The petroglyphs of the Kybra Aboriginal Site, South-Western Western Australia

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Abstract

The Kybra Aboriginal Site is the largest and most important petroglyph site in south-western Australia. It holds immense cultural significance, symbolising the Dreaming of Kybra, a giant bird, and being an important camping and ceremonial place in Bibbulmun Nyoongar land. The site is now located in a cleared farm paddock in the Scott River Region of the south coast of Western Australia. It comprises some 267 petroglyphs on horizontal limestone sheets, dominated by the tracks of birds and animals, and previous researchers have considered it to be an isolated example of the Australia-wide Panaramitee petroglyph tradition. This paper documents the petroglyphs and their context to assist with a later re-assessment of their status in relation to the Panaramitee.

Keywords: Petroglyphs, South-west Western Australia, Panaramitee Tradition

Introduction

On the basis that the Kybra petroglyph site contained a predominance of macropod and bird track motifs, Clarke (1983) and later Franklin (1992, 2004, 2007a) proposed that it belonged to the "Panaramitee Style" or Tradition (see Maynard 1976:182–199; Flood 1997, but note Rosenfeld 1991; Bednarik 1995). Maynard considered the style (erroneously) to be Australia's earliest art tradition although, at the time of her study, the Kybra site had not been reported and so was not considered. In a later re-evaluation of the Panaramitee style, Franklin (1992) included the Kybra site due to its similarity with other peripheral sites mentioned by Maynard. She counted 75 motifs at the site and was cautious of Clarke's 1983 claim of more than 100 motifs (1992: 50). Franklin (2007a) further concluded that not only was the Kybra site a peripheral site of the Panaramitee style, its existence could be explained by what she termed the "discontinuous Dreaming network model", that linked petroglyph sites across the continent by a web of Pleistocene and early-mid Holocene Dreaming Tracks (contra David 2002).

The Kybra Aboriginal site, DIA Site ID 4882 (also known as the Scott River or Milyeannup site), is on the southern coast of Western Australia, some 260 kilometres south of Perth (Fig. 1). Despite the local distribution of apparently suitable rock exposures, no other petroglyphs are known in this region (DIA files). Three other open petroglyph sites have been reported on granite hills to south-east of Perth (DIA files from Davidson 1952; Wolfe-Okongwu 1978), but recent investigation found them all to be natural markings (Webb and Gunn 2004). Petroglyphs have also been reported from three deep cave sites to the north (Hallam 1972, 1975; Bednarik 1987/88, 1998) but, while of definite Aboriginal origin, they consist of sets of parallel finger-flutings and possess no similarities to the open Kybra petroglyphs. The most common Aboriginal heritage sites within 50km of the Kybra site are surface exposures of stone artefacts, representing past camping or manufacturing sites (DIA Site Files). Hence, the Kybra petroglyph site complex is highly unusual and therefore particularly significant among the Nyoongar sites and places of the south-west.

Research background

The first account of the site was published in "People" magazine in 1962 where it was stated that the markings were fossilised bird footprints. This claim was investigated by Alex Baynes, of the Western Australian Museum, and John Clarke, from the Department of Conservation and Environment, Perth. They determined the petroglyphs were cultural rather than natural markings and gave a description of the site and its environment (Clarke 1983). Clarke suggested the petroglyphs were early Holocene in age (Clarke 1983) but, following the publication of dated "Panaramitee" style petroglyphs from South Australia that reportedly ranged from c.1000 BP to 33,000 BP in age (Nobbs & Dorn 1985), he revised his estimate to a likely late Holocene age (Clarke 1989). [These proposed dates however were subsequently withdrawn by Dorn (1997)]. Clarke estimated there to be over 100 "engravings" on some 25

Figure 1. Location of the Kybra site in SW Western Australia and the extent of the Noongar NT claim

"blocks" (1983: 64). He found the motifs consisted mostly of bird tracks, but also macropod tracks (both forepaws and hind feet), star-shapes, single wandering-lines, and boomerang-shaped outlines (ibid.). Clarke noted the singular and isolated occurrence, and hence high archaeological significance, of the site, and concluded his report with a number of urgent conservation and management recommendations, but none of these were implemented by the management authorities.

Natalie Franklin included the Kybra site (then known as the Scott River site) in an examination of the variation within the so-called Panaramitee Tradition across Australia (Franklin 1992: 224–225 & 241, Plates 13A & B). She located and classified 75 motifs and provided the first tracing of the petroglyphs, which clearly show the linear character of the motifs. Like Clarke, she found the suite here to be dominated by "bird" and "macropod" track motifs (47% and 21% respectively). Compared with other Panaramitee sites across Australia, the Kybra suite was small and homogeneous (see also Franklin 2004, 2007a&b), and most similar to two sites in central and northern Queensland, on the opposite side of the continent over 3000 km away. It was found to have little in common with her closest Panaramitee site at Edah, in the Murchison region, some 700 km to the north. This supported the notion that the site is indeed an isolated cultural feature.

Later, Stephen Corsini (1997) undertook a management study of the site and produced scaled-

Figure 2. View of the Kybra site prior to excavations (2005)

drawings of the visible motifs and slabs following removal of some overgrowing vegetation. He proposed that the petroglyphs were produced as a form of "sympathetic hunting magic": an interpretative paradigm that has long been considered inappropriate to Australian rock art (cf. Morwood 2002; Whitley 2005).

The site setting

The petroglyphs occur within a low-lying paddock on the flood plain of the Scott River in the south-west of Western Australia. The location is separated from the coast, three kilometres to the south, by a ridge of vegetated sand dunes reaching to 50 m above sea level (Dortch *et al.* 2006). Clarke concluded from the vegetation that the area was originally a swampy plain prior to its draining for agriculture (1983: 63). The paddock is presently used for cattle pasture (Fig. 2).

