

Twenty Interesting Points: An Analysis of Bone Artefacts from Platypus Rockshelter

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While bone artefacts have been largely ignored in Australian archaeology, a wide range of functions for this artefact type are noted ethnographically. Twenty bone artefacts from Platypus Rockshelter, southeast Queensland, were used to test the applicability of residue analysis for functional assessment of archaeological bone artefacts. Analysis produced both predicted and unexpected results when compared with the known range of functions and results from other studies at this site. Plant and animal residues were observed on the artefacts, ranging from blood and collagen to starch raphides and the mineral, vivianite. These results have implications for site occupation as well as more general ones for the study of bone artefacts.

Introduction

Few scientific studies have been conducted on Australian Aboriginal bone points despite their being found in archaeological deposits throughout Australia dating well into the Pleistocene, the oldest specimens coming from Devil's Lair dated to 29,000 BP (Flood 1990). Although a wide range of sizes, shapes and functions is recorded ethnographically for this artefact type, it is common for archaeologists to infer that their presence in sites is evidence of either skin-working or fishing activities (e.g. Beaton 1977; Bowdler 1970, 1979; Flood 1974, 1980, 1990, 1995; Lampert 1971; McBryde 1974; Pretty 1977). The relative paucity of bone artefact studies in Australia is probably due largely to their fragility. Further, analytical techniques such as scanning electron microscopy (commonly used elsewhere) can considerably damage bone artefacts (Fisher 1995; LeMoine 1994; Olsen 1988). Although attempts at residue and use-wear analysis have been made on Australian specimens (e.g. Webb 1987; Webb and Allen 1990), the residue results are downplayed in favour of the apparently more conclusive use-wear results. In the study reported here, residue analysis of bone artefacts from Platypus Rockshelter, southeast Queensland, was undertaken to evaluate whether or not archaeological bone points were used for functions described ethnographically.

Ethnographically Recorded Functions of Bone Artefacts

Ethnographies that recorded Aborigines at the closest possible point of contact with Europeans were reviewed in order to ascertain a functional range for Australian bone artefacts. As Table 1 outlines, bone point functions ranged from food-procuring utensils (fishhooks, spears) to ornaments (nose-bones, cloak toggles, ear piercing, hair pins) and weapons (death spears, strangling cords, death bones, bone pins).

While a diverse range of functions for bone artefacts has been recorded in Australia, these are most frequently associated with skin working (sewing, pegging out skins, smoothing seams, awls – e.g. McCarthy 1976) and fishing activities (i.e. fishhooks and fishing spear barbs – see Massola 1957). Their use throughout Australia as nose ornaments is also relatively well documented (see McCarthy 1976).

Platypus Rockshelter

Platypus Rockshelter is a weathered double-chambered cavern in a Mesozoic conglomerate outcrop overlooking the Brisbane River some 60km west of Brisbane (Figure 1). Excavated as a salvage operation in the late 1970s, it has been covered by the waters of Wivenhoe Dam since 1985 (Hall 1980; Hall *et al.* 1988). Excavation recovered thousands of stone artefacts associated with large amounts of bone and shellfish (predominantly freshwater mussel) (Hall *et al.* 1988). Various studies have been conducted at the site including detailed analyses of chronology, stratification and site formation (Hall *et al.* 1988), a taphonomic assessment of the faunal assemblage (Novello 1989), a technical analysis of the stone artefact assemblage (Hiscock and Hall 1988) and a lithic residue analysis (Skelton 1996). Site occupation, spanning a period between 560±60 BP (Beta-3076) and 4,540±80 BP (Beta-3074), was generally sporadic and was influenced by the changing morphology of the rockshelter (Hall *et al.* 1988). Owing to the site's proximity to permanent water, it is considered to have been used by larger groups mainly during winter months (Lilley 1978).

