

A revised sequence of backed artefact production at Capertee 3, New South Wales

PETER HISCOCK and VAL ATTENBROW

KEY WORDS: lithics, variability, technology, typology, Australia

Abstract

Re-analysis of the artefact assemblage from Capertee 3, an Australian rockshelter excavated by F.D. McCarthy in the 1950s and 1960s, yields a revised image of chronological changes in backed artefact production. A technologically-defined sample of backed retouched flakes gives a new depiction of the vertical distribution of backed artefacts in this site. Analysis of artefact weathering indicates most specimens were probably altered *in situ*, with minimal large-scale vertical displacement. Calibration of radiocarbon dates provides refined age-depth estimates for the site. The result is identification of backed artefacts up to 6000 to 7000 years old, documentation of many backed specimens prior to 3500 cal b.p., and observation of only a relatively brief period, between 1500 and 3500 cal b.p., in which backed artefact production rates were extremely high. Changes in production rates are similar to those previously reported from Upper Mangrove Creek.

In this report we present a revised chronological sequence of backed artefact production rates from Capertee 3, a rockshelter immediately west of Sydney in the headwaters of the Hawkesbury River drainage basin. Revision of archaeological interpretations of the Capertee 3 site is important for several reasons. Firstly, this site, excavated by McCarthy in the 1950s and 1960s, yielded a large sample of retouched flakes from the Holocene. It was the artefact assemblage at Capertee 3 that served as a basis for McCarthy's (1961, 1964) recognition of a pre-Bondaian phase in the archaeological sequence of eastern New South Wales. The transition from assemblages in the lower levels in the deposit said to contain 'roughly' retouched flakes but no backed artefacts, which McCarthy (1961:98-99) named the Capertian, to assemblages in the upper levels said to contain abundant backed artefacts, named the Bondaian, was viewed as a rapid, distinct and dramatic change in prehistoric tool kits. This interpretation was reflected in Mulvaney's (1969:111) early formulation of a tripartite industrial sequence for Australia.

Decades later Capertee 3 remains an important site in discussions of Holocene assemblage change in Australia because multiple investigators have argued that backed artefacts at the site are restricted to the late Holocene.

Johnson (1979) estimated the initiation of the Bondaian to less than 3,100 years ago, while McCarthy (1964) implied a similar, if slightly earlier date. The image of a rapid Capertian/Bondaian transition at Capertee 3 played a central role in debates about the antiquity of early and late backed artefacts, and variation in backed artefact production rates through time. These issues have long been a focus of archaeological debates about technological change in Australia (e.g. Bowdler 1981; Bowdler and O'Connor 1991; Dortch 1975; Hiscock 1986, 2001, 2002; Hiscock and Attenbrow 1998; Hughes and Djohadze 1980; Johnson 1979; Morwood 1984; Mulvaney 1985; Mulvaney and Joyce 1965; Pearce 1974).

It has now been established that backed artefacts were made, at least at low rates and in some locations, in the early Holocene (Hiscock and Attenbrow 1998). However, variation in backed artefact production between regions and through time is poorly defined. This issue is complicated by the small sample size of assemblages recovered from many sites – so small they may be inadequate for investigating the presence and frequency of backed artefact production before about 3500 to 4000 b.p. at many sites (Hiscock 2001). Stratified sites with a long chronology and large artefact samples are one key to understanding variation in temporal patterns. Capertee 3 is such a site and since this site has been offered as evidence for the restriction of backed artefacts to the late Holocene (e.g. Johnson 1979), it is crucial that its assemblage be accurately and systematically described. To this end we have reanalysed its stone artefact assemblage from a strict technological perspective which has yielded a different record of the artefact assemblage (see Hiscock and Attenbrow in press). This paper presents a re-examination of the backed artefacts and their chronological sequence at Capertee 3, and demonstrates that although high rates of backed artefact production occurred only during a brief period between 1500 and 3500 b.p. these implements had probably been made in low numbers during the early and middle Holocene.

Stratigraphy and vertical movement in Capertee 3

Deposits within the sandstone rockshelter derive from the surrounding colluvial slope with a large sediment contribution from the roof and walls of the shelter (Walker

PH: School of Archaeology and Anthropology, Australian National University, Canberra, Australia.
peter.hiscock@anu.edu.au; VA: Anthropology, Australian Museum, Sydney, Australia. vala@austmus.gov.au.

