, there is consistency in the missing elements in that they are from the lower limb bones, hands, and feet. This suggests a common set of processes were in operation, with four possible hypotheses. First, elements may have never been recovered, or they may not have been recognized by the analysts. We reject these hypotheses for Hora 2 because unlike with Hora 1, details of missing elements were reported by the excavator and documented with a photograph of the remains in situ (Clark 1956; Fig. 2). We also reject the possibility of lack of recovery for Kahora 1, because all sediments from MALAPP excavations at HOR-1 were water sieved through nested 3-mm and 1-mm sieves and sorted, without exception. Similar preservation of infant remains, including bones of similar size, thickness, and density, found in situ and in the sieve suggests no destruction occurred through wet-sieving or that elements were not preserved due to the pH of the soil. Tiny well-preserved elements such as distal phalanges were identified during sorting, which makes it unlikely that large elements such as a tibia and fibula would be missed.

Taphonomic factors such as scavenging, sediment compaction, and/or selective dissolution are not satisfactory explanations for some of the missing elements. Hora 2's missing left fibula would have been lying underneath the other lower limb elements based on body position, and moving water or rodent burrows would not selectively move only a few bones while keeping the remainder in articulation or relocating only the calcaneus to the patellar position. For Kahora 1, the missing elements are on the right side and would have been lying on top, so a scavenger may have been more able to access them from above the burial pit. However, if this happened, then it did not disturb the anatomical position of the other elements, including the femur. Instead, both individuals appear to have decomposed in situ and then been slightly disturbed or partially disarticulated, with elements removed and others repositioned at some point after burial.

For other sites, non-anthropogenic explanations are more plausible. For example, the infant remains from

MAZ-1 are more suggestive of either a previous inhumation that was removed or heavily disturbed while in a partially decomposed state or a secondary deposition of elements. Vertebral elements from the cervical, thoracic, and lumbar regions are all present, but these fragments only represent a small part of the total vertebrae in a complete individual. Other elements from the skeleton are either missing or spatially displaced by more than 1 m in any horizontal direction. This is because only one other element (a phalanx) was found in the rest of the excavated area. Unlike the adult remains from the Holocene layers, the infant remains are clustered and represent the tiniest ossified elements from an individual this young. Because vertebrae are among the elements least resistant to density-mediated attrition (Lam et al. 2003), we do not consider sediment compaction or dissolution of the more robust limb bones to be a likely explanation for this pattern. Access to a partially or completely decomposed body, which was then removed from the site by either carnivores or people, could account for the disappearance of these elements.

Deviations from expected representation of certain elements

Another line of evidence that may suggest some skeletal elements were deliberately removed is the overrepresentation of teeth and phalanges relative to other skeletal parts among isolated elements from all of the sites (Tables 4, 5, 6, and Supplementary Data). While this could be explained by their highly identifiable morphology leading to collection bias, this is unlikely based on site recovery methods that employed consistent wet-sieving and considered less diagnostic elements such as fragmented long bone shafts. Although we also searched for these during sorting, we found only a very small number that could be tentatively identified as human. Moreover, our excavations at HOR-1, HOR-5, and MAZ-1 were extended laterally enough to be confident that most remains not assigned to a primary inhumation truly were isolated and not part of a disturbed feature with elements displaced to fall outside the excavation area.

We must then consider how the isolated remains entered the archaeological records at this site (i.e., through intentional collection and mortuary deposition or through more quotidian means). Across all remains recently excavated from all five sites (i.e., not including the Hora 1 and Hora 2 adult burials, because we cannot quantitatively assess element representation for them based on published reports or discount the possibility of element loss after recovery), we found a total of 20 teeth and 58 phalanges. Three of the phalanges present anthropogenic modifications (see below). While deciduous teeth are naturally shed and teeth in general are commonly lost through disease and trauma, this is less so the case with fingers and toes. Forensic literature and experimental studies also show that fingers and toes are lost late in the sequence of decomposition and/or carnivore scavenging (Darwent and Lyman 2002; Pickering 2001; Pokines and Kerbis Peterhans 2007; Pokines et al. 2022). The fact that so many more phalanges were found relative to teeth, which tend to be the most identifiable and well-preserved human remains in the archaeological record, raises the possibility that phalanges, particularly the ones with anthropogenic modifications, were intentionally brought to and interred at the site as part of mortuary practices.

Anthropogenic modifications to elements

Detailed microscopic study of the bone surfaces of the primary inhumations at HOR-1 is still underway; these represent 885 of the 1,006 elements listed in the Supplementary Data Set. The balance of the sample ($N = 121$) is from the isolated remains, which we have examined for bone surface modifications. Of these, only 67 (55%) have at least half the surface unencrusted by sandy matrix and visible for observation. Three of these are phalanges from HOR-5 that retain stone tool marks from defleshing, disarticulation, percussion, or a combination of these based on the direction of the marks and their characteristics (Fig. 7). These are not flesh-bearing bones that would be useful for nutritive cannibalism, which indicates to us that the purpose was likely related to mortuary practice or other symbolic behaviors. We suggest that these actions, combined with the other lines of evidence presented here, are most consistent with behaviors associated with curating and subsequently transporting the remains for the purpose of secondary mortuary deposits.

Contextualizing mortuary practices in the regional LSA record

Consistent with our reporting here, archaeological human remains from southern-central Africa have been historically reported as complete but disturbed primary burials or unassociated (isolated) fragments (Clark 1973; Fagan and Van Noten, 1971; Phillipson 1976; Sandelowsky and Robinson 1968). At Fingira, the northernmost site in our literature review, Sandelowsky (1972; Sandelowsky and Robinson 1968) found only one individual with any evidence of articulation, while remains of at least 15 others were scattered near the shelter wall and represented by a few elements.