The faunal assemblage exhibited a wide taxonomic range including mammals, birds, reptiles, amphibians and fish. As numerous anthropogenic bones have been identified in that assemblage (Novello 1989), the lithic assemblage was also expected to exhibit evidence of meat processing. Surprisingly, residue analysis of stone artefacts revealed a predominance of plant material (starch, raphides and cellulose), with only one artefact yielding animal residue (Skelton 1996). While this sole blood specimen was identified as mammalian, the more abundant plant residues could not be taxonomically resolved.

The Bone Artefact Assemblage

Twenty bone artefacts were recovered from the Platypus Rockshelter deposits. They were distributed both horizontally and vertically throughout the excavated deposits, several being found lying on the various 'living floors' identified during excavation. As shown in Figure 2, this assemblage comprises two bi-pointed artefacts (Artefacts 2–3), one uni-pointed artefact (Artefact 1, the shape of which was similar to ethnographically collected and observed awls) and 17 pointed/chipped bone shaft fragments (Artefacts 4–20).

Table 1. An overview of Australian bone point function.

Food Procurement	Ornamental	Weaponry	Manufacturing Equipment	Other
Fishhooks (Smyth 1878; Spencer 1904; Thomson 1936)	Nose bones (Angas 1969[1847]; Dawson 1881; Kenyon 1912; Roth 1984[1897-1910])	Death spears (Flanagan 1888)	Needles (Curr 1883; Dawson 1881; Petrie 1904; Spencer 1915; Worsnop 1897)	Canoe punter (Roth 1984[1897-1910]; Worsnop 1897)
Extracting shellfish (Kenyon 1912; Spencer 1915)	Cloak toggles (Dawson 1881; Smyth 1878)	Strangling cords (Smyth 1878)	Awls (for skin and plant material) (Smyth 1878; Roth 1984[1897-1910])	Digging stick (Le Souef 1916 cited in Webb 1987)
Eel/fish spears (Curr 1886; Dawson 1881; Spencer 1915; Thomson 1936)	Gum lancing (Collins 1910)	Death bones (Roth 1897; Smyth 1878; Thomson 1936)	Bark piercing (Roth 1984[1897-1910]; Thomson 1936)	
Spear thrower rest (Spencer 1915)	Ear piercing (Roth 1984[1897-1910])	Bone pins (Roth 1897)	Smoothing seams (Smyth 1878)	
Picking kernels from nuts (Roth 1984[1897-1910])	Incising skin (Smyth 1878)		Wood chisel (Curr 1886; Dawson 1881; Spencer 1915; Thomson 1936)	
	Hair pin (Curr 1883)		Stone tool fabricator (Mitchell 1949)	

