Multiple uses for Australian backed artefacts

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Backed artefacts, otherwise microliths or backed bladelets, are key indicators of cultural practice in early Australia – but what were they used for? The authors review a number of favourite ideas – hunting, scarification, wood working – and then apply use-wear analysis and residue studies to three prehistoric assemblages. These showed contact with a wide range of materials: wood, plants, bone, blood, skin and feathers. These results are unequivocal – the backed artefacts were hafted and employed as versatile tools with many functions.

Keywords: Australia, use-wear, residue, microliths, backed artefacts, craft, inter-site variability

Introduction

In Australia, backed artefacts, called microliths or backed bladelets in many parts of the world, have been employed by archaeologists to demonstrate culture change. We know they appeared in the archaeological record of north-eastern Australia in the late Pleistocene, were made in many regions across southern Australia and were abundantly produced in the south-east from about 3500 BP to 1500 BP, and had seemingly ceased to be made by the time of British colonisation; there are no ethnographic observations of backed artefact use (Hiscock & Attenbrow 1998; Slack *et al.* 2004; Hiscock 2008). Over the last century archaeologists have speculated about how they were used. Many earlier conjectures reflected expectations that prehistoric use of backed artefacts in Australia would parallel inferred uses for microliths elsewhere in the world or the ethnographic use of other stone artefacts in composite tools, but often they were guesses, sometimes fanciful. In recent decades several use-wear and/or residue studies have investigated backed artefacts in Australia, but questions of the nature and diversity of uses of this tool form remain. In this paper we present an integrated residue and use-wear analysis, employing both low and high magnification, which studied large samples of backed artefacts from three rockshelters in a valley in eastern Australia. This study provides a novel image of antipodean backed artefact use which challenges models that have dominated the last century of thought on this subject.

Models of backed artefact use in Australia

Several models of backed artefact use have been widely discussed in Australia. Etheridge and Whitelegge (1907) hypothesised that they were scalpels used in scarification to produce

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cicatrices such as those seen historically on Aboriginal people. The idea that these small implements were primarily employed in ritual/ceremonial contexts was advanced by several early researchers (e.g. Horne & Aiston 1924), and in the 1980s it was argued that they were a symbol associated with the growth of ceremonial activities (e.g. Bowdler 1981; Morwood 1981; White & O'Connell 1982: 123). These views shared an expectation that backed artefacts would be used for only short-term single events principally on human flesh, and not necessarily hafted. The idea that backed artefacts were involved in ceremonies/rituals continues to be raised (e.g. McDonald *et al.* 2007).

A different set of models advocated backed artefacts as domestic tools, probably hand-held or more likely hafted. There was no agreement on what the likely use might have been. Hypotheses included wood-working tools (e.g. Mitchell 1949: 56); skinning or skin-working tools (e.g. Tindale 1955; Stockton 1970); and cutting tools, perhaps in composite knives or saws (e.g. Turner 1932; Stockton 1970; Flood 1980; Kamminga 1980; Morwood 1981; Fullagar 1992). These models implied a single dominant use for most or all backed artefacts, which predicated that wear and residues should be uniform on most archaeological specimens.

Initially those inferences were based on the tools' morphology, but researchers also cited the presence of damage such as polish and/or plant tissue residue as evidence of use. In this literature the specimens being examined varied. Many authors principally referred to relatively thin varieties of backed artefacts, which were labelled as 'bondi points', 'geometric microliths', or collectively 'backed blades'. Some researchers examined thick specimens, called *eloueras*, though these were not always backed. These choices affected each study's conclusions; there was often consensus that eloueras had been wood-working tools, whereas there was no agreement that smaller forms were for that task. In this paper the focus is exclusively on the non-elouera forms of backed artefact, and our analysis excludes eloueras.

By far the most common and persistent model has been that backed artefacts were hafted onto thrown spears and served as spear barbs and/or tips (e.g. Turner 1932; Campbell & Noone 1943; McCarthy 1948: 72; White & O'Connell 1982; McDonald *et al.* 2007). This proposition was frequently based on the assertion that although in historical times so-called 'death spears' were barbed with flakes, shells or bones, in the prehistoric period it was the backed artefacts that provided the barbs. However this argument is flawed. No historical items labelled 'death spears' in museums contain retouched stone flakes (Flood 1995: 224–5). More importantly, the earliest colonial literature does not even use the term 'death spears' (Corkill *pers. comm.*); people such as Hunter (1793: 495–6) simply commented that spears barbed with stone, shell or bone caused death. Ethnographic information lends no support to the idea that backed artefacts were spear barbs.