Sandelowsky (1972:121) describes the state of the partially articulated skeleton as follows: "Many of the bones had been broken, in some cases shattered. Stones lay above the fractures of the right shoulder, arm, and leg, and two breaks in the bones of the left leg. All these fractures must have occurred while the flesh still held the bones together, and the body must have been covered by earth before the decaying bones could scatter."

The image published in the dissertation does not show any hand or foot elements (Sandelowsky 1972:121, Plate 8), and a memoir later published by Sandelowsky (2004:16) states that "there was no trace of hand or foot bones." The missing elements cannot be explained through rough recovery methods because the memoir further describes "a great deal of blowing and very light brushing" during excavation of the remains (Sandelowsky 2004:14). Targeted dissolution or fragmentation of only hands and feet is further unlikely because the bones "were so hard that we thought they could well be semi-fossilised" (Sandelowsky 2004:16), and Brothwell and Molleson's report in the dissertation (Sandelowsky 1972:405) confirms that "cleaning off hard calcareous matrix" was necessary prior to analysis. Post-depositional disturbance therefore appears to be the most likely explanation.

Original excavations at Fingira measured ~10 m^2 and reached a maximum depth of 1.5 m, which is not a large space to contain the remains of at least 16 individuals. Therefore, the fragmented and isolated state of other remains may be attributable to anthropogenic disturbance from later burials. This appears less likely for the Fingira 1 individual, who was missing both hand and foot elements while retaining most other bones in articulation (Sandelowsky 1972, 2004). Rock collapse and sediment movement could explain displacement, but not complete removal, of only these body parts. The two remaining possibilities are partial access to the cadaver by scavenging animals or intentional mortuary behavior.

Brothwell and Molleson (in Sandelowsky 1972:429) offer evidence for the scavenging possibility by describing the left tibia as "gnawed by animals" and only describing the presence of a few distal limb elements (left radius, proximal right ulna, distal left ulna, and complete right tibia). However, the report does not provide a complete element inventory for this individual, and further inconsistencies make it difficult to evaluate if this is the only explanation. For example, the image in Sandelowsky (1972:121, Plate 8) shows the right tibia and fibula in articulation, but no fibulae are mentioned in the report. The report attributes a measurement on a left calcaneus to this individual, although the original excavator states that feet were not present. Transfer of the remains to London occurred in three batches, providing ample opportunity for element loss or mix-up.

Approximately 300 km to the south in central Malawi and eastern Zambia, there is more evidence for intentional commingling of individuals in the same primary or secondary inhumation (Mtuzi, Thandwe) and instances of interments consisting primarily of cranial elements (Mtuzi, Kalemba). Only isolated elements were recovered at Makwe: one incisor, three molars, and one radius fragment (Phillipson 1976). Thandwe contained a primary burial of a female and a second individual that Phillipson (1976) suggests was partially disarticulated or dismembered because the pelvis and lumbar vertebrae were not recovered (Phillipson 1976:50). The remains were associated with stone "slabs," with a second burial of a male individual on top of the slab covering the remains of the female. Next to the male burial were the crushed skull bones and very fragmentary postcranial remains from a child (Phillipson 1976).

At Kalemba rock shelter, Phillipson (1976:168–169) reports a total of five individuals mainly represented by parts of the skull and cervical vertebrae. Only in one case were significant postcranial remains preserved, but they were fragmentary and incomplete (Table 2). Phillipson (1976:168–169) also suggests that in each case, there were signs that the skull had been broken before burial and the pieces separated. The only deposit of postcranial remains consisted of fragmented, burned bones, potentially evidence for a secondary cremation deposit. Phillipson (1976:168–169) suggests that the dismemberment and burial of heads was a ritual process; he also proposes that the contexts may be indicators of cannibalism.

At Mtuzi, in the central region of Malawi ~175 km east of Kalemba, Thandwe, and Makwe, Mgomezulu (1978) reports that at least six sets of adult male remains were recovered in three separate burials. Mgomezulu (1978) suggests that the "bodies were left in the shelter. Later the remains of the bodies in various stages of preservation were found by relatives, and it is possible that this could explain why several body parts are missing . . . the pile of long limb bones was made from bare bones which, when buried, received little or no disturbance from the revisits of animals. It is easier to make such a pile from bare and partly disconnected bones than from connected bone surrounded by the flesh" (Mgomezulu 1978:106–107).

Similar deposits of human remains with missing elements and fragmented burials were found in the Thandwe rock shelter (Mgomezulu 1978; Phillipson 1976). Mgomezulu (1978) mentions that individuals may have died close to rock shelters under various circumstances, such as warfare between groups or attacks by wild animals. Wild animals such as hyenas

and vultures may prey on the bodies after death, but no mention of animal puncture marks or animal damage is described in the publications. Animal puncture marks and damage are common in individuals who die in open areas when their bodies are not recovered immediately (Beck et al. 2015; Roberts and Ingham 2008; Suckling et al. 2016), and future work that involves microscopic examination of the surfaces of the Mtuzi bones may provide more information. Archaeological research on early Holocene hunter-gatherer sites in Somalia also found similar patterns of missing hands and feet and isolated clusters of teeth (Brant 1988), suggesting a potential archaeological case of intentional removal of these elements in a different African forager context.

