8

EXCAVATIONS AT UPSIDE-DOWN-MAN

This chapter details the excavation of Upside-Down-Man (UDM) shelter in the lower Mangrove Creek catchment, north of the Hawkesbury River (Figure 8.1). The site contains an extensive pigment art assemblage with several phases of production. Also present are all three shelter engraving types (pecked, Sydney miniature and abraded), thought to be diachronic indicators in shelter art production (McDonald 1991). Dripline scours initially indicated that there was occupation evidence at the site. The site was test excavated in September 1991. A total of 12 person days was spent testing the site.

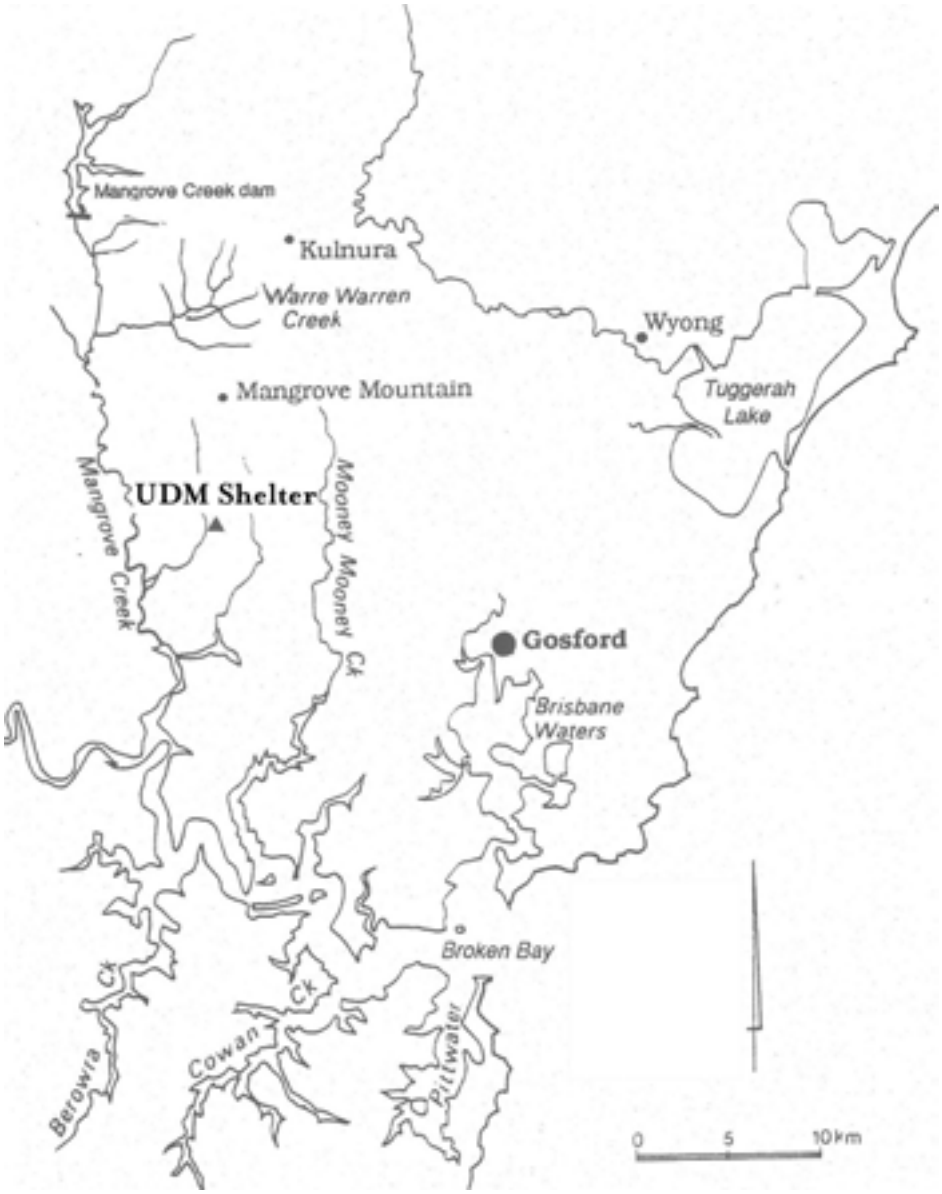


Figure 8.1: Locality Map. UDM Shelter in its local context.

Environmental Context

The site is located on the hillslope 300m from the confluence of Ironbark Creek and one of its minor eastern tributaries. The site is 50m from and 20m in elevation above the tributary creek. There is a spring c.50m upstream of the shelter on the tributary creek and a smaller spring at the southern end of the shelter. While the understorey and surrounding vegetation were extremely dry at the time of the excavation, both of these springs were producing water - in sufficient quantities to feed a waterfall.

The confluence of Ironbark Creek and Mangrove Creek is less than 10km upstream of the junction with the Hawkesbury River. Tidal estuarine mudflats occur in the lower reaches and at the mouth of Mangrove Creek less than 3km from Ironbark Creek (Figure 8.1).

The shelter bedrock is of the Hawkesbury Sandstone formation and the shelter is surrounded by dry sclerophyll forest. Dominant tree species include a variety of *Eucalyptus* spp. and *Angophora* spp., while the mid-storey contains many wattles, Geebung (*Persoonia* spp.) and grevilleas.

The Site

The shelter is large and cavernously weathered, measuring 17m x 6m x 3.5m (Figure 8.2, Figure 8.3; Figure 8.4). It has a westerly aspect. The archaeological components of the shelter include art (engravings, paintings, drawings and stencils) and occupation deposit (including lithics, ochre, faunal and floral remains, shellfish and charcoal). Outside the shelter on a sloping sandstone ramp there are numerous grinding grooves. On the platform roof above the shelter there is an engraved macropod.

The Art

A moderately large assemblage of 274 motifs was recorded within the shelter. Most of these are black, red and/or white drawings (Table 8.1). A complex range of artistic techniques has been employed at the site. One simple-non-figurative motif on Panel 4 is polychrome (black, white and yellow). Of the 58 technique variables identified in detailed diachronic work in Mangrove Creek, 36 are present at Upside-Down-Man (Table 8.2). Of the 66 sites recorded in detail around the Mangrove Creek area, in Upper Mangrove Creek (Attenbrow 2004, Gunn 1979) and in the Warre Warren area (McDonald 1988a), only one shelter has a larger assemblage. That site is Swinton's, with a motif total of 857 including 575 hand stencils.

Stencils

Fifty-five stencils were recorded amongst the UDM assemblage. Of these, 36 were of hands and 18 were of hand variations (hand and wrist, hand and arm, finger manipulation). The majority was white (90%) with the remainder red (7%) or yellow (2%).

Most (67%) of the 36 hand stencils were of left hands, a fair proportion (22%) were indeterminate and four only were of right hands. Only half of the 18 hand stencils variations were of left hands while a larger proportion (39%) was of right hands. Only two of these were indeterminate. While for a fair proportion of the stencils 'handedness' is no longer recognisable (owing to pigment flaking, fading etc.), left hands appear to have been stencilled more often than right hands.

This pattern generally holds for the white stencils [(67%) were of left hands, (18%) were of right hands and (16%) were indeterminate] but not for the minor colours. Half of the four red stencils were indeterminate and there was one each of the right and left hands. The one yellow stencil was of a right hand. While these coloured stencils provide too small a sample to make much of comparative preferences, the nature of the red stencils indicates a greater antiquity for this technique (i.e. red stencilling). The pigment in these examples has bonded with the rock and

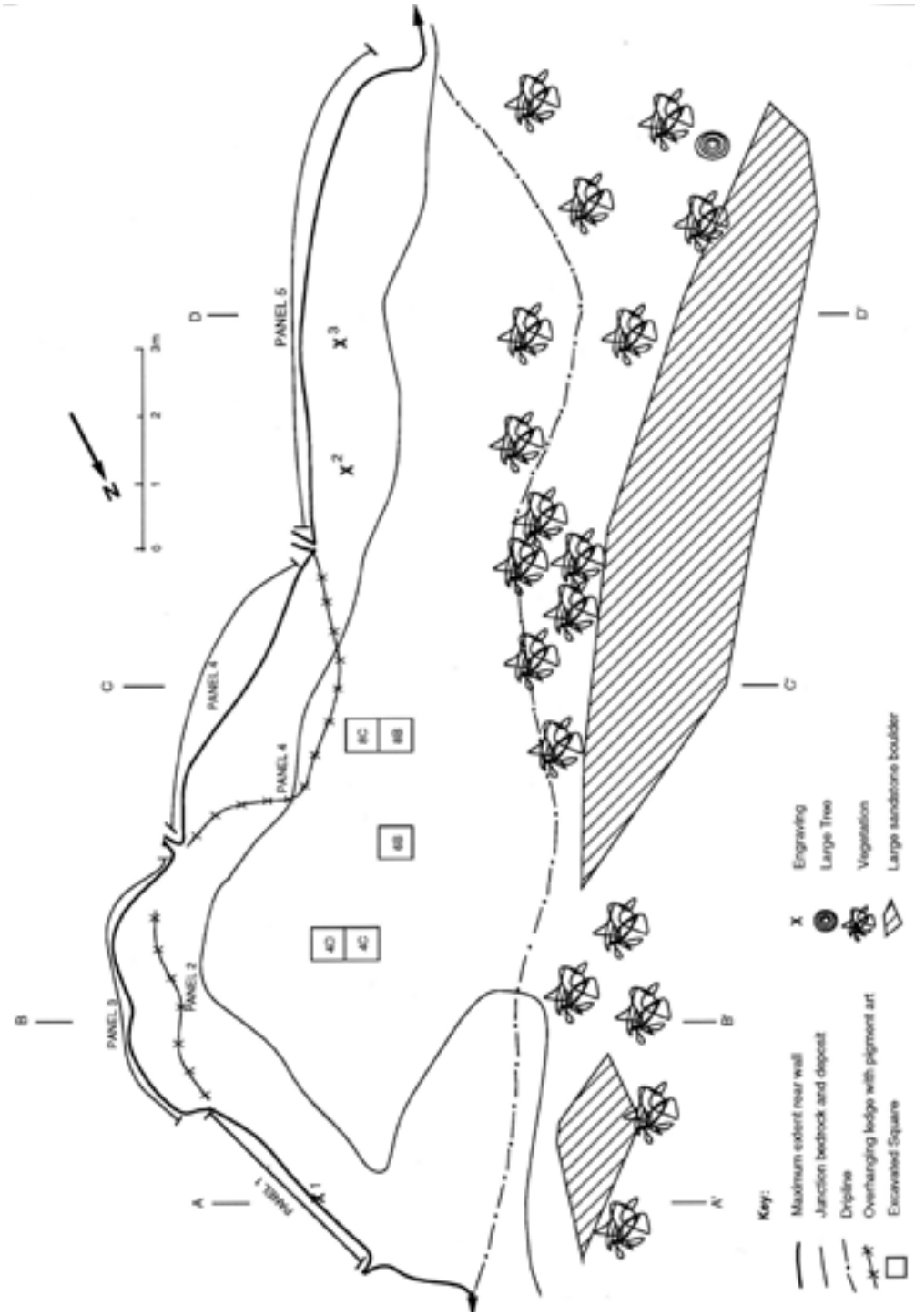


Figure 8.2: UDM Shelter. Site Plan.

there is considerable exfoliation of the rock surface. Red hand stencils are consistently found beneath white hand stencils where superimpositionning occurs.

Most of the pigment art is in good condition, although there is evidence for exfoliation postdating some art production and predating a later phase in Panel 5. There is also deterioration (cracking, spalling and exfoliation) of the case-hardened surface in Panel 1.

Engravings

A number of petroglyphs occur within the shelter. Three of these are engraved male anthropomorphs. One of these is a pecked upside-down-man on the vertical surface, low on Panel 1[23] and beneath

[23]This motif is probably the source of the shelter's name, although there is also a red drawn upside down human

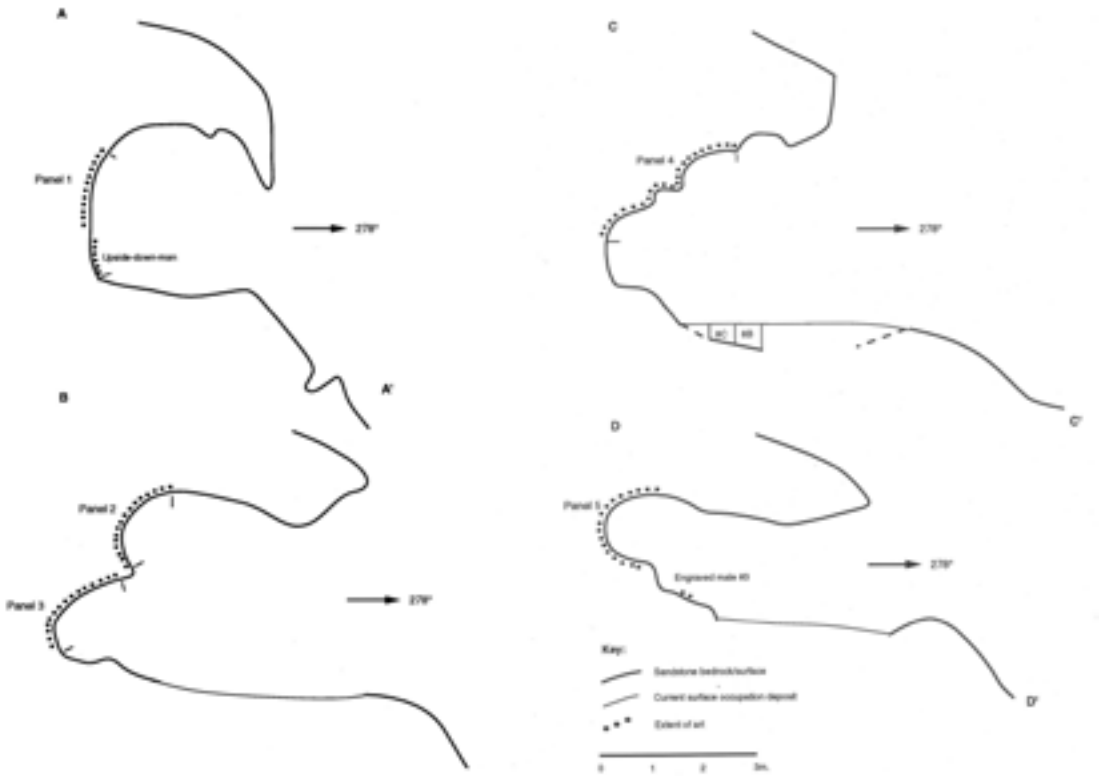


Figure 8.3: UDM Shelter. Site Cross-sections A - D.

Figure 8.4: View of the internal space of the rockshelter, camera facing north-east. Panel 1 is in the background; Squares 4 and 8 are open.

Panel 5 there is a pecked man and an outline pebraded miniature-Sydney style man, both on a horizontal ledge.

These three motifs (Figure 8.5) are clearly separated spatially from the pigment art. The five abraded motifs have been incorporated into a pigment panel (Panel 4). Superimpositionning analysis reveals that the abraded motifs occurred fairly late in the site's art production, and post-date charcoal motifs drawn on this Panel (Figure 8.6).

figure amongst the pigment art on Panel 1 also.

Table 8.1: UDM Shelter. Motif and Technique Information.

Motif	Colour				Technique				Form			Total
	Red	White	Black	Yellow	Dry	Wet/*	Stencl	Engr'v	Out.	Infill	O/I	
Man	2	1			2	1		3å	2	3	1	6
WomanΩ	2	1	1		3						3	3
Anthrop. Ω	10	5	5	1	9	3/2				4	10	14
MacropodΩ	2	14	11		18	4/2		2ß	12		14	26
SnakeΩ		4	4		5						5	5
EchidnaΩ		1	1			/1					1	1
Reptiles≈	3		1		1	3					4	4
Fish	1				1					1		1
EelΩ		2	1		1	1			1		1	2
Shield			1		1						1	1
Axe	1				1						1	1
O. mat objΩ	1	1				/1			1			1
Hands	2	33		1			36					36
Hand var.	2	16					18					18
Bird tracks		2				2				2		2
Circle				1		1			1			1
Dots		18				18				18		18
CXNF	1				1				1			1
SNFΔ		2	2	1	3			1ß			3	3
Other†	2				2						2	2
Unid lines	1	2	3		6				6			6
Unid solidΩ	34	26	62		111	7/1	1	2ß	24	57	41	122
Total	64	128	92	4	165	40/7	55	8	48	85	87	274

ΩEighteen of these are bichrome (i.e. black and white, red and white) and Δone is trichrome (yellow, white and black)
å 2 pecked, 1 outline (miniature Sydney)
≈ 3 goannas, 1 turtle
* wet and dry
ß abraded
† shields?

The pecked motifs beneath Panels 1 and 5 cannot, because of their locations (Figure 8.2), be directly correlated with the pigment tradition. As stated above, two of these motifs are pecked (intaglio), and the other is a miniature (pecked and abraded) outline engraving. The pecked intaglio male figures would appear to be related to an earlier transitional phase of art production in the region. This has been dated at Yengo 1 to the pre-Bondaian (this volume). There is a small number of sites with this earlier art style recorded in the Mangrove Creek area (at 11 sites; 17%). In all other instances the art consists of tracks (bird and macropod), circles, and pecked pits or dots.

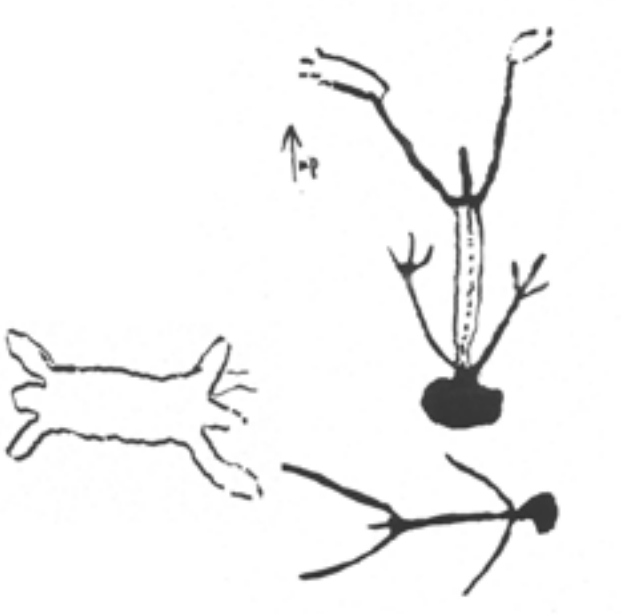


Figure 8.5: UDM Shelter. The three engraved male human figures.

