# **19** Deadly weapons: backed microliths from Narrabeen, New South Wales

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# ABSTRACT

A recently excavated skeleton dated to 3677 cal BP provides an extraordinary opportunity to determine the function of its associated backed artefacts. Seventeen stone artefacts were recovered during salvage excavation of an adult male Aboriginal skeleton from a sand dune in Narrabeen, a coastal suburb of Sydney. The skeletal and artefact evidence indicate death by spearing. Three artefacts were refitted, and, of the 14 near complete artifacts, 12 have been clearly backed. One backed artefact was found lodged between the L2 and L3 vertebrae with unhealed wounds, indicating spear penetration near the left hip. Other backed artefacts were found adjacent to or lodged in vertebrae suggesting two spears had penetrated from the back. Breakage and use-wear on most artefacts indicate use as barbs or 'lacerators'. In this study, we describe the use-wear and suggest possible hafting arrangements of these backed microliths, which probably functioned as piercing, cutting and lacerating elements of spears and knives.

## **KEYWORDS**

use-wear, residues, backed artefacts, microliths, spears, knives

## INTRODUCTION

A recently excavated skeleton dated to 3677 cal BP provides an extraordinary opportunity to determine the function of its associated backed artefacts (Figure 1). Seventeen stone artefacts (Figures 2 - 4; Table 1) were recovered during salvage excavation of an adult male Aboriginal skeleton, exposed during cable installations in a sand dune, 1.5 m below the present ground level in Narrabeen, a coastal suburb of Sydney (McDonald *et al.* 2007). The skeletal and artefact evidence indicates death by spearing.

A backed artefact (OON1; Figure 2) found during excavation was lodged between the second and third lumbar vertebrae in the region of the intervertebral disc, with major unhealed



Figure 1. Schematic diagram of the upper torso and the location of the backed artefacts associated with the skeleton. The head has moved approximately 40 cm away from the vertebral column; however the mandible is still articulated. Dots on the spinal column indicate the location of the lodged backed artefacts (arrowed) and the placement of the other images indicates schematically the locations in which the artefacts were found (Reproduced from Antiquity [McDonald *et al.* 2007:879, Figure 1] with permission).

damage to the body of L2 and minor but unhealed damage to the body of L3 (McDonald *et al.* 2007). The artefact has bone residue (similar in colour and structure to the human vertebra) embedded in cracks at the crushed tip. If it were a spear barb, tip or lacerator – the latter a term employed by Kim Akerman (pers. comm.) to describe fragments of stone designed to release from the haft like shrapnel to aggravate haemorrhaging and other internal injuries (rather than to hold a spear in the wound as a barb might function) – this artefact would have entered the body on the left hand side, just above the blade of the left hipbone, assuming the body was in normal anatomical position and a horizontal entry wound. This spear probably passed through the large and small intestines and came close to the left renal artery and vein, and possibly the aorta. Backed artefact OON14 (Figure 3) was found in the position of the (missing) spinous process of the 11th thoracic vertebra. A tiny fragment (OON15, Figure 4) that refits to OON14 was later found in the vertebral canal of another thoracic vertebra (T4). Another backed artefact, OON16 (Figures 1 and 3), was found near L1 although this does not appear to have damaged the bone. Given their positions, these two artefacts (OON14 and 16) are likely to have been part of a spear that entered the back of the individual from the rear.

The artefacts were grouped in four areas around the skeleton (Figure 1): six stone artefacts (OON1, 11, 14+15, 16 and 17) found near the vertebral column; four (OON5,