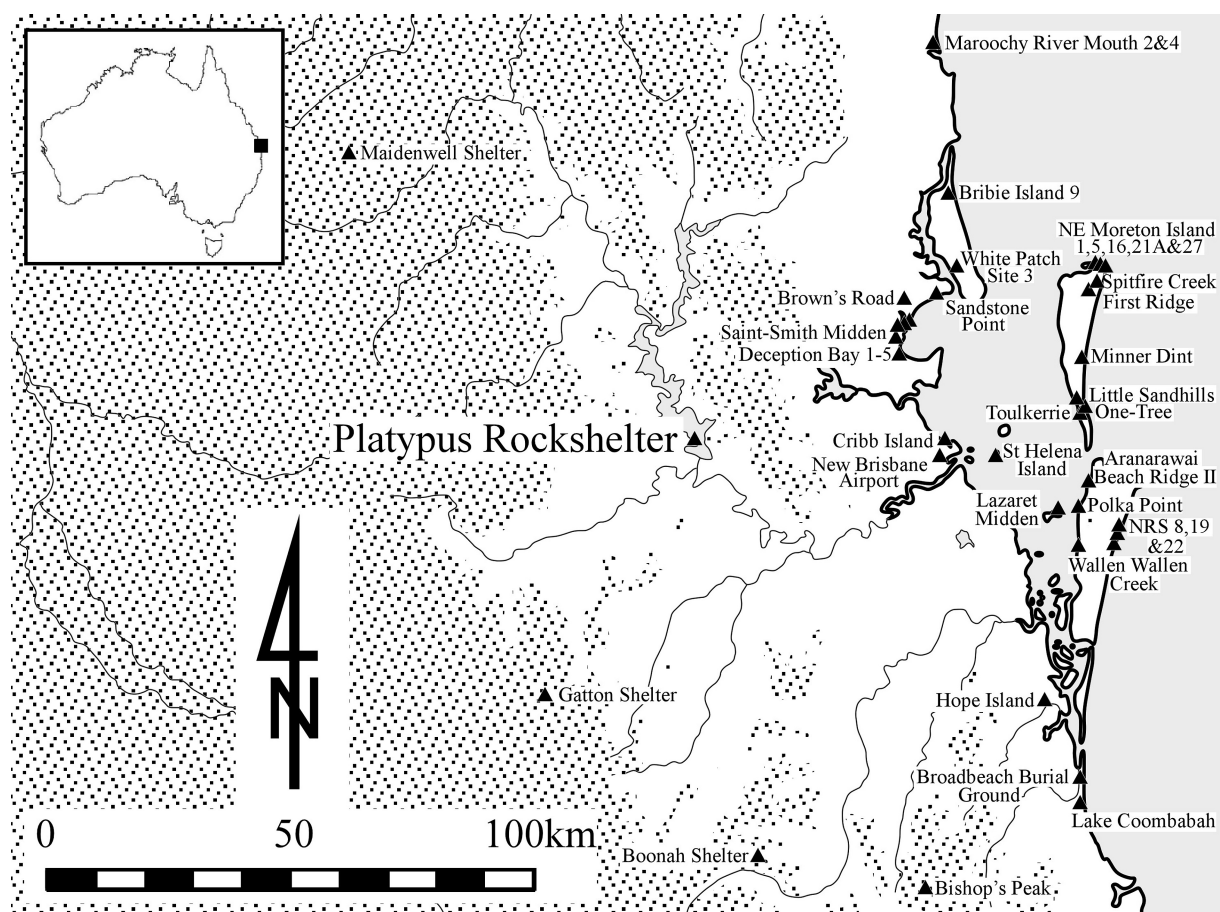


Figure 1. Map of dated archaeological sites in southeast Queensland, highlighting the location of Platypus Rockshelter (after Ulm and Hall 1996:47).