Unconsolidated sand dunes now border the southern and western sides of the site. The sand plain for many kilometres to the north and east of the site, which has an average elevation of 16m above sea level, is seasonally flooded and poorly drained. Consequently, the sediments surrounding the petroglyph slabs are seasonally waterlogged.

The rock can be described as a limestone of open porous structure, possibly formed in a waterlogged swamp environment, or possibly through stromatolite formation (Dortch *et al.* 2006). The movement of the water-table over time is probably critical to both its formation and deterioration. Continuing geological investigations are aimed at clarifying both the rocks' formation and age.

The regional climate is Mediterranean with mostly dry, hot summers and wet, cool winters. The average annual rainfall is around 1000 mm; with the predominant wind directions from the SE and NW (Bureau of Meteorology 2004). Mean daily maximum temperatures range from 25° C in February to 16° C in July, highest recorded temperatures are 43° C in February and 4° C in September. Frosts have not been recorded. There are at least 6 rain-days per month in summer, and up to 25 in winter; giving the potential for plant growth throughout much of the year. As the site is fully exposed, the pavements housing the petroglyphs are subject to the full impact of rainfall, flooding, and insolation.

The swampy coastal plain features many resources used by Nyoongar people and the estuaries and wetlands could have supported significant gatherings in spring and summer. The woodland and forest associations around Kybra would have supported many resources used by Nyoongar people as they were the habitats of c.60 species of favoured mammals, birds, and reptiles, and the source of c.80 edible and collected species of plants (Dortch 2004). These areas would have been easily accessible, since rivers in south-western Australia also defined routes for pathways. Crossing points on large rivers are likely to have been important "nodes" (pathway intersections) in the Nyoongar landscape. The chains of swamps and wetlands across the Scott Coastal Plain would have provided waterfowl, turtles, frogs, freshwater crayfish, and edible rhizomes (reed roots), used by Nyoongar people particularly in spring and summer, as well as providing permanent water. River mouths and inlets in south-western Australia also enabled fish-trapping on a large scale, which supported large gatherings. Details of the pathways and nodes in the Scott Coastal Plain are presently unknown but the proximity of the river and the Hardy Inlet, 10–20 km to the west, means that the site was probably located in an area important to Nyoongar people in the past. Further inland, food resources were scattered, and any given location could not support long occupations or large numbers of people.

The most common tracks represented in the petroglyphs are consistent with those of fauna commonly seen around the site today: *i.e.* three-toed bird track – emu (*Dromaius novaehollandiae*) and narrow opposed-tick tracks – western-grey kangaroo (*Macropus fuliginosus*). Both are well-known Nyoongar food animals, but which also have social and mythical associations.

Aboriginal associations

The site is within the area of the south-western cultural group known as the Bibbulmun (or Bibelmen or Pibelmen), a territorial group within the Nyoongar language group covering all of south-western Australia (Berndt 1979, Tindale 1974). The Bibbulmun people occupied the south-western Australian coast and hinterland from the Blackwood River in the west to Broke Inlet (or possibly further) in the east. Their neighbours were the Wardandi to the west and north-west, the Kaneang to the north, and the Minang (Meneang) to the east. Descent from one or more of these territorial groups is commonly claimed among many Nyoongar people today.

The site's traditional custodians recount that the area was the home of *Kybra*, a giant white bird who at some time in the distant past flew westward out to sea where its wings could still be seen on the horizon from time to time. The white sails of European sailing ships likely to have been frequently visible on the western horizon in the 17th, 18th and 19th centuries, could have been identified as the wings of *Kybra*, signalling his return. Today, the petroglyphs are associated with the *Kybra* Dreaming. *Kybra*, or *Kibbera*, means "ship" in Nyoongar vocabularies from the Busselton and Albany areas (Bindon and Chadwick 1992). The historic vocabularies suggest that *Kybra* came to mean "ship", at least for some Nyoongars, by the 1830s–1840s.

The location of the site near natural fords on the Blackwood River suggests that the area is also a likely place for inter-group meetings and gatherings, particularly between Bibbulmun people and their neighbours to the west, the Wardandi, for marriage-partner exchange (Goode and Irvine 2006).

Before European colonisation, Nyoongar people foraged in different parts of their respective territories according to seasonal abundances of resources and social needs, and under a system of inherited land tenure and cultural and ritual obligations. The archaeological record shows that Aboriginal occupation of the immediate region has been continuous for at least the last 45,000 years (Dortch 2004, Turney *et al.* 2001). Nearby sites also show that Aboriginal people used the Scott Coastal Plain and adjacent areas throughout many changes in

