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## Explaining changing patterns of wood presence across the Bronze and Iron Age at Kaman-Kalehöyük, central Anatolia

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### ABSTRACT

Previous anthracological research on multi-use pit fills at Kaman-Kalehöyük in central Turkey shows a sudden and dramatic increase in pine use from the Early Iron Age onwards, accompanied by a decline in taxa richness from the Middle Bronze Age to the Late Bronze Age. This paper explores whether fuel choice was the driving factor behind this pattern of change through a comparative taxonomic analysis of wood charcoal assemblages derived from multi-use pits, domestic hearths, and room fills accumulated during the Middle Bronze Age to Late Iron Age occupation at the site. Results from the hearth assemblages parallel those from the pits, documenting a decline in taxa richness from the Middle Bronze Age to the Late Bronze Age, particularly during the Hittite Empire period, followed by a dramatic increase in pine in the Iron Age. However, the room fill composition does not match the same pattern. Results confirm that changes in taxonomic representation represented in the pit fills at Kaman-Kalehöyük was driven by fuel wood selection, with remains from room fills reflecting different selection behaviour relating to construction activities.

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### 1. Introduction

Central Anatolia's high plateau supports a highly modified anthropogenic landscape, the origin and subsequent history of which is progressively understood through palaeoenvironmental research (Roberts et al., 2011a; Marsh and Kealhofer, 2014). Archaeological sequences from the region are increasingly being used to complement information about past vegetation derived from widely spaced pollen records (Asouti and Kabukcu, 2014), though data from well sampled multi-period archaeological sequences are still rare in the Bronze Age (~3000–1200 BC) and Iron Age (~1200–300 BC) where the research focus has primarily been on the changing political and social landscape (Dörfler et al., 2011).

Rare examples of how contextualised archaeobotanical research can illuminate anthropogenic landscape change from this period are found at Gordion, Turkey where both Marston (2009, 2012) and Miller (2010) have reconstructed agricultural organisation and wood procurement. Building on the research conducted at Gordion, recent anthracological research at Kaman-Kalehöyük has provided

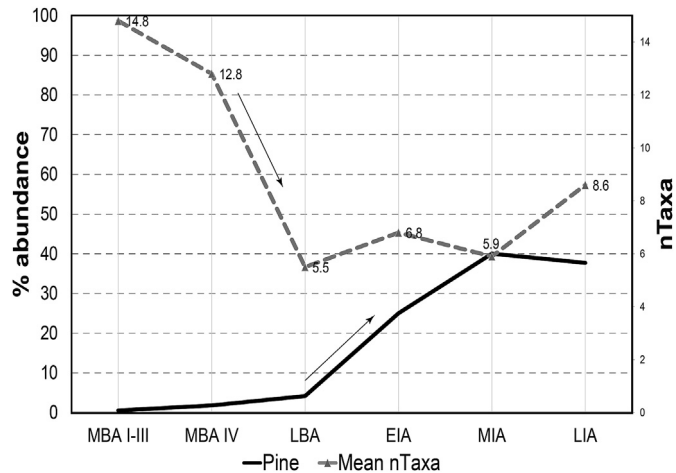
another Anatolian history of woodland resource use from the Middle Bronze Age I–III to the Late Iron Age (Wright et al., 2015). As well as indicating long term reduction in taxa richness, yet maintenance of oak cover, this analysis demonstrated a significant increase in the use of pine (*Pinus* spp.) at the end of the Late Bronze Age and beginning of the Early Iron Age (Fig. 1).

Although pollen data from Eski Acıgöl and Lake Beyşehir demonstrates that pine was present in the study region throughout the Bronze and Iron Ages (Roberts et al., 2001; Woldring and Bottema, 2002; Wick et al., 2003; Litt et al., 2009), the anthracological data from Kaman-Kalehöyük show it was little used until the Iron Age when a dramatic increase in pine, hereafter the pine shift, occurs. After investigating four possible mechanisms for this dramatic increase in pine use, we concluded that the pine shift was either a result of increased use of existing pine stands for either fuel or other uses such as construction and “shows that Kaman-Kalehöyük is characterised by a local exploitation pattern reflecting specific cultural and economic practices” (Wright et al., 2015:228).

This paper aims to evaluate and develop this explanation by investigating the role of pine as a construction and fuel resource through a diachronic analysis of new wood charcoal data from a range of different archaeological deposit/context types at Kaman Kalehöyük. Specifically, this paper will determine whether changes in the fuel regime at Kaman-Kalehöyük were the driving force

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**Fig. 1.** Summary diagram of the pit assemblage data from Kaman-Kalehöyük as presented in Wright et al. (2015). Note the increase in pine (primary axis) is preceded by a decline in taxonomic richness (secondary axis) and cannot be explained by sample size (Wright et al., 2015).

behind the pine shift and taxa richness decline seen in the pit fills. Determination of the extent to which fuel regimes and/or construction changes at the site influenced the pine shift observed in the Early Iron Age allow us to address whether the implicit assumption that general fills such as pits and middens usually indicate what people are burning is correct (Chabal et al., 1999; Asouti and Austin, 2005).