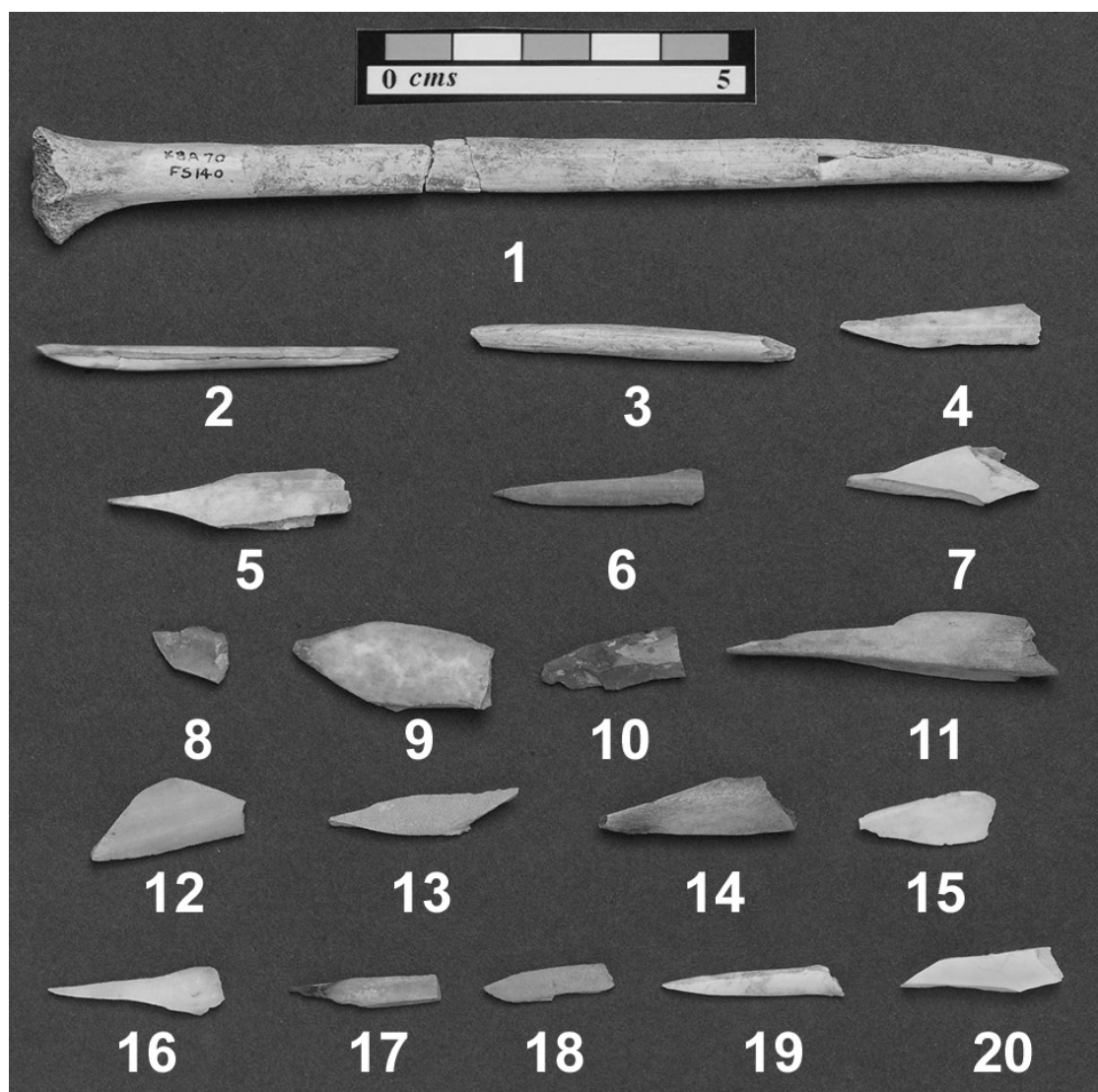


Figure 2. The Platypus Rockshelter bone artefact assemblage (Photograph: Information Technology Services Unit, University of Queensland).

Methods

Residue analysis incorporates methods from a range of fields including histology, forensics, botany and immunology (Loy 1999) and is based on the key forensic premise that contact between two materials inevitably causes some matter transfer (Loy 1993, 1994; Loy *et al.* 1992). Another key premise is that organic material can remain preserved indefinitely on artefacts under a wide range of environmental conditions.

Microscopy is the one crucial method that must be conducted to locate and identify residues, providing particular diagnostic features are present and particular effects are achieved using different types of illumination. For example, plant residues can be distinguished from animal residues by their differential reaction to cross-polarised light (Loy 1999). Other tests may be conducted on residues to chemically identify (Hemastix® and Na EDTA tests for haemoglobin) and categorise residues (e.g. Staphylococcal A to identify whether or not blood is mammalian) (Loy 1999).

This study was conducted solely through the use of microscopy to detect and identify residues on the artefact

surfaces (BX60 Olympus microscope at magnifications of x50, x100, x200, x500 and x1000). This single method was used so as to cause the least damage to the artefacts and to prevent destruction of the residues. Bright field (BF) and dark field (DF) incident lighting was employed in order to observe features on artefacts. Dark field lighting provides more contrast between the surface features due to the placement of a stopper over the light source that diminishes the amount of light projected onto the microscope stage (Loy 1999, in prep.). Bright field lighting is more useful for observing use-wear or manufacturing marks as there is less contrast. However, bright field lighting can be used with cross-polarised (XPOL) lighting to observe how much light a residue refracts; this can help distinguish between plant (e.g. starch, raphides, cellulose) and collagen or keratin residues (Loy in prep.).

