

DIACHRONIC VARIATION IN THE ART OF THE SYDNEY BASIN

This chapter investigates the role of time as a significant factor accounting for variability in the Sydney rock art. It is assumed that the majority of the region's art coincides with the recent archaeological evidence in the region - the late Holocene Bondaian periods. The Bondaian has three phases of production based on changes in stone tool technology. At issue here is whether these phases correlate with the different kinds of social changes and relations which might also be reflected by the region's art.

There are few indications of clear-cut diachronic change in the Sydney Basin art style (*contra* Arnhem Land, the Kimberley or Western Desert art sequences; Chaloupka 1985, 1994; Lewis 1988; McDonald 2005a; McDonald and Veth 2007; Taçon and Chippindale 1993; Walsh 1994). Social change in Sydney may not have been as dramatic as was evidenced in Arnhem Land or the Western Desert over the last 10,000 years.

The relationship between lithic technology, typology and social change is a highly complex one. The 'intensification debate' (Lourandos 1985, Lourandos and Ross 1994) characterises late Holocene increases in the number of sites and changes in their uses. A number of researchers have explored the archaeological evidence for Holocene demographic and technological changes in a range of different environments (e.g. Attenbrow 2004, Barker 2004, Beaton 1985, Boot 1996, David *et al.* 2006, Lampert and Hughes 1974, Lourandos 1985, Ross 1985, M.A. Smith 1982, Thorley 1999; Ulm 2006; Veth 2006; Williams 1985). Such studies have produced a variety of behavioural explanations (see Attenbrow 2004:185-186; cf. Bird and Frankel 1991).

If the social ramifications of changes in lithic technology are poorly understood, then the relationships between lithic technologies and artistic traditions have been even less transparent for the Sydney region.

In other parts of Australia, the burgeoning of regional art bodies has been explained in terms of greater demographic pressure, increased social complexity and amplified territoriality (David 1991; David and Cole 1990; McDonald and Veth 2006; Morwood 1984, 2002; Rosenfeld 1993, 2002). It has been argued that patterns of change in symbolic behaviour (including rock art) were functionally interrelated with changes in resource structure, technology and economy (David 2002, Morwood 1987). A similar model has now been developed for the Sydney region. This model views art as the material manifestation of peoples' value systems and ideologies and as having a role in negotiating social relations. Through the art, inherent conflicts and stressful situations are mediated.

The expectation of this model is that increased social pressure would result in increased art production. Social pressure and increased interaction is likely to be a consequence of increased population pressure. Cultural phases with the greatest amounts of archaeological evidence (Attenbrow 2004, Lourandos 1985, Ross 1985) are likely to be correlated with phases of peak art production providing *in situ* evidence for symbolic behaviour (Conkey 1978, 1980; Gamble 1982; Morwood 1987). During such cultural phases there would be increased levels of territoriality, with amplified inter-group competition and imposed 'political' control necessitating group action and re-action. During such a period the conditions would be ideal for demonstrations of local and regional group identity (*viz.* Wiessner 1989).

While group identity and territoriality are imposed at a local level, increased social complexity also necessitates broad scaled social cohesion.

The emergence of regionally distinctive systems for encoding ... may therefore document the emergence of more standardised ceremonial, trade, and mating networks, which were bounded by emphasising stylistic differences...(Morwood 1984:370)

Regionally distinctive styles are seen to not only distinguish one culture area from another; they can also demonstrate social cohesion at the regional level. Shared ceremonial commitments and widespread stylistic similarities in items of material culture and body design are other signs of regional cultural cohesion.

In the preceding chapter the contemporaneity of art production with other forms of occupation evidence in sheltered locations was demonstrated. The art produced in shelters is considered to have had highly visible social context and should reveal localised stylistic patterning. In this chapter I explore how changes in the lithic production and occupational evidence may be correlated with changes in pigment art production over time.

Sheltered art is the better medium for exploring diachronic variability at several levels. Open engraving sites generally lack any superimpositioning. Sheltered sites often contain superimposed sequences. As indicated above, they are also often associated with dateable deposits. Pigment art also has the potential to be directly dated, using AMS techniques. This technique was in its infancy when this research was undertaken, and so only limited testing was attempted (McDonald 2000c, McDonald *et al.* 1990). Since then, techniques have improved (McDonald and Veth 2005, 2008; Rowe 2001) and the Sydney region offers great potential for further direct dating analysis (e.g. Taçon *et al.* 2006).

A previous regional approach to diachronic variability

Previous regional art studies have analysed the possibility of diachronic stylistic variability, but few in the detail of Morwood's (1979) Central Queensland Highlands work. Working on a sample of 92 art sites with 17,025 motifs, he analysed stylistic variability over time, and correlated this with excavated data for the region.

[S]ome of the changes in the art through time, are clear. Others are less so, while others are still tenuous. However, taken in combination, they suggest that there was a general pattern of change which included colours, techniques, compositions, and context. Relative dating techniques ... used to outline these differences, are differential weathering, superimpositions, spatial analysis, subject and style. (Morwood 1979:278)

Morwood detailed the technical difficulties associated with the recognition of superimpositions and discussed the problems of demonstrating comparative bias (i.e. non-random variations) in the distribution of artistic variables in any sequence. He concluded that superimposition sequences can only deal with major changes in the most common variables. Morwood argued that much of the inter- and intra-site variability in his region reflected the episodic nature of art production. He identified that small assemblages commonly reflect a single artistic event and successfully demonstrated that spatial analysis of these could refine a regional sequence.

A threefold sequence was defined for the Central Queensland Highlands based on technique and colour and a change in motif emphasis. Seriation of the three art phases with the archaeological context was done using relative chronologies from excavated site data, the introduction of stone axes (in deposit and art) and stencilled contact motifs (particularly trade axes). Elements of Morwood's approach are of relevance here. The following assumptions and methodology direct the current analysis:

- 1) It is assumed that association (and direction of association) between contemporary art categories is random. Therefore:
 - a) the number of superimpositions that an art type is involved in is proportional to the frequency of that art type and,
 - b) there being no inherent bias in the direction of association between pairs of categories;
- 2) small art assemblages provide better information about contemporaneity of stylistic variables than large complex sites. Small assemblages are likely to represent a single artistic event;
- 3) large complex sites are most likely to produce superimpositioning information;
- 4) colour, context, composition and technique are all aspects which are sensitive to change over time. These need to be analysed individually and in combination, by the processes of superimpositioning, and through quantitative analyses to investigate trends in spatial patterning and motif preference.

An Earlier Model for Diachronic Change in the Sydney Basin shelter art

McCarthy (1967[1979], 1988) identified a temporal sequence for pigment art in the Sydney Basin. This was based on the introduction (and decline) of certain colour preferences and artistic techniques, e.g. stencilling, bichrome, polychrome. The sequence was not correlated with the engraved component, nor was it synchronised with the ERS. McCarthy's art sequence was based on several sites from across the region (McCarthy 1988:18) and was as follows:

- (1) Stencil phase. Stencils in red and white, also yellow, of human hands and feet, and artefacts, in wet paint, together with the imprints of human hands and feet, and an occasional outline figure. This is the earliest phase.
- (2) Red and white phase. Drawings in dry pigment in outline, solid and various infilled styles, of culture heroes, humans, animals and artefacts.
- (3) Black phase. Drawings in dry charcoal in a wider range of subjects than Phase 2, in outline, solid and various infilled styles, with an important series of black and red, black and white, black and yellow bichromes, red, white and black trichromes; the richest phase of shelter art in the region.
- (4) Polychrome phase. This is known in only one figure, a culture hero in four colours, associated with a large red bora initiation ground figure.
- (5) White stencil phase. A very rich phase of stencils of human hands and feet, animals' paws, a wide variety of artefacts parts of plants and other subjects.

