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## Cultural and human dynamics in southern Arabia at the end of the Middle Paleolithic

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### ABSTRACT

The Arabian Peninsula has long been considered as a region devoid of long-term human settlement until the Holocene period, as a result of drastic climatic changes throughout the Pleistocene. It might be expected that the area was deserted during hyper-arid and arid periods, and populated by new migrant groups during humid events, according to a “push and pull” phenomenon. Although this scenario may be perfectly valid for a large part of the Peninsula, a set of recent data points to the persistence of populations in several regions, which may have served as refugia for human groups who developed their own technological traditions. Such a scenario is suggested by:

- (1) The succession of dense human occupations under arid conditions between ca. 60 and 50 ka, in the Wadi Surdud basin, a small sedimentary basin in the foothills of the Yemeni Western Highlands. This archaeological site complex encompasses several successive human settlements characterized by a Middle Paleolithic tradition which significantly differs from the Middle Paleolithic and Middle Stone Age contemporaneous traditions from neighboring regions;
- (2) The regional diversity of the Middle Paleolithic throughout the Saharo-Arabian arid belt during MIS 3, expressed by an array of local techno-typological facies that likely relate to distant and disconnected source regions where populations contracted when climate worsened.

Together with a set of high-resolution archaeological contexts recently discovered in the Arabian Peninsula and dated to MIS 5, these data suggest that the major human expansion waves which occurred in the region during the Upper Pleistocene are correlated with the wet phases of MIS 5, while populations probably contracted into a few refugia areas at the beginning of MIS 3.

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### 1. Introduction

Over the last two decades, the Arabian Peninsula has played a major role in the issues relating to the expansions of populations of Anatomically Modern Human (AMH) out of Africa. Combining the genetic record (Quintana-Murci et al., 1999; Forster and Matsumura, 2005; Macaulay et al., 2005) with a demographic

and climate-based modeling approach, the “Out of Africa 3” scenario speculates that the expansion of East African AMH occurred ca. 60 ka following a southern Arabian route along either the Indian Ocean or the Red Sea shores during one or multiple wet phases (Clark, 1989; Lahr and Foley, 1994, 1998; Stringer, 2000; Rose, 2007a). Conversely, Arabia would have been deserted by humans during the arid and hyper-arid or tabula rasa events (Rose, 2007b) throughout the Pleistocene. Testing these hypotheses, and in particular the timing, environmental conditions and trajectories of the AMH expansions out of Africa through the archaeological record is a challenging task for a number of reasons which first relate to the specific environmental characteristics of the region:

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- (1) Some three-quarters of the more than 3 million km<sup>2</sup> total area of the Arabian Peninsula are covered by deserts, where the opportunities for recovering Pleistocene stratified archaeological contexts are limited to isolated paleolakes (Petraglia et al., 2011, 2012; Rosenberg et al., 2011, 2012).
- (2) A large portion of the Arabian Pleistocene shorelines and its potential archaeological record are now submerged, in particular for the time periods corresponding to the phases of marine regression, when the distance between the sides of the Red Sea was the most favorable for sea crossing (Bailey et al., 2007; Bailey, 2009; Lambeck et al., 2011). The Arabian Peninsula has a narrow continental shelf exposed during the Pleistocene marine low stands with two major exceptions, the drying up of the Persian Gulf and the considerable narrowing of the Bab al Mandab strait with substantial coastal flats exposed between Yemen and Saudi Arabia. Furthermore, there are some sunken landscapes but at a much smaller scale along the Omani coast of the Indian Ocean.
- (3) Pleistocene environmental proxies are lacking, given the scarcity of accessible sedimentary deposits and the very poor preservation of organic material.