Results

A range of residues was observed on the artefacts and they were classified as plant, animal or inorganic (Table 2). The most remarkable of the animal and plant residues are discussed below.

Table 2. Summary of the residues observed on the Platypus Rockshelter bone artefact assemblage. Numbers in brackets indicate the original artefact specimen code. SU = stratigraphic unit.

Artefact ID	SU	Plant Residues	Animal Residues	Inorganic Residues
1 (140)	VIIa	none	collagen and lipids	none
2 (127)	VI	none	lipids and keratin	none
3 (120/2)	IV	cellulose, starch	lipids	none
4 (226/3)	V	starch, raphides, crystalline plant residue	none	none
5 (226/2)	V	cellulose, starch, bordered pits associated with a clear smooth residue	none	none
6 (23/7b)	I	starch, plant material	none	none
7 (120/6f)	IV	resin, charcoal fragments	lipids	ochre fragments
8 (161)	VI	starch, resin, crystalline plant material	none	none
9 (124c/4b)	VI	crystalline material associated with raphides, starch	none	none
10 (122/10)	V	charcoal, crystalline residue & cellulose, starch	none	none
11 (79-23/7b)	VIIa	crystalline residue	none	large amounts of ochre
12 (117/6a)	II	crystalline residue associated with starch, raphides, cellulose & plant cell walls	none	none
13 (82/2b)	VI	crystalline residue associated with starch & cellulose	none	none
14 (197/10)	V	relatively large amounts of clear smooth residue	none	none
15 (120/6e)	IV	none	none	synthetic fibre
16 (113/6e)	VIIa	crystalline residue associated with starch, raphides, cellulose & plant cell walls	none	none
17 (23b-31/7a)	I	crystalline residue associated with starch, raphides, cellulose & plant cell walls	none	none
18 (113/6d)	VIIa	smooth clear residue, crystalline residue associated with starch grains	none	none
19 (150/15b)	IV	bordered pits associated with clear residue, starch grains	none	none
20 (33/13f)	II	none	lipids, collagen, blood residue	ink

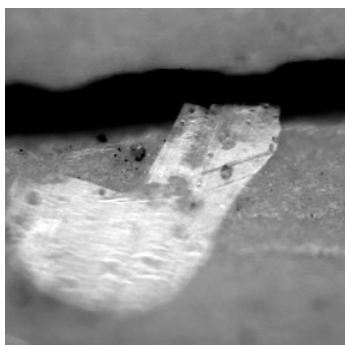


Figure 3. Keratin fragment from Artefact 2, DFX100 (Photograph: V. Francis).

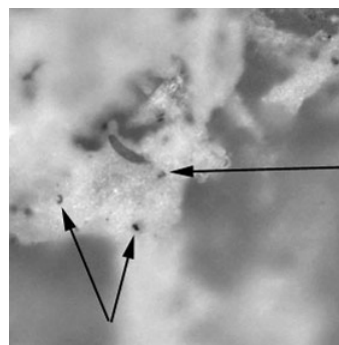


Figure 4. Lipid residue containing vivianite crystals on Artefact 2, DFX500 (Photograph: V. Francis).

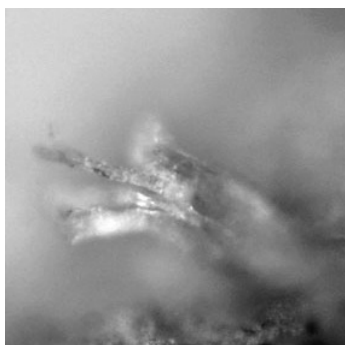


Figure 5. Entwined collagen fibres from near the tip of Artefact 1, BFXPOLX500 (Photograph: V. Francis).

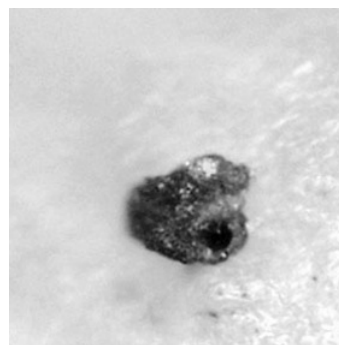


Figure 6. Blue vivianite crystal on surface of Artefact 1, DFX500 (Photograph: V. Francis).