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Function⁵	[A] Impact, probably projectile barb	[C] Piercing and slicing skin. Not from a projectile.		projectile tip	[B] Likely damage from projectile tip	[B] Likely damage from projectile tip	
⁺9≳U	т	с	ოო		т	2	2
ព្រាវានអ	Probably hafted. Grey residue is possibly resin	Probably hafted. Dark smears are possibly resin.	Complex	in acture, probably from hafting configuration	Probable	Probable	
⁵səubisəЯ	Grey residue on backed edge	Dark smears cellulose, starch on backed edge		Plant tissue, charcoal, carbonate		Impacted yellow tissue same colour as bone fragments.	
лsewear	Rounding on backed edge; none on chord, use scar at proximal tip; cf. barb	Rounding, polish, striae	Crushing at tip	Crushing at tip Scarring on chord Impact scar on tip		Probable impact scar.	
Damage	Broken tips.	No breakage	Crushed tip	Steps from break		Break is probably along 'old' fracture	caused by backing.
Retouch	Bi-direct. backing	Bi-direct. backing	Bi-direct. backing	Bi-direct. backing	Uni-direct. backing initiated on ventral	Bi-direct. backing but rare	
₹ASDT	40	27.5	13.2	55	52	22.3	na
Thick. (mm)	ω	ى ۲	4.2	7	5.8	5.3	
(mm) AibiW	10	1	10 6.3		7.7	8.4	4.6
(աա) գքնսծղ	17.4	5	10	16	17.4	13.3	9
Stone material	Pink-red silcrete	Grey quartzite	Pink silcrete	Pink silcrete	Red silcrete	Red silcrete	Red silcrete
Refit with .on	Refit with no.		4	n		ω	9
Location	Around Skull Skull			West side vert column	Underneath skull	Underneath skull	
∫ype'	Backed flake	Backed flake	Backed broken flake (tip)	Backed flake	Backed flake	Backed fragment	Fragment (tip)
.oN NOO	-	р	ů	4	വ	9	œ

(Reproduced from *Antiquity* [McDonald *et al.* 2007, Table 1 at http://www.antiquity.ac.uk/projgall/mcdonald] with permission) Table 1. Summary of use-wear and residues on stone artefacts from the Narrabeen site

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Uncertain, tip used	Uncertain, tip used	Uncertain, possible use of tip	[A] Hard impact, possibly from projectile	[C] Uncertain, probably not hard impact, awl or projectile?	Uncertain, possible use of tip, awl or projectile?	[A] Hard impact possibly from	projecure, also considerable damage along chord	[A] Hard impact possibly from projectile	Uncertain, possible use of tip	ct.
ო	-	~	m	n	N	ო	ო	ო	<del>.</del>	impa
Dark residue is possibly hafting resin			Probable		Uncertain		Probably hafted	Probably hafted		unction not from harc
Dark residues on backed edge		Carbonised plaques – probably not from use			Black residue on backed edge	Sediment, unidentified particles				indicates dominant f
Rounding and step scar on tip	Possible impact scar	Uncertain	Scars associated with broken tip	Rounding and longitudinal striations near tip	Scarring on chord, tip crushed	Rounding, bending scars along chord	Impact scar cf. barb	Impact scar cf. barb, scarring	Impact damage unclear	ht microscopy. efinite). head-on impact; [C]
		Bipolar crushing and scars	Tip broken	Tip broken	Tip crushed or broken?	Tips broken	Missing fragments.	Tip broken	Broken	rr transmitted lig bable) and 3 (d ct. [B] indicates
Bi-direct. backing near tip	Bi-direct. backing	Backing not clear	Bi-direct. backing, not very steep	Uni-direct. backing, initiated on ventral	Bi-direct. backing	Bi-direct. backing	Bi-direct. backing	Bi-direct. backing	Possible backing, uni-direct.	l for study unde ossible), 2 (pro g oblique impac
19.8	11.7	15.4	20.8	5	21	14.4	na	na	na	removec ise), 1 (p
4.6	3.6	4.4	4	5.6	4.2	3.8	N	3.8	4.1	/et been aces of ι dicates p
8.6	6.5	2	10.4	7.5	10	7.6	3.6	8.8	5.6	classes ave not y : 0 (no tr :ar. [A] in
18.8	14.2	15.7	15.1	15	19.7	7	4.5	18.8	7.5	sidues har follows for the second sec
Grey quartzite	Quartzite	Quartz	Quartzite	Red silcrete	Quartzite	Red silcrete	Red silcrete	Red silcrete	Grey quartzite	king and techr Shea (2006) light only. Re arpretations, a use of dominal
						15	4			e of backes a after ( incident be of inte kely cau
Excavated around skull		Around skull	Vertebral column		Dry sieved	Dry sieved	Inside vertebral canal. Dry sieved	Between L1 and L2		fers to presenc ss Sectional Arr ations are from ers to confidenc n refers to the li
Backed flake	Backed flake	Bipolar piece	Backed flake	Backed flake	Backed fragment	Backed fragment	Backed fragment (tip)	Backed flake	Fragment	<ol> <li>Type re</li> <li>Tip Croi</li> <li>Observi</li> <li>Use reft</li> <li>Function</li> </ol>
4	6	10	7	12	13	14	15	16	17	