1964:249). Excavations by McCarthy (1964) and Johnson (1979) established the archaeological deposit reached a depth of two metres and extended several metres from the shelter wall before terminating. The floor was level when McCarthy began his work, and for that reason his excavation units were measured in terms of depth below the deposit surface. McCarthy excavated the deposit in arbitrary depth units, which he called layers and labeled alphabetically from A to K. He justified this by claiming '... it was impossible for an archaeologist to distinguish depositional strata' (McCarthy 1964:199). In the upper portion of the deposit, layers A–F, he employed 6 inch (15.25 cm) deep excavation units. Below that, in layers G–K, McCarthy dug in 12 inch (30.5 cm) units. McCarthy described layers A to F as containing Bondaian assemblages, while concluding that assemblages in layers G to K were Capertian (McCarthy 1964).

Walker (1964) recognised human and non-human disturbance processes in the site that had the capacity to mix sediments and stone artefacts they contained. The idea that artefacts may have moved vertically within the sandy deposit was a powerful influence on the interpretation of the artefact assemblages. McCarthy invoked vertical movements to explain what he inferred to be anomalous backed artefacts, saying of a specimen in layer G: 'The faunal cavities up to $\frac{3}{4}$ in. [2 cm] in diameter would appear to account for these tiny implements working their way down to such depths' (McCarthy 1964:238). Although he offered no evidence that small artefacts had actually been displaced, McCarthy consistently cited this mechanism to explain backed specimens found in levels he assigned to the Capertian. Johnson (1979:73) also hypothesized that low numbers of backed artefacts in some Capertee 3 layers might be explained through vertical displacement resulting from 'occupational disturbance'.

As we argued elsewhere (Hiscock and Attenbrow 1998), assertions that vertical movement of artefacts may have occurred are not evidence that it did. Intensive efforts are sometimes required to establish the extent of artefact movement in any deposit. Refitting of artefacts cannot be applied to McCarthy's assemblage because he discarded most of the unretouched flakes. An alternate test is observation of the extent of weathering that artefacts have undergone at different depths within the site. The dominant raw material throughout the deposit was called 'chert' by McCarthy, a nomenclature we continue even though it is likely to be tuffaceous mudstone. Variation in chert weathering was noted by McCarthy (1964:223, 225) who

described artefacts retrieved from lower levels as yellow and patinated. Inspection of the collection in the Australian Museum indicated that artefacts from lower layers were typically more weathered than those from upper layers, suggesting that the weathering occurred in situ. Measurement of increasing artefact weathering was facilitated by dividing the continuous weathering process into five categories as follows:

- *Fresh* fracture surfaces of the chert are dark grey (2.5YR N4/0), smooth, lustrous, and the same as the interior of the artefact.
- *Lightly Weathered 1* (LW1) artefact surfaces are mid-grey (10YR 5/1), smooth, lustrous, with the appearance of a white film over the surface. Broken artefacts show that inside the artefact less weathered chert is still dark grey.
- *Lightly Weathered 2* (LW2) artefact surfaces are yellow grey (10YR 7/2), smooth, lustrous. Broken artefacts show that inside the artefact less weathered chert is still mid-grey.
- *Heavily Weathered 1* (HW1) artefact surfaces are pale yellow brown (10YR 8/3) and have a dull and rough texture. Some specimens are a mottled very pale brown (10YR 8/3) and orange or brownish yellow (10YR 6/6). Broken specimens reveal that while the weathering is not confined to the surface, it need not occur throughout the entire artefact. Inside broken artefacts, the rock is mid-grey (10YR 5/1) or white (5YR 8/1) in colour.
- *Heavily Weathered 2* (HW2) artefact surfaces are pale yellow brown (10YR 8/3) or orange brownish yellowish (10YR 6/8), with a rough and chalky texture. Within broken specimens, the material is white (5YR 8/1) and specimens are extremely light in weight. This degree of weathering occurs uniformly throughout broken artefacts.

