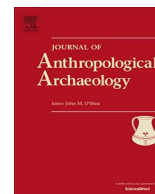




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Pre-Neolithic evidence for dog-assisted hunting strategies in Arabia

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ABSTRACT

The function of prehistoric dogs in hunting is not readily visible in the archaeological record; interpretations are thus heavily reliant on ethnographic data and remain controversial. Here we document the earliest evidence for dogs on the Arabian Peninsula from rock art at the sites of Shuwaymis and Jubbah, in northwestern Saudi Arabia. Hunting scenes depicted in the rock art illustrate dog-assisted hunting strategies from the 7th and possibly the 8th millennium BC, predating the spread of pastoralism. Though the depicted dogs are reminiscent of the modern Canaan dog, it remains unclear if they were brought to the Arabian Peninsula from the Levant or represent an independent domestication of dogs from Arabian wolves. A substantial dataset of 147 hunting scenes shows dogs partaking in a range of hunting strategies based on the environment and topography of each site, perhaps minimizing subsistence risk via hunting intensification in areas with extreme seasonal fluctuations. Particularly notable is the inclusion of leashes on some dogs, the earliest known evidence in prehistory. The leashing of dogs not only shows a high level of control over hunting dogs before the onset of the Neolithic, but also that some dogs performed different hunting tasks than others.

1. Introduction

The subject of the dog's domestication and early uses has a long and complex history in archaeological research. Though it is now clear that dogs were the first domesticate and were domesticated from a grey wolf ancestor before the advent of food production (Larson et al., 2012; Vilà et al., 1999; Wayne et al., 2006), questions about the timing, location, and number of domestication centers remain unresolved. Though an initial domestication period around 15,000 years ago has long been suggested by archaeological material (e.g., Clutton-Brock, 1995; Davis and Valla, 1978; Morey, 1994) and more recent genetic findings (e.g., Axelsson et al., 2013; Freedman et al., 2014; Larson et al., 2012), some have proposed earlier domestication, up to 40,000 years ago, based on disputed canid remains and genetic analyses (Camarós et al., 2016; Druzhkova et al., 2013; Germonpré et al., 2015; Thalmann et al., 2013).

Like its timing, the geographic origin(s) of dog domestication is the focus of abundant debate. While much research has pointed to East Asia (Ding et al., 2012; Pang et al., 2009; Savolainen et al., 2002) as the center of domestication, others have proposed Europe (Thalmann et al., 2013), Central Asia (Shannon et al., 2015), and the Middle East (vonHoldt et al., 2010). Recently, Frantz et al. (2016) suggested multiple domestication locations in both Europe and East Asia, but the resolution of the debate remains unclear.

Proposals for a domestication of dogs in southwest Asia have been

made on the basis of archaeological (Clutton-Brock, 1995; Dayan and Galili, 2000; Lawrence, 1967; Reed, 1961; Scott, 1968) and genetic (vonHoldt et al., 2010) research, but have not been as regularly discussed as those from East Asia and Europe. Confirmed dog remains are reported from Late Pleistocene and Early Holocene sites in Israel (Davis and Valla, 1978; Dayan, 1994; Dayan and Galili, 2000; Tchernov and Valla, 1997) and other debated remains come from Palestine (Zeuner, 1958), Iraq (Lawrence and Reed, 1983; Turnbull and Reed, 1974), and Turkey (Lawrence, 1967), though early dogs have thus far not been identified on the Arabian Peninsula. The earliest possible dog remains on the Arabian Peninsula date to the fourth millennium BC in Yemen (Fedele, 2008). Later Arabian dog remains have been found in the United Arab Emirates (2300–2100 BCE, Blau and Beech, 1999; third millennium BC, Potts, 1993) and Oman (fourth and third-millennium BC, Blau and Beech, 1999; Tosi, 1986).

Most research on early dogs in southwest Asia focuses on the corpus of dog remains from the Natufian Levant (beginning c. 13,000 BP), especially those from the Mount Carmel region (Davis and Valla, 1978; Dayan, 1994; Tchernov and Valla, 1997; Valla, 1988) and the subsequent Neolithic period (Dayan and Galili, 2000), where they were often included in burials. Several researchers have documented Natufian dogs as morphologically distinct from southern Levantine wolves and other local wild canids, such as jackals and foxes (Dayan, 1994; Maher et al., 2011; Tchernov and Valla, 1997). In the Natufian Levant