McCarthy's (1988:18) sequence does not withstand large scale field testing (McDonald 1988b). The major methodological, theoretical and practical problems with the sequence include:

- stencils at the beginning and end of the sequence provide an untestable hypothesis; how do you differentiate between an early white stencil and a late one?;
- the sequence omits several techniques which are quite common across the region - white, red and yellow paintings and the three distinct engraving techniques;

- the sequence is not correlated with any recognisable archaeological phases. While not invalidating the sequence, this limits its usefulness. Several of the phases were thought to be ‘probably contemporaneous’ (McCarthy 1988: 18): hence these are not technically temporal phases.

In the north of the region, Sim’s work in a large rockshelter west of the Macdonald River provided a detailed superimpositioning analysis (1969: 168-70). He proposed the following sequence at this site:

1. red infill;
2. white stencils, black infill, red infill/white outline, white outline;
3. black infill/white outline, white infill, red outline;
4. black outline.

At Maroota (south of the Hawkesbury River and north of ‘Canoelands’) a complex medium sized assemblage provided a different superimposition sequence (McDonald 1986a (Vol. 2): 60-70). The art in this shelter included white stencils (hands, material objects and twigs) and drawings, black and red drawings and cream drawings and paintings. One black and white bichrome motif was present. The superimposition relationships here indicated that the art was executed in a single phase. A charcoal outline and infill ship motif amongst the assemblage, led to the assumption that this assemblage was relatively recent. The Maroota assemblage challenges McCarthy’s sequence, both because a contact motif (in charcoal) appears over white stencils (Phase 1 or 5?), and because of the contemporaneity of techniques which McCarthy suggests may be separated into different phases.

At the Audley site in the south of the region, a sequence was discerned which fitted into the early and intermediate phases of McCarthy’s model (Cox *et al.* 1968). However, Officer’s work in the Campbelltown region indicated that there is no support for a chronological sequence of colours or support for a stylistic division according to colour (Officer 1984: 32).

McCarthy’s sequence has been found to have major limitation in its application to sites across the Sydney region. In part this is because it does not accommodate the full range of artistic traits known to exist; but also because it subdivides the art into unworkable and untestable divisions. Individual sites, including no doubt his original type sites, support parts of the sequence but at a broader scale there is limited applicability.

Diachronic variability in the art of Mangrove Creek

The aim of this analysis was to synthesise trends in rock shelter occupation indices and artistic traits. This analysis was based on superimposition analysis in large assemblages, analysis of motif preferences and a quantitative analysis of artistic variables in small sites.

The Sample and the Technique variables

This test of diachronic variability involves shelter art sites from the Mangrove Creek drainage basin. The 65 shelter art sites used included 26 sites recorded in UMCC (Attenbrow 1981, 1987; Gunn 1979) and 39 sites from Warre Warren in the mid-reaches of the valley (McDonald 1987, 1988a). These sites provide both sufficient detail of recording in a local context where there is an excavated and dated local archaeological sequence. Seven of the 65 shelter art sites included in

this analysis have also been excavated (Attenbrow 1981, 1987, 2004; MacIntosh 1965: Upside-Down-Man, this volume).

A localised assemblage was selected for this analysis given synchronic variation across the region. The resultant sequence may not, therefore, be broadly applicable on a regional basis, but require modification to accommodate localised variability.

A comprehensive list of 58 variables (colour, form and technique combinations) was initially used in this analysis (Table 10.1). Two levels of analysis were undertaken:

1. sites were counted for the presence and frequency of these 58 variables, i.e. the each assemblage was treated as a single entity and the presence of variables was counted; and,
2. the motif classification (used elsewhere in this research) was counted using these 58 variables to investigate motif/technique preferences and possible trends in preferences over time.

The frequency and distribution of these technique variables at the sites was initially investigated with the aim of determining which of these had the potential to provide the necessary information.

Assemblage sizes in the Upper Mangrove Creek sample are generally smaller than those found in the Warre Warren area. The 26 UMCC sites contained 424 motifs, while the 39 Warre Warren sites produced 2,371 motifs: 5.6 x the number of motifs from 1.5 x as many sites (Table 10.2). A twin column chi squared test on the motif assemblages from these two samples revealed that the differences between these were not statistically significant (at .05 level).

Generally speaking, the extended technical variables (cf. Table 10.3 and Table 10.4) occur in very low percentage frequencies, i.e. 17 variables account for 91.3% of the motifs, while the other 41 variables account for only 8.7% of the motifs.

The most commonly used techniques are white stencilling (26%), black outline and infill drawing (16%) and black infilled drawing (10%). These occur in a great number of sites, but their distribution does not correlate with the relative frequency of their use. The technique which represents the highest frequency of motifs does not occur in the greatest number of sites - white stencils are found in 23% of sites; black outline and infilled motifs and black infilled motifs are each found in c.60% of sites. Black outline (accounting for 6% of motifs) is found in 57% of sites. Most of the red and white monochrome drawings (consistently a low-average proportion of motifs present) are found in between 30-40% of the sites. Engraved intaglio motifs represent only 1.7% of the motifs counted, but are found in 15.4% of sites. Linear infill is found in 1.3% of motifs, but in 13.8% of sites.

To determine how this proliferation of variability correlates with overall assemblage size, technique occurrence and assemblage size was investigated. This suggests that much of the variability is not of temporal or spatial significance - since these techniques occur rarely, as one-off production episodes.

Of the 41 variables which occur infrequently (<1%: see Table 10.3):

- 8 (20%) are found at small sites;
- 17 are found at medium sized sites;
- 10 are found at large sites;
- 16 (37.6%) are found only at very large sites.

Table 10.1: Techniques and/or colour. Artistic variables counted in the diachronic analysis.

Variable	Colour and form	Technique
1	black outline	Dry
2	black infill	
3	black outline + infill	
4	red outline	
5	red infill	
6	red outline + infill	
7	white outline	
8	white infill	
9	white outline + infill	
10	yellow outline	
11	yellow infill	
12	yellow outline + infill	
13	white outline	Wet
14	white infill	
15	white outline + infill	
16	red outline	
17	red infill	
18	red outline + infill	
19	yellow outline	
20	yellow infill	
21	black infill	
22	wet + dry, outline + infill (w/w+b, b/w, b+w/b)	Wet/Dry combinations
23	red dry outline/wet infill	
24	black + white outline	Bichrome
25	white outline, black infill	
26	black outline, white infill	
27	black + white, outline + infill	
28	black + white outline, black infill	
29	black + red outline, black infill	
30	white outline, black + white infill	
31	red + white outline	
32	white outline, red infill	
33	red outline, white infill	Polychrome
34	red + white, outline + infill	
35	white outline, red + white infill	
36	red outline, black infill	
37	yellow outline, black infill	
38	yellow outline, white infill	
39	black + red, outline + infill	
40	yellow + white, outline + infill	
41	red and white outline, black infill	
42	red + black + white/yellow, outline + infill	
43	black + red + white outline, black + white/red infill	
44	black, white + yellow outline; black, white + yellow infill; white + black outline, yellow infill.	
45	black + red + white outline, black infill	
46	black, red, white and yellow outline	
47*	linear infill	

Table 10.2: Mangrove Creek valley: different sized assemblages located in Upper Mangrove Creek compared with the midstream Warre Warren sites.

Assemblage sizes	UMCC sites	%	WW sites	%
Small Sites (< 20 motifs)	18	69.2	23	59.0
Medium Sites (20-50 motifs)	6	23.1	7	17.9
Large Sites (50-100 motifs)	2	7.7	3	7.7
Very Large (>100 motifs)	0		6	15.4
	26	(40%)	39	(60%)

Most of the rarer technique combinations occur only in a small number of sites.

