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Aboriginal craft and subsistence activities at Native Well I and Native Well II, Central Western Highlands, Queensland: results of a residue and use-wear analysis of backed artefacts

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ABSTRACT

This research provides insight into activities at two adjoining Aboriginal rockshelters in the Central Highlands in western Queensland, Native Well I and Native Well II. The study involved a residue and use-wear analysis of the backed artefact component of the stone assemblage. Prior to this, interpretation of the sites essentially relied on evidence of changes in stone technology over time, sequential and spatial patterning of artefacts and ethnographic analogy. This analysis revealed a range of activities occurring during the mid-to-late Holocene. Backed artefacts were used as knives, scrapers and/or incisors for wood-working and bone-working, as well as knives and scrapers for plant processing, including cooked starchy plants. Artefacts with ochre and feather residues may have been used for ceremonial purposes, while distribution of resin indicates more than half the artefacts had been hafted.

KEYWORDS

residue analysis, use-wear-analysis, microscopy, Australian backed artefacts, Aboriginal rockshelters

INTRODUCTION

This paper discusses the results of an integrated residue and use-wear analysis of the backed artefact component of stone assemblages from two Aboriginal occupation sites in the Central Highlands in western Queensland, Native Well I and Native Well II. The study was undertaken as part of a larger research project that addressed the question of backed artefact use in eastern Australia during the mid-to-late Holocene through an analysis of artefacts from six different sites (Robertson 2005). The two Central Highland sites were excavated by Morwood (1979) as part of his doctoral research, in which he employed a multi-attribute approach to the region's prehistory by documenting both the artwork and the artefact assemblages at a number of different sites.

THE SITES

Native Well I and Native Well II are adjacent rock shelters located in a quartzite outcrop overlying sandstone on a tributary of Sandy Creek, which is itself a tributary of the upper Warrego River (Figure 1). Native Well I is a relatively large low shelter and art gallery with a floor area of approximately 30m² situated on the western edge of the outcrop. Native Well II, which has a floor area of only 18m², is an adjacent but separate shelter directly to the south (Morwood 1979:168, 206). The coarse sandstone of the rear walls of the shelters is heavily engraved, mostly by an abrasion technique but with some peckings. There are also numerous stencils and paintings (Morwood 1981). The two sites are discussed sequentially below.

Figure 1. Map of Central Highlands, western Queensland illustrating the archaeological sites of Turtle Rock, Native Well I and II (from Morwood 1979, Fig. 1.1).

Native Well I

Almost 10,000 stone artefacts were recovered from excavations at Native Well I. Of these, 566 were identified as tools on the basis of either use-wear or retouch and 41 artefacts were recorded as being backed (Morwood 1979:181). As well, there were 675 pieces of ochre and pipe-clay of a wide range of colours, although red (60%) predominated (Morwood 1979:179). Organic material was poorly preserved with recovered bone mostly from the top two excavation units, possibly natural rather than cultural given that very little was burnt (Morwood 1979:178-179; 1981:27). Two emu feathers, an emu egg-shell fragment and two echidna quills were the only other faunal remains

identified. There are no recorded plant remains in the site. Occupational deposits reached a depth of approximately 90 cm throughout most of the shelter, although squares outside the shelter contained artefacts to a greater depth. The deposits were sieved at the site through 2 mm, 5 mm and 9 mm sieves, with material remaining in the sieves bagged and eventually wet sieved in the laboratory.

Five radiocarbon dates on charcoal samples were obtained for the site (Table 1). Backed artefacts in the deposits are bracketed by the dates 1270±70 BP and 4320±90 BP. Morwood (1979:178) noted that artefacts were found below the earliest dated deposits and by extrapolation suggested that the site was initially occupied from ca. 13,000 BP, although there was no evidence of Aboriginal use inside the shelter until 6190±100 BP.

The criteria used to classify the diagnostic artefacts for the Central Highlands, including backed artefacts, were based on variants of those of McCarthy (1946, 1976) with regional

Table 1. Native Well I conventional ^{14}C dates on charcoal (Morwood 1979:176-7)