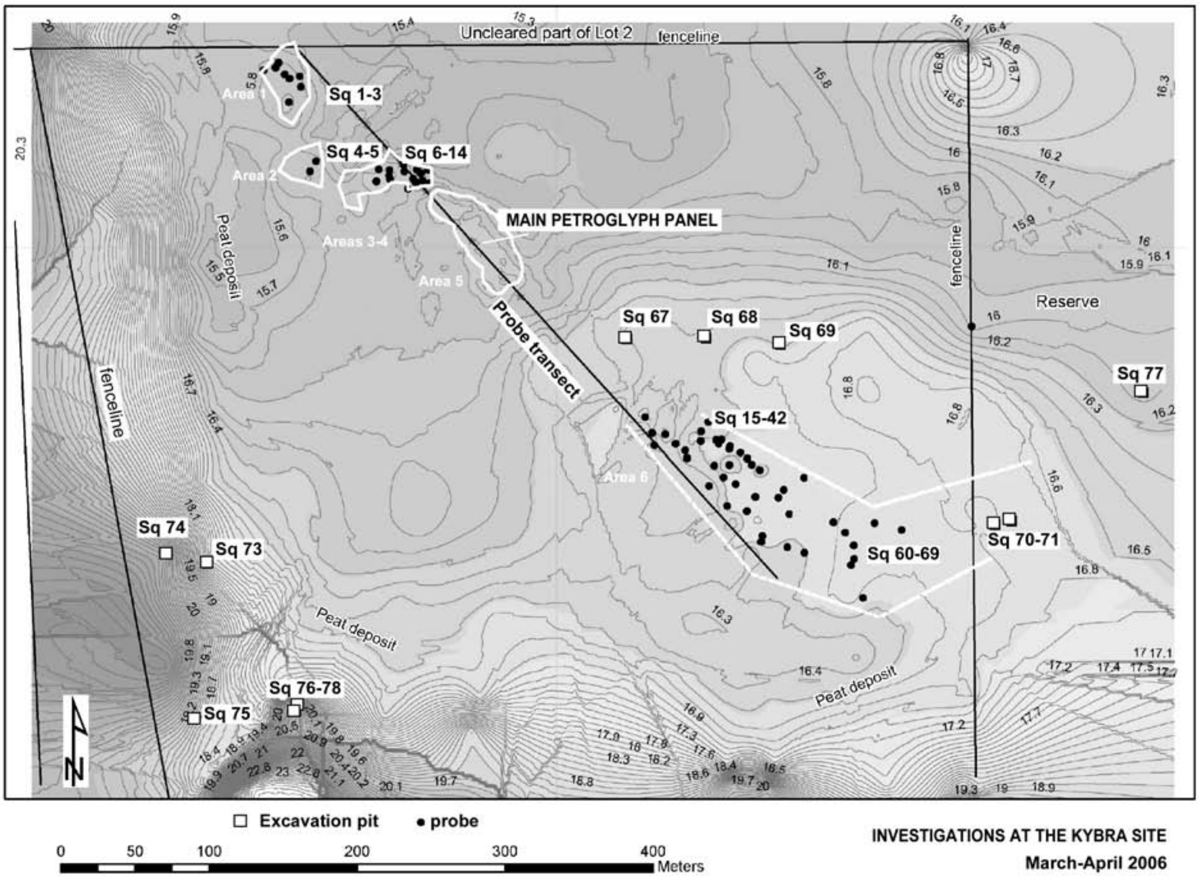

Figure 3. Plan of the Kybra site showing location of petroglyph areas, probe transects and excavation pits

Figure 4. The exposed area showing the fractured nature of the bedrock. Most of the smooth rocks bear petroglyphs

environment, include sea-level rise caused by post-glacial global warming. The absence of evidence for major population disruptions despite these environmental changes supports the notion that these people had a highly flexible and resilient economy that sustained a similar way of life for many millennia.

Despite experiencing massacres and introduced diseases, Nyoongar people retained connections to the lower south-west in colonial times (Hammond 1833, Bates 1985). In the Scott River and the Margaret River regions, "King" Bungaitch and "Queen" Ginny were widely recognised as elders belonging to those areas. Nyoongar families in the south-west maintain their association with ancestral Bibbulmun or Wardandi territory though hunting, fishing, and gathering, and passing down oral histories.

The present survey

Before the present survey, the full extent of the petroglyphs had not been determined (Clarke 1983; Franklin 1994, 2004). Consequently, pedestrian surveys were undertaken of other rock outcrops to the north-east and east but only a single other petroglyph was located (400m to the east; Dortch *et al.* 2006). Within the 40ha site paddock, sub-surface probe survey, using 40cm survey pins inserted on a 20m grid, showed limestone at depths of 5–40cm extending in a NW–SE orientation across the paddock, through the main area of engravings, and into eastern outcrops (Fig. 3). The survey team inspected six sheets of limestone identified in the paddock by removing grass and sand with hand tools at 67 locations, each c.1m^2, but found petroglyphs only on sheet 5 (modern plough damage was also seen on this and two other sheets). At sheet 5, another c.1,000 m^2 of sediment and grass was then removed to expose the bulk of limestone and several previously unrecorded petroglyphs (Fig. 4). The paddock, archaeological features (including engravings and test-excavations) and areas of exposed rock were then mapped using a Leica 1200 total station (see below).

To improve understanding of the use of the area, the team conducted eight test-excavations on the paddock and nearby, within 100–300m of sheet 5 (Fig. 3). Only two test-excavations, on the dunes south and west of the paddock, contained artefacts. These slightly elevated locations, beside former springs, gave views of the petroglyph area and surrounding country. The small, highly reduced quartz artefacts suggest prolonged residential or base camping with few logistical camps or forays during each episode of occupation. Charcoal associated with artefacts in the upper 50cm of square 74 is dated 1500–1800 BP and 2500–2800 BP (calibrated to calendar years). These results suggest that Nyoongar people have camped for prolonged periods at Kybra throughout a period of more than 2,800 years.

Figure 5. Detail of the rock pavement showing abrupt edges (Panels E09 foreground)

Figure 6. Excavation pit at the edge of the rock pavement showing upper crust which becomes more clay-rich and friable with depth. (Pit width 25 cm).

The rock

Clarke (1983) considered the rock in which the petroglyphs are pecked to be a limestone-like calcitic crust, formed as a result of algal mats in a shallow lake depositing the calcite during dry conditions. This forms a broken pavement, some 75x25m in area and around 0.2m thick. The edges of the petroglyph panels are partially buried by regrowth and soil, but the greater majority of rock, and hence the bulk of motifs, are now exposed. Following excavation, the edges of the panels were found to be both abrupt and crenulated (Fig. 5).

The rock substrate varies from a substantially calcitic crust to a more clay rich and friable structure at the underside (Fig. 6). The sheet is interrupted with many channels, fractures and holes that in some cases penetrate through the upper few centimetres of the crust (Fig. 7).

