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Late Middle Palaeolithic surface sites occurring on dated sediment formations in the Thar Desert

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ABSTRACT

The dominance of erosional sedimentary processes in desert regions results in Palaeolithic records rich in surface scatters. Engaging with this abundant archaeological resource, including incorporating them within absolute chronologies or schemes of environmental variability, is critical to understanding hominin habitation in arid landscapes. Extensive archaeological surveys in the Thar Desert of India and Pakistan over the past 60 years have identified a large number of Palaeolithic surface sites in a diverse range of geographic contexts. In the past twenty years, a rich Upper Pleistocene palaeoenvironmental record has been developed within the region due to the application of chronometric dating techniques. However, as yet there have been few attempts by archaeologists to survey previously dated sediment formations in the Thar Desert and capitalise upon the potential to attribute preliminary *terminus post quem* dates to surface sites. Surface survey has been undertaken targeting sediment deposits that may preserve evidence for hominin behaviour between Marine Isotope Stage 5 and 3, a period in which technological and demographic overhauls in hominin populations appear to occur in South Asia. Following brief review of the Palaeolithic archaeology and palaeoenvironmental history of the Thar Desert, the results of recent archaeological survey of dated sediments at Chamu, Karna and Shergarh Tri-Junction are presented. The results offer tentative evidence for the presence of late Middle Palaeolithic populations in the region, which are evaluated and discussed within the context of contemporary occupations across southern Asia.

1. Introduction

The desert environments of the mid-latitude arid belt yield widespread evidence for occupation by Middle Palaeolithic populations during the Upper Pleistocene and share climatic characteristics that led Finlayson (2013:30) to label them 'crucibles of human evolution'. Recent research across northern Africa (Arzarello et al., 2013; Beyin, 2013; Cancellieri and di Lernia, 2013; Foley et al., 2013; Scerri, 2013a,b), Arabia (Petraglia et al., 2011; Rose et al., 2011; Delagnes et al., 2012; Groucutt and Petraglia, 2012; Delagnes et al., 2013; Usik et al., 2013) and India (Blinkhorn, 2013; Blinkhorn et al., 2013) supports this suggestion, indicating the shear wealth of Palaeolithic sites in these regions. Emerging theoretical perspectives based in biogeographic approaches prioritise the colonisation of the mid-latitude arid belt as critical to understanding the Upper Pleistocene dispersals of modern humans in place of the more simplistic dichotomy evident in 'out of Africa' approaches (Petraglia et al., 2012; Boivin et al., 2013; Finlayson, 2013; Groucutt and Blinkhorn, 2013). In this context, the Thar Desert of south east Pakistan and west India (Fig. 1) plays a crucial role in the investigation of the capabilities of human populations to adapt to radically new environments, as it is the last of the desert landscapes that would have been colonised by eastward dispersing groups through the mid-latitude arid belt before entering the monsoonal Oriental biogeographic realm beyond. Therefore, the nature of lithic industries that occur in the Thar Desert, the timing of their appearance and evolution can offer critical insights into the technological repertoire and expertise of the first modern human populations and their adaptability in colonising the significantly different habitats encountered in the Indian subcontinent.

The general scarcity of caves or other such sediment traps in many areas of the mid-latitude arid belt stands in contrast to other regions with rich Middle Palaeolithic and Middle Stone Age archives such as the Maghreb, the Levant or South Africa's Western and Eastern Cape. Instead, erosional sedimentary processes predominate, whether as deflation of fine sediments through aeolian transportation or the mobility of a broader range of deposits through fluvial activity. The result is a highly visible archaeological record on exposed sediment surfaces. The integration of evidence

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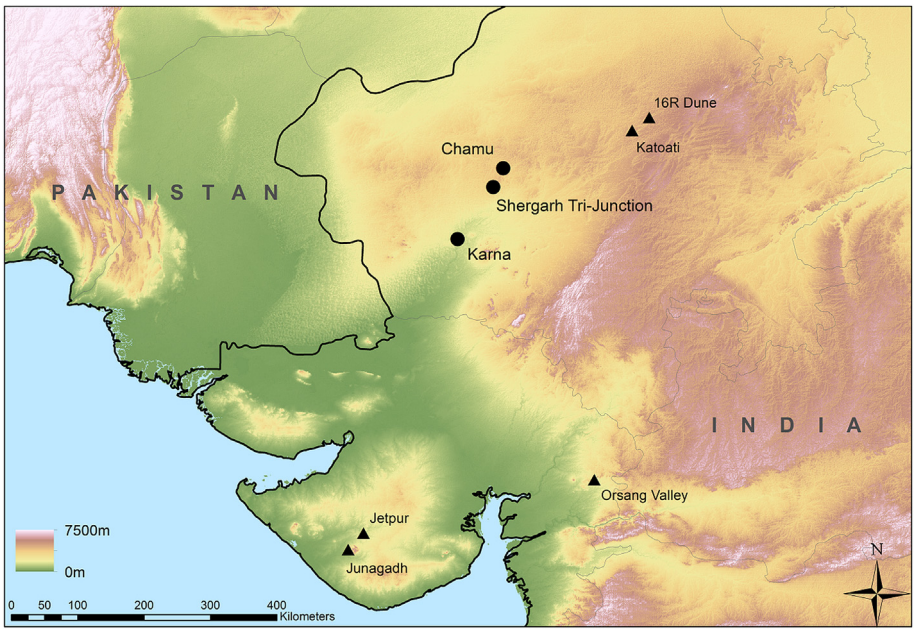

