



The environmental setting of Epipalaeolithic aggregation site Kharaneh IV



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ABSTRACT

The archaeological site of Kharaneh IV in Jordan's Azraq Basin, and its relatively near neighbour Jilat 6 show evidence of sustained occupation of substantial size through the Early to Middle Epipalaeolithic (c. 24,000–15,000 cal BP). Here, we review the geomorphological evidence for the environmental setting in which Kharaneh IV was established. The on-site stratigraphy is clearly differentiated from surrounding sediments, marked visually as well as by higher magnetic susceptibility values. Dating and analysis of off-site sediments show that a significant wetland existed at the site prior to and during early site occupation (~23,000–19,000 BP). This may explain why such a substantial site existed at this location. This wetland dating to the Last Glacial Maximum also provides important information on the palaeoenvironments and potential palaeoclimatic scenarios for today's eastern Jordanian desert, from where such evidence is scarce.

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1. Introduction and background

There is much contemporary interest in people's relationships with their natural environment and how resources can be sustainably maintained given changing climates, population sizes, and per capita demands. Today people are increasingly vulnerable to risk associated with a changing climate and a finite resource base (e.g. IPCC, 2014). Arguably these issues were also critical for pre-historic societies, although for hunter-gatherers their ability to move around the landscape represented a highly flexible strategy through which climatic change could be effectively mitigated, as long as population levels remained relatively low. In the wider Levant region people's adaptation and mitigation strategies to a changing climate during the transition from the last glacial period into the Holocene interglacial have been widely discussed in relation to the beginnings of agriculture (e.g. Rosen, 2007; Blockley and

Pinhasi, 2011; Maher et al., 2011a; Rosen and Rivera-Collazo, 2012). Yet our understanding of how the Levant experienced this global transition in climate is still somewhat unclear (e.g. Robinson et al., 2006; Enzel et al., 2008) and relies on palaeoclimate datasets mainly from the west of the region. To improve our ability to test hypotheses about people's reactions to climatic and environmental change, or about their influence on climate and local environments (e.g. Ruddiman et al., 2015; Ramsey et al., 2015), improved spatial and temporal resolution of our palaeoenvironmental and archaeological records is required (Maher et al., 2011a).

The Azraq Basin of eastern Jordan has long been the focus of archaeological excavation and associated environmental investigations documenting a long history of human occupation dating back to the Lower Palaeolithic (e.g. Field, 1960; Copeland and Hours, 1989; Rollefson et al., 1997; Betts, 1998; Garrard and Byrd, 2013). The latest set of excavations in the basin includes work by the Epipalaeolithic Foragers in Azraq Project (EFAP; e.g. Maher et al., 2011b, Maher et al. 2012; Richter et al., 2013; Maher et al., 2015a) and this paper reports the results of geomorphological

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investigations around the site of Kharaneh IV, placing the site into its wider palaeoenvironmental context.

1.1. Kharaneh IV

The Early to Middle Epipalaeolithic site of Kharaneh IV (KHIV) is an important Late Pleistocene site in the Eastern Levant. Recent excavations at KHIV, building on the initial work of M. Muheisen (e.g. 1988), have shown the site to be of great archaeological interest. The high density of artefacts, given a relatively short occupation history (19,830–18,600 cal years BP; Richter et al., 2013), as well as the thickness of archaeological deposits, large size of the site (22,000 m²), and the presence of very early hut structures (Maher et al., 2012; 2015a), are all rare for Epipalaeolithic sites and suggest frequent re-use of KHIV by hunter-gatherer groups.

The site is located approximately 40 km west of the Azraq Oasis (Fig. 1) at an elevation of ~640masl, lying on a sedimentary terrace of pale, cream-coloured silts, in the Wadi Kharaneh, south of the Islamic castle of the same name. The local topography (Fig. 2) shows the site is the highpoint on the floor of the greater Wadi Kharaneh (Fig. 3); it sits at the confluence of two minor wadis with a general gradient of about 0.3 m per 100 m to the east, towards the central oasis.

The sediments around the site have been described very briefly before as part of regional reviews (Garrard et al., 1985; Besancon et al., 1989) but before EFAP were not dated or systematically surveyed to link KHIV into the wider landscape. Here we describe such work, providing a geomorphological background to the establishment of KHIV and adding to the palaeoenvironmental reconstruction of the local environment. In combination with faunal data (Martin et al., 2010; Jones, 2012) and ongoing archaeobotanical analysis, this geomorphological data contributes to our understanding of why this particular locality was selected for settlement

and why people returned to the same place on the landscape for c. 1000 years (see also Maher, 2015b). In addition, this work provides more information for an emerging picture of environmental change within the wider Azraq Basin through the late Quaternary (e.g. Jones and Richter, 2011; Cordova et al., 2013; Ames et al., 2014) that improves our understanding of regional environmental and climatic change throughout the Pleistocene and Holocene.