Table 8.2: UDM Shelter. Technique variables. Variables in identified superimposition relationships (Table 8.4) highlighted in bold.

Variable	Technique description		Total motifs
1	black outline	(all dry)	13
2	black infill		34
3	black outline + infill		29
4	red outline		7
5	red infill		16
6	red outline + infill		21
7	white outline		14
8	white infill		2
9	white outline + infill		15
13	white outline	(all wet)	7
14	white infill		23
15	white outline + infill		1
17	red infill		8
19	yellow outline		1
20	yellow infill		1
22	wet + dry, o + i (w/w + b, b/w, b + w/b*)		3
23	red dry outline/wet infill	(wet/dry)	1
24	black + white outline	(bichromes)	1
25	white outline, black infill		4
26	black outline, white infill		1
27	black + white, outline + infill		1
28	black + white outline, black infill		1
31	red + white outline		2
32	white outline, red infill		2
34	red + white, outline + infill		1
35	white outline, red + white infill		2
44	black, white + yellow outline, black, white + yellow infill, white + black outline, yellow infill.	(polychrome)	1
47	linear infill		2
48	white	(stencils)	50
49	red		4
50	yellow		1
54	intaglio	(engravings)	2
55	outline		1
56	incised outline		1
57	incised o/i		4

Variables numbered according to the more extensive classification system used in broader analysis.
*white and black combinations

The UDM intaglio motifs, being figurative, are not within the usual range of motifs found in this earlier style, and it is possible that they represent a transitional phase of art production. The inverted man beneath Panel 1 has an infilled circular head and stick body and limbs (Figure 8.5). While the feet are depicted as open ovals (*mundoes*), both hands have three fingers, reminiscent of bird tracks. Some of the red, early wet infilled anthropomorphic depictions at the site (Panel 5) also have three fingers on their hands. The other intaglio male figure also has a solid circular head, but no digits appended to the limbs (Figure 8.5, Figure 8.7). These motifs will be further discussed in terms of the art phases identified at the site.

Change over time

Ongoing surface exfoliation as well as superimposition evidence at the site indicates several art production episodes. While the pecked and outline engravings cannot be related to any particular phase of pigment art production at the site by direct association, there are several pigment

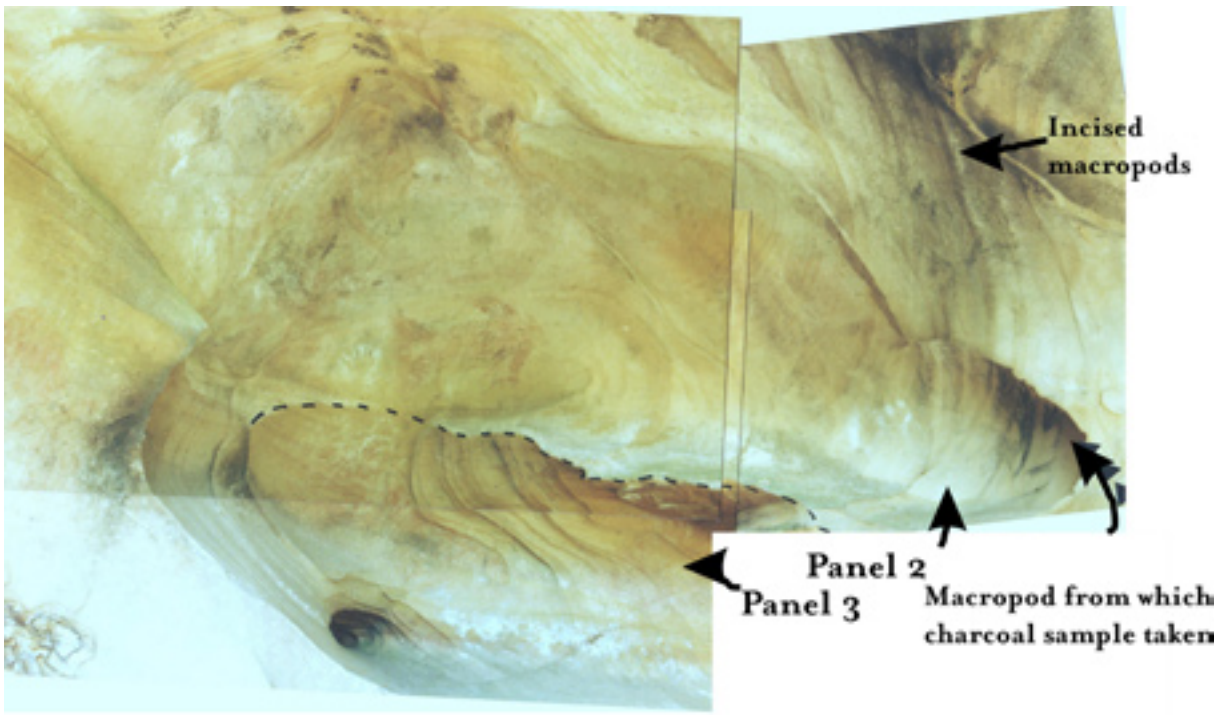


Figure 8.6: Panel 2 (above) and Panel 3. Incised macropods on far right of Panel 2 (detail Figure 8.10). The current floor level is c. 1m below Panel 3.

Figure 8.7: Pecked Upside down-man beneath Panel 1. Note the charcoal infill in the hands and feet. This may be recent graffiti. The spine of the figure is more deeply pecked than the rest of its intaglio body.

Figure 8.8: UDM Panel 4. White painted blobs, bird tracks and white hand stencils.

Figure 8.9: UDM Panel 5. Red anthropomorphs (one with white outline) beneath white outlined macropods.

techniques (and motifs) which are consistently beneath others and are interpreted as being older than the majority of the art. Incised motifs also occur in superimposition relationships with other techniques, and as indicated above, appear relatively late in the art sequence (Figure 8.10, Figure 8.11).

The diachronic analysis used with the Mangrove Creek shelter sites was used at UDM to explore intra-site diachronic variability. Eighteen techniques occur in superimposition relationships at UDM (Table 8.2), and the general sequence identified for Mangrove Creek (Table

Figure 8.10: UDM Panel 2. Detail of incised macropods over black charcoal macropods.

8.3) was found here also (Table 8.4). The variable numbers used (Table 8.2) relate to the more comprehensive list identified (Table 11.1; chapter 11).

Phases 1 and 2 show distinct separation in motif preferences from Phase 3 (Chapter 9). This is interpreted as indicating that Phases 1 and 2 are temporally discrete from each other and from Phase 3. Phase 3 represents most of the art in the Mangrove Creek area and is characterised by a proliferation of artistic techniques.

Superimposition relationships were recorded at the site (Figure 8.6, Figure 8.8 and Figure 8.9). This was not quantified, i.e. recording every example (cf. Morwood 1979), but indicatively, i.e. recording presence/absence of trends (Table 8.4).

White hand stencils provide the best evidence for the contemporaneity of much of the assemblage and/or the ubiquity of this technique. White hand stencils occur above and below many of the techniques which do not occur in other superimposition relationships. White hand stencils occur over black infilled and outlined and infilled motifs, red o/i, white o/i, wet white outlined and infilled motifs, white + red o/i motifs and red hand stencils. White hand stencils have been drawn over by red infilled motifs, wet and dry black + white o/i motifs and wet white outline motifs.

On the basis of close visual inspection, these appear to be generally contemporaneous. All appear to be of roughly the same coloured pigment, and the expertise indicated by the user(s) of the technique across the site is consistent. Weathering varies slightly, mainly as a result of the varying degrees of protection afforded to the different art panels.

At UDM, Mangrove Creek Art Phase 2 is represented by the solid red painted anthropomorphs and goannas and red hand stencils on Panel 5. The red figurative motifs are beneath a series of red

Table 8.3: Proposed Diachronic Sequence; Mangrove Creek Shelter Site Phases 1-3. Those elements observed at UDM in bold.

1. (Earliest)	**Intaglio motifs** (? usually tracks, circles etc.)
2.	**red hand stencils**
	wet red infill, outline and infill
3.	**dry black outline, infilled, outlined and infilled, dry red infill, outlined and infilled**
	wet red outline, **red and white outline**
	wet white infill, incised motifs
	white, red, **yellow** and pink **stencils**
	bichromes, black outlined and infilled
	dry white infill and white and/or yellow outlined and infill
	polychromes and **wet and dry black and white motifs**
most recent	**dry red outline**, wet red outline, **wet white outline**, most dry yellow outline, **dry black outline** contact motifs (white stencils, red outlined and infill and white outlined and infill).

Table 8.4: UDM shelter. Recorded superimposition information.

(Horizontal variables over vertical variables)

	1	2	3	4	5	6	7	9	13	14	17	22	24	31	32	48	49	57
1							1											
2			1		1			1	1	1						1		
3							1	1		1						3		1
4							1		1									
5			1															
6	1		1				2						1			1		
7																		
9																1		
13																1		
14																1		
17			1			1			1						1			
22																		
24																		
31			1															
32			3					1								1		
48					1				1			1						
49																1		
57																		

This analysis revealed the following trends:

Never over other techniques	Never under other techniques
dry black infill	white outline
wet red infill	white + black o/i (wet and dry)
red hand stencils	incised motifs
red and white outline	black and white outline.

and white bichrome anthropomorphs, which, in turn, are below several white outline macropods. The red hand stencils - which are completely bonded to the sandstone matrix - are beneath white hand stencils. In Panel 2, two red and white bichrome anthropomorphs are beneath black drawings and white hand stencils. In Panel 4, the incised motifs are on top of several types of black drawings, which are in turn beneath several white painted motif types.

These superimposition relationships indicate temporal trends and also indicate certain colour relationships. Black and/or red monochrome motifs are never placed over white ones (either wet or dry), although white was placed often over red and/or black motifs. Black was never drawn over white hand stencils, although the converse did occur. Many of these superimposed colour relationships may result from visibility considerations. Colour avoidances, however, may also be operating.

The assemblage at UDM is interpreted as consisting primarily of elements from Art Phases 2 and 3. The pecked motifs may be from Phase 1, although based on motif analyses (chapter 10) these are interpreted as transitional and are therefore conservatively placed in Phase 2. The majority of the UDM art falls in Art Phase 3, with several techniques (namely dry and wet red outline) which occur consistently late in the phase also present.

Given this art sequence, the excavations at the site aimed to determine whether there were multiple occupation phases at the site, and their temporality.

Art Dates

Four samples from two charcoal macropod drawings were collected for AMS dating (Figure 8.12). These samples were processed by John Head (ANU Quaternary Dating Research Centre) and the counting was completed at the ANSTO Facility at Lucas Heights. The following dates were received (Table 8.5).

Table 8.5: UDM Shelter. AMS dates from the two macropod motifs.

Sample No.	Field Number	Motif #	Date
ANU-AMS 773	UDM/1	1	c.480 + 80 BP
ANU-AMS 774	UDM/2	1	indistinguishable from modern
ANU-AMS 775	UDM/3	1	indistinguishable from modern
ANU-AMS 776	UDM/4	2	indistinguishable from modern

These age determinations are inconclusive as to the age of the motifs, and suggest problems with the field sampling procedure (McDonald 2000c).

The three dates which are indistinguishable from modern standard suggest that there has been contamination of both motifs by younger material (lichens or other microscopic organics). Conversely this art was produced either just prior to European contact or up until 1950 AD. This latter scenario would seem unlikely for motif #2 which is faded and partially affected by surface exfoliation (Figure 8.11). Motif #1 was produced using a lump of charcoal and comprises a single line outline. The samples were collected from locations where it was clear that only one stroke had been executed. This makes it unlikely, in archaeological terms, that this motif has been contaminated by a more recent 'touching up' of the motif.

The date c.500 BP may be an accurate representation of the age of motif #1. Conversely, given that the two contaminated dates from this same motif, it could indeed be older. If the contamination is contemporary (i.e. micro-organics still alive at the time of sample collection), then the date returned may be significantly younger than it should be. John Head (Quaternary Dating Research Centre, pers. comm., 1994) suggested that the 500 year old date may indeed be double that - c.1,000 years BP. Resolution of this problem will only be achieved through further fieldwork which aims to identify sources of local contamination on the surface of the rock or growing on the art.

Figure 8.11: Panel 3 showing context of incised panel and the macropod #2 in the alcove (arrowed right) which was sampled for AMS dating.

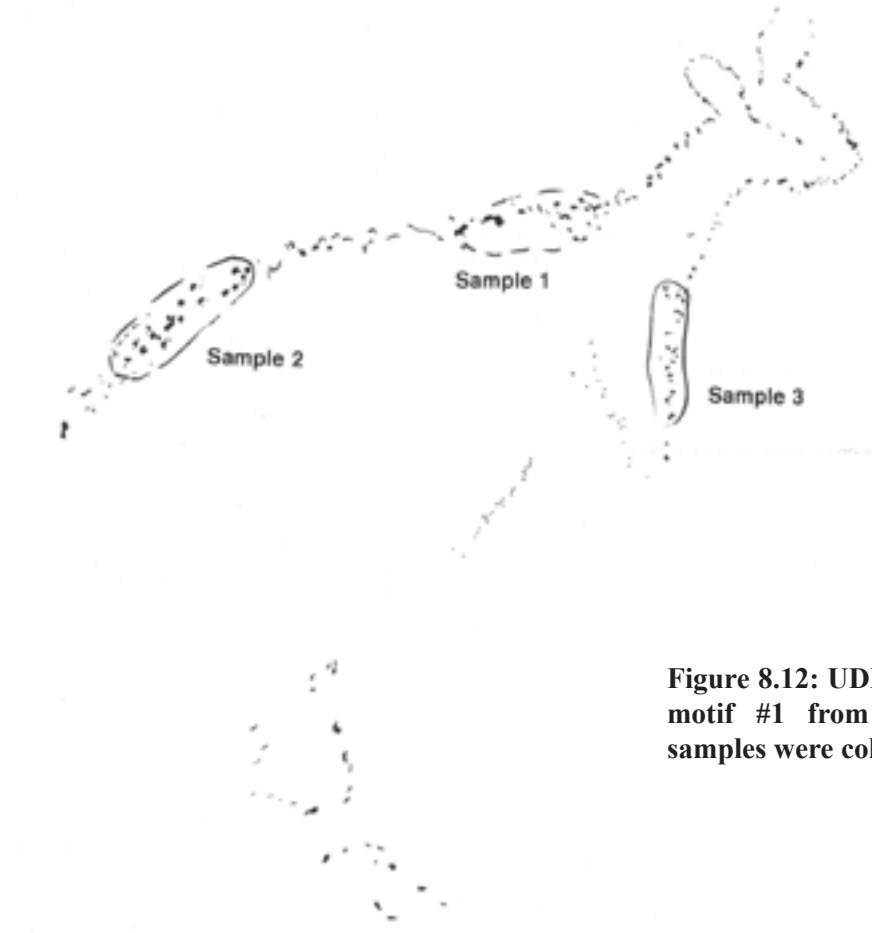


Figure 8.12: UDM Shelter. Macropod motif #1 from which three AMS samples were collected.

These contradictory results make it difficult to make firm conclusions about the production date of the outlined charcoal macropod. On face value, it would appear that art was being produced at this site up until c.500 BP: after other occupation of the shelter had ceased. The fact that contamination cannot be ruled out means that this motif may have been produced in the final or even terminal phase of the site's occupation.

The Excavation

Aims

The aims of the excavation were to determine;

1) the nature and timing of the occupation evidence at the site;

Of particular interest was whether this evidence indicated domestic use of the shelter. Only one site with a larger art assemblage had previously been excavated in the Mangrove Creek Valley (MacIntosh 1965). None of Attenbrow's 31 occupation sites had major art assemblages. It was thus of interest to characterise the occupation debris at UDM.

2) Whether there were two or more phases of occupation evidence at the site (as suggested by the art); and,

3) Whether the art was contemporaneous with the occupation deposit.

All three aims have been achieved by this work, the last inconclusively.

Methods

Conventional archaeological techniques were employed in this test excavation (Figure 8.2). Squares were located based on two criteria:

1) the presence of a relatively flat, protected floor area in relatively close proximity to pigment art panels; and,

2) the likelihood of a reasonable depth of deposit.

The sloping back wall of the shelter suggested that much of the deposit at the site would be shallow. Probing with metal skewers indicated that most of the deposit close to the back wall is <20cm deep. Excavating in immediate proximity to decorated panels (cf. Rosenfeld *et al*. 1981, Morwood 1992b) was not an option here.

A 50cm x 50cm pit (6B) and two 50cm x 100cm trenches (Squares 4 and 8) were excavated. A total of 1.25m^2 was investigated: a 2.8% sample of the floor area with reasonable depth of deposit.

Excavation in all squares was by 5cm spits or in stratigraphic units, whichever were smaller (Figure 8.13). The two 50cm x 100cm trenches were excavated as two consecutive 50 x 50cm pits. Large and/or diagnostic artefacts and charcoal samples were provenanced during excavation. The small size of the excavation units was felt to be sufficient for the purposes of provenancing excavated material.

All deposit was dry-sieved through 5mm and 2.5mm sieves on site. Unsorted residue from the 2.5mm sieve was bagged and retained for later sorting. This has been preliminarily sorted but is retained as a category of cultural material. The residue consists mainly of charcoal, fine gravel,

vegetation (leaves and small twigs in the upper most layers, root material lower down) and micro-debitage, although the latter was specifically targeted during sorting.

Stratigraphy

The excavations revealed four stratigraphic layers (Figure 8.16, Figure 8.17). These were identified on the basis of soil colour and texture (Figure 8.14, Figure 8.15). An ashy lens occurred in all squares between layers 1 and 2 (at varying depths). Each of these was considered to be a specific and separate hearth, and so these not given Layer status. This ashy lens is the best indicator of where recent scuffage stops and *in situ* deposit starts. This is generally quite close to the surface (see section drawings). The sandy deposit was extremely compact. The identified Layers were clearly defined on the basis of colour and textural variation. While there may have been some downward movement of smaller artefactual material, the stratigraphic integrity of the site is good.

The Layers identified were;

I Surface leaf litter, loose grey sandy deposit with high organic/humic and charcoal content. Some recent materials e.g. cigarette filter (Colour 10YR 3/3; pH = 9).