Fig. 1. Map showing location of sites reported in this study (circles) and sites reported with chronometric dates by previous researchers (triangles).

from such surface sites with that from excavated and dated assemblages can be difficult. However, where the sediment formations upon which surface sites occur can be dated it is possible to suggest robust *terminus post quem* dates for such assemblages.

Contemporary archaeological debate surrounding the modern human colonisation of the Indian subcontinent is focused upon whether an abrupt or gradual transition from Middle to Late Palaeolithic industries occurred at the onset Marine Isotope Stage (MIS) 3 (Boivin et al., 2013; Mellars et al., 2013; Mishra et al., 2013). An abrupt transition would suggest that Late Palaeolithic industries were required by human populations to colonise the mosaic habitats of the Oriental biogeographic zone and out-compete resident archaic hominins (Mellars et al., 2013; Mishra et al., 2013). In contrast, a gradual transition may indicate that human populations were able to successfully adapt to these new environments using Middle Palaeolithic technologies, with the localised development of Late Palaeolithic industries a long term consequence of such ongoing adaptations (Boivin et al., 2013). Currently, there is little clear evidence from the Thar Desert as to the nature of lithic industries that existed in MIS 3, whereas Middle Palaeolithic assemblages occur at the MIS 4/3 boundary and the earliest reported Late Palaeolithic industries occur in an MIS 2 context (Blinkhorn, 2012). An appraisal of surface assemblages that appear on sediment formations that post-date MIS 3 in the Thar Desert offers a preliminary means to assess whether Middle Palaeolithic occupations extended into MIS 3, if Late Palaeolithic technologies are readily apparent in MIS 3 and the nature of the relationship between the two industries. Such an assessment will help to illuminate the technological means by which modern human populations were able to transcend biogeographic boundaries and colonise the Oriental zone.

This paper reports the results of surface surveys of dated sediment formations in central Rajasthan, India. Firstly, a brief geographic, palaeoenvironmental and archaeological background of this region are set out. Following this, a review of published palaeoenvironmental and chronometric research from three sites in the Thar Desert is provided. The methodology details the survey strategy and attributes of lithic artefacts recorded, which are subsequently presented in the results section. The ensuing discussions and conclusion evaluate the effectiveness of the survey to address human adaptations and dispersals in the Thar Desert and contextualise them within contemporary debate.

2. Geography and palaeoenvironments

The current extent of the Thar Desert is ~3,00,000 km^2, occurring predominately in the Indian states of Rajasthan, Gujarat, Haryana and Punjab, and the Pakistani provinces of Upper and Lower Sindh. The Thar Desert is characterised by low topographic relief, with marked changes to this observed on three sides (East, North and West), namely the Aravalli range, the foothills of the Himalaya and the Iranian Plateau. To the south, the desert is bounded by the coastline of the Arabian Sea. Low hills occur in places, where the regions Tertiary geology becomes exposed, but extensive sedimentation throughout the Quaternary period, exceeding 300 m depth in some places (Bajpai et al., 2001), has evened out major breaks of slope.

The Indian Summer Monsoon (ISM) plays a critical role in the region, delivering the majority of the Thar Desert's precipitation within the summer months, whereas the weaker, winter monsoon often delivers little or no rainfall to this area. As monsoonal circulation involves cross-equatorial exchanges of atmospheric heat and pressure, changes to both Arctic and Antarctic ice volumes, as well as northern and southern hemispheric temperatures affect ISM intensity. Although maximum monsoonal intensity appears to coincide with glacial minima observed at both poles, steep inter-polar temperature gradients appear to typically produce a monsoonal minimum ca. 20 kyrs before the glacial maximum (An et al., 2011; Liu, 2011). As this temperature gradient decreased toward the glacial maximum, monsoonal intensity increased (An et al., 2011; Liu, 2011). Therefore, global proxies for palaeoenvironmental change in the region suggest that while enhanced humidity in this area would have occurred during the Last Interglacial, the Thar Desert may have experienced depressed monsoonal activity between ~40 and 20 ka, which, due to the lack of precipitation, may have led to extinction of hominin populations in the region. Critically, regional precipitation gradients based upon terrestrial