

The Neolithic site of Jebel Oraf 2, northern Saudi Arabia: First report of a directly dated site with faunal remains

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Abstract

The archaeological record of the Arabian Neolithic remains extremely fragmentary. Archaeological sites containing faunal remains of early domesticates are extremely rare and only a few sites yielding these excavated in Yemen and along the eastern coast of the Arabian Peninsula. Neolithisation models have therefore had to infer population dynamics and subsistence changes across vast distances. Here we present the first report of a newly discovered Neolithic site in the Jubbah oasis, on the southern edge of the Nefud desert. The site is located on the margin of palaeolake deposits and consists of a large cluster of at least 170 visible hearths. Test excavation of two hearth features yielded radiocarbon ages between 5200 and 5070 BC. Abundant lithics consisted of both ground and chipped stone artefacts, some of which recall the Pottery Neolithic in the Levant. Some 15 fragments of *Bos* dentition were also recovered. The age of the site raises the distinct possibility that the faunal remains represent domestic cattle. The nature of the site, with evidence for repeated occupation, may therefore indicate seasonal use by pastoralists. The site of Jebel Oraf 2 promises to fill a major geographic gap in our understanding of the Neolithisation process in Arabia.

Keywords

Neolithic; Saudi Arabia; Arabian Peninsula; Pastoralism; Faunal remains; Cattle; groundstone tools

Introduction

In Arabia, the transition to a Neolithic economy arrived in the form of mobile pastoralism. Domestic cattle, sheep and goat were probably introduced from the Levant between 6800 and 6200 BC (Drechsler 2007; Uerpmann et al. 2000). However, the archaeological record of the Arabian Neolithic remains poorly understood as Neolithic sites with faunal remains of domesticates are so far only known from the east coast of the Arabian Peninsula and from Yemen. Two opposing Neolithisation models have been put forward, centring on either a migration of Levantine herders (see for example Drechsler 2009; Uerpmann et al. 2000), or an indigenous adoption of herding. In Yemen, cattle, sheep, and goat are attested at the earliest Neolithic site of Manayzah (Martin et al. 2009), while later sites show an indigenous development of specialised cattle pastoralism (Fedele 2008; Henton et al. 2014; McCorrison et al. 2012). This is in contrast to the archaeological record of the southern Levant where subsistence during the Neolithic was primarily based on cereal and pulse agriculture, caprine herding and some cattle husbandry, with caprine herding still accompanied by hunting in eastern Jordan (Henry et al. 2003; Rollefson et al. 2014). Similarly, the lithic evidence shows Levantine styles of

pressure flaked bifacial arrowheads in the early Neolithic in the northern peninsula (the Jubbah Oasis and Qatar), but more idiosyncratic fluted and ridged arrowheads in the south (Charpentier & Crassard 2013; Crassard 2009; Crassard et al. 2013; Crassard & Drechsler 2013).

The oasis of Jubbah, on the southern edge of the Nefud desert, is located in the archaeologically little known region of northern Saudi Arabia. Surveys in the 1970s recorded 12 possible Neolithic or Chalcolithic sites in Jubbah with a range of stone tools including tanged arrowheads, blades, and hoes (Figure 1; Garrard et al. 1981; Parr et al. 1978). Recent surveys by the Palaeodeserts project have identified two further early Holocene sites. At Al-Rabyah, a lithic assemblage with bladelets and geometric microliths was attributed to a drier climatic phase around 8000 BC (Hilbert et al. 2014). At Jebel Qattar 101 El-Khiam and Helwan points similar to those recorded during the Pre Pottery Neolithic (PPN) in the Levant (where they occur between 10,200 and 6900 BC) were associated with a palaeolake that was dated to 7000 - 6000 BC (Crassard et al. 2013). However, whether these are the result of Neolithic populations coming from the Levant, or of local groups adopting Levantine lithic technology remains an open question. The method of blank production for the El-Khiam and Helwan points is not the same as in the Levant for example and there are tanged scrapers at Jebel Qattar 101 that are not found in the southern Levantine PPN (Crassard et al. 2013). None of the sites identified so far have yielded faunal remains, and the closest sites with domestic fauna are as far afield as Kuwait, Yemen, and Jordan.

A change from hunting to herding scenes in the stratigraphy of the local rock art, along with continuity in the depiction of cultural markers associated with human figures (such as headdresses and penis sheaths) may indicate that local hunters, perhaps associated with the PPN arrowheads, adopted cattle herding (Guagnin et al. 2015). The rock art also shows the herding of goat and possibly sheep (Guagnin et al. 2017).