Death and meaning in the LSA of Malawi and Zambia

We can see that mortuary practices in the LSA of southern-central Africa had some commonalities, such as placing the dead in rock shelters. Individuals undertaking residential or other activities in those spaces may have encountered remains and removed bones and repositioned them, potentially even thousands of years after initial inhumation. Archaeological studies have suggested that the interments of a sedentary group tend to symbolize corporate membership and rights to land and inheritance (McAnany 1995). Parker Pearson (2008:141) suggests that "fixing the dead in the land is a social and political act which ensures access and rights over natural resources." These ideas highlight a cross-cultural pattern previously proposed by Arthur Saxe (1970) and reformulated by Lynne Goldstein (1976), in which formal disposal areas such as cemeteries are used by corporate groups to claim ancestral ties to the ancestors and control access to crucial but restricted resources and territories. While this cross-cultural pattern usually applies to agricultural groups, Charles and Buikstra (1983) applied these ideas of territoriality to hunter-gatherer groups in an interesting way. They proposed and tested that formal corpse-disposal areas can reflect a corporate unit reflecting corporate behavior, and this corporate behavior can be tied to territorial behavior. We suggest that these ideas can be used for LSA groups in Africa, which are generally inferred to have been residentially mobile hunters and gatherers (Kusimba 2005; Lipson et al. 2022; Pfeiffer and Harrington 2018).

It is highly plausible that forager groups considered the shelters to be important landmarks and part of the territory they used. The small amount of archaeological research in the region overall makes it difficult to tie these patterns to other aspects of forager lifeways, although new zooarchaeological data from HOR-1 suggest small hunting ranges (Bertacchi et al. 2025). Ancient DNA from individuals at Fingira and HOR-1 provide some effective population size estimates between ~300 and 1,000 individuals (Lipson et al. 2022: Extended Data Figure 9). Together with data from other ancient foragers in Malawi, Zambia, Tanzania, and Kenya, these ancient genetic data sets show that in the terminal Pleistocene to Holocene, groups of foragers across southern-central Africa exchanged genes mainly within geographic scales of 100 to 300 km, consistent with the ethnolinguistic territory sizes of modern non-equestrian warm-climate hunter-gatherers (Marlowe 2005). The implication is that at the time HOR-1 was occupied, genetically and potentially also culturally differentiated groups of hunter-gatherers lived in the region. Because treatment of the dead is deeply culturally embedded, variation in mortuary practice may offer unique insight into a period of time when ethnolinguistic identities among central African foragers were becoming more strongly expressed.

While there might be other areas in the landscape to deposit the dead, we center the discussion on the rock shelters as these types of places are where human remains have been more often found and excavated. They occur because of rocky outcrops on inselbergs, which are largely unvegetated stone escarpments that rise abruptly from the surrounding landscape and can be seen in distinctive profile from many tens of kilometers away (Fig. 9). In addition to their practical uses (e.g., shelter, vantage points), multiple lines of evidence point to their social significance. Their deposits often contain hundreds of personal ornaments, including debris from ornament manufacture on site (Miller et al. 2021). Malawi's extensive rock art record always occurs in shelters (Malijani 2019; Smith 1995). Food-producing societies that now live in Malawi also associate earlier populations of foragers with mountains and caves in their oral histories (Rangely 1952, 1963; Zubieta 2016). Through careful excavation and documentation, we are now able to add the mortuary record to an emerging understanding of these places as part of the socio-symbolic landscape, highlighting their importance through time and among diverse groups.

There is considerable time depth (sometimes on the order of thousands of years), over which these places were repeatedly used for burial. Direct dating of remains we recovered at Fingira showed that the site was used for mortuary purposes minimally at ~6,100 and ~2,500 cal. B.P. (Skoglund et al. 2017). These remains lacked the hard matrix on bones recovered by earlier excavations, suggesting some may be even