II More consolidated than Layer I, brown grey, sandy deposit. Reddish brown in square 4 (5YR 5/4, pH = 6.5); more orange brown (Colour 10YR 5/3; pH = 6.5) in Squares 6 and 8.

III Yellow brown, sandy deposit with low charcoal content. There are again slight colour differences between square 4 and Squares 6 and 8, with the latter being somewhat pinker (Colour 7.5 YR 6/6; pH = 3.5) than found in square 4 (Colour 7.5YR 6/4; pH = 3.5).

IV Yellow/pink white (Colour 7.5YR 7/4; pH = 4.5) sandy deposit with very low charcoal content. Many small roots. N.B While there is a general increase in acidity with depth, layer III is more acidic than layer IV.

In Square 4 (Figure 8.16):

Layer II - was quite orange with a red area (Colour 10YR 5/6) at the eastern end of the pit. This was apparently associated with the burning event/ashy lens (very low quantity of charcoal and bone were observed, suggesting an extremely hot fire oxidising the surrounding deposit).

Layer III - yellow brown sandy deposit in contact with bedrock: immediately adjacent to bedrock there is a darker band (<1cm thick) of deposit.

The following specific notes were made regarding Square 6 (Figure 8.16):

Layer I - Ashy lens here is associated with two separate hearths with ashy lenses above the charcoal rich features. One of these is in the southern corner, the other along the northern baulk.

Layer II - extends down to bedrock in southern corner in this square, beneath the intact hearth. This suggests prehistoric disturbance (pit? some other sort of excavation?), which has disrupted the units below. Several largish pieces of sandstone roof-fall were found here and above intact Layer III in eastern corner.

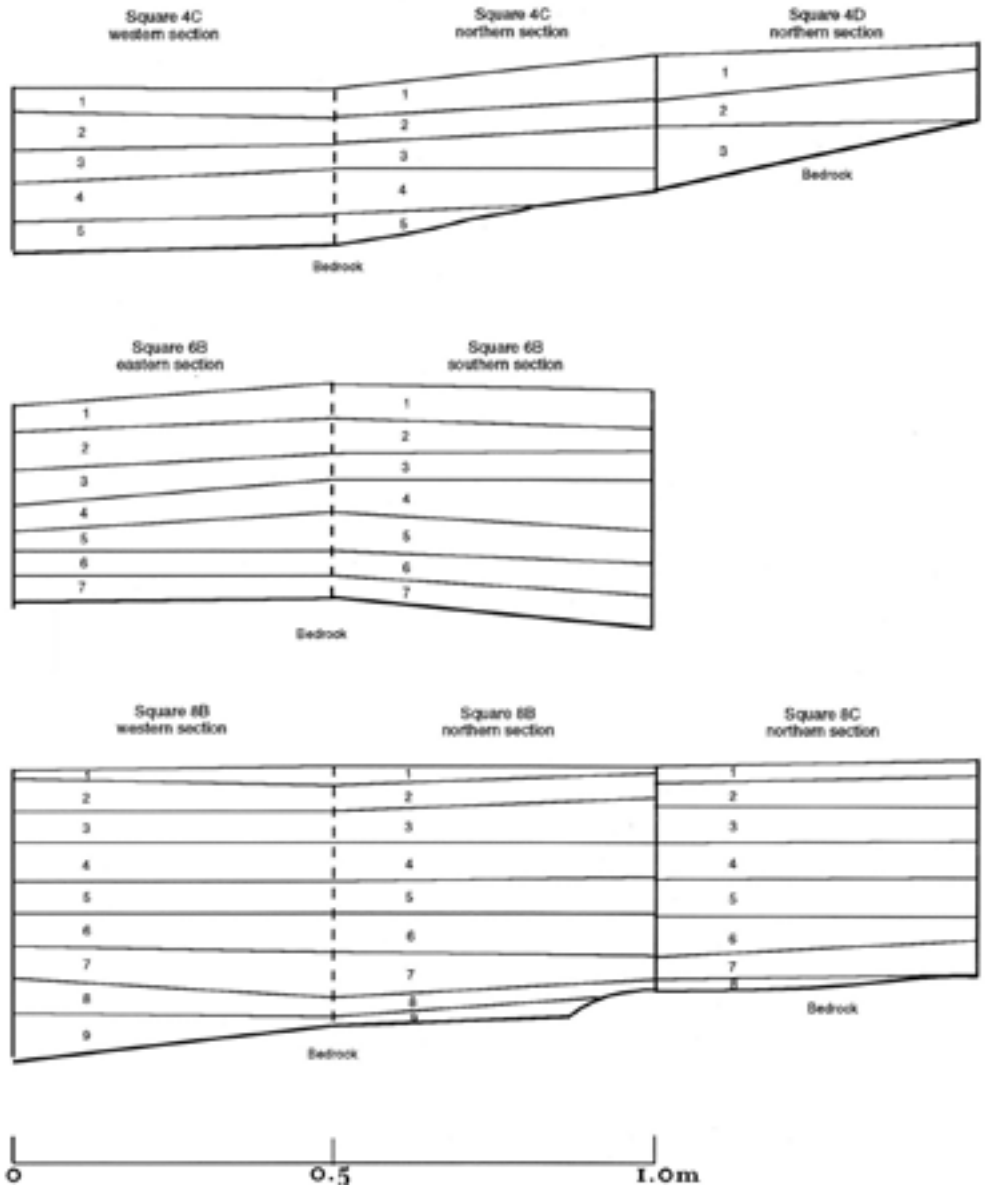


Figure 8.13: UDM Shelter. Excavated spits – all squares.

Layers III and IV - thicker at western side of pit (deeper owing to sloping bedrock).

In Square 8, the following notes were made (Figure 8.17):

Layer I - deeper at the western end of pit (square 8b) and thinner at eastern end (square 8c). Ashy lens found at both ends of pit but not in centre.

Layer II - found only at eastern and western ends of pit on the northern side of the square, but present along entire length by southern side of pit. This Layer is quite deep at the western end of the square.

Layer III - quite pink in this square. Very large extant root in this unit (and below) at western end of pit, may have affected the stratigraphic integrity of square 8B particularly Layer III.

Layer IV - most intact and deepest example of this unit across the three pits.

Correlation of Excavation Layers with Stratigraphic Layers

For the purposes of analysing vertical distribution and diachronic change, the excavated spits have been correlated into analytical and stratigraphic layers. This was straightforward since the shelter floor was flat and adjacent squares were dug simultaneously (Table 8.6; Figure 8.13).

Dates

Four charcoal samples were submitted to the ANU Quaternary Dating Research Centre. These have been counted and the following age determinations obtained (Table 8.7). The proveniences of these samples are illustrated on the stratigraphic sections (Figure 8.16 and Figure 8.17).

Table 8.6: UDM Shelter. Correlation of analytical units with excavation spits and stratigraphic layers (Squares 4, 6 and 8).

Analytical Layer	Squares and excavated spits					Stratigraphic Layer
	4c	4d	6	8b	8c	-
1	1	1	1	1	1	I
2	2	2	2	2	2	II
3	3	3	3	3	3	II
4	4	-	4	4	4	II
5				5	5	III
6	5		5	6	6	III
7	-		6	7	7	IV
8			7	8	8	IV
9			-	9	-	IV

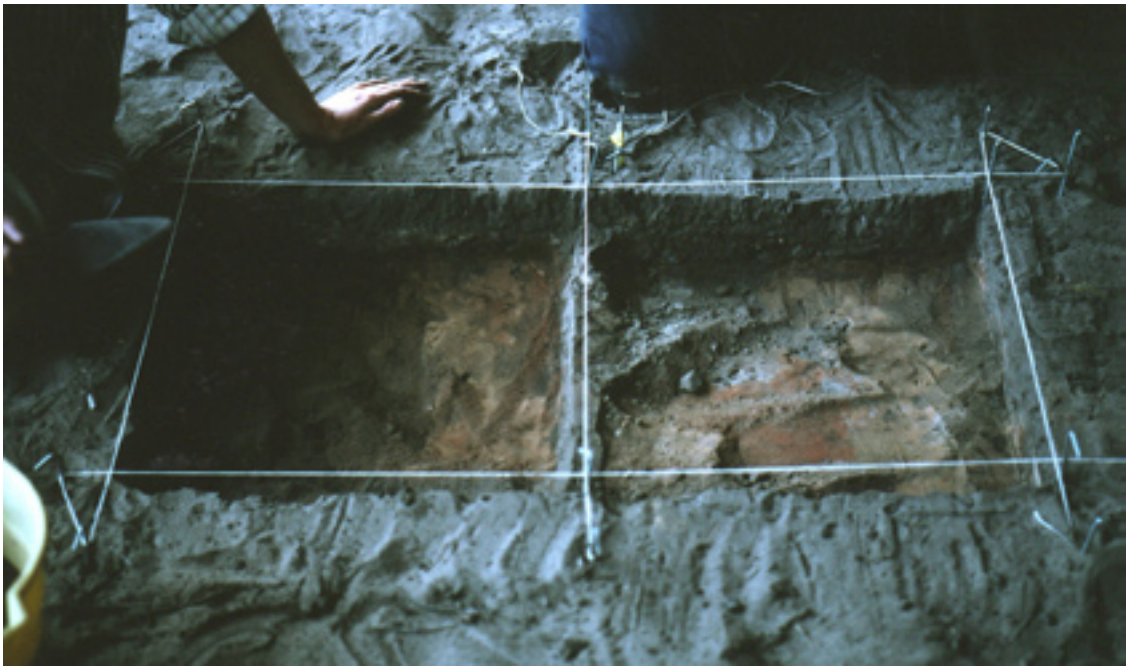


Figure 8.14: Square 4, excavation in progress. Note the marked colour contrast between the reddened ashy lens below Layer 1.

Figure 8.15: Square 8, excavation to bedrock. The colour differences in the different strata are quite clear.

Table 8.7: Radiocarbon dates, depth below surface and association with stratigraphic units.

Sample No.	Field Number	Depth below surface	Stratigraphic Layer	Date
ANU-8134	6B/2/1	6.5 cm	II	1,220 ± 120 BP
ANU-8135	6B/4	15-20cm	II	1,860 ± 70 BP
ANU-8133	8B/5/1	20 cm	III	1,540 ± 60 BP
ANU-8132	8B/8	34-39cm	IV	4,030 ± 140 BP

The samples derived from two squares (6B and 8B). While each square's dates are internally coherent, there is a reversal in the expected outcome for layers II and III. The presence of the large tree root in square 8B may have affected the integrity of this square, although the field notes accompanying sample 8B/5/1 suggest that this was not obvious in the field. The field notes do indicate that there were a number of smaller roots though this spit; hence it is possible then that this age determination has been contaminated by younger carbon. This was, however, a provenanced sample while sample ANU-8135 was collected from the sieves. The *in situ* sample is considered to be the more reliable of the two. The two results are within the same range for the Middle Bondaian.

Table 8.8: Proportions of lithic, charcoal, shell, bone, residue and 'other' from the excavated squares. Weights in grams.

Cultural component	Total (g)	*%f*
Stone artefacts	1,561	*27.6*
Shell/bone	63	*1.1*
Charcoal	1,980	*35.0*
Unsorted Residue	2,055	*36.3*
Other (seeds and pigment)	1.1	*0.0*
Total	5,660	*100.0*

Cultural Material

A total of 543kg of deposit was excavated from the site. From this derived slightly less than 5.7kg of cultural deposit (Table 8.8) and 4.5kg of roof-fall. The shallowest squares (4D and 4C) had the most recent deposit and the highest densities of cultural material. Square 8C had the lowest proportions and densities of cultural material (Table 8.9).

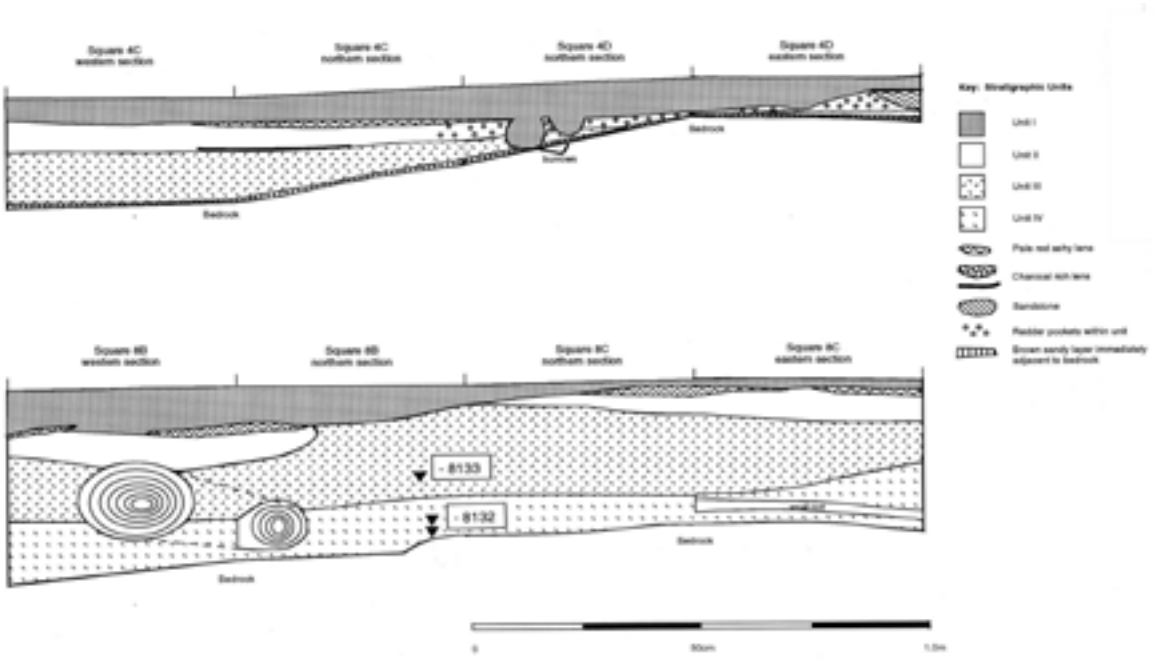


Figure 8.16: UDM Shelter. Stratigraphic sections, Squares 4 and 8.

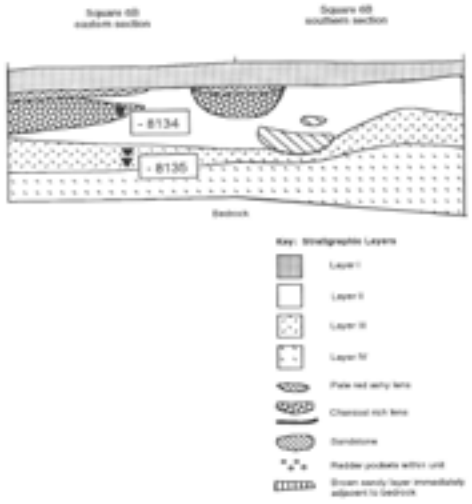


Figure 8.17: UDM Shelter. Stratigraphic Section, Square 6.

Stone Artefacts, Charcoal and Unsorted Residue

Charcoal and unsorted residues represent the bulk of the cultural material by weight. Both of these categories, being largely organic (the latter also contains small gravel fraction, and possibly some micro-debitage), are present in greater quantities in the upper layers than deeper in the deposit.

Stone artefacts represent a slightly lower proportion of the cultural material (by weight). These are present in fairly high numbers.

Table 8.9: Proportions of cultural material retrieved from the excavated squares. Weights in grams except where specified.

Square	Artefacts	Shell/Bone	Charcoal	Residue	Other	Total Cult. Mat	Excavated Deposit [kg]	density/m^3 (%)
4D	96.2	14.5	571.6	466.8	0.8	1,150	85.5	1.35
4C	53	14.9	682.7	417.1	0.1	1,168	56.3	2.08
6B	392.4	28.3	242.8	401.3	0.2	1,065	125.0	0.85
8B	509	2.5	270.1	515.1	0	1,297	146.8	0.88
8C	510.5	2.5	212.6	254.7	0	980.3	129.5	0.76
Tot	1,561.1	62.7	1,979.8	2,055.0	1.1	5,660.3	543.1	1.04%

Shell and Bone

Small quantities of highly fragmented shell [Sydney cockle (*Anadara trapezia*), hairy mussel (*Trichomya hirsuta*) and freshwater mussel (*Hyridella sp.*)] were present in the upper layers: 12g in the five squares. Bone was also present in very small quantities (50.7g) in the upper layers. Most of this is highly fragmented. With the exception of several macropod and small marsupial teeth, rib fragments and a few reptile vertebrae, most is unidentifiable. The bone fragments were found in several conditions: burnt, calcined, weathered and/or stained and fresh. While some of the fresh bone, particularly of smaller species, may represent recent additions, the majority is considered to be culturally derived.

Plant Remains and Pigment

Amongst the cultural remains, in minute quantities, are seeds, white pipeclay and red ochre.

The seeds were analysed by the Seeds Laboratory (NSW Department of Agriculture). These included:

- Geebung (*Persoonia spp*.) 2 seeds;
- Native cherry (*Exocarpus cipressiformis*) 1 seed each in 4C/1 (gnawed) and 4D/1 (cracked);
- Vine lilac or false sarsaparilla (*Hardenbergia violace*) in 4C/1, 1 seed; in 8B/3, 4 seeds; and,
- Senna (*Cassia spp*.) - in 4C/1, 1 seed; 6B/5, 1 seed.

There are also 20 seeds in 8B/3 and two desiccated fleshy pieces which could not be identified. Under a microscope, the interior of these seeds (somewhat like *Callitris* seeds) has a honeycombed appearance, more in keeping with bony structure.

Pigment was found only in isolated spits (pipeclay in 6B/3 and 8B/2, red ochre in 4C/3 and 4D/1). The pipeclay (four fragments in 6B/3; one fragment in 8B/2) is highly weathered and, possibly as a result of this poor condition (and small size), shows no traces of use. The two fragments of red ochre in 4C/1 are of a fine texture and produce a dark red colour (Munsell 5R 3/6) on white paper. These two fragments are extremely small (0.1g). Neither shows striations or other evidence of usewear. This may result from their very small size. The one small fragment (0.2g) of dark red ochre in 4C/3 is very granular and of poor quality.

Change over time

The site's cultural deposit demonstrates obvious changes over time in its composition. In the lower two levels, stone artefacts make up the bulk of the cultural material present. In the upper layers there is significantly more charcoal and a higher proportion of finer residue. Shell and bone are only found in the top two strata (Figure 8.18).