Figure 2. Both sides of artefacts OON1 to 8 (in sequence from upper left to right, and down the page) (scale bar = 1 cm).

9, 12, and 13) were found near the right arm (humerus); five (00N2, 3+4, 7 and 10) were found near the front of the skull, and two (00N6+8) were found just behind and underneath the skull.

A total of 17 stone artefacts including three conjoin sets (Figures 4-6; Table 1) were found, resulting in 14 near complete artefacts. Of these, twelve have clear backing retouch and two others (OON10 and 17) have indistinct edge crushing, which may also be the result of deliberate backing retouch.

# STONE PROJECTILES, POINTS, LACERATORS AND BARBS

Archaeological evidence for, and diagnostic indicators of, projectile tips have been important in tracking hunting technology and modern human evolution (Shea 2006). Diagnostic use-wear traces have been reported on experimental stone tipped arrows and spears (e.g. Boot 2005; Dockall 1997; Fischer *et al.* 1984; Lombard 2005; Odell 2004: 178-9; Odell and Cowan 1986). Dockall (1997) reviews the range of impact breaks, macrowear, and microwear that have been considered



Figure 3. Both sides of artefacts OON9 to 17 (in sequence from upper left to right, and down the page). Note that the tiny fragment OON15 (which refits tip the tip of OON14) is excluded (scale bar = 1 cm).

diagnostic either alone or in combination with other traces of use such as linear polish, striae, edge rounding, longitudinal macroscars, lateral macroscars, distal breaks, distal crushing and spin-off factures. Using these categories, we provide a summary of the traces found on the Narrabeen artefacts (Table 2). Longitudinal macroscars and lateral macroscars were not found on these small backed artefacts. Step and feather terminated bending scars occurred along the backed margins of several artefacts, indicating head-on and oblique impact, depending on the force producing the fractures (Figure 5). Neither microscopic linear streaks of polish or 'MLIT' (Fischer *et al.* 1984; van Gijn 1990:45-46) nor edge rounding were distinctly visible on any artefacts with diagnostic impact damage, but this was perhaps because of the grainy stone material. However, rounding and weakly developed polish was observed on the tip of OON2 (Figure 6), the chord of OON14 (Figure 7) and near the tip of OON12 (Figure 8). Linear striations were also very rare and only visible at high magnification in the form of possible scratches on quartz crystals. Rounding was visible on the fragile tip of OON2 as well as OON7, 12 and 14.

Distal crushing and breaks were both common, the latter occurring mostly in the form of scars with bending initiations and step or feather terminations along an arris or main edge of the



Figure 4. Detail of conjoin OON14 and 15, showing narrow feather terminating bending scar down the backed edge.

inimical to survival of blood and other tissues.

backed margin (Table 2). Spin off fractures that appear to be initiated from the bending scars snapped from the tips were common (e.g. Figure 9), and are thought by Fischer *et al.* (1984) and Lombard (2005) to be a diagnostic impact fracture on points hafted as arrows or spears. It is uncertain whether the small robust backed artefacts (as in the Narrabeen assemblage) will break in quite the same way, although it seems likely. Further experiments are needed, particularly to model variables such as the effect of hafting arrangements and impact forces. Proximal damage was also rare and less marked than distal damage near the tips.