Models of backed artefacts as spear points or barbs also relied on assertions that they were so small they would have been part of a composite tool. Although resin observed on backed artefacts confirms that some specimens were hafted (e.g. Boot 1993; Therin 2000), the argument that specimens with indications of hafting resin must necessarily have been on spears is tenuous; other composite tools would have had the same resin residues. In addition, even if hafted on composite tools they may have been thrown as projectiles or used in a thrusting or hacking motions. For example, McDonald *et al.* (2007) concluded that some backed specimens buried with Narrabeen man had been spear barbs because they were

lodged within the body and had damage consistent with penetration and impact. However all of these features are equally consistent with attack from any composite weapon, including daggers and thrusting poles/spears as well as projectiles.

Presumptions that backed artefacts were armatures on projectiles led Kamminga (1980) to argue that the *lack* of diagnostic wear visible in his low-power microscope inspections of backed artefacts indicated they had probably been barbs on composite spears. This conclusion continues to be widely accepted even though contradicted by residue evidence on specimens examined by Barton (1993), Boot (1993), Fullagar (1994), Therin (2000), Slack *et al.* (2004), and Robertson (2005). The model that backed artefacts were solely, or even principally, barbs and tips on thrown spears predicts not only that abundant specimens would display impact damage and have residue/wear distinctive of flesh/blood but also that few traces of other uses would exist.

Australian wear and residues studies have not yielded evidence consistent with that prediction. Instead the emerging model is that backed artefacts were employed in multiple ways for many uses, including cutting, incising and scraping of plant and animal materials as well as stabbing/thrusting and/or projectile tools. For instance, Hiscock (1994, 2002, 2006, 2008) hypothesised that prehistoric Australian foragers emphasised composite tools containing backed artefacts because of their readiness and multi-functionality, employing them for almost any task at hand. Prior to this paper the most detailed demonstration that Australian backed artefacts were multi-functional, multi-purpose and frequently part of composite tools used in both subsistence and craft activities, was the study by Robertson (2005). She examined wear and residues on backed artefacts from six eastern Australian sites and concluded that specimens had been used in various ways: for working bone, wood, skin/hides and mica, as well as butchery and activities involving feathers. In addition, they functioned as cutting, drilling/awling, and scraping tools. Our study below develops Robertson's previous work, describing wear and residues on backed artefacts from three sites in Upper Mangrove Creek.

Method

All specimens came from the 101km^2 Upper Mangrove Creek catchment, approximately 30km west of Wyong on the Australian east coast (Figure 1). Mangrove Creek and its tributaries formed deeply incised valleys in the sandstone plateau. Over 50 sites were excavated (Attenbrow 1981, 1982, 2004, 2007), and three rockshelters are the subject of this study: Deep Creek, Emu Tracks 2 and Mussel. Deep Creek is a large shelter containing 0.9m of deposit extending back almost 7000 years. Emu Tracks is a small overhang on a ridge overlooking a tributary of Mangrove Creek. The deposit is 80cm deep and covers the last 3500 years. Mussel is a large overhang in the valley bottom, containing a well-stratified deposit up to 10 000 years old. Backed artefacts were discarded in this shelter from about 8300 years ago until 1600 years ago (Hiscock & Attenbrow 1998). All three shelters contained abundant backed artefacts which Robertson examined for wear and residues (Robertson 2002, 2005; Robertson & Attenbrow 2008).

Employing an integrated residue and use-wear analysis, Robertson identified 33 used backed artefacts from the Deep Creek shelter (out of 41 specimens), 60 from Emu Tracks