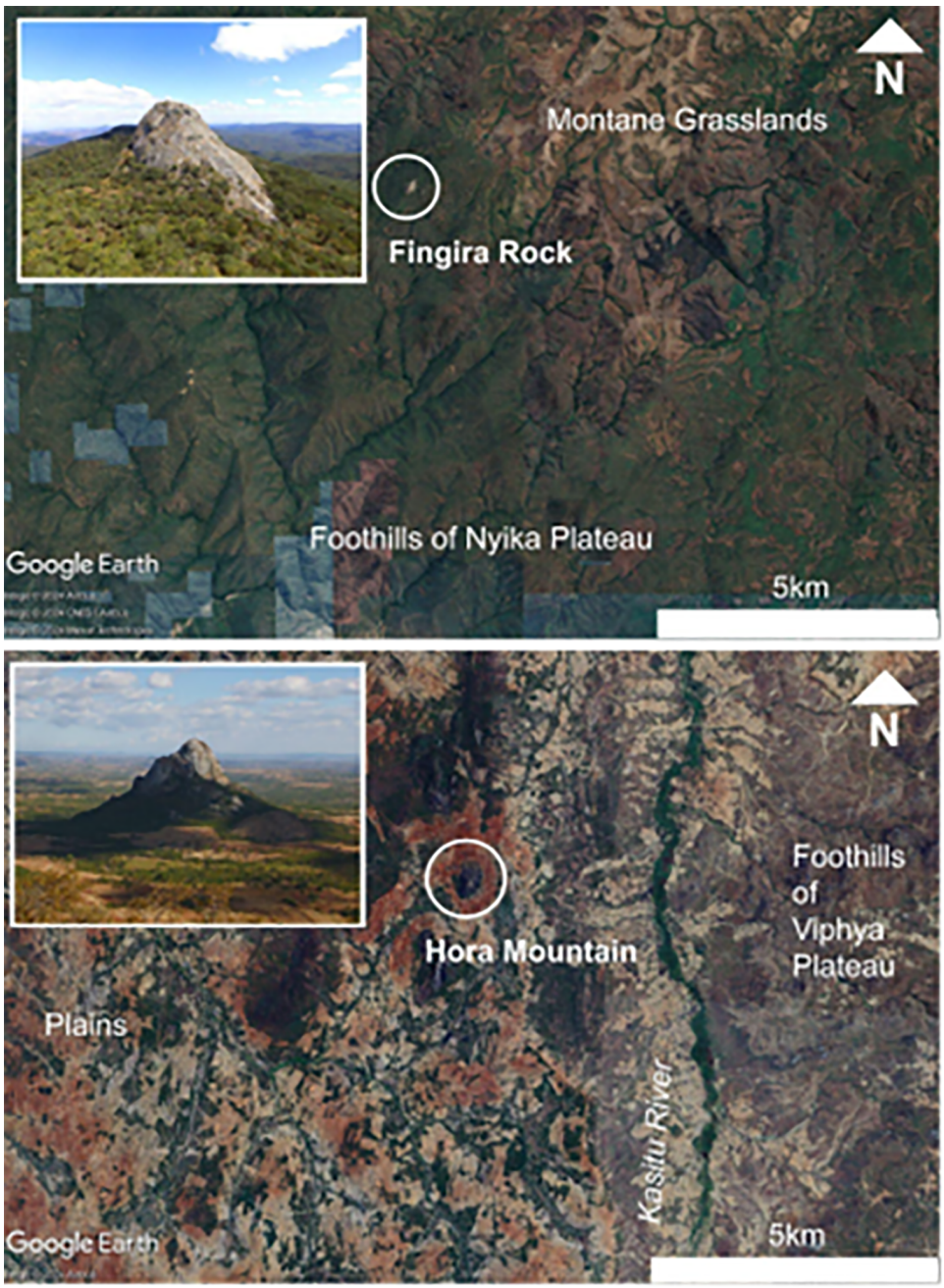

Figure 9. Location of Fingira Rock (top) and Hora Mountain (bottom) relative to landscape features. Insets show their unique local prominence as steeply rising inselbergs (~90 m and ~250 m, respectively). There are no similarly large landmarks in the local viewsheds. Image credits: Google Earth, Jacob Davis, and Chelsea Smith.

older (Brothwell and Molleson, in Sandelowsky 1972:405). In addition to stratigraphic placement at multiple sites that suggests long-term use, remains from HOR-1 have been directly dated to ~8,200 and ~9,000 cal. B.P. and through close association with dated materials to ~14,000 and ~16,000 (Lipson et al. 2022; Skoglund et al. 2017). Our finding that many more individuals are represented by isolated remains than by primary inhumations reveals these sites as greater loci of mortuary behavior than previously recognized. People from across the entire community structure appear to have been included, as shown by the variable developmental age and biological sex distributions, and the apparent paucity of specific grave objects. At the same time, there is subregional variability that may yet be revealed through detailed excavation, fine sieving, and careful sorting of all osteological materials.

We are not necessarily suggesting that observed patterns correlate to territoriality or control of these areas on the landscape. However, it is possible that in using these locations as homes, shelters, and places to bury their dead, LSA foragers created memories and established connections to the sites in various ways that could be related to family histories and ancestral places. The space was used and revisited, creating individual and collective memories through time. Creating "persistent places" over time through burial practices has been suggested for mobile early food producers elsewhere in Africa, notably across the Sahara and eastern Africa (di Lernia 2013; di Lernia and Tafuri 2013; Hildebrand et al. 2018; Sawchuk et al. 2018). Among megalithic "pillar sites" associated with early herders in Kenya's Turkana Basin, secondary burial and the inclusion of isolated remains (especially fingers and teeth) in anthropogenic mortuary cavities is commonplace (Sawchuk et al. 2018; Sawchuk et al. 2019; Sawchuk et al. 2022). There is no reason to assume, a priori, that such complex mortuary behaviors would not have deeper roots among LSA foragers and predate food production.

Interpreting this evidence, we infer that variation in LSA mortuary rituals in south-central Africa focused on the body itself. While people inhabiting these rock shelters may have regularly encountered remains and even repositioned them, this did not result in indiscriminate scattering of elements. Furthermore, it is possible that additional isolated remains were brought to these places, potentially as part of secondary burial deposits. We are not claiming or even suggesting that this is the case for every isolated human element found in these sites; post-depositional disturbances and taphonomic issues were surely important factors. Rather, we are opening the possibility that evidence of postmortem manipulation in the form of intentional removal of skeletal elements, the selection of particular skeletal elements for burials, and even the cutting and burning of the remains as part of funeral ceremonies must also be considered when reconstructing site histories. Our findings are consistent with reports of previously excavated sites in the study region, which also show highly variable evidence of body manipulation and/or secondary treatment.

It is possible that variation in body treatment could be used to display and distinguish the identity of each deceased individual, as well as the mourners. Particular body treatments could show the social relations of these individuals or be associated with belonging, whereby returning with a piece of human remains the mourners claim a connection to the specific community and their ancestors (Cerezo-Román 2014; Chapman and Gaydarska 2007; Geller 2012; Liston 2007; McAnany 1995; Rakita 2009). Chapman and Gaydarska (2007) suggest that through the fragmentation process and secondary treatment, a connection between the objects, the living community, and the ancestors can be created and maintained. Secondary treatment in the form of exhumation, grave reuse and reopening, skeletal relics of the decedent, or skull removal had been documented in different groups through time in Africa related to ancestral veneration (e.g., Chilver 1965; David 1992; Fagan 1969; Insoll 2016; Madden 1940; Muller 1976; Siiriäinen 1977; Volavka 1998). Variation among mortuary behaviors suggests a lack of a unifying way of treating the dead across the spans of space and time represented in our study. This implies freedom by the mourner to follow their family or group preferences but within a more widespread tradition of posthumous body manipulation. Although time depth likely accounts for some of this variation, examination of the published record together with our new data from the Kasitu Valley offers hints of geographic patterning. Complete primary inhumations with missing and likely removal hand and foot skeletal elements are more common in the northern part of the study, while the southern part features more secondary and/or commingled burials that include crania. This may indicate some degree of regional cultural continuity in mortuary practice, which is consistent with genetic evidence for LSA groups choosing partners within their immediate geographic region during the terminal Pleistocene and Holocene (Lipson et al. 2022).