While the rock art of Jubbah is indicative of links with sites further south, such as Shuwaymis and Hanakiyah, the lithic record of Jebel Qattar 101, and the presence of sheep and goat also suggest contact with the Levant. The population dynamics and timing of the local Neolithisation process now need to be substantiated in the archaeological record.

Here we present a first report of a newly discovered Neolithic habitation site in the Jubbah basin, with features, stone tools, and faunal remains. The presence of Neolithic faunal remains has the potential to close a major gap in our understanding of the timing and the population dynamics of the Neolithic in Arabia. Larger scale excavations of the site are currently being planned and will form the basis for more detailed reports in the near future.

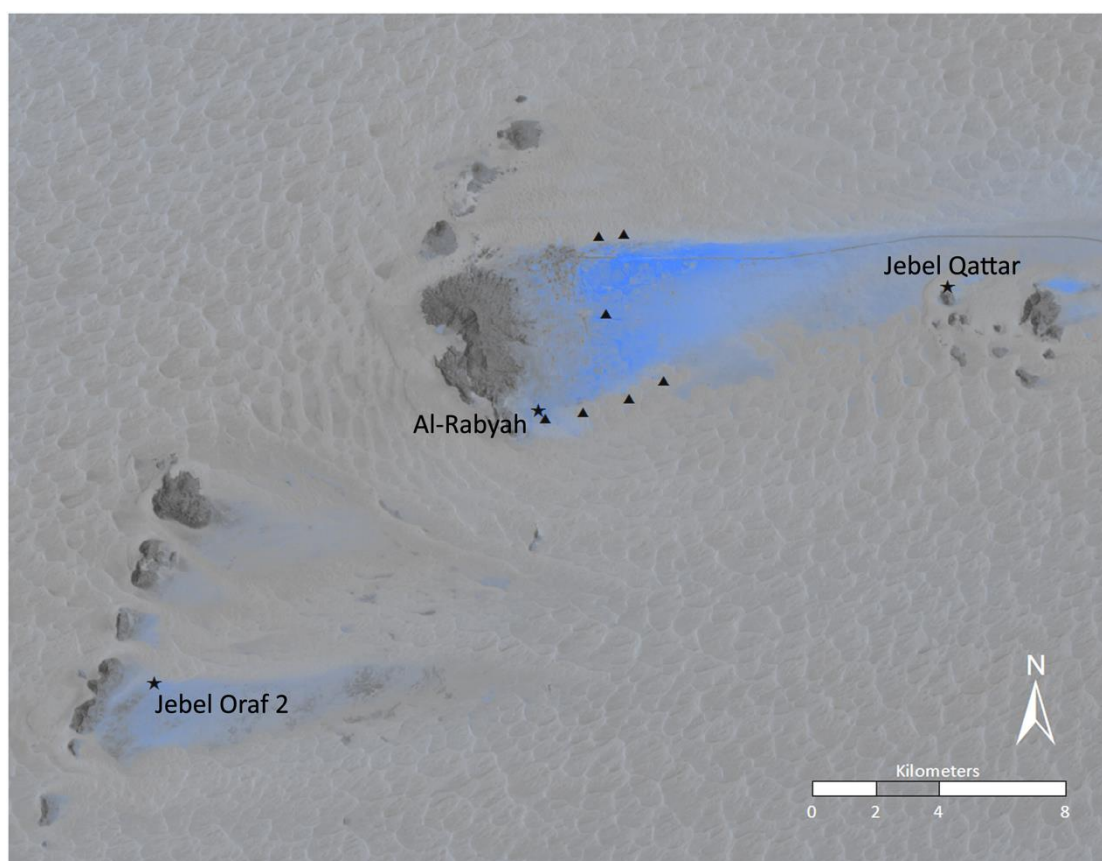


Figure 1 False colour Landsat TM satellite image of the Jubbah oasis and surrounding Jebels (bands 1 and 4; band 1 modified in blue for better visibility of lake deposits). Palaeolake deposits are visible in blue. Sand seas surround the jebels and palaeolake deposits. Neolithic sites mapped by Garrard and colleagues (1981) are indicated with triangles; early Holocene sites recorded by the Palaeodeserts project are indicated with stars.