Many of these patterns, particularly those involving the site's organic remains, may be due to unequal preservation: the lower layers are very acidic. This is consistent with the environment usually provided by Hawkesbury sandstone but also reflects an absence of neutralising components in the older depositional period (i.e. ash, shell) which provided a more alkaline (neutralising) environment (see McDonald 1992a).

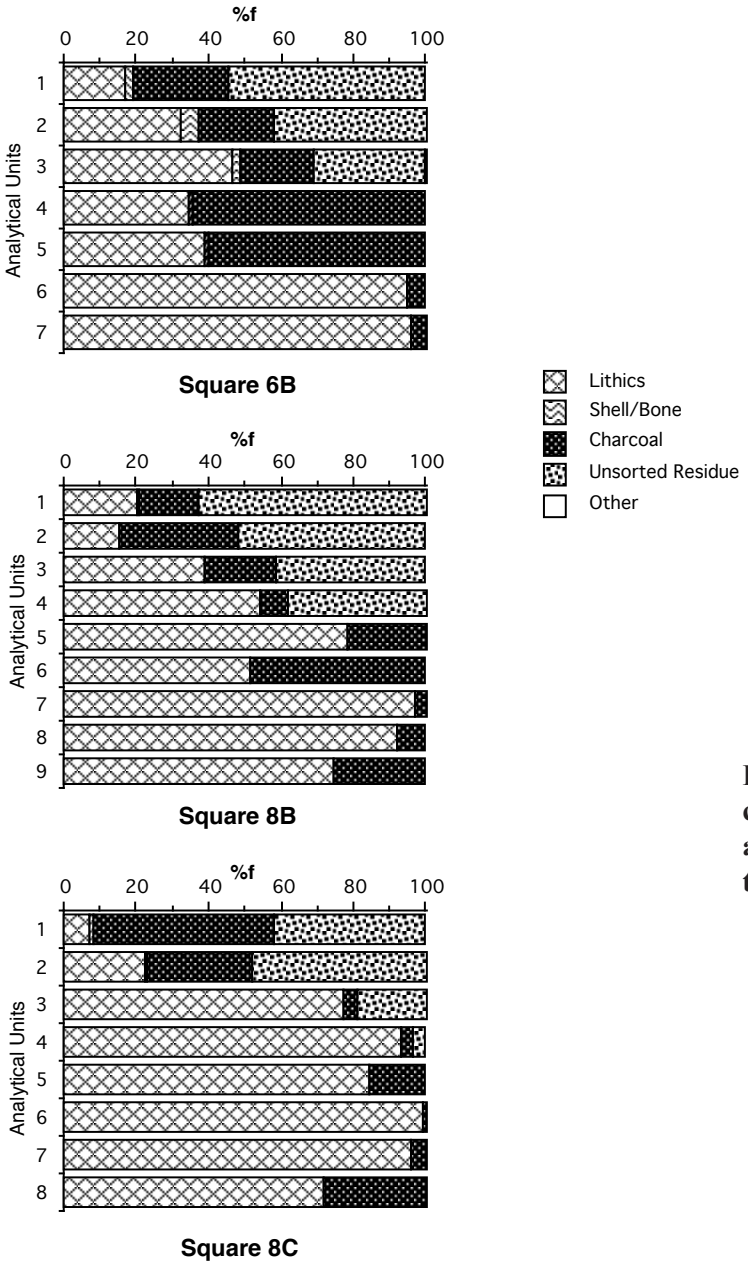


Figure 8.18: UDM. Cultural components in the three analysed squares. Change over time.

Artefact Analysis

When this site was first recorded by Patricia Vinnicombe in 1978, a bifacially flaked hatchet preform (Figure 8.19) was found in the vegetation at the front of the shelter. Four pieces of fragmented shell (*Anadara sp*. and *Hyridella sp*.) and 25 knapped stone artefacts were collected from the dripline (and lodged in the Australian Museum). These artefacts were made of a range of raw materials, silcrete, silicified tuff, quartzite, fine-grained basic (FGB), quartz. Three of the FGB pieces amongst this collection had evidence of previously ground facets, and there was one broken silcrete backed blade. Also found was one piece of thick black/green glass, although this does not appear to have been worked. Many more artefacts were observed in the dripline during the current fieldwork, but these were not collected or recorded.

A total of 3,550 artefacts were retrieved from the five test pits at the site. Only three of the pits (6B, 8B and 8C), with 3,290 artefacts, were analysed in detail.

The artefact material from the three analysed squares is dealt with collectively and then detailed according to each square, separately and in combination, for the analyses of vertical distribution.

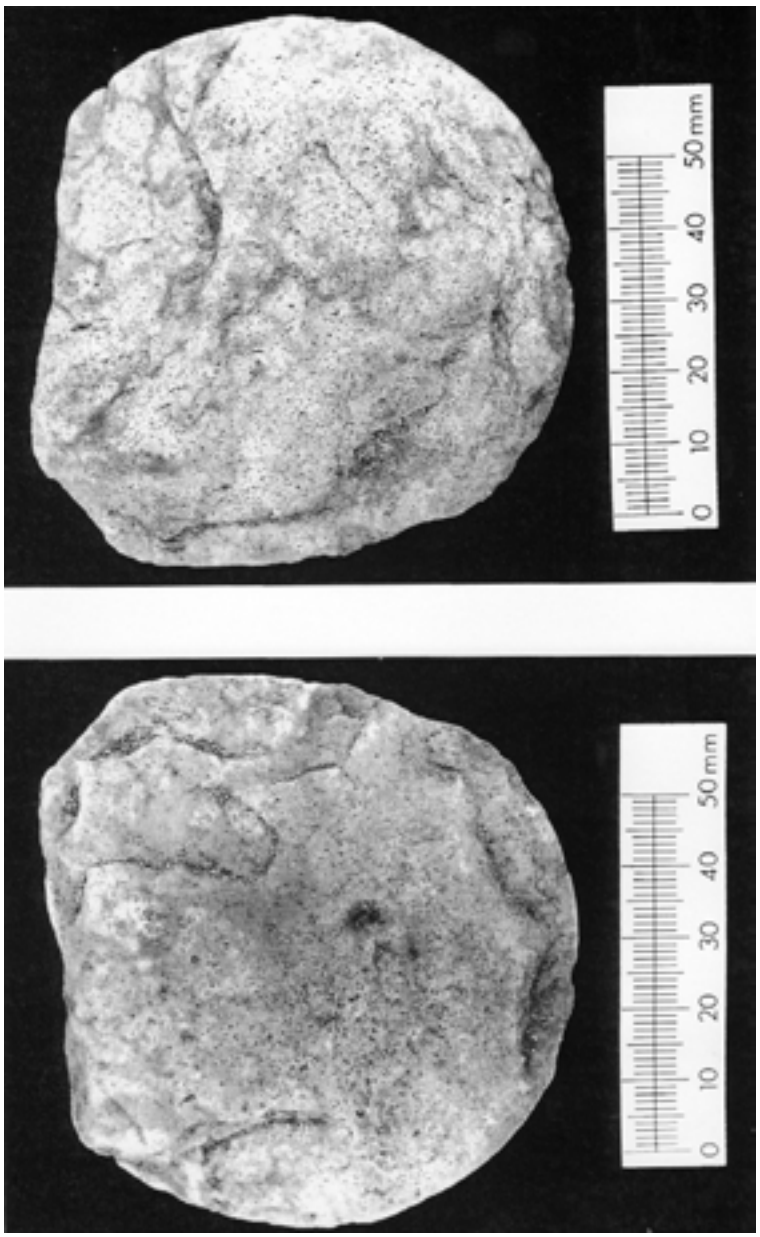


Figure 8.19: The bifacially flaked basalt axe pre-form collected by Pat Vinnicombe in 1978. Pitting on one face suggests that this may have also been used as an anvil.

Raw Material

Quartz is the predominant raw material found at UDM (38%), followed by Silicified Tuff (21%), fine grained basic (19%) and veined pebble chert (15%). The remaining raw material types (silcrete, chert, quartzite and 'other') were present in very small numbers. The general proportions are mirrored in the individual squares (Figure 8.20), although there is more FGB in square 6B and a larger proportion of silicified tuff in Squares 8B and 8C.

When only artefacts >1cm are considered (Figure 8.21) the overall pattern is similar, although there is proportionally more veined chert in square 8B, more quartz in 8C and an equal dominance of quartz and FGB in square 6B. These patterns can be partially explained by the presence of discrete knapping events in various locations across the site, and partially by temporal variability (see below 5.3.4.ii).

Some interesting patterns are observable when the raw material preferences for utilised artefacts are considered. Most of the artefacts with R/U (retouch and/or usewear) are made of silicified tuff (31.8%) or chert (22.7%), with veined chert being the next most used material (13.6%). While these figures show a consistency in preference (i.e. compared with the overall assemblage figures) for silicified tuff and veined chert, chert figures much more highly amongst

the R/U than it does in the assemblage generally. Over 17% of the chert artefacts (>1cm) have evidence for retouch and/or usewear (Table 8.9) significantly more than the percentage frequency for any other raw material. The fact that there are no cores made of this raw material suggests either that this was a valued raw material, artefacts of which were transported around the landscape in finished form; or perhaps that valued cores of this material were subsequently removed from the site for continued use elsewhere. Some knapping of this material obviously occurred at UDM; although some of this micro-debitage may have been produced by the usage of several of the chert artefacts (e.g. the tool from 6B/3 has extensive and heavy R/U and some notching). Many (60%) of the R/U chert artefacts are of translucent chert, more common in the Hunter Valley than the Sydney sandstone.

Size

The majority (71.7%) of the artefacts in the assemblage are <1cm long while most of the remainder (26.8%) are between 1-3cm long (Table 8.10). Relatively few artefacts (1.1%) are between 3-5cm, and two only (0.1%) are larger than 5cm[24].

Artefact Types

The majority (98.2%) of the artefacts at the site consists of unmodified debitage (Table 8.10). The remainder include 37 cores (1.1%) and 22 artefacts with retouch and/or usewear (R/U - 0.7%). Of this latter type, eight are backed artefacts. Seven (87.5%) of these are Bondi (i.e. asymmetric) points, while the other is a trapezoidal geometric. Also present amongst the assemblage are numerous flakes (63) with residual evidence of edge-grinding in the form of smooth faceted planes with striations. These artefacts indicate that several edged-ground implements have been broken up at UDM. None of these artefacts shows any sign of further utilisation and thus, while indicative of grinding as a technological component, they are not, strictly speaking, utilised artefacts. While included in the artefact type discussions, they have been excluded from some calculations of artefact type proportions.

Almost half (43%) of the material with evidence of grinding is micro-debitage (<1cm in size): two pieces only are in the 3-5cm range. From the colour ranges in this raw material it would appear that three edge-ground implements were knapped in the vicinity of Squares 6 and 8. None of this material has evidence for further retouch/usewear and these implements appear to have being broken up for some reason other than the production of useable flakes: possibly further flaking prior to additional grinding?

Of the eight backed artefacts at the site, four are incomplete. Two are butt ends probably broken during manufacture. The other two are the distal tips of backed blades, one of which has R/U on the chord. These may have broken during use: two of the eight have fine flaking along their chords, indicating some sort of use. The geometric backed blade has macroscopic residue, suggesting this artefact may have been hafted. There is no evidence for usewear or damage to the chord or point of this artefact.

There is an increase over time in the density of artefactual material deposited (Figure 8.22). This has been calculated on the basis of artefacts per kilogram of excavated deposit.

Vertical Distribution

Clear stratigraphic divisions in the deposit were observed in the field. Analysis of the excavated assemblage indicates that some of these differences are cultural and that there is change over time in the nature of the artefactual material deposited.

[24]At the time that this analysis was undertaken (1991) the artefact size was usually measured in these size categories. The current standard is 5mm intervals Rich (1992), McDonald *et al.* (1994), JMcD CHM 2005a.

Table 8.10: UDM Shelter. Artefact Types according to raw material and size. The three analysed squares (6B, 8B and 8C).

Raw Material	Unmodified Debitage				Cores	BA	R/U	Total
	<1	1-3	3-5	>5				
Quartz	953	261	15	0	27	1	1	1258
Silcrete	27	26	2	0	1	1	0	57
ST	499	184	6	0	2	2	7	700
FGB	434	127	4	1	0	0	64	630
Quartzite	10	23	0	0	1	0	1	35
Veined chert	345	133	4	0	5	1	2	490
Chert	48	23	0	0	1	2	3	77
Other	15	22	3	1	0	1	1	43
Total	2331	798	34	2	37	8	79	3290
%f	*70.9*	*24.3*	*1.0*	*0.1*	*1.1*	*0.3*	*2.4*	*100.1*
Total (R/U minus ground artefacts)								
	2358	836	35	2	37	8	14	3290
%f	*71.7*	*25.4*	*1.1*	*0.1*	*1.1*	*0.3*	*0.4*	*100.1*
Type		Size						
	<1	1-3	3-5	>5				
Unmodified*	2358	836	35	2				3231
R/U	1	18	3					22
Cores		27	10					37
Total	2359	881	48	2				3290
%f	*71.7*	*26.8*	*1.5*	*0.1*				*100.1*

* includes ground material

Artefact Density

Artefact densities in the earliest two units (III and IV) are the lowest, with a minor peak being demonstrated across all squares within unit IV. Unit II consistently contains the highest density of artefactual material with a decrease over time within this unit. Square 8B is anomalous: it contains the highest artefact density in the most recent spit.

Table 8.11: UDM Shelter. Modified artefacts and raw material types.

	Backed Artefacts	**R/U**	**Grinding**	**Total**	***% of R/U***	**Artefacts >1cm**	***% R/U***
Quartz	1	1	0	2	*2.4*	303	*0.7*
Silcrete	1	0	0	1	*1.2*	30	*3.3*
ST	2	5	0	7	*8.2*	161	*4.3*
FGB	0	1	63	64	*75.3*	629*	*10.2*
Quartzite	0	1	0	1	*1.2*	24	*4.2*
Volcanic	1	2	0	3	*3.6*	141	*2.1*
Chert	2	3	0	5	*5.9*	28	*17.9*
Other	1	1	0	2	*2.4*	26	*7.7*
Total	8	14	63	85		1342	*6.3*
%f	*9.4*	*16.5*	*74.1*				

*FGB total raw material has been included here since 43 % of the FGB material with evidence of grinding is in the <1cm size category.

Changes in artefact density seem to indicate that there were two main phases of occupation at the site, with peaks in these depositional periods coinciding first with unit IV and then later with unit II. The earlier period is characterised by a sparse artefact density; the later period was much more intensive. The occupation represented by Unit III indicates either a hiatus in shelter use, or at least a very low level of occupation. Interpretation of this occupation can be refined by more detailed artefact analyses.

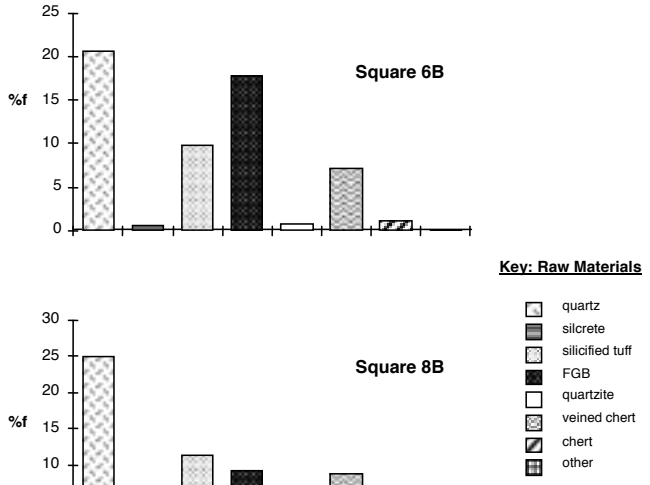


Figure 8.20: UDM. Raw material proportions in the three analysed squares. All artefacts.

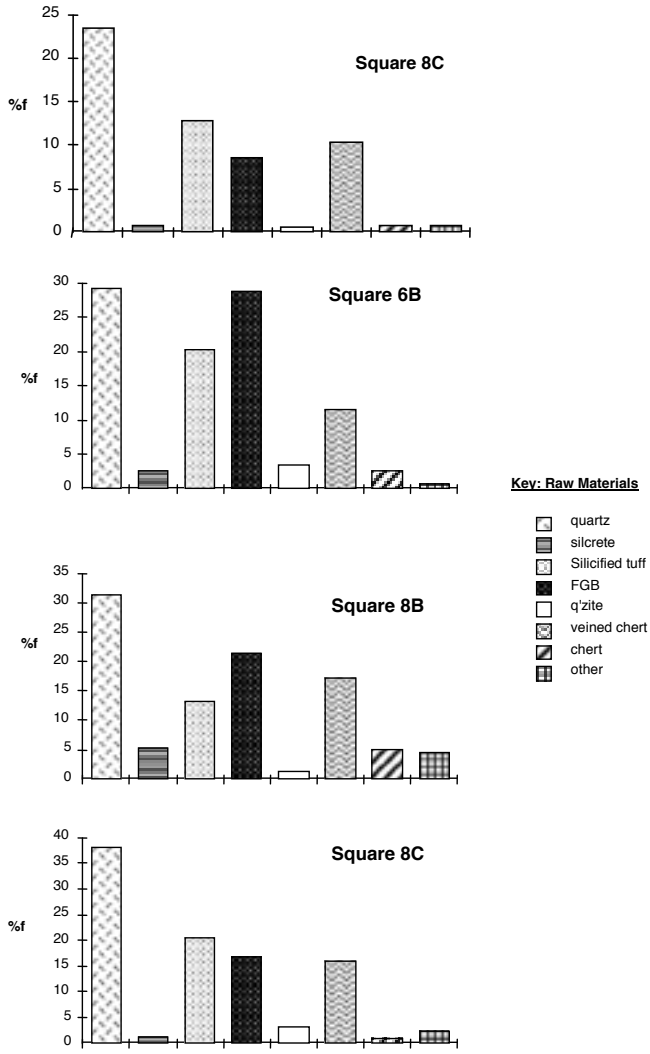


Figure 8.21: UDM. Raw material proportions in the three analysed squares. Artefacts >1cm.