An analysed sample of the rock contained sub-rounded to rounded quartz grains within an overall porous matrix with several continuous tunnels and voids. Some voids appear to be collapsed shell-like structures although only a single fragment of shell was found within the calcite. Under low magnification it appears to be fine-grained and evenly wrapped around the quartz

Figure 7. Vermicular surface of the rock showing vegetation attracting cracks (Panel E02)

Figure 8. Rain filled petroglyphs after 4 days of light drizzle totalling 3.2mm (Panel E13)

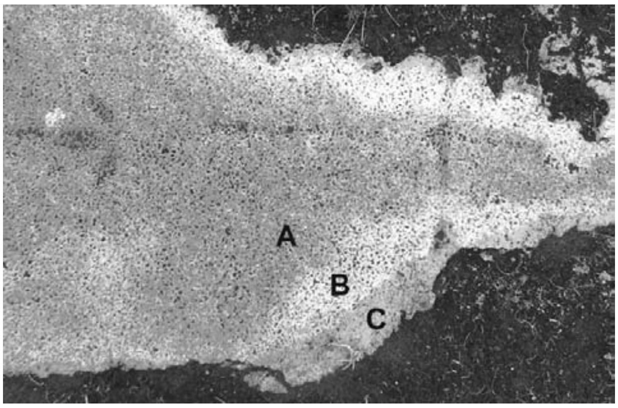

Figure 9. The three surface zones of dissolution. A: grey inner surface – moderately stable, B: white band of redeposited material – more stable, C: brown out surface previously covered by soil – moderately stable but subject to root destruction (Panel F01).

in a precipitation-type relationship with no evidence of deposited particles that may indicate a calcarenite-type formation. A polarising Light Microscopy analysis showed no evidence of coccoliths or other animal structure, and the calcite particles were all fine-grained with no evidence of larger nodules. The calcite character is consistent with a calcrete-type formation and not any other. There is evidence of charcoal particles within the rock, indicating a surface or near-surface formation environment.

The exposed nature of the site ensures that the rock surface is flushed after each heavy rain. It was observed that even small showers can fill the petroglyphs (Fig. 8) and it is expected that heavier rain would wash all soluble ions off the slabs. Soluble ions in this case include calcium sulphate that will have formed through combination of calcium from the rock with atmospheric sulphur. The water within the petroglyphs however, will be retained much longer, creating a protracted acidic pool that, in theory, should cause more rapid erosion within the petroglyphs, ensuring that they continue to deepen more rapidly than the surrounding rock. However at the site there is variable evidence of dissolution within the petroglyphs themselves and on the whole there is no topographic difference between the inner walls of a petroglyph and the sheet surface into which it has been pecked. It is apparent that plants have caused more damage to the surface of the petroglyphs than to areas of the rock that have been exposed for longer periods. The vermiculated surface shows the extent of root penetration and grain loss. Grass roots not only exert mechanical forces but also provide a highly acidic local environment that will rapidly dissolve the calcite. It is not possible to say whether the roots have created these channels or have simply taken advantage of a pre-existing natural nutrient supply.

Three weathering zones are apparent on the exposed slabs (Fig. 9):

A- Inner grey surface surrounding the engraving is moderately stable but has detaching sand grains and a high lichen colonization.

B- White band of redeposited material lies between the exposed rock and recently soil covered rock. This zone has no exposed sand grains and appears more stable. Stability here depends very much on whether the precipitate is gypsum or calcite.

C- Brown surface indicating recently soil covered rock. This area is as stable as the grey exposed surface but has much more root growth and deeper channelling.

Also, it is difficult to explain why the majority of petroglyphs have an identical topography to surrounding rock, while a few, such as motifs 183 and 192, have a very smooth interior surface. As this is unlikely to be the result of a selective natural process, they may have been reworked by abrading.

As the 75% calcite content, by dissolution in hydrochloric acid, can allow this to be called limestone (>50%), it is considered that the nature of the relationship of the deposited calcite coating and binding quartz particles is worthy of a more specific description. It is noted that that it is not calcarenite. The term "calcitic crust" is more appropriate as it implies the calcite has acted as a binder to the quartz. This may not be absolutely correct as a classification as some definitions of calcrete indicate the non-calcitic component should be alkaline. Here we have chosen to define the nature of the precipitated calcite from solution, including the presence of charcoal, rather than compaction of calcite grains and coccoliths *etc*. In essence it is a conglomerate of surficial sand and gravel cemented into a hard mass by calcium carbonate, which has been precipitated from solution and redeposited through the agency of infiltrating waters, or deposited by the escape of carbon dioxide from vadose water. The specimen studied conforms to each of the key principles here.

The sample can therefore be described as a limestone of open porous structure, possibly resulting from an intermittently flooding environment, or as is suggested here, through stromatolite formation. The presence of charcoal indicates the formation has developed while in its current position in relation to surrounding soil levels for at least part of its formation life. The pavement would have thus formed many millennia ago, creating a puzzle as to how the fragile rock has survived to the present day. Clarke's (1983) hypothesis that it may have been

