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Zooarchaeological reconstruction of newly excavated Middle Pleistocene deposits from Elandsfontein, South Africa

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A B S T R A C T

The current study provides the first zooarchaeological account of systematically excavated faunal material from Elandsfontein, South Africa (ca. 1.0–0.6 Ma). Archaeological assemblages of this age typically lack well-preserved faunal remains recovered in primary association with artifacts, and thus studies have primarily focused on lithic technology. The sizeable faunal sample from Elandsfontein, South Africa is a rare exception and has dramatically influenced the way that we interpret early hominin foraging behavior during this time. Surface collections, starting in the 1950s, recovered ~13,000 mammalian fossils and > 160 Acheulean artifacts. The Elandsfontein faunal assemblage was interpreted as having accumulated through natural mortality and subsequent scavenging by carnivores and hominins, with hominins playing a very minimal role in carcass modification. Low frequencies of stone tool cutmarks were taken as evidence that Acheulean hominins had limited ability to obtain large carcasses. However, this interpretation contrasts with a growing body of evidence suggesting that many Acheulean hominins across sub-Saharan Africa not only had access to large mammal carcasses but were often the primary agents of accumulation and modification. The majority of the original Elandsfontein faunal material was collected from deflation surfaces and lacks sufficient contextual information. We conducted a detailed zooarchaeological analysis of faunal remains from four recent excavations within the Elandsfontein dune field. Our results differ from those based on surface collections and suggest multiple agents of bone accumulation with varying degrees of hominin and carnivore activity across the paleolandscape. Frequencies of hominin-induced butchery are higher (up to 3.6% NISP) than reported for previously collected samples (< 1% of limb surfaces) and demonstrate butchery of megafauna on at least two occasions. Our findings indicate that earlier zooarchaeological studies at Elandsfontein underestimate the degree of hominin contribution to the fossil assemblage and do not take into account the complicated taphonomic history across the paleolandscape. The results of this analysis are congruent with recent studies suggesting that Acheulean hominins and their Oldowan producing predecessors had regular access to large carcasses and that megafauna were an essential component of the diet for early *Homo*.

1. Introduction

The Elandsfontein assemblage provides a rare glimpse into hominin foraging behavior during a critical and under-investigated time in human evolution (ca. 1.0–0.6 Ma). Climatic changes coincide with the extinction of *Homo erectus* in Africa and Europe and the appearance of behaviorally and anatomically derived Middle Pleistocene hominins across the Old World (Berger and Jansen, 1994; Blome et al., 2012; Head and Gibbard, 2005). The development of the Acheulean tool complex (~1.76 Ma–100 ka) is often attributed to the appearance of

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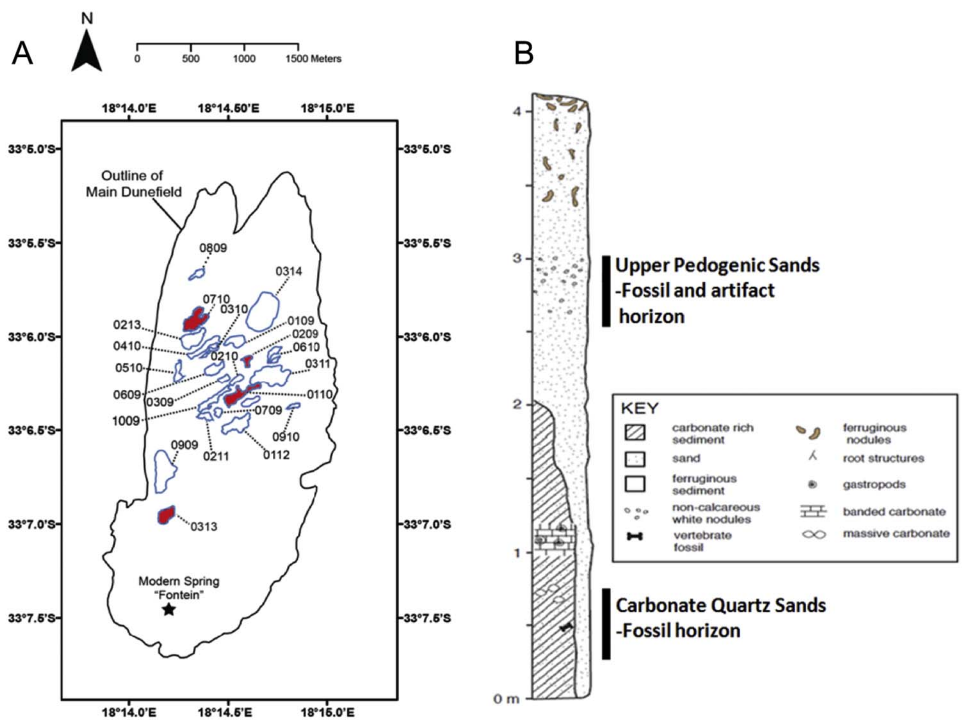

Fig. 1. a–b. a) Sitemap with location of study bays highlighted in red. b) Composite section of the Elandsfontein stratigraphy (after Braun et al., 2013b).