- 30 variables (52%) are not found at more than three sites (i.e. they occur in <5% of the sample);
- 42 variables (72%) are not found at more than 6 sites (they occur in <10% of the sample).

Of the 30 variables which occur at very few (<5% of) sites:

- 3 are found in small sites;
- 10 are found in medium sized sites;
- 4 are found in large sites;
- 14 are found only in very large sites.

More than half (57%) of these variables only occur at medium, large or very large sites. This suggests that these variables result from chance development rather than specific stylistic phasing, i.e. they are likely to result from greater frequency of artistic activity at large sites (and random development) rather than as a result of changing artistic trends over time.

The three rare techniques which occurred only in small sites were analysed although none of these are found in superimposition relationships with other techniques. These are:

#26 dry black outline, white infill

#37 dry yellow outline, black infill

#45 dry black, red and white outline, black infill

The conclusions which can be reached on the basis of these analyses:

- Most of the art in the Mangrove Creek valley can be accounted for by an abbreviated list of 17 technique variables. These include the monochrome dry variables (excluding yellow), white paint, red infilled paint, and combinations of red, white and black dry bichrome techniques. White hand stencils are common; red and yellow hand stencils are less common. The engraved intaglio technique is also quite common.
- There is no direct correlation between most frequently used techniques and the numbers of sites at which these techniques are used. This suggests that a few large sites may be foci for both the development of certain technical combinations and for a proliferation of these.
- The most common techniques are rarely present in more than 50% of the sample sites. This suggests that the art is relatively diverse and that there is no standardised (i.e. culturally prescribed) technical formula for art production.
- The small sites contain a range of common, average and rare techniques. These sites have the potential for testing the combination of techniques which may have temporal or spatial significance.

Table 10.3: Mangrove Creek shelter art sites. Number and % frequency of motifs for each technique variable.

Variable	Total	% techniques
1	169	6.0
2	289	10.3
3	440	15.8
4	106	3.8
5	87	3.1
6	96	3.4
7	137	4.9
8	51	1.8
9	130	4.7
10	24	0.9
11	6	0.2
12	9	0.3
13	34	1.2
14	48	1.7
15	9	0.3
16	8	0.3
17	59	2.1
18	1	0.0
19	7	0.3
20	2	0.1
21	4	0.1
22	9	0.3
23	6	0.2
24	7	0.3
25	9	0.3
26	3	0.1
27	18	0.6
28	9	0.3
29	3	0.1
30	6	0.2
31	3	0.1
32	5	0.2
33	1	0.0
34	5	0.2
35	2	0.1
36	2	0.1
37	2	0.1
38	1	0.0
39	13	0.4
40	4	0.1
41	2	0.1
42	4	0.1
43	5	0.2
44	3	0.1
45	2	0.1
46	1	0.0
47*	36	1.3
48	718	25.7
49	76	2.7
50	69	2.5
51	12	0.4
52	20	0.7

More can be made of these findings on the basis of the superimposition and multivariate analyses.

Superimposition Analysis

Thirty-six of the 58 technique variables (62%) occur in superimposition relationships (Figure 10.1). Assemblages with superimposition relationships were found in 19 of the 65 sites (29%). A total of 189 superimpositions relationships were recorded. This was not intended to be a numerically-oriented recording of superimpositioning (cf. Morwood 1979) since the total number of relationships at each site was not always recorded. Rather, the existence of certain trends at each site was recorded²⁸, as was the reversal of such trends if these occurred. Superimposition relationships between two techniques would thus only be mentioned twice at any site if the relationship was found to be reversed, i.e. indicating contiguity in the use of those artistic variables.

Many of the 36 variables were not recorded in more than one superimposition relationship. This paucity is due to the relative infrequency of certain technique variables and lack of superimpositioning generally, rather than deliberate avoidance of certain technique combinations.

As expected, the most common technique variables occurred most frequently in superimposition relationships. The greater frequency of examples was not taken to be necessarily significant, given the methodology involved presence and/or absence data (Figure 10.1). This analysis revealed the following:

- Intaglio motifs occur very rarely in superimpositions (at only 10% of sites with such motifs) as the majority of these are spatially separated from the pigment assemblage in most shelters. Where they do co-occur with pigment motifs, they are always underneath the pigment art.

It has already been argued (chapter 6) that these motifs are residual artistic elements, predating the Bondaian. The spatial separation of this technique from pigment assemblages generally supports a change in focus.

- The earliest pigment techniques include red paint. Red (and sometimes white) hand stencils also appear low in many superimposition relationships.

²⁸At many sites the superimposition relationships noted represented repeated trends. In other sites, these were single occurrences.

Variable	Total	%f techniques
53	7	0.3
54	37	1.3
55	2	0.1
56	6	0.2
57	6	0.2
58	1	0.0
Total	2795	99.7

Table 10.4: Mangrove Creek shelter art sites: Sites at which different technique variables are present.

Variable	Number of sites	%f sites with technique
1	37	56.9
2	27	41.5
3	39	60.0
4	20	30.8
5	22	33.8
6	26	40.0
7	26	40.0
8	7	10.8
9	24	36.9
10	3	4.6
11	3	4.6
12	2	3.1
13	5	7.7
14	7	10.8
15	5	7.7
16	3	4.6
17	6	9.2
18	1	1.5
19	4	6.1
20	2	3.1
21	3	4.6
22	3	4.6
23	4	6.1
24	6	9.2
25	3	4.6
26	3	4.6
27	8	12.3
28	4	6.1
29	3	4.6
30	4	6.1
31	2	3.1
32	4	6.1
33	1	1.5
34	6	9.2
35	1	1.5
36	1	1.5
37	2	3.1
38	1	1.5
39	5	7.7
40	2	3.1
41	2	3.1

There is a subsequent proliferation of techniques, with wet and dry pigment, a variety of hand stencil colours (including bichrome). Outline motifs occur in the uppermost layers of many superimposition sequences (wet or dry red, dry yellow and wet or dry white) finishing several sequences. Contact stencils (e.g. metal axes) occur only in white pigment. While stencilling was obviously being practised at contact, although there is some evidence for a decline for this technique in the last production phase.

■ McCarthy's phased sequence is not supported by the data. Stencils (particularly of hands) occur throughout the entire production period of the pigment art. However, a stencil-only phase does not predate the depictive art – and nor does the depictive art replace stencilling in a terminal phase (Figure 10.1). There is no evidence for a red and white bichrome phase predating the predominant 'black phase'.

The following superimposition sequence is identified (Table 10.5). This was achieved by initially clumping the variable techniques into 12 gross classes (e.g. all three dry black variables, all three dry red variables, polychromes, stencils etc.: Figure 10.1) to identify general trends. A more detailed ordering within these general trends was then explored. Given the number of variables involved and the variety of superimposition relationships, this was the only rational way to manually attempt the task²⁹.

On the basis of this sequence it appeared that three technical phases of production could be identified. The main pigment art phase contains a proliferation of techniques. While these are generally contemporaneous (archaeologically speaking), there are apparent trends in sequencing which are indicated by the order that the variables shown. The general scarcity of superimpositioning makes more definitive division of the main phase impossible. To further explore this phased sequence for the catchment, an analysis of motif preference was undertaken.

Changes in Motif Preference over Time

The motif range in each of the three potential art phases was examined to determine whether there was any major change in motif preference between these. This would support the supposition that these were discrete artistic assemblages.

²⁹Enquires were made about seriation programmes (Computing Services Section, ANU). At the time this research was completed, none were known which could have dealt with this specific problem.