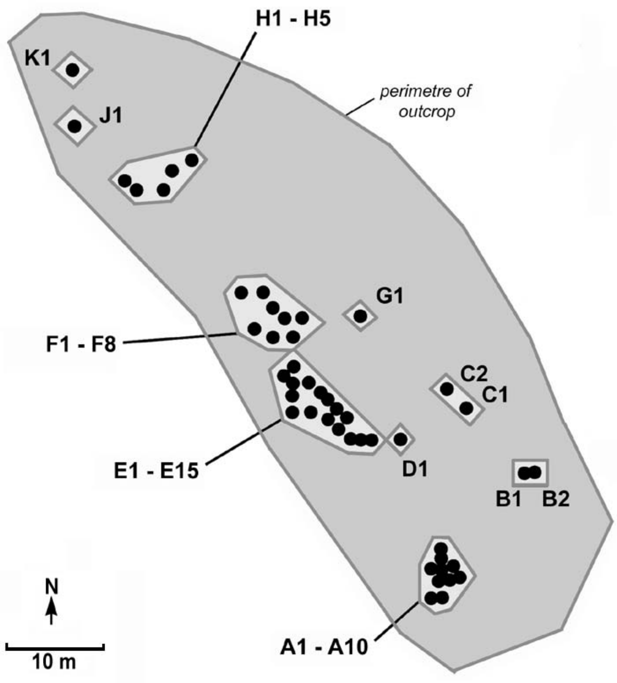

Figure 10. GPS plot of the petroglyph panels A–K

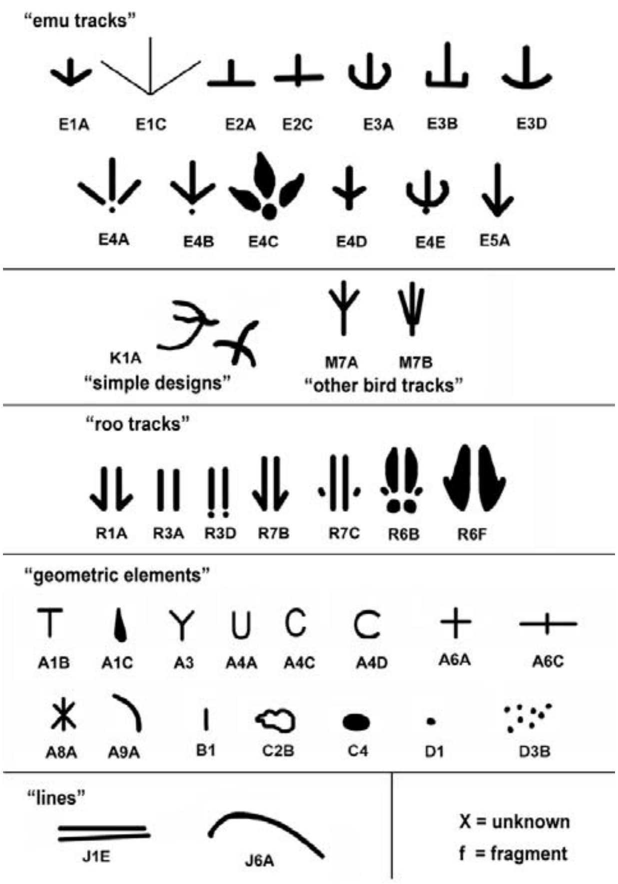

Figure 11. Motif types at Kybra

due to it being covered by sand dunes after the period of petroglyph production and then later re-exposed by wind erosion is feasible.

Impacts from both bulldozer tracks and scalloped plough discs occur across the southern and eastern sections of the site, but the overwhelming concern for its preservation is the extreme fragility of the rock and its vulnerability to erosion, whether in the form of rain, pooling water, or soil moisture.

The Rock Art recording

The petroglyphs were located in ten clusters on the main outcrop (A–K; Fig. 10) and one 400m to the east (L). A total of 267 motifs were recorded. Of these 240 could be classified by type, with the other 27 being relegated to a class of fragments (Table 1; Fig. 11). The motifs were dominated by tracks (66%: emu tracks 45%) and geometric elements (31%) and are mostly between 50mm and 200mm in length. A few instances of superimposition testify to the site's re-use over a prolonged, but unknown, period. All of the motifs are heavily weathered but the form of most remains well defined.

The petroglyphs occur on forty-seven panels, ranging from 0.14 m^2 to 15 m^2 in area (median 0.64 m^2), with maximum widths ranging from 0.5 m to 5 m (median 1.2 m). The number of motifs per panel ranged from 1 to 55, with a median of 2. Thirty-eight panels had less than 10 motifs, and 13 had only a single motif. The number of motifs on each panel was unrelated to the size of the panel (Fig. 12).

The present project undertook four methods of recording of each of the petroglyph panels. First freehand sketching was undertaken to locate and designate all the motifs. This was followed by detailed photographic record on a digital camera (Fujipics 6500) and then by laser scanning. Subsequent to the fieldwork,

Table 1

Motif class percentages

MOTIF CLASS	No.	%	*No of types*
emu tks	116	48	*13*
roo tks	36	15	*7*
geometric elements	30	13	*10*
bars	26	11	*1*
dots	12	5	*2*
other bird tracks	8	3	*2*
lines	4	2	*2*
simple design	3	1	*1*
unknown	3	1	*3*
ovals	2	1	*2*
TOTAL	**240**	**100**	***41***
fragments	27		

MOTIF GROUP	No	%
Tracks	160	67
Geometric elements	74	31
Other	6	3
TOTAL	**240**	**101**
fragments	*27*	
(n)	*267*	