Figure 7. Bordered pit from Artefact 5, BFXPOLX1000 (Photograph: V. Francis).

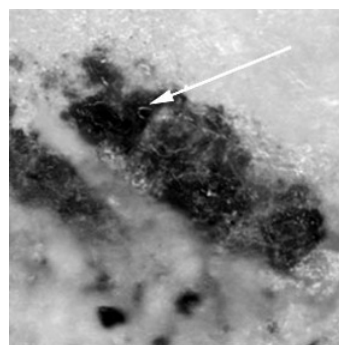


Figure 8. Blood residue on Artefact 20, DFX500. Arrow indicates a red blood cell (Photograph: V. Francis).

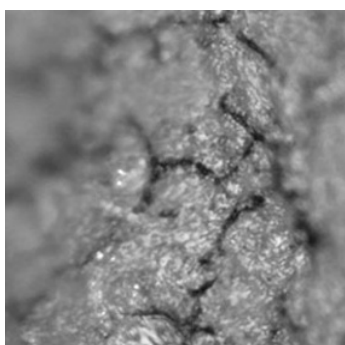


Figure 9. Dried resin near surface of Artefact 8, DFX500 (Photograph: V. Francis).

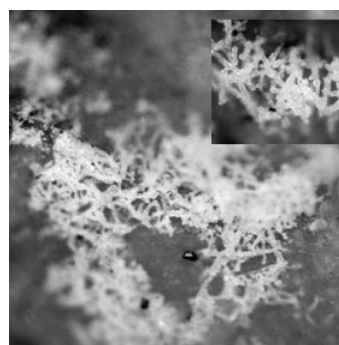


Figure 10. Patterned plant residue on Artefact 8, DFX100. Inset: BFXPOLX500 (Photograph: V. Francis).

Animal Residues

Collagen fibres and sheets were observed on several artefacts and a blood residue, in which two red blood cells were embedded, was also detected (Figure 8). On Artefact 1 (which is awl-shaped) collagen fibres were identified around the tip (Figure 5), a pattern consistent with the artefact being used to pierce skin. Furthermore, skin piercing is the most commonly observed use for artefacts of this shape (e.g. Petrie 1904; Roth 1984[1897-1910]; Smyth 1878). A small keratinous fragment, probably a reptile scale, was also observed on one artefact (Figure 3).

Interestingly, bright blue crystalline residues were observed on five artefacts (Figure 6), one of which exhibited a variation in that these residues were dispersed through an opaque white residue (Figure 4). These blue flecks are possibly lipids that have crystallised with the mineral, vivianite, which is found in soil throughout Australia (Ralph 2001). Such a reaction has been observed frequently on ancient animal specimens in the Americas, the most famous example being an extinct bison known as 'Blue Babe' (Guthrie 1990). Such residues on these bone artefacts do not derive from modern handling (during excavation or processing) because the reactions involved with the lipid conversion require soil particles. Their presence on the Platypus Rockshelter artefacts is extremely unusual and warrants further investigation.

Plant Residues

A range of plant residues including starch, cellulose, resin (Figure 9), raphides and charcoal fragments was observed on several of the artefacts, from which two major groups were distinguished by their association. The first group was characterised by a distinctive white, crystalline residue (Figure 10) identified as floral in origin by its birefringent reaction to cross-polarised light. This residue was often associated with numerous small, round starch grains (1–2µm diameter), rod-shaped pointed raphides, cellulose fibres, and discrete cell wall structures. This association was inferred as coming from the roots of *Typha* sp. (bulrush or cattail) on the basis of three significant factors: the size, shape and abundance of the starch grains; the presence, size and shape of the raphides; and, the characteristic structure of the white crystalline residue. *Typha* sp. is found throughout the world and is commonly used as a food source (Cribb and Cribb 1980; Isaacs 1987; Latz 1995; Symons and Symons 1994). Several ethnographers have observed *Typha* being exploited for food (generally during Spring-Summer due to new shoot growth) and the fibres were used for weaving throughout Australia (McBride 2000). More research should be conducted on the artefacts as well as on Indigenous uses of *Typha* sp. before more detailed statements can be made about the association noted in this study. However, because this residue was observed in abundance on 12 artefacts, these bone tools are inferred to have functioned in some way associated with the processing of *Typha*.