The use of sites over thousands of years as living areas (territories/investment in "places") and the deposition of "tokens" or parts of people from elsewhere seems relevant. There are many reasons why groups practice secondary burials of a few or one skeletal elements related to different ideas of personhood, ancestral veneration, symbolic representation of the decedent, acts of purification, and acts of desecration, among others (Cerezo-Román 2015; Cerezo-Román et al. 2017; Graham 2009; Graham et al. 2018; Liston 2007). We suggest that perhaps in the instances that we found, "token" or secondary burials could have had symbolic power as a source of remembrance of the deceased and the connections and networks that previously existed between the deceased and mourners. They may also connect with specific places on the landscape that are both prominent visual landmarks and specific points of social memory.

Conclusions

Here, we show with careful recovery and complete sorting of osteological remains from new excavations

in the Mzimba District of Malawi that there are ancient human remains in every excavated rock shelter, reiterating the important role of these places as repositories for the dead among ancient African foragers. We also show that there is biased skeletal part representation that is, in some cases, best explained through anthropogenic removal and deposition of remains, and for at least some of these, there is evidence of defleshing and/or fragmentation using stone tools. This supports a conclusion that intentional postmortem body manipulation was practiced in the area and sets the scene for broader interpretations of mortuary ritual and the embodiment of memory.

We caution, however, that it is necessary to go back and reanalyze other human remains from sites in the region that reported intentional and extensive postmortem treatment and evaluate the presence or absence of non-anthropogenic damage alongside new analyses of anthropogenic modifications. There is good archaeological evidence of non-anthropogenic factors that contribute to the finding of human remains in rock shelters, such as redeposited human bones, disturbance, and reasons not associated with secondary burials in rock shelters at several LSA sites in South Africa (Hall 2000; Parkington et al. 1980; Pearce 2008). Although the South African record is relatively geographically distant from Malawi, it offers the closest available data set for comparison. This approach may also be a fruitful avenue of research for ancient forager remains from northern Africa, which also show substantial evidence for intentional disturbance of burials and movement of bodies or body parts into specific sheltered locations with long records of human occupation (Haverkort and Lubell 1999). Some patterns, however, may only be possible to understand with new excavations that maintain careful spatial control and documentation.

Our work shows that an excavation, recovery, and analytical focus on more obvious mortuary features, such as burials, may have rendered invisible other important and meaningful cultural practices. Evidence of selective removal and transport of elements requires careful consideration and analysis of the data and can reveal a tradition of embodied memory-making that carries the relationship between community members and the bodies of their dead beyond the brief moment of interment. It draws out the duration of the relationship between the body of the deceased and the people tending to their remains, effectively extending the mortuary ritual over time. It also extends the ritual spatially, across the broader cultural landscape (Watts et al. 2020). This interpretive approach offers a richer view of the complexity of ancient forager social and symbolic worlds than simply analyzing more complete burial features as the physical traces of singular, unassociated events and isolated remains as random collections of elements. Our findings illustrate a need for more in-depth discussions about mortuary complexity about ancient foragers in south-central Africa and beyond.

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Ethics Statement

The two HOR-1 non-adult burials (Kahora 1 and Kahora 2) were recovered in 2019 and are curated by the Malawi Department of Museums and Monuments (formerly Department of Antiquities). Additional remains from HOR-1, HOR-5, and MAZ-1 were recovered in 2017, 2018, and 2019. Permission for the research was provided under permits A/III/3.3/70, A/III/3.3/71, AD/23/56, and NCST/RTT/2/6. Export was provided under A/1/1/1/3.6/50, A/1/1/1/3.6/44, A/II/1.5/33, and MHQ/CUL/1/04/2. Spatial coordinates in the Supplementary Data Set have been modified from the original UTM to obscure exact site locations. They are correct relative to one another within each site but do not tie to real-world locations.

References

AlQahtani, S. J., M. P. Hector, and H. M. Liversidge. 2010. Brief communication: The London atlas of human tooth development and eruption. *American Journal of Physical Anthropology* 142:481–490.

Arizona State Museum, University of Arizona. 2018. ASM Osteology Recording Packet. Arizona State Museum, University of Arizona, Tucson. https://statemuseum.arizona.edu/file/712 [accessed 1 January 2018].

Beck, Jess, Ian Osterichter, Gregory Sollish, and Jason De León. 2015. Animal scavenging and scattering and the implications for documenting the deaths of undocumented border crossers in the Sonoran Desert. *Journal of Forensic Sciences* 60:S11–S20.

Bertacchi, Alex, Potiphar Kaliba, and Jessica C. Thompson. 2025. Short-distance hunting strategies of Late Quaternary foragers in the miombo woodlands of Malawi. *Journal of Anthropological Archaeology* 77:101656. https://doi.org/10.1016/j.jaa.2025.101656

Blumenschine, Robert J., Curtis W. Marean, and Salvatore D. Capaldo. 1996. Blind tests of inter-analyst correspondence and accuracy in the identification of cut marks, percussion marks, and carnivore tooth marks on bone surfaces. *Journal of Archaeological Science* 23:493–507.

Brandt, Steven A. 1988. Early Holocene mortuary practices and hunter-gatherer adaptations in southern Somalia. *World Archaeology* 20(1):40–56.

Buikstra, Jane E. 1991. Out of the appendix and into the dirt: Comments on thirteen years of bioarchaeological research. In *What Mean These Bones? Studies in Southeastern Bioarchaeology*, edited by Mary L. Powell, Patricia S. Bridges, and Ann Marie Wagner Mires. The University of Alabama Press, Tuscaloosa, pp. 172–188.

Buikstra, Jane E., and Douglas H. Ubelaker. 1994. *Standards for Data Collection from Human Skeletal Remains: Proceeding of a Seminar at the Field Museum of Natural History*. Arkansas Archeological Survey Research Series No. 44, Fayetteville.