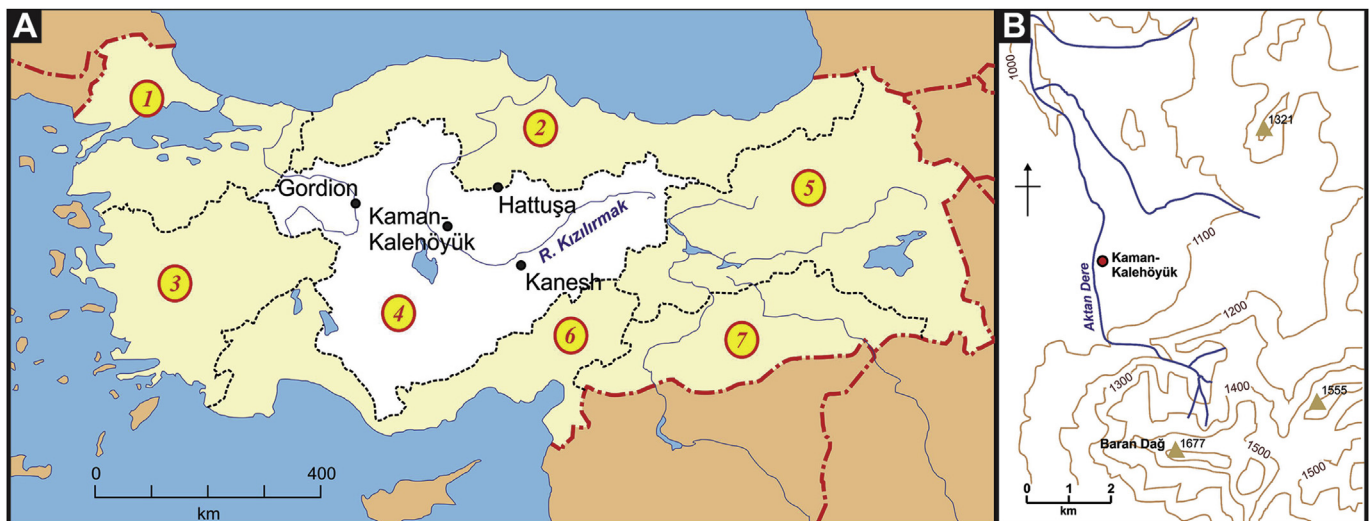
## 2. Background

Located in the central Anatolian highlands, Kaman-Kalehöyük (39° 21' 46" N, 33° 47' 12" E at 1070 m ASL) is positioned 110 km southeast of the Turkish capital, Ankara, in Kırşehir Province (Fig. 2) (Ishimaru and Kashima, 2000; Sayhan, 2000). With mount Baran (Baran Dağ) just to the south and the water course Atkan Dere running along its western edge the settlement mound of Kaman-Kalehöyük is located on the southern edge of an open plain

stretching to the north. Positioned within the bend of the Kızılırmak, approximately 30 km to the west, Kaman-Kalehöyük is located in the middle of the central Anatolian region and situated in a region surrounded by abundant natural resources. Nearby mountains contain a variety of geological resources and several watercourses in close proximity to the site water an area rich in agricultural soils. The region around the site has a strong agricultural economy and currently consists of a mosaic of farms and small towns dominated by cash crop production.

This region is characterised by summer droughts and winter rains/snow with temperatures varying between  $-25^{\circ}\text{C}$  and  $40^{\circ}\text{C}$  resulting in a semi-arid steppe environment (Ünal, 1989; MGM, 2014). Modern records from the township of Kaman (~6 km from the site and in an identical ecological zone to the site) show annual rainfall averages c. 380 mm which is above the requirement for reliable arable farming, the dominant economy of the area (MGM, 2014). Lake isotope records indicate that a climate similar to that of today did not occur until ~500 BC, while the early Holocene was wetter than today and began drying after ~4500 BC (Roberts et al., 2011a). Two drought events, 2200–2000 BC and 1200–1000 BC respectively, also occurred in the occupation period under investigation (Mayewski et al., 2004; Weninger et al., 2009; Roberts et al., 2011b).

While only making up less than 5% of the current central Anatolian landscape, steppe-forest with elements from both Irano-Turanian and Xero-Euxinian types would have been the dominant woodland landscape feature in the past (Zohary, 1973; Condé et al., 2002). The landscape today is primarily anthropogenic, with extensive agricultural and pastoral habitats dominating and open steppe grassland elsewhere (Kaya and Raynal, 2001a). Forest elements of any type are sparse and usually planted, including riparian taxa such as willow/poplar (*Salix/Populus*), ash (*Fraxinus* sp.) and elm (*Ulmus* sp.). These are the most common large tree taxa in the area, especially around small villages and townships, and dominate in proximity to streams and lakes (Davis, 1965–1985; Zohary, 1973; Condé et al., 2002). Planted willow and poplar can be found along the course of Atkan Dere which runs along the western edge of the site as well as other larger waterways less than 5 km of the site. Small pockets of remnant oak and pine forest do exist, although most are planted, coppiced and pollarded, with the closest to the



**Fig. 2.** A – Map showing the location of Kaman-Kalehöyük relative to other key Bronze and Iron Age sites. The geographic zones within Turkey are numbered as follows (compiled from: Republic of Turkey Ministry of Forestry and Water Affairs Department of Information Technology, 2015; Turkish Statistical Institute, 2015): 1 – Marmara, 2 – Black Sea, 3 – Aegean, 4 – central Anatolia, 5 – eastern Anatolia, 6 – Mediterranean, 7 – southeast Anatolia. B – Topographic map of the area close to the site showing the Atkan Dere and mount Baran to the south (Maps drawn by Peter Robinson, 2015).

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