The age-depth curve and estimates of artefacts deposited/year produce a somewhat different picture[25]. While the two more recent stratigraphic layers exhibit the similar trends to those indicated by density calculations, the earliest strata have extremely low artefact deposition rates (see Table 8.12, Figure 8.22). The main period of occupation at the site is definitely defined by this reworking of the data, as is the sporadic nature of the earlier occupation.

[25]The middle date of 1,540±60 BP (ANU-8133) was used here as this was a provenanced sample, while ANU-8135 was a sample collected from the sieves.

Table 8.12: UDM Shelter. R/U artefacts and cores and raw material types.

Raw material	Backed Artefacts	R/U	Total R/U	*% of R/U*	cores	Artefacts >1cm	*% R/U*	*% cores*
Quartz	1	1	2	*9.1*	27	305	*0.7*	*8.9*
Silcrete	1	0	1	*4.6*	1	29	*3.4*	*3.4*
ST	2	5	7	*31.8*	2	201	*3.5*	*1.1*
FGB	0	1	1	*4.6*	0	169	*0.1*	-
Quartzite	0	1	1	*4.6*	1	25	*4.0*	*4.0*
Veined chert	1	2	3	*13.6*	5	145	*2.1*	*3.4*
Chert	2	3	5	*22.7*	1	29	*17.2*	*3.4*
Other	1	1	2	*9.0*	0	28	*7.1*	-
Total	8	14	22	*(100)*	37	931	*2.4*	*4.0*

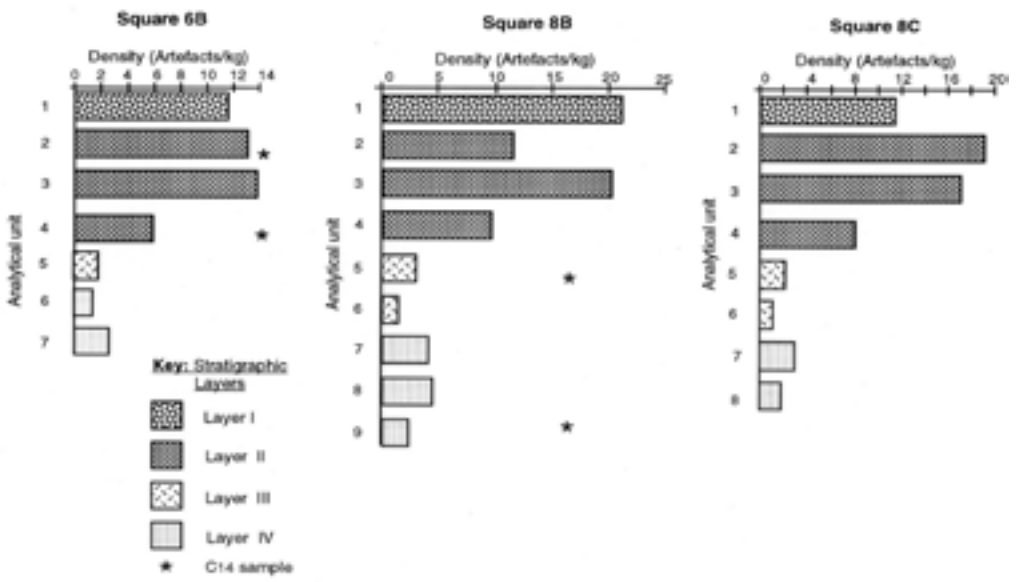


Figure 8.22: Artefact densities in the three analysed squares showing locations of the four radiocarbon dates.

Table 8.13: UDM Shelter. Age-depth calculations: artefacts per year.

Analytical Unit	Number of Artefacts	Number of Years	Artefacts/year
1	522	90	5.80
2	898	110	8.16
3	949	110	8.63
4	441	90	4.9
5	104	800	0.13
6	77	800	0.10
7	149	800	0.19
8	115	750	0.15
9	35	600	0.06

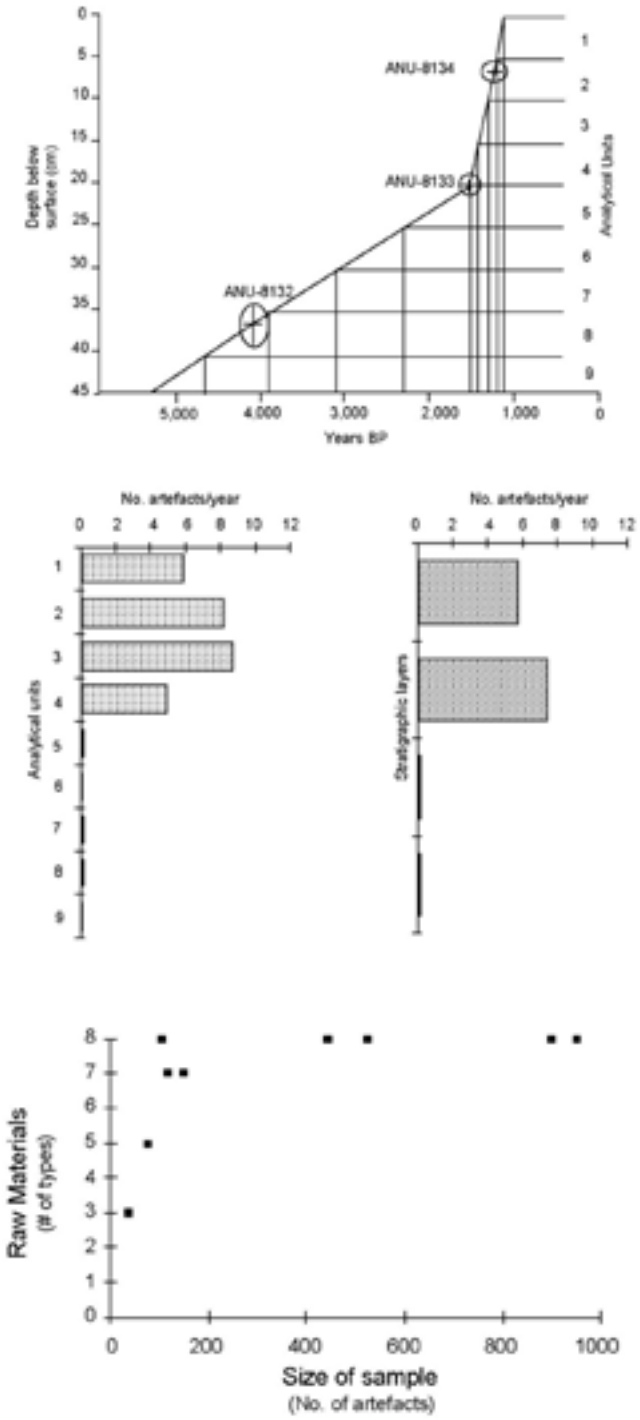


Figure 8.23: UDM shelter. Age depth curve and artefact accumulation rates by analytical and stratigraphic units.

Figure 8.24: Correlation between sample size and number of raw material types per analytical unit.

Raw Material

There are definite changes in raw material preferences over time. While there are differences in sample size between the earlier and the later assemblages, the sample sizes in the earlier units are sufficiently large (i.e. >100 artefacts per stratigraphic unit) to make meaningful comparisons. Given the biases inherent in smaller sample sizes, a correlation between sample sizes and raw material ranges was sought (Figure 8.24). There is no direct positive correlation between sample size and the range of raw material present – so sample size will not affect the interpretation of these results (James 1993). The data below are based on calculations for both total artefact numbers (Figure 8.25) and artefacts >1cm (Figure 8.26).

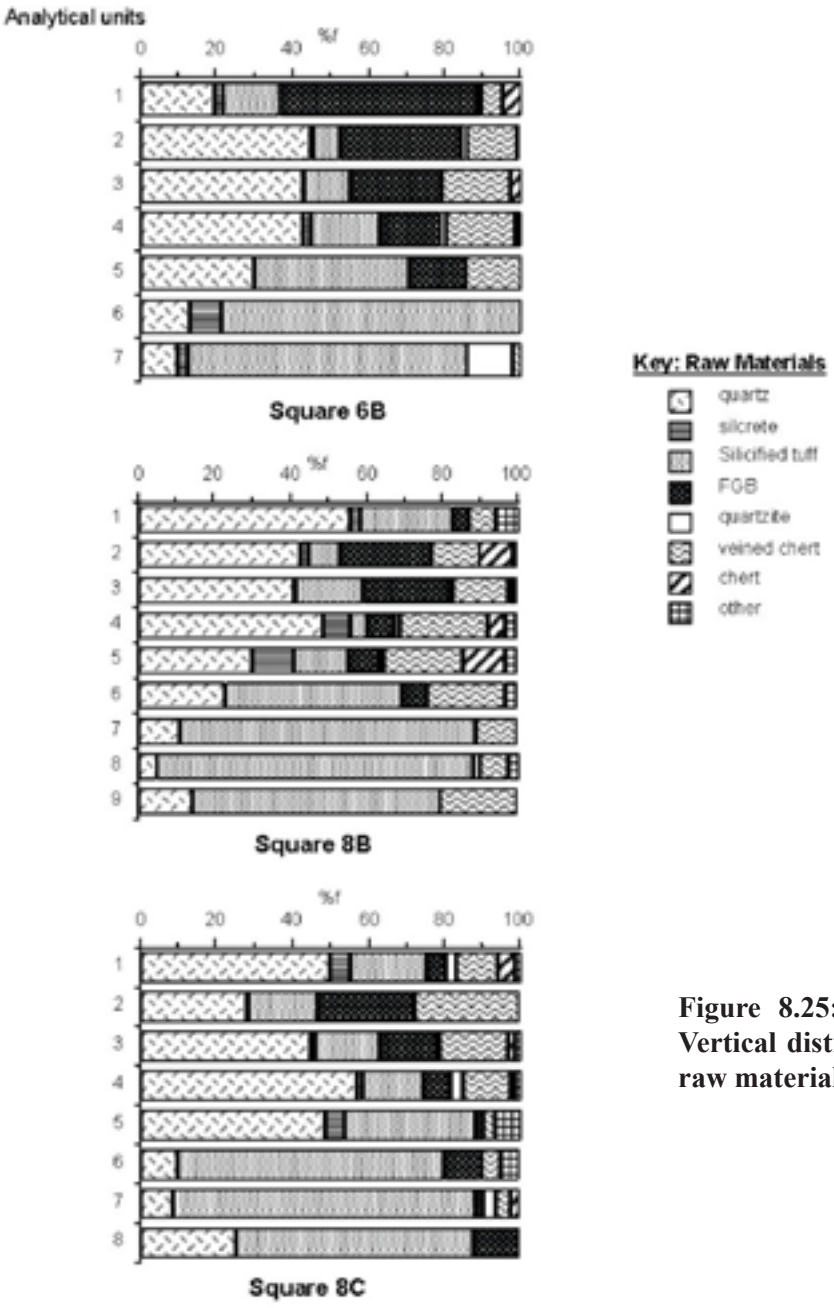


Figure 8.25: UDM Shelter. Vertical distribution (%f) of raw material. All artefacts.

In the earlier period of occupation, silicified tuff predominates and there is a more restricted range of raw materials generally. In the later period of occupation quartz gradually increases in use, while silicified tuff declines. There is a proliferation in the range of raw material being used. Some of these are not found at all in the earliest phase of occupation. The relationship between quartz and silicified tuff (Figure 8.27) is contrary to the divergent pattern which would be the expected result if sample size were responsible for raw material proportions (James 1993).

FGB material is notably absent from the earlier layers of deposit. While some micro-debitage of this material occurs in square 8C, it is virtually absent from the earliest layers. Based on this evidence, the earlier phase is presumed to predate edge grinding as a technique. Sample sizes in Layers III and IV are comparable, justifying this conclusion. This evidence, supported by the dates received, suggests that the earlier occupation is Early Bondaian or older (Attenbrow 2004).

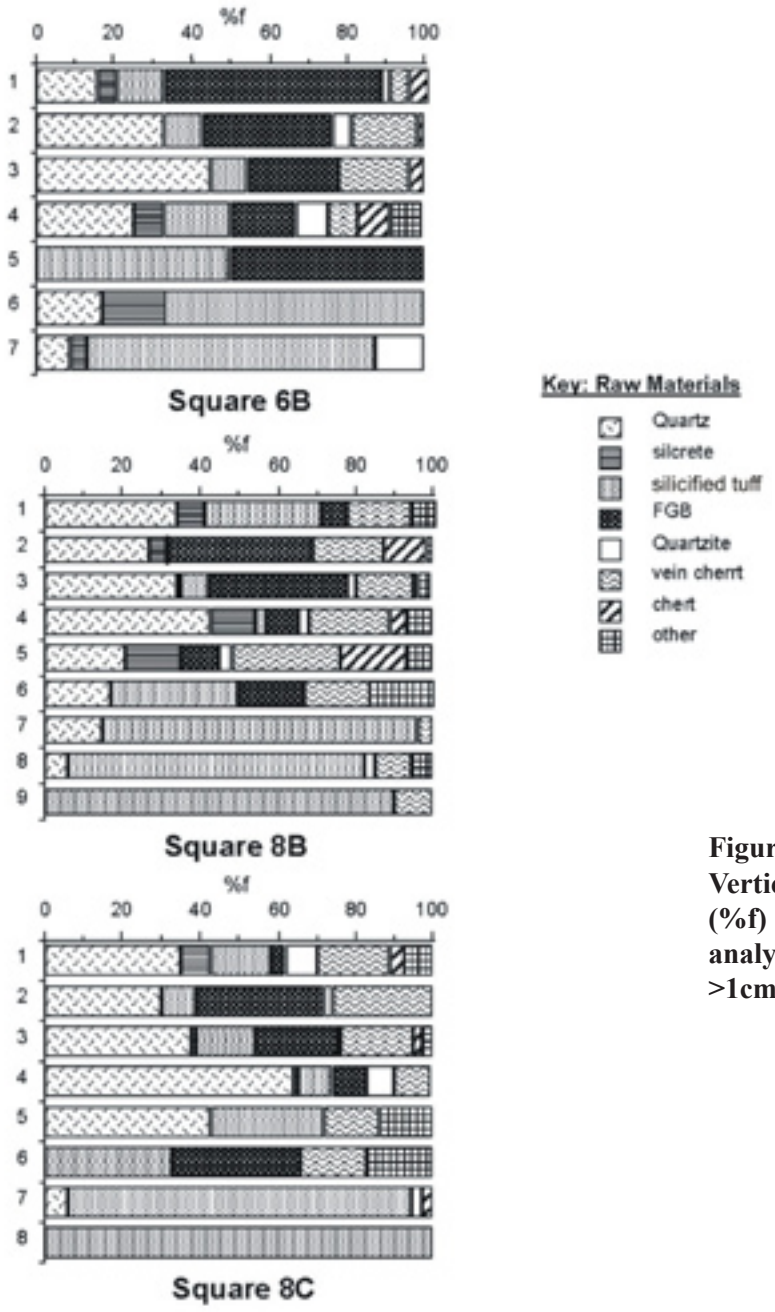


Figure 8.26: UDM Shelter. Vertical distribution (%f) of raw material per analytical unit. Artefacts >1cm.

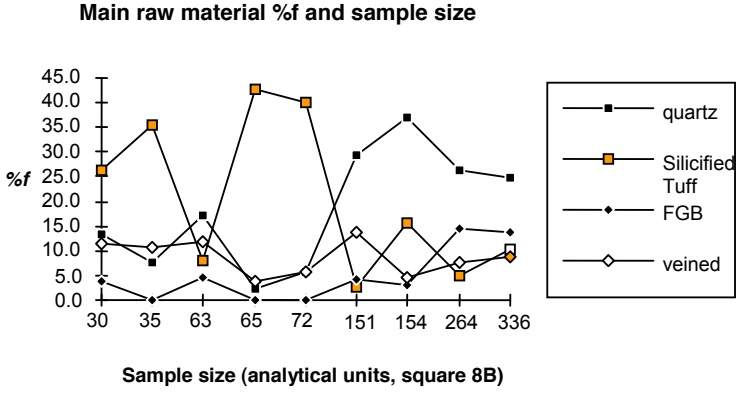


Figure 8.27: UDM. Raw material proportions plotted against sample size.

Table 8.14: UDM Shelter. Size ranges for backed blades and artefacts with retouch/ usewear per stratigraphic layer.

Stratigraphic layer	<1cm	1-3cm	3-5cm
I	1	3	-
II	-	11	-
III	-	1	-
IV	-	3	3

Table 8.15: UDM Shelter. Size ranges for cores per stratigraphic layer.

Stratigraphic layer	<1cm	1-3cm	3-5cm
I	-	2	-
II	-	23	5
III	-	-	2
IV	-	2	3*

*includes core with R/U

Size

As noted above, the majority of the lithic material at the site is very small. There are definite indications, particularly amongst artefacts with R/U and cores (all tending to be >1cm) that there is a general decrease in the size of the assemblage over time.

In stratigraphic layer IV, only larger artefacts with R/U occur; in Layers II and III all of the retouched artefacts are between 1-3cm, while in Layer I, most of these artefacts are 1-3cm long and the other is <1cm long (Table 8.14). Because of small sample sizes these items are discussed in terms of stratigraphic rather than analytical units. Cores show a similar general reduction in size with time. In Layer I, all are in the 1-3cm category; in Layer II the majority are in the 1-3cm category, while in Layer IV less than half are in this size category (Table 8.15).

The debitage indicates a similar trend of decreasing size with time (Table 8.16 and Table 8.17). While there is a general decrease in size with time, the two artefacts in the excavated assemblage which are >5cm occur in layers II and III. The artefact in Layer II consists of a porphyry (BP) flake, the only piece of this material at the site. The large artefact in Layer III is an FGB flake (with a broad platform and platform preparation). Both of these larger artefacts were found in square 8C.

Table 8.16: UDM Shelter. Raw material per analytical unit. All Artefacts.

Unit	Quartz	Silcrete	IM	FGB	Q'zite	V Cht	Chert	Other	Total
1	198	16	98	137	5	39	18	11	522
2	342	7	106	242	7	166	23	5	898
3	408	7	149	194	4	160	18	9	949
4	224	15	55	41	10	77	10	9	441
5	39	9	23	6	1	14	7	5	104
6	17	0	39	8	0	11	0	2	77
7	16	2	117	1	2	10	1	0	149
8	9	1	90	1	6	6	0	2	115
9	5		23		0	7			35
Total	1,258	57	700	630	35	490	77	43	3,290

During the earlier occupation periods at the site around half of the material was larger than 1cm, while in the more recent phases only 20-30% of the assemblage was this big. Micro-debitage may well indicate intensity of knapping activity. It has also been suggested (Hiscock 1986) that raw material and knapping technique may contribute to the amount of shatter in an assemblage, and that the change to bipolar technique is heralded by the very high proportion of small material in the later phases of the Eastern Regional Sequence. At UDM both bipolar quartz and indurated mudstone (knapped used a hand held technique) reveal a similar pattern in artefact size reduction between the earlier and later phases at the Upside-Down-Man Shelter. This tends to support the hypothesis of a greater degree of knapping *per se* in the upper levels.