Excavation Unit	Depth below surface (cm)	Lab code	C14 dates
Charcoal from a hearth in Stratigraphic Layer 3, Square C4	20±2cm	ANU 2002	1270±70 BP
Charcoal from the top 10cm of Stratigraphic Layer 4A, Square B5	49±5cm	ANU 2003	4320±90 BP
Charcoal from the top 5cm of Excavation Unit 6, Square C2	56±2.5cm	ANU 2171	4230±90 BP
Charcoal from Stratigraphic Layer 5, Square B5	95±5cm	ANU 2001	6190±100 BP
Charcoal from Excavation Unit 14 at the base of Stratigraphic Layer E4, Squares C0 and C1	140±5cm	ANU 2035	10,910±140 BP

characteristics taken into account (Morwood 1981:2). Figure 2 illustrates the defined categories. According to this method of classification, 41 artefacts were recorded as being backed. However, for the purpose of uniformity across the sites in this study, the definition of Australian backed artefacts provided by Hiscock (1993, 2002:163) and Hiscock and Attenbrow (1996) was adopted for this study. A technological analysis was undertaken by Hiscock (Australian National University, pers. comm., 4. May 2001) and 26 artefacts were identified as backed. These are catalogued as geometric microliths ($n=14$), backed microliths ($n=4$), and backed pieces ($n=8$). All artefacts catalogued as backed microliths are asymmetric in morphology and are referred to in the text as asymmetric or Bondi points for consistency. All but one of the backed artefacts were manufactured on quartzite, with NWI#1 produced on silcrete. They range in size from 1–4 cm, with 10 artefacts between 2–3 cm, 12 artefacts between 1–2 cm, two artefacts 3–4 cm and two exactly 2 cm in length.

Native Well II

The Native Well II Aboriginal rockshelter also contains a gallery of rock art including engravings and red and white (and one black) stencils. The site was excavated by Morwood (1979:206) in 1977, and 3849 pieces of stone were recovered, with 178 identified as tools on the basis of morphology and either retouch or use-wear. Excavated faunal material comprised five pieces of bone, only

Figure 2. Categories of backed artefacts as classified by Morwood (1979): (a) geometric microlith (NWI#8); (b) backed piece (NWI#15); (c) backed microlith or Bondi point (NWI#4).

one of which was unburnt and identifiable, all recovered from the three uppermost excavation units (Morwood 1981:38). Abundant ochre and pipe clay fragments were also excavated with a distribution similar to that of the stone tools. However, because of the range and quantity of material, Morwood (1979:213) concluded that the pigments were applied to a variety of artistic endeavours not all represented by the rock art at the site.

Three radiocarbon dates on charcoal samples were obtained for the site (Table 2). Morwood (1979:210) suggests the most recent backed artefacts recovered may have been ‘scuffed up’ from lower levels. The corresponding radiocarbon date for the most recent backed artefacts would therefore be younger than 2170 ± 80 BP. A date of 3700 ± 500 BP for the earliest appearance of backed artefacts at the site was based on an age/depth curve and differs from that of 4320 ± 90 BP for Native Well I.

Table 2. Native Well II conventional ^{14}C dates on charcoal (Morwood 1979:210)

Excavation Unit	Depth below surface (cm)	Lab code	C14 dates
Charcoal from Excavation Unit 5 in Square L7	46 $\pm$ 5cm	ANU 2117	2170 $\pm$ 80 BP
Charcoal from Excavation Unit 10 Square L7	92 $\pm$ 5cm	ANU 2091	2470 $\pm$ 80 BP
Charcoal from Excavation Unit 18, near the base of Stratigraphic Layer 5 in Squares L7 and M7	173 $\pm$ 5cm	ANU 2035	10770 $\pm$ 135 BP

The same classification criteria have been applied to the Native Well II backed artefacts as described for Native Well I. Fourteen backed artefacts in the Native Well II assemblage were catalogued as geometric microliths (n=6), backed microliths, also referred to as asymmetric or Bondi points, (n=2), and backed pieces (n=6). All of the backed artefacts at Native Well II were manufactured on quartzite. This is particularly interesting as other artefacts recovered from the site are produced on chert, sandstone,

fine-grained silcrete, volcanics, and a duricrust silcrete, with changes in raw material use over time (Morwood 1981:30). In fact, other tools in the ‘small tool tradition’ were produced on fine-grained silcrete (Morwood 1979:215). All artefacts were less than 4 cm in size with nine artefacts between 1–2 cm, two exactly 2 cm, two 2–3 cm, and one 3–4 cm.

METHODS

The techniques of residue and use-wear analysis have demonstrated their combined effectiveness as a means of inferring task association and function in archaeological material (for examples, see Fullagar 1986, 1994, 1998; Haslam 1999; Robertson 2002, 2005, 2006; Rots and Williamson 2004; Wadley and Lombard 2007). In combination with the use of powerful optical microscopes for observation, the analysis relied on access to a comprehensive comparative reference collection assembled during the course of the project by the author and colleagues in the Archaeological Science Laboratory, School of Social Science, University of Queensland, and also on published data. As a component of this research, tables were created to reflect anticipated residues and use-wear associated with various hypothesised tasks such as butchery, hunting, bone-working, skin-working, wood-working, general plant processing and also ceremonial or decorative activities (see Robertson 2005:Table 3.2 and Robertson 2005:Table 3.4). These tables were employed to make inferences on the use of backed artefacts at Native Well I and Native Well II.

