

Chapter 5

Analyses and Results

5.1 Introduction

One of the aims of this thesis was to provide an interpretive framework for government agencies from which to make informed management and conservation decisions. In this Chapter, I describe the art assemblage and the geographic contexts in which rock art was produced. I have identified and analysed the organising principles and structures of the rock art assemblage across technique and location. In addition, I have investigated the relationship between associated rock art traditions and associated archaeological materials and aspects of the rock art assemblage.

5.2 Geographic description of site complexes

Although there is some correlation between the following geographic contexts, for clarity, each category has been presented separately.

Biogeographic Regions

Table 5.1 Biogeographic regions in which rock art complexes are located

| Bioregional Description | Number of site complexes | Percentage of site complexes |
|-------------------------|--------------------------|------------------------------|
| Burt Plain | 1 | 2 |
| Finke | 10 | 20 |
| Great Sandy Desert | 2 | 4 |
| MacDonnell | 38 | 74 |
| TOTAL | 51 | 100 |

The majority of art complexes analysed in this research cluster in the central ranges within the MacDonnell bioregion or in the riverine corridors of the Finke River and its tributaries. The uneven distribution of rock art complexes within the four biogeographic regions, in part, reflects the corresponding biases in the location of Parks throughout central Australia (Chapter 4). Fewer rock surfaces suitable for the production and preservation of rock art are found in the Burt Plain and Great Sandy Desert regions (Table 5.1).

Topographic Location

Table 5.2 Topographic location of rock art complexes

| Topographic Description | Number of site complexes | Percentage of site complexes |
|--------------------------------|---------------------------------|-------------------------------------|
| Creekbed/pavements | 3 | 6 |
| Escarpmment/rockshelters | 16 | 31 |
| Gorge/gully/gap | 22 | 43 |
| Ridge terrace | 4 | 8 |
| Rockhole | 1 | 2 |
| Rocky outliers | 5 | 10 |
| TOTAL | 51 | 100 |

Rock art complexes are found in a wide range of topographic locations (Plates 5.1 & 5.2). However, systematic surveys undertaken during this research show that some topographic locations that appear to have the same geographic attributes, do *not* contain rock art. It could be argued then, that the selection of locations for the production of rock art did not depend solely on the availability of suitable topographic features. Two factors may account for the strong correspondence between rock art complexes and gorge/gully/gap sites (Table 5.2); first, the availability of water from rockholes even after a small amount of rain and second, the availability of rock surfaces suitable for engraving or painting.

Geology

Table 5.3 Geology at rock art complexes

| Geological Description | Number of site complexes | Percentage of site complexes |
|-------------------------------|---------------------------------|-------------------------------------|
| Hermannsburg sandstone | 17 | 33 |
| Hermannsburg quartzite | 4 | 8 |
| Mereenie sandstone | 20 | 39 |
| Sandstone/other | 10 | 20 |
| TOTAL | 51 | 100 |

The predominance of sandstone as a rock art surface is predictable as it is the most commonly occurring geological formation throughout the study area, it is easier to engrave and erodes in a manner that forms spacious rockshelters with surfaces suitable for the production of pigment art. The harder metamorphosed quartzite surfaces at complexes such as Emily Gap and Trepina Gorge provide rectangular block-like surfaces for the production of pigment rock art.

Vegetation

Table 5.4 Vegetation at rock art complexes

| Vegetation Description | Number of site complexes | Percentage of site complexes |
|---------------------------------------|---------------------------------|-------------------------------------|
| Acacia woodland | 33 | 65 |
| Eucalyptus woodland/hummock grassland | 8 | 16 |
| Hummock grassland | 10 | 19 |
| TOTAL | 51 | 100 |

The majority of rock art complexes are found within areas where *Acacia* woodlands predominate. This patterning is influenced by the distribution of parks within the Central Ranges where *Acacia* woodland are a common. While *Acacia* woodlands produce a wide range of plant resources (Latz 1995), Latz and Griffin (1978:81) demonstrate that the hummock grasslands on the sand plains are almost three times as diverse in edible plant species than the ranges, so that access to these regions would have been desirable.

Water source

Table 5.5 Water source at rock art complexes

| Water source Description | Number of site complexes | Percentage of site complexes |
|---------------------------------|---------------------------------|-------------------------------------|
| Clay pan | 1 | 2 |
| Rockhole/waterhole | 41 | 80 |
| Spring | 9 | 18 |
| TOTAL | 51 | 100 |

Many rock art complexes are found in gorges where the topography provides a substantial catchment area. Rainfall runoff is channelled into shaded pools or rockholes, providing a water supply that outlasts alternative ephemeral sources. Less common water sources such as clay pans and springs do not always have rock surfaces suitable for the production of rock art associated with them.

Reliability of water source

Table 5.6 Reliability of water source at rock art complexes

| Reliability of water source | Number of site complexes | Percentage of site complexes |
|------------------------------------|---------------------------------|-------------------------------------|
| Ephemeral | 33 | 65 |
| Reliable | 18 | 35 |
| TOTAL | 51 | 100 |

Only 18 of the rock art complexes recorded have water resources that would have provided reliable fall back supplies in times of prolonged drought, and even some of these may have run dry in severe droughts. The most reliable surface water supplies are found along the base of the George Gill Range and along the length of the Finke River (see Figure 2.1). Rock art then, is more commonly found at locations where ephemeral water supplies occur, which indicates that the reliability of water was *not the overriding factor* influencing the choice of location for the production of rock art in central Australia. Chi squared analysis of the relationship between ephemeral and reliable water sources and engraved and pigment art (Table 4.12) shows that there is a statistically significant association between engravings and ephemeral water ($\chi^2 = 5.92$) but this relationship is not evident for pigment art with either water class ($\chi^2 = 0.27$). The implications of these relationships and relationships with other factors such as geology will be discussed in Chapter 7.

5.3 Description of site complexes

Number of art sites and motifs per complex

Table 5.7 Rock art complexes showing the number of art sites at each complex and the total number of motifs per site complex (Locations shown in Figure 7.2)

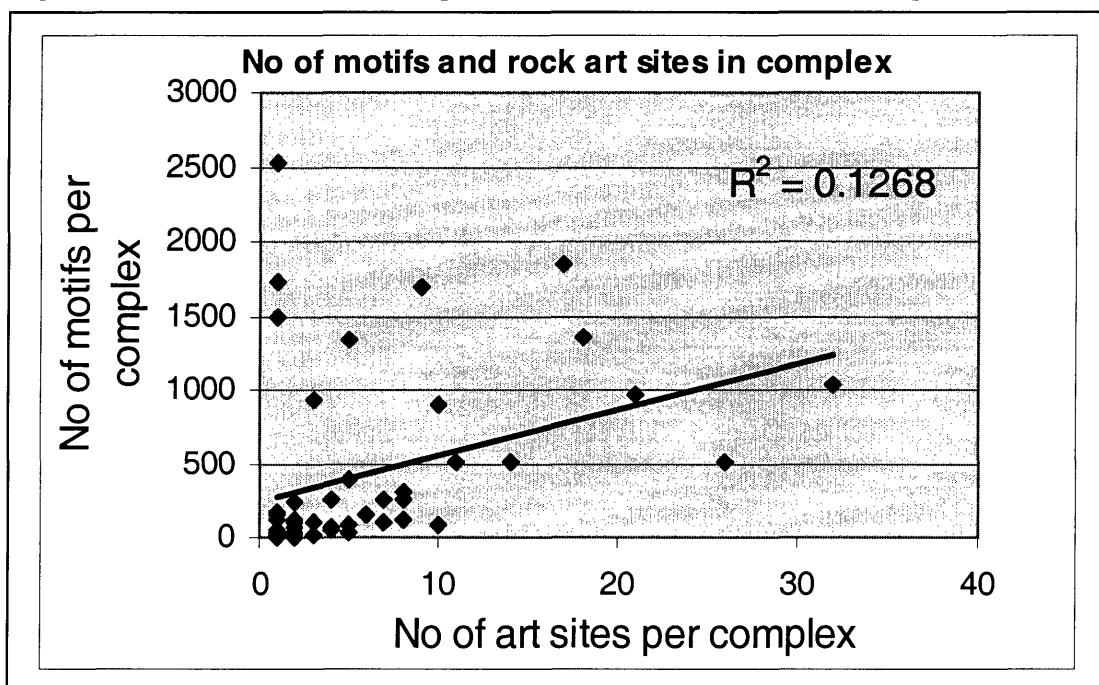
| Site Complex Name | Number of Art Sites in Complex | Total number of motifs at art complex |
|----------------------|--------------------------------|---------------------------------------|
| Emily Gap | 1 | 154 |
| Jessie Gap | 1 | 14 |
| Trephina Gorge | 1 | 120 |
| Arltunga/Joker Gorge | 2 | 65 |
| Arltunga/Waterhole | 1 | 2 |
| Arltunga/Rockshelter | 1 | 1 |
| Ellery Creek | 1 | 172 |
| Arrenge | 5 | 79 |
| Ilbillia | 2 | 103 |
| Irbmankara | 1 | 14 |
| Palm Valley, 5 | 1 | 58 |
| Palm Valley, 6 | 1 | 13 |
| Itaratharra | 1 | 5 |
| Palm Creek | 1 | 5 |
| Wallace Rockhole | 10 | 899 |
| Puritjarra | 5 | 388 |
| Glen Thirsty | 3 | 108 |
| Ooraminna Bushcamp | 1 | 4 |
| Ooraminna Range | 1 | 11 |
| Ooraminna Rockhole | 1 | 32 |
| N'Dhala Main Gorge | 5 | 1335 |
| N'Dhala Side Gorge | 1 | 1490 |
| Ewaninga | 3 | 926 |
| Roma Main Gorge | 1 | 2526 |

| | | |
|---------------------------|---------------|---------------|
| Roma Gorge A | 2 | 41 |
| Roma Gorge B | 1 | 167 |
| Roma Gorge C | 4 | 76 |
| Roma Gorge D | 4 | 260 |
| Roma Gorge E | 1 | 1727 |
| Kuyunba | 32 | 1029 |
| Rainbow Valley | 18 | 1851 |
| Rainbow Valley/Back | 5 | 33 |
| Rainbow Valley/Central | 1 | 32 |
| Watarrka/Bagot Creek | 8 | 121 |
| Watarrka/Bagot/Central | 2 | 73 |
| Watarrka/Petermann | 7 | 259 |
| Watarrka/Stokes Creek | 14 | 516 |
| Watarrka/Lilla | 8 | 248 |
| Watarrka/Penny/Springs | 10 | 82 |
| Watarrka/Atalpi | 11 | 507 |
| Watarrka/Kathleen/Springs | 6 | 160 |
| Watarrka/Wanga | 8 | 299 |
| Watarrka/Kings Creek | 3 | 13 |
| Watarrka/Cypress Creek | 7 | 110 |
| Watarrka/NE Plateau | 21 | 965 |
| Watarrka/NE Ridge | 26 | 506 |
| Orange Creek | 2 | 234 |
| Hugh River | 2 | 115 |
| Dulcie Range | 18 | 1354 |
| Buka | 4 | 54 |
| Art Complex A | 9 | 1696 |
| 51 Complexes | 285 Art sites | 21,084 Motifs |

The number of art sites per complex ranges from one to 32 (Table 5.7). Of the 285 rock art sites recorded, 278 contain motifs, while the remaining seven contain abraded grooves or stone arrangements. As these features are considered to be either associated rock art traditions or part of the context in which rock art is produced, the sites where they occur were also included on the database.

There is a wide variation in the number of motifs per complex with a range of 1 to 2526 motifs per complex. Distribution is uneven with 61% of the site complexes ($n = 31$) containing fewer than 200 motifs while 16% of complexes ($n = 8$) have more than 1000 motifs.

Figure 5.1 Number of motifs compared to the number of rock art sites per complex



The correlation between the number of art sites and the number of motifs per complex is weak ($R^2=0.1268$) (Figure 5.1). This is, in part, a result of the way in which the art sites were defined in this thesis where gorges containing engraved boulders and bedrock extending over many hundreds of metres, were recorded as a single art site (e.g. Roma Gorge E, $n = 1727$ motifs) while complexes consisting of numerous rockshelter sites may contain only one or two motifs in each site. For example, the Penny Springs (*Urarita*) complex at Watarrka has 10 art sites, but the total number of motifs recorded at this complex was only 82.

The inclusion of numerous isolated painted and engraved sites located during systematic surveying for this research, demonstrates that not all rock art sites are clustered into large complexes with multiple sites. These isolated rock art locations have been largely excluded from previous rock art research because research in central Australia has been concerned with the management of rock art at popular tourist destinations or the registration of major sacred sites (cf. Gunn 1995a, 2000a). It is evident that rock art complexes comprising a single site, or very few sites, and relatively few motifs, make up a more significant part of the regional assemblage than previously recognised (Table 5.7). Understanding the relationship between the

structure of such sites and the larger rock art assemblages will assist in understanding of the variability of contexts under which rock art was produced. In order to develop an interpretive framework from which management decisions can be formulated, it is essential that analysis incorporate *all* rock art site types.

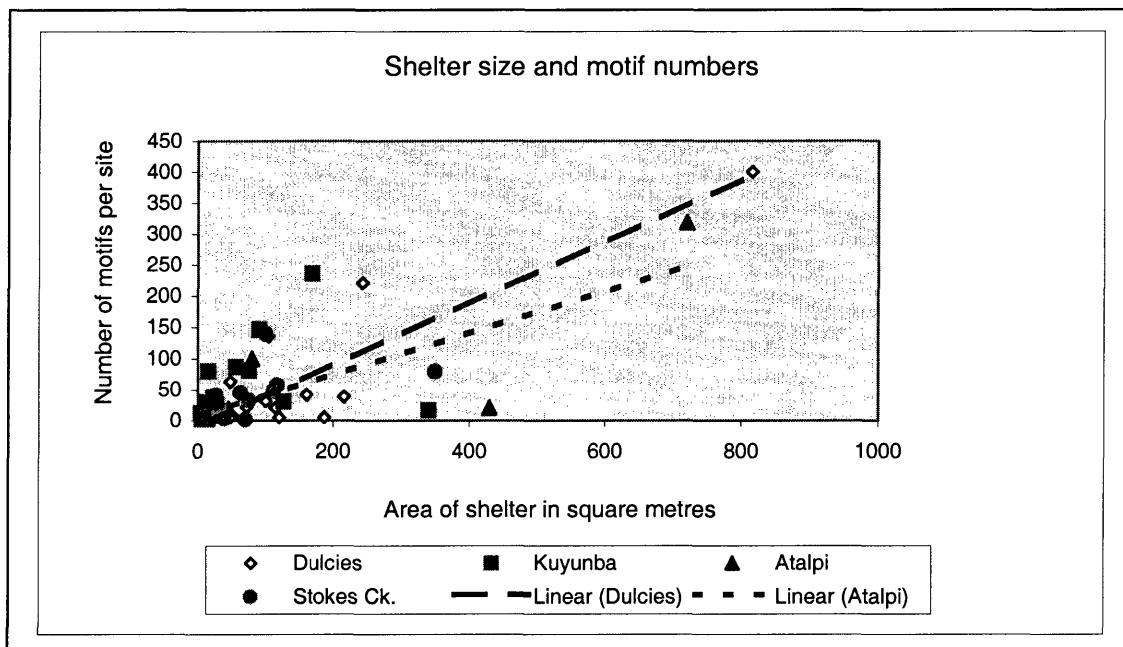
Table 5.8 Distribution of motif numbers at rock art sites

| Number of motifs per site | Number of rock art sites | Percentage of rock art sites |
|---------------------------|--------------------------|------------------------------|
| <10 | 110 | 39 |
| 10 - 20 | 55 | 19 |
| 20 - 50 | 59 | 21 |
| 50 - 100 | 23 | 8 |
| 100 - 200 | 17 | 6 |
| 200 - 400 | 10 | 4 |
| 400 - 1000 | 2 | 1 |
| 1000 + | 7 | 2 |
| TOTAL | 278 | 100 |

In order to describe the distribution of motifs at rock art sites, motifs per site were grouped into arbitrarily selected numerical ranges (Table 5.8). Table 5.8 shows that the most common rock art sites in the central Australian assemblage contains fewer than 10 motifs and that more than half the art sites (58%, n =165) contain fewer than 20 motifs. Nine rock art sites (3%) have 400 or more motifs.