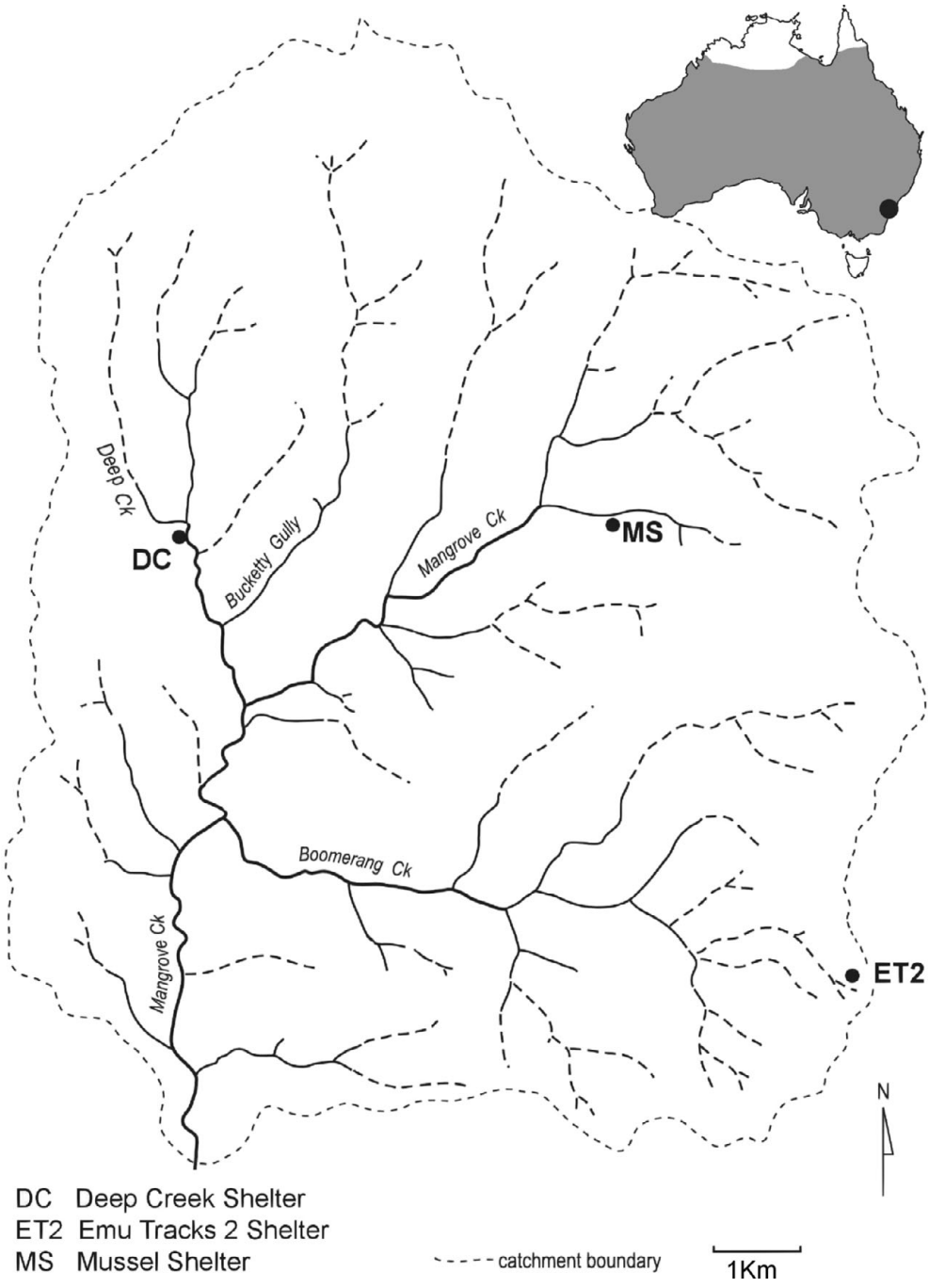

Figure 1. The Upper Mangrove Creek catchment showing the location of Deep Creek, Emu Tracks 2 and Mussel Shelters. Map of Australia shows the distribution of backed artefacts and the location of the Upper Mangrove Creek catchment.

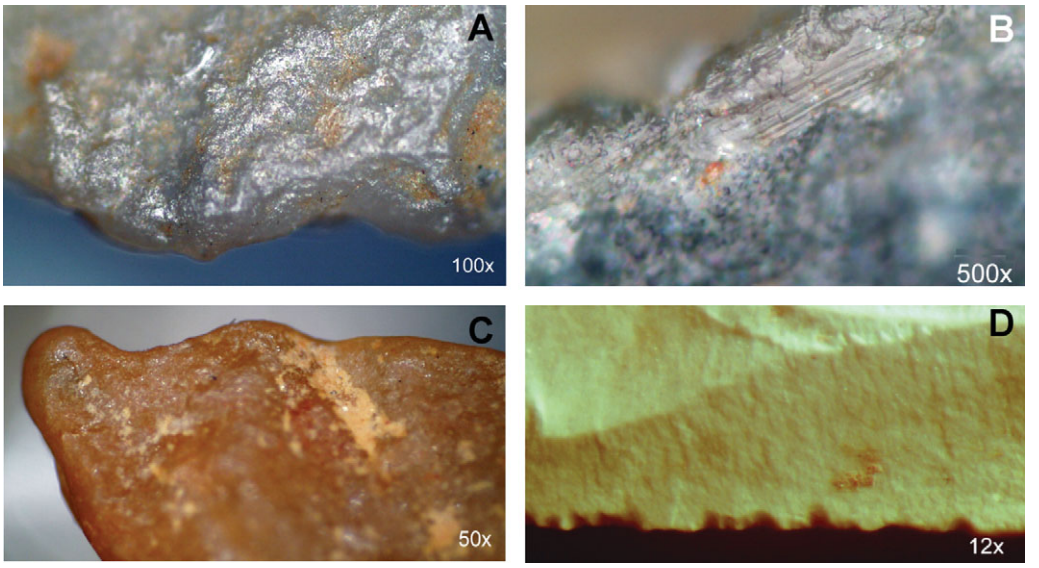

Figure 2. Examples of use-wear on backed artefacts from Upper Mangrove Creek: A) edge-rounding and polish; B) striations; C) pronounced rounding on tip; D) series of flake scars on the chord.

