

Thesis title: Home is where the knowledge is: An investigation of Zooarchaeology by Mass Spectrometry (ZooMS) to provenance, enrich and manage material culture items

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Project abstract: Within this study, collagen extracted from 0.8-3.2mg spear barb bone powder was successfully tested via two Zooarchaeology by Mass Spectrometry (ZooMS) techniques (Peptide Mass Fingerprinting (PMF) and Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)). These tests resulted in kangaroo or wallaby (n=1), cat (n=1) and flightless bird (n=2) being identified as spear barb manufacture material for four Aboriginal spears housed in the University of Queensland Archaeology Museum. These spears initially had unconfirmed or unknown contextual information, including manufacture and acquisition origins and the animal origins from which the spear barb material was derived.

Although broad, the ZooMS results present useful information that has been considered within further ethnographic and spear typology records accessed through the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS). Data indicates that the spears are from northern Australian regions, most likely the Cape York Peninsula. The incidence of cat bone being used in spear manufacture presents a unique and significant finding within Australia, and may indicate spear association with alternative areas where traditional and exclusive feral cat hunting is known to have occurred (including the Gibson Desert in Western Australia). Conversely, this spear may represent a new, previously unknown geographic distribution for cat hunting.

The often fragmented or degraded nature of animal material and the destructive nature of other testing methods have presented key limitations in testing feasibility for many items. The current study offers a solution to these limitations by way of ZooMS. Successful analysis of the small, delicate bone fragments on the study spears demonstrates the applicability of the technique to a variety of materials containing collagen. While the procedure is ideal for larger samples without destruction constraints, for which result accuracy is likely increased, this research shows that it is also an option for miniscule samples from precious materials or items. ZooMS is posited as being particularly helpful in the classification of non-diagnostic bone material to assist in interpreting sites and contexts, and it can also be used as a formal confirmatory measure.

Within Australian archaeology, there have been limited instances of animal material undergoing scientific testing to determine animal type, especially that of cultural tools or objects. This is despite animal material being readily present in the archaeological record and being subject to other testing like radiocarbon dating and conventional residue analyses. ZooMS presents promising potential in further understanding our archaeological sites and items. Although this was a pilot study undertaken on complex material culture items, the results provide significant positive implications within archaeology by introducing the informative PMF and LC-MS/MS techniques. Both techniques require minimal item destruction and minimal effort sampling procedures. PMF is also confirmed as a fast and low-cost option that can be outsourced and integrated into projects for ~\$65 per sample. It is proposed that ZooMS

should be used where possible on archaeological materials and objects suspected to contain animal material as either a lone measure, or to bolster other test results. Consequently, species information presents an avenue to increase and enrich archaeological item and site interpretations to improve Australian archaeological knowledge.