Residue analysis

Residue analysis is the study of organic and inorganic materials left adhering to artefacts as a result of Locard’s ‘exchange principle’ (Briuer 1976:478). In this discussion, the term residue analysis refers to the methodology associated with the identification and interpretation of archaeological residues. Although residues on stone artefacts are the focus of this study, residue

analysis is employed in a growing number of areas of archaeological research including the study of pottery, glass, coprolites and archaeological soils. Residues on stone tools may be from several different sources. They may be culturally derived, for example as the result of association with a task or as part of the manufacturing process (i.e. hafting and/or tool decoration). They may also arise incidentally from some other activity, or they may be due to taphonomic factors and result from the post-depositional environment or post-excavation processes. An essential part of residue analysis is the exclusion of the non-cultural elements present on an artefact.

The types of diagnostic organic residues potentially associated with excavated stone artefacts are generally subdivided into plant and animal residues, while inorganic residues such as ochre, aragonite, vivianite and some other minerals may also relate to stone tool use. Typical plant residues are cellulose (amorphous, tissues and fibres), sap, resin, starch grains, raphides and druses, each with specific characteristics that generally allow their microscopic identification (for identification characteristics see Franceschi and Horner 1980:381; Fullagar 1986:176; Gunning and Steer 1975:117; Haslam 2004; Horner and Wagner 1995:56; Langenheim 2003:46; Lombard 2005; Raven *et al.* 1999; Robertson 2005:54-85). Among the animal residues identified on stone artefacts are blood (including proteinaceous films and red blood cells), bone, animal tissue and fibres (including collagen and muscle), lipids, feathers and hair (Akerman *et al.* 2002; Balme *et al.* 2001; Cooper 2003; David 1993; Francis 2000, 2002; Fullagar 1986; Fullagar and Jones 2004; Lombard 2005; Lombard and Wadley 2005; Loy 1983, 1985, 1990, 1993, 1994; Loy and Dixon 1998; Loy and Hardy 1992; Loy and Wood 1989; Robertson 2002, 2005, 2006; Sobolik 1996; Tomlinson 2001; Wadley *et al.* 2004a; Wallis and O'Connor 1998; Williamson 2000). Microscopic identification to a specific taxonomic level is only possible with a limited number of these residue types, namely, hair and feather, and then only if the residue is relatively undamaged and there is access to a reference collection of local specimens (Loy 1985, 1990, 1993; Loy and Nelson 1986; Robertson 2002). For more specific information from the residues, further testing is usually necessary.

Despite the fact that the mechanisms of preservation are not yet fully understood (but see Jones this volume), there is still substantial evidence that organic residues on stone tools, unlike macro-remains, are capable of surviving for long periods of time under a variety of conditions, including caves and open air sites, swamps and deserts (Cattaneo *et al.* 1993:41; Loy 1990). Whether blood proteins survive in a biologically active form is still a matter for debate, although there appears to be a consensus on the relative stability of haemoglobin (or at least the haem portion). This suggests that the modified Hemastix test (see Matheson *et al.* this volume) is still the most useful indirect screening test for the presence of blood residue, although it cannot be used as the only indicator.

Use-wear analysis

Use-wear analysis comprises a series of techniques for obtaining functional information from stone tools to augment that available from conventional morphological and technological approaches. Information is obtained by studying 'the effects of the utilisation process on the tool itself' (Odell 2004:135). It is defined as 'the study of tool functions by examining modifications to the edges and surfaces of stone tools' (Fullagar 1986:9). Since such modifications may be cultural or taphonomic, use-wear analysis has two components: it is a method of defining or describing wear features attributable to cultural factors, that is, tool-use; and a means of interpreting function. The major forms of use-wear observed were edge rounding, edge-fracturing, striations, lineation and abrasive smoothing and polish (see Robertson 2005 for definitions of these terms with reference to Fullagar 1986 and Kamminga 1982). Use-wear analysis, in this study, was employed primarily to locate used edges and to determine the mode of action of a tool. The more complex wear patterns associated with sustained use were not consistently identified.

The potential for confusion of use-wear with non-use-related wear features is a major methodological issue. All tools will have been subjected to non-use wear usually from a number of different sources during their life histories, and unless this is identified as such or at least

recognised as a possibility, any functional interpretation based on use-wear analysis alone is likely to be questionable. A number of researchers have attempted to address the problem through experimentation (see Burroni *et al.* 2002 for detail), but Hurcombe (1992:71) has adopted an interesting methodological approach to the issue by employing Schiffer's (1972) separation of archaeological and systemic contexts as a basis for constructing a table of phases in the life history of a tool which might produce non-use wear (see Robertson 2005:Table 2.1). This framework allows consideration of the various types of potential wear patterns and also the possibility of identifying at least some of them (Hurcombe 1992:71). Hurcombe (1992:71-78) provides an excellent discussion of numerous sources of non-use modifications and accidental damage to lithic artefacts within this framework. Those considered relevant to this research included some manufacturing techniques such as abrasion and retouch, 'bag-wear', and accidental damage due to trampling by either human or animal agency (see Kamminga 1982:7-8; McNiven 1993; Vaughan 1985:23).