(out of 65 specimens) and 66 from Mussel (out of 93 specimens). Use-wear analysis was employed primarily to recognise used edges and to determine the mode of action of each tool. Frequent forms of use-wear observed were edge-rounding, edge-fracturing, striations and lineation, and abrasive smoothing and polish (Figure 2, for definitions see Keeley 1982; Kamminga 1982; Hurcombe 1992). Organic residues were also preserved on many of these stone tools, and were identified using established diagnostic criteria (e.g. Lombard 2008). Among the animal residues identified were bone, red blood cells (RBC), fibres of collagen and muscle, lipids and feathers (Figure 3). Plant residues also survived, and included resin, plant cells/fibres, plant tissue with bordered pits, and cellulose (Figure 4). For both plant and animal residues specific taxonomic identifications were not attempted, although some feather residues at Deep Creek were identified as duck. Additionally inorganic residues such as ochre, mica and vivianite (an iron mineral found in clays associated with bone or other organic remains) were observed. Using both low and high magnification microscopes, with varied light conditions, these observations were interpreted with the aid of an extensive comparative collection. For detailed descriptions of the analytical procedures see Robertson (2002, 2005) and Robertson and Attenbrow (2008).

Results

Our interpretations of tool use differentiate between task and function. Task (or task association) describes tool use in terms of the materials being worked: plant-working, wood-working, bone-working, skin-working, flesh-working (such as butchering) and trimming feathers. The task(s) of each tool were recognised by identifying unambiguous residues or remnants of materials with which the tool made contact during use. The majority of specimens also have residues of resin and marks of abrasion which are probably evidence