Results

Several archaeological surveys and excavations have been carried out in the Jubbah oasis by the Palaeodeserts Project team in recent years (e.g., Crassard et al. 2013; Hilbert et al. 2014; Guagnin et al. 2017). In 2011, hearth features were noted during an initial survey of archaeological sites and palaeolake deposits in the area around Jebel Oraf. In 2015, the area was revisited during a survey of the rock art and associated archaeological features in the wider Jubbah basin (Guagnin et al. 2017). This second, more detailed survey and investigation revealed a large cluster of 170 visible hearths. The site of Jebel Oraf 2 is located on the edge of palaeolake deposits, ca 900m from the base of Jebel Oraf (Figure 2). Numerous lithics, grinding stones, and faunal remains were visible on the surface. The visible extent of the site was mapped, and faunal remains and stone tools were collected from the surface for further analysis. In addition, two hearths were identified for test excavations in order to collect charcoal samples for radiocarbon dating and in the hope of securing material culture and faunal remains from stratified contexts.

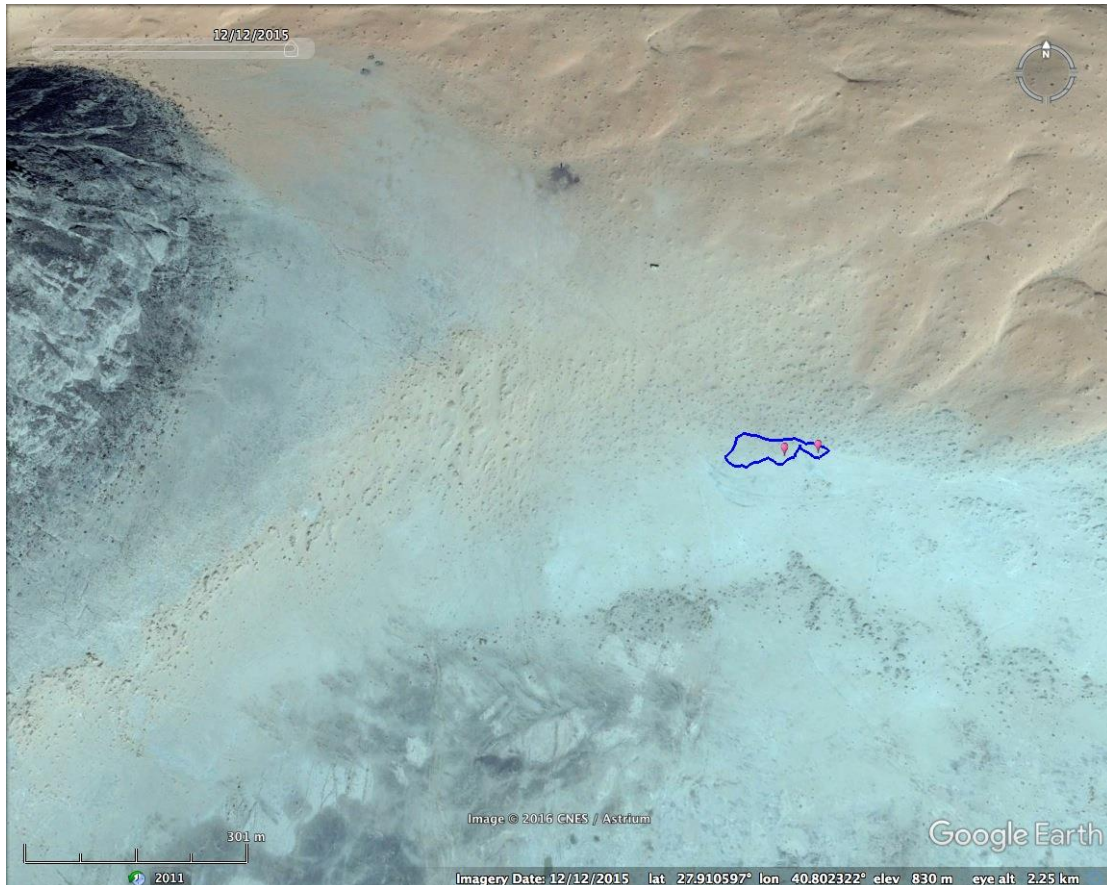


Figure 2 Google Earth image showing the outline of the visible cluster of hearths at Jebel Oraf 2. The two pink pins indicate the locations of the two excavated hearths.

