Archaeology and Australian Megafauna

Roberts et al. (1) suggested an age date of around 46.4 thousand calendar years ago (ka) for extinction of at least six genera of Australian megafauna based on dated articulated remains. Since the exploitation of animals by people inherently involves the disarticulation of faunal remains, this criterion excludes most archaeological sites. The two best archaeological sites that provide evidence of human/megafauna overlap and interaction through the Late Pleistocene in the region are thus either ignored [Nombe Rockshelter (2)] or dismissed as disturbed (Cuddie Springs).

Cuddie Springs, dated to 36.4 ka in the oldest human levels that also contain megafaunal remains, has been rejected using two assertions: (i) sediment mixing and (ii) the redeposition of bones from older to younger units. Neither assertion can be justified with the data available from the site. At Cuddie Springs, megafauna and extant fauna are present with stone artifacts in sequential stratigraphic horizons that exhibit distinctly different assemblage characteristics (3). In the earliest archaeological level, some of the megafaunal bones are in close anatomical position (3). The human/megafauna overlap is sealed at its upper and lower limits by consolidated old land surfaces (3), precluding movement of older or younger material into that horizon after its formation. The argument for disturbance made by Roberts et al. (1) contradicts the archaeological, faunal, palynological, and geomorphological data compiled for the site (3–6). In particular, pollen data can be an indicator of disturbance, yet the pollen record for Cuddie Springs shows typical trends of increasing aridity leading up to the Last Glacial Maximum (LGM), as identified at other sites (3, 7).

Optically stimulated luminescence (OSL) ages for Cuddie Springs show increasing age with depth and are consistent with the established radiocarbon chronology. Even though single-grain OSL analyses suggest a mixture of younger grains with older ones, none of the older grain ages approach the dates Roberts et al. claimed for megafaunal demise across the continent. There is thus no evidence of any sediments older than the stated OSL ages for the site. Although they asserted that bones have been redeposited, Roberts et al. offered no mechanism for the manner in which older megafaunal bones could be fed into an accumulating younger deposit unaccompanied by older sediments.

The stratigraphic integrity of a site cannot be assessed by dating alone. Dating is only one component of site analysis—all available data must be considered in context, and Cuddie Springs is no exception.

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Response: To minimize the risk of dating deposits containing reworked megafaunal remains, we concentrated on sites with articulated bones (1). This approach does not necessarily exclude all archaeological sites from consideration [e.g. (2, 3)]. Many animals also died through causes other than human predation, and some of their remains would have been preserved in primary deposition at nonarchaeological sites. But we found no articulated elements younger than about 46 ka in our continent-wide survey, and Miller et al. (4) found no Genyornis eggshells younger than this in central or southeastern Australia. Both studies included the Murray–Darling Basin, where Cuddie Springs is situated, so the claimed survival of megafauna to 35,000–28,000 radiocarbon years ago [about 41 to 33 ka (5)] at this site (6) requires scrutiny.

There is no direct evidence that humans interacted with megafauna at Cuddie Springs. The disarticulated remains do not show extensive predepositional fragmentation or evidence of selection of the most important meat- and marrow-bearing elements [compare to (2)], and the cut marks on bone relate to an extant species of kangaroo (6). But considerable evidence exists for postdepositional disturbance of the human/megafauna units (5, 6a, and 6b). Some bones are oriented vertically, and many exhibit signs of postdepositional crushing, attributed to trampling (6). Field and Dodson also acknowledged that some megafaunal elements are probably intrusive (6), and the single-grain optical ages indicate some intrusion of sediments after 36 ka (1). The variable degree of bone mineralization (6) and extensive degradation of proteins in the skeletal remains (7, 8) also cast doubt on the entire assemblage dating to only 41 to 33 ka. We interpret the megafaunal material in the human/megafauna units as a lag deposit, sourced from older bone-bearing sediments. Such sediments underlie the lowest cultural levels, with a stratigraphic break in the critical period between >76 and 41 ka (6). We propose that the sediments deposited during this period were mostly removed by wind or water, while the bones were concentrated and incorporated in sediments deposited after 41 ka. The optical dating signal in sediments is reset upon exposure to sunlight, so optical ages greater than 41 ka would be obtained only if the grains had been incompletely bleached.

Pollen from the human/megafauna units can reveal little about any climatic trends leading up to the LGM (23 to 19 ka), because these units were mostly deposited between 41 and 33 ka (6). The evidence for subsequent disturbance provided by optical dating (1) need not be reproduced in the pollen data, because each unit may have been contaminated by pollen of similar composition. There is a stratigraphic break of at least 9 ka with the overlying deposits, which accumulated after 24 ka (6). These deposits could contain pollen of LGM age, but the incoherent pattern of 14C ages and the presence of glass flakes and modern cow bone above the contact with unit 5 (6) indicate that the pollen record is insensitive to substantial postdepositional disturbance.

 Reliable ages for the disarticulated remains at Cuddie Springs and Nombe Rockshelter can be determined only by direct dating, such as that used at Lancefield Swamp to revise the age of the disarticulated assemblage from 31 ka to about 50 ka (8, 9).

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