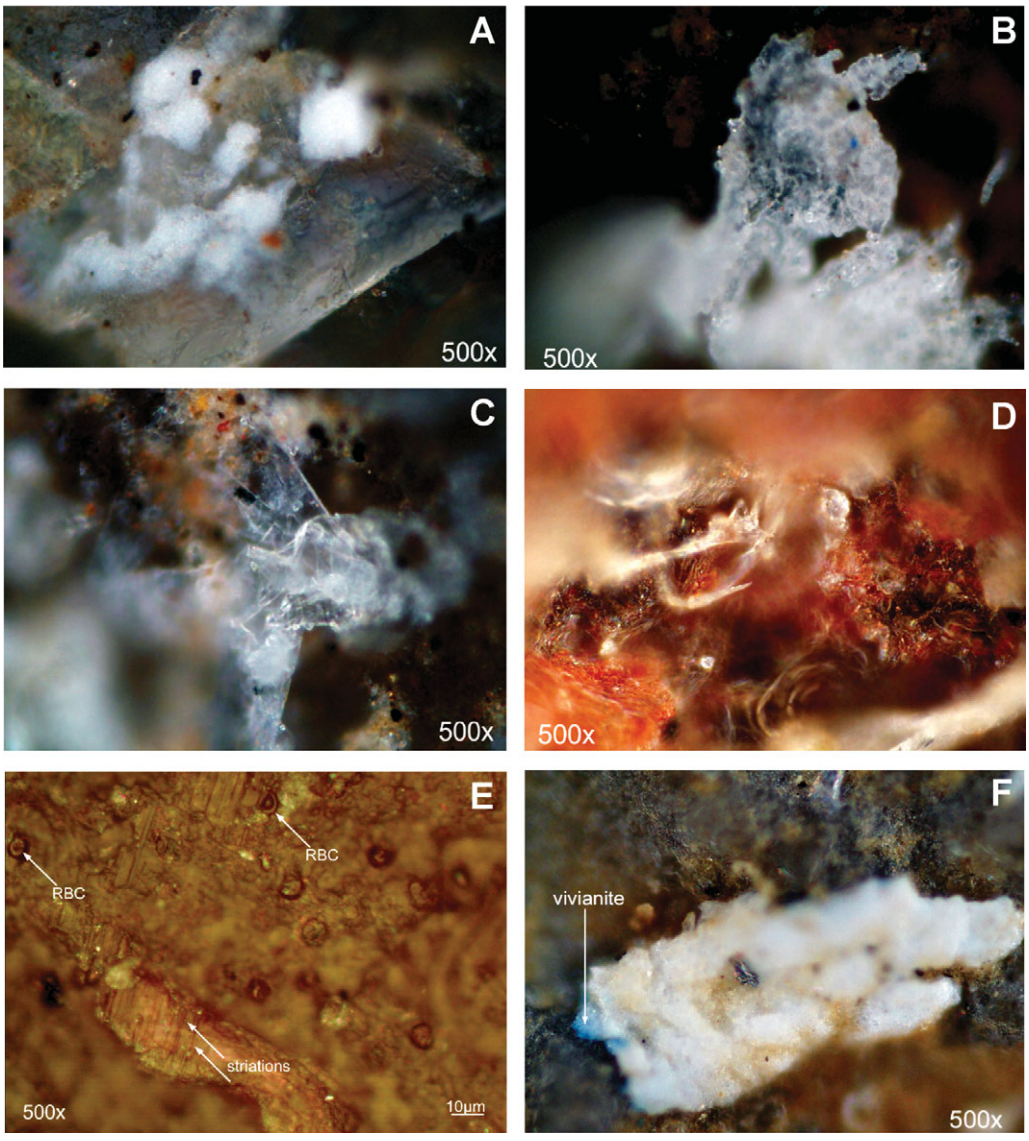

Figure 3. Examples of animal residues on backed artefacts from Upper Mangrove Creek: A) bone collagen near backed edge (dark field); B) smeared connective tissue on backed edge towards the proximal end (bright field); C) sheet collagen on distal end (bright field); D) downy feather barbule with two different nodes indicating Order Anseriformes (dark field); E) striations sub-perpendicular to the chord in thick blood residue with 6–7µm mammalian red blood cells (RBC) (bright field); F) bone fragment with vivianite forming along one edge (dark field).

for hafting, but our main concern in this paper is with evidence for the tasks and functions involved.

Function describes tool use in terms of the way an implement was used: for cutting, scraping, incising, drilling or thrusting/throwing. For each tool these actions were inferred from observations of both patterns of use-wear and the location of task-related residues. For

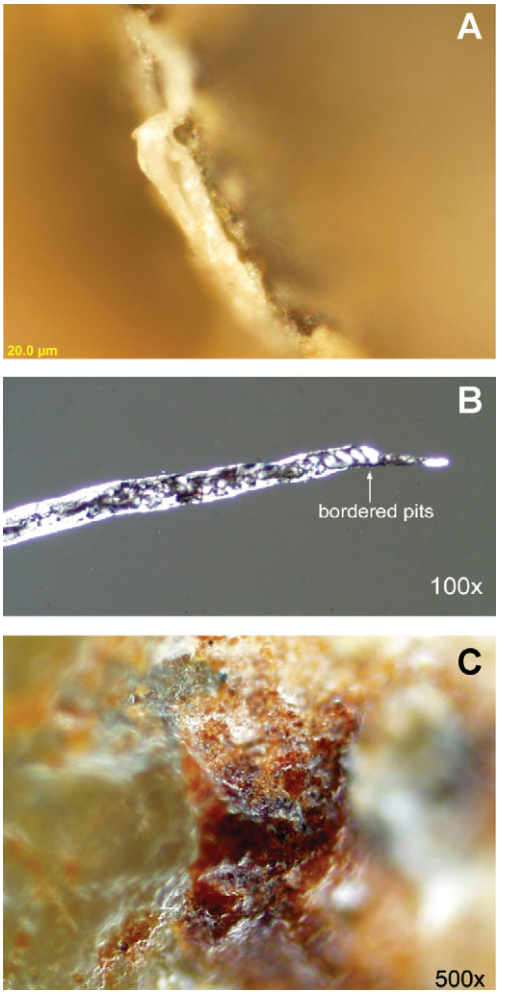

Figure 4. Examples of plant residues on backed artefacts from Upper Mangrove Creek: A) plant fibres in a crevice (dark field); B) woody plant fibre, tracheid, showing internal structure, including bordered pits (bright field); C) resin (dark field).

instance, in cutting, where the tool is drawn longitudinally across some material with the edge held parallel to the direction of use, use-wear is likely to be apparent on both surfaces adjacent to the cutting edge, with the type of damage depending on the material being cut. Striations parallel to the cutting edge, rounding of the tip and chord, and possibly fine flake scarring are the likely result. Even if residues indicated the task performed, a function was not inferred unless wear or distinctive residue location was observed. Hence it was sometimes possible to infer task association but not function, and *vice versa*. However firm identification was often possible: 63 per cent of used specimens have information on both task association and function, 27 per cent have information on either task association or function but not both, and only 10 per cent could have neither task or function identified.