Three hundred and two non-backed chert retouched flakes were classified into these five classes (see Hiscock and Attenbrow in press for details). Non-backed artefacts were chosen because they were found in abundance in all levels of the deposit. Percentages of specimens in each weathering class, for different levels of the deposit are presented in Table 1. Fresh and LW1 specimens are most frequent in the upper layers, decrease in relative abundance through the deposit and are not found in the lower layers. HW1 and HW2 specimens show the reverse pattern, being most common in the lower layers and becoming progressively less abundant in upper layers, with no HW2 being recovered from the upper four layers. Percentages of

Layers	Fresh	LW1	LW2	HW1	HW2	Number of specimens
A-B	16.9	38.5	33.8	10.8	0	65
C-D	5.1	28.2	41.0	25.6	0	39
E-F	1.9	26.9	21.2	44.2	5.8	52
G-H	0	6.5	26.8	59.4	7.2	138
I-J	0	0	25.0	50.0	25.0	8

Table 1. Percentage of non-backed chert retouched flakes in each weathered class for different layers in Capertee 3.

each weathering category in a layer appear to be related to depth, and by implication age. A univariate analysis of variance test revealed a statistically significant relationship between weathering categories and layer ($F=10.81$, $d.f.=9$, $p<0.001$), supporting our argument that weathering occurred since the deposit formed. These changes are not congruent with the artefact assemblage being largely mixed by vertical movement within the deposit. Colour and surface texture displayed by chert artefacts can be understood in terms of variations between layers in the amount of time in which *in situ* weathering has taken place. While vertical movement of a few specimens is possible, the weathering pattern reveals that movements were probably infrequent in this deposit. This conclusion is important for interpretations of the vertical changes in backed artefact abundance.

If post-depositional movement alone is not responsible for the vertical patterns in assemblage composition what factors could be? One factor is a sample-size relationship. Bondaian layers display high implement richness but also high sample sizes. The number of flake-based implements is significantly correlated with the number of implement classes recognized by McCarthy ($r = 0.867$, $N = 10$, $p = 0.001$ for log sample size and richness). Differences in assemblage size may explain much of the typological variation displayed between layers, in that although backed artefacts were made earlier than 3500 to 4500 b.p. they were infrequently recovered because of the smaller assemblages of the Capertian layers. Sample-size/richness relationships may explain the geometric microlith recorded by McCarthy (1964) in layer G, the 'Capertian' layer with the largest sample of retouched flakes, without invoking vertical movement.

Chronology

Absolute chronology for Capertee 3 is based on radiocarbon analyses of samples of charcoal, shell and plant material collected by McCarthy and Johnson. We employed the nine available radiometric age estimates, calibrated using a decadal tree-ring dataset in CALIB 4.3, to describe the age-depth relationship for the deposit. Radiocarbon estimates from Capertee 3 are described by a linear regression that depicts a line of best fit for the age-depth relationship of the deposit as a whole. The equation of depth in centimetres = $27.1024 + 0.02476$ years provides a robust depiction of the relationship between the age and depth of all samples ($r^2=0.89$). The high coefficient of determination is a strong basis for our use of that regression line to infer antiquity of any level in the deposit. The equation of the regression line was used to estimate two calendar age ranges for each of McCarthy's layers (Table 2). First is the *estimated age* of each layer, represented by the age predicted by the line of best fit for the start and end depth of the layer. Second is the *age range*, given by the 95% confidence interval (CI) for the line of best fit, calculated as the lowest CI value for the start depth of the layer and the highest CI value for the end depth of the layer. Age range is a less precise but more reliable indication of the antiquity of each layer than the age

estimate. This model for the antiquity of each excavation unit is employed to talk about the antiquity of backed artefacts at the site and the timing of assemblage change.

Layer	Depth (cm)	Age estimate (years b.p.)	Age range b.p. (95% CI)
A	0 – 15.25	0 – 1710	
B	15.25 – 30.5	1711 – 2326	700-2850
C	30.5 – 45.75	2327 – 2942	1040-3600
D	45.75 – 61.0	2943 – 3558	2050-4300
E	61.0 – 76.25	3559 – 4174	2700-5000
F	76.25 – 91.5	4175 – 4790	3500-5800
G	91.5 – 122.0	4791 – 6024	4150-7500
H	122.0 – 152.4	6025 – 7249	5300-9250
I	152.4 – 182.9	7250 – 8481	6200-10300
J	182.9 – 213.4	8482 – 9713	7200-11200
K	213.4 – 243.8	9714 – 10940	

Table 2. Depth and estimated age of McCarthy's layers in Capertee 3.