Variable	Number of sites	%f sites with technique
42	3	4.6
43	3	4.6
44	3	4.6
45	2	3.1
46	1	1.5
47*	9	13.8
48	15	23.1
49	5	7.7
50	7	10.8
51	1	1.5
52	2	3.1
53	1	1.5
54	9	13.8
55	2	3.1
56	5	7.7
57	3	4.6
58	1	1.5
Total	65	

Stencils were removed from the analysis, since this technique occurs throughout the pigment sequence. This analysis was restricted to identifiable motifs (Table 10.6). This analysis involved 24 motif classes, a total of 853 motifs and a more restricted range of techniques (n=48: variables #16, 18, 19 and 35 were excluded on the basis because only unidentified motifs were recorded in these; variable #47 was excluded because it was not independent; and variables #48 - 53 were excluded because they were stencils).

This analysis demonstrates clear differences between the three proposed phases (Figure 10.2, Table 10.6).

Phase 1 has a very restricted range of motifs - tracks predominate (95%) and there are circles and 'other' motifs (dots). A Simple-non-figurative motifs (SNF) and male anthropomorph (one each) were also recorded (<3% of this assemblage).

Phase 2 has a slightly less restricted motif range, with 'other' motifs (dots) dominating (61%). Macropod tracks, SNF, circles and men are present (15%), but new elements are introduced. Most important amongst these are anthropomorphs (13%) and goannas (7.5%), but a snake, a quadruped, and a complex non-figurative motif are also present (2% each).

Phase 3 has a proliferation in the motif range and amongst these a dominance of macropods (30%). Tracks, circles and 'other' motifs diminish significantly, and this shift is towards a greater focus on figurative motifs (and a characteristic *Darkingung* motif assemblage: see chapter 9).

As the Phase 3 assemblage represented a much larger sample than the other two, a Student's t-test (designed to test whether differences between two populations may be the result of random chance) was run to assess the statistical significance of their similarities and/or differences.

This revealed the following statistics ($df=23$):

	Statistic (chi-)	Degree of Significance
Phase 2:	-0.2	0.88
Phase 3:	-3.0	0.006
Phase 3:	-3.1	0.005

This test indicated that Phases 1 and 2 are both very different to the later Phase 3. This result shows that the differences between Phases 1 and 2 - as well as the differences between the earlier two phases and the later one - are unlikely to be the result of chance. The differences between the two earliest phases and the third are statistically significant.

The main phase (designated Mangrove Creek Art Phase 3: Table 10.7), contains a proliferation of techniques. The production of new art appears to have been cumulative. New techniques have not superseded older ones. It does not appear possible to archaeologically subdivide this major artistic period into discrete temporal events.

Prior to this, however, there was an engraved phase and a pigment phase, both of which may also have been temporally discrete. It is possible that pigment component accompanied the engraved form, although tying these two together is difficult. The phased motif analysis shows that these two assemblages are sufficiently different to warrant calling them separate populations.

This is supported by a low correlation between the two techniques occurring in the same site (Table 10.9). There are seven sites which have engravings (Phase 1) but no pigment art; three

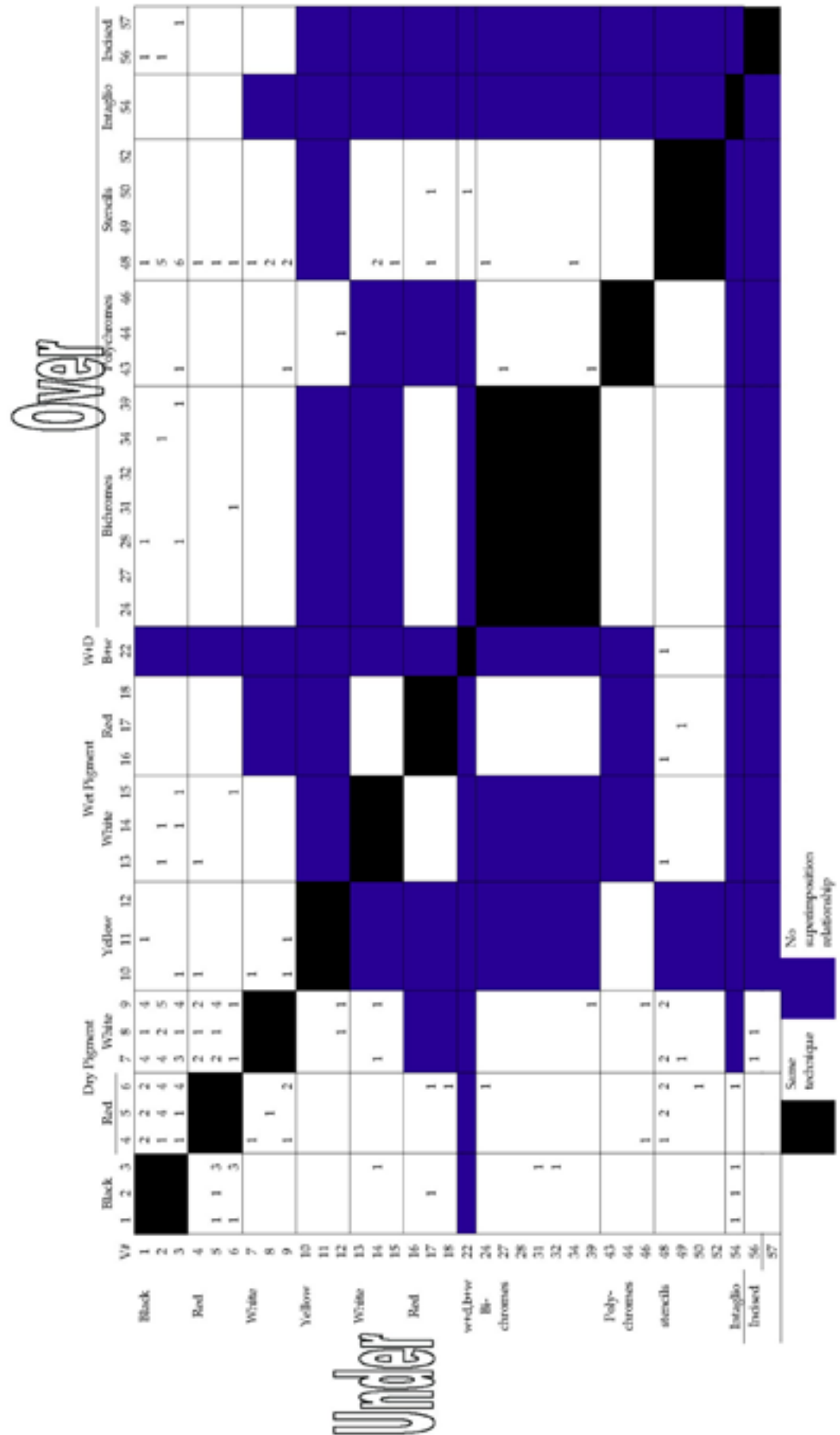


Figure 10.1: Results of the superimposition analysis.

