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Identifying and characterising different types of stone artefact accumulations on the surface of the Lake Mungo lunette, southwest New South Wales, Australia

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ABSTRACT

Undertaking meaningful analysis of stone artefacts obtained from open, surface contexts is a challenge in any setting, and particularly so in the context of a large, complex and eroding Pleistocene dune formation. This study investigates a methodology for identifying surface accumulations on the Lake Mungo lunette from which meaningful data can be obtained. Careful selection of study areas, detailed field mapping, and the use of GIS for data management and distributional analysis are combined to identify types of surface accumulations with different potential for correlation with past environmental conditions. This provides a framework for future analysis of stone artefact technology and thus the investigation of past human behaviour and palaeoenvironmental context at a commensurate scale.

1. Introduction

1.1. Aim

The challenges faced by archaeologists working with exposures of archaeological material in surface or eroding contexts are well documented (*e.g.* Foley 1981a; Holdaway et al. 1998; Schick 1987; Thomas 1973). It is often assumed from the outset that such assemblages have been subject to mixing and disturbance and that they lack chronological precision, making meaningful analysis difficult. Assemblages of stone artefacts that contain no artefact types with well-defined chronologies, such as most of Australia's Pleistocene stone material, are particularly problematic. Often surface material is ignored in favour of excavated or embedded material, which is usually perceived to have a more secure stratigraphic context and more precise chronological control. This practice has largely been the case in the Willandra Lakes Region in southwestern New South Wales, Australia (Fig. 1).

The Lake Mungo lunette, a crescentic, clay-rich transverse dune that borders the Lake Mungo basin (Fig. 2), preserves sediments that document a complex history of wetting and drying, deposition and deflation and soil formation that reflects the changing environmental and hydrological conditions that controlled the Willandra Lakes system in the late Pleistocene (*e.g.* Bowler 1971; Bowler 1973; Bowler 1976). The lunette has been subject to significant erosion, both recently and in the past, which exposes the internal structure of the lunette and uncovers archaeological material. In some locations, erosion has proceeded through tens of metres of sediment; sediment that potentially represents tens of thousands of years of deposition (Bowler 1998; Bowler et al. 2012). Archaeological material, along with sediment, can be transported hundreds of metres laterally down large erosion gullies and into the outwash fans that spread from the base of the lunette. Alternatively, artefacts may be moved much shorter distances down slope, becoming concentrated in erosion runnels or shallow erosion basins. On rare occasions, material is encountered while still embedded in its surrounding sediment, providing a secure stratigraphic and sedimentary context. In some instances, artefacts may have been exposed on the surface, but not moved laterally.

Distinguishing which situation prevails at each location where artefacts are observed is not straightforward, requiring detailed assessment of topography and palaeotopography. One recent study from the Willandra Lakes (Foley et al. 2017) utilised artefact refitting to demonstrate the integrity and stratigraphic origin of surface assemblages. This paper demonstrates an alternative (but complementary) strategy for assessing assemblage integrity and stratigraphic origin, based on surface processes and patterning within surface artefact accumulations. The potential for different accumulation types to provide evidence about the behaviour of people during different palaeoenvironmental or palaeolandscape conditions is then discussed.

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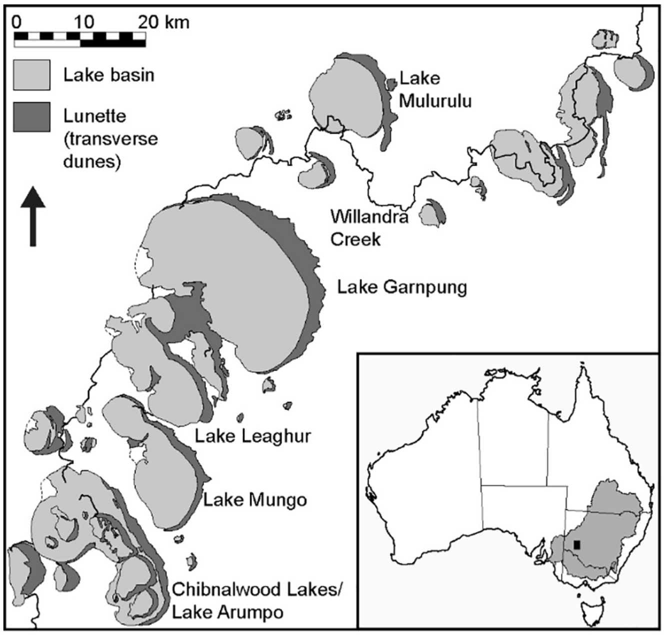

Fig. 1. Location of Lake Mungo and the Willandra Lakes (southernmost lakes not shown). Shading in the inset map represents the Murray-Darling basin.