these derived African hominins with increased intellectual ability, larger absolute brain size, and larger body size. Biological changes are suggested to have been fueled by major behavioral and dietary shifts such as increased consumption of animal tissue and increased predatory behavior (Aiello and Wheeler, 1995; Klein, 2009; Milton, 1987; O' Connell et al., 1999; Pante, 2010; Ruff and Walker, 1993; Shipman and Walker, 1989). Unfortunately, our understanding of Acheulean hominin foraging behavior is limited by a lack of well-preserved faunal remains in association with evidence of hominin behavior (e.g., artifacts). Despite the abundance of Early-Middle Pleistocene hominin localities across sub-Saharan Africa, many of these assemblages represent individual scatters of artifacts or isolated fossil finds and thus have not been the subject of intense study. (e.g., Beaumont, 1982; Beyene et al., 2013; Butzer, 1974; Chavaillon et al., 1974; Clark, 1987; Cruz-Uribe et al., 2003; de la Torre et al., 2003; Deino and McBrearty, 2002; Gibbon et al., 2009; Gowlett and Crompton, 1994; Harris and Isaac, 1997; Howell, 1961; Kuman and Clarke, 2000; Lepre et al., 2011; Potts et al., 2004; Quade et al., 2004; Shackley, 1980; Schick and Clark, 2003). Our current understanding of landscape use in early *Homo* derives mainly from a relatively limited number of localities in East Africa [e.g., Olorgesailie, Olduvai Bed I and II, Koobi Fora, (Blumenschine and Peters, 1998; Bunn, 1994; Peters and Blumenschine, 1995; Potts et al., 1999; Rogers et al., 1994; Sikes, 1994)]. Elandsfontein provides a rare opportunity to investigate Acheulean hominin foraging behavior in South Africa on a landscape scale (Braun et al., 2013a, 2013b).

Elandsfontein lies within the Cape Floral Kingdom (CFK) and Winter Rainfall Zone (WRZ). This unique setting provides an opportunity to expand our comprehension of Acheulean hominin interactions with their environments. Conditions were likely more difficult for hominins in southern Africa than elsewhere on the continent. Dust, pollen, and leaf wax records have been linked with intensified upwelling of cold bottom waters in the Benguela Current System (Dupont et al., 2005, 2011, 2013; Etourneau et al., 2009; Marlow et al., 2000). This climatic event resulted in regional aridity and growth of the endemic Cape flora. However, stable isotopic analysis of micromammal and macromammal teeth suggests that Elandsfontein may have been spared from regional aridification by ancient spring activity (Lehmann et al., 2016; Patterson et al., 2016).

The Elandsfontein fossil and artifact collections have been subject to a long history of research. Initial survey and surface collections occurred between the 1950′s and 1990′s (Avery, 1989; Drennan, 1953; Klein, 1978; Singer, 1956; Singer and Crawford, 1958; Singer and Heltne, 1966). Collection efforts focused primarily on well-preserved, easily identifiable specimens (Braun et al., 2013a, 2013b; Klein, 1988; Klein and Cruz-Uribe, 1991; Klein et al., 2007). In the mid-1960′s, a series of excavations were undertaken in the southern part of the dune field, though only one (Cutting 10) has been fully described (Deacon, 1998; Singer and Wymer, 1968). In total, over 13,000 mammalian fossils were collected along with > 160 Acheulean bifaces, thousands of flake tools, and flaking debris. The most notable discovery was a hominin calvaria that is variably classified as *Homo rhodesiensis*, “archaic” *H. sapiens*, or *H. heidelbergensis* (Drennan, 1953; Rightmire, 1998, 2001; Singer, 1954a, 1954b), and is referred to as the “Saldanha skull” (Drennan, 1953, 1955; Singer, 1954a, 1954b, 1958). The fossil and artifact collections from these initial reconnaissance efforts are collectively referred to as “Elandsfontein Main” (EFTM) (Klein et al., 2007). Despite the long history of research at Elandsfontein, many studies have focused on materials collected from deflated surface horizons which have no spatial or temporal provenience.

Taphonomic and zooarchaeological interpretations of the EFTM fauna have had an important influence on our perception of Acheulean hominin foraging behavior in Africa (Klein, 1988; Klein and Cruz-Uribe, 1991; Klein et al., 2007; Milo, 1994). Low frequencies of stone tool cutmarks [< 1% of limb surfaces (Milo, 1994)] were interpreted as evidence that hominins had little impact on the mammalian community and limited ability to obtain large carcasses (Klein, 1988). This view of hominin foraging ability contrasts with a growing body of evidence suggesting that hominins at many Oldowan and Acheulean sites had primary access to carcasses and often consumed very large ungulates, including megafauna (e.g. Díez et al., 1999; Domínguez-Rodrigo and Barba, 2007; Domínguez-Rodrigo et al., 2002, 2009b, 2014; Egeland and Domínguez-Rodrigo, 2008; Fernandez-Jalvo et al., 1999; Goren-Inbar et al., 1992, 1994, 2000; Monohan, 1996; Pante, 2010, 2013; Pickering et al., 2004a, 2004b; Pobiner et al., 2008; Rabinovich and Biton, 2011; Rabinovich et al., 2008, 2012; Saladié et al., 2014).

In 2008, the West Coast Research Project (WCRP) began systematic