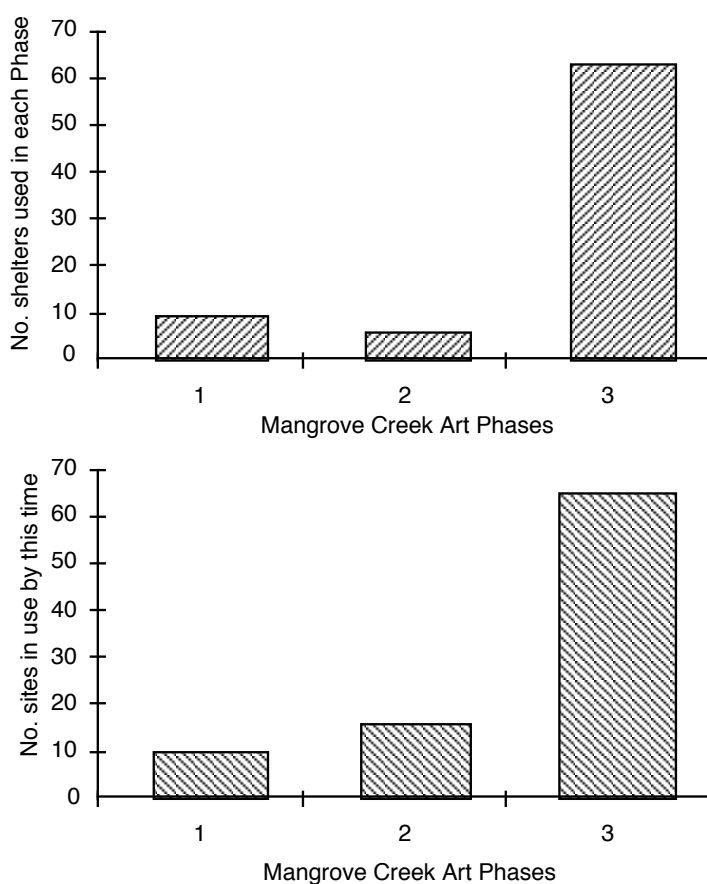
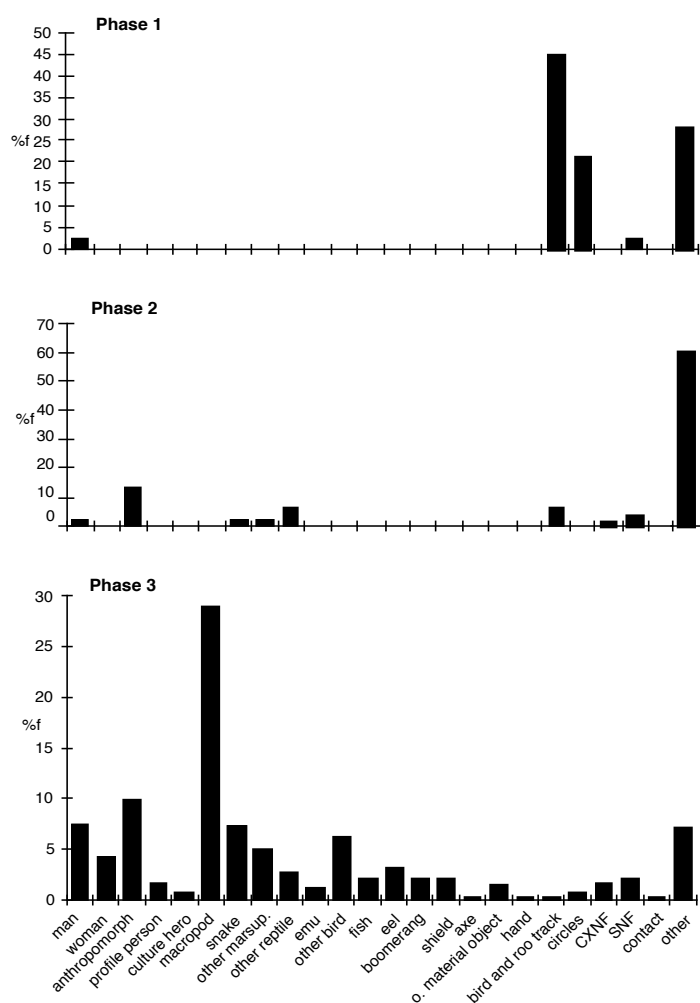


Table 10.5: Mangrove Creek Shelter Art sites. Superimposition sequence.

Earliest	Intaglio motifs
	white and red hand stencils, wet red infill (solid), wet red outline and infill
	dry black outline, infilled and outlined and infilled motifs, dry red infill and outline and infill motifs, wet red outline, wet white infill, white, red, yellow and pink stencils, incised, 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
	dry and wet red outline, wet white outline, dry yellow outline. Contact motifs occur in white stencils and red and/or white outlined and infill drawings
Most Recent	

sites which have Phase 2 but no Phase 1 engravings, and three sites where both art forms are present.

To view diachronic patterning in the Mangrove Creek pigment sites a cumulative frequency analysis of these three phases was applied (following Attenbrow 2004, Morwood 1987). The art in the 65 sites was categorised into the three identified phases (Table 10.9).

The sites with more than one phase were weighted to demonstrate where the focus of art production lies. The number of shelters used in each Phase varies. Phase 3 has the largest number of sites. Phase 2 has the smallest number of sites (Table 10.8).

Multivariate Analyses

The sample sites were subject to multivariate analysis. The variance displayed by the small sites was considered important, given the assumption that these should be more sensitive to temporal or spatial trends. Correspondence Analysis (CA) was employed for this purpose (Chapter 11 contains a detailed description of this technique).

All variables which were present at <5% of the sites were clumped into generalised categories and a reduced variable list of 35 attributes was analysed. This avoided the possibility that the rarer techniques would force 95% of the data into a homogeneous indistinguishable mass - thus masking any patterning therein. The revised variable list is shown (Table 10.9).

The CA results showed that the first two components accounted for 47% of the variance in the data set. The scree slope plot (Wright 1992) demonstrates that the variance is well described by this CA (Figure 10.4).

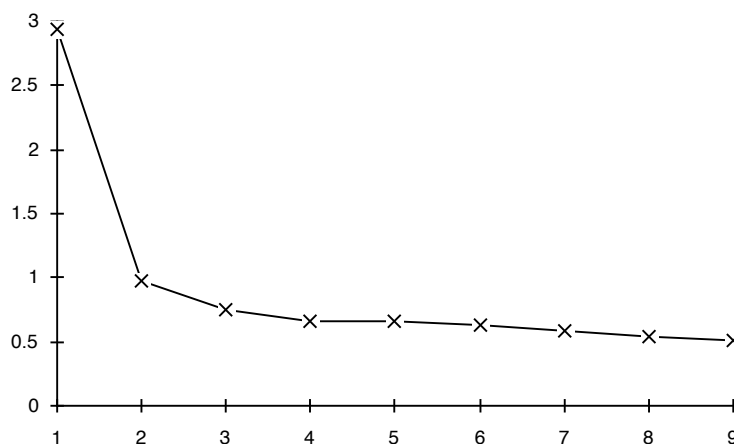


Figure 10.4: Mangrove Creek shelter CA results. Scree slope plot of latent roots.

Table 10.6: Mangrove Creek shelter art: Motif totals in the proposed art phases.

Variable	man	woman	anthrop	prof pers	Cult hero	roo	snake	Marsup.	reptile	emu	bird	fish	eel	boom'g	shield	axe	mat obj	hand	tracks	circles	CXNF	SNF	contact	other	Total
Phase 1																									
Total	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	9	0	1	0	12	42
%f	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45.2	21.4	-	2.4	-	28.6	
Phase 2																									
Total	1	0	6	0	0	0	1	1	3	0	0	0	0	0	0	0	0	0	3	0	1	2	0	28	46
%f	2.2	-	13.0	-	-	-	2.2	2.2	6.5	-	-	-	-	-	-	-	-	-	6.5	-	2.2	4.4	-	60.9	
Phase 3																									
Total	57	33	76	13	6	222	56	39	21	9	48	17	25	16	16	2	12	2	2	6	13	16	3	55	675
%f	7.5	4.3	9.9	1.7	0.8	29.0	7.3	5.1	2.7	1.2	6.3	2.2	3.3	2.1	2.1	0.3	1.6	0.3	0.3	0.8	1.7	2.1	0.4	7.2	100

A bivariate plot of the attribute scores revealed a tight cluster around the origin with few outliers (Figure 10.5). The only variable to fall out significantly was intaglio pecking (variable #32). A surprise combination which also separated were two black + white bichrome variables (#s 18 and 21).

Focussing on the main body of variables (Figure 10.6), certain patterns are clear:

- there is a tendency for colour and technique characteristics to cluster: the dry reds, blacks and whites are similarly and separately distributed. The painting techniques are inversely correlated on the second component with the drawing techniques.
- the monochrome techniques, particularly the dry red and black separate (and cluster internally), while the polychrome and most of the bichromes cluster in close proximity to each other.