Table 8.17: UDM Shelter. Raw material per analytical unit. Artefacts >1cm.

Unit	Quartz	Silcrete	IM	FGB	Q'zite	V Cht	Chert	Other	Total
1	31	7	22	28	3	14	3	5	113
2	60	3	12	71	4	41	9	3	203
3	111	3	32	75	4	50	8	7	290
4	81	10	11	15	8	23	4	6	158
5	9	4	2	3	1	9	5	3	36
6	1	0	5	4	0	2	0	2	14
7	8	2	60	0	1	2	0	0	73
8	4	1	48	0	4	3	0	2	62
9	0	0	9	0	0	1	0	0	10
Total	305	30	201	196	25	145	29	28	959

Artefact Type

Debitage

Platform characteristics of the 424 flakes and the shape of the 393 flaked pieces (i.e. all debitage >1cm) were analysed to investigate possible changes over time. Four types of platforms were distinguished on the flakes; broad ('B'), broad with evidence for platform preparation (i.e. platform remnant on dorsal surface; several scars on platforms - 'BP'), focalised ('F') and bipolar ('Bip'). Two types of flaked pieces were identified; amorphous ('Am') and lamellate ('Lamm') (see McDonald 1994: Appendix A3.1 for raw data; Appendix 8 for glossary of terms used).

The proportions and the changes in the proportions of these characteristics were investigated (Table 8.17; Figure 8.28). Detailed technological analysis was not undertaken, but the approach was based on the findings of the (then) recent work of Baker (1992), following Hiscock's (1986) approach to technological change during the Holocene. Baker's work had refined Hiscock's earlier model and determined that certain flake characteristics are sensitive indicators of technological strategies and change over time. He demonstrated that:

> the Sandy Hollow pre-Bondaian level SH1/5 is characterised by core rotation, a lack of platform preparation and ... low platform angles ... By contrast Phase I levels SH1/3 and SH1/4 are characterised by platform preparation and high platform angles typical of a blade based technology. Phase II levels SH1/1 and SH1/2 are characterised by focalised platforms which represent continued attempts to remove thin flakes or, more probably, blades from the core. (Baker 1992: 84)

Baker's analysis validated Hiscock's analytical approach at the Sandy Hollow site. However, he encountered difficulties using the approach to test for chronological phases in the Narama open site assemblages from the central Hunter lowlands (Rich 1992). There was no consistent association between any of the Sandy Hollow levels and the Narama assemblages, which, from their associations with backed artefacts and other flake and core characteristics, were clearly Bondaian in age (Baker 1992:84). Baker's analysis indicated that an abbreviated set of variables may as effectively allow different technological phases to be differentiated. The current analysis was attempted on the basis of that finding.

At UDM, focalised platforms are the most common form (43.6%), followed by bipolar flakes (30.9%) and broad platforms (23.1%). Platform preparation is relatively rare and was observable on only 10 flakes (2.4%). Lamellate flaked pieces (56.5%) are slightly more common than amorphous flaked pieces (43.5%: Figure 8.28).

The most consistent indicator of change over time is flake platform shape. The general pattern is one of a decrease over time in broad platformed flakes, with a concomitant increase in bipolar flakes. Focalised platforms are present in roughly the same proportions throughout the sequence although percentage figures for this platform type are consistently highest in the upper

layers (Table 8.18). Platform preparation appears to be present only in the early to mid occupation of the shelter.

Table 8.18: Platform characteristics over time. Frequency and %f per analytical unit.

Unit	Broad		BP		Focal		Bipolar		Total
		%		%		%		%	
1	8	*19.5*	0	*0*	27	*65.9*	6	*14.6*	41
2	11	*12*	0	*0*	44	*47.8*	37	*40.2*	92
3	25	*19.5*	0	*0*	51	*39.8*	52	*40.6*	128
4	9	*13.6*	1	*1.5*	27	*40.9*	29	*43.9*	66
5	2	*13.3*	2	*13.3*	7	*46.7*	4	*26.7*	15
6	4	*40*	1	*10*	5	*50*	0	*0*	10
7	17	*47.2*	5	*13.9*	13	*36.1*	1	*2.8*	36
8	20	*69*	0	*0*	7	*24.1*	2	*6.9*	29
9	2	*28.6*	1	*14.3*	4	*57.1*	0	*0*	7

With the exception of analytical unit 9 (where n=2), the proportions of lamellate to amorphous flaked pieces is generally consistent over time (Figure 8.28).

Cores

The 37 cores were analysed, with multiplatformed ('M'), single platformed ('S') and bipolar ('B') types being distinguished. The general proportions and changes in these characteristics were investigated and the results plotted (Figure 8.28).

Only bipolar (86.5%) and multiplatformed cores were found. The fact that no single-platformed cores were observed possibly reflects a conservation of raw materials by the knappers at the site: i.e. cores were used until exhausted, or at least more than once.

The sample size for cores is relatively small for considering temporal change at the site. However, with the exception of one bipolar core found in spit 8B/7, all the cores in the lower levels are multiplatformed while all those in the upper layers are bipolar (Figure 8.28). This pattern reflects the trend observed in the debitage for an increase in dominance over time in the bipolar flaking of (particularly) quartz.

Using the mosaic of platform characteristics over time, the assemblage is best interpreted as demonstrating two phases of knapping over time.

1. The earliest phase is characterised by the presence of mainly broad-platformed flakes although focal platforms are used; platform preparation and bipolar techniques are rare.

2 The subsequent phase shows a sharp increase in platform preparation and an increase in focal platforms. The bipolar technique becomes increasingly important. This phase represents the most intensive occupation (in which the highest discard rate occurred). Broad platforms occur in much smaller proportions. No platform preparation is in evidence. In the terminal phase of site occupation a decreased artefact frequency (and sample size) results in fewer bipolar pieces and an increase in focal platforms.

Backed Artefacts

Eight backed artefacts were found at the site. There are no raw material preference trends over the short period of their use (Figure 8.30). These were only found in the top five units: in Layers I, II and the top of unit III (Figure 8.29). The presence of this artefact type coincides with the period of maximum artefact density (and larger sample sizes), and the increase in quartz and the bipolar technique. Flakes with focalised platforms also predominate here, as expected with a technology geared to the production of backed artefacts.

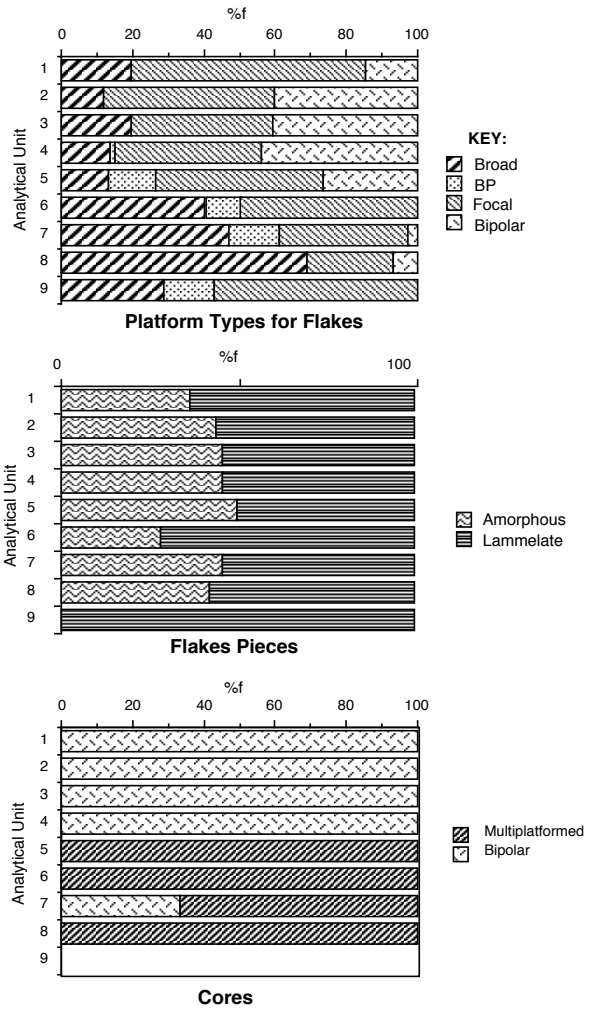


Figure 8.28: UDM Shelter. Platform, flaked piece and core types over time.

The presence of this tool type postdates the introduction of focalised platforms and flakes with platform preparation. This pattern is consistent with other excavated assemblages (e.g. Sandy Hollow), and would appear to indicate either a time lag in the appearance of this tool type after the appropriate technology had evolved, or that the production of backed blades was initially only a low frequency occurrence, leading to very low deposition rates for this rarer artefact type (i.e. a sampling effect).

Amorphously Retouched Flakes

Fourteen artefacts with retouch/usewear (R/U) were recorded from the three analysed squares. These were found in all analytical units except 5 (Figure 8.29). While there is a general decrease in the size of retouched artefacts with time (Table 8.14) and a trend in raw material preferences (i.e. from exclusively indurated mudstone to a proliferation of raw material types: Figure 8.30), there are few other artefact characteristics which are easily seen as changing throughout the deposit. With the exception of one core tool found in unit IV (spit 6B/7) the artefacts in this class can only be described as amorphously retouched pieces; there are no scrapers or any other diagnostic tool types present.

Table 8.19: UDM Shelter. Artefacts with R/U per stratigraphic layer. Platform and flaked piece types.

Layer	Broad	BP#	Focal	Bipolar	Amorph's	Lammel
I	-	-	1	-		1
II	1	-	2	1	-	-
III	2	-	1	-	-	-
IV*	2	1	2	-	1	-

*excludes core with r/u

broad platform with evidence of previous platform preparation

There are suggestions of trends in flake platform and flaked piece shapes over time, but the sample is too small to make much of these (Table 8.19). While the sample is extremely small, the trend indicated by the retouched material is similar to the general pattern found in the whole assemblage (Figure 8.29); i.e. a change over time from broad platform in the earlier deposit, to focal platforms and bipolar technique in the later deposit.

As with artefact density (Figure 8.22) and platform shapes (Figure 8.28) the vertical distribution of the artefacts with macroscopic R/U suggests two phases of site occupation. There are two peaks in the use of artefacts (Figure 8.29). The very low number of artefacts with R/U in Layer III suggests that this period represents some sort of hiatus in site usage, rather than a period

of very low density occupation. Again, low accumulation rates and smaller sample size in the lower units makes this interpretation difficult.

Grinding

As well as the ground edged hatchet collected in the dripline and the many grinding grooves located outside the sandstone shelter, grinding activity is documented by the presence of 63 fragments with ground facets in the deposit. They are all unmodified debitage and the distinctive colour ranges indicate that at least three edge-ground implements were broken up at the site. The three colours are black, blue-grey and brown-grey. While the blue-grey is found in both pits, black occurs only in square 6B, but the brown-grey is restricted to square 8 (Table 8.20). Only a small proportion of the blue-grey occurs in square 8, and it would appear that the focus for the knapping of the first two colours was in square 6B.

The vertical distribution of this material includes Layers I-III (Table 8.20), with the main concentration in the upper layers of Layer II (Figure 8.29).

Table 8.20: Colour distribution of ground FGB artefacts; as per stratigraphic unit.

Stratigraphic layer	black	blue-grey	brown-grey
I	3	3	
II	12	10	33
III	-	2	1
IV	-	-	-
	< Square 6B >		
		< Squares 8B and C >	

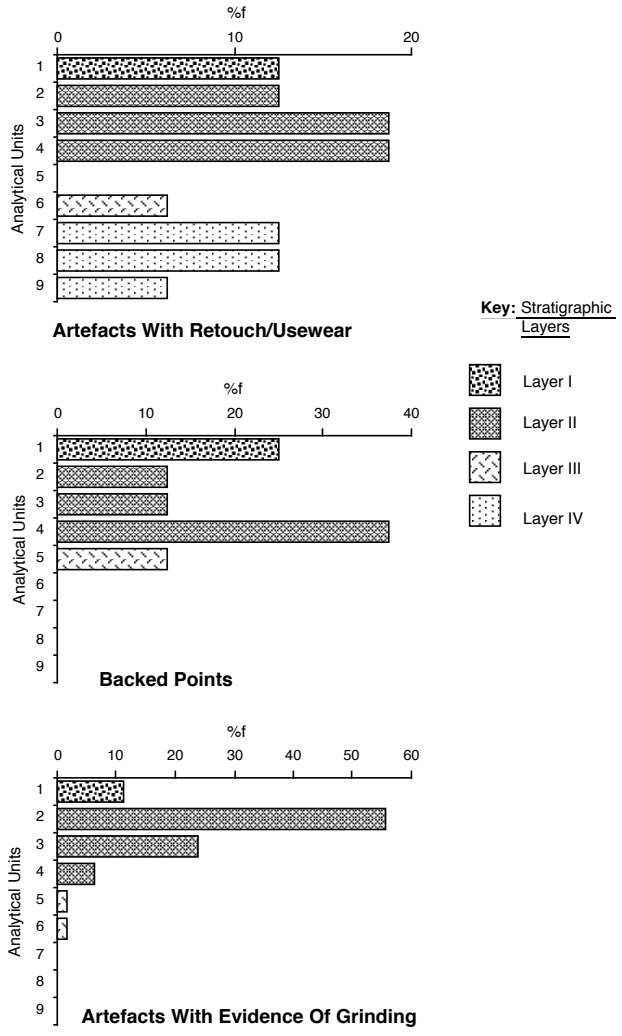
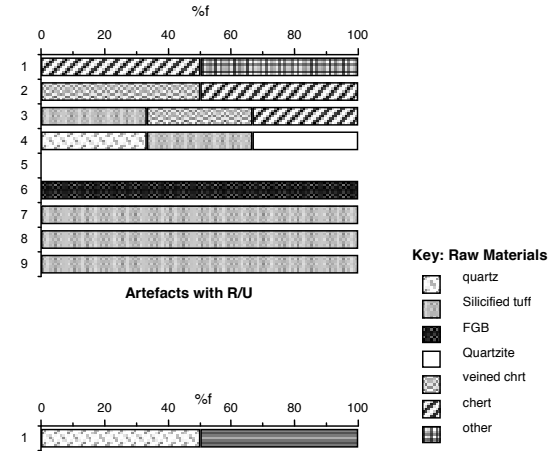


Figure 8.29: UDM Shelter. Vertical distribution of artefacts with retouch usewear, grinding and backed blades.



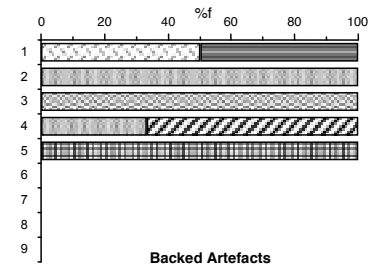


Figure 8.30: UDM Shelter. Modified artefacts and raw materials shown by analytical units.

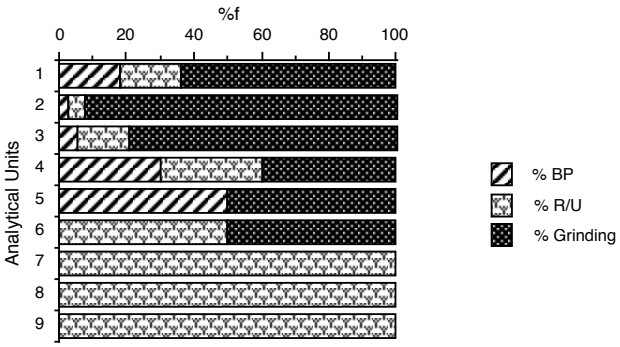


Figure 8.31: UDM Shelter. Proportions of modified material per analytical unit.

Discussion

The aims of this excavation and analysis were to determine:

1) the nature and timing of the occupation evidence at the site;

2) whether there were two or perhaps three phases of occupation evidence at the site (as suggested by the art);

3) whether the art was contemporaneous with the occupation deposit.

The first two aims were achieved by the excavation.

Contemporaneity has thus been argued on the basis of excavated and associated evidence. It had been hoped to resolve this issue more specifically – and charcoal samples were collected from two drawn macropod motifs at the site in the hope of dating these using Accelerator Mass Spectrometry (AMS). Four samples were collected (Figure 8.11, Figure 8.12) and submitted to the ANU Quaternary Dating Research Centre for processing. The dates returned on these samples were inconclusive and indicate sampling problems (McDonald 2000c).

Only one site with a large art assemblage, *Dingo and Horned Anthropomorph* (DHA), has been excavated previously in the Mangrove Creek valley (MacIntosh 1965). The analysis of this excavated material was cursory and not comparable to more recent work. The finds associated

with this art assemblage were reported as 'sparse'. It should be noted that the opportunity afforded by DHA for camping, in terms of flat, protected floor area, is limited.

None of Attenbrow's 31 excavated sites in Upper Mangrove Creek (UMCC) contained a major art assemblage. The largest UMCC art assemblage (Site #17) contained 61 motifs. The issue of differing site functions, then, could not be addressed without the excavation of a major art site with accompanying occupation debris. Characterising the occupation evidence at UDM was of additional interest.

Of further interest was a comparison of the UDM site with the results of Attenbrow's (1987, 2004) UMCC research. Attenbrow's defined patterns of site usage - over the last three millennia in particular - are of considerable relevance to the analysis of diachronic variability in the shelter art in this valley. All her sites were located in the upper reaches of Mangrove Creek, as was *Dingo and Horned Anthropomorph*. Patterns in the middle to lower reaches of this valley system test the wider applicability of Attenbrow's results.