Gunn (1995d:57, 87) demonstrated that there is a positive relationship between the floor area and the number of motifs per rockshelter at the extensive Kulbi Maru rock art complex to the east of Watarrka. To test if this relationship occurs across the region, the floor area of rockshelters from a sample of four rock art complexes comprising multiple rockshelters containing pigment art (Dulcie Range, Watarrka/Stokes Creek [*Tjunku*], Watarrka/Atalpi and Kuyunba) was analysed against motif numbers at each site and a regression line plotted (Figure 5.2).

Figure 5.2 Regression of motif numbers and shelter area



Dulcie Range $R^2=0.7884$

Watarrka/Atalpi $R^2=0.6749$

Watarrka/Stokes Creek $R^2=0.2778$

Kuyunba $R^2=0.1245$

Results demonstrate that there is a strong correlation between shelter size and motif numbers at Dulcie Range and Watarrka/Atalpi complexes. In contrast, the correlation at Kuyunba and Watarrka/Stokes Creek is weak although there are large shelters with high numbers of motifs at both complexes. From personal observation the relationship between shelter size and motif numbers throughout the region would be more accurately described as one where each complex containing multiple rockshelters has a large shelter containing a high number of motifs but that the correlation between shelter size and motifs numbers is not consistent in the remainder of the sites within each complex. What is evident is that each complex has a large rockshelter that contains a high number of motifs but that the correlation between floor area and motif numbers is not consistent.

It can be inferred then, that the size of the rockshelter was only one of a number of elements that people considered when selecting sites for the production of rock art.

Although time in the field did not permit the measurement and documentation of the many rockshelters without rock art, a number of general preferences were noted.

Rockshelters with sandy deposits were preferred over shelters where people would have had to sit and/or sleep on rocky ledges, and access to water sources, firewood and resources for foraging also appear to have been considerations (see also Thorley 1998a:181).

Distribution of techniques at site complexes

Table 5.9 Distribution of engraved and pigment assemblages at rock art complexes

| Site complexes with engraved art only | Site complexes with pigment art only | Site complexes with engraved & pigment art | Total |
|---------------------------------------|--------------------------------------|--|-------|
| 9 (18%) | 21 (41%) | 21 (41%) | 51 |

Table 5.9 and Table 5.10 show that there is considerable *spatial overlap* in the distribution of the modes of rock art production across the study area in central Australia. Site complexes where engraving is the most commonly used technique have larger rock art assemblages with 9 complexes containing a total of 13,804 motifs or 65% of the entire assemblage recorded.

Table 5.10 Distribution of techniques at rock art complexes

| Technique | Number of site complexes in which technique occurs | Percentage of site complexes in which technique occurs |
|------------|--|--|
| Pecked | 35 | 69 |
| Abraded | 10 | 20 |
| Pebraded | 9 | 18 |
| Pounded | 9 | 18 |
| Incised | 5 | 10 |
| Bruised | 2 | 4 |
| Scratched | 16 | 31 |
| Intaglio | 12 | 24 |
| Painted | 36 | 71 |
| Drawn | 34 | 67 |
| Stencilled | 31 | 61 |
| Printed | 25 | 49 |

With the exception of two site complexes where scratched and abraded motifs occur with pigment art, all the techniques used to produce engraved rock art are found within the range of complexes where pecked motifs occur. There are, however, 11 site complexes (37%) where pecking is the only engraving technique used.

Significantly, all site complexes where scratched motifs are found also have drawn motifs present. Drawings have been recorded at 29 site complexes (81%) where paintings were produced. Additional drawings are found at site complexes where stencilled and printed art assemblages occur (Plate 5.3).

In almost all cases (92%) where site complexes contain printed art (23 of the 24 complexes), stencilled art is also present. However, there are eight site complexes where stencilling was recorded without painting being present.

Thirty six site complexes (71%) contain pigment art produced using two or more techniques. This considerable overlap in the distribution of techniques used to produce pigment art indicates that either multiple techniques were used contemporaneously or, that places continued to be used through time with motifs added using different techniques.

In summary, although rock art is usually produced in a dominant technique at each complex, lower numbers of motifs in a variety of other techniques are commonly present.

There is considerable overlap in the distribution of techniques throughout the region (Chapter 7).

5.4 Rock art

In this section, I will consider the relationship between the motif classes and the techniques in which they were produced against a range of other categories: colour, bichrome, polychrome, outline and application method.

The organising principles governing the production of the rock art assemblage are then outlined. The relationship between motif classes and the techniques in which they were produced are compared with visual dominance, repetition, size and remarking.

The final analysis presented in this section describes the structure of trails of track motifs. The relationship between the length and direction of trails is compared. This

section concludes with a comparison between the structure of trails and motif classes and techniques.

Motifs

Table 5.11 Number of motifs in each class

| Motif | Number | Motif | Number |
|-------------------------|--------|----------------------|--------|
| Birdtrack/linear | 809 | Oval/fern/infill | 7 |
| Birdtrack/silhouette | 577 | Fern | 199 |
| Birdtrack/linear/spur | 152 | Solid circle | 151 |
| Birdtrack/silh/spur | 66 | Circle | 1339 |
| Birdtrail simple | 220 | Organic circle | 91 |
| Birdtrail silhouette | 121 | Thick/outline/circle | 41 |
| Birdtrail/lin/spur | 14 | Circle pit | 780 |
| Birdtrail/transverse | 10 | Concent/circle <4 | 423 |
| Multitrdent | 35 | Concent/circle >3 | 271 |
| Macro track/simple | 1144 | Concentric circ/pit | 169 |
| Macro/simple/random | 1451 | Spiral | 66 |
| Macro track/trans 12 | 16 | Continuous circle | 22 |
| Macro/heel 14 | 163 | Spoked circle | 55 |
| Macro/heel/toe 15 | 82 | Spoked con/circles | 14 |
| Macro/toe 16 | 473 | Spoked circle/dots | 7 |
| Macro trail/simple | 317 | Barred circle | 102 |
| Macro trail 12 | 131 | Circle/ex/lines | 75 |
| Macro trail 14 | 38 | Bisect/circ/ex/lines | 17 |
| Macro trail 15 | 13 | Circle/joined lines | 11 |
| Macro trail 16 | 58 | Linked circles | 52 |
| Plus paws | 19 | Radiating circle | 94 |
| Plus tail | 104 | Radiating fan | 154 |
| Macro/paws/tail | 2 | Arc | 443 |
| Macro/p/t/trail | 7 | Concentric arcs | 260 |
| Paws | 56 | U shape | 119 |
| Lizard trail | 8 | Concentric U shape | 2 |
| Human track | 98 | Inverted U shape | 121 |
| Human trail | 16 | Con/invert/U shape | 16 |
| Tracks other | 58 | Y shape | 49 |
| Trail tracks other | 244 | Hydra shape | 94 |
| Tracks/other /tail line | 6 | Rake | 35 |
| Trail of dots | 145 | Curved rake | 24 |
| Cluster of dots | 44 | Elongated two lats | 27 |
| Sinuous line | 64 | Elongated one lat | 16 |
| Meandering line | 540 | Lizard | 40 |
| Line | 495 | Rectilinear grid | 58 |
| Parallel lines | 118 | Amorphous grid | 46 |
| Vert/lines/random | 193 | Amorphous shape | 43 |
| Series/vertical lines | 82 | Complex pole | 97 |
| Horizontal lines | 31 | Phytomorph | 49 |
| Horiz/vert/lines | 40 | Anthropomorph | 76 |
| Striped design | 64 | Anthrop/headdress | 30 |
| Fingermarks | 34 | Anthrop/weapons | 12 |
| Hand | 4357 | Macropod | 8 |
| Boomerang | 129 | Bird | 15 |
| Contact object | 1 | Snake | 20 |
| Other object | 82 | Horse | 18 |
| Oval | 497 | Camel | 5 |
| Organic oval | 277 | Quadruped | 26 |
| Concentric ovals | 14 | Topview/quadruped | 9 |

| | | | |
|---------------------|-----|-----------------|--------|
| Barred oval | 155 | Rect/bar/fringe | 8 |
| Oval/crosshatch | 16 | Complex | 59 |
| Oval/external lines | 32 | Various | 56 |
| Oval/infill | 6 | Pecked area | 409 |
| Oval/fern | 3 | Indeterminate | 624 |
| | | TOTAL | 21,084 |

All motif classes are illustrated in Appendix 2. Hands are the most commonly produced motifs, with macro/simple/random, circle, macro track/simple, birdtrack/linear and circle and pits also frequently recorded (Table 5.11). In contrast, 115 unique or rare motifs were grouped into two classes according to the simplicity or complexity of their forms (see Appendix 2) so that the class, complex includes 59 motifs and the class, various, 56 motifs.

Table 5.12 Range of motif numbers within each motif classes.

| Number of motif classes in each range | Range of motif numbers per class |
|---------------------------------------|----------------------------------|
| 14 classes have | 0 – 9 motifs |
| 16 | 10 - 19 |
| 42 | 20 - 99 |
| 17 | 100 - 199 |
| 5 | 200 - 299 |
| 1 | 300 - 399 |
| 11 | 400 - 999 |
| 4 | 1000 + |
| TOTAL 110 | |

Table 5.12 shows the range of motif numbers in each class. Motif classes that have between 20 and 199 motifs per class make up 54% of the art assemblage, 18 % of the motif classes have fewer than 20 motifs per class and 19 % has 300 or more in each class. Motifs that have 300 or more per class include meandering lines, lines, ovals, arcs, concentric circles <4, pecked areas and indeterminate. Motifs with the lowest numbers per class include oval/infill, oval/fern, oval/fern/infill, spoked circle/dots, lizard trail, macro/paws/tail, macro/trail/paws/tail, tracks other/tail line, concentric u shape, contact object, camel, macropod, topview quadruped and rectilinear/bar/fringe.

Among pecked motifs, the total number of motifs in 25 circle classes is 3965 or 30% of the pecked assemblage, while 32 track classes total 5810 or 44% of the pecked assemblage. The combined total of all pecked track and circle motifs is 74%, considerably less than that recorded by Edwards (1966, 1971) at other sites in the arid zone (Chapter 3) but nevertheless, these are still dominant classes. However, if each single track was counted as an individual motif, rather than in pairs or trails as I have

done, the numbers may have been more similar than my figures indicate. Further, if the stencilled and printed assemblages are excluded from the mathematical calculations, track and circle classes have been utilised in roughly similar proportions to that displayed in the pecked assemblage throughout the remaining techniques.

Therefore it can be concluded that track and circle classes were utilised as a common vocabulary across a number of techniques, although generalised descriptions like these mask differences within and between sites that well might hold the potential to explain the types of human behaviour that led to the selection of motif classes and the locations in which they were produced.

Technique

Table 5.13 Number of motifs in each technique

| Technique | Number of motifs in each technique | Percentage of motifs in each technique |
|------------|------------------------------------|--|
| Pecked | 13,205 | 63 |
| Abraded | 112 | 1 |
| Pebraded | 103 | 0 |
| Intaglio | 110 | 1 |
| Scratched | 53 | 0 |
| Incised | 31 | 0 |
| Pounded | 125 | 1 |
| Bruised | 57 | 0 |
| Painted | 1893 | 9 |
| Drawn | 904 | 4 |
| Stencilled | 3697 | 17 |
| Printed | 794 | 4 |
| TOTAL | 21,084 | 100 |

The chronological implications of identifying motifs unique to a particular technique or common to a multiplicity of techniques was outlined in Chapter 4. Some motifs are limited to one or a few techniques by their definition such as circle and pit which are pecked, abraded or pebraded; pecked area are pecked or pounded; fingermarks are produced by pulling fingers across the rock surface after covering them in wet pigment so these marks are limited to the painted technique; contact object and object other classes record only stencilled objects and hand is the only motif produced using the print technique. In addition, a number of other motif classes are unique to one technique (Table 5.14).

Table 5.14 Motifs unique to one technique

| Technique | Motif |
|-----------|--|
| Painted | concentric u shape, concentric inverted u shape, fingermarks |

| | |
|------------|---|
| Stencilled | contact object, other object |
| Pecked | curved rake, thick outline circle, macro trail 15, macro track with transverse 12, macro track with paws and tail |
| Drawn | camel |

The majority of motifs are produced in a variety of techniques. Macro and bird tracks and trails are produced using pecked, pounded, abraded, pebraded, painted and drawn techniques although silhouette class tracks are more common in the pecked assemblage. No individual macro or bird tracks are found in the pounded assemblage but they were recorded amongst the drawn motifs. A large proportion of tracks/other and trail/tracks/other are produced using an intaglio technique while tracks/other/tail line are mainly found in the pecked technique. Human tracks and trails were recorded in the painted and stencilled assemblage as well as the engraved assemblage.

Grouped bird track classes are relatively evenly represented in the painted and pecked assemblages with 12% of pecked motifs ($n = 1664$) and 12% of the painted assemblage ($n = 206$). Grouped macropod tracks however, constitute a greater proportion of the pecked assemblage (28%, $n = 3835$) but only 10% ($n = 167$) of the painted assemblage.

Line class motifs are proportionally more common in the painted ($n = 336$, n = 20%) and drawn assemblage ($n = 278$, 32%) than they are in the pecked assemblage ($n = 364$, 3%), although line motifs make up 32% ($n = 17$) of the scratched motifs. While there are 65 painted ‘striped designs’ these motifs are entirely absent from the pecked assemblage although there are single examples of striped designs in the abraded and bruised assemblage. Vertical lines/random make up 19% ($n = 168$) of the entire drawn assemblage and 13 % ($n = 7$) of the scratched assemblage but constitute an insignificant proportion in other techniques.

Circle classes form the largest proportion of the pounded assemblage (38%, $n = 46$). The two classes of concentric circles combined together form 4% ($n = 583$) of the pecked assemblage, 3% ($n = 52$) of the painted assemblage and 6% ($n = 52$) of the drawn assemblage.

Stencilled motifs are restricted to a few classes with ‘hand’, ‘human track’, ‘boomerang’ and ‘other object’ being the most common.

Motifs identified explicitly as camels and horses (see Chapter 3 on classification of figurative motifs) are classified as drawn with the exception of two horses recorded at Watarrka/Bagot Central, which are outlined in red pigment (Plate 5.4) and a scratched example at Wallace Rockhole. Drawn motifs are often placed in frieze-type compositions at sites in the George Gill Range but exfoliation of shelter walls has eroded sections away making them hard to decipher. A clear composition of five small camels tied together with nose ropes was recorded at Watarrka/N E Ridge.

Motifs identified as snakes are more common in the painted ($n = 11$) and drawn ($n = 6$) assemblage than in other techniques (Plate 5.5). Two of the three snake motifs in the engraved assemblage are pounded.

Other motifs identified as animals were commonly produced using an intaglio technique, for example, 58% or 23 of the 40 lizards are intaglio (Plate 5.6), as are 5 or 33% of the 15 birds. Three quadrupeds and two top view quadrupeds were also produced using an intaglio technique demonstrating that this is a technique preferred for the production of engraved animal motifs. Macropod, bird and tother quadruped motifs were also produced using a linear outline (Figure 5.3). There are no naturalistic representations of macropods produced using pigments although bird motifs are represented in the drawn art.

There are no anthropomorph/headdress or anthropomorph/weapons in any of the pigment classes although anthropomorphs are represented in pecked, pebraded, painted and drawn motifs. Many of the drawn anthropomorph motifs were recorded at art sites where drawn horse or quadruped motifs (possibly cattle) are also found and some of the figures appear to be clothed and may therefore be representations of the explorers, pioneers, pastoralists or station workers who arrived in the region in the 1870's (Chapter 6).