Cerezo-Román, Jessica I. 2015. Unpacking personhood and funerary customs in the Hohokam area of Southern Arizona. *American Antiquity* 80:353–375.

Cerezo-Román, Jessica I., Anna Wessman, and Howard Williams, eds. 2017. *Cremation and the Archaeology of Death*. Oxford University Press, Oxford.

Chapman, John, and Bisserka Gaydarska. 2007. *Parts and Wholes: Fragmentation in Prehistoric Context*. Oxbow Books, Oxford.

Charles, Douglas K., and Jane E. Buikstra. 1983. Archaic mortuary sites in the central Mississippi drainage: Distribution, structure, and behavioral implications. In *Archaic Hunters and Gatherers in the American Midwest*, edited by James L. Phillips and James A. Brown. Academic Press, New York, pp. 117–145.

Chávez Balderas, Ximena. 2018. Fire, transformation, and bone relics: Cremated remains at the Templo Mayor of Tenochtitlan. In *Smoke, Flames, and the Human Body in Mesoamerican Ritual Practice*, edited by Vera Tiesler and Andrew K. Scherer. Dumbarton Oaks Research Library and Collection, Washington, D.C., pp. 379–409.

Chilver, E. M. 1965. Meta village chiefdoms of the Bome Valley in the Bamenda Prefecture of West Cameroon, Part 1. *Nigerian Field* 30(1):4–18.

Clark, J. Desmond. 1956. Prehistory in Nyasaland. *The Nyasaland Journal* 9:92–119.

Clark, J. Desmond. 1973. Archaeological investigation of a Painted Rock Shelter at Mwana Wa Chencherere, north of Dedza, Central Malaŵi in July to September, 1972. *The Society of Malawi Journal* 26:28–46.

Crader, Diana Catherine. 1984a. *Hunters in Iron Age Malaŵi: The Zooarchaeology of Chencherere Rockshelter*. Malaŵi Government Ministry of Education and Culture, Lilongwe.

Crader, Diana Catherine. 1984b. Faunal remains from Chencherere II Rock Shelter, Malawi. *The South African Archaeological Bulletin* 39:37.

Cunningham, Craig, Louise Scheuer, and Sue M. Black. 2016. *Developmental Juvenile Osteology*. 2nd ed. Elsevier/AP, Amsterdam.

Darwent, Christalynn M., and R. Lee Lyman. 2002. Detecting the postburial fragmentation of carpals, tarsals and phalanges. In *Advances in Forensic Taphonomy: Method, Theory, and Archaeological Perspectives*, edited by William D. Haglund and Marcella H. Sorg. CRC Press, Boca Raton, FL, pp. 356–377.

David, Nicholas. 1992. The archaeology of ideology: Mortuary practices in the central Mandara Highlands, northern Cameroon. In *An Africa Commitment*, edited by Judith Sterner and Nicholas David, University of Calgary Press, Calgary, pp. 181–210.

DeBusk, George H. 1998. A 37,500-year pollen record from Lake Malawi and implications for the biogeography of Afromontane Forests. *Journal of Biogeography* 25:479–500.

di Lernia, Savino. 2013. Places, monuments, and landscape: Evidence from the Holocene central Sahara. *Azania: Archaeological Research in Africa* 48(2):173–192.

di Lernia, Savino, and Mary Anne Tafuri. 2013. Persistent deathplaces and mobile landmarks: The Holocene mortuary and isotopic record from Wadi Takarkori (SW Libya). *Journal of Anthropological Archaeology* 32(1):1–15.

Duday, Henri. 2009. *The Archaeology of the Dead: Lectures in Archaeothanatology*. Oxbow Books, Oxford.

Edlich-Muth, Miriam. 2022. Dissolving subjects in medieval reliquaries and twentieth-century mass graves. In *Interdisciplinary Explorations of Postmortem Interaction: Dead Bodies, Funerary Objects, and Burial Spaces Through Texts and Time*, edited by Estella Weiss-Krejci, Sebastian Becker, and Philip Schwyzer. Springer, Cham, pp. 189–209.

Fagan, B. M. 1969. Excavations at Ingombe Ilede, 1960-2. In *Iron Age Cultures in Zambia, Volume 2*, edited by B. M. Fagan, D. Phillipson, and S. G. H. Daniels. Chatto and Windus, London, pp. 57–161.

Fagan, Brian M., and Francis L. Van Noten. 1971. *The Hunter-Gatherers of Gwisho (Zambia)*. Musee Royal de l'Afrique Centrale, Tervuren, Belgique.

Fernández-Jalvo, Yolanda, and Peter Andrews. 2016. *Atlas of Taphonomic Identifications: 1001+ Images of Fossil and Recent Mammal Bone Modification*. Springer, Dordrecht.

Geller, Pamela L. 2012. Parting (with) the dead: Body partibility as evidence of commoner ancestor veneration. *Ancient Mesoamerica* 23(1):115–130.

Goldstein, Lynne. 1976. *Spatial Structure and Social Organization: Regional Manifestations of Mississippian Society*. Ph.D. dissertation, Northwestern University, Evanston, IL.

Graham, Emma-Jayne. 2009. Becoming persons, becoming ancestors: Personhood, memory and the corpse in Roman rituals of social remembrance. *Archaeological Dialogues* 16(1):51–74.

Graham, Emma-Jayne, Carrie L. Sulosky Weaver, and Andrew T. Chamberlain. 2019. Pars pro toto and personhood in Roman cremation ritual: New bioarchaeological evidence for the rite of os resectum. *Bioarchaeology International* 2(4):240–254.

Haglund, William D. and Marcella H. Sorg, eds. 2002. *Advances in Forensic Taphonomy Method, Theory, and Archaeological Perspectives*. CRC Press, Boca Raton, FL.