Using this conceptual framework we characterised task association(s) and function(s) involved in each backed artefact's use, to quantify the frequency of different tasks and functions in each assemblage and the magnitude of inter-site variability in tool use. We undertook this investigation with an explicit acknowledgement that any specimen could have more than one use. When tools were used for more than one function, such as being used to both scrape and incise, we describe them as multi-functional. When tools were used on more than one material, such as being employed for wood-working and skin-working, we describe them as multi-purpose. The multiplicity of uses of individual specimens is an additional aspect of inter-site variability that we examined.

Wear and residue evidence make it clear that many backed artefacts from Deep Creek, Emu Tracks and Mussel were used, and that the nature of those uses differed at each locality. At all three sites backed artefacts had been used as tools to work several materials, such as wood and other plant materials, bone, skin, feathers and flesh. However, the frequency with which specimens were used on these different materials varied substantially between the sites (Figure 5). At Deep Creek the majority of backed artefacts had been used on

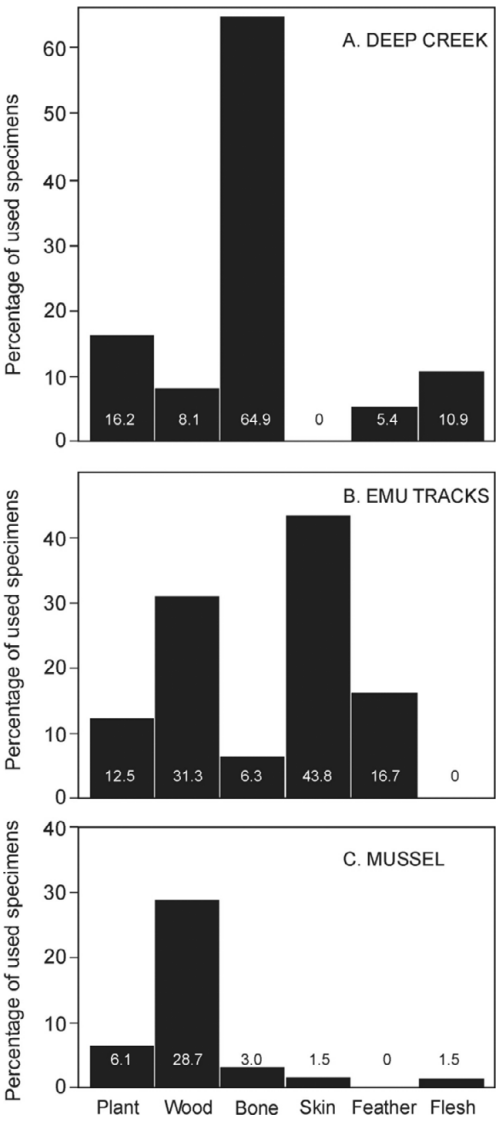

Figure 5. Frequency of different task associations for backed artefacts with evidence for use and for which task was identified: A) Deep Creek (n = 39); B) Emu Tracks 2 (n = 49); C) Mussel (n = 26). Values represent percentage of used backed artefact. Note multi-purpose tools are counted more than once; percentage of unknown task associations is not shown.

bone, while no signs of skin working were observed. At Emu Tracks skin-working was the most frequent task and bone-working was the least frequent. Neither bone-working nor skin-working were frequent tasks at Mussel, instead wood- and plant-working were the common tasks. The pattern is one of a distinctive combination and emphasis of backed artefact tasks at each location in the landscape, perhaps reflecting dissimilar resources in the immediate neighbourhood of each site and/or different activities habitually undertaken at each site.

It is important to note that cutting flesh was a minor element of backed artefact use at all sites, and hence models in which backed artefacts were primarily employed to hunt and butcher game are not supported by the evidence from Upper Mangrove Creek. Furthermore, at two of the three sites the majority of tasks for which backed artefacts were used were probably maintenance rather than extractive in nature and involved in the production of goods rather than the preparation of food. Although the bone- and flesh-working at Deep Creek could indicate that backed artefacts were frequently involved in processing animal products there, it is more likely that they were involved in production of bone artefacts rather than food preparation (see below). The evidence of wood-working, skin-working and feather use that dominate at Emu Tracks and wood-working and plant-working at Mussel is reason to conclude that at those sites many backed artefacts were used to make organic tools and clothing.