Few distinctive residue structures or films were observed directly on the artefacts or in extractions after aqueous sonication (Table 1). Embedded in cracks on some artifacts were fragments similar in colour and structure to bone; and on the backed edges of some artefacts there are dark, opaque smears (thought to be resin).

Table 2. Wear traces found on the Narrabeen artefacts. STBS back: step terminated bending scar on the backed surface; FTBS back: feather terminated bending scar on the backed surface. Artefact numbers with '\*' indicate that backing retouch is not distinct. No longitudinal macroscars or lateral macroscars were observed (cf. Dockall 1997)

Cellulose fibres and starch were noted on OON2. Presumably the open sandy environment was

No.	Find Location	Linear polish	Striae	Edge rounding	Distal breaks	Distal crushing	Spin-off factures	Proximal damage
1	Spine	-	?	-	STBS	-	-	
					back			
2	Skull front	Х	?	Х	-	-	-	
3-4	Skull front	-	-	-	STBS	x	х	
					back			
5	Right	-	-	-	STBS	x	-	
	humerus				back			
6-8	Skull back	-	-	-	STBS	х	х	
					lateral			
7	Skull front	-	-	х	Step?	х	-	х
					lateral			
9	Right	-	-	-	Steps	х	х	-
	humerus				back			
10*	Skull front	-	-	-	FTBS	х	-	х
11	Spine	?	-	-	STBS	-	х	
	-				back			
12	Right	?	Х	х	snap	х	-	-
	humerus							
13	Right	-	-	-	-	?	-	-
	humerus							
14-	Spine	?	-	х	FTBS	-	XX	х
15	-				back			
16	Spine	-	-	-	STBS	-	х	-
	-				back			
17*	Spine	-	-	-	?	?	-	?



Figure 5: Narrabeen artefacts showing suggested impact direction and breaks.

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Figure 6: Microwear on the fragile tip of OON2, with marked rounding and polish indicating function as a skin working implement (awl).



Figure 7: Edge scarring and rounding on the chord of OON14.



Figure 8: Rounding and faint striations near the tip of OON12.



Figure 9. Tip break of OON3+4, showing a long narrow fracture with a step termination that initiates a spin off fracture (with step termination).

#### DISCUSSION

Possible hafting arrangements (see Figure 10), given the fractures and wear traces, must account for hard impact on small asymmetric stone artefacts which have hafting traces in the form of dark smears similar to resin, and rounding along the backed edge. Such weapons, armed with lithic barbs, lacerators or tips, might have been thrown (e.g. spears), stabbed (e.g. spears or knives) or swung (e.g. clubs). The wear traces are all consistent with use as hafted elements of spears, knives or even 'barbed' clubs (i.e. clubs studded with backed artifacts). Ethnographic, experimental and contextual evidence indicate that spears and knives are likely. For example, OON1 is most likely to be from a spear simply because of the penetration requirements from left hip to spine. Conjoined artefacts OON14 and 15 together with OON16 could be from one or more spears or stabbing knives.

The absence of distinctive wear along the backed edge and the proximal end of each flake suggests that the backed artefacts were not firmly slotted into wooden or bone handles, which might be expected for reliable use as a knife or club, although 'taap' saw- knives restricted to southwest Western Australia were probably used for general butchering. However, these were 'resin hafted' and not slotted into their wooden handles (Kamminga 1982:32). On the other hand, ethnographic data (e.g. Akerman *et al.* 2002) show that stone lacerators and tips may be deliberately set in resin



Figure 10. Possible hafting arrangements of backed artefacts. McCarthy's suggested hafting arrangements reproduced with permission from The Australian Museum.

away from direct contact with the spear shaft, so that the chipped stones could easily detach on impact (Akerman 1978). Kim Akerman (pers. comm. April 15th 2007) suggested that the effect of multiple detachable lacerators would be similar to the effect of shrapnel wounds. Several Narrabeen artefacts have edge rounding and other use-wear on the chord indicating use as knives, and there is one awl. Small stones including awls, edge elements of knives and other tools could have been

re-cycled as lacerators, in much the same way as the stone chips of the ethnographically known death spear (e.g. Dortch 1984:53; see also an illustration of a death spear [Collector : Unknown (A4932)] on the South Australian Museum Website, 2007). It is also possible that detachable fore shafts (with *firmly* attached backed artefacts) might have been removed from spears and used for a variety of tasks including butchery, despite their primary function as projectile heads (see also the description by Davidson (1934:61) of reed shafts with (detachable?) hardwood heads armed with stone flakes).

#### CONCLUSION

The skeletal injuries, penetration depth, distribution of fragments and use-wear indicate a minimum of three weapons, and probably more, were used in the slaying of the Narrabeen man. Substantial proximal (tip) damage and spin off fractures thought to be diagnostic of projectile impact are found on artefacts in all find locations (skull – front and back, spine and right humerus), suggesting a minimum of three spears. Six artefacts may be barbs, lacerators or tips with spin-off fractures (depending on the possible orientation and hafting arrangements). These six indicate the maximum number of possible high impact contacts (e.g. with bone). If we assume that only the initial impact of each spear with the victim is likely to result in such damage (to lacerators, barbs or tips), then up to six spears each armed with one tip and two or three barbs or lacerators seems a likely configuration. Of course, there are many assumptions involved in such reconstructions, and we have outlined the logic of some possibilities. Trying to test and evaluate each possibility is fraught with difficulty, and Tom Loy (to whom this volume is dedicated, and who kept revising elements of Ötzi's alpine mummy mystery) would be familiar with such unfinished stories! We are planning further experimental work to evaluate likely hafting arrangements.

The Narrabeen artefacts provide the first Australian archaeological evidence of backed artefacts used for fighting, payback killing or other human violence, as distinct from hunting game, as commonly inferred (Kamminga 1980; McBryde 1985, 1986; McCarthy 1976). If the Narrabeen artefacts were recycled tools and hafted in similar fashion to the stone lacerators of the death spear, this evidence may also be consistent with the wide range of functions identified recently by Robertson (2005), Fullagar *et al.* (1994) and McDonald *et al.* (1994). The timing of this mid-Holocene occurrence of payback or other killing correlates with a widespread proliferation of backed artefacts in the archaeological record, particularly in south-eastern Australia (Hiscock & Attenbrow 2005a, 2005b; Jo McDonald Cultural Heritage Management 2005). While the slaying of the Narrabeen man may be related to climate change, increased stress, shifts in subsistence and settlement and an increased social proscription, it seems less and less likely that backed artefacts as a class have a dominant primary function. They appear to have been used for many purposes in different times and places. We have demonstrated here that one of these functions was as detachable lacerating elements of death spears.

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## REFERENCES

- Akerman, K. 1978. Notes on the Kimberley stone-tipped spear, focusing on the hafting mechanism. *Mankind* 11(4): 486.
- Akerman, K., R. Fullagar and A. van Gijn 2002. Weapons and *wunan*: production, function and exchange of spear points from the Kimberley, northwestern Australia. *Australian Aboriginal Studies* 1:13-42.
- Boot, P. 2005. Transverse snapping on stone artefacts. In I. McFarlane, M.J. Roberts and R. Paton (eds.) Many Exchanges: Archaeology, History, Community and the Work of Isobel McBryde, pp. 343-366. Canberra: Aboriginal History Monograph..
- Davidson, D.S. 1934. Australian spear-traits and their derivations. *Journal of the Polynesian Society* 43(1):41-72.
- Dockall 1997. Wear traces and projectile impact: a review of the experimental and archaeological evidence. *Journal of Field Archaeology* 24(3): 321-331.
- Dortch, C. 1984. Devil's Lair, A Study in Prehistory. Perth: Western Australian Museum.
- Fischer, A., P.V. Hensen and P. Rasmussen 1984. Macro and micro wear traces on lithic projectile points. *Journal of Danish Archaeology* 3:19-46.
- Fullagar, R., J. Furby and L. Brass 1994. Stone artefacts from Bulga, Hunter valley. Unpublished report for M. Koettig. [Fullagar, R., J. Furby and L. Brass 1994. Use-wear and residue analysis of stone tools from Bulga. In Bulga Lease Authorisation 219 salvage excavations. A report to Saxonvale Coal Pty Ltd, by M. Koettig, Vol. 5, pp. 26-105].
- Hiscock, P. and Attenbrow V. 2005a. Reduction continuums and tool use. In C. Clarkson & L. Lamb 2005. (eds) *Lithics Down Under: Recent Australian Approaches to Lithic Reduction, Use and Classification*, pp. 43-55. BAR International Monograph Series S1408. Oxford: Archaeopress..
- Hiscock, P. and V. Attenbrow 2005b. *Australia's Eastern Regional Sequence revisited: technology and change at Capertee 3.* BAR International Monograph Series 1397. Oxford: Archaeopress.
- Jo McDonald Cultural Heritage Management 2005. Salvage Excavation of Six Sites along Caddies, Second Ponds, Smalls and Cattai Creeks in the Rouse Hill Development Area, NSW. Australian Archaeological Consultancy Monograph Series, Volume 1 [Available online: http://www.aacai.com.au/monograph/index.html].
- Kamminga, J. 1980 A functional investigation of Australian microliths. The Artefact 5:1-18.
- Kamminga, J. 1982. Over the Edge. Functional Analysis of Australian Stone Tools. Occasional Papers In Anthropology 12. St Lucia: Anthropology Museum, University of Queensland.
- Lombard, M. 2005. A method for identifying stone age hunting tools. *South African Archaeological Bulletin* 60(182):115-120.
- McBryde, I. 1985. Backed blade industries from the Graman rock shelters, New South Wales: some evidence on function, in V. N. Misra and P. Bellwood (ed.) Recent advances in Indo-Pacific Prehistory, pp. 231-249. New Delhi: Oxford and IBH Publishing.
- McBryde, I. 1986. The broken artefact and functional studies. In G. Ward (ed.) *Archaeology at ANZAAS, Canberra*, pp.203-209Canberra: Canberra Archaeological Society.

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- McCarthy, F. 1976. Australian Aboriginal Stone Implements, Including Bone, Shell and Tooth Implements. Sydney: The Australian Museum Trust.
- McDonald, J., Rich, E., and Barton, H. 1994 The Rouse Hill Infrastructure Project (Stage 1) on the Cumberland Plain, western Sydney. In M.E. Sullivan, S. Brockwell and A. Webb (eds) Archaeology in the North: Proceedings of the 1993 Australian Archaeological Association Conference, pp. 259-293. Darwin: North Australian Research Unit, Australian National University.
- McDonald, J. D. Donlon, J. Field, R. Fullagar, J. Brenner Coltrain, P. Mitchell and M. Rawson 2007. The first archaeological evidence for death by spearing in Australia. *Antiquity* 81:877-885.
- Odell, G. 2004. Lithic Analysis. New York: Kluwer Academic/Blackwell.
- Odell, G. H. and F. Cowan 1986. Experimentation with spears and arrows using animal targets. *Journal of Field Archaeology* 13:195-212.
- Robertson, G. R. 2005. Backed artefact use in Eastern Australia: a residue and use-wear analysis. Unpublished PhD thesis. St Lucia: School of Social Science, The University of Queensland.
- Shea J. 2006. The origins of lithic projectile point technology: evidence from Africa, the Levant, and Europe. *Journal of Archaeological Science* 33 (6):823-846.
- South Australian Museum Website [URL: http://www.samuseum.sa.gov.au/ngurunderi/ng6htm. htm; Accessed May 2007].
- van Gijn, A. L. 1990 The wear and tear of flint: principles of functional analysis applied to Dutch Neolithic assemblages. *Analecta Praehistorica Leidensia* 22.