The second group of plant residue comprises a relatively clear vitreous residue that was observed on four artefacts. Bordered pits were observed embedded in two of these residues (Figure 7). Bordered pits are found in plant vascular systems and are used to control the transport of fluids to and from tissues. Their presence in the residue indicates traces of plant vascular fluids. In one case this

residue appeared to be deposited over a fungal growth, perhaps the result of the artefact being manufactured, discarded, then re-used. However, further investigation is required before definitive statements about how these residues were deposited may be made.

Resin, while present on several artefacts, was not observed in sufficient quantities to provide information about hafting. Only Artefact 8 exhibited resin in quantity; it is a broken bone tip and was possibly used to slice bark from a tree (T. Loy, School of Social Science, University of Queensland, pers. comm., 2000).

Ochre Residue

Ochre was the most abundant inorganic residue detected in this assemblage. On two artefacts the distribution of orange-red ochre appeared to have been smeared into the surface some time after manufacture. This inference is based on the residue being embedded into various indentations characteristic of aged or degraded bone surfaces that were surrounded by well-polished surfaces. Ochre is commonly used in Indigenous Australian cultures for body and artefact decoration and it is often imbued with spiritual significance (Sagona 1994).

Conclusions

Although several different residue types were observed on these bone artefacts, more detailed investigation should be conducted before any decisive functional label is assigned to any of them. Nevertheless, at a coarse-grained level the results permit the interpretation that one artefact was probably used to process skin, several were used to process plant material and the other residues probably resulted from incidental touch-transfer contact. Artefact 1 appears to have had a similar function to that ethnographically described for skin processing. Unfortunately, while the ethnographic record may imply that bone artefacts were used to process plants, it contains insufficient detail to warrant similar analogous reasoning of the direct sort in respect of function. On evidence, these artefacts were possibly used to peel or cut *Typha* sp. but replicative 'middle range' research should be conducted to test this hypothesis.

This study complements Skelton's (1996) residue analysis of Platypus Rockshelter stone artefacts, especially since plant residues appear to predominate in both assemblages. It would be useful to undertake a detailed comparison of the results of both studies in order to ascertain whether or not the plant species are the same. Further investigation of the *Typha* sp. residues is also needed. In particular, as *Typha* sp. was known to have been exploited in Spring-Summer its presence may provide a seasonal indicator of site use and could thus be used in testing Lilley's (1978) seasonal model of the region's occupation. Finally, while the sample size in this study was too small to investigate chronological matters, it would be worthwhile to expand this investigation to examine possible chronological change in bone artefact manufacture and use in southeast Queensland and beyond.

In conclusion, this study demonstrates that non-destructive residue analysis can be undertaken on such fragile artefacts as bone points. Further residue analyses should be conducted on bone artefacts to enhance our knowledge of this undervalued component of Indigenous

Australian material culture as well as other aspects of material culture that do not often survive in the archaeological record.

Acknowledgements

Thanks to Sean Ulm for his advice, support and feedback. I also thank A/Prof. Jay Hall and Dr Tom Loy for their advice and comments. A/Prof. Hall kindly provided access to the bone artefacts for this study. I am grateful to members of Tom's Group at the Archaeological Sciences Laboratory at the University of Queensland, especially Sue Nugent, Gail Robertson, Alison Crowther, Ken Dusza, Luke Kirkwood and Paul Kajewski. Tony Eales prepared Figure 1. This study was undertaken as a Bachelor of Arts (Honours) research project (Francis 2000) supervised by A/Prof. Hall and Dr Loy at the University of Queensland.

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