The motif classes with the greatest number of abraded and pebraded motifs are birdtrack/linear ($n = 47$) and birdtrack/linear/spur ($n = 15$), which are most commonly found at abraded groove sites (see Plate 5.7). Elongated/two laterals motifs were recorded at Wallace Rockhole and Ewaninga on faces separated from the main

assemblages where the interior of each motif was abraded until smooth. Three life-sized emus recorded on a vertical face at N'Dhala Gorge (*Iluntja*) were also rubbed smooth and the vestigial wings of one emu had been abraded into 300mm deep parallel grooves (Chapter 6). Three similar grooves were recorded enclosed in a pecked circle on the main face at Ewaninga (Plate 5.8). Abrading of motifs in this way, like re-marking, suggests that the ritual significance *continued* after the initial production of the motif (Chapters 3 & 4). All scratched motif classes are also found in the drawn assemblage, which indicates that the two assemblages may be part of the same art system.

Table 5.15 Number of techniques in which each motif class is produced

| Number of techniques in which motif class was produced | Total number of classes | Percentage |
|---|--------------------------------|-------------------|
| One | 11 | 11 |
| Two | 10 | 9 |
| Three | 21 | 19 |
| Four | 26 | 24 |
| Five | 15 | 14 |
| Six | 12 | 11 |
| Seven | 8 | 7 |
| Eight | 3 | 3 |
| Nine | 3 | 3 |
| TOTAL | 109* | 100 |

*Technique was not recorded in detail for the motif class 'indeterminate' so is excluded from this table.

Table 5.15 demonstrates the majority of motifs were produced in a *variety* of techniques.

Birdtrack/linear, birdtrack/silhouette, circle, line, macrotrack/silhouette and fern have been produced in either eight or nine techniques.

Table 5.16 Techniques used to produce hand motifs in rockshelters

| Technique | Number of hand motifs |
|------------------|------------------------------|
| Drawn | 69 |
| Printed | 758 |
| Stencilled | 3475 |
| Scratched | 4 |
| Painted | 2 |
| Abraded | 1 |
| TOTAL | 4309 |

Hand motifs, the class with the greatest number of motifs, have been produced in a variety of techniques and are found in 184 rockshelters. Fourteen shelters contain a single hand motif and 4 shelters contain more than 200 hand motifs.

Scratched hand outlines are always found in association with stencilled hands and almost always (75%) in association with drawn hand motifs. Printed hand motifs appear in 58 rockshelters and in 46 of these, hand stencils have also been produced. Hand stencils were recorded in 171 rockshelters. Drawn hand outlines appear in 22 rock art sites and are the only hand motifs in 5 of these sites, which suggests that drawn hands were not produced exclusively to emphasise previous stencils or prints but were also produced as independent motifs. The significant difference however, is that the rough and spontaneous method of application means that they would have been less identifiable as a particular person's hand as is claimed for handstencils and prints unless others witnessed the event and passed the authorship of the drawn hands to others.

In summary, even when the art assemblage is classified at a fine-grained level, the *general vocabulary of motifs between techniques shows considerable overlap*, although there are a small proportion of motifs unique to individual techniques. A similar range of motifs is shared between the painting and the drawing techniques and between the drawing and scratching techniques. Printing is the only technique restricted to a single motif class and appears at all the complexes (but not sites) where stencilling also appears.

Colour

Most motifs produced using pigment were produced using a single colour.

Table 5.17 Numbers of monochrome motifs.

| Colour of motifs | Number of painted motifs | Number of drawn motifs | Number of stencilled motifs | Number of printed motifs | Total |
|------------------|--------------------------|------------------------|-----------------------------|--------------------------|-------|
| White | 350 | 13 | 40 | 13 | 416 |
| Red | 366 | 72 | 2404 | 336 | 3178 |
| Dark red | 238 | 7 | 595 | 165 | 1005 |
| Black | 68 | 705 | 30 | 3 | 806 |
| Grey | 127 | 33 | 30 | 71 | 193 |
| Brown | 1 | 0 | 69 | 15 | 85 |
| Cream | 25 | 0 | 0 | 0 | 25 |
| Light red | 10 | 0 | 22 | 6 | 38 |
| Metallic purple | 54 | 0 | 226 | 48 | 328 |
| Orange | 17 | 6 | 60 | 15 | 98 |
| Pink | 12 | 1 | 71 | 24 | 108 |
| Red orange | 44 | 8 | 13 | 22 | 87 |
| Yellow | 169 | 9 | 28 | 76 | 282 |
| TOTAL | 1481 | 853 | *3588 | 794 | 6716 |

*The colour of 109 handstencils at Watarrka/NE Ridge were not recorded individually although most were red or dark red.

Red and dark red ochre are the most commonly used ochre colours, although white is also frequently used in the painted assemblage as are grey and yellow. Much of the grey paint appears to have been made from an ash base and was often applied as a thick streaky pigment. Yellow painted pigment, on the other hand, was normally applied as a translucent watery mixture.

Stencils and prints were produced using all colours except cream with a distinctive metallic purple characterising several assemblages in the George Gill Range.

Red and dark red account for 76% of the hand motifs recorded. Grey and yellow handprints form a larger proportion of the printed hand assemblage than these colours provide in the stencilled hand assemblage but these figures reflect a local preference at Ilbillia where all prints are yellow and grey.

Drawn motifs have the most limited colour range with 83% (n=705) of the motifs produced using charcoal resulting in black or grey motifs. The grey pigment used to draw several motifs at Lilla and Stokes Creek at Watarrka had an unusual creamy texture, which was attributed to the mixing of beeswax with ash or charcoal to produce a crayon for drawing (Leo Abbott personal communication). The use of beeswax as a pigment binder has not been recorded elsewhere in central Australia although Smith and Rosenfeld (1992) record the presence of beeswax on a muller found in the deposit at a rockshelter containing both drawn and painted motifs at Watarrka/NE Plateau. The high organic content of beeswax makes it amenable to radiocarbon analysis and direct dates from beeswax motifs have been published for the northern parts of the Northern Territory (e.g. Nelson *et al.* 1995; Taçon & Garde 2000) and the Kimberley (Walsh & Morwood 1999:45-58). If, in fact, the figures at Watarrka have been produced using beeswax, they would provide an ideal sample from which to establish a distinct chronological marker.

Bichrome and Polychrome

There were 169 bichrome motifs and 16 polychrome painted motifs. The most common colour combination was red/white ($n = 124$, 73%) followed by red/black ($n = 15$) and black/white ($n = 10$). Red/white/black and red/white/yellow together form 69% of the polychrome assemblage. There were 9 bichrome drawn motifs and a single polychrome drawn motif. Five different polychrome colour combinations were utilised.

Some of the more common motifs painted or drawn in bichrome or polychrome colours include striped motifs ($n = 44$), oval classes ($n = 33$), concentric circle<4 and >3 ($n = 23$) (Plate 5.9), birdtrack variations ($n = 10$), snakes ($n = 7$), complex poles ($n = 6$), variations of the u shape motifs ($n = 5$), complex motifs ($n = 5$), circle/joined lines ($n = 3$, see Plate 5.10), boomerangs, horses, quadrupeds and elongated/two laterals (all $n = 2$).

Outline

Table 5.18 Technique used to produce motif outline.

| Technique used to produce outline | Number of motifs with outline |
|-----------------------------------|-------------------------------|
| Drawn | 81 |
| Scratched | 4 |
| Painted | 102 |
| Pecked | 4 |
| Pounded | 2 |
| Pebraded | 1 |
| TOTAL | 194 |

Drawn outlines around stencilled or printed hands were the most frequently occurring outlined motif 33% ($n=61$) of the outlined motifs. Four hand stencils were outlined with a scratched line. Other hands were drawn roughly with a freehand outline independent of a handstencil or print. Drawn hands have characteristically fat fingers, are roughly executed and are usually enclosed at the wrist (Plate 5.11). Stencilled boomerangs outlined in charcoal constituted 5% ($n = 9$) of the outlined assemblage.

The range of *painted* motifs with outlines corresponds very closely to the bichrome and polychrome motif range.

Outlined animals such as birds ($n = 2$), horses ($n = 2$) and snakes ($n = 15$) were produced in a variety of techniques including painted, drawn, pebraded and pounded assemblages.

Application Method

Some classes in the category, application method, are specific to particular techniques (Chapter 4). Table 5.19 incorporates data for all techniques.

Table 5.19. Motif numbers and classes produced in each application method.

| Application method classes | Number of motifs produced using method | Number of motif classes produced using method |
|----------------------------|--|---|
| Sparse | 1168 | 60 |
| Deep even | 1456 | 79 |
| Deep irregular | 1598 | 75 |
| Irregular shallow | 2066 | 84 |
| Fine | 1433 | 90 |
| Shallow | 495 | 71 |
| Shallow/solid/infill | 2666 | 84 |
| Regular | 47 | 28 |
| Even | 5620 | 105 |
| Thick | 497 | 60 |
| Rough | 909 | 102 |
| Not recorded | 3126 | N/A |
| TOTAL | 21084 | |

Shallow/solid/infill was the most commonly used engraving application method and accounts for a large proportion of the track assemblage where the entire track motif is pecked out. Similarly, most handstencils were recorded in the even class making this the most common application method in the pigment assemblage. Most drawings ($n = 835$) were recorded in the rough class as were a number of pecked motifs, most notably macro/trail 12 ($n = 48$). All intaglio motifs are classed as sparse, including animal forms such as lizards, birds and quadrupeds, as well as a range of trail tracks/other ($n = 81$) (Plate 5.12). The application method, fine, accounts more than 40% ($n = 281$) of concentric circles (2 classes), complex poles ($n = 46$), ferns ($n = 94$) and anthrop/headdress ($n = 15$). That is, a considerable proportion of these more complex motifs appear to have been produced using a finer pecking technique or with a fine brush stroke.

In summary, results of the analysis of application methods demonstrate that there are preferred application methods utilised in specific techniques. Preferences for particular application methods are also shown for some motifs or groups of motifs.

Visual Dominance

Table 5.20 Technique used to produce visually dominant motifs

| Technique of visually dominant motifs | Number of motifs | Percentage of total number of motifs in technique |
|---------------------------------------|------------------|---|
| Pecked | 577 | 4 |
| Painted | 182 | 10 |
| Drawn | 11 | 1 |
| Pebraded | 26 | 25 |
| Abraded | 16 | 14 |
| Other | 42 | N/A |
| TOTAL | 854 | |

854 motifs were recorded as visually dominant (Table 5.20). Dominant motifs are produced in a variety of techniques but a much higher proportion of abraded (14%) and pebraded (25%) motifs are visually dominant.

There are 78 motif classes represented amongst the visually dominant motifs although many (63%) are represented by 5 or fewer motifs. Some motif classes have a higher proportion of the total motifs classified as visually dominant than others including anthropomorph with headdress ($n = 19$, 63%), complex pole ($n = 34$, 35%), snake ($n = 7$, 35%), bird ($n = 5$, 33%) and organic oval ($n = 74$, 27%).

One hundred and two (56 %) of the painted motifs classified as visually dominant are bichrome or polychrome suggesting that the use of a more elaborate colour system has been utilised to emphasise the importance of the motifs in the painted assemblage.

Repetition

An additional means of emphasising a motif to create visual dominance is to repeat the motif numerous times (Chapter 4). Repetition is a feature of the structure of the entire rock art assemblage in central Australia. Two measures of repetition are included below. The first is an analysis of the most commonly occurring motif at each complex and the second is a measure of repetition within individual rock art panels.

The three most commonly occurring motifs at each complex were identified as a more accurate measure of repetition than the total number of motifs in each class irrespective of location (Table 5.11). However, some motif classes in Table 5.21 are represented by just a few motifs while others are represented by hundreds depending on the total number of motifs at the complex.

Table 5.21 Most commonly repeated motifs at each complex

| Commonly occurring motif | No. of complexes in which motif is most common | Commonly occurring motif | No. of complexes in which motif is most common |
|--------------------------|--|--------------------------|--|
| Hands* | 27 | Line | 2 |
| Circle | 21 | Barred oval | 2 |
| Birdtrack/linear | 12 | Inverted U shape | 2 |
| Macro/simple/random | 11 | Anthropomorph | 2 |
| Macro/track/simple | 9 | Arc | 2 |
| Vert/lines/random | 7 | Horse | 2 |
| Meandering line | 7 | Quadruped | 1 |
| Concentric circle<4 | 6 | Fingermarks | 1 |
| Concentric circle>3 | 5 | Barred circle | 1 |
| Circle and pit | 5 | Paws | 1 |
| Boomerang | 5 | Oval infill | 1 |
| Birdtrack/silhouette | 4 | Radiating fan | 1 |
| Macro trail 12 | 3 | Pecked area | 1 |
| Striped design | 2 | Amorphous shape | 1 |
| Oval | 2 | Birdtrack/linear/spur | 1 |
| Fern | 2 | Other object | 1 |
| Macro/heel 14 | 2 | Macro/toe 16 | 1 |
| Radiating circle | 2 | Horizontal/vert/lines | 1 |

*Hands includes hands produced in all techniques

Table 5.21 includes 36 motif classes indicating that there are clear preferences shown for the *repeated production of different motifs at different complexes*. The results also demonstrate that Edwards (1966, 1971) hypothesis that circle and track motifs are produced in the same consistent proportions in engraved assemblages across the arid zone (Chapter 3) is not supported by an analysis of a broader range of rock art complexes incorporating all techniques.

The repeated production of a single motif on an individual panel or face was also a common practice in the central Australian assemblage. Table 5.22 lists the motifs repeated more than 10 times *on a single panel*. At some complexes, the motifs listed may have occurred in this repeated form on numerous panels throughout the complex but have been listed in Table 5.22 only as being ‘present’, not in total numbers of panels with repetitions.

Table 5.22 Motif classes repeated more than 10 times on a panel

| Motif classes | No. of complexes in which they are repeated | Motif classes continued | No. of complexes in which they are repeated |
|-------------------------|---|-------------------------|---|
| Circle | 5 | Birdtrack/linear | 6 |
| Circle and pit | 5 | Birdtrack/silhouette | 6 |
| Organic circle | 5 | Macro track/simple | 6 |
| Concentric circle>3 | 4 | Macro trail/simple | 6 |
| Concentric circle<4 | 2 | Macro/simple/random | 5 |
| Concentric circle + pit | 1 | Macro/toe 16 | 1 |
| Solid circle | 1 | Macro trail 12 | 1 |
| Radiating circle | 1 | Macro/heel/toe 15 | 2 |
| Oval | 3 | Macro trail 15 | 1 |
| Organic oval | 1 | Macro heel 14 | 1 |
| Spoked circle | 1 | Macro trail 14 | 1 |
| Striped design | 1 | Quadruped | 1 |
| Series/vertical lines | 1 | Pecked area | 1 |
| Vert/lines/random | 2 | Boomerang | 1 |
| Meandering lines | 2 | Concentric arcs | 1 |
| Handstencil | 13 | Radiating fan | 1 |
| Handprint | 6 | Fern | 1 |
| Hand outlines | 1 | Inverted U shape | 1 |

There is considerable overlap in motif classes included in the repetition tables: the most commonly produced motifs in each complex (Table 5.21) and the motifs repeated on a single panel (Table 5.22). Repetition of particular motifs is a structural principle throughout each complex as well as within individual panels or faces in most complexes.