2. Methodology

2.1. Mapping and sediment logging

The topography of the site and the surrounding area was mapped in high-resolution using a ProMark3 differential GPS system, with survey data fixed to the local site grid. In total, 1076 data points were used to create a local contour map of the site and the immediate surrounding area. Six off-site sections were dug into wadi terraces and were visually described and surveyed into the site grid. In addition, a 9 m × 1 m 'GeoTrench' was dug into the edge of the site itself. Careful surveying of all sections to the site grid allowed these off-site sections to be directly compared to the excavation areas on-site (see Maher et al., 2015a for details of these). Of particular interest to this study are the deep sounding in Areas A (excavation square AS42) and B (R/S2/60) and a deep sounding between the two main excavation areas (AZ51), all of which were excavated into the archaeologically sterile units underlying the site.

2.2. Age-estimates

A number of dating methods have been used to try and constrain the age of the stratigraphy, both on- and off-site, at KHIV. The methodologies for both Optically Stimulated Luminescence (OSL) and U-series approaches are outlined here.

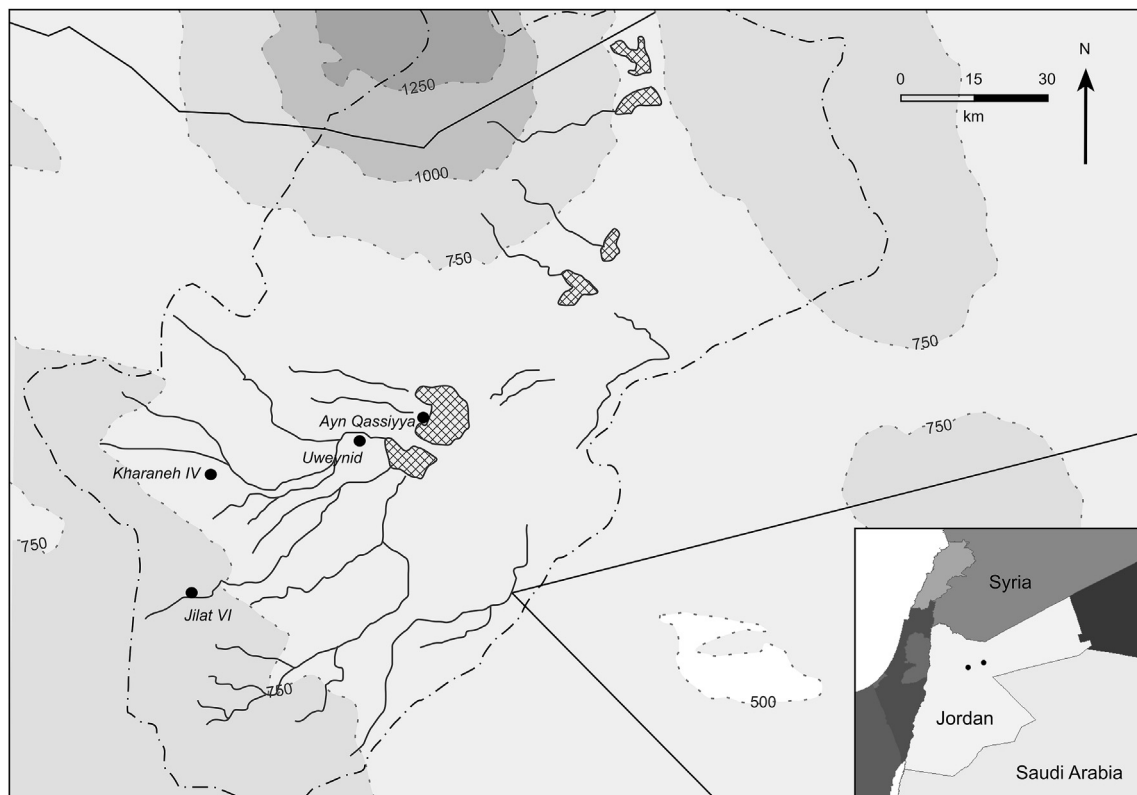


Fig. 1. Extent of the Azraq basin (dashed line) showing major wadis (solid lines) and playa (hashed areas). The major archaeological sites discussed in the text are shown. Shading depicts 250 m contour intervals (masl). The sites of Kharaneh IV and Ayn Qassiyya are also shown on the regional map for context.

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