Hall, Simon. 2000. Burial and sequence in the Later Stone Age of the Eastern Cape Province, South Africa. *The South African Archaeological Bulletin* 55(172):137–146.

Haverkort, Caroline M., and David Lubell. 1999. Cutmarks on Capsian human remains: Implications for Maghreb Holocene social organization and palaeoeconomy. *International Journal of Osteoarchaeology* 9:147–169.

Hildebrand, Elisabeth A., Katherine M. Grillo, Elizabeth A. Sawchuk, Susan K. Pfeiffer, Lawrence B. Conyers, Steven T. Goldstein, 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(36):8942–8947. https://doi.org/10.1073/pnas.1721975115.

Hogg, Alan G., Timothy J. Heaton, Quan Hua, Jonathan G. Palmer, Chris S. Turney, John Southon, et al. 2020. SHCal20 Southern Hemisphere calibration, 0–55,000 years cal BP. *Radiocarbon* 62:759–778.

Insoll, Timothy. 2015. Constructing ancestors in sub-Saharan Africa. In *Death Rituals, Social Order and the Archaeology of Immortality in the Ancient World: 'Death Shall Have No Dominion'*, edited by Colin Renfrew, Michael J. Boyd, and Iain Morley. Cambridge University Press, Cambridge, pp. 153–167.

King, Julia A. 2016. Comparative colonialism and collections-based archaeological research: Dig less, catalog more. *Museum Worlds* 4(1):4–17.

Kjellström, A. 2022. From saint to anthropological specimen: The transformation of the alleged skeletal remains of Saint Erik. In *Interdisciplinary Explorations of Postmortem Interaction: Dead Bodies, Funerary Objects, and Burial Spaces Through Texts and Time*, edited by Estella Weiss-Krejci, Sebastian Becker, and Philip Schwyzer, Springer, Cham, pp. 167–188.

Knüsel, Christopher J., and Eline M. J. Schotsmans, eds. 2022. *The Routledge Handbook of Archaeothanatology: Bioarchaeology of Mortuary Behaviour*. Routledge, London.

Knüsel, Christopher J. 2014. Crouching in fear: Terms of engagement for funerary remains. *Journal of Social Archaeology* 14:26–58.

Kristeva, Julia. 1980. *Pouvoirs de l'horreur: Essai sur l'abjection*. Éditions du Seuil, Paris.

Kusimba, Sibel B. 2005. What is a hunter-gatherer? Variation in the archaeological record of Eastern and Southern Africa. *Journal of Archaeological Research* 13(4):337–366.

Lam, Y. M., O. M. Pearson, Curtis W. Marean, and Xingbin Chen. 2003. Bone density studies in zooarchaeology. *Journal of Archaeological Science* 30(12):1701–1708.

Lipson, Mark, Elizabeth A. Sawchuk, Jessica C. Thompson, Jonas Oppenheimer, Christian A. Tryon, Kathryn L. Ranhorn, et al. 2022. Ancient DNA and deep population structure in sub-Saharan African foragers. *Nature* 603:290–296.

Liston, Maria A. 2007. Secondary cremation burials at Kavousi Vronda, Crete: Symbolic representation in mortuary practice. *Hesperia: The Journal of the American School of Classical Studies at Athens* 76(1):57–71.

Madden, J. F. 1940. The exhumation of Latuka Rain Queen. *Sudan Notes and Records* 23:351–354.

Malijani, Oris. 2019. Towards community inclusion: Chongoni world heritage site and sustainable cultural tourism in Malawi. *South African Archaeological Bulletin* 74(209):35–41.

Marlowe, Frank W. 2005. "Hunter-gatherers and human evolution." *Evolutionary Anthropology: Issues, News, and Reviews: Issues, News, and Reviews* 14(2):54–67.

McAnany, Patricia A. 1995. *Living with the Ancestors: Kinship and Kingship in Ancient Maya Society*. University of Texas Press, Austin.

McClelland, John, and Jessica I. Cerezo-Román. 2016. Personhood and re-embodiment in osteological practice. In *Dealing with the Dead: Mortuary Archaeology and Contemporary Society*, edited by Howard Williams and Melanie Giles. Oxford University Press, Oxford, pp. 39–67.

Mgomezulu, Gadi Godfrey Yobe. 1978. *Food Production: The Beginnings in the Lithipe/Changoni Area of Dedza District, Malawi. 411*. University of California, Berkeley.

Muller, Jean-Claude. 1976. Of souls and bones: The living and the dead among the Rukuba, Benue-Plateau State, Nigeria. *Africa* 46:258–273.

Nilsson Stutz, Liv. 2003. *Embodied Rituals and Ritualized Bodies: Tracing Ritual Practices in Late Mesolithic Burials*. Almqvist & Wiksell International, Stockholm.

Nilsson Stutz, Liv. 2016. The importance of "getting it right": Tracing anxiety in Mesolithic burial rituals. In *The Archaeology of Anxiety: The Materiality of Anxiousness, Worry, and Fear*, edited by Jeffrey Fleisher and Neil Norman. Springer, New York, pp. 21–40.

Parker Pearson, Mike. 2008. *The Archaeology of Death and Burial*. Texas A & M University Press, College Station.

Parkington, John, Charles Cable, P. L. Carter, H. J. Deacon, Janette Deacon, A. J. B. Humphreys, et al. 1980. Time and place: Some observations on spatial and temporal patterning in the Later Stone Age sequence in Southern Africa [with Comments and Reply]. *The South African Archaeological Bulletin* 35(132):73–112.

Pearce, David. 2008. *Later Stone Age Burial Practice in the Eastern Cape Province, South Africa*. Ph.D. dissertation, University of the Witwatersrand, Johannesburg, South Africa.