Size

Table 5.23 Size of selected motifs

| Motif | Small <150mm | Medium 150-<500mm | Large >500 |
|----------------------|--------------|-------------------|------------|
| Oval | 189 | 218 | 90 |
| Organic oval | 73 | 142 | 62 |
| Concentric oval | 1 | 6 | 7 |
| Barred oval | 60 | 80 | 15 |
| Oval/crosshatch | 3 | 12 | 1 |
| Oval/infill | 0 | 4 | 2 |
| Oval/fern | 0 | 2 | 1 |
| Oval/fern/infill | 1 | 4 | 2 |
| Circle | 927 | 363 | 39 |
| Organic circle | 29 | 50 | 12 |
| Thick outline circle | 38 | 3 | 0 |
| Circle and pit | 569 | 207 | 4 |
| Concentric circle<4 | 189 | 217 | 17 |

| | | | |
|-------------------------|----|-----|----|
| Concentric circle>3 | 38 | 213 | 20 |
| Concentric circle/pit | 42 | 114 | 14 |
| Spiral | 17 | 45 | 4 |
| Spoked circle | 8 | 35 | 12 |
| Barred circle | 65 | 32 | 5 |
| Anthropomorph | 37 | 37 | 2 |
| Anthropomorph/headdress | 0 | 20 | 10 |
| Anthropomorph/weapons | 1 | 6 | 5 |
| Bird | 6 | 4 | 5 |
| Macropod | 0 | 0 | 8 |
| Snake | 0 | 0 | 20 |
| Complex pole | 6 | 49 | 43 |
| Fern | 38 | 121 | 40 |
| Lizard | 9 | 16 | 13 |

Oval motif classes are commonly found in the medium size class while several of the circle classes, circle, circle and pit, barred circle and thick outline circle are most commonly found in the small size class although the remaining circle classes have higher percentages of motifs in the medium and large size classes (Table 5.23). Amongst the anthropomorph motifs, all but two motifs are equally divided between small and medium but anthropomorph/headdress and with weapons classes are more common in the medium and large size classes. A similarly high proportion of medium and large sized motifs are recorded for complex poles. Bird motifs are evenly represented in each size class but all macropods and snakes were measured as large.

Each technique is represented in approximately the same relative proportions in each size class.

A greater number of large and medium sized motifs ($n = 301$) were classified as visually dominant than small motifs ($n = 70$) as would be expected. Additionally, those motifs that were small and visually dominant were often those *repeated* numerous times on a single panel or, alternatively, they were the only motif at a site. It can be inferred from these results that size was a factor in emphasising particular motifs. Only 12 large motifs amongst those measured were recorded as bichrome or polychrome so that *colour together with size* was not commonly used to emphasise motifs in the assemblage recorded for this research (*cf.* Gunn 2000a, 2002a).

Size of handstencils and handprints

Hand size was measured across a sample of 99 of the 171 rock art sites where handstencils were recorded (Table 5.24). Eighty eight, or 89% of the sites where stencils were measured contained large handstencils, while 61 (62%) contained small handstencils. Medium handstencils were the most common in the measured sample and were found in 66 rockshelters (67%). The results indicate that children were actively involved in the production of handstencils in at least 62% of recorded cases so that many of the medium handstencils at these sites may belong to women (McDonald 1995).

The size of handprints was measured from a sample of 35 of the 63 sites where prints were produced (Table 5.24). Although handprints are inclined to create a motif that minimises the size of the hand and stencils maximise the size of the hand, numbers in each size range were proportionally similar to that of the handstencils (*cf.* Gunn 1989b:14) as was the spread of sizes across the sample sites.

Both men and children participated in the widespread production of handstencils and handprints and it is therefore likely, by association, that women also took part in the production of these art forms.

Table 5.24 Size of stencilled and printed hand motifs at sample sites

| Size of hand | Handstencil | Handprint |
|----------------------|-------------|-----------|
| Large >500 mm | 547 | 118 |
| Medium 150-500mm | 625 | 184 |
| Small <150mm | 448 | 152 |
| TOTAL hands measured | 1640 | 454 |

Re-marking or Repainting

Table 5.25 Technique used to re-mark motifs.

| Technique used to re-mark | Number of motifs re-marked |
|---------------------------|----------------------------|
| Pecked | 38 |
| Painted | 39 |
| Drawn | 7 |
| Abraded | 3 |
| Pebraded | 11 |
| Stencilled | 2 |
| TOTAL | 100 |

One hundred motifs in 36 motif classes were re-marked using 6 different techniques. Re-marking was recorded as proportionally more common in the painted assemblage but it is highly likely that taphonomic processes such as weathering and fungal growth may have obscured earlier pecked re-marking. Concentric circles <3 (n = 10) striped design (n = 10) and circles (n = 9) were the most frequently re-marked motifs.

It can be inferred from these results that re-marking *was not confined to a few distinctive motif classes* or a single technique but rather, common motifs such as hands, birdtrack/linear or macro trail 12 were also occasionally re-marked.

Summary of structuring principles

The analysis of the central Australian rock art assemblage has shown that a variety of structuring principles have been practiced on a wide range of motif classes.

Visual dominance in painted motifs classes has been achieved by a variety of means including repainting, the use of bichrome or polychrome colour combinations, production of large motifs and repetition of motifs within a single panel or complex.

In some cases such as Emily Gap, all of these techniques have been adopted.

Pebrading and abrading were common means used to create visual dominance in the engraved assemblage.

Repetition within individual panels and within site complexes is evident. Repetition has been used as a structuring principle in assemblages produced in most techniques. Significantly, a wide variety of motif classes, rather than just a few select or dominant classes are included amongst the classes repeated within complexes and within panels.

Particular motif classes were more commonly produced in specific size ranges irrespective of the technique in which they were produced. Size has been used as one means to create visually dominant motifs.

Re-marking and repainting is more commonly identified in the painted assemblage but was practised on a wide range of motifs.

Structure of TrailsLength of Trail

Table 5.26 Length of motif trails

| Motif | Trail <500mm | 500<1000mm | 1000<5000mm | > 5000mm |
|-----------------------|--------------|------------|-------------|----------|
| Birdtrail/simple | 113 | 51 | 26 | 0 |
| Birdtrail/silhouette | 72 | 23 | 11 | 0 |
| Birdtrail/linear/spur | 9 | 2 | 0 | 0 |
| Birdtrail/transverse | 2 | 2 | 3 | 2 |
| Macro/trail/simple | 123 | 67 | 72 | 7 |
| Macro trail 12 | 28 | 43 | 46 | 9 |
| Macro trail 14 | 18 | 7 | 11 | 0 |
| Macro trail 15 | 9 | 1 | 3 | 0 |
| Macro trail 16 | 22 | 11 | 11 | 1 |
| Macro/paws/tail/trail | 1 | 3 | 3 | 0 |
| Human trail | 8 | 2 | 5 | 0 |
| Lizard trail | 2 | 2 | 4 | 0 |
| Trail of tracks/other | 104 | 61 | 50 | 3 |
| Trail of dots | 73 | 32 | 29 | 1 |
| Meandering line | 177 | 145 | 124 | 9 |
| TOTAL | 761 | 452 | 398 | 32 |

There are a total of 1643 motifs composed in trail form. Shorter trails are more common (46% <500mm, n = 761) with only 7 of the motif trail classes (or 2% of the measured trails) represented in the >5000mm class. Bird trails tend to be shorter than macro trails with 87% (n = 274) less than 1000mm long while only 67% (n = 333) of macro trails fall into these shorter classes. Macro trail 12 (44%, n = 55, (Plate 5.13) and lizard trails (50%, n = 4, see Plate 5.12) have the highest proportional representation of trails longer than 1000mm.

The shortest trails (<500mm) are produced in all techniques except printing but the longest trails (>5000 mm) are restricted to pecked (n = 23), painted (n = 7), bruised (n = 1) and drawn (n = 1) techniques. The production of trails generally was not restricted to particular techniques but the less frequently used techniques were less likely to be used to produce long trails.

Direction of trail

Table 5.27 Direction of trail motifs

| Motif | Horizontal | Vertical | Diagonal | Meandering |
|-----------------------|------------|----------|----------|------------|
| Birdtrail/linear | 11 | 124 | 16 | 20 |
| Birdtrail/silhouette | 12 | 49 | 21 | 6 |
| Birdtrail/linear/spur | 0 | 9 | 1 | 0 |
| Birdtrail/transverse | 0 | 4 | 1 | 1 |
| Macro/trail/simple | 18 | 110 | 26 | 100 |
| Macro/trail 12 | 6 | 40 | 4 | 68 |
| Macro/trail 14 | 1 | 22 | 4 | 1 |
| Macro/trail 15 | 1 | 10 | 1 | 0 |
| Macro/trail 16 | 6 | 30 | 6 | 7 |
| Macro/paws/tail/trail | 0 | 6 | 1 | 0 |
| Human trail | 2 | 8 | 2 | 3 |
| Lizard trail | 1 | 6 | 0 | 1 |
| Trail/tracks other | 20 | 84 | 29 | 78 |
| Trail of dots | 15 | 53 | 18 | 46 |
| Meandering line | 5 | 15 | 7 | 418 |
| TOTAL | 98 | 570 | 137 | *749 |

*Direction was not measured for all trails (see Chapter 4).

Trails are most commonly produced to create a meandering sequence over the rock surface (48%, n = 749) or to run vertically up the rock face (37%, n = 570). Bird trails, human trails and lizard trails are more likely to be produced in a vertical composition while macro trails are found more evenly distributed in all directional classes (see also Rosenfeld & Smith 2002). Macro trails are sometimes painted to follow the contours of rockshelter walls following horizontal ledges to finish in a splattered circular trail in a concave alcove (Plate 5.13). At engraved sites, macro trails may extend up and over and down a number of rock faces.

Table 5.28 Direction of motif trails by technique.

| Technique | Horizontal | Vertical | Diagonal | Meandering |
|------------|------------|----------|----------|------------|
| Pecked | 79 | 496 | 127 | 613 |
| Abraded | 0 | 3 | 0 | 2 |
| Pebraded | 1 | 6 | 0 | 1 |
| Bruised | 0 | 4 | 1 | 8 |
| Painted | 11 | 48 | 8 | 106 |
| Drawn | 7 | 8 | 0 | 16 |
| Stencilled | 0 | 3 | 0 | 0 |
| Other | 0 | 2 | 1 | 0 |
| TOTAL | 98 | 566 | 136 | 746 |

Trails are represented in relatively equivalent proportions in each technique in each direction recorded except for a small number ($n = 3$) of stencilled trails that are limited to the vertical class (Table 5.28).

Table 5.29. Direction of motif trails by length of motif trails

| Direction | <500 mm | 500-1000 mm | 1000-5000 mm | >5000 mm |
|------------|---------|-------------|--------------|----------|
| Horizontal | 67 | 22 | 24 | 3 |
| Vertical | 312 | 147 | 144 | 9 |
| Diagonal | 92 | 31 | 23 | 0 |
| Meandering | 285 | 253 | 224 | 23 |

Table 5.29 shows that both vertical and diagonal trails are likely to be shorter. In contrast, meandering trails are represented by a higher proportion of motifs in the longer trail classes.

5.5 Locations selected for the production of rock art

In the following section, I present results from the analysis of the spatial distribution of rock art motifs within each site complex in relation to water sources and other topographic features in order to identify non-random patterning. In addition, I have analysed the relationship between motif classes and techniques and:

- i) the accessibility of the art panel or face
- ii) the location of motifs within the panel
- iii) the orientation of the panel.
- iv) the sites where occupants could view the surrounding country

Finally, the implications of the spatial distribution of motifs within site complexes will be considered in relation to prospective *audiences* who may have participated in the production of the art or who may have viewed the art as it was made or at a later stage.

Proximity to water source

Proximity to the available water source, either ephemeral or permanent, was recorded for all engraved motifs and included pecked, abraded, pebraded, intaglio, pounded and bruised motifs (scratched and incised motifs were most frequently found in rockshelters associated with pigment techniques so were excluded from category).

38% of motifs in the engraved assemblage ($n = 5,165$) were produced within 20 metres of the water source.

Table 5.30 Example of the chi squared analysis undertaken: < 20 m water and circle motif

| | < 20m to water | > 20m water | TOTAL |
|------------|----------------|-------------|-------|
| Circle | 384 | 955 | 1339 |
| Not circle | 4781 | 7592 | 12373 |
| TOTAL | 5165 | 8547 | 13712 |

$$\chi^2 = 50.65, \text{ very highly significant}$$

Chi squared analysis showed that the location of thirteen motif classes was non-random (Table 5.31) and that they are more likely to be produced close to the water supply than further away.

Table 5.31 Engraved motif classes with non-random distribution < 20 m from a water source

| Motif class | No. of motifs | Chi squared | Significance |
|-----------------------|---------------|-------------|--------------|
| Circle | 384 | 50.65 | *** |
| Circle and pit | 174 | 81.76 | *** |
| Concentric circle <4 | 135 | 5.90 | * |
| Concentric circle >3 | 120 | 4.86 | * |
| Oval | 163 | 4.02 | * |
| Bird track/simple | 198 | 63.14 | *** |
| Bird trail/simple | 64 | 6.64 | ** |
| Bird trail/silhouette | 62 | 9.00 | ** |
| Meandering line | 274 | 40.34 | *** |
| Lizard | 8 | 4.60 | * |
| Phytomorph | 27 | 5.63 | * |
| Hydra-shaped | 54 | 14.93 | *** |
| Macro track/heel 14 | 31 | 23.64 | *** |

Four classes of commonly occurring circle class motifs, ovals and meandering lines are non-randomly distributed within 20 metres of a water source, as are classes such as lizard, phytomorph and hydra-shaped motifs, which constitute a much smaller proportion of the whole assemblage, demonstrating that there is a range of common and uncommon motifs found around water sources (Table 5.31). As these motifs would have been seen by people visiting the water source, I contend that the viewing of these motifs was not likely to be restricted unless restrictions were enforced by cultural means such as a convention of averting the eyes in the vicinity of particular panels. It is also possible that a location close to the water source was selected intentionally so these particular motifs would be seen by *all* those visiting the water source.

Topographic location of motifs

Motifs were most commonly found in the middle of gorges or in rockshelters (Table 5.32). However, not all topographic classes represent the same area, so that differences in motif numbers recorded in each topographic class may reflect this fact. Appendix 3 illustrates the spatial areas represented in each topographic class at Roma Gorge E.

Table 5.32 Distribution of techniques in each topographic location

| Technique | Camping area | Gorge entrance | Middle gorge | Rocky shelf/creek | Cliff face | Rocky outlier | Rockshelter |
|------------|--------------|----------------|--------------|-------------------|------------|---------------|-------------|
| Pecked | 760 | 1366 | 7764 | 243 | 24 | 960 | 2046 |
| Abraded | 4 | 1 | 17 | 0 | 0 | 2 | 82 |
| Pebraded | 1 | 10 | 61 | 0 | 0 | 2 | 35 |
| Incised | 0 | 0 | 7 | 0 | 0 | 6 | 18 |
| Scratched | 0 | 0 | 9 | 0 | 0 | 0 | 47 |
| Bruised | 15 | 16 | 27 | 0 | 15 | 0 | 0 |
| Intaglio | 13 | 12 | 101 | 0 | 1 | 0 | 1 |
| Pounded | 1 | 12 | 67 | 0 | 6 | 1 | 38 |
| Painted | 0 | 0 | 276 | 0 | 14 | 103 | 1504 |
| Drawn | 0 | 0 | 19 | 1 | 0 | 14 | 877 |
| Stencilled | 0 | 0 | 9 | 0 | 2 | 1 | 3693 |
| Printed | 0 | 0 | 13 | 0 | 0 | 23 | 759 |
| TOTAL | 794 | 1417 | 8370 | 244 | 47 | 1112 | 9100 |

The distribution of techniques throughout topographic areas is uneven with motifs produced using pigment more likely to be found in rockshelters, rocky outliers or in middle gorges (Table 5.32). In contrast, engraved motifs are found in all topographic locations. Taphonomic processes may be partly responsible for this pattern as pigment motifs are more prone to weathering than engravings and may therefore have disappeared from more open areas.