Table 10.7: Proposed Diachronic Sequence in the Mangrove Creek sites. Mangrove Creek Pigment Phases 1-3.

1 (Earliest)	intaglio motifs
2	white and red hand stencils, wet red infill (solid), wet red outline and infill
3	dry black outline, infilled and outlined + infilled motifs, dry red infill and outline + infill motifs, wet red outline, wet white infill, white, red, yellow and pink stencils, incised, bichromes, black outlined + infilled, dry white infill and white and/or yellow outline + infill, polychromes and wet + dry black + white motifs dry and wet red outline, wet white outline, dry yellow outline. Contact motifs occur in white stencils and red and/or white outline+ infill drawings.

In terms of colour and technique correlations:

- Red and black drawings appear to be negatively correlated, while black

and white bichromes are strongly and negatively correlated with black monochrome art.

- White stencils appear to be negatively correlated with the remainder of the stencil combinations, suggesting an inverse relationship in colour usage.

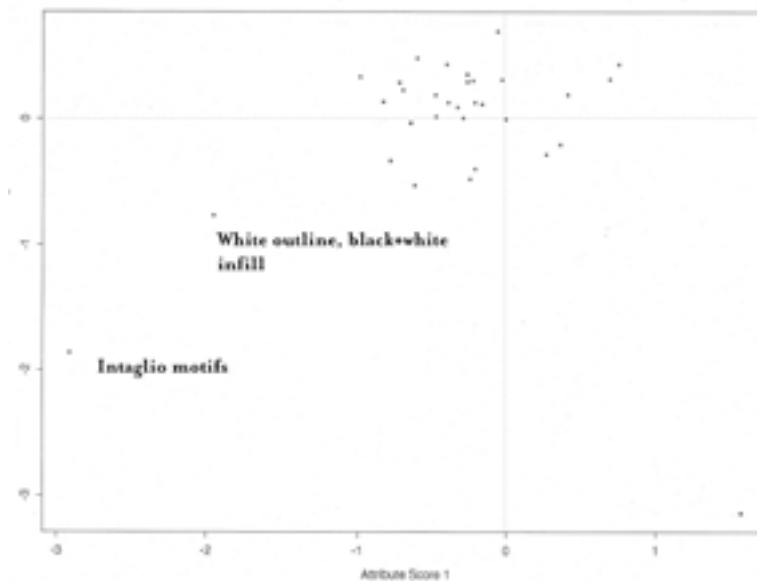


Figure 10.5: Mangrove Creek CA Results. Bivariate plot of component scores. Technical variables.

Table 10.8: Phased Sequence: Mangrove Creek Shelter Art sites.

Site No	Site Name	1	2	3
26	Emu Tracks 2‡	x		
51	Drought breaker	x	+	+
7	Emu Tracks	x	x	x
35	Corroboree	x	x	xx
65	Upside down man‡	?	x	xx
14	Black Hole	x		x
43	Black echidna	x		xx
47	Tic Alley	x		xx
36	Three emus	x		x
58	Break-a-leg	x		x
54	Wasps and women		x	x
27	Swinton's		x	xx
18	Fallen Rock		x	xx
5	Kangaroo Head			x
6	Red Eel			x
9	Roo and Echidna*			x
10	Second Look			x
16	Black Figure			x
19	Bracken			x
20	Owl Figure			x
21	Eleven Cranes			x
22	Damsite 3			x
24	Bird Tracks‡			x
25	Lizard's Leap			x
29	Solitary Kangaroo			x
32	Little end shelter			x
37	The nook			x
38	Macropod and eel			x
42	Eel shelter			x

These results appear to offer only limited support to the temporal sequence with the exception of an earlier pecked phase. Wet red infill (Phase 2) does not separate distinctively from the other phase 3 variables, although it is inversely correlated with red drawings. Red paintings (Phase 2) are inversely correlated with pecked engravings, supporting Phases 1 and 2 as separate phases rather than pigment and engraved versions of the same style.

The CA component score diagrams (plotted according to site size: Table 10.2) reveal some interesting patterning (Figure 10.7). The distribution of sites across the plot (cf. Figure 10.5, Figure 10.6) is similar to that shown by the variables.

Small sites

Analysis of the small sites showed some clustering of sites, although this appears to have little temporal significance. Two sites separated strongly on the basis of their pecked assemblages.

Site No	Site Name	1	2	3
45	Scumball			x
49	The cranny			x
52	Follow the bouncing ball			x
53	Matrigaggle			x
56	Hunting site			x
63	Headwater			x
64	Blunt Instrument			x
8	Black Hands‡			xx
23	Dairy Arm 8			xx
62	Fishmonger			xx
34	Flannel flower			xx
55	Lion's mouth			xx
50	Swain's surprise			xx
48	Wave Rock			xx
1	Dingo and Horned Anthrop‡			x
3	Loggers‡			x
4	Echidna			x
13	Frogman			x
15	Red Figure			x
17	Sandy cave			x
28	Metal Axe			x
31	Eel headed men			x
33	Roos and snakes alive			x
40	Warre Warren Ck			x
41	Rain Gott			x
46	Formal macropod			x
59	Big valley site			x
60	Red Ned			x
61	Black mac			x
11	Candelabra			x
12	Sailing Boat			x
57	White ones			x
39	Banksia			x
2	Red rat kangaroo			x
44	Waratah 1			x
30	WW Corroboree			x
	No. of shelter used	10	6(+1?)	63 (+1?)
	for each phase			
	No. shelter used by this time	10	16	65

+ white stencils only - phasing indistinguishable

‡ excavated sites with radiocarbon dates (see Table 10.10)

* excavated site

With the exception of the two outlier pecked sites, the small sites are spread diagonally across the top of the plot (Figure 10.7). These sites can be divided into four main groups. In the top right quadrant, the sites contain almost exclusively black motifs. This is the largest group (16 sites: 39%). Another large group (11 sites: 27%) is clustered around the origin. These sites contain black, red and/or white assemblages. In the top left quadrant the art consists of predominantly white motifs. In the lower left quadrant the site assemblages contain predominantly red infill.

Only two of the small sites contain white stencils. Only four of these sites (10%) contain bichrome motifs (one of which also contains a polychrome motif). Seven multicoloured techniques are used at these four sites, and, as identified earlier, three of these techniques occur only in small sites. These represent unique combinations rather than temporally significant markers.

Medium sites

The medium sized sites show a much more restricted distribution with a cluster to the top right. These sites contain mainly black and/or red drawings and white hand stencils. The sites close to the origin have a mixture of techniques and colours. The two outlying sites contain red, black and/or white bichromes (site #31) and black and red drawings and pecked motifs (site #58: see Figure 10.7). Most of the sites in the top right quadrant in this size group contain white hand stencils (unlike the smaller sites).

Large and complex sites

The large and very large sites show a very different distribution. Almost all of the very large sites are located in the top left quadrant, containing a much wider variety of techniques (stencils, bichromes and polychromes) and colours (particularly yellow and white).

Table 10.9: Techniques and/or colour combination variables used in Correspondence Analysis.