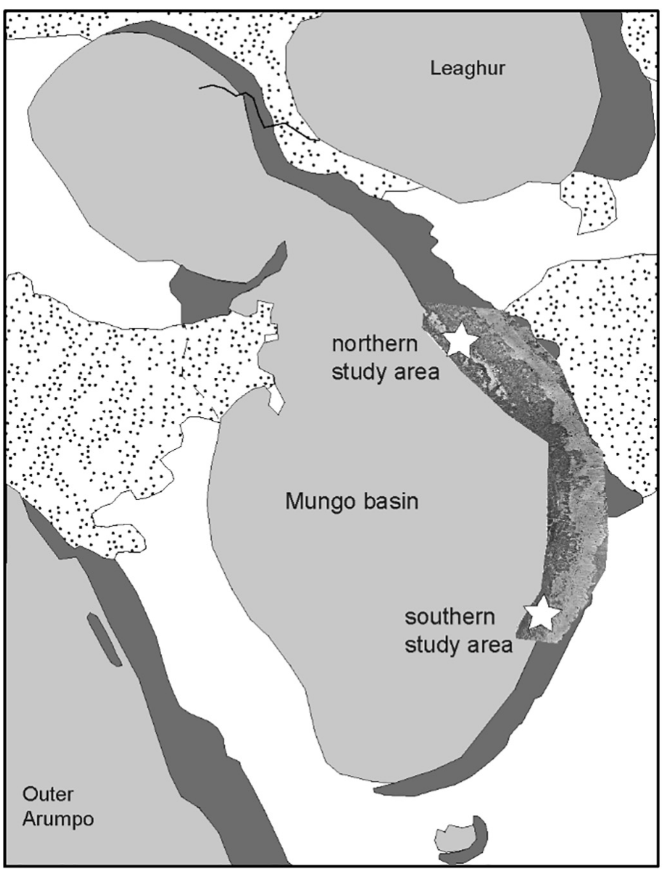

Fig. 2. Location of the two study areas on the Mungo lunette. Shading and location as per Fig. 1, with textured areas representing east-west trending linear dunes.

1.2. Background

Abundant archaeological remains are preserved in the clay-rich dunes, or lunettes, that border each basin in the now dry chain of lakes that makes up the Willandra Lakes Region World Heritage Area (Fig. 1). The lake system was established during the previous glacial cycle, and dried up around 14,000 years ago (Fitzsimmons et al. 2014). Lake Mungo, the most well-documented and best known of the lakes, initially came to the attention of archaeologists in the late 1960s with the discovery of what is still the oldest known cremation burial in the world, at approximately 42,000 years old (Bowler et al. 1970, 2003). The phase of archaeological research that followed this discovery focused predominantly on material obtained from a few (relatively) large-scale excavations, or from rare features like the cremation burial that were encountered while still partially buried (Johnston and Clark 1998; Shawcross and Kaye 1980). Shell middens, hearths and burials comprise the majority of studied *in situ* archaeological material within the lake system, with relatively small numbers of stone artefacts having been obtained from contexts considered secure. However, with the exception of areas commonly visited by tourists, who have been known to collect or move material (MacManus 2008; Midgley et al. 1998), casual perusal of almost any location on the Mungo lunette reveals a nearly continuous distribution of stone artefacts on the eroding surface. These comprise the most abundant and widespread trace of past human activity in this region, yet they have until recently made minimal contribution to our understanding of the behaviour of the people who occupied the lake shores during the past 40,000 years or more.

Since the first phase of archaeological research in the Willandra Lakes came to an end in the 1980s, the technology used to collect, collate and analyse complex data-sets has advanced considerably (*e.g.* Marwick et al. 2018; Sullivan et al. 2014; Wandsnider 1992) and a number of methodologies for dealing with issues associated with surface assemblages have been developed (*e.g.* Foley 1981b; Goudie 1987; Holdaway et al. 1998, 2000; Isaac and Harris 1980). These advancements, along with refinements in the understanding of the sedimentary context and age of the Mungo lunette (*e.g.* Bowler 1998; Bowler et al. 2012; Fitzsimmons et al. 2014; Stern et al. 2013), make it possible to tackle the abundant surface stone assemblages of the region with greater knowledge of the sedimentary and environmental context, in more detail, and with greater efficiency than ever before.

Previous studies into post-exposure disturbance of archaeological assemblage have determined a number of factors that influence the likelihood and magnitude of artefact movement on an exposed surface (*e.g.* Cameron et al. 2006; Frostick and Reid 1983; Kirchner et al. 1990; Petraglia and Nash 1987; Rick 1976; Schick 1987). These factors include artefact weight and shape, the gradient of the ground surface and the nature of the substrate (*i.e.* grain size/clay content). In short, artefacts are subject to the same processes as other sedimentary particles, and recognisable patterning arises because artefacts of different size and shape are differentially affected. The presence and nature of patterning in an assemblage as a result of disturbance depends on the strength of the force that has been applied to the material and the length of time over which that force is applied.

Gullies, runnels, sheetwash, large mobile dunes and smaller coppice dunes provide visible evidence that the Mungo lunette is being actively eroded by water and wind. Observation of slopes, gullies and runnels in the study area indicate that water is likely to be the main contributor to artefact movement. Table 1 summarises the patterns that can be expected if post-exposure disturbance of artefacts has occurred as a result of water flow, based on previous studies. Areas with obvious evidence for movement and deposition of eroded sediment due to water are expected to have a lower density of artefacts than undisturbed (*in situ*) sediments, as well as a larger average artefact size due to the loss or burial (low visibility) of the smallest component (particularly artefacts smaller than 20 mm in maximum dimension; Pigdon 1996, Schick 1987). The density and size distribution of artefacts found on *in situ* sediments will depend on the local gradient and topography. Upper slopes are expected to have differentially lost small material, therefore will have relatively low artefact densities and larger average artefact size. Lower slopes and local topographic basins are likely to act as