Rock art ($n = 794$ motifs) was recorded at 8 locations classified as camping areas. Engravings were recorded on isolated boulders scattered on sandy flats at either end of Roma Main Gorge and Roma Gorge E. In addition, engravings were recorded on the stone capping along a 20m length of low ridgeline at the back of an open sandy rise at the southern end of Gorge E. Concentrations of occupation debris including dense artefact scatters, knapping floors, grindstones and mullers were recorded on these flats. Within the main gorge at N'Dhala, further evidence of occupation was

recorded on two enclosed sandy flats where engraved boulders are located. A small silicious rock outcrop with evidence of opportunistic quarrying was also found embedded in the larger flat. Rock art was recorded on isolated boulders along the creek bank below N'Dhala Gorge in associated with extensive artefact scatters. Similar archaeological evidence of occupation was found extending over a wide area on a sand sheet surrounding a low rocky outcrop to the east of the main gorge at Rainbow Valley (see also Smith 1988:236). Numerous engraved panels were recorded on rocky shelves running down to the sand sheet. Similar occupation debris was recorded below many of the other gorges where engravings are found although rock art does not extend into these areas at other sites.

Table 5.33 Motifs with non-random distribution in camping areas

| Motif class | Motif numbers | Chi squared | Statistical significance |
|-------------------------|---------------|-------------|--------------------------|
| Birdtrack/ linear | 55 | 21.69 | *** |
| Birdtrack/silhouette | 32 | 5.12 | * |
| Macro track/toe 16 | 10 | 22.94 | *** |
| Macro trail 16 | 10 | 22.94 | *** |
| Spoked circle | 22 | 193.58 | *** |
| Anthropomorph/headdress | 11 | 82.49 | *** |

Some track motifs were found to cluster in camping areas in a non-random way (Table 5.33). Spoked circles and anthropomorph/headdress are also found distributed in a statistically significant manner in camping areas but these results have been influenced by the predominance of these motifs at Rainbow Valley and N'Dhala Gorge respectively.

Art was recorded in 14 gorge entrances. At some sites, such as the southern ends of Roma Main Gorge and Roma Gorge E, these areas comprised large sheets of bedrock, which were densely covered with engravings while at other complexes such as Rainbow Valley, engravings were limited to outcropping boulders and scree slopes at the gorge entrance. No pigment art was recorded in gorge entrances. A small range of motifs are non-randomly produced in gorge entrances (Table 5.34).

Table 5.34 Motifs with non-random distribution at gorge entrances

| Motif class | Motif numbers | Chi squared | Statistical significance |
|----------------------|---------------|-------------|--------------------------|
| Arc | 48 | 11.69 | *** |
| Circle and pit | 187 | 383.61 | *** |
| Thick outline circle | 41 | 29.94 | *** |
| Oval | 63 | 28.09 | *** |

Rock art was recorded in 30 middle gorge topographic areas, which covered a much more extensive ground area than other areas documented in the topographic analysis so that the higher motif numbers recorded, are expected. While all techniques of production are found in middle gorges, pecked motifs constitute the highest proportion. Painted sites at Emily Gap, Jessie Gap and Trephma Gorge are all classified in the middle gorge class.

The motif range included amongst those that are non-randomly distributed in middle gorges (Table 5.35) include many of the same motifs that were recorded as non-randomly associated with areas <20 m to water source. As most water sources within gorges are found in areas classified as middle gorges, this overlap is expected.

Table 5.35 Motifs with a non-random distribution in middle gorges

| Motif class | Motif numbers | Chi squared | Statistical significance |
|----------------|---------------|-------------|--------------------------|
| Barred circle | 53 | 6.52 | ** |
| Circle | 599 | 14.93 | *** |
| Circle and pit | 381 | 27.92 | *** |
| Complex pole | 62 | 22.87 | *** |
| Curved rake | 21 | 20.98 | *** |
| Concentric arc | 135 | 15.92 | *** |

Small groups of pecked engravings were recorded at six locations classified in the rockshelf/creekbank topographic class. Fisher's Exact Test demonstrates that four motif classes are found clustered in a non-random way on rocky shelves alongside creek beds (Table 5.36). Six simple but unique motif forms produced at two Palm Valley (*Watara Ulbaia*) site complexes were classified in the various motif class and account for the inclusion of this motif class in the non-random distribution.

Table 5.36 Motifs with a non-random distribution on rockshelf/creek bank areas

| Motif class | Motif numbers | Fisher's exact test | Statistical significance |
|---------------------------|---------------|---------------------|--------------------------|
| Concentric circle and pit | 6 | P=0.012 | * |
| Solid circle | 6 | P=0.007 | *** |
| U shape | 6 | P=0.002 | *** |
| Various | 6 | P=0.000 | *** |

Both engraved and pigment art are found on the 10 rocky outlier topographic locations.

Table 5.37 Motifs with a non-random distribution on rocky outliers

| Motif class | Motif numbers | Chi squared | Statistical significance |
|-----------------------|---------------|-------------|--------------------------|
| Meandering lines | 96 | 171.14 | *** |
| Inverted U shape | 41 | 193.90 | *** |
| Inverted/concentric/U | 8 | 55.53 | *** |

| | | | |
|-------------|----|--------|-----|
| shape | | | |
| Pecked area | 73 | 129.66 | *** |

Four motif classes are non-randomly clustered at rocky outliers (Table 5.37).

Meandering line motifs are particularly evident at Ewaninga where they are pecked across the largest sloping panel of engravings and extend down from the highest point to meander up to 5000mm over the rock face. Pecked areas are also common at Ewaninga. Painted, inverted U shape motifs are prevalent at Kuyunba where they are repeated over one overhead panel on the rocky outlier.

The least common topographic area in which to find rock art in central Australia is on cliff faces.

Table 5.38 Motifs with non-random distribution on cliff faces

| Motif class | Motif numbers | Fisher's exact test | Statistical significance |
|----------------------|---------------|---------------------|--------------------------|
| Birdtrail/silhouette | 3 | P=0.002 | ** |

Only 47 motifs were produced on cliff faces with 18 motif classes represented.

Fischer's Exact Test showed that birdtrail/silhouette was the only motif distributed on cliff faces in a non-random way (Table 5.38).

More rock art (n=9100 motifs) was recorded in rockshelters than in any of the other topographic classes. The 27 motif classes that demonstrated a non-random association with rockshelters included classes well represented in the painted, drawn and stencilled motif ranges (Table 5.39).

Table 5.39 Motifs with a non-random distribution in rockshelters

| Motif class | Number of motifs | Chi squared significance value | Statistical significance |
|---------------------------|------------------|--------------------------------|--------------------------|
| arc | 163 | 7.13 | ** |
| anthropomorph | 42 | 4.09 | * |
| amorphous grid | 9 | 9.49 | ** |
| barred circle | 17 | 28.18 | *** |
| bird track/linear/spur | 65 | 80.47 | *** |
| bird track/linear | 303 | 10.80 | *** |
| boomerang | 89 | 34.34 | *** |
| complex pole | 21 | 17.46 | *** |
| hand | 4309 | 6961.48 | *** |
| horizontal/vertical/lines | 34 | 27.09 | *** |
| horizontal lines | 21 | 6.70 | ** |
| concentric circle <4 | 93 | 77.78 | *** |
| concentric circle >3 | 53 | 61.21 | *** |
| continuous circle | 20 | 18.67 | *** |
| horse | 17 | 17.31 | *** |
| inverted U shape | 67 | 6.95 | ** |
| parallel lines | 63 | 4.68 | * |

| | | | |
|--------------------------|-----|--------|-----|
| rectalineal grid | 39 | 12.82 | *** |
| series of vertical lines | 25 | 4.86 | * |
| snake | 17 | 12.65 | *** |
| vertical lines/random | 170 | 158.65 | *** |
| organic circle | 29 | 120.71 | *** |
| other object | 82 | 106.24 | *** |
| oval | 109 | 92.35 | *** |
| radiating circle | 13 | 31.85 | *** |
| solid circle | 40 | 16.49 | *** |
| quadruped | 22 | 16.61 | *** |

Engravings within rockshelters and outside rockshelters

An additional comparison between the range of pecked motif classes found within rockshelters and the pecked assemblage found outside rockshelters was undertaken. Circles are the most commonly occurring pecked motifs in rockshelters and represent 37% ($n = 273$) of the pecked assemblage in this location, while outside they only represent 8% ($n = 854$) of the assemblage. Other circle class motifs such as circle and pit, linked circles, organic circles and barred circles are much more evenly distributed throughout the whole assemblage. The two most commonly occurring macropod track motifs (macro track/simple, macro/simple/random) form a smaller proportion of the engraved rockshelter assemblage (10 %) than they do in the whole assemblage (15%).

The analysis of the relationship between the distribution of motif classes and particular topographic areas has shown that selection of location for the production of motifs is structured with particular motifs preferentially associated with different topographic areas. A range of circle class motifs, which constitute a high proportion of the total motif assemblage, are non-randomly associated with areas where people using water sources at art complexes, or walking through the engraved gorges, would be likely to see them. Motifs placed in these locations would have been seen by the majority of visitors to the complex. Analysis of the small sample of motifs recorded at camping areas, on cliff faces and rockshelf/creekbank, has identified the non-random distribution of several distinctive motifs such as spoked circles, concentric/invert/U shape, anthropomorph/headdress and meandering lines. Location of motifs in these spatially separated areas provides an opportunity to restrict access to these motifs.

It is also evident that the choice of motif, is in part, bound to the technique most regularly used in each topographic area and therefore the motif range is likely to reflect that most frequently chosen within each of these techniques. The chronological implications of this patterning will be investigated in Chapter 6 and the implications of the preferences shown for the production of particular motif types in different topographic areas will be discussed in Chapter 8.

Orientation of rock surface on which rock art is produced

Table 5.40 Motif distribution on art surfaces of different orientation.

| Orientation of art surface | Number of motifs | Percentage of art assemblage |
|----------------------------|------------------|------------------------------|
| Vertical | 4189 | 21 |
| Horizontal | 6459 | 32 |
| Sloping | 9371 | 47 |
| TOTAL | 20019* | 100 |

*total number of motifs in this category. The indeterminate class and 172 handstencils were excluded.

Table 5.41 Motifs with a non-random distribution on horizontal surfaces

| Motif | Number of motifs on horizontal surfaces | Chi squared | Significance |
|-----------------------|---|-------------|--------------|
| Amorphous shape | 18 | 10.182 | *** |
| Arc | 130 | 18.895 | *** |
| Birdtrack/linear | 274 | 84.553 | *** |
| Birdtrack/silhouette | 268 | 232.299 | *** |
| Birdtrail silhouette | 46 | 20.465 | *** |
| Boomerang | 17 | 4.250 | * |
| Circle | 374 | 42.117 | *** |
| Circle pit | 296 | 141.083 | *** |
| Complex pole | 32 | 7.857 | ** |
| Concentric circle+pit | 59 | 19.306 | *** |
| Curved rake | 13 | 14.089 | *** |
| Hydra shape | 38 | 20.537 | *** |
| Linked circles | 20 | 8.656 | ** |
| Macro track/simple | 415 | 171.822 | *** |
| Macro/heel 14 | 136 | 384.295 | *** |
| Macro/simple/random | 546 | 262.718 | *** |
| Macro/toe 16 | 187 | 100.247 | *** |
| Macro trail 12 | 10 | 13.282 | *** |
| Organic circle | 39 | 25.260 | *** |
| Parallel lines | 13 | 6.453 | * |
| Solid circle | 48 | 10.199 | *** |
| Spiral | 29 | 19.824 | *** |
| Spoked circle | 18 | 3.955 | * |
| Thick outline circle | 16 | 7.075 | ** |
| Tracks other | 19 | 4.232 | * |
| Paws | 30 | 34.220 | *** |

| | | | |
|------------------|----|--------|-----|
| Phytomorph | 24 | 21.696 | *** |
| Radiating circle | 29 | 5.037 | * |

The range of motif classes showing a non-random distribution on horizontal surfaces demonstrates a strong correspondence to those motif classes with large proportions in the engraved assemblage (Table 5.41).

Table 5.42 Motifs with a non-random distribution on sloping surfaces

| Motifs | Number of motifs on sloping surfaces | Chi squared | Significance |
|-----------------------|--------------------------------------|-------------|--------------|
| Anthropomorph | 21 | 10.351 | ** |
| Birdtrack/linear | 326 | 14.096 | *** |
| Birdtrack/silhouette | 172 | 68.270 | *** |
| Birdtrail/simple | 122 | 6.329 | * |
| Circle | 732 | 35.243 | *** |
| Circle pit | 417 | 14.143 | *** |
| Fern | 77 | 4.995 | * |
| Fingermarks | 25 | 8.720 | ** |
| Hand | 1830 | 51.484 | *** |
| Inverted U shape | 26 | 30.338 | *** |
| Lizard | 12 | 3.898 | * |
| Macro track 12 | 12 | 4.040 | * |
| Macro trail/simple | 184 | 15.870 | *** |
| Macro/heel/toe 14 | 26 | 6.947 | ** |
| Macro/simple/random | 630 | 7.084 | ** |
| Macro/toe 16 | 149 | 44.976 | *** |
| Macro/trail 12 | 84 | 15.180 | *** |
| Meandering line | 288 | 9.216 | ** |
| Organic oval | 175 | 29.555 | *** |
| Other object | 22 | 12.409 | *** |
| Parallel lines | 43 | 4.716 | * |
| Paws | 13 | 11.626 | *** |
| Radiating circle | 27 | 11.690 | *** |
| Series vertical lines | 24 | 9.481 | ** |
| Sinuous line | 19 | 6.887 | ** |
| Striped design | 19 | 6.887 | ** |
| Trail/tracks/other | 138 | 9.033 | ** |
| U shape | 37 | 11.252 | *** |
| Vertical lines/random | 73 | 5.962 | * |

A wide variety of motif classes demonstrated a non-random distribution on sloping surfaces including classes common in both the engraved and pigment assemblages (Table 5.42).

Table 5.43 Motifs with a non-random distribution on vertical surfaces

| Motif class | Number of motifs on vertical surfaces | Chi square significance | Statistical significance |
|---------------------------|---------------------------------------|-------------------------|--------------------------|
| Amorphous grid | 9 | 6.716 | ** |
| Amorphous shape | 6 | 6.937 | ** |
| Anthropomorph/headdress | 16 | 5.175 | * |
| Anthropomorph | 52 | 43.990 | *** |
| Arc | 88 | 31.295 | *** |
| Birdtrack/silhouette | 131 | 24.401 | *** |
| Birdtrack/linear | 201 | 20.880 | *** |
| Birdtrail/silhouette | 20 | 13.077 | *** |
| Birdtrail/simple | 49 | 9.704 | ** |
| Boomerang | 56 | 6.877 | ** |
| Circle | 224 | 157.711 | *** |
| Circle pit | 64 | 213.826 | *** |
| Complex pole | 19 | 6.596 | * |
| Concentric circle+pit | 17 | 37.436 | *** |
| Concentric circle<4 | 64 | 57.253 | *** |
| Concentric circle>3 | 50 | 23.352 | *** |
| Continuous circle | 14 | 8.533 | ** |
| Elongated/2 laterals | 14 | 3.891 | * |
| Hand | 2199 | 843.590 | *** |
| Horizontal/vertical/lines | 24 | 12.865 | *** |
| Horizontal lines | 20 | 13.336 | *** |
| Horse | 18 | 34.785 | *** |
| Hydra shape | 13 | 13.851 | *** |
| Inverted U shape | 93 | 108.735 | *** |
| Line | 186 | 6.305 | * |
| Lizard | 22 | 8.466 | ** |
| Macro track/simple | 192 | 132.309 | *** |
| Macro trail/simple | 54 | 33.480 | *** |
| Macro/simple/random | 261 | 145.199 | *** |
| Meandering line | 126 | 19.837 | *** |
| Multitrident | 18 | 5.046 | * |
| Organic circle | 8 | 21.981 | *** |
| Organic oval | 44 | 33.728 | *** |
| Other object | 59 | 57.531 | *** |
| Parallel lines | 62 | 21.410 | *** |
| Phytomorph | 8 | 5.002 | * |
| Quadruped | 17 | 11.594 | *** |
| Rectalineal grid | 32 | 12.936 | *** |
| Series of vertical lines | 43 | 14.413 | *** |
| Sinuous lines | 33 | 10.073 | ** |
| Snake | 16 | 18.745 | *** |
| Solid circle | 27 | 13.748 | *** |
| Striped design | 41 | 28.264 | *** |
| Trail tracks other | 61 | 5.633 | * |
| Vertical line/ random | 115 | 65.305 | *** |

The motif classes demonstrating a non-random distribution on vertical surfaces are those most common in the pigment assemblage with many of the classes common in

the drawn assemblage evident (Table 5.43). A number of classes restricted to, or more common in the engraved assemblage are also found non-randomly distributed on vertical walls. These classes include lizard, anthropomorph, anthropomorph/headdress, circle and pit, concentric circle and pit and various track and trail motifs.