Variable	Colour and Form	Technique
1	black outline	Dry
2	black infill	
3	black outline + infill	
4	red outline	
5	red infill	
6	red outline + infill	
7	white outline	
8	white infill	
9	white outline + infill	
10	dry yellow	
11	white outline	Wet
12	white infill	
13	white outline + infill	
14	red infill	
15	yellow outline	
16	red dry outline/wet infill	Wet/Dry
17	rare wet combinations	
18	black + white outline	Bichromes
19	black + white, outline + infill	
20	black + white outline, black infill	
21	white outline, black + white infill	
22	white outline, red infill	
23	red + white, outline + infill	
24	black + red, outline + infill	
25	rarer bichromes (combined)	
26	polychromes (combined)	
27	linear infill	
28	white	Stencils
29	red	
30	yellow	
31	rarer stencils (combined)	Engravings
32	intaglio	
33	incised outline	
34	rarer engravings (combined)	
35	incised o/i	

Conclusions

These combined analyses demonstrate:

- 1) intaglio motifs (Phase 1) separate significantly from the remainder of the techniques;
- 2) the wet red infill (Phase 2) does not separate well from many of the more complex colour and technique combinations. The fact that few sites are found with this phase alone may be masking this characteristic;
- 3) red and white hand stencils separate well on the first component;
- 4) monochrome colour usage (in a variety of techniques) distinguishes well between art assemblages. This suggests that art production using a single colour occurred in an episodic fashion;
- 5) the strong separation between the black and red use was not indicated by the superimpositioning analysis (Table 10.6; Figure 10.1), although this hinted that black might precede red (i.e. red drawings consistently covered black drawings: dry black infill is only recorded over red infill, and none of the black techniques were recorded over red outline motifs);
- 6) assemblages with more complex uses of colour and technique and those with of rarer colour usage cluster together, along with the use of wet pigment;
- 7) small sites, representing probably single artistic events, demonstrate clustering on the basis of specific colours. Four main groups are distinguished:

- i) predominantly black;
- ii) predominantly white;
- iii) predominantly red; and,
- iv) dry black, red and white combined.

- 8) hand stencils and bichrome/polychrome motifs rarely occur in sites with <20 motifs;

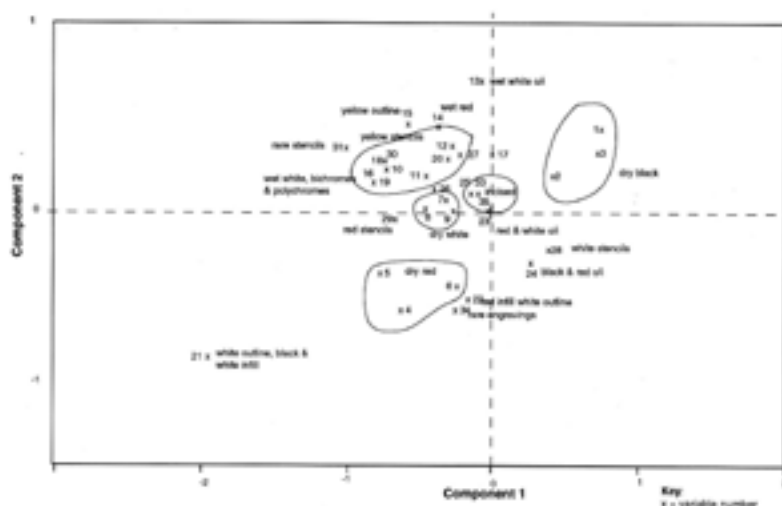


Figure 10.6: Mangrove Creek CA Results. Bivariate plot of component scores. Technical variables (excluding variable #32, intaglio).

- 9) medium sized sites contain assemblages which use predominantly black and red drawings and have white hand stencils. These sites rarely have other coloured hand stencils present;
- 10) large sites contain a range of (mainly monochrome) techniques with white hand stencils, and or pecked engravings;
- 11) very large sites contain the full range of techniques employed in this valley; most of the rarer techniques and colours are only found in these sites.

The CA has demonstrated clustering of the sites based of colour and technique preferences. These groupings do not indicate temporal trends – as determined by superimposition analysis.

These results appear to demonstrate how the art body in this valley system was produced - namely that small sites contain limited artistic events created with a range of similar raw materials. These appear to be *ad hoc* episodes producing art with whatever raw material was to hand (i.e. the ubiquitous charcoal). Sites which represent more conspicuous art foci contain a wider range of techniques and raw materials. The sites which have been used extensively for the production of art demonstrate the full range of techniques and colours available to the artists in the Valley. Increasing artistic complexity - while the result of repeated artistic events – does not demonstrate an evolution of the style.

Two earlier art phases are supported by motif preference and superimpositioning analyses. The separation of the pecked motifs from other techniques is also strongly supported by the CA. No strong trends in colour preference or technique are indicated in the main art phase. Complex sites appear to have been used for longer periods of time or for more intensive episodes of artistic activity. The proliferation of techniques in these sites represents an accumulation of technical options rather than an evolution of traits. The fact that the largest and most complex sites cluster cohesively (Figure 10.7) demonstrates an overriding stylistic homogeneity in the sites of this size. A similar pattern is identified with the medium sized sites. These results are suggestive of different types of art activity locations being identified.

Mangrove Creek Art Sequence

Basis on superimpositioning, motif preference and multivariate analyses the following phases of art production are discerned within the Mangrove Creek valley:

Mangrove Creek Art Phase 1 pecked engravings of tracks and circles.

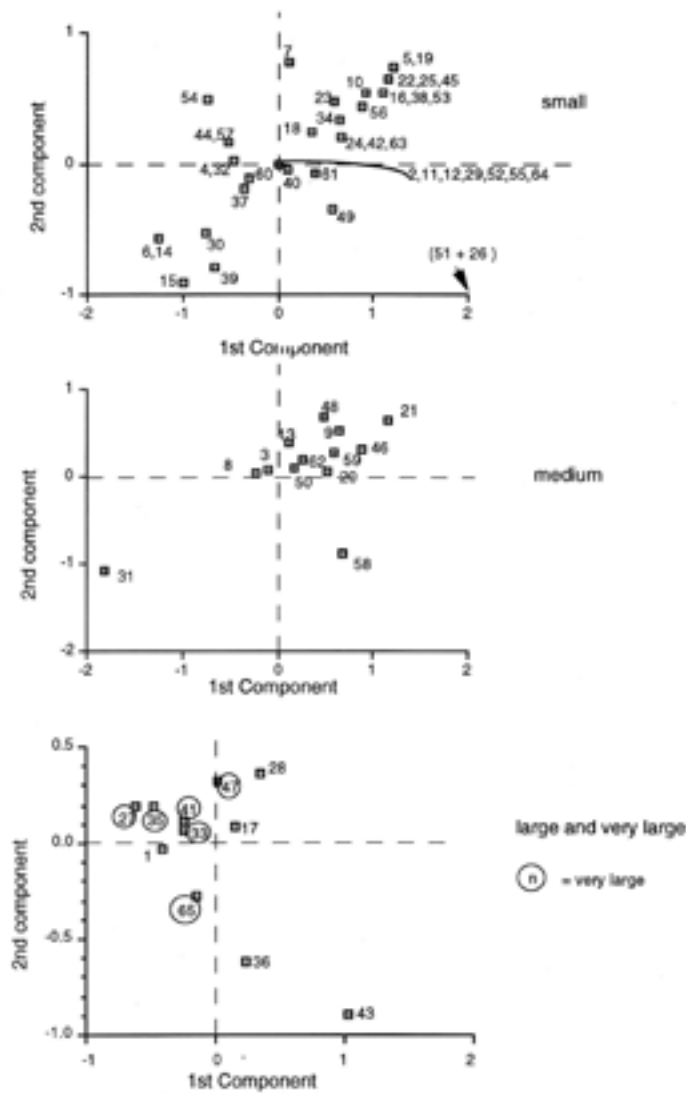


Figure 10.7: Bivariate plot of component scores, Mangrove Creek. Small, medium and large-very large sites plotted separately.

Mangrove Creek Art Phase 2 red paintings and hand stencils, and white hand stencils (red and white hand stencils do not co-occur).