The functions for which backed artefacts were used display little inter-site variation and confirm our interpretations that in Upper Mangrove Creek most tools were used for domestic and tool production purposes rather than to hunt and butcher game. At all three sites backed artefacts were most frequently used to cut and scrape (Figure 6), but there was no fixed or strong association between cutting or scraping and specific tasks. Our evidence

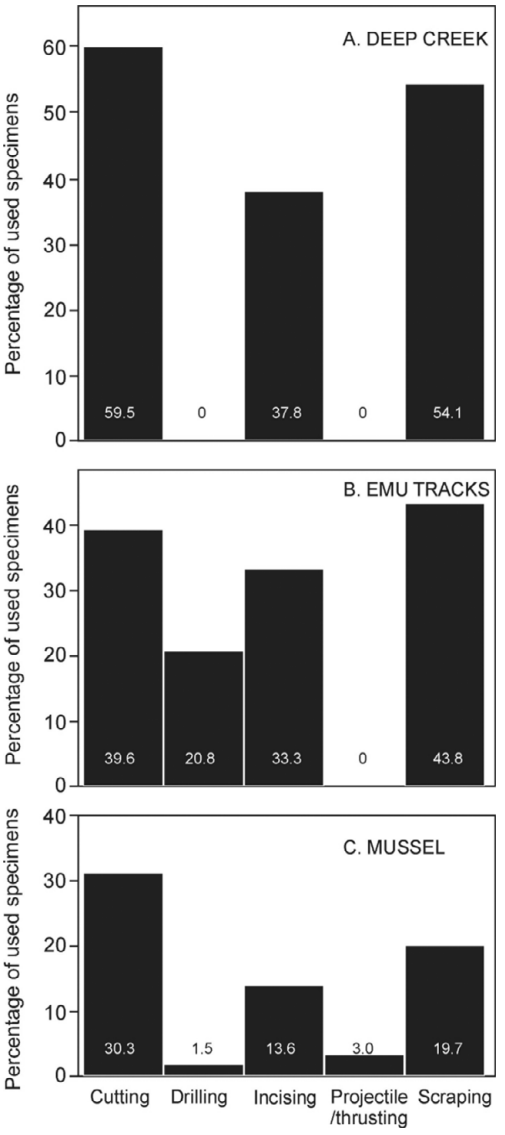

Figure 6. Frequency of different functions for backed artefacts with evidence for use and for which function was identified: A) Deep Creek (n = 37); B) Emu Tracks 2 (n = 49); C) Mussel (n = 39). Values represent percentage of used backed artefact. Note multi-functional tools are counted more than once; percentage of unknown functions is not shown.

is that backed artefacts were used for general purpose cutting or scraping on a large range of materials, including wood, non-woody plants, bone and skin.

Incising was a moderately common function at all sites, but the materials that were frequently incised differ between sites. For instance, at Emu Tracks incising was significantly associated with wood-working ($\chi^2 = 18.44$, d.f. = 1, $p < 0.001$, $V = 0.667$) and skin-working ($\chi^2 = 4.67$, d.f. = 1, $p = 0.031$, $V = 0.356$), at Mussel incising was statistically associated only with wood-working ($\chi^2 = 9.59$, d.f. = 1, $p = 0.002$, $V = 0.430$), while at Deep Creek incising was associated only with bone-working ($\chi^2 = 7.16$, d.f. = 1, $p = 0.007$, $V = 0.471$). These analyses reveal that incising was not tied to any specific material, and that backed artefacts were used to incise any tough material being processed at a site. Furthermore, at Deep Creek the only statistically significant relationship between a task and a tool function was between bone-working and incising; hence the high level of bone-working at that site was probably a consequence of bone tool production rather than of butchering, as suggested above.

Drilling/awling were functions common only at Emu Tracks. There it is statistically associated with only one task: skin-working ($\chi^2 = 8.73$, d.f. = 1, $p = 0.003$, $V = 0.478$). Hence at Emu Tracks, where skin-working was very frequent, some form of hide-working involved the use of backed artefacts perhaps to perforate skins in readiness for sewing them together.

Evidence of chord spalling that might indicate use of backed artefacts as projectiles or thrusting tools was only observed at Mussel and only in 3 per cent of specimens. This does not conform to models in which backed artefacts were exclusively or predominantly spear barbs or tips. Furthermore, at Mussel projectile/thrusting-like damage was often associated with wood-working and plant-working. We therefore conclude that in these three Upper

Mangrove Creek sites there is no unequivocal evidence of any backed artefacts being hafted on spears and projectiles. The idea that backed artefacts were primarily mounted as spear barbs and tips is untenable for these sites.