McCarthy's backed artefact sequence

McCarthy (1964) depicted implements at Capertee 3 with a variant of his own classification of Australian implement types (McCarthy *et al.* 1946). He distinguished three implement types as possessing backing retouch: elouera, Bondi points and geometric microliths. McCarthy (1964:203) was clear in defining the elouera in terms of its 'thick back trimmed on one or both edges'. Bondi points were similarly defined by asymmetrical shape and steep retouch on one margin and the platform. Geometric microliths are backed flakes that have shapes such as a trapezoid, a triangle or a crescent. McCarthy (1964:221) argued that while geometric microliths, which he called 'segments', were a distinct typological group they also graded into the Bondi points in shape and dimensions. For our purposes we group all three types together as backed artefacts (see Hiscock and Attenbrow 1996).

At Capertee 3, McCarthy (1964:199) argued assemblage change occurred through a succession of alterations. He observed a sequence of implement 'introductions': fabricators first, then burins, geometrics, Bondi points, and elouera, and finally ground edged axes. In this model, a single date cannot be assigned to all the cultural changes at this site; each element must be dated separately. However McCarthy (1964:201) still squeezed a series of changes into his two phases of Bondaian and Capertian, claiming '... four diagnostic traits, the Bondi point, geometrics, burins and elouera, all occurred to a depth of 30 in. [76 cm] in site 3 but not below that depth, and it could be argued that the addition of so many traits at one time was due to the arrival of a new wave of people'. This is an interpretation, not a description of the archaeological patterns. Two of McCarthy's four 'diagnostic' implement forms, geometric microliths and burins, are present 37 to 48 inches [91.5 to 122 cm] below the surface. McCarthy's argument implied that not only had

these diagnostic classes been contemporary, they were abundant immediately they first appeared. These expectations were also displayed in Johnson's (1979) interpretations of Capertee 3 (see Hiscock and Attenbrow 1998).

McCarthy's own data do not sustain his interpretation. Changes in backed artefact abundance show a battleship-shaped curve (Figure 1). Backed specimens are present in low numbers in layers E–G, increase in abundance, peaking in layer C, above which they decline in abundance. This evidence, reported in McCarthy's original site report, can be used to support a model of gradual rather than sudden change in the rates of backed artefact manufacture, partly, as we have argued, because there was insufficient vertical movement of artefacts to have created the totality of vertical patterning. Our new record of backed artefact distribution from the site enhances the evidential basis for this model.

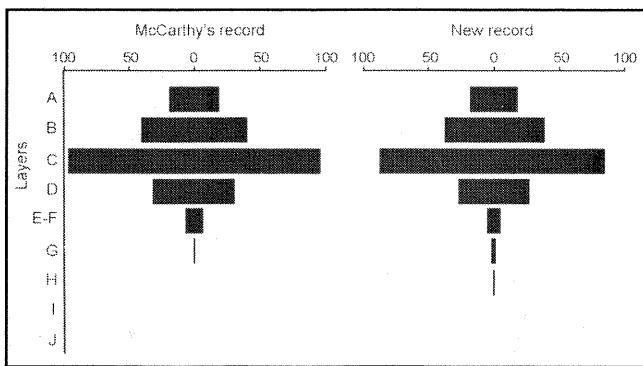


Figure 1. McCarthy's counts of backed specimens and our new record of backed artefact distribution through the Capertee 3 deposit.

Principles for reanalysis

McCarthy's (1964) approach, counting specimens in ill-defined normative implement categories, was a poor tool for quantifying change in assemblage characteristics through time. His classification was often based on similarities in shape, without an understanding of the ways these shapes had been produced. Our reanalysis focuses on a technological study of the kind outlined by Hiscock (in press), and our sample includes only specimens that retain features showing that they were flakes (i.e. a recognisable ventral

surface) and that they had been retouched (i.e. the junction between distal and ventral faces was modified by flake scars). The sample we measured comprised only 'backed' specimens; those with a retouched edge containing steep, short, and often bidirectional retouch, in which scars from both directions are clearly retouch (i.e. not residual platform scars). This definition coincides with the common typological category of backed artefact and most specimens were classified as Bondi points or geometrics by McCarthy (1964).