Test excavations

On the site surface, hearths were identifiable as distinct clusters of stones. Test excavations were carried out in two separate features, a smaller hearth (ORF2_1) and a larger hearth (ORF2_2). The excavations showed that shallow pits of ca 5-6cm depth were dug in the sand to accommodate the hearths. Sandy layers with high concentrations of charcoal were found inside each pit, topped with stones that show evidence of exposure to heat. These hearths appear to have been at least partly deflated, causing the stones to appear slightly raised against the surrounding sand, and exposing ashy deposits and fragments of bone. Hearth 1 (ORF2_1) was ca 45-50cm in diameter. Hearth 2 (ORF2_2) was of similar size and can be seen sitting on top of a grey ashy layer on the top left of the test excavation. Directly beneath Hearth 2 was a grey layer with charcoal inclusions that appears to form part of the lake deposit. This was excavated to a depth of ca 8cm in an area of 50cm by 60cm (Figure 3). Samples from both hearths yielded radiocarbon ages, placing them in the late 6th millennium BC (Table 1). Both excavated hearths appear to be the result of a single, small fire.

Table 1 Radiocarbon dates. Calibrated using OxCal v. 4.2.4, IntCal13 atmospheric curve. The Carbon-13 stable

isotope value ($\delta^{13}\text{C}$) was measured on prepared graphite using the AMS spectrometer. The radiocarbon date has therefore been corrected for isotopic fractionation. However the AMS-measured $\delta^{13}\text{C}$ value can differ from the $\delta^{13}\text{C}$ of the original material and it is therefore not shown. Samples were washed in hot HCl, rinsed and treated with multiple hot NaOH washes. The NaOH insoluble fraction was treated with hot HCl, filtered, rinsed and dried.

Lab code	Sample Code	Dated material	Context	Radiocarbon date	Calibrated date
Wk43210	ORF2_1	Charcoal	Charcoal deposit	6156±29 BP (AMS measurement)	5220-5020 cal BC
Wk43212	ORF2_2	Charcoal	Lake deposit directly below the hearth	6242±23 BP (AMS measurement)	5300-5200 & 5170-5070 cal BC



Figure 3 Jebel Oraf 2 Right: Hearths as they appear on the surface, typically with grindstone fragments on top; top left: excavation of Hearth 1 (ORF2_1); bottom left: excavation of Hearth 2 (ORF2_2) and of lake deposit with charcoal inclusions directly below.

Faunal remains

Bone fragments are visible on the surface across the site. Some 15 fragments of large bovid dentition were collected from the surface around Hearth 2. Based on their morphology and size they appear to be adult *Bos*, similar in size to domestic cattle, although larger samples and morphometric analysis are required to confirm this attribution. The fragments make up a minimum of two teeth, which could potentially belong to the same individual. All tooth fragments are highly weathered and show abrasion, which may have been caused by exposure to sand or water. Two further tooth fragments belonging to the same species were recovered from the ashy deposit that forms part of Hearth 2.

Lithics

Lithics were abundant on site, and consisted of both grindstone fragments and knapped artefacts. The grindstone fragments were typically located on or beside the hearths, and were nearly exclusively made of local sandstone, often showing bifacial flaking around the perimeter to shape them. The majority of knapped lithics were small quartz and quartzite pieces produced from pebbles which were locally available in the Oraf Basin. Expedient reduction methods were noted among the local cores including bipolar, single platform, and multi-platform cores. The test excavation in Hearth 2 produced 51.7g of local quartz/quartzite flakes and 0.1g of exotic chert flakes, and did not include any cores or retouched pieces. The excavation also produced a grindstone fragment 103.5 mm in maximum dimension and 26.2 mm in thickness.

A random sample of exotic lithics were collected from the surface. Of the 58 lithics, 6 (10.3%) were chert and chalcedony cores, and similarly to the local material included bipolar, single platform, and multi-platform pieces, with the addition of invasively flaked tabular chert. Of the 44 flakes, 30 (68.1%) were retouched, with end-scrapers typical of the more formal types (Figure 4). A tongue-shaped scraper was also recovered (Figure 4), which is a form known from the Pottery Neolithic and Chalcolithic of the Levant (Rosen 1997). Four groundstone axe fragments on rhyolite and chert were among the exotic lithics (Figure 4). Groundstone axes in chert, an extremely hard and difficult stone to grind, are characteristic of the Levantine late Pre Pottery Neolithic and PN (Barkai 2005). A PN chronology for the site accords with the radiocarbon dates obtained from the fireplaces.