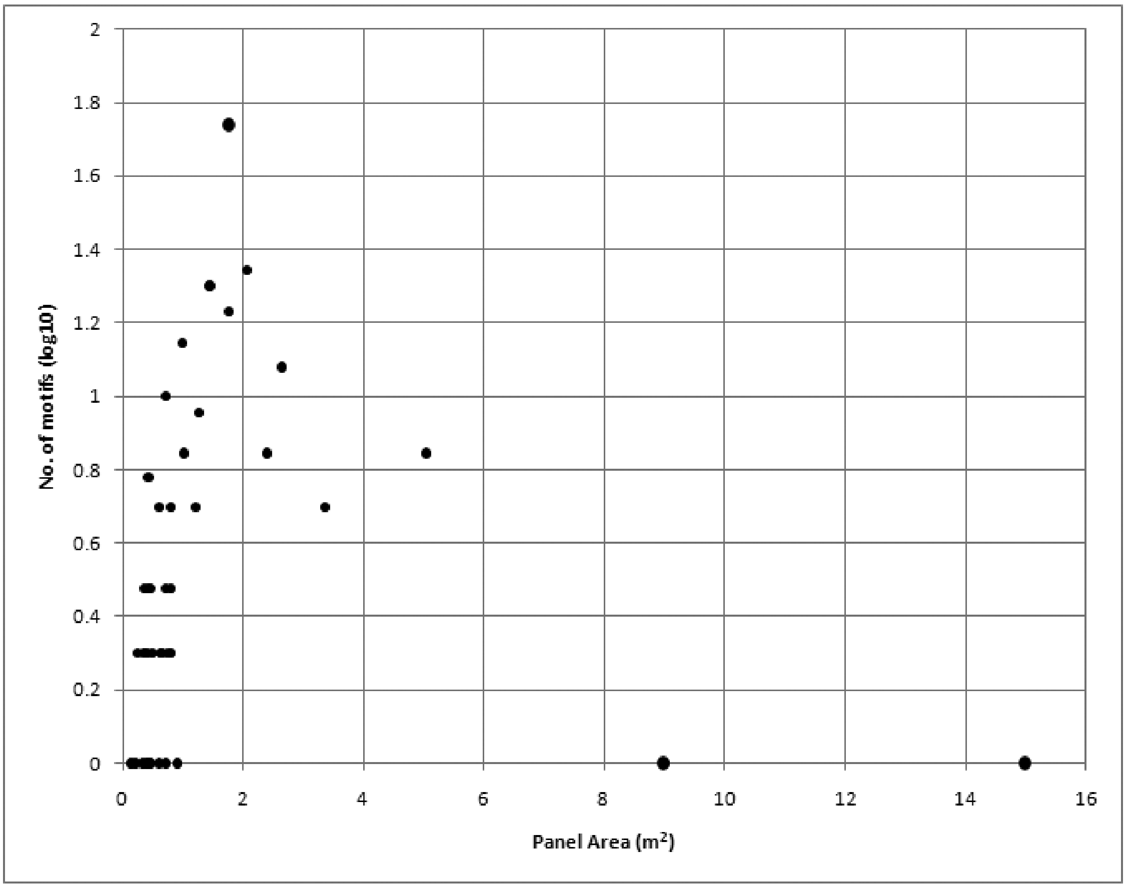

Figure 12. Plot of motif number per panel by panel size

detailed tracings were produced of select panels from enlargements from the photographic record.

The Laser-Scanning record

Three-dimensional laser-scanning systems are a recent development in the process of acquiring 3D records of complex surfaces. There is a wide variety of instrument types, ranging from long-range machines designed for topographic and mining applications, through to those designed for sub-millimetre accuracies on small artefacts and the human body.

The short-range instruments generally use visible laser with a similar data acquisition rate, but giving a much higher accuracy and precision. The Konica Minolta Vivid 910 used here uses a laser triangulation process, where a camera on the instrument records the laser profile as it is passed over the surface being measured. As this unit used relatively low-power visible laser, the scanner had to be insulated from sunlight. Since this project the scanner is now housed in a light-reducing tent on a lightweight trolley, but at the time it was necessary to undertake the scanning at night. The scanner was mounted vertically above the rock platform on a tripod, which also supported a laptop computer and a light. The scans covered a surface area of around $0.25m^2$, and scan areas were overlapped to provide a comprehensive panel cover. The overlapping scans were later stitched together in the scan-processing software.

An arbitrary coordinate system was established on site, which was later connected to the Map Grid of Australia (MGA) using a Leica GPS unit. The GPS observations were processed using the Auspos service, which allows high accuracy positioning with one GPS unit. Position control for each panel of art/scans was established using a combination of 3D targets and natural features, surveyed using a Leica "total station". This was to enable the recording of the correct position and orientation of each set of stitched scans on the site.

The data acquisition process resulted in topographic measurements of the site, along with over 100 scans of the motifs. The scanner obtains detailed shape data, along with a low-resolution image of the surface (Fig. 13). This is effectively a micro-DEM (digital elevation model) and can be studied using a variety of spatial analysis operations often found in Geographic Information Systems (GIS) if the need arises. Using software it is possible to produce a colour map of the surface with the colours indicating depth variation. As the data is a set of three-dimensional measurements, it is also possible to rotate the surface so that it can be viewed or studied from almost any vantage point, and with illumination from any angle (Fig. 14).

The complete digital data for the surface models are now available for future analysis such as minute measurement of erosion. The data is also suitable for the production of facsimile panels for public display.