Other taphonomic factors to be considered are soil processes, including patination caused by soil chemicals, soil movement causing friction, and the detrimental effects of exposure to wind, heat and water (Burroni *et al.* 2002). The site context of the artefacts should indicate which, if any, of these issues need to be accounted for during analysis. Sieving and cleaning of artefacts is known to cause significant modifications to an artefact surface, particularly abrasion and striations, and also of course the removal of residues (Hurcombe 1992:77; Kooyman 2000:154). Use-wear attributes were observed in less than ideal conditions in this study. Totally accurate use-wear analysis requires artefacts to be thoroughly cleaned, often with harsh chemicals, prior to microscopic examination. However, this research was an integrated study involving both use-wear and residue analysis and cleaning of the artefacts was not a viable option.

Hafting also has a significant influence on the mode of action of a tool and the presence of a haft may occasionally be inferred from wear traces. However, according to Rots (2003:812) the 'use of resin often hinders trace production'. This is an interesting finding in relation to interpretations of Australian artefact use where the presence of resin traces is the most distinctive hafting evidence recorded in most previous research. Rots (2003:812) determined that 'absence of scarring and polish in a well-delimited area' usually signifies the use of resin, not necessarily the absence of hafting. Lombard (2005) used a multi-analytical approach that included both use-wear and the presence of resin to infer hafting on artefacts from Sibudu Cave in South Africa.

Microscopy

Both low and high magnification microscopes were employed in the analysis because each provided a different image of the artefact surface. This difference relies not only on their differing range of magnifications and degree of resolution, but, more significantly, on the angle of lighting (Fullagar 1986:27).

Initial examination of an artefact at low magnification allowed assessment and identification of traces of wear, including use-wear and wear due to taphonomic factors, location of potential use-related residues, hafting evidence, and contaminants. This analysis involved the use of a Wild stereo-binocular microscope with variable magnifications from 6x to 30.6x diameters mounted with an Olympus DP10 digital camera set at highest resolution (3.2 million pixels). The light source employed was a Microlight 150 fibre-optic light with adjustable arms. The latter allow observation of artefact surfaces with oblique lighting, which is essential for the identification of a number of use-wear attributes.

An Olympus BX60 metallographic microscope fitted with 10x eyepiece lenses and 5x, 10x, 20x, 50x and 100x objective lenses was used for high-power microscopy, providing nominal magnifications of 50x, 100x, 200x, 500x and 1000x diameters. The microscope employs vertical incident brightfield and darkfield illumination for observation of residues and artefact surfaces, but also has the capacity for use as a transmitted light microscope for observation of residue samples removed to slide. The Olympus microscope was also fitted with an Olympus DP10 digital camera.

RESULTS

Native Well I

Of the 26 artefacts analysed from Native Well I, 20 show evidence of having been used for an identifiable task or tasks, two exhibit only a slight indication of use with one of these being allocated a task association of possible ceremonial activities on the basis of residues, and a further four artefacts were unable to be assigned a specific task although they exhibited some evidence of use (Table 3). Half of the artefacts exhibited evidence for hafting and this is discussed below in conjunction with resins. Figure 3 provides a broad overview of the analysis results. Inferred task associations for each artefact are categorised separately, but several artefacts were used for more than one task, including a backed piece (NWI#9) used for both wood-working and processing of starchy plant food, and two symmetric artefacts (NWI#10, NWI#20) used for both general plant processing and processing of starchy plant food. One artefact (NWI#3) with numerous feather residues was also used for general plant processing. Ochre was present in varying quantities on 19 artefacts, one of which may have been used for pigment preparation or in a ceremonial context.

Plant processing

General plant processing includes cutting or shredding non-woody material and scraping or cutting to remove bark from woody stems, with the latter activity often adding a dark resinous plant sap, occasionally charred. Eleven artefacts were allocated the task association of general plant working on the basis of the presence and distribution of plant sap or exudate, amorphous and fibrous cellulose and small starch grains and, occasionally, resin. Associated use-wear features included small bending flake scars along a slightly rounded edge with occasional lineation in the residues. A further two artefacts (NWI#4, NWI#23) exhibited some of the above features, but the evidence was insufficient to confidently infer plant processing. Five artefacts showed evidence of hafting.