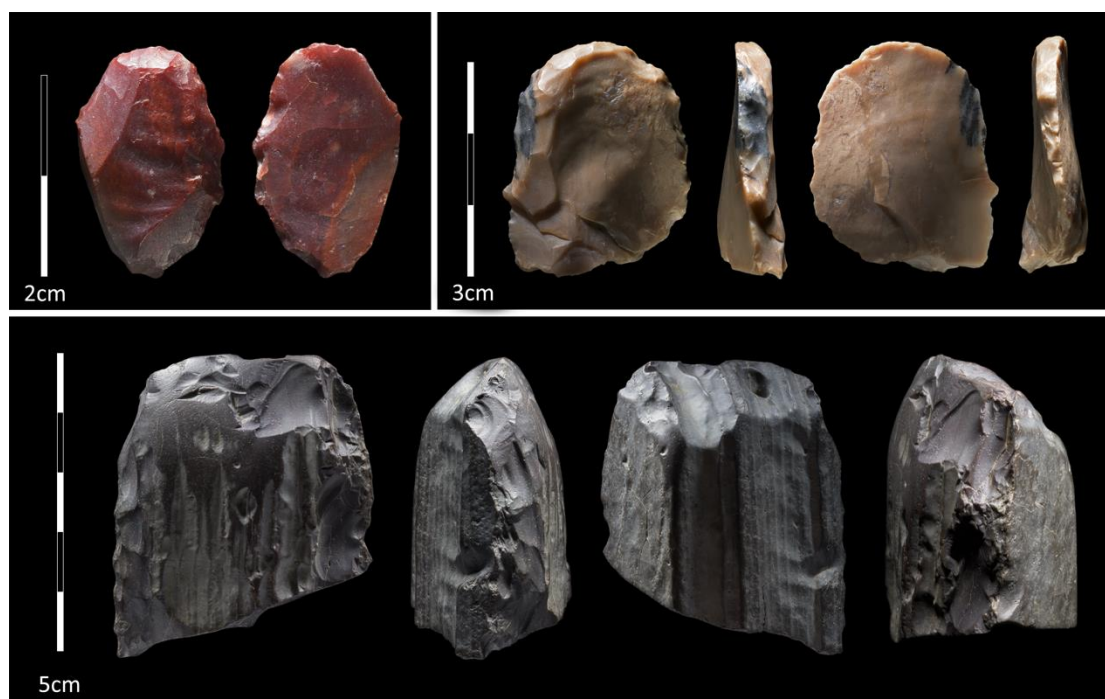


Figure 4 Examples of chert lithics collected at Baja Harayiq. Top left –endscraper; top right - tongue-shaped scraper; bottom –groundstone axe distal fragment.

Discussion

The site of Jebel Oraf 2, located near the base of Jebel Oraf in the Jubbah oasis, is the first Neolithic site in northern Arabia to yield associated faunal remains, stone tools, and well-preserved features in dateable contexts. At this stage in our research, recovered tooth fragments are too few and fragmentary for a morphological distinction between wild and domestic cattle; wild aurochs (*Bos primigenius*) certainly needs consideration in the light of evidence showing its presence in the Neolithic of eastern and southern Arabia (summarised in McCorrison & Martin 2009). There is the distinct possibility, however, that the faunal remains represent domestic cattle. Radiocarbon dates place the site in the late 6th millennium BC, when pastoralism is likely to have been firmly established. Moreover, the nature of the site, with evidence for repeated occupation, may indicate seasonal use by pastoralists. This interpretation is supported by the lithic evidence, where a high frequency of well-used grinding stones suggest longer term occupation, while exotic materials indicate contact across longer distances. Comparable sites have also been recorded from the central Sahara, where semi-residential settlements of the Middle Pastoral period (ca 5000-3800 BC), located on lake shores in interdune corridors (di Lernia 1999), show similar intrasite organisation with multiple fireplaces and associated grinding stones.

Both the rock art and the faunal record show evidence for cattle herding. This is in contrast to the dominant caprine pastoralism attested in eastern Jordan and the southern Levant (Martin & Edwards 2013) and may represent an adaptation to local environmental conditions in the Jubbah oasis. Although the rock art shows clear cultural links with central Saudi Arabia, the lithic technology is more indicative of links with the Levant, notwithstanding some idiosyncrasies. Further investigations will be conducted to reveal the nature and extent of local adaptations and introduced elements, and to place Jebel Oraf 2 in the context of wider cultural patterns and population dynamics in the Neolithic of the Middle East.

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