Finally, the level of multiple use found on backed artefacts also differs between sites. At Emu Tracks (10.4 per cent) and Mussel (8.3 per cent) a relatively low percentage of specimens was used for more than one task, whereas at Deep Creek the frequency of a specimen being used for two or three tasks was distinctly higher (20 per cent). Inter-site differences in multi-functionality were even more marked. At Mussel only 9.2 per cent of specimens had more than one function, but the frequency of multi-functionality was 41.7 per cent at Emu Tracks and an astounding 60 per cent of specimens at Deep Creek. These differences might reflect factors such as the cost of obtaining replacement backed artefacts, intensity/duration of occupation, or variation in time-stress, but statements about local causes of differential multi-functionality await further investigation, including use-wear and residue analyses of the scraper component of the assemblages. It should be noted however, that the few elouera recovered from these sites conform to the patterning for the other backed artefacts, being used for multiple tasks (i.e. working with wood, bone, plant and feather) and having multiple functions such as scraping, incising and cutting, but not drilling or spearing/thrusting. Clearly the idea that backed artefacts had a single or even a typical function is untenable in the Upper Mangrove Creek sites. Instead we infer that backed artefacts were used on multiple occasions and/or were often multi-purpose and multi-functional.

Implications of the multiplicity of uses for prehistoric backed artefacts

These data demonstrate that backed artefacts in Upper Mangrove Creek shelters were used in numerous ways, including craft activities in which objects of wood, non-woody plants, bone, hide and feathers were manufactured and maintained, as well as subsistence activities in which animal and plant materials were prepared. These backed artefacts were typically part of composite tools which were often multi-functional, perhaps used and/or recycled on several occasions. This evidence refutes models in which backed artefacts throughout Australia had only one use, and especially models that posit the dominant use was to cut human flesh in rituals or as armatures on projectiles. The only existing model that survives our investigation is one that reconstructs backed artefacts as elements in flexible, multi-functional composite tools used variously for scraping, cutting, incising, and perhaps occasionally, on throwing spears or thrusting weapons.

Although many Australian researchers believe that backed artefacts were barbs or tips of projectiles there is no unambiguous evidence that they were used for this function at these Upper Mangrove Creek sites where projectile/thrusting-like damage is more commonly associated with working wood and plant materials. In other parts of Australia it is claimed that evidence is consistent with some backed artefacts having been employed as barbs/tips on spears but a projectile function cannot now be generalised to all, or even most, archaeological backed artefacts. Consequently Flood's (1995: 236) notion that backed

artefacts were primarily a weapon of war, and that the period of intense backed artefact production from about 3500 to 1500 years ago was one of heightened conflict in Australia, is refuted. It now seems that the use of backed artefacts as weapons for violence against humans, even murder, was not ubiquitous and indeed may have been extremely rare or geographically localised (e.g. McDonald *et al.* 2007). More plausible explanations for the widespread increase in backed artefact manufacture have been offered (Hiscock 2008: 156–60).

Interpretations of backed artefacts as symbolic display-only objects and/or ritual knives can also be rejected in light of this study, at least as a continent-wide pattern. Many backed artefacts in the Upper Mangrove Creek sites retained residues that indicate craft and processing activities. It is entirely possible that some of the wooden, plant, bone, feather or hide artefacts produced by these activities may have had ceremonial or symbolic roles, but as part of the multi-purpose and multi-functional manufacturing tools there is no reason at the moment to think that backed artefacts were regarded in a non-profane way. Hence, our evidence is against backed artefacts necessarily or typically having only a symbolic purpose.

Furthermore, despite their small size and fragile appearance our observations are inconsistent with ideas that backed artefacts were manufactured in abundance because they were used only once, or for a very limited time. At Upper Mangrove Creek evidence of extensive re-use, for different purposes, perhaps accompanied by re-hafting, reveals that while some backed artefacts may have been employed for only one activity others had a far longer and more elaborate history of use. Suggestions that backed artefacts might sometimes have been modified by further retouching, perhaps in association with re-hafting events, should be examined further in light of this evidence (Hiscock 2003; McDonald *et al.* 2007; Attenbrow *et al.* 2008). In any case the multiple uses of many specimens at Upper Mangrove Creek sites lead us to reject claims that prehistoric uses of Australian backed artefacts can be simply described and generalised. The high level of inter-site variation that we found in backed artefact use, even within a small region, emphasises the multi-functional and multi-purpose nature of this category of tool and reminds archaeologists that they cannot expect investigations of any single specimen or site to characterise the nature of this tool's complex use.

This conclusion might prompt consideration of the diversity of backed artefact uses in other parts of the world. While it is not clear that Australian backed artefacts are morphologically or technologically identical with Old World 'microliths' in Africa, Europe, and Asia, use-wear and residue analyses there have also concluded that they commonly have multiple functions (e.g. Wadley & Binneman 1995; Elston & Brantingham 2002; Milisauskus 2002). The Australian evidence promotes questions of whether multiplicity of uses and high levels of inter-site functional variability is also typical in microlithic assemblages across the Old World.

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