On five artefacts, cooked or heated starch was a significant residue, generally co-occurring with plant fibres, cellulose fragments and in one instance (NWI#19), with raphides. Most uncooked grains were approximately 2 µm, while cooked grains were generally larger (4–8 µm on these artefacts) and with a diffuse extinction cross (Figure 4). The source of starch is likely to be tubers or rhizomes. Two artefacts (NWI#10, NWI#20) were also used for processing resinous plant material at some stage, and the tip of one (NWI#9) was used to incise wood. None of these artefacts appeared to have been hafted.

Three artefacts (NWI#1, NWI#19, NWI#23) exhibited raphides, although not in any significant quantity. In each case they were associated with starch grains and other plant residues and their presence substantiates the inferred use of the artefacts for plant processing. The co-occurring starch grains on one artefact (NWI#19) appeared cooked, signifying possible food preparation. All raphides observed were of similar morphology with lengths of 25 µm, widths of 2–3 µm and slightly uneven edges possibly due to variations in their crystalline structure producing banding (see Robertson 2005:61). This similarity in size and shape is a possible indicator of their source from the same plant family (see Crowther this volume), particularly as they were all found in conjunction with almost identical starch grains. Raphide identification on NWI#23 is confirmed by the presence of part of a raphide idioblast. An almost complete raphide idioblast was also observed on another artefact (NWI#3) and, although no raphides were identified, this artefact also had an inferred task association of general plant processing.

Wood and bone-working

Seven artefacts were allocated the task association of wood-working on the basis of residues and use-wear features such as moderate to pronounced rounding of edges (scraping) or tips (incising), the presence of striations, and edge-scarring in the form of bending and step microfractures (Figure 5). Residues consisted of smeared resin and/or plant exudate that was often charred,

Table 3. Task association/s and hafting assessment for Native Well I artefacts

NW I #	Artefact Type	Animal Task Association	Animal Function	Plant Task Association	Plant Function	Other Task Association	Hafting Assessment
1	Bondi point			general plant processing / fibrous	cutting and scraping		insufficient evidence
2	Geometric microlith			general plant processing / non-woody	cutting and scraping		probably hafted
3	Geometric microlith	feathers	uncertain	general plant processing / non-woody	scraping and shredding		hafted
4	Bondi point			uncertain - possible plant processing	uncertain		insufficient evidence
5	Bondi point				uncertain		hafted
6	Bondi point			wood-working / resinous	cutting and incising		probably hafted
7	Backed piece			wood-working / resinous	incising and/or scraping		insufficient evidence
8	Geometric microlith			probable wood-working / resinous	uncertain - probable scraping		probably hafted
9	Backed piece			starchy plant processing (cooked and fibrous); wood-working / resinous	cutting and scraping (starchy plant); incising (wood)		insufficient evidence
10	Geometric microlith			general plant processing; starchy plant processing	cutting and scraping		insufficient evidence
11	Geometric microlith	secondary or tertiary bone-working	cutting				insufficient evidence
12	Geometric microlith			wood-working	scraping and engraving		probably hafted
13	Backed piece			general plant processing / resinous	cutting		insufficient evidence
14	Backed piece			general plant processing / resinous	cutting		insufficient evidence
15	Backed piece			general plant processing / resinous	scraping and cutting		probably hafted
16	Geometric microlith			general plant processing / woody stems or sappy plant	scraping		hafted
17	Geometric microlith			wood-working / charred	scraping and burnishing		insufficient evidence
18	Geometric microlith			general plant processing/ soft, fleshy stems	cutting and/or scraping		hafted
19	Geometric microlith			starchy plant processing	cutting and scraping		insufficient evidence
20	Geometric microlith			general plant processing / resinous; starchy plant processing	cutting and/or scraping		insufficient evidence
21	Geometric microlith			starchy plant processing	cutting		insufficient evidence
22	Backed piece			wood-working / resinous	incising		probably hafted

23	Backed piece			uncertain - possible plant processing / resinous	cutting		hafted
24	Geometric microlith					possible ritual or pigment preparation	hafted
25	Geometric microlith			unknown	unknown		hafted
26	Backed piece			general plant processing / charred, resinous	cutting		insufficient evidence

Figure 3. Inferred task associations, hafting assessment and ochre residues for Native Well I.

Figure 4. Cooked starch grains (2-4 µm) and cellulose, on the chord of NWI#9 (BFxp).

Figure 5. Striations sub-parallel to the flattened tip in a smoothed and polished section of the tip of NWI#6 (BF+a).

Figure 6. Granular bone collagen in a flake scar on one end of the chord (ventral surface) of NWI#11 (BFplp).