Table 5.44 Chi squared analysis of association between orientation of art surface and technique

| Technique | Vertical motif numbers | χ^2 Vertical | Sloping motif numbers | χ^2 Sloping | Horizontal motif numbers | χ^2 Horizontal |
|------------|------------------------|-------------------|-----------------------|------------------|--------------------------|---------------------|
| Abraded | 76 | *** | 24 | *** | 6 | *** |
| Bruised | 7 | ** | 37 | * | 14 | |
| Scratched | 41 | *** | 12 | *** | | |
| Incised | 7 | | 10 | | 14 | * |
| Intaglio | 59 | ** | 38 | *** | 31 | |
| Pebraded | 52 | *** | 25 | *** | 32 | |
| Pecked | 2156 | *** | 6273 | *** | 4568 | *** |
| Pounded | 76 | *** | 43 | * | 5 | *** |
| Drawn | 556 | *** | 331 | *** | | |
| Painted | 1140 | *** | 693 | *** | 4 | |
| Printed | 309 | *** | 423 | *** | | |
| Stencilled | 1974 | *** | 1461 | *** | | |

The distribution of all pigment techniques is non-randomly associated with sloping or vertical rock surfaces as would be expected (Table 5.44). The orientation of motifs produced using an engraved technique are less clear, as motifs were more evenly distributed between the three orientation classes. Rock art on faces or panels orientated in each direction could be viewed by people seated or standing although much of the engraving on horizontal faces could be produced and viewed more easily from a seated position. The distribution of motifs on flatter sections of the rock surface within sites indicates a preference for areas where groups of people could have sat together to participate in activities associated with production of the art.

Location of motif on art panel

Table 5.45 Location of motifs on art panels.

| Location of motif | Number of motifs | Percentage of art assemblage |
|-------------------|------------------|------------------------------|
| High | 1831 | 8.78 |
| Medium | 12267 | 58.81 |
| Low | 6760 | 32.41 |
| TOTAL | 20858* | 100 |

*total number of motifs recorded in this category

Rock art, ritual and relationships

Most motifs across all techniques are located in the areas that would be easily reached today (Table 5.45). There are some differences in the choice artists made in the location selected for particular motif types. Macro/trail 14, trail of dots and trail/tracks/other are all found non-randomly distributed in higher more difficult to reach rock faces, which indicates that artists often extended trails into these regions (Table 5.46).

Table 5.46 Motifs with a non-random distribution in high or low areas

| Motifs /high areas | Number of motifs | Chi squared significance | Motifs/ low areas | Number of motifs | Chi squared significance |
|--------------------|------------------|--------------------------|---------------------|------------------|--------------------------|
| Macro trail 14 | 11 | *** | Amorphous grid | 22 | * |
| Trail of dots | 22 | ** | Barred circle | 60 | *** |
| Trail tracks/other | 33 | * | Circle | 682 | *** |
| | | | Circle and pit | 341 | *** |
| | | | Circle extern lines | 35 | * |
| | | | Cluster of dots | 25 | *** |
| | | | Complex pole | 51 | *** |
| | | | Fern | 88 | *** |

Motifs found non-randomly distributed on the lower sections of rock art sites are those strongly represented in the engraved assemblage (Table 5.46 & Table 5.47).

This association is not unexpected as 42% of pecked assemblage is classified as low reflecting the preference for bedrock shown for the production of much of the engraved rock art. The intaglio technique stands out as the only technique non-randomly distributed in higher areas of art surfaces (Table 5.47).

Table 5.47 Non-random distribution of techniques on art panels.

| Technique | Location | Number | Significance |
|------------|----------|--------|--------------|
| Pecked | low | 5464 | *** |
| Abraded | medium | 79 | ** |
| Stencilled | medium | 2931 | *** |
| Bruised | medium | 21 | *** |
| Drawn | medium | 630 | *** |
| Painted | medium | 1356 | *** |
| Pecked | medium | 6372 | *** |
| Printed | medium | 615 | *** |
| Intaglio | high | 34 | *** |

View from art site

This category was recorded at rock art site level rather than at complex level. Seventy five rock art sites have a vista where someone sitting at the site could observe the surrounding country for at least 500m. Sixty of the sites with such views are rockshelters, and, of these, 31 are in the George Gill Range. The additional sites include a number of elevated engraved ledges or alcoves at the entrance to gorges, or strategically located engraved boulders within gorges from which views of the gorge could be obtained and the approach of any person or animal entering the area could be noted.

Table 5.48 Motifs with a non-random distribution in rock art sites with a view

| Motifs | Number of Motifs | χ^2 Significance |
|--------------------------|------------------|-----------------------|
| Amorphous shape | 19 | *** |
| Arc | 138 | *** |
| Barred oval | 19 | * |
| Birdtrack linear | 207 | *** |
| Birdtrack silhouette | 59 | *** |
| Birdtrail silhouette | 36 | ** |
| Circle | 165 | *** |
| Complex pole | 9 | * |
| Concentric ovals | 7 | * |
| Concentric circles<4 | 49 | *** |
| Concentric circles>3 | 33 | ** |
| Continuous circle | 9 | * |
| Fern | 17 | *** |
| Inverted concentric U | 7 | * |
| Line | 142 | *** |
| Macro trail/simple | 34 | *** |
| Macro/ heel 14 | 110 | *** |
| Macro/simple/random | 395 | *** |
| Macro/trail 12 | 9 | *** |
| Organic oval | 81 | *** |
| Paws | 19 | * |
| Radiating circle | 9 | * |
| Radiating fan | 15 | ** |
| Series of vertical lines | 6 | ** |
| Trail of dots | 18 | * |
| Trail tracks/other | 28 | ** |
| U shape | 34 | * |

Twenty percent of the art assemblage or 4212 motifs were recorded in sites with views but no rationale for the patterning observed can be suggested.

Table 5.49 Techniques with a non-random distribution at rock art sites with views

| Technique | Motif numbers | χ^2 Significance |
|------------|---------------|-----------------------|
| Drawn | 272 | *** |
| Painted | 383 | ** |
| Stencilled | 793 | * |
| Printed | 134 | *** |
| Pebraded | 35 | ** |
| Scratched | 26 | *** |

All techniques are found in sites with views but drawn, painted, stencilled, scratched, pebraded and printed motifs show a non-random distribution in sites with a view (Table 5.49). These are mainly pigment techniques so that, if it can be shown that pigment art is amongst the more recently produced rock art, the preference for a site with a view may be chronological.

Accessibility

Table 5.50 Accessibility of motifs within a rock art site

| Accessibility of motifs | Number of motifs | Percentage of the assemblage |
|-------------------------|------------------|------------------------------|
| Easy | 14419 | 70 |
| Moderate | 5549 | 27 |
| Difficult | 563 | 3 |
| TOTAL | 20531* | 100 |

*total number of motifs recorded in this category

All but 3% of the entire rock art assemblage were produced in places that were classified as easy or moderate to reach so that little or no climbing would have been required to produce them.

Table 5.51 Motifs with a non-random distribution in difficult to reach locations

| Motif | Motif numbers | Fisher's Exact Test | Significance |
|----------------------|---------------|---------------------|--------------|
| Barred circle | 7 | P=0.02 | * |
| Birdtrack/silhouette | 10 | P=0.001 | *** |
| Elongated/2laterals | 4 | P=0.005 | ** |
| Human tracks | 10 | P=0.000 | *** |
| Striped design | 11 | P=0.000 | *** |
| Hand | 25 | $\chi^2=96.48$ | *** |

Several motif classes are non-randomly distributed in places where access today would be more difficult (Table 5.51).

Table 5.52 Techniques with a non-random distribution in each accessibility class

| Technique | Accessibility | Motif number | Significance |
|------------|---------------|--------------|--------------|
| Abraded | easy | 95 | *** |
| Bruised | easy | 51 | ** |
| Drawn | easy | 789 | *** |
| Painted | easy | 1413 | *** |
| Pecked | easy | 7985 | *** |
| Printed | easy | 685 | *** |
| Stencilled | easy | 3127 | *** |
| Drawn | moderate | 22 | *** |
| Painted | moderate | 52 | *** |
| Pecked | moderate | 4339 | *** |
| Printed | moderate | 89 | *** |
| Stencilled | moderate | 487 | *** |
| Incised | moderate | 21 | *** |
| Pebraded | moderate | 41 | * |
| Pebraded | difficult | 11 | Fishers *** |
| Pecked | difficult | 420 | *** |

There was considerable overlap in the non-random distribution of techniques in accessibility classes although pebraded and pecked techniques were the only classes non-randomly distributed in the difficult class with bruised and abraded techniques only non-randomly distributed in places that were easy to reach (Table 5.52). It is significant that almost all of the rock art produced in central Australia was produced in locations with easy, or moderately easy access, indicating that restriction of physical access to the viewing of art was not a common practice. There is ethnographic evidence (Spencer & Gillen 1899, 1912, 1927; Strehlow 1947; Wallace & Wallace 1977) that avoidance practices can be utilised even when art is located in areas that would appear to be on public display, so that it cannot be automatically assumed access to art on open display was unrestricted.

Summary of analysis of the location of motifs within complexes, art sites and panels

There is a strong and predictable relationship between topographic area, motif range and technique but there is also further, more subtle structuring within each technique. A range of circle class motifs are amongst those non-randomly distributed near water, in middle gorges (often the same area) or at gorge entrances suggesting that artists may have preferred locations where a wide audience would have viewed this suite of engravings. While all people visiting the water source would have seen these engravings, the distribution of archaeological occupation debris indicates that people did not generally camp in the limited confines of the gorge. To do so would have denied animals access to water and open sandy areas favoured as campsites are not commonly found within gorges. People producing engravings would have moved up

into the gorge from outlying camping areas. Track class motifs are widely distributed throughout complexes with some variation in particular classes and some tracks found in camping areas. A few distinctive painted and engraved motifs are located in topographic areas where physical separation of the sites at places such as rocky outliers would have provided the means to restrict access to the art.

Motifs were generally produced within an area of the panel that was easy for the artist to reach. Similarly, locations selected for the production of art would have been relatively easy for the artist to reach. Few motifs were non-randomly distributed in places that provided difficult access suggesting that if the viewing of motifs was restricted, this was not achieved by physical separation of the art but by some means of learned behaviour such as avoiding the area or averting the head. Of course, it may well be that the geometric form of the motif assemblage in central Australia provided the means to restrict access if that was required. I will take this point further in Chapter 8.

The influence of technique was evident in the analysis of rock art motifs and the orientation of the rock art panel. The widespread use of sloping or horizontal surfaces for the production of pecked motifs suggests that those participating in the production of art may have been seated at the site.

The relationship between motifs common in the pigment assemblage and sites with a view may simply reflect the distribution of pigment art in rockshelters, by far the most common site recorded with views. It is possible however, that if it can be shown that the pigment art in the shelters was produced in the last few hundred years, there may be recent preference shown for the selection of sites with a view for the production of rock art.

5.6 Associated rock art traditions

The composition and location of five different types of associated rock art traditions were recorded. Table 5.53 describes the relationship between associated rock art traditions and other aspects of the rock art assemblage. Table 5.54 shows the distribution of each associated rock art tradition within topographic areas. I will discuss each associated rock art tradition and its topographic distribution in turn.

Table 5.53 Number of rock art sites where associated rock art traditions were recorded.

| Associated rock art traditions | Total number of sites where marks were recorded | Number of pigment art sites* where marks were recorded | Number of engraved sites* where marks were recorded | Number of sites with marks where no associated art was recorded |
|--------------------------------|---|--|---|---|
| Abraded grooves | 59 | 34 | 20 | 5 |
| Pecked pits | 31 | 19 | 12 | |
| Abraded areas | 35 | 14 | 20 | 1 |
| Random pecking/pounding | 24 | 7 | 17 | |
| Battered edges | 23 | 11 | 12 | |

*dominant rather than exclusive technique.

Table 5.54 Number of topographic locations in which associated rock art traditions were recorded.

| Topographic location | Abraded grooves | Pits | Abraded areas | Random pecking/pounding | Battered edges |
|----------------------|-----------------|------|---------------|-------------------------|----------------|
| Camping area | 1 | 5 | 5 | 5 | 4 |
| Gorge entrance | 3 | 11 | 10 | 10 | 6 |
| Middle gorge | 5 | 14 | 14 | 12 | 10 |
| Cliff face | 3 | 4 | 5 | 3 | 5 |
| Rockshelter | 46 | 14 | 25 | 13 | 13 |
| Rocky outlier | 2 | 3/2 | 2 | 3 | 1 |
| Rockshelf/creekbank | 0 | 1 | 1 | 2 | 0 |
| TOTAL | 60 | 52 | 62 | 48 | 39 |

Abraded grooves

Fifty nine of the rock art sites recorded contain abraded grooves (Table 5.53). Whilst some complexes have up to 7 rock art sites with grooves, many other complexes (22) have no abraded groove sites at all, so they are by no means a universal element of central Australian rock art assemblages. For example, no abraded grooves were recorded at the extensive engraved site of N'Dhala Gorge and grooves were recorded in only two of the six gorges at Roma. Geology may play some role in the distribution of abraded grooves in central Australia. Analysis shows that all sites with abraded grooves are formed in sandstone. Further, while I had no way of comparing the density of the sandstone, it would appear from general observation that grooves are more commonly found on the softer areas of sandstone where little effort would have been required to produce them. Although no abraded grooves were recorded at Ooraminna Rockhole and Glen Thirsty, this omission is the result of the limited time allocated for recording at these complexes (Chapter 4) as abraded grooves are

known to be present at both locations (Gunn 1991b; Andrew Bridges personal communication).

The number of abraded grooves per art site varies from just two at Ilbillia to more than 500 at Watarrka/NE Plateau where the grooves extend for more than 100 metres along the back wall of a shallow overhang. Many sites contain several spatially discrete clusters of abraded grooves. The number of abraded grooves per cluster was measured over a sample of 52 sites and demonstrates that the number of grooves per cluster and site varies significantly (Figure 5.4).