Our sample of backed artefacts differs from McCarthy's sample in that it excludes:

1. non-artefactual objects with thermal shattering such as potlid scars and/or crenated fractures that superficially look similar to backed artefacts in plan shape;
2. a small number of specimens that did not have an ink label, and hence were of unknown provenience; and,
3. a substantial number of specimens which are unretouched flakes. These specimens had some or all of the following characteristics:
 - large or distinctive faceted platforms likely to be mistaken for backing;
 - pronounced overhang removal which may have been mistaken for backing retouching;
 - scars originating from dorsal ridges, and often truncated by the ventral fracture. McCarthy mistook those dorsal scars for retouching. In most instances he misidentified these ridge straightening flakes as backed retouched flakes such as Bondi points;
 - potlid scars removing material from their lateral margins, which may have been mistaken for backing retouch scars.

With this revised and technologically-defined sample of backed, retouched flakes, we can provide a more precise depiction of the vertical distribution of backed artefacts in the Capertee 3 sequence.

Using these criteria we recognize 353 backed artefacts, 90.7% of the number accepted by McCarthy (Table 3). Our more systematic approach to identifying backed artefacts not only excluded specimens that McCarthy had included, it also identified backed artefacts which McCarthy had classified as belonging to some other group. In particular we discovered 12 backed artefacts that McCarthy had classed as scrapers (e.g. end or side scrapers).

Layer	McCarthy record	New record	Age estimate (years b.p.)	Discard rate #/1000 years	Age range b.p. (95% CI)
A	38	36	0 – 1710	2.1	
B	82	75	1711 – 2326	122.0	700 – 2850
C	191	173	2327 – 2942	281.3	1040 – 3600
D	63	54	2943 – 3558	87.8	2050 – 4300
E-F	14	14	3559 – 4790	11.4	2700 – 5800
G	1	3	4791 – 6024	2.4	4150 – 7500
H	0	1	6025 – 7249	0.8	5300 – 9250
I-J	0	0	7250 – 9713	0?	6200 – 11200
Total	389	353		3.6	

Table 3. Estimated numbers and discard rates of backed artefacts through Capertee 3.

Revised chronological sequence of backed artefact production

The revised sample suggests greater antiquity for backed artefacts at Capertee 3 than previously acknowledged. The lowest backed artefact we have identified in the deposit derived from layer H. This specimen, number ESP1749, is 30.2 mm long and 11.5 mm wide, and is a regularly-shaped backed artefact with bipolar retouch on one margin and the distal end (Figure 2). We have no doubt about classifying this specimen as a backed artefact; or about its derivation from layer H because it retains an original ink label. Furthermore, this specimen is intensively weathered, and would be classified as HW2. We see no reason to explain this specimen away as having been relocated from a much higher level. If *in situ* we estimate this specimen to be approximately 6000 to 7200 years old. It was recovered from at least 120 cm below the surface, and more than 30 cm below layers estimated to be 3500 to 4500 b.p. Furthermore, this specimen was 30 cm below the level that McCarthy (1964) concluded marked the Bondaian/Capertian transition, and nearly twice that depth below levels that Johnson (1979) suggested marked the transition.

We identified a number of other backed artefacts in early and middle Holocene levels of the Capertee 3 deposit. For instance, McCarthy reported only one specimen in layer G, but we have identified three specimens from that level. McCarthy (1964:225) described one backed specimen from layer G as '... yellow patinated ...'; what we have termed HW1. That specimen has a degree of weathering consistent with other artefacts recovered from that depth in the deposit. The additional two specimens we located in level G were also altered to the extent they are HW1.