Figure 7. Red ochre and resin on one tip of NWI#8 (BFplp).

plant fibres, amorphous cellulose fragments, charcoal and small starch grains. Five of the seven artefacts functioned as incisors as attested to by the wear on the tips, often with scraping and cutting as adjunct functions. One artefact (NWI#17) appeared to have been used to burnish wood, with significant wear and residues on the obtuse angle ridge. Four artefacts exhibited evidence for hafting.

Only one artefact (NWI#11) was found to be associated with bone-working. Bone collagen and a putative blood residue in the form of a greasy proteinaceous film were the most significant residues, indicating either secondary or tertiary bone-working (Figure 6). Use-wear suggested a cutting action.

Feathers and ochre

NWI#3 was the only artefact with feather residues and, although three downy barbules were observed, more specific identification was not possible. The residues were mostly located on and below the obtuse angle ridge and in association with resin, and any inference regarding their use is purely speculative. They may have been the result of a specific processing task or alternatively they may relate directly to the hafting method, possibly as temper or decoration. The artefact was also used for general plant processing.

Nineteen artefacts exhibited ochre residues, with both red and yellow ochre

occurring on six of these, and red alone on the remainder (Figure 7). In many instances ($n=11$) where quantities were slight and patchy, ochre appears to be the result of incidental transfer from the surrounding soil or possibly from the hands of the user or the excavator. On artefact NWI#24, ochre was scraped onto edges in sufficient quantity to suggest use of the artefact in pigment preparation or in a ritual or ceremonial context. On the remaining seven artefacts, ochre was possibly associated with decorative use, especially on or around the haft, although four of these artefacts were used for wood-working, which may also account for the presence of ochre if the wood was painted with ochre. Ochre also has a practical purpose as an additive to hafting resin and may be used as a filler to reduce the brittle character of the resin (Wadley *et al.* 2004b:670).

Six artefacts with ochre residues exhibited clear evidence for hafting, and a further three may have been hafted although the evidence is ambiguous. A variety of coloured ochre fragments (including red, yellow and white) were found throughout the excavated deposits at Native Well, and also on the ground adjacent to the shelter and in caches in association with stone tools and pieces of worked wood (Morwood 1979:165). A retouched stone flake with one heavily abraded 'corner' and splatters of adhering white and yellow ochre attesting to its use as an engraving implement was discovered cached in an area surrounded by engravings (Morwood 1979:171). Morwood (1979:180) deduced that artistic endeavours, including engraving and decoration of the walls with stencils and painting, have been a significant feature of the site since its initial use by Aboriginal people. The use of ochre for other aesthetic purposes in connection with stone artefacts was borne out by the current study.

Resin and hafting

Hafting was inferred on the basis of appearance, relative quantity and pattern of distribution of resin on 13 of the 26 tools examined. Only one artefact (NWI#19) had no visible resin but the remainder exhibited resin in some form, with resin or a resinous plant exudate usually the result of wood-working ($n=3$) or general or starchy plant processing ($n=7$). Resin/plant sap on the latter was frequently smeared and/or charred and was located on the tip or cutting edge in association with use-wear features such as striations and edge damage. On several artefacts, resin was in limited quantity and/or without any particular pattern of distribution preventing any confident inference regarding hafting.

Hafting resin on most artefacts was brownish-black but on two artefacts (NWI#2, NWI#12) it appeared red-brown and on one (NWI#5), yellow, indicating different sources. Resin was frequently charred and occasionally thick and ‘crazed’ (Figure 8). The hafting method appeared to vary with the morphology of the tool, with resin distribution on the symmetric artefacts ($n=8$) generally on the backed edge, obtuse angle ridge and one or both lateral margins (Figure 9). The symmetric artefacts may have been hafted in series. For the asymmetric artefacts ($n=2$), hafting resin was located principally on the backed edge at the proximal end, and for these the inferred function was incising which would require individual hafting. As expected, there was no general pattern for hafting of the backed pieces ($n=3$).

Figure 8. Smeared black/charred and ‘mud-cracked’ resin near the chord on NWI#8 (BFxp).

Figure 9. Resin distribution along the left lateral margin on the ventral face of NWI#15 (Wild).

Summary

Of the 26 Native Well I artefacts analysed, all exhibited some evidence of use although four were unable to be assigned a specific task/function, and a ceremonial or decorative purpose was tentatively proposed for one on the basis of residues. Eleven artefacts were used for general plant processing with cutting and/or scraping as the inferred functions. Five artefacts were allocated the inferred task association of processing cooked starchy plants, and seven had been used for wood-working, principally as incisors. Only two artefacts gave any indication of an association with animals: one artefact had been used for bone-working, with use-wear indicating a cutting function; and one had feather residues, although these were unable to be unequivocally associated with a particular task or function. Several artefacts were probably multipurpose although the inferred task associations overlap since they were all associated with plant working in some form. For example, the separation of starchy plant processing and general plant processing may be too prescriptive. Half of the artefacts had hafting evidence, and there is a possibility that some of the geometric artefacts were hafted in series as proposed historically. Ochre residues occurred on over 70% of the backed artefacts, which is to be expected for an art site.