As well as the specific UDM excavation aims, there was the broader aim of identifying how shelter occupation evidence associated with a large art assemblage fitted into Attenbrow's scheme for the prehistoric use of Mangrove Creek valley. Significant differences in art site content in the Mangrove Creek Valley have been identified (cf. Gunn 1979; Attenbrow 1987; and McDonald 1988a) raising questions about the stylistic variability inherent in any particular catchment. The diachronic art analyses undertaken for this research used the art from the wider Mangrove Creek catchment. Because Attenbrow's excavated data was derived almost entirely from sites with 'minor' art assemblages, there was a need to investigate occupation evidence from a major art site. The UDM shelter fulfilled both criteria of art assemblage size and geographic location.

The Archaeology of Mangrove Creek

A Sydney-wide regional perspective of the archaeological context is discussed in detail in chapter 4. Here the archaeology of the Mangrove Creek valley, particularly in its upper reaches (Attenbrow 1981, 1987, 2004) is discussed. The art from this valley has also been the focus for considerable previous interest and research (Gunn 1979; McDonald 1987, 1988a; Smith 1983;Vinnicombe 1984). Because of this prior research focus, the art of this drainage basin is used to exemplify diachronic change in the Sydney region. More than 80 shelter art sites have been recorded from this catchment, 65 in sufficient detail for further analysis. Many of these sites were located as a result of a stratified random sampling procedure (Attenbrow 1987, McDonald 1988a). This sample of shelter art sites represents one of the most systematically collected in the region. With the detailed archaeological context provided by Attenbrow's excavations, the shelter art of this valley appeared ideally suited to answering questions of the context and contemporaneity of shelter art with general occupation evidence. The exact nature, direction and timing of changes in the archaeological record, particularly occupation indices, were of considerable interest.

This current analysis has used a combination of (the modified) Hiscock, Baker and Attenbrow approaches to determine the nature and timing of change at Upside-Down-Man. Before discussing the specifics of artefact change at UDM, however, the general pattern of change in the Upper Mangrove Creek (UMCC) are outlined.

UMCC

To measure quantitative change, Attenbrow converted into indices the number of habitations (excavated shelter sites) used and the artefact accumulations within these. Indices used were the rate of habitation establishment and use over time and the rate of artefact accumulation. Rate was calculated as frequency per millennium for each factor.

Attenbrow identified highly variable patterns of individual habitation (site) usage and thus averaged the catchment's data to demonstrate generalised patterns and to quantify local characteristics. She found that while there was a continuing increase in the number of habitations

established and used in successive periods of time, there was a substantial decrease in the local artefact accumulation rates during the most recent phase and last millennium. She also identified that the onset of quantitative changes and the introduction of changes in typology, technology and lithology did not necessarily coincide. Two scales of temporal change were achieved by using millennial increments as well as typological phases. Attenbrow concludes that:

> using the millennial increments as the basis for the temporal sequences, results in a more accurate representation of the trends in the [intensity] indices, than does the use of the typological phases. ... The main implication is that each aspect of the archaeological record is likely to have its own trajectory and temporal sequence, and therefore should not be presented in terms of previously constructed sequences designed for other purposes. (Attenbrow 1987: 214)

Sampling Issues

Attenbrow's habitation indices were based on artefact analysis and radiocarbon dates from eleven sites. The identification of phases within the assemblages at the remaining 20 sites was achieved on typological grounds (i.e. the presence/absence of particular artefacts etc.). The typological data that Attenbrow analysed are in summary form in her thesis but vertical distribution data was provided only for Loggers and Mussel shelters (Attenbrow 2004: Table 4.6).

Data for Attenbrow's Phase 4 sites (Attenbrow 2004: Table 6.2) indicates that certain sampling problems are inherent. The classification of assemblages in this time period was based both on the depth of deposit and the typological characteristics of the assemblages (Attenbrow pers. comm.). Small sample sizes are an issue.

Should the absence of backed implements be considered sufficient evidence for Phase 4 occupation? It would seem that the absence of this artefact type most clearly distinguishes Attenbrow's Phase 3 from Phase 4. The designated Phase 4 sites all contain less than 25 artefacts *in toto.* The percentage frequency of backed artefacts at sites with large assemblages is between 0.2-0.9% (at the five sites with >1000 artefacts; 2004: Table 4.6). Thus the probability of locating backed artefacts in such small assemblages would be extremely low (~0.025 backed blades would be expected in an assemblage with 25 artefacts). The absence of backed artefacts in the assemblages for the vast majority of Attenbrow's most recent sites may be due to no more than sampling bias.

Because the majority of UMCC Phase 4 sites have extremely small assemblages, doubt is also cast upon the calculations of artefact accumulation rates over time and the conclusion that this rate dropped significantly in the last millennium. Similarly, the rates of shelter establishment could also be affected by this unfounded placement of sites into the later parts of the sequence.

Rates of artefact accumulation were based on the estimated total number of artefacts in an archaeological deposit and on the estimated total number within each spit/phase/millennium. Estimated artefact totals were (quite reasonably) used 'to avoid problems associated with inter-site variability' (Attenbrow 1987: 202) and in an effort to make comparable disparate data sets. Estimates were based on mostly very small and very different sized samples. At most sites (68%) between one and four 50cm x 50cm test pits were excavated, representing <3% of the total floor area. At only two sites (Loggers and Black Hands) was more than 10% of the floor area excavated (Attenbrow 2004: Table 3.5). The number of stone artefacts retrieved from sites also varied enormously, ranging from 1-30 artefacts at 15 sites to more than 7,000 at another site.

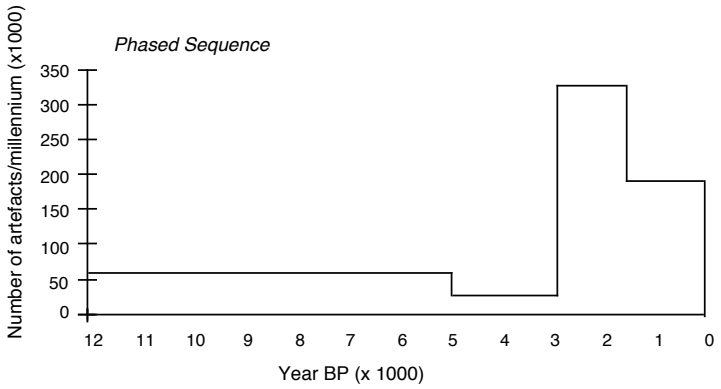
The index for artefact accumulation rates appears to have the most problems, since the method for calculating this is subject to more sources of potential error than that for habitation establishment. However, the classification of assemblages into typological phases on the basis of extremely small sample sizes, for the majority of Attenbrow's sample, also has the potential to have skewed the results towards a proliferation of sites with low artefact numbers (and therefore low accumulation rates and late establishment dates) in the most recent millennium.

In order to establish if these sampling problems have affected Attenbrow's patterns, her data were re-analysed using only the seven larger sites (i.e. >100 excavated artefacts).

This testing confirmed the general pattern of Attenbrow's results for artefact accumulation rates particularly in the most recent millennia (N.B. however the reversal indicated between Phases 1 and 2). However, it revealed very different patterns in terms of the habitation indices (Table 8.21, Table 8.22; Figure 8.32, Figure 8.33).

Table 8.21: UMCC Sites with >100 excavated artefacts. Reworked estimated artefacts totals in successive periods of time (Attenbrow 2004: Table 6.7).

Site	Phase 1	Phase 2	Phase 3	Phase 4	Total
Loggers	63,000	5,600	22,950	36,450	128,000
Uprooted tree	800	3,250	4,650	22,500	31,200
White figure	500	2,100	19,250	15,250	37,100
Sunny		3,600	38,550	46,050	88,200
Emu Tracks 2		14,500	199,000	36,100	249,600
Black Hands		950	41,700	34,350	77,000
Delight SH			3,200	1,800	5,000
7 UMCC habitations	64,300	30,000	329,300	192,500	616,100
UDM	17,588	10,677	165,294		193,559
Mangrove Ck Tot	81,888	40,677	494,594	192,500	809,659



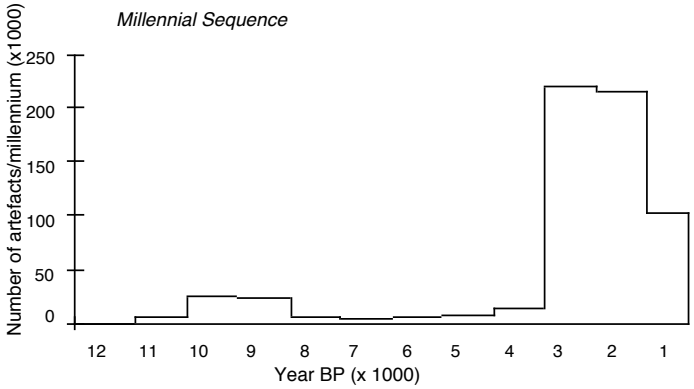


Figure 8.32: Reworked UMCC data. Local rates of artefact accumulation in successive periods (cf. Attenbrow 2004: Table 6.9).

As indicated by Attenbrow's results, artefact accumulation peaked in Phase 2 (particularly between 3,000 and 1,000 years ago), followed by a decrease in the last millennium.

The re-calculation of habitation indices, albeit based on a considerably smaller number of sites, indicates that there was a low establishment rate up until c. 4,000 years ago. After the third millennium, no new shelters were established. The pattern revealed by number of habitations in use over time is like that achieved by Attenbrow, although there is no increase, by these re-calculations, in either the last 2,000 or 1,000 years. This index shows a consistent or stable use of the same shelters over the last three thousand years.

Table 8.22: UMCC Sites with >100 excavated artefacts. Reworked estimated totals of artefacts in successive periods of time: subsequent millennia (Attenbrow 2004: Table 6.13).

Site	12th	11th	10th	9th	8th	7th	6th	5th	4th	3rd	2nd	1st
Loggers	150	3850	24,100	23,200	4,300	3,650	3,550	4,150	5,850	7,000	11,800	36,450
Uprooted tree				50	200	300	850	1,150	1,300	2,350	13,050	12,050
White Figure							300	450	1,550	11,550	17,250	6,000
Sunny								300	2,100	13,950	55,850	16,050
Emu Tracks 2									3,650	165,200	66,300	14,450
Black Hands									100	16,050	46,300	14,600
Delight Shelter											2,650	1,100
Total UMCC	150	3850	24,100	24,100	4,500	3,950	4,700	6,050	14,550	217,350	213,200	100,700
UDM									17,588	10,588	165,294	0
Mangrove Creek Total	150	3850	24,100	24,100	4,500	3,950	4,700	6,050	32,138	227,938	378,494	100,700

Discussion

One of Attenbrow's most significant findings was the marked contrast between:

i) the substantial decrease in the local artefact accumulation rates during the most recent phase and millennium; and,

ii) the persistent increase in both the rates of occupation establishment and numbers of habitations used over time.

The re-testing of Attenbrow's data using only sites with reasonable sample sizes does not support this contrast. The pattern would appear to indicate stability over the last 3,000 years in the habitation indices, while supporting a decrease in artefact accumulation in the established shelters in the last millennium.

This pattern does not suggest the same degree of mobility or increase in the territorial range over the last 2,000 years as the occupation mosaic proposed by Attenbrow. It does however emphasise the decrease in shelter site usage - or at least the deposition of stone artefacts - in the last millennium.

Another of Attenbrow's important conclusions was the unsynchronised nature of changes in the occupation indices. She argued there was no coincidence in the timing of the typological phases with either artefact discard rates or the numbers of shelter being used. The re-calculations done here do not support this finding. Rather they show a major coincidence in typological changes (to the Middle Bondaian) with an increased artefact discard rate and increasing number of shelters being used. The peak millennium for habitation establishment appears to be the fourth, predating the typological change and increase in artefact discard rate. But these different sources of evidence all appear to support a proliferation of activity and possibly a major social change at the beginning of the third millennium.

On the basis of these results the following model for the catchment is proposed.

The period of most intensive shelter usage in the valley appears to have been between 3,000 and 1,000 years ago, when enormous numbers of artefacts were deposited within shelters. The

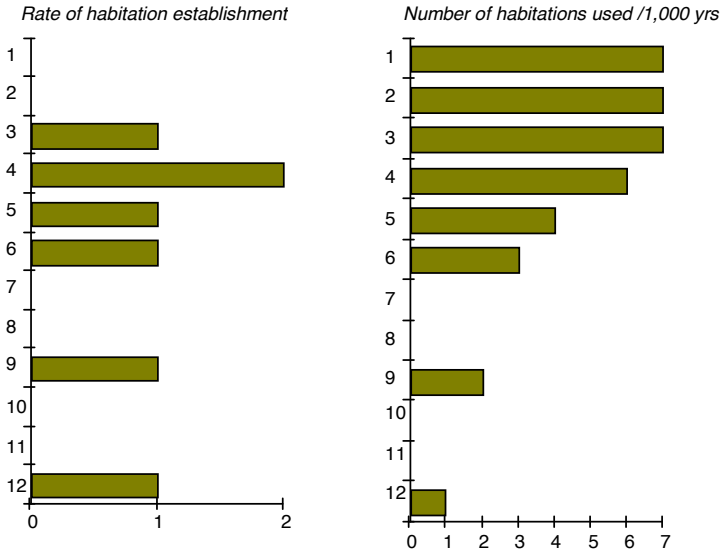


Figure 8.33: UMCC reworked data. Rates of habitation establishment and habitation use in the seven sites with >100 excavated artefacts (cf. Attenbrow 2004: Figure 6.2).

beginning of this major increase coincides with the beginning of Phase 3, when backed blade production was at its peak and the assemblages began to be dominated by bipolar flakes of (particularly) quartz. This peak period slightly postdates an increased habitation establishment rate, but coincides well with the beginning of a relatively stable period of shelter occupation.

The local artefact accumulation rate drops significantly in the last millennium, while the rate of habitation usage remains consistent. People continued using their established shelters but they deposited less artefacts within these locations. All three indices suggest that over the last 3,000 years there was an increased use of shelters. On the basis of artefact accumulation rates it would appear that the use of shelters as foci in the landscape - for stone tool manufacture or discard at least - declined in the last millennium.

Morwood (1986) identified a similar pattern at Gatton in SE Queensland in the last millennium. As well as decreasing artefact discard and the disappearance of backed blades and 'barbs', he noted that;

> increased rates of faunal, charcoal and sediment deposition indicate that the site was being used more intensively, while late increases in faunal diversity show a broadening of the resource base, with more extensive exploitation of a wider habitat and species range. ... general changes in the technology of predation are suggested. (Morwood 1986: 117)

He concluded that;

> Given the integrated nature of subsistence settlement systems, there are likely to have been associated changes in other components such as group size, frequency of site occupation, duration of occupation and inter-site distribution of activities. (Morwood 1986: 117)

Two of Attenbrow's shelters (Loggers and Mussel) contained significant faunal remains (Aplin 1981, Attenbrow 2004: 70, 92). Neither of these sites showed the same pattern as that found at Gatton.

Loggers revealed a contrary pattern both to the Gatton shelter and to general trends in the UMCC: an increased deposition rate for artefacts in the top spits - dated to the last millennium[26]. While sedimentation was fairly constant over time, there is an increase in organic matter in the top 30cm of deposit, coinciding with increased artefact density (Hughes and Sullivan 1979: Figure

[26]Three geometrics were found in spit 2 which was dated to 780 ± 80 BP (SUA-1124). Attenbrow has classified the two upper spits at Loggers as Late Bondaian on the basis of the date and not on artefact typology. [Attenbrow has reported that reanalysis of artefacts originally identified in spit 2 as eloueras, has revealed that these had been incorrectly identified; pers. comm. 1994]. The Logger's artefact density and typological data (Attenbrow 1981: Table 6.6) suggests that spit 2 could more properly be assigned to the upper level of the Middle Bondaian layer, supporting a later changeover date for these two Phases (like UDM and Yengo 1). With a reclassification of spit 2, Loggers shelter would no longer anomalous in terms of increased artefact accumulation rates in Phase 4.

10). Charcoal was collected only for dating purposes at Loggers (Attenbrow 1981: 64) so no analysis of changing proportions of this component was undertaken.

Aplin described a proliferation of faunal remains and increase in the number of species in the most recent unit (319 individuals; 23 species) compared with the preceding, Middle Bondaian, unit (66 individuals; 14 species: Aplin 1981: 25; Table 4). Unit I contained new species from both 'wet' and 'dry' environmental conditions. While he does not draw the conclusion, it could be inferred that these species indicate a broader resource range in the most recent period. Aplin does point out that there is a decrease in the relative abundance of large macropods in the most recent level, this being 'compensated by an increase in the abundance of smaller macropods as well as in the introduction of several smaller species not previously present amongst the assemblage e.g. bandicoots, wombats etc.' (Aplin 1981: 23-5). Thus while the artefacts do not conform, patterns identified by Morwood (increase in organic content, late increase in faunal diversity) are suggested at Loggers.

At Mussel, where the top unit is clearly (typologically) late Bondaian there is a sharp decrease in artefact densities. Hughes and Sullivan (1979: Appendix I) identified an increase in organic matter in the top spits. This shelter then would appear to support Morwood's conclusions: a decrease in artefacts in the most recent deposit during a period of increased sedimentation. Aplin, however, determined a concomitant decrease in faunal remains between the middle and top units (1981: Table 7). He also identified that the species in the middle unit are predominantly from 'dry' environments while those from the upper unit are from 'wet' environments.

Interpretation of the Upside-Down-Man site

The initial occupation of the UDM site took place around 4,000 BP. This was relatively ephemeral with low artefact deposition rates. Raw material preferences were restricted, with silicified tuff (known as 'indurated mudstone' in 1994 and 'chert' in Attenbrow's classification) predominating. Later occupation was more intensive and is marked by the introduction of backed implements and a focus on bipolar knapping of quartz. Backed implements were in use throughout the later occupation of the shelter, which appears to have been abandoned before the start of the last millennium.

Based on the assemblage's typological characteristics, and compared with Attenbrow's diagnostic traits, the earlier occupation appears to have taken place during Phase 1, while the later occupation would appear to be Phase 3 (compare Table 8.21 with Figure 8.22 to Figure 8.25). A period of even lower occupation between these two 'phases' (analytical units 5 and 6; Stratigraphic Layer III) may represent a hiatus in site usage, but could also represent Attenbrow's Phase 2: the absence of backed and ground material may be the result of low sample sizes (Table 8.16 and Table 8.17). FGB does occur within Layer III but ground fragments are found only at the top of this Layer and these are demonstrably part of the knapping event focussed within Layer II. There is no Phase 4. Backed artefacts are present in spit I and the terminal date for the site (at 6.5cm depth) was 1,220 ± 120BP.