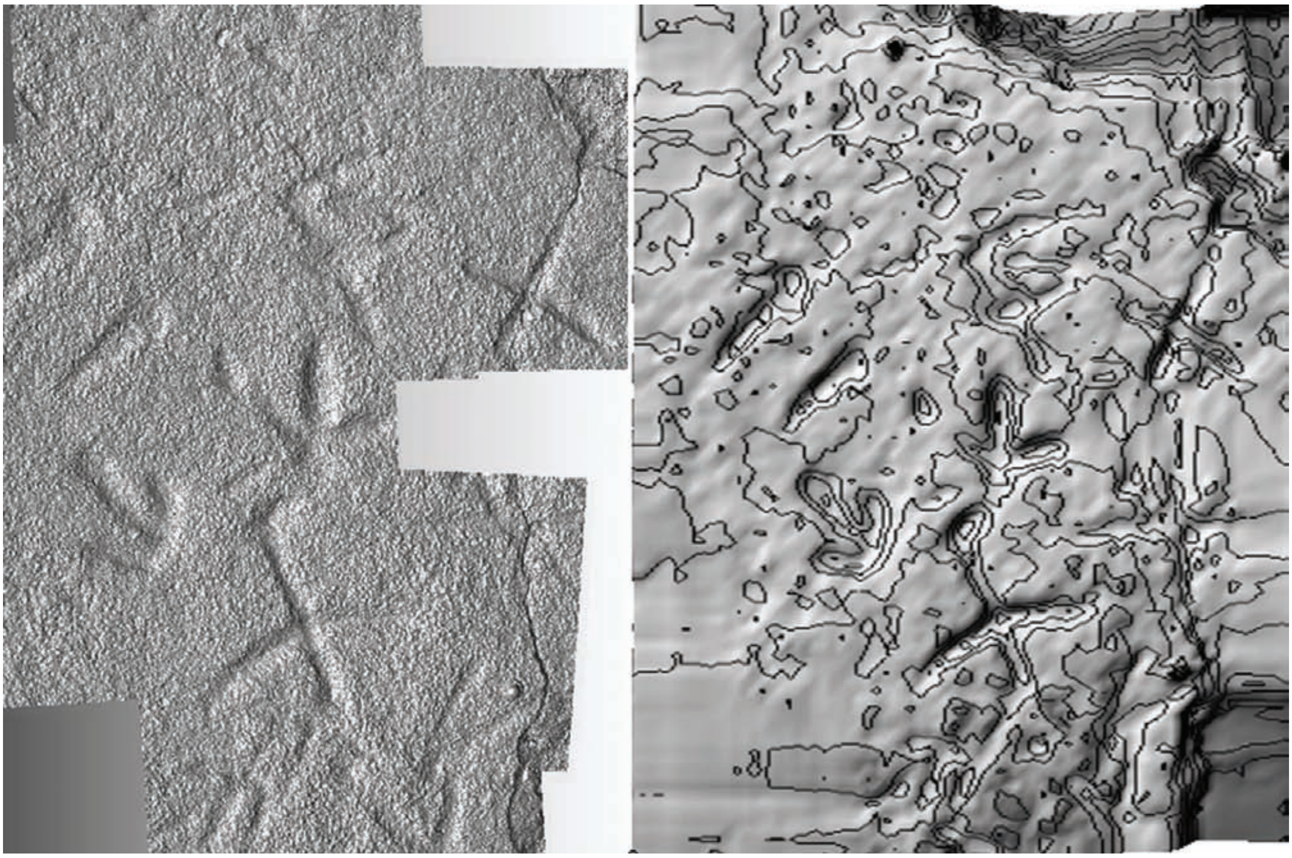

Figure 13. Example of a micro-digital elevation model of the petroglyphs and contour map of the same area

Freehand sketching and tracing

Freehand sketches were undertaken of all panels showing the approximate shape of the panel, its orientation, and the shape and placement of the petroglyphs. This allowed careful observation of each motif from which its motif type, form, and any superimpositioning were described, and its longest axis measured. The tracings were produced from enlarged digital photographs, using a variety of enhancement applications to achieve maximum interpretation. These applications were restricted to increasing and decreasing contrast rather than utilising the applications more commonly used for coloured motifs (cf. David *et al*. 2001; Gunn *et al*. 2010).

Motif numbers and distribution

A total of 47 panels with 267 motifs were located at the site (Figs 3 and 10; Appendix 1). Panels were distinguished by the physical perimeter of each slab and, while some motif distributions and arrangements reflect existing slab forms, others have been clearly disrupted by the present erosional patterns. Consequently, panel degradation has occurred since the production of the petroglyphs and the nominated panels cannot be seen to fully reflect the available rock surfaces at the time the petroglyphs were made. The number of motifs per panel ranged from 1 to 55, with a median of 2 (Figs 15–20). Six panels had more than 10 motifs, but 63% had less than five motifs, and 28% had only a single motif. The artwork is not evenly distributed across the site but is concentrated in the central area (group E; Fig. 10) and with a greater density to the south than to the north. This pattern, however, is not reflected in the areas of available surface as the larger panels occur at the northern end (groups H–K), suggesting either that the concentration is an artefact of use or that less of the northern panels were exposed and available at the time of motif production.

Panel E2, near the centre of the main group, has 55 motifs (Figs 15 and 16), which is more than twice that of any other panel. The arrangement and distribution of the motifs on this panel closely parallels the current perimeter of the rock slab and is therefore likely to reflect the shape of the panel when the motifs were produced. The panel also appears to have seven instances of superimposition and three stages of weathering suggesting that the motifs were produced over a considerable, but unknown, period of time. Consequently, this dense and central panel is taken to be the focus for the petroglyphs.

Panel L, 500m east of the main cluster, is a singular outlier with five motifs on a small slab (0.5x0.4m). Although fractured, the presence of adjacent undecorated panels suggests that the panel was the work of a single person or event, rather than part of a substantial sub-site (cf. Clegg 1987).

Motif types

Thirty-nine distinct types (or subjects) were recorded from the motif suite, with an additional class for