Native Well II

Of the 14 artefacts analysed from Native Well II, 13 exhibited clear evidence for use although one (NWII#4) was unable to be assigned a specific task (Table 4). Ochre was present on all artefacts, although in various quantities and locations and the presence of which requires clarification. Hafting evidence is notable and is discussed in conjunction with resins. Figure 10 provides an overview of the results.

Plant processing

Three artefacts were allocated the inferred task association of general plant working on the basis of the presence and distribution of plant sap or exudate, amorphous and fibrous cellulose and small starch grains and, occasionally, resin. Associated use-wear features included small bending and occasional step flake scars along a slight to moderately rounded edge with occasional lineation in the residues. General plant processing includes functions such as cutting, shredding, and scraping bark from woody stems, and use-wear evidence on the tools was often slight. Only one of the artefacts (NWII#1) had evidence for hafting.

Wood and bone-working

Seven artefacts were allocated the inferred task association of wood-working based on presence and distribution of resin (frequently charred and smeared), plant sap, plant fibres and tissue, small 1-2 μm starch grains and charcoal. Ochre frequently occurred in conjunction with the plant residues. Use-wear features were generally obvious and included moderate to pronounced edge-rounding on the chord (often including the tip), edge-scarring in the form of a semi-continuous distribution of bending and step flake scars, and various types of striations, the latter often occurring as lineation in resin or plant exudate on the chord (Figure 11). For five of the artefacts, one of the functions was incising as attested to by the wear on one or both tips, although this was always in conjunction with cutting and/or scraping activities. Only three of the seven wood-working artefacts had sufficient evidence to infer hafting, although there is obvious overlap in hafting and wood-working residues which makes the differentiation difficult. NWII#8 also had significant feather and ochre residues indicating a possible decorative or ceremonial association.

Tertiary bone-working as a task was inferred for two artefacts (NWII#3, NWII#7), with residues consisting of granular bone collagen, collagen fibrils and red ochre in conjunction with moderate edge-rounding and a series of bending flake scars with rounded margins on the chord and some striations. NWII#7 also exhibited bevelling on the obtuse angle ridge, while NWII#3 had feather residues associated with hafting resin. Both artefacts were hafted, and use-wear indicated that they were used as scrapers with NWII#3 also used for cutting, although both appear to have had limited use, possibly a single episode.

Feathers and ochre

Feather residues were present on only two artefacts (NWII#3, NWII#8), with two downy barbules visible on the latter. NWII#8 is a backed piece and the downy barbules were located near the truncated end with both red and yellow ochre residues in association. It was not possible to further identify the feather barbules to Order or Family as the morphology of the one of the barbules is common to a number of taxa and a second barbule was fragmented and exhibited few diagnostic features. The combination of ochre and feather residues suggests a decorative or ceremonial purpose, although the artefact had been used for wood-working. On NWII#3, feather residues occurred in association with resin and may relate to hafting or other activities as discussed previously.

Red and/or yellow ochres were present on all Native Well II artefacts although the quantity and distribution varied, as did an association with use-wear and/or other residues. Ochre occasionally appeared greasy and was associated with vivianite, lipids and/or collagen residues and had obviously been mixed with other substances. Roth (1904: 466) notes that ochre was often 'fixed' with a variety of materials including spittle, water, gum-cement (*Leptospermum*

Table 4. Task association and function for Native Well II artefacts

NWII#	Artefact Type	Animal Task Association	Animal Function	Plant Task Association	Plant Function	Other Task Association	Hafting Assessment
1	Backed piece			general plant processing / fleshy	cutting		hafted
2	Geometric microlith			general plant processing / woody stems	cutting and scraping; possible incising		insufficient evidence
3	Geometric microlith	tertiary bone-working	scraping and cutting				hafted
4	Geometric microlith			uncertain	uncertain / possible cutting		hafted
5	Bondi point			general plant processing or wood-working / resinous	scraping and cutting		probably hafted
6	Geometric microlith			wood-working / resinous	incising and scraping		hafted
7	Bondi point	tertiary bone-working	scraping and incising				hafted
8	Backed piece			wood-working / resinous	incising and/or cutting	decorative / ceremonial	insufficient evidence
9	Backed piece			wood-working / resinous	cutting and scraping		hafted
10	Geometric microlith			wood-working / resinous	incising and/or burnishing		insufficient evidence
11	Backed piece			wood-working / resinous	incising and/or cutting		insufficient evidence
12	Backed piece			wood-working / resinous	scraping and cutting or incising		insufficient evidence
13	Backed piece						hafted
14	Geometric microlith			general plant processing	cutting		insufficient evidence

Figure 10. Inferred task associations and hafting assessment for Native Well II artefacts.