Using the modified Hiscock approach (Baker 1992), the assemblage characteristics throughout the site's usage are similar to that found by Hiscock at Sandy Hollow (SH1). At UDM there is the additional use of the bipolar technique. The earliest UDM phase is characterised by a lack of platform preparation (viz. SH1 Pre-Bondaian levels). The assemblage in Unit III is characterised by platform preparation (viz. SH1 Phase I Bondaian levels), while the most recent UDM assemblage is characterised by focalised platforms (Figure 8.28).

While the typological analyses indicate that the site was occupied by knappers during Attenbrow's Phases 1-3 (Hiscock's Pre-Bondaian and Phase I and Phase II Bondaian) the dates for UDM are not in accord with the dates from Sandy Hollow, nor within the time frames set by Attenbrow for these Phases in Upper Mangrove Creek. The inherent inaccuracies of the SH1 dates (Hiscock 1986: 42) means that this discord in dating is not problematic. The differences with the general trends outlined by Attenbrow, however, require further discussion.

The UDM Phase 1 material is more recent - by at least a millennium - than any Phase 1 material excavated by Attenbrow. Similarly, the Phase 3 assemblage fits better into the time frame for Attenbrow's Phase 4, starting as it does before Attenbrow's transition date of c. 1,600 BP and continuing until c.1,200 BP.

Assemblage Size and Characteristics

In comparing UDM with the UMCC sites, assemblage totals only will be used. In terms of lithic assemblage size, UDM is a major site. A total of 3,550 artefacts was retrieved from the five test pits, making it the third largest assemblage excavated in the Mangrove Creek Valley (Attenbrow 2004: Table 4.6). A projected artefact total of 193,559 artefacts is calculated for UDM based on the 2.8% sample excavated and 1.7% sample analysed (Table 8.21). On this basis the site is the second largest in the catchment after Emu Tracks 2 with a projected 249,600 artefacts (Attenbrow 2004: Table 6.13).

Artefacts with retouch/usewear and backed artefacts are relatively rare at UDM (0.4% and 0.3% of the assemblage respectively: Table 8.11). These figures are indeed extremely low when compared with Attenbrow's data (i.e. only those five UMCC sites with >1,000 artefacts). Artefacts with retouch/usewear represent between 0.6-1.9% of the UMCC assemblages, while backed artefacts represent between 0.2-0.9% (Attenbrow 2004: Table 4.7). At UDM, then, while backed blades fall towards the low end of the expected range, artefacts with retouch/usewear are notably lower. Conversely, ground fragments commonly occur only as very small percentage frequency of the larger assemblages (between 0.1-0.7%). At UDM this artefact type represents 1.9% of the artefact assemblage, significantly more than any other site.

Artefact Accumulation Rates

Artefact accumulation rates at UDM were calculated on the basis that Unit II material accumulated in roughly 1,000 years, while the deposit in units III and IV accumulated in roughly double that time, 2,000 years (Figure 8.23: ignoring sample ANU-8133 a constant sediment accumulation rate prior to unit II is assumed based on the age-depth curve). The floor area estimated to have depth of deposit is 45 square metres. The excavations represented a 2.8% sample of this deposit while the analysed data represents a 1.7% sample. Based on these figures and on the artefact totals retrieved (three analysis squares), the estimated artefact accumulation rates for UDM were calculated (Table 8.23).

Attenbrow's analyses identified a highly variable pattern of individual site usage amongst her sample of 31 sites. Comparison of UDM with her 31 sites in terms of artefact accumulation rates reveals that this site is not the same as any other site in UMCC. The site is immediately differentiated on the basis that it has no Phase 4. It would appear to be the only shelter in the catchment which, once established, was not occupied into the last millennium.

Table 8.23: UDM: Rates of Artefact accumulations in successive phases.

Layer(Phase)	Artefact total	Estimated Total	Rate of accumulation*
Units I+ II (Phase 3)	2,810	165,294	165,300
Unit III (Phase 2?)	181	10,677	10,700
Unit IV (Phase 1?)	299	17,588	17,550
Total	3,290	193,559	

*Rate calculated /1,000 years; rounded to nearest 50 (following Attenbrow 1987: Table 7.8)

Comparing this site with the re-calculated data, it in fact accords well with the general UMCC trends. The site is established in the fourth millennium, the peak identified in the other main shelters (Figure 8.34), and the major period of artefact deposition was in Phase 2, albeit later than predicted by Attenbrow's dated sequence.

A re-working of the artefact accumulation rates and habitation indices, including the UDM assemblage, provides a slightly different pattern for the Mangrove Creek Valley (Figure 8.35). A later date for the Phase 3/4 transition is proposed on the basis of the UDM shelter. This re-worked habitation pattern is tested, in the diachronic analysis of the Mangrove Creek shelter art sites (Chapter 10).

Hatchets and grinding technology

A notable feature of the site's artefact assemblage is the evidence for the breaking up of three edge-ground hatchets. These fragments (63), as evidence for this technological component, are present in far higher proportion than elsewhere in the Mangrove Creek catchment. The small size of this material (43% < 1cm in size) indicates that these ground items were knapped in the vicinity of Squares 6 and 8. From the absence of use-wear and /or retouch on any of the larger broken up pieces, it would appear that this knapping was completed for the purpose of breaking up or reworking these implements.

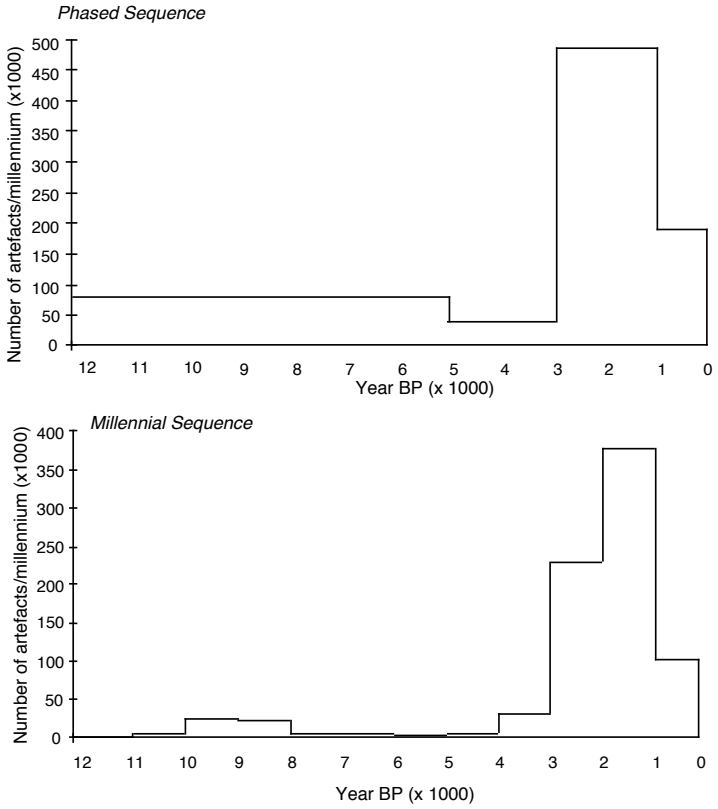


Figure 8.34: Mangrove Creek Valley. Rates of artefact accumulation in successive periods. Attenbrow's seven large sites plus UDM (cf. Attenbrow 1987: Table 7.9 and Table 8.22).

A ground edged hatchet (Figure 8.19) was found at the site and the sandstone 'ramp' outside the shelter has a large collection of grinding grooves. Several more groups of grooves (with up to 20 in each group) were observed around a number of potholes on sandstone surfaces within 100m of the site.

Clearly, edge-grinding technology was used by the inhabitants of Upside-Down-Man during the most recent phase of its occupation. This use included the maintenance or breaking up of previously ground implement.

While stencilled hatchets are found elsewhere in UMCC, no stencilled hatchets occur in the UDM art assemblage. On Panel 1, however, a red anthropomorph is drawn with a red axe (Figure 8.7). An association can be drawn on this basis between the more recent phase of occupation deposit and with the production of the red outlined and infilled motifs on Panel 1.

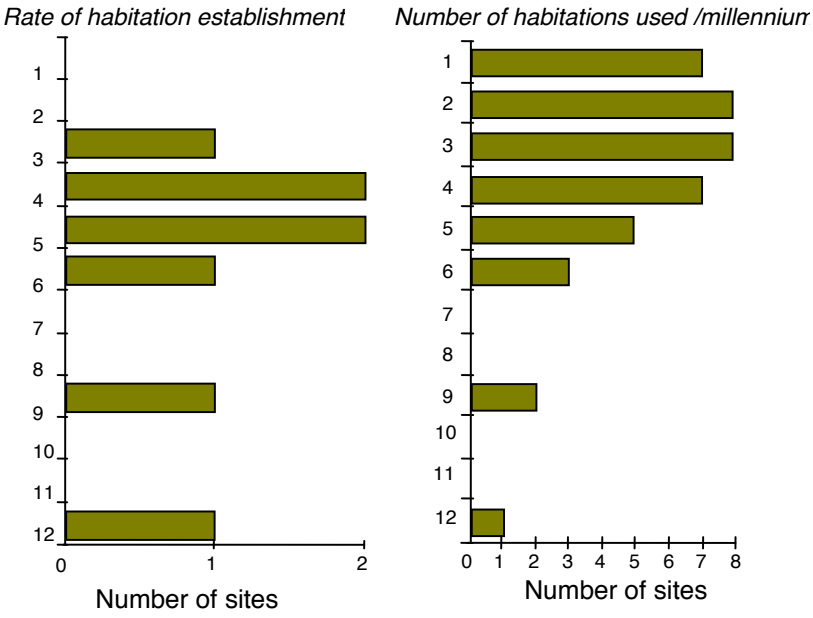


Figure 8.35: Mangrove Creek Valley. Rates of habitation establishment and habitation use in the eight sites (including UDM) with >100 excavated artefacts (cf. Attenbrow 1987: Figure 7.11).

The art and the occupation evidence

Very little ochrous material was retrieved from the site. And none of the red ochre or pipeclay retrieved bore evidence of use. The absence of faceted usewear evidence on this material makes definite correlation between the art and deposit tenuous. Certain points can be made about this material, however.

1. None of the excavation squares were directly below art panels. The presence of art producing material in the general floor area is considered to be fortuitous and less likely than in close proximity to the art panels.

2. These materials do not occur naturally in the shelter, and therefore must have been brought to the shelter during its occupation history.

3. All possible art producing material is confined to the top three spits of the deposit.

4. Ochre was recovered from only one of the shelters in UMCC, and this site had no art (Attenbrow 1987: Tables 5.5; A3/1).

While there is no evidence that the pipeclay and red ochre were used in the production of art, this conclusion is not unreasonable. Both colours are found amongst the art. While the colour of the pigment recovered is quite distinctive, the red-coloured motifs at the site vary considerably. On Panel 1, the red is mainly tomato red, with some more cherry hues (Munsell colours were used in the recording of the art: see McDonald 1994; Appendix 3.3). On Panel 2, the red is mainly dark cherry red, while the large red shields on Panel 3 are more tomato coloured. Panel 5 contains the widest range of reds. The 'oldest' wet infilled motifs are a dark brown red; the red anthropomorphs with head-dresses are dark cherry red; the CXNF motif is dark carmine; while the red outline macropod is dark crimson.

White pipeclay appears to have been used late in the art production sequence at the site. It is found as an outlining material to both black and red bichrome motifs; in the white hand stencils, the white outline paintings and in the white painted blobs found in Panels 4 and 5 (see photographs). The four fragments of this material found in square 6B/3 are from below an intact hearth (dated to 1,220 + 120 BP). The use of this ochrous material is firmly placed within the most intensive period of site usage.

The two pigment fragments in 4D/1 produce the same colour red (5R 3/6) as the painted boomerang and stick figure on Panel 1 - and the red outlined macropod on Panel 5. The boomerang motif appears to be associated with a dry outline/infilled anthropomorph (i.e. is positioned as if in the hand of the anthropomorph: Figure 8.4), while the red stick figure is superimposed by the red woman motif. On Panel 5, the motif in this colour is beneath a painted white outlined macropod.

The depiction of a hafted hatchet in the hand of an anthropomorph on Panel 1 and the presence of edge-ground fragments in the upper units at the site provides another correlation between elements of the art and features of the occupation deposit.

The faunal remains at the site provide no such correlation. These are too highly fragmented to allow identification, but are almost without exception from very small species. There are not, for instance, any large, medium or even small macropod bones present amongst the faunal remains, such as would 'match' the depiction of such species amongst the art.

A direct link to the people who created the art is provided by the hand stencils. These were not measured (and engendered information is thus difficult of ascertain: see the Mount Yengo excavation chapter). During recording of the art assemblage it was noted that these filled a range of sizes which included children, adolescents and adults.

Other than in terms of stone tool production, the deposit provides scant insight into the lifestyle of the site's occupants. The plant remains suggest medicinal use (senna, sarsaparilla) as much as food sources (native cherry, Geebung), and these remains are too few to be other than highly speculative. Both the native cherry fragments indicate breakage and/or gnawing, which suggests that these two items may have been introduced to the deposit by small herbivores. The other plant remains appear to have been humanly introduced into the deposit (mainly on the grounds that none of the other species concerned was observed in the immediate vicinity of the shelter mouth at the time of excavation). Those remains in 8B/3 and 6B/5 (particularly) had a highly carbonised appearance under the microscope, and looked different from the comparative specimens at the Seeds Lab. It would seem unlikely that these have been introduced into the deposit recently, and had worked their way down into the deposit (and this scenario is not supported given the interpretation of stratigraphic integrity of the deposit). Of course this does not discount their natural introduction into the site some time during its prehistory. The small amount of shell in the deposit also provides a glimpse of the ranges covered by the shelter's occupants in their quest for food. The nearest estuarine conditions necessary for *Anadara* are around four kilometres from UDM, while the hairy mussel may have come from rocky shores of the Hawkesbury River. Freshwater mussel could have been collected from closer to the site, in deep pools on Ironbark Creek.

The AMS samples

The black outline macropod motif on Panel 1, from which three AMS samples were collected, is clearly superimposed over the red art on this Panel. It would appear from the superimpositionning analysis of this Panel, that this was one of the final motifs created on Panel 1. It was hoped that the dates from this motif would provide a minimum date for the final period of art production at the site. The other macropod motif, from which one sample was collected, is not in direct association with any other techniques/motifs. It is however one of series of similar motifs, which occurred relatively early in the art sequence, beneath incised motifs, white hand stencils and white outlined motifs. It was hoped that a date from this motif would provide an age estimate for the main period of art production at UDM.

Unfortunately, the age determinations received are inconclusive, and suggest problems with the field sampling procedure (McDonald 2000c). One sample from the outlined macropod (ANU-AMS-773) returned a date of c.480 ± 80 BP. The two other dates from this motif, as with the date for Motif #2, were indistinguishable from modern.

The three dates which are indistinguishable from the modern standard suggest that there has been contamination of both motifs by younger organic material.

Several difficulties arise from these results and several interpretative scenarios are possible.

1) The date c.500 yrs BP may be an accurate representation of the age of motif #1. The two more recent dates suggest either than this motif was partially contaminated, or that part of it was redrawn around contact. This scenario is unlikely on archaeological grounds.

The modern date for motif #2 suggests that this too was produced around contact. This seems unlikely, however, given its location in the superimposition sequence, that it is faded and affected by surface exfoliation.

2) Both motifs were created more recently, using an older piece of charcoal found lying on the surface. Contamination of this charcoal may have resulted from the artist having some form of organic material (e.g. animal fat) on his/her hands. This material may have encouraged the growth of micro-organics, thus affecting, unequally, the radiocarbon signal of the charcoal in the drawing.

3) It is possible that this motif could be older, if the contamination is younger than contact, i.e. more recent European interference or ongoing micro-organic growth on the surface of the rock. If this is so, then all the dates returned would be younger than they actually are. A modern contamination of the prehistoric charcoal could mean that the 500 year old date is realistically double that received; c.1,000 years BP.

The contradictory nature of these results makes it unwise to rely on them and impossible to make firm conclusions about the production date of the outlined charcoal macropod. On face value, it would appear that art was being produced at this site up until c.500 yrs BP: after other occupation of the shelter had ceased. As contamination cannot be ruled out, it is possible that this motif was produced in the final phase of the site's occupation.

The use of AMS at UDM shelter did not provide confirmation on the terminal date of art production as had been hoped. Thus, the association of the excavated evidence and the art assemblage is used. Associations suggest that the main art production phase coincided with the main occupation phase at the site. The presence of red pigment in the top spit of square 4D suggests that art production continued beyond the main occupation phase and possibly after use of the shelter for habitation ceased. The one (apparently reliable) AMS date suggests that use of the shelter for art production may have continued into the last millennium.

Upside-Down Man in the local context

The occupation of UDM reveals a markedly different pattern from the habitation pattern proposed by Attenbrow 1987 (2004).

1. The earliest UDM stone tool assemblage, which falls into Attenbrow's typological Phase 1, is more recent (i.e. 4,030±140 BP ANU-8132) than is defined by Attenbrow for this Phase (i.e. c 11,200 to c. 5,000 years BP);

2. The most intensive occupation of the site (as seen in artefact accumulation rates) took place between 2,000 and 1,000 years ago - late within Attenbrow's sequence for Phase 2 (Figure 8.34);

3. The site was not occupied during Phase 4. The site's occupation ceased prior to the last millennium and it was not used in the contact period. The occupation evidence is supported by the art assemblage, which has no contact motifs (which are found elsewhere in the catchment);

4. There is evidence for a slight decline in artefact densities in the top spit at the site. This occurs within one typological Phase and probably reflects taphonomic processes (i.e. recent visitor treadage and scuffage) at the site.

UDM follows the general pattern of the reworked UMCC data, with the only anomaly being the later date for the main (Phase 2) occupation. When the UDM material is combined with the data from the other large sites in the catchment, the habitation indices show a peak in habitation establishment rate in the fourth and fifth millennium. The rate of habitation usage peaks slightly later, between the second and third millennium, and there is a decline in the most recent millennium.

These combined data from the Mangrove Creek sites suggest that shelter occupation in the catchment peaked in the third and second millennium, but that there was a decrease in shelter usage in the most recent millennium. They also suggest that the timing for the changeover between the Middle and Late Bondaian should perhaps be pushed to c.1,000 years BP, and this date is proposed as an alternative (see below).