Figure 5.4 Number of grooves per cluster

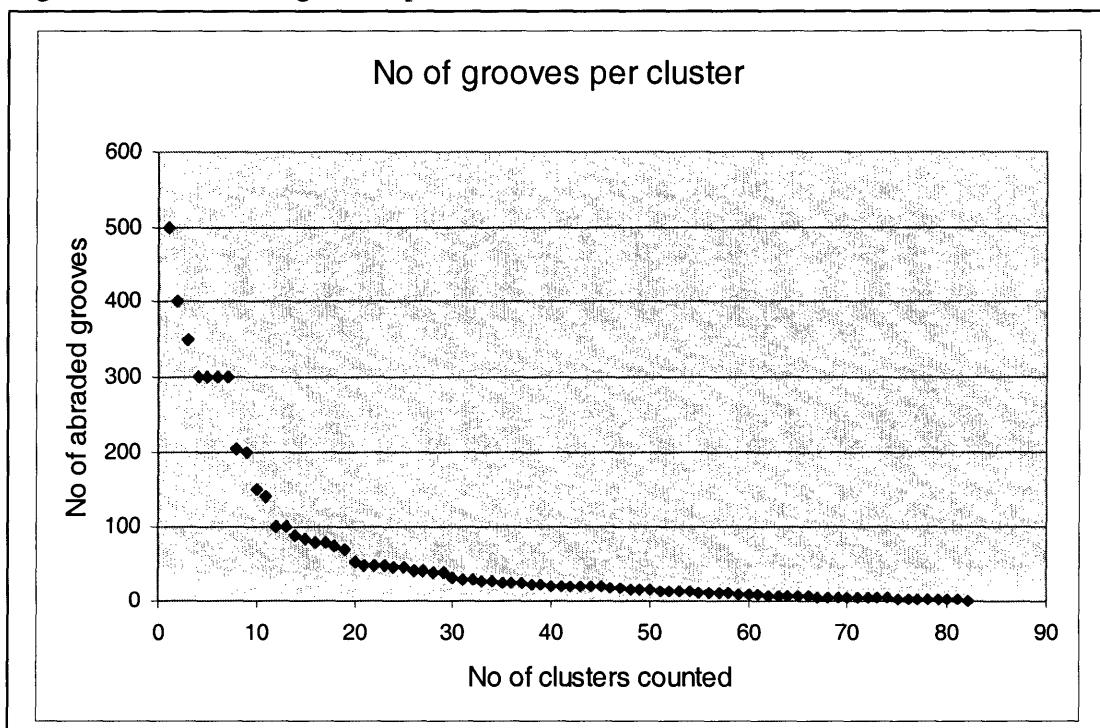
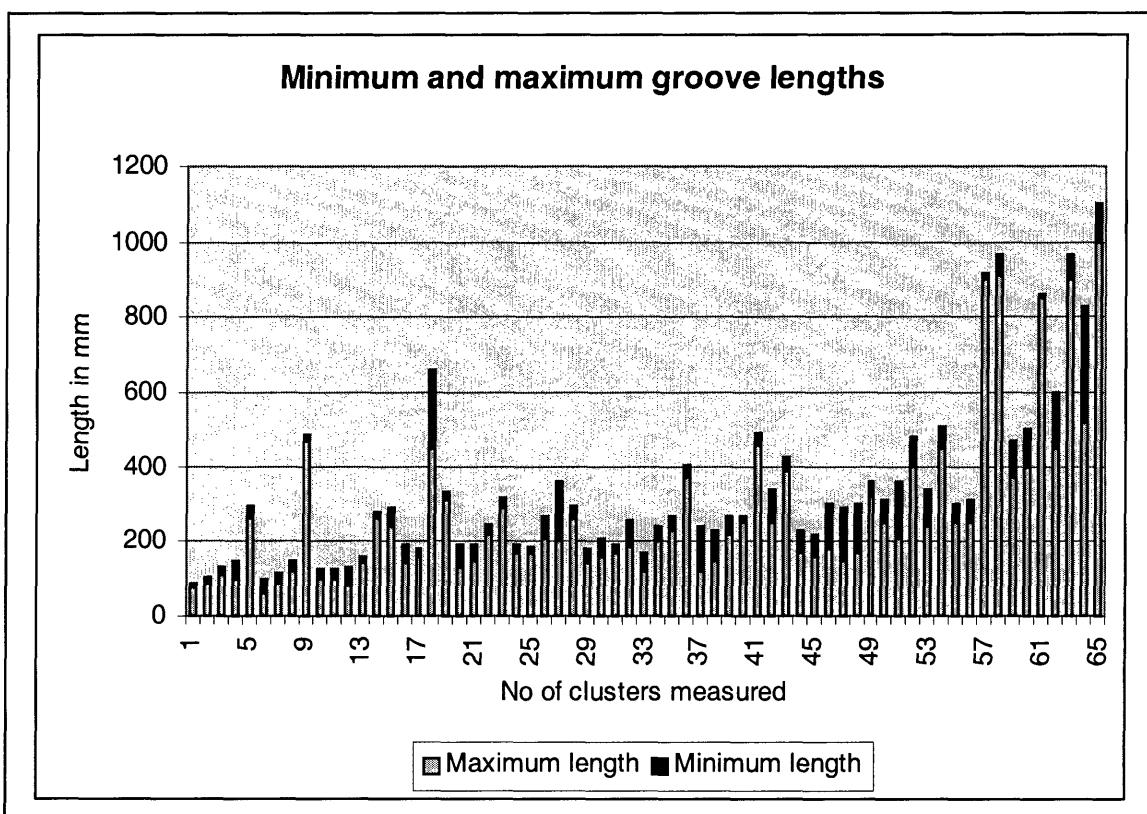


Figure 5.5 Sample of maximum and minimum lengths of abraded grooves per cluster



Grooves were more common in sites where pigment art was found but were also recorded in five rockshelters where no other art at all is evident (Watarrka/NE Plateau, Rainbow Valley, Watarrka/Atalpi, Dulcie Range and Buka) although these sites are all in the general vicinity of other art sites.

No statistically significant patterning could be discerned between abraded grooves and particular motif types, specific techniques or associated archaeology although grindstones, charcoal and stone artefacts were frequently found in surface deposits in rockshelters where the grooves are located. If the presence of these items is taken to infer general occupation, it could be suggested that access to these sites had not been restricted, at least in the recent past. However, there is evidence that men also occasionally used grindstones to grind seeds and other materials (Peter Bullah personal communication), so that it is difficult to determine the gender composition of site occupants from surface deposits alone. However, the presence of a number of grindstones with grinding hollows has generally been accepted as evidence for the presence of women in central Australian sites.

Abraded grooves had been formed into motifs at a nine sites with birdtrack/linear, birdtrack/linear/spur and fern motifs most common. U shape and rectalineal grid motifs were also recorded. A unique example of an abraded trail motif (macro trail/12) was recorded at Buka. This distinctive motif commonly occurs in both the painted and the pecked assemblages, which suggests that the abraded trail may have been produced contemporaneously. Grooves are not generally infilled with ochre but at Watarrka/Atalpi a fern motif has been stained red as has a birdtrack/linear motif at Kuyunba. At Watarrka/NE Plateau, a number of grooves have been marked in dry black pigment while others in the adjacent site appear to be stained with red ochre. There is no way of establishing if this was done at the time of production or if the pigment was a later application but the implications for the chronology of the production of abraded grooves will be discussed in Chapter 6.

Abraded grooves are most commonly found in rockshelters ($n=46$) cut vertically into protruding natural ledges along the interior shelter walls or cut into boulders on the shelter floor. Grooves are also found on open pavements on horizontal and sloping surfaces (e.g. Ewaninga Puritjarra and Wallace Rockhole [*Thuiparta*]).

Although abraded grooves are more commonly found in rockshelters ($n=46$), χ^2 analysis did not demonstrate a statistical significant association ($p=0.082$) between this topographic location and the grooves.

Pits

Pits were recorded at 31 rock art sites at 18 site complexes (Table 5.53). Unlike abraded grooves, pits are *only* found at locations where other rock art is evident and always in assemblages where other engravings are present. Geology does not seem to influence the location in the same way that it appears to have done for abraded grooves in that pits are found at a number of sites where the base rock is harder silicious sandstone, quartzite or schist (e.g. Orange Creek, Jokers Gorge and Anna's Reservoir). Flood (1997: 148) states that pits in Australia are 'seldom found on open rock engraving sites, but tend to occur in rockshelters in large groups of very regular size ...often on steeply sloping or vertical boulders or walls.' Contrary to this, in central Australia pits are more frequently found at open rock art sites although some

pits are found in rockshelters (Table 5.54). Fisher's Exact Test aimed at establishing non-random association between pits and topographic areas showed that pits distributed in camping areas ($p=0.0001$), on cliff faces ($p=0.0043$) and in rockshelters ($p=0.0004$) demonstrated a statistically significant association.

Analysis of the orientation of the rock surface on which pits have been produced at two complexes in the study area, (Ewaninga, [19 faces] and Roma Main Gorge, [41 faces]) shows that less than 10% of the rock surfaces were vertical and many of the larger clusters of pits (e.g. Ewaninga $n=19$ pits, Roma Main Gorge $n=53$ pits) were produced on horizontal surfaces. However, at N'Dhala Gorge, Anna's Reservoir in the Dulcie Range, dense panels of pits have been pecked into vertical surfaces. These results suggest that placement of *clusters of pits in central Australia may be less standardised* than in other areas of Australia (cf. Flood 1997; Taçon et al. 1997).

Pits occur as isolated examples and as discrete clusters. The most extensive assemblage of pits recorded is at Dulcie Range where more than 400 pits extend over a vertical face. Similar numbers of pits were noted at Anna's Reservoir but the site has not yet been recorded in detail. Following Taçon et al. (1997:951), a sample of pits was counted in a series of 50x50cm representative squares at a number of sites to ascertain the density of motifs for comparison with pits at other Australian rock art sites. Density varies from the equivalent of 31 pits per m^2 at Dulcie Range, 27 per m^2 at Ewaninga, 18 per m^2 at N'Dhala Gorge and less than 6 per m^2 at Wallace Rockhole. This is far less than that recorded by Taçon et al. (1997:951) for the Keep River sites in the East Kimberley where densities from 372 pits per m^2 to 463 per m^2 were reported (N.B. These figures appear anomalous as pits would be extremely small if so many were pecked into one square metre and it may be that Taçon et al. are recording a features that I would not classify as pecked pits) and demonstrates that the central Australian pits are less densely clustered and occur in fewer numbers per rock face than those recorded in the East Kimberley in the north of Australia.

Pits have been produced in several ways; some are deeply pecked and abraded while others are simply pecked to form the characteristic concave shape. Small shallow circular motifs without a depression were excluded from this analysis and classified as 'cluster of dots' or when occurring individually as 'solid circle'. The size of pits in a

measured sample varied quite markedly from a diameter of 90 mm down to 35mm while the depth of pits within assemblages and between sites also varied. One or two, much larger and deeper pits were recorded amongst several patinated pit assemblages at Roma Main Gorge suggesting that these particular pits may have been *repeatedly reworked*. An additional variation was recorded at this site where a repeated association between pits and circle and pit motifs was evident on a number of rock faces (22 of the 41 faces with pits at Roma Main Gorge (53%) also had circle and pits pecked onto them). This combination is common in other parts of the world where pits are recorded but has not been reported elsewhere in Australia.

Abraded/rubbed areas

Abraded areas were found at 35 rock art sites (Table 5.53) and generally cover less than one square metre of flat rock surface (e.g. Watarrka/Atalpi). A much larger area was recorded at Buka where the abrading covered 24m² and extended 12 metres along the back wall of a shallow overhang. The abraded vertical rock surface at Buka retains a smooth white appearance, indicative of considerable recent wear. Similar extensive abraded areas were also recorded in the Dulcie Range at the entrance to an engraved site in an unusual narrow rock crevice and at Orange Creek on a large sloping boulder above the waterhole. An example of the type of tool used to abrade rock surfaces was found at one unrecorded site where a rounded river pebble with abraded surfaces, which fitted comfortably into the hand, was cached nearby.

The abrading at the sites discussed above and a number of additional sites is superimposed *over* engraved motifs but no significant association between particular motifs and abraded areas could be established. In addition, at Watarrka/Atalpi the abraded area was also superimposed over abraded grooves so, must therefore, post-date the grooves. A number of distinctive motifs, which were infilled with abraded areas were recorded as abraded motifs although they could well form part of the same artistic practice as abraded areas.

The majority of abraded areas were found in rockshelters ($n = 25$) on boulders embedded in the deposit and all were found associated with art sites (Table 5.54). No

preference was shown for rock surfaces orientated in a particular way although abraded areas on vertical surfaces generally covered a larger area. Fisher's Exact Test showed that abraded areas were associated with camping areas ($p=0.0004$) and cliff faces ($p=0.001$) in a statistically significant way.

Random pecking/pounding

Random pecking or pounding was recorded at 28 rock art sites in 18 site complexes (Table 5.53). These marks are found at rock art sites in association with both engraved ($n=19$) and pigment motifs ($n=9$) and are produced both over motifs and on surfaces adjacent to art panels. All random pecking has a fresh appearance and while it is most commonly produced in sparsely spaced clusters, there are several more densely pecked panels. At the southern entrance of Roma Main Gorge random pecking extends over a number of rock faces and is especially evident in association with trails of macro tracks.

Fisher's Exact Test demonstrated that there was a statistically significant association between random pecking/pounding and two topographic locations (Table 5.54); camping areas ($p=0.0000$) and rockshelters (0.0006).

Battered edges

Battered edges take two main forms; the first, a flaked edge, where a series of small flakes are removed from angular edges on harder sandstones and quartzite blocks, and the second where rough and intermittent battering, which usually follows the edges of protruding horizontal ledges occurs in softer sandstone. The technique used to produce these latter marks is similar to that used to produce random pecking and pounding and may therefore be a version of random pecking although, the battering in this tradition is targeted at one specific zone. All battered edges were recorded as fresh. At one unrecorded site, the battered edges extend for more than 7 metres and are associated with abraded areas, but more commonly, battered edges are less than 2 metres in length. The exception to this is at Watarrka/NE Plateau where an extensive painting panel has fresh battered edges extending for more than 10 metres across the painted panel.

Battered edges are found in both open and shelter sites (Table 5.54) and in association with both painted and engraved rock art motifs. Fisher's Exact Test showed that battered edges were associated with a wide range of topographic areas; camping areas ($p=0.0008$) cliff faces ($p=0.0000$) gorge entrances ($p=0.0002$) and middle gorges ($p=0.0000$) in a statistically significant way.

5.7 Associated archaeological material

A wide range of addition archaeological material was recorded at rock art complexes (Table 5.55). Analysis of this material will provide additional information on the context in which rock art was produced.

Table 5.55 Distribution of associated archaeological material.

| Type of archaeological material | Number of rock art sites containing the material | Percentage of rock art sites in which material is found |
|---------------------------------|--|---|
| Hearth | 95 | 33 |
| Cache | 8 | 3 |
| Grindstone | 129 | 45 |
| Muller | 49 | 17 |
| Other artefacts | 141 | 50 |
| Knapping floor | 8 | 3 |
| Wooden artefact | 15 | 5 |
| Ochre | 21 | 7 |
| Quarry | 7 | 2 |
| Grinding patch | 26 | 9 |
| Stone arrangement | 24 | 8 |
| Graffiti | 25 | 9 |
| Historic items | 21 | 7 |

Hearth

Hearths, or more commonly charcoal, were recorded from 95 rockshelter art sites.

There was no statistically significant association between the presence of charcoal, the motif range present, and the variety or quantity of other archaeological material. Rather, some sites with large quantities of charcoal on the surface deposit did not contain any other associated archaeological material. As many rockshelter sites where art was found did not retain traces of charcoal, it could be argued that the production of rock art may have been independent of camping activities at some locations.

Intact hearths at open sites were considered more likely to be related to post-contact activities and were not included in this analysis.

Caches

Ochre (see ochre below), stone artefacts and skeletal remains and unidentified material (see stone arrangements below) were found cached in rockshelters. Most were found on ledges at the rear of shelters although a single chert flake was found wedged into a small hole in a shelter wall at N'Dhala Gorge.

Grindstones

Grindstones were recorded from 129 rock art sites. At some sites, such as the camping area on the northern end of Roma Main Gorge, more than 35 grindstones or grindstone fragments were recorded on the flat. Similar numbers of grindstones were found on other camping areas associated with gorge rock art complexes. A surprising number of the grindstones recorded during this research are broken fragments. A number of explanations have been suggested for this anomaly (Dick Kimber personal communication); natural degradation, trampling by cattle and the active collection and marketing of unbroken grindstones during the 1960s and 1970s leaving behind the broken fragments. In addition, *Inkata* Peter Bullah (personal communication) explained that, in the western parts of the study area, a woman's grindstones were traditionally broken up by her family following her death.

Although many rockshelters contained a single grindstone, other shelters (Watarrka/NE Plateau) contained as many as forty grindstones or fragments of grindstones.

The widespread distribution of grindstones with both flat and concave surfaces demonstrates that both seed grinding, seed pounding and the preparation of other materials were intense and widespread activities. Traces of ash evident on a number of grindstones (e.g. Rainbow Valley/Back), indicates that the preparation of native tobacco was undertaken in many of rockshelters where rock art was recorded.