Figure 11. Bending flake scars on the rounded edge near the tip of NWII#8.

Figure 12. Red ochre and charred resin smeared on the obtuse angle ridge on NWII#12 (DF).

sp.), human or animal blood (especially on men's weapons and implements), honey (on women's digging sticks), candle-nut oil (*Aleurites moluccana*), and snake and iguana fat. In some instances ochre is associated with resin on hafted implements and may be either decorative or an additive to improve the hardening qualities of the resin (Robertson 2005:83; Wadley *et al.* 2004b) (Figure 12).

Several artefacts used for wood-working or tertiary bone-working had co-occurring smeared ochre residues indicating use on ochred materials or possibly concurrent application of ochre to the materials being worked. However, there is no doubt that some ochre residues on Native Well II artefacts also occurred as a result of incidental soil or hand transfer. The presence of ubiquitous ochre residues is not unexpected because Native Well II is a rock art gallery, and large quantities of ochre were recovered during the excavation of the site (Morwood 1979:213). However, because not all excavated pigments are represented on the gallery walls, Morwood (1979:213) argued that the pigments were applied not only to rock art but also to a diversity of artistic activities, and the results here tend to support his conclusion.

Resin and hafting

Based on the presence, form and pattern of distribution of resin, eight of the fourteen Native Well II artefacts provided distinct evidence of hafting. Hafting resin on these tools was consistently black or blackish-brown, often thick and crazed, and occasionally with lineation or striations visible in the residue. Resin was frequently associated with small (2-4 μ m) starch grains and cellulose, both amorphous and fibrous, charcoal and ochre, and in one instance (NWII#3), feather residues. Three backed pieces (NWII#8, NWII#11, NWII#12) are missing the proximal end and although resin distribution appeared to relate to hafting as well as wood-working, an unequivocal inference could not be made. One artefact (NWII#2) had no visible resin, and the resin on another (NWII#14) was fragmented and distributed indiscriminately across the artefact.

Three of the hafted artefacts had been used for wood-working, two for bone-working and one for general plant processing. Artefact NWII#13 appeared to have been hafted but not used, while NWII#4 had been used but did not exhibit any identifiable use-related residues. The method of hafting was not totally clear, although the haft on the geometric microliths (NWII#3, NWII#4, NWII#6) encompassed the backed edge and obtuse angle ridge and parts of one or both lateral margins, and the haft on one backed piece (NWII#13) appeared to have been angled across part of the chord.

Summary

Of the fourteen artefacts analysed, seven had the inferred task association of wood-working, with one of these possibly also associated with a decorative or ceremonial activity. Three artefacts were used for general plant processing and two for tertiary bone-working, while one had not been used and another was used but its task association was unable to be determined. The wood-working

tools have functioned as incisors and scrapers and occasionally also as knives, and those applied to bone-working and general plant processing were scraping and cutting tools. Eight artefacts exhibited evidence for hafting, although, as discussed previously, this did not indicate that the remaining artefacts had never been hafted. Of particular interest is the fact that blood residues were not observed on any of the artefacts. Bone collagen and fibrils with occasional vivianite and lipids were the only mammalian residues identified, although feather barbules occurred on two artefacts. Ochre residues are ubiquitous, which is a reasonable finding considering that the site includes a rock art gallery, and a large number and variety of ochre and pipe-clay pieces were recovered during excavation.

CONCLUSION

Although they comprise only a small percentage of the excavated stone artefacts at Native Well I and II, backed artefacts provide an interesting insight into some of the activities undertaken by the Aboriginal occupants of these two rockshelters during the mid-to-late Holocene. An integrated residue and use-wear analysis revealed that backed artefacts were used for a range of craft and subsistence activities. They functioned as knives, scrapers and/or incisors for wood-working and bone-working, and also as knives and scrapers for plant processing, including the processing of cooked starchy plants. Some artefacts with ochre and/or feather residues may have been used for ceremonial purposes, which, given that both sites have extensive galleries of rock art, is not unexpected. The presence and location of resin indicates more than half the artefacts were hafted at some stage of their use cycle, and some may have been hafted in series.

This research has made an important contribution to our knowledge of site activities at Native Well I and II. Prior to this work, interpretation of these activities generally depended on the analysis of faunal remains, the presence of ochre and shell fragments, inferences for stone tool use based on morphology, and ethnographic analogy. At these sites, although ochre was ubiquitous throughout the levels where backed artefacts were found, bone was poorly preserved and there is no ethnographic analogy for the use of backed artefacts in the Australian context. This study therefore begins the process of filling in the missing details of mid-Holocene Aboriginal life in the Queensland Central Highlands.

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