Pfeiffer, Susan, and Lesley Harrington. 2018. Regional continuity and local challenges to resilience among Holocene hunter-gatherers of the Greater Cape Floristic Region, South Africa. In *Hunter-Gatherer Adaptation and Resilience. A Bioarchaeological Perspective*, edited by Daniel H. Temple and Christopher M. Stojanowski. Cambridge University Press, Cambridge, pp. 26–46.

Phillipson, D. W. 1976. *The Prehistory of Eastern Zambia*. British Institute in Eastern Africa, Nairobi.

Pickering, T. R. 2001. Carnivore voiding: A taphonomic process with the potential for the deposition of forensic evidence. *Journal of Forensic Sciences* 46(2):406–411.

Pokines, James T., Ericka N. L'Abbe, and Steven A. Symes, eds. 2021. *Manual of Forensic Taphonomy*. 2nd ed. CRC Press, Boca Raton, FL.

Pokines, James T., and Julian C. Kerbis Peterhans. 2007. Spotted hyena (*Crocuta crocuta*) den use and taphonomy in the Masai Mara National Reserve, Kenya. *Journal of Archaeological Science* 34(11):1914–1931.

Rakita, Gordon F. M. 2009. *Ancestors and Elites: Emergent Complexity and Ritual Practices in the Casas Grandes Polity*. AltaMira, Lanham, Maryland.

Rangeley, W. H. 1952. Two Nyasaland rain shrines. *Nyasaland Journal* 5(2):31–50.

Rangeley, W. H. J. 1963. The earliest inhabitants of Nyasaland. *The Nyasaland Journal* 16(2):35–42.

Roberts, C., and S. Ingham. 2008. Using ancient DNA analysis in palaeopathology: A critical analysis of published papers, with recommendations for future work. *International Journal of Osteoarchaeology* 18:600–613.

Roksandic, Mirjana. 2002. Position of skeletal remains as key to understanding mortuary behavior. In *Advances in Forensic Taphonomy: Method, Theory and Archaeological Perspectives*, edited by William D. Haglund and Marcella H. Sorg. CRC Press, Boca Raton, FL, pp. 99–117.

Sandelowsky, Beatrice Henriette. 1972. *Later Stone Age Lithic Assemblages from Malawi and Their Technologies*. Ph.D. dissertation, University of California, Berkeley.

Sandelowsky, Beatrice Henriette. 2004. *Archaeologically Yours, Beatrice Sandelowsky: A Personal Journey into the Prehistory of Southern Africa, in Particular Namibia*. Namibia Scientific Society, Windhoek.

Sandelowsky, B. H., and K. R. Robinson. 1968. *Fingira: Preliminary Report, Publication (Malawi. Department of Antiquities) No. 3.* Government Press, Zomba, Malŵi.

Sawchuk, Elizabeth A., Steven T. Goldstein, Katherine M. Grillo, and Elizabeth A. Hildebrand. 2018. Cemeteries on a moving frontier: Mortuary practices and the spread of pastoralism from the Sahara into eastern Africa. *Journal of Anthropological Archaeology* 51:187–205. https://doi.org/10.1016/j.jaa.2018.08.001.

Sawchuk, Elizabeth A., Elisabeth A. Hildebrand, Austin Chad Hill, Daniel A. Contreras, Justus Erus Edung, Anneke Janzen, et al. 2022. The Jarigole mortuary tradition reconsidered. *Antiquity* 96(390):1460–1477.

Sawchuk, Elizabeth A., Susan Pfeiffer, Carla E. Klehm, Michelle E. Cameron, Austin C. Hill, Anneke Janzen, et al. 2019. The bioarchaeology of mid-Holocene pastoralist cemeteries west of Lake Turkana, Kenya. *Archaeological and Anthropological Sciences* 11(11):6221–6241.

Saxe, Arthur A. 1970. *Social Dimensions of Mortuary Practices*. Ph.D. dissertation, University of Michigan, Ann Arbor.

Siiriäinen, Ari. 1977. Later Stone Age investigation in the Laikipia Highlands, Kenya: A preliminary report. *Azania* 12:161–186.

Skoglund, Pontus, Jessica C. Thompson, Mary E. Prendergast, Alissa Mittnik, Kendra Sirak, Mateja Hajdinjak, et al. 2017. Reconstructing prehistoric African population structure. *Cell* 171:59–71.e21.

Smith, Benjamin W. 1995. *Rock Art in South-Central Africa: A Study Based on the Pictographs of Dedza District, Malawi and Kasam District, Zambia*. Ph.D. dissertation, University of Cambridge, Cambridge.

Suckling, Joanna K., M. Katherine Spradley, and Kanya Godde. 2016. A longitudinal study on human outdoor decomposition in central Texas. *Journal of Forensic Sciences* 61:19–25.

Villa, Paola and Eric Mahieu. 1991. Breakage patterns of human long bones. *Journal of Human Evolution* 21:27–48.

Volavka, Zdenka. 1998. *Crown and Ritual*. University of Toronto Press, Toronto.

Watts, Rebecca, Maurice Mugabowagahunde, André Ntagwabira, and John Giblin. 2020. Deposition of modified human remains as evidence for complex mortuary treatment in East Africa during the first millennium AD. *International Journal of Osteoarchaeology* 30:824–834.

Woodburn, James. 1982. Egalitarian societies. *Man* 17:431.

Wright, David K., Sarah J. Ivory, Jago J. Birk, Jeong-Heon Choi, Benjamin Davies, Sabine Fiedler, et al. 2024. Palaeoenvironmental data indicate late quaternary anthropogenic impacts on vegetation and landscapes in Mzimba, northern Malawi. *Frontiers in Environmental Archaeology* 2:1–20.

Zubieta, Leslie F. 2016. Learning through practise: Chewa women's roles and the use of rock art in passing on cultural knowledge. *Journal of Anthropological Archaeology* 43:13–28.