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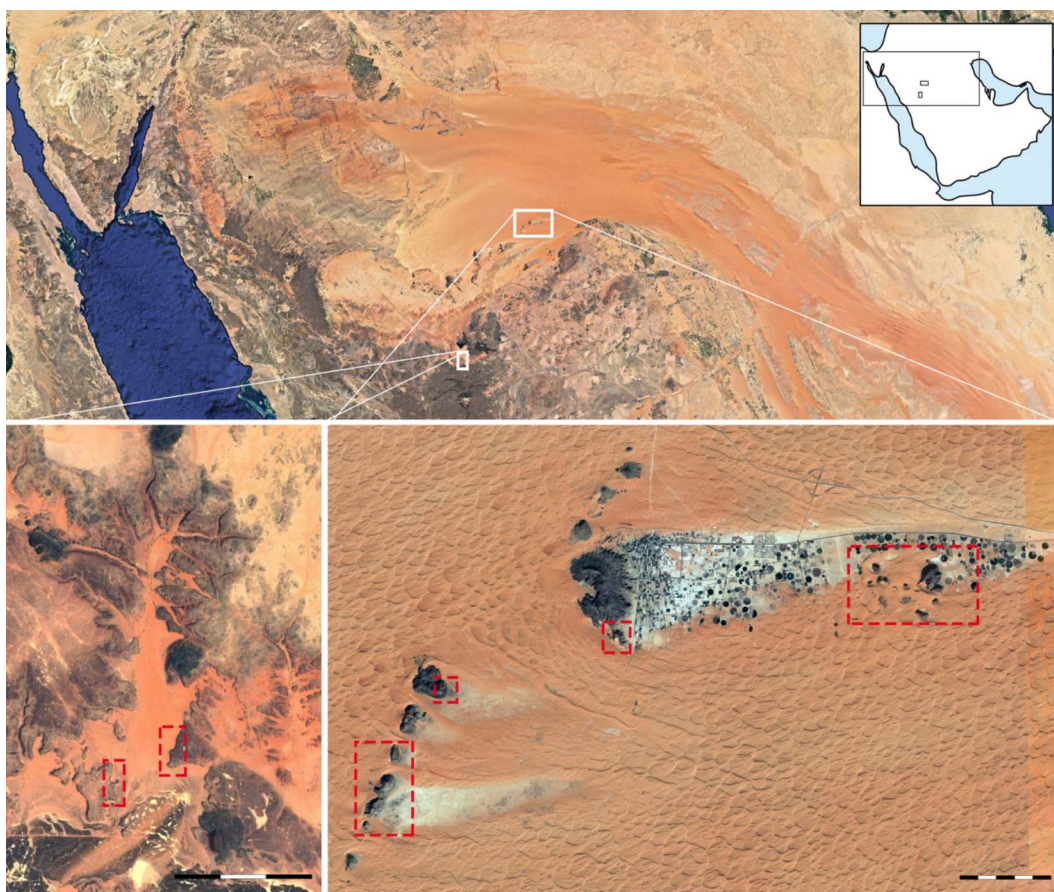


Fig. 1. Satellite images showing the location and topography of Shuwaymis (bottom left) and Jubbah (bottom right). The rock art of Shuwaymis is located along the sides of a wadi on the northern edge of the lava fields of the Harrat Khaybar (only Shuwaymis east was surveyed systematically by the Palaeodeserts project). The rock art in Jubbah is found along the slopes of hills (jebels) that flank the paleolakes of this ancient oasis in the southern Nefud desert. All images are Google Earth, Landsat/Copernicus. Top: Data SIO, NOAA, U.S. Navy, NGA, GEBCO. Bottom left: Image ©CNES/Astrium and ©2016 DigitalGlobe. Scales are in 1 km segments.

gazelle were heavily exploited (Tchernov and Valla, 1997), likely with help of hunting dogs (Driscoll et al., 2009), as caprines continue to be hunted today in southwest Asia, including Arabia (Serjeant, 1976).

In addition to the timing and geographic location of dog domestication, the use of early domestic dogs, and the extent to which humans controlled them remain open questions (Shipman, 2015; Perri et al., 2015; Perri, 2016). These activities leave virtually no trace in the archaeological record and thus remain difficult to address. Moreover, skeletal remains provide only limited evidence of the phenotypic variation in a dog population. Prehistoric hunting strategies have generally been reconstructed using ethnographic data (Lupo, 2017; Perri, 2014, 2016), but it remains uncertain to what extent observed strategies and changes in hunting productivity are applicable to prehistoric contexts. The depiction of domestic dogs in rock art, particularly in the context of hunting scenes, provides a snapshot of dog-assisted hunting activity in prehistory. While rock art will, to an extent, relate to the symbolic world of its creators, it also captures and preserves the experiences and observations of prehistoric populations in the narratives of rock art scenes and in the depicted animal species (Guagnin et al., 2016). The imagery therefore offers a unique opportunity to explore the behavior and morphology of early domestic dogs, and their use in the hunting strategies of prehistoric populations. Moreover, the engraved scenes allow us to explore to what extent hunting strategies observed in the ethnographic record are reflected in prehistoric depictions of hunting.

Here we discuss depictions of hunting dogs on Pre-Neolithic panels from the rock art sites of Shuwaymis and Jubbah in northwestern Saudi Arabia (in the absence of established terminology we adopt Fedele's (2008) term "Pre-Neolithic" here to describe the period preceding the adoption of food production). These panels represent the earliest

evidence of dogs on the Arabian Peninsula, perhaps depicting dogs brought to the region from the Levant or a Pleistocene refugium, or an independent domestication of dogs from Arabian wolves. The panels predate finds of skeletal dog remains on the Arabian Peninsula by at least 2000 years and indicate that dogs were a critical part of Pre-Neolithic hunting strategies in Arabia.

2. Regional background

On the Arabian Peninsula the archaeological record of the early Holocene remains largely unknown. Between 38,000 and 10,000 years ago a phase of hyper-aridity across the region combined with a scarcity of archaeological sites has generally been interpreted as a period of sparse occupation (Armitage et al., 2011; Magee, 2014). Evidence from coastal sites in eastern and southern Arabia suggests occupation in the late tenth millennium BC, possibly in favorable zones that acted as refuges. The earliest dates from Holocene sites in the interior currently range between the mid-ninth and eighth millennium BC (Magee, 2014; Uerpmann et al., 2009) and have been interpreted as a reoccupation of inland zones after a hiatus, facilitated by climatic amelioration of the Holocene Humid Phase (Magee, 2014).

By the sixth millennium BC these groups had transitioned from hunting-based subsistence economies to mobile pastoralism; domestic cattle, sheep, and goat were probably introduced from the Levant between 6800 and 6200 BCE (Drechsler, 2007; Magee, 2014). However, the occupation history of the interior of the Arabian Peninsula remains uncertain. Of the few known Neolithic sites with faunal remains, most are found along the east coast of the Arabian Peninsula and in Yemen (Drechsler, 2007, 2009; Uerpmann et al., 2000).

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