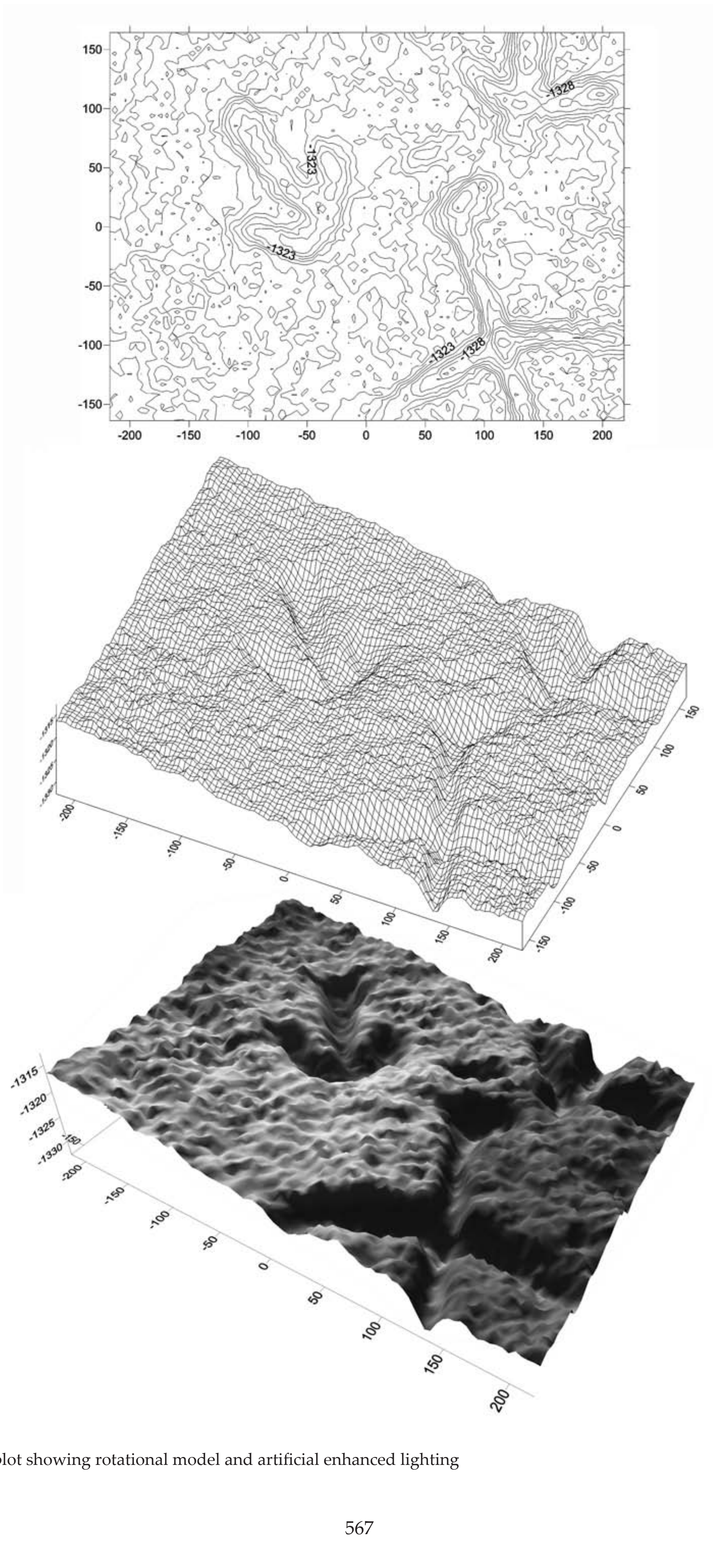

Figure 14. Scanner plot showing rotational model and artificial enhanced lighting

Figure 15. Vertical photograph of Panel E02

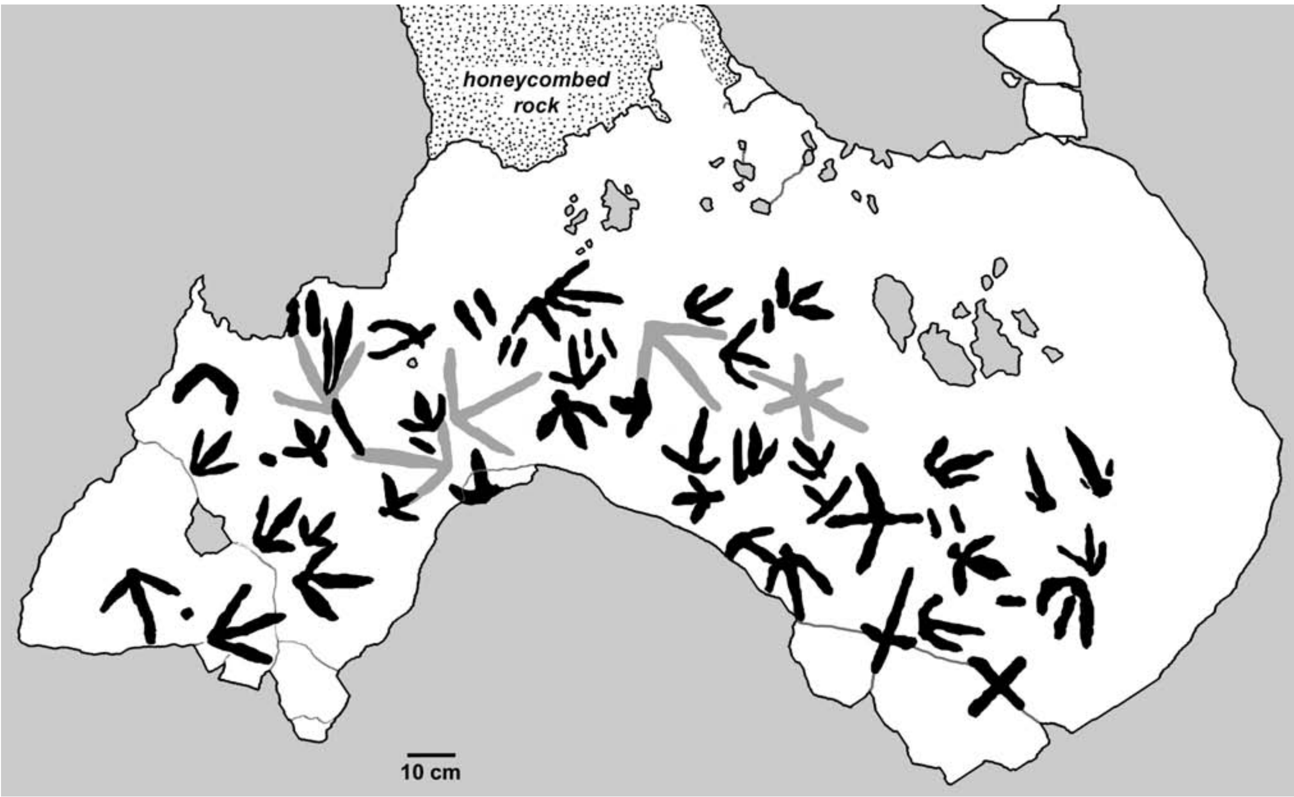

Figure 16. Photo-tracing of Panel E02: the densest and most highly decorated of the panels

Figure 17. Panel E10: the second most highly decorated panel

Figure 18. Panel E11: the third most decorated panel