As a consequence, the archaeological data available originate mainly from non-stratified and undated open air localities where Acheulean, Middle Paleolithic and Neolithic artifacts are often mixed on sites' surfaces (Caton-Thompson, 1938, 1953; Van Beek et al., 1963; Inizan and Ortlieb, 1987; Whalen and Pease, 1991; Amirkhanov, 1994; Petraglia, 2003; Petraglia and Alsharekh, 2003; Crassard, 2008; Scott-Jackson et al., 2008), and not a single Pleistocene human fossil has been recovered in the whole Arabian Peninsula. While these sites perhaps have a low potential per se for discussing expansion models in and across Arabia,

they provide valuable information when compared with stratified contexts at a local scale. The increased interest in the Arabian Pleistocene archaeological record over the last decade (see Groucutt and Petraglia, 2012) has resulted in the recovery of several stratified archaeological complexes in Oman (Rose et al., 2011), in the United Arab Emirates (Armitage et al., 2011), in Saudi Arabia (Petraglia et al., 2011, 2012) and in Yemen (Delagnes et al., 2012). Although the mesh size is still very coarse given the overall area of the Arabian Peninsula (Fig. 1), these occurrences point to more complex and diverse settlement patterns than suggested so far by the "Out of Africa 3" or Recent African Origin model (Stringer and Andrews, 1988). Furthermore, several occurrences suggest the development of local Middle Paleolithic traditions during phases of aridification. They result from long-term or recurrent human settlements in distinct desert margin areas that have provided sustainable biotic resources. This paper discusses the role played by these desert margin areas for the populations that occupied the Arabian Peninsula during Marine Isotope Stage (MIS) 3, based on the recent outcomes of the Wadi Surdud archaeological complex (Delagnes et al., 2012; Sitzia et al., 2012), in the context of the most recent discoveries.

## 2. Wadi Surdud regional setting

The Wadi Surdud site complex, located in the al-Mahwit/Tihama region of Yemen (Fig. 1), forms the only known stratified site complex in the western part of Arabia that directly faces the African continent. The Wadi Surdud basin is filled with a 32 m thick alluvial terraced sequence. The archaeological sites are distributed along two small desiccated tributaries of Wadi Surdud: Shi'bat Dihya and Al-Sharj, at elevations ranging from 360 m to

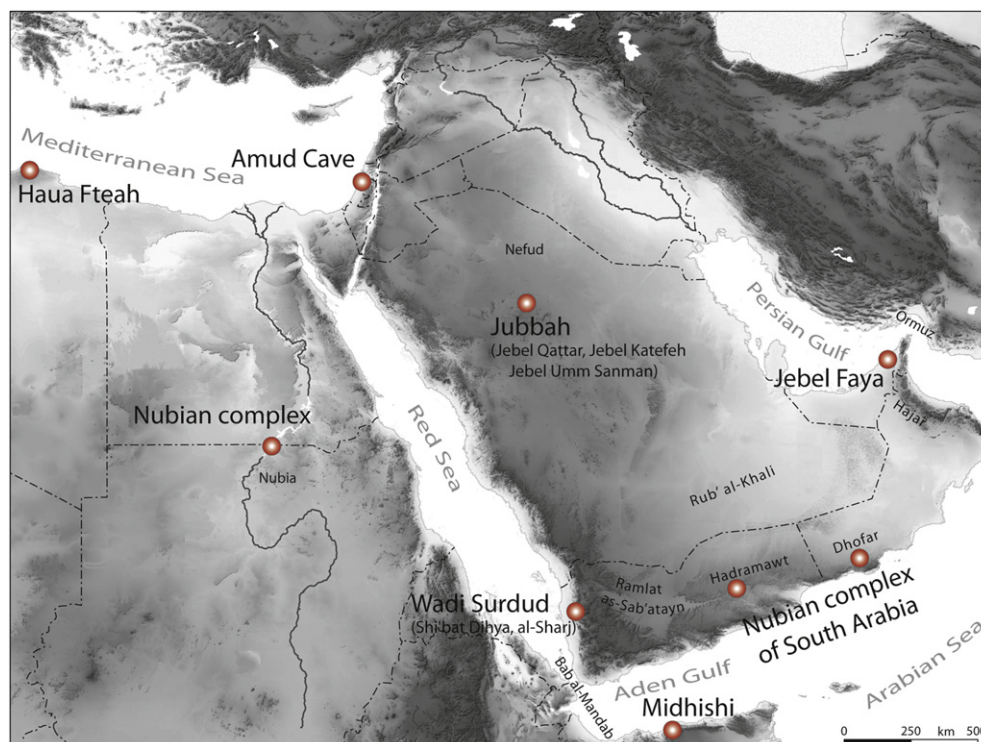


Fig. 1. Location of the archaeological sites and site complexes mentioned in the text; map adapted after Olivier Barge, service cartographique CNRS-MOM.

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