Nicotiana species are commonly found in or around rockshelters in the region and leaves from these were dried, broken up and mixed with ash from particular plants to form a quid to be chewed (Latz 1995:63). Traces of what appeared to be resin were also recorded on two grindstones (Watarrka/NE Plateau). The proximity of these sites to a stand of *Xanthorrhaea thorntonii* from which an adhesive resin is known to have been manufactured (Latz 1995:337) suggests the resin may have originated from this source (see also Smith & Rosenfeld 1992:45). There is also widespread evidence of the preparation of red and yellow ochre on grindstones.

There are 88 rock art sites where both grindstones and handstencils have been recorded and a chi squared analysis demonstrates that the association is statistically significant ($\chi^2=5.22$) with 51% of sites where handstencils are produced also containing grindstones. It is likely that these figures underestimate the association between grindstones and handstencils as many of the more accessible sites in central Australia will have been looted by souvenir hunters (see above). The significance of this relationship will be discussed in Chapter 8.

Mullers

Mullers were found at 49 rock art sites both individually and in association with grindstones. The mullers were made with different raw materials suggesting that the selection of stones was opportunistic.

Other artefacts

Other artefacts were recorded at 141 rock art sites. Flakes and cores are the most common artefact type with backed artefacts and tula slugs found in open scatters at Rainbow Valley and the Dulcie Range. A leilira blade was recorded at Ooraminna Bushcamp.

The most common raw material at Roma and N'Dhala Gorges, the Dulcie Range, Rainbow Valley, Orange Creek and Hugh River are local grey silcretes. Local white chalcedony has been utilised in the Dulcie Range while a variety of imported coloured cherts have been flaked at Rainbow Valley. These are believed to have been sourced

from a quarry site about 20 kilometres to the north of Rainbow Valley (Jack Kenny personal communication). River cobbles have also been used to provide raw material at N'Dhala Gorge, Orange Creek and AS/A.

Ninety nine sites contain both artefacts (other artefacts class) and grindstones and there is a statistically significant association between these two classes $\chi^2=25.23$.

One hundred and two sites contain both artefacts (other artefact class) and handstencils and there is a statistically significant association between these two classes $\chi^2=15.79$.

Knapping floor

Knapping floors were most commonly found on the flats at the entrance to gorge sites or in areas associated with the major engraving sites. Grey silicious material was the most common raw material recorded. The presence of substantial amounts of small sized debitage suggests that artefacts were manufactured close to the source of raw material in some cases.

Wooden artefacts

A variety of wooden artefacts was found in 15 rockshelter art sites including a possible nose peg at Watarrka/NE Plateau, a spear shaft at Watarrka/Atalpi and 14 mulga spear points with ground tips. Many of the spear points had clearly been made with metal blades so are likely to post-date the contact period. Most of the wooden artefacts were found at Watarrka complexes or in the Dulcie Range in rockshelter sites that are remote from major tourist venues or population centres and are less accessible to souvenir hunters. Wooden song sticks located by Smith & Rosenfeld (1992) could not be relocated during the field work for this research, which suggests that souveniring of Aboriginal artefacts continues to occur. These findings have implications for the ongoing management of these more remote sites.

Ochre

Evidence of the mining, preparation and caching of ochre was recorded. Red ochre with faceted sides was found stored on a ledge in a small stencilled site at Rainbow Valley but the colour does not match the colour of the handstencils at the site so may have been used for another purpose. A similar piece of faceted red ochre was found cached at Watarrka/NE Plateau and numerous small pieces of ochre were found on the deposit at sites in this area (see also Smith & Rosenfeld 1992).

A dark red/purple vein of ochre eroding from the rock base at Watarrka/Petermann showed evidence of having been mined. This location is a possible source of the distinctive purple pigment evident in many of the Watarrka shelters although the extensive Ulpanyali ochre mine to the north west of Watarrka is known to have been an important source of ochre in the recent past and may have been the source of ochre in the Watarrka area (Leo Abbott personal communication; Smith *et al.* 1998).

Flat stones (recorded as grindstones) with evidence of the grinding and preparation of ochre were recorded at many pigment rock art complexes including sites in the Dulcie Range, Watarrka, Rainbow Valley, Glen Thirsty and Puritjarra.

Quarry

Quarrying activities were recorded in association with 9 rock art site complexes. Silcrete outcrops showing evidence of quarrying was found in close proximity to art sites in the Dulcie Range, Ooraminna Rockhole, Rainbow Valley, Rainbow Valley/Central and Rainbow Valley/Back and at N'Dhala Main and Side Gorges. The quarry at Rainbow Valley was the most extensive covering more than 40 m². At the southern end of Roma Gorge E, there is evidence of quarrying on some outlying slabs of silcrete in the camping area and at Site Complex/A conglomerate pebbles had been removed from exposed faces (see Figure 2.1).

Grinding patches

Grinding patches were recorded at 26 rock art sites with 12 or more commonly clustered on the same rock surface. They were frequently recorded on bedrock close to a water source or on larger fallen boulders on a flat or slightly sloping surface. This context is similar to that found for grinding patches in northwest Queensland (Gorecki *et al.* 1997). A sample of 22 grinding patches was measured, the largest being 0.28 m², the smallest 0.005 m² and the average being 0.086 m², with an average length of 344mm, which is slightly longer than the Queensland sample. All grinding patches have a distinct concave longitudinal hollow with an average ratio of length to breadth of 5.3:2.9.

The morphology and the location of the patches in close proximity to water suggests that these were *in situ* grindstones used for the preparation of seed. In contrast to grinding patches in the Queensland sample, the patches found in central Australia were all associated with rock art and other archaeological material.

Stone arrangements

Table 5.56 Types of stone arrangements and the number of rock art sites where they are found.

| Type of stone arrangement | Number of art sites where stone arrangements are present | Percentage of total art sites where stone arrangements are present |
|---------------------------|--|--|
| Cairn | 4 | 1.41 |
| Cleared floor | 12 | 4.21 |
| Rocks on ledge | 3 | 1.05 |
| Other | 5 | 1.76 |

Cairns were recorded in four rockshelter art sites (Table 5.56). Aboriginal Custodians suggest these piles of stone were built to prevent dogs eating stores of meat (Gunn personal communication) but no skin or bones could be detected inside any of the intact cairns. Two large ritual stone arrangements consisting of multiple piles of small stone were visited during this research, but time precluded a full survey and recording of these. It is unlikely that the cairns found in rockshelters relate to this type of ethnographically recorded ritual stone arrangement. It is more likely that cairns were used as stores as outlined above or result from floor clearing or post-contact activities.

Cleared floors are the most common type of stone arrangement recorded where rocks were simply moved to one side of the shelter away from the main living floor. At one shelter in the Dulcie Range stones were stacked in a more precise way along a gap at the side of the shelter, possibly as a wind break suggesting that the site had been used for sheltering during the colder months (see also Strehlow 1947:3).

Two rockshelter sites were recorded at Watarrka where small stones had been placed on ledges to hold down piles of vegetation. At the first, broken branches of *Acacia macdonnellensis* had been carefully arranged in the same direction and then covered in stones and at the second, spinifex had been placed in a more random fashion before being covered with stones. Nothing could be seen cached under the rocks. The stones and vegetation were left undisturbed as no Custodian was present at the time.

Several functions have been suggested for the stacking of stones on rock ledges in rockshelters; to store or cache *pituri* or sacred objects, or to store a boomerang or other personal possessions that had belonged to a deceased man associated with the site (Andrew Bridges personal communication). The cached boomerang would be broken to signify the man had died before it was hidden on the ledge. Alternatively, Strehlow (1947:10; also Kimber personal communication) has described one of the rituals associated with approaching particular sites where a branch broken or leaves from a tree near the site, was placed within the rockshelter to mark the visit. A similar practice was recorded during this research in which branches, broken off from trees by Aboriginal Custodians at a specific location along a remote track, were placed on a pile of decaying branches to signify our passing that point. To the north of the study area in the Davenport Ranges, small stones are collected and left at particular sites to mark a visit in much the same way (Mike Heywood personal communication).

Stones had been moved to provide a number of additional practical measures at three rock art sites. At Maruntji waterhole (see also Kimber 1981:15) and at Atalpi in the George Gill Range, large boulders had been placed to form steps up to higher elevations. Stones had also been moved to provide a capping over a small rockhole (gnamma) on a large sandstone slab adjacent to the Hugh River art site. No practical

purpose could be ascribed to a circular, stone-lined pit, 1m. deep with a diameter of one metre dug into the deposit in a small rockshelter overlooking the main waterhole in N'Dhala Gorge, but it is possibly of historical origin.

Standing stone slabs were recorded at Watarrka/Atalpi and at Ooraminna Rockhole (Gunn 1991b) but neither was located in the immediate vicinity of the rock art.

Graffiti

It was common practice for early explorers and adventures to carve initials and dates into rock faces at prominent locations in the landscape as they ventured into unmapped territory. These locations are often those where rock art had previously been placed, therefore historic graffiti is occasionally superimposed over earlier rock art. At Murantji waterhole near Puritjarra, distinctive birdtrack/silhouette motifs, share the cliff face with three sets of initials belonging to early pioneering characters of central Australia. 'RHB' was Robert Henry Buck, a cattleman from Middleton Ponds who visited the site in 1930 and 1931 (see Rosenfeld & Smith 2002:123). 'BN' was Ben Nicker, a legendary bushman and 'WHL' was William H. Liddle from Angas Downs (a large cattle station to the south of the George Gill Range) (Dick Kimber personal communication).

Pastoral workers have also left carved, drawn and scratched graffiti at a number of rock art sites. A longhorn bullock's head has been scratched into an engraved panel at the peak of a rocky outcrop at Ewaninga and station workers have drawn a number of motifs at Art Complex/A and signed them the 'the ringers' (see also Kimber 2000:124-5).

The names of present day Aboriginal people have been written alongside handstencils at Hugh River and Wallace Rockhole art sites demonstrating that these sites continue to be visited by Aboriginal people. At Roma Main Gorge, the names of Aboriginal men known to have lived at the Hermannsburg Mission early last century have been pecked into rock faces amongst the engravings, along with the corresponding identification numbers given to them by the missionaries of the time (Taçon 1992:53). Several dates and a human head in profile at Roma Main Gorge, are believed to have

been pecked by members of the Royal Australian Air Force stationed nearby during World War II (Taçon 1992:13).

Although graffiti at the rock art complexes commonly visited by tourists is surprisingly rare, instances were recorded at Ewaninga, Kuyunba and N'Dhala Gorge. Several unsuccessful attempts to remove graffiti have been undertaken at Ewaninga and the results warn that some attempts to remove graffiti may further damage rock art sites.

Historical material

A single bullet casing was found in the soft sediment at Watarrka/NE Plateau (*cf.* Smith & Rosenfeld 1993). This is the only historical material found inside Watarrka rock shelters despite evidence demonstrating that the rugged plateau on top of the range was used as a refuge by Aboriginal people escaping from punitive expeditions of mounted police searching for offenders who had speared cattle on adjoining cattle stations in the decades following the introduction of pastoralism (Mulvaney *et al.* 2000).

Varied items such as a ceramic vase, glass, tin cans and wire were recorded at Kuyunba close to Alice Springs. Glass from beer bottles was found in a rockshelter site at Arltunga which overlooked a disbanded Aboriginal mission site which was set up during World War II. Glass, tin cans, discarded clothing and the ubiquitous 'Number 8'¹ wire were also recorded at site complexes. These historical items indicate that people continued to visit rock art sites well after contact.

In summary, all rock art complexes contained associated archaeological material. The presence of these materials, especially the widespread distribution of charcoal, grindstones and other stone artefacts, indicates that subsistence activities were undertaken in the vicinity of rock art sites. As art sites are located near vital water sources, the association with evidence of subsistence activities is expected. The major campsites at larger engraved rock art complexes are found on flats spatially separated from the main body of engravings although isolated engraved faces are found in these

¹ A general grade of fencing wire used to repair almost anything in the Australian bush.

areas. The richness and density of material found on these flats attests to the variety of different activities that were undertaken at these locations by large numbers of people and/or over a long period of time. The overlay of archaeological evidence for a wide range of past human activities within the same complex, means that it is more difficult to ascertain which activities are specifically associated with the production of rock art.

Given the statistically significant association between handstencils, grindstones and other artefacts indicating that subsistence activities were undertaken at these locations, the additional evidence for the presence of families formulated from the analysis of hand size, lends support to the contention that these sites were not subject to restricted access and functioned as family shelters.

5.8 Conclusions

Analysis of the art assemblage and the context in which it was produced has shown that rock art in central Australia has a structured relationship with the regional landscape, with the topography of the site complex and with individual rock faces or panels.

Rock art is always associated with a water source but the water source needs to provide *adequate* water supplies rather than permanent water supplies. The largest engraved rock art complexes included in this analysis are all located at places where the water source is classified as ephemeral and statistical analysis confirmed that there is a significant association between engraved assemblages and ephemeral water across the database and demonstrates that this relationship does not simply reflect the greater number of ephemeral water sources (Ross & Abbott 2000).

Previous rock art research aimed at management of rock art complexes or recording of sacred sites has tended to focus on rock art complexes, which are typically made up of a substantial number of individual rock art sites. My analysis has shown that the composition of rock art complexes is varied. Large rock art complexes with multiple sites containing both engraved and pigment rock art assemblages are characteristic of the region and central to this thesis but in addition, I have also recorded a number of

isolated complexes containing one or two rock art sites and low numbers of motifs. Engraved and/or pigment rock art has been recorded at these small complexes. The inclusion of small complexes in the analysis will help to identify the spatial patterning of practices associated with the production of rock art and will help with the understanding of the ways in which sites evolved over time.

Importantly, the rock art of central Australia is not simply an assemblage of circles and tracks (Edwards 1966, 1971). This analysis has shown that while circles, tracks and trails constitute a large proportion of the assemblage, the form and structure of these motifs can vary. There is also widespread distribution of an extensive range of additional motif classes including complex motifs and some representational motifs demonstrating that the rock art motif vocabulary is considerably richer than earlier research indicates. Most significantly, *the motif vocabulary is shared between techniques* with considerable overlap between pecked, painted and drawn assemblages (Ross 2002).

Rock art was produced in a variety of topographic locations where motifs could potentially be seen by anyone visiting the gorge or water source, suggesting that there were no restrictions on future audiences. Motifs were produced on panels and faces within easy reach of the artist and at sites that were easily accessible so that physical isolation or separation was not used as a means to restrict access to any groups of people or potential audience. Rather, art was produced in locations such as rockshelters, on gorge walls or on open rocky shelves where groups of people could congregate and participate in the activities associated with the production of rock art.

It is also clear that the production of rock art took place in the same vicinity as a number of varied subsistence activities. Extensive evidence for general occupation of sites with presence of hearths or charcoal deposits, wooden artefacts, ochre and cached items and historical items as well as evidence for subsistence activities such as the quarrying of raw stone materials, knapping of artefacts and the pounding and grinding of seed is found associated with rock art assemblages. The production of rock art was one activity that was undertaken at any site. In addition, there is a relationship between the stencilling and printing of handstencils and the presence of

grindstones which supports the contention that family groups were frequently involved in the production of these motifs.

Finally, the structure and distribution of the five associated rock art traditions indicates that these traditions were strongly associated with, if not integral parts of the rock art assemblage in central Australia. Each tradition involves the repetition of the same form on a face or panel with similar morphology, demonstrating that these are not haphazard or undirected marks *but are intentionally constructed repeated marks placed in similar locations* within site complexes. The structure in the composition of these traditions that I have identified in this chapter indicates that associated rock art traditions are indeed culturally mediated. Further, each groove, pit, battered edge, or abraded area could be classified as a motif under the definition used in this thesis. Random pecking is more difficult, but theoretically the light spattering of pecking or pounding could also be described as a motif.

In the following chapter I will assess the patterning identified in the central Australian rock art assemblage outlined above against the evidence for chronological change in order to develop an understanding of the organising principles, continuity and variation in the assemblage through time.