Mangrove Creek Art Phase 3 a proliferation of techniques and colour use, perhaps starting with plain dry black and dry red motifs and then developing into a range of paints, dry bichromes, stencils of varying colours, polychromes and incised motifs. Outline-only motifs end the sequences of many shelter, although contact motifs have also been recorded in white stencils and drawn red and white outlined and infill forms.

How does this art sequence correlate with occupation indices? Is it possible to propose an absolute chronology based on the data obtained here? Definite comments about the earliest and terminal phases are possible.

At Yengo 1 a date of c.6,000 years BP is given for Phase I (associated with a Pre-Bondaian lithic assemblage). A pre-Bondaian association can also be inferred for Emu Tracks 2 in upper Mangrove Creek, although this is not demonstrated by the excavation results.

At Emu Tracks 2, the 15 engraved emu tracks were recorded as being level with the current surface of the deposit. Here the first major occupation of the shelter began sometime around 4,000 years ago (Attenbrow 1987: Table 7.2). Regardless of the exact timing of the shelters first usage, it would appear that the art's position on the wall indicates that this was contemporaneous with earliest usage of the shelter, predating the Early to Middle Bondaian occupation (see Table 10.10).

At the most recent end of the art sequence, there is evidence that pigment art was being produced at European contact. Drawings of sailing ships in a range of colours and the stencilling of metal axes indicate that the art in the Mangrove Creek valley was being produced as late as 1788, although 1770 (the arrival of Captain Cook at Botany Bay), is a possible *pro terminus* (McDonald 2008).

Both Mathews (1897c) and McCarthy (1939) cite evidence of an Aboriginal person in Wollombi Brook producing art as late as 1843, but there is no evidence that this was produced in a culturally prescribed fashion. The ethnohistoric literature offers no evidence of people observed producing art in the early days of white settlement. The fact that contact motifs are relatively rare in the Sydney area suggests either that the production of art at this time was either sporadic, or that the use of art as a cultural medium quickly diminished after contact.

There is an absence of associated evidence for Phase 2 art and the question of timing between Phases 2 and 3 is problematic.

A correlation between art and deposit can be investigated at the seven excavated shelter art sites in the Mangrove Creek valley, five of which have been dated³⁰. From these dates and the archaeological sequencing at each site, correlations between art and occupation phases can be made (Table 10.10). This is not a simple exercise as the sites excavated by Attenbrow were not excavated for this explicit purpose.

Of the five art shelters excavated by Attenbrow, four have multiple phases of occupation and most have Phase 3 art. The site that has a single phase of both art and deposit is Bird Tracks (Table 10.10). The art here is designated Phase 3, the deposit (undated) Phase 4 (Attenbrow 1987: Table 7.2). If one assumes that the two were produced contemporaneously, Art Phase 3 at this site dates to the last 1,600 years.

Table 10.10: Excavated shelters with radiocarbon determinations, estimated archaeological phases and designated art phases.

Site	Dates	Occupation Phases	Art Phases
Emu Tracks 2	-	2, 3, 4	1
Upside Down Man	4,030 ± 140BP	1,	1?, 2
	1,5440 ± 60 BP	3	
	1,220 ± 120 BP	3	3
Roo and Echidna	6,700 ± 150 BP	1	
	-	2, 3, 4	3
Bird Tracks	-	4	3
Black Hands	3,040 ± 85 BP	2	
	-	3, 4	3
Dingo and Horned Anthrop	581 ± 120 BP	not analysed	3
Loggers	11,050 ± 135 BP	1	
	7,950 ± 80 BP	2	
	2,480 ± 60 BP	3	3
	530 ± 90 BP	4	3

Three of the art shelters with multiple phases of occupation (Roo and Echidna, Black Hands and Loggers) had their most intensive occupation during Lithic Phase 3 (2,800-1,600 years ago). There is no direct evidence from these shelters to correlate the two forms of evidence. If it's assumed

³⁰While 18 shelter art sites were excavated by Attenbrow, the art in only five was recorded in sufficient detail for this analysis.

that the production of pigment art coincided with the most intensive period of occupation, a Middle to Late Bondaian association is suggested for the Phase 3 art in these sites.

More direct associations are possible from the remaining excavated art shelters.

The presence of at least three artistic episodes at the Upside Down Man (UDM) shelter has already been argued (above), while the dating and analysis of the deposit indicates two distinct phases of use. The contemporaneity of the main phase of occupation (Lithic Phase 3) and the majority of the art (Art Phase 3) is indicated on the basis of excavated evidence. It is also argued that a late artistic episode, including a suite of outline motifs, one of which was AMS dated, may well indicate that art production continuing after the abandonment of the shelter for habitation, c. 1,200 years BP.

The two pecked motifs at this site are figurative, unlike the majority of the pecked assemblage in this creek valley. It is possible that these represent a 'transitional' form between Phases 1 and 2. The relatively recent basal dates and the nature of the pre-Bondaian Phase 1 assemblage, support such an argument. The early pigment art (with painted red anthropomorphs that are stylistically similar to the engraved anthropomorphs) may be more closely related to Phase 1 and 2 motifs. The UDM Phase 2 motifs are correlated with the earlier occupation of the site.

The main phase of Middle Bondaian occupation at UDM ends later than proposed by Attenbrow's (2004) sequence (i.e. between 2,800 -1,600 years ago). Similarly, the UDM early Bondaian (Unit III) also returned a comparatively recent date (c.4,000 years BP).

Using UDM's excavated assemblage, the following dates are suggested for the art phases:

Art Phase 2	<4,000 -> 1,600 years BP
Art Phase 3	c.1,600 - 1,200 years BP

The other shelter excavated expressly to date its art was Dingo and Horned Anthropomorph (MacIntosh 1965). Two dates (144 ± 125 BP (GX-0069) and 581 ± 120 BP (GX-0070) were obtained from one pit at this site. This site has the most conclusive excavated evidence for ochrous art production in the Sydney region³¹. The faceted red ochre, of the same colour as the dingoes and horned anthropomorphs, associated with the earlier date establishes the likely production date for these motifs (see discussion above). The remainder of the art at this shelter (in a separate panel) is classified as Phase 3. Its condition suggests that much of its production may predate the dingo and horned anthropomorph composition. The horned anthropomorphs³², dingoes and echidnae are classified, as late Art Phase 3. The dated evidence for this site indicates that these motifs were produced midway through the last millennium, long after occupation in UDM ceased.

Based on Emu Tracks 2 and these two shelters with good correlations between art and deposit, and given to the presence of contact motifs in the Valley, the following chronology for the Mangrove Creek Art sequence is proposed:

Art Phase 1	Pre- or Early Bondaian	> 4,000 years BP
Art Phase 2	Early Bondaian	<4,000 – c.1,600 years BP
Art Phase 3	Middle to Late Bondaian	c.1,600 - European contact

Difficulties were encountered in accurately pegging this chronology because of the scarcity of sites with art in dateable contexts. There are inconsistencies in dating the stone tool phases both in Mangrove Creek and in the broader region (see chapter 4). Art Phase 3 could have commenced a millennium earlier than the dates proposed here: and the Late Bondaian transition may have occurred later.

³¹Attenbrow 1987 (Sunny), Glover 1974 (2CU/5), Tracey 1974 (4cU/5) and Megaw and Roberts 1974 (WL/-).

³²This particular motif has an extremely restricted distribution in the Mangrove Creek catchment and near Mogo Creek just to the west (Chapter 12).

A correlation of art phases with broader lithic phases appears to be the most judicious categorising of the material. Assuming that the main art production period in most sites is contemporaneous with the most intensive period of stone tool production, the Middle Bondaian is likely to be the peak art producing period. Art production certainly continued through the late Bondaian and indeed up until contact. Art was produced in shelter contexts throughout this period without appreciable stylistic change. The significance of this finding is discussed (Chapter 13), in terms of the model for stylistic behaviour in the region.