We argue there is no evidence for vertical movement over 60 cm, required to explain this new record of backed artefact distribution as post-depositional reorganization. Data reported here confirms the presence of backed artefacts in early Holocene assemblages and also reinforce interpretations of a long period in which such implements were present as minor elements preceding a relatively brief period, between 1500 and 3500 b.p., in which production rates were far higher than before or since (see Table 3). Changes in production rates are similar to those from Upper Mangrove Creek (Hiscock and Attenbrow 1998), despite different deposits and formational histories in the shelters from each region. It is this pattern that must be explained by

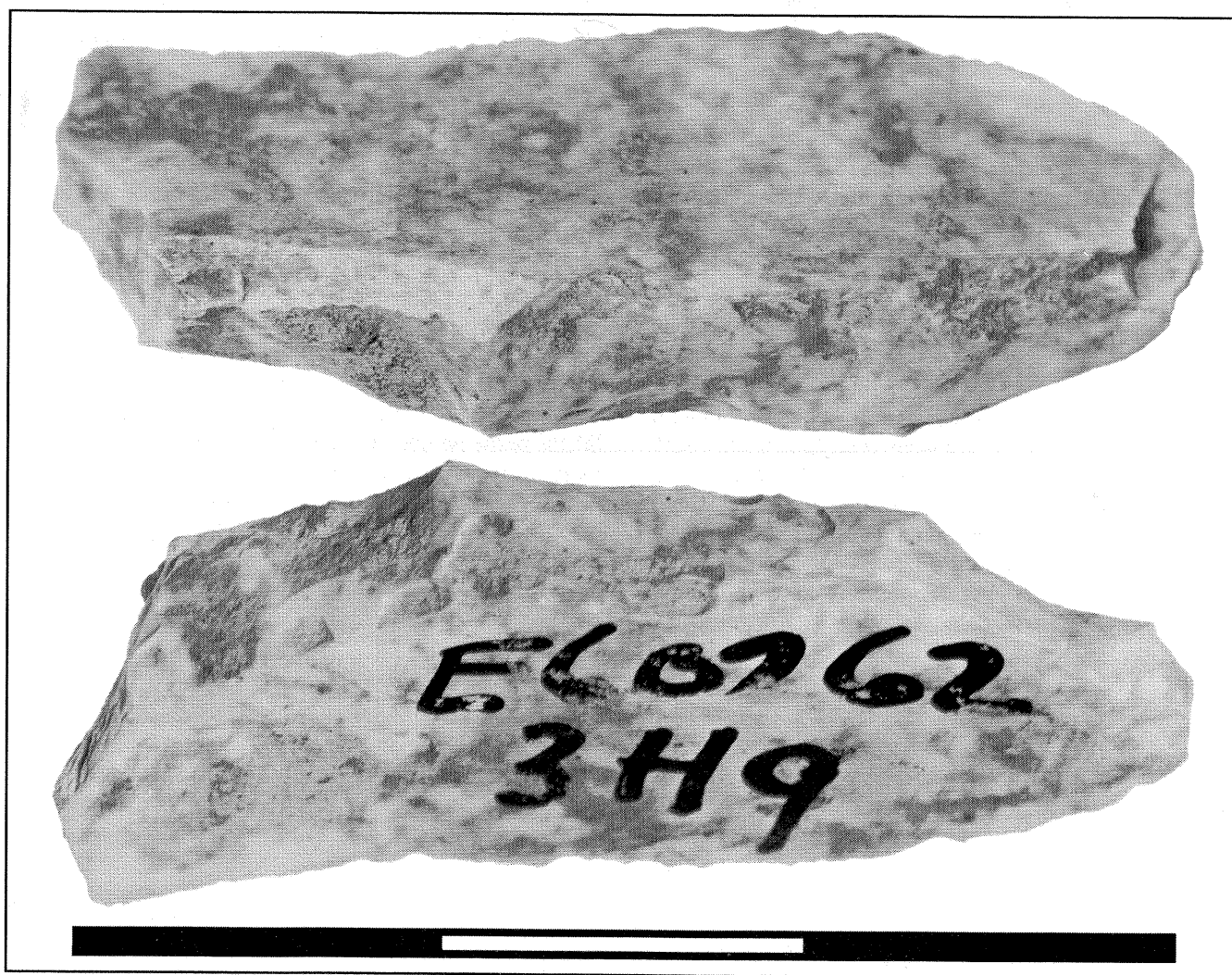


Figure 2. The lowest backed artefact identified at Capertee 3.

archaeological models, and which cannot be explicated by reference to the introduction into Australia of the idea or technology of making backed artefacts (see Hiscock 1994, 2002). These data from Capertee 3 are consistent with the emerging picture of backed artefact manufacture throughout the Holocene, but with far higher rates of production in some time periods than in others. Our reanalysis of the classic site of Capertee 3 therefore supports a model of continuing long-term backed artefact production, with increasing then decreasing production rates during the Holocene. One implication of this model of long-term, fluctuating backed artefact production is that the traditional division of the Australian east coast archaeological sequence into industries such as the Capertian and Bondaian obscures the nature of assemblage change.

References

- Bowdler, S. 1981. Hunters in the highlands: Aboriginal adaptations in the eastern Australian uplands. *Archaeology in Oceania* 16, 99-111.
- Bowdler, S. and S. O'Connor 1991. The dating of the Australian Small Tool Tradition, with new evidence from the Kimberley, W.A. *Australian Aboriginal Studies* 1991/1, 53-62.
- Dortch, C. 1975. Geometric microliths from a dated archaeological deposit near Northcliffe, Western Australia. *Journal of the Royal Society of Western Australia* 58, 59-63.
- Hiscock, P. 1986. Technological change in the Hunter River Valley and the interpretation of Late Holocene change in Australia. *Archaeology in Oceania* 21, 40-50.
- Hiscock, P. 1994. Technological responses to risk in Holocene Australia. *Journal of World Prehistory* 8, 267-292.
- Hiscock, P. 2001. Sizing up prehistory: sample size and composition of artefact assemblages. *Australian Aboriginal Studies* 2001/ 1, 48-62.
- Hiscock, P. 2002. Pattern and context in the Holocene proliferation of backed artefacts in Australia. In R.G. Elston and S. Kuhn (eds), *Thinking Small: Global Perspectives on Microlithization*, pp.163-177. Anthropological Papers of the American Anthropological Association (AP3A) number 12.
- Hiscock, P. in press. Looking the other way. A materialist/ technological approach to classifying tools and implements, cores and retouched flakes. In S. McPherron and J. Lindley (eds), *Tools or Cores? The Identification and Study of Alternative Core Technology in Lithic Assemblages*. University of Pennsylvania Museum.
- Hiscock, P. and V. Attenbrow 1996. Backed into a corner. *Australian Archaeology* 42, 64-65.
- Hiscock, P. and V. Attenbrow 1998. Early Holocene backed artefacts from Australia. *Archaeology in Oceania* 33, 49-62.
- Hiscock, P. and V. Attenbrow in press. *Australia's Eastern Regional Sequence Revisited: Technology and Change at Capertee 3*. British Archaeological Reports International. British Archaeopress.
- Hughes, P.J., and V. Djohadze 1980. *Radiocarbon Dates from Archaeological Sites on the South Coast of New South Wales and the Use of Depth/Age Curves*. Occasional Papers in Prehistory. Department of Prehistory, Research School of Pacific Studies, Australian National University, Canberra.
- Johnson, I. 1979. The Getting of Data. Unpublished PhD thesis, Australian National University, Canberra.
- McCarthy, F.D. 1961. Australia. *Asian Perspectives* 5, 98-104.
- McCarthy, F.D. 1964. The archaeology of the Capertee Valley, N.S.W., *Records of the Australian Museum* 26, 197-246.
- McCarthy, F.D., E. Brammell and H.V.V. Noone 1946. The Stone Implements of Australia, *Memoirs of the Australian Museum* 9, 1-94.
- Morwood, M.J. 1984. The prehistory of the Central Queensland Highlands. In F. Wendorf and A. Close (eds), *Advances in World Archaeology* 3, 325-380. Orlando: Academic Press.
- Mulvaney, D.J. 1969. *The Prehistory of Australia*. London: Thames and Hudson.
- Mulvaney, D.J. 1985. Australian backed blade industries in perspective. In V.N. Misra and P. Bellwood (eds), *Recent Advances in Indo-Pacific Prehistory*, pp.211-217. New Delhi: Oxford and IBH Publishing.
- Mulvaney, D.J. and E.B. Joyce 1965. Archaeological and geomorphological investigations on Mt Moffatt Station, Queensland. *Proceedings of the Prehistoric Society* 31, 147-212.
- Pearce, R.H. 1974. Spatial and temporal distribution of Australian backed blades. *Mankind* 9, 300-309.
- Walker, P.H. 1964. Soil and landscape history in the vicinity of archaeological sites at Glen Davis, N. S. Wales. *Records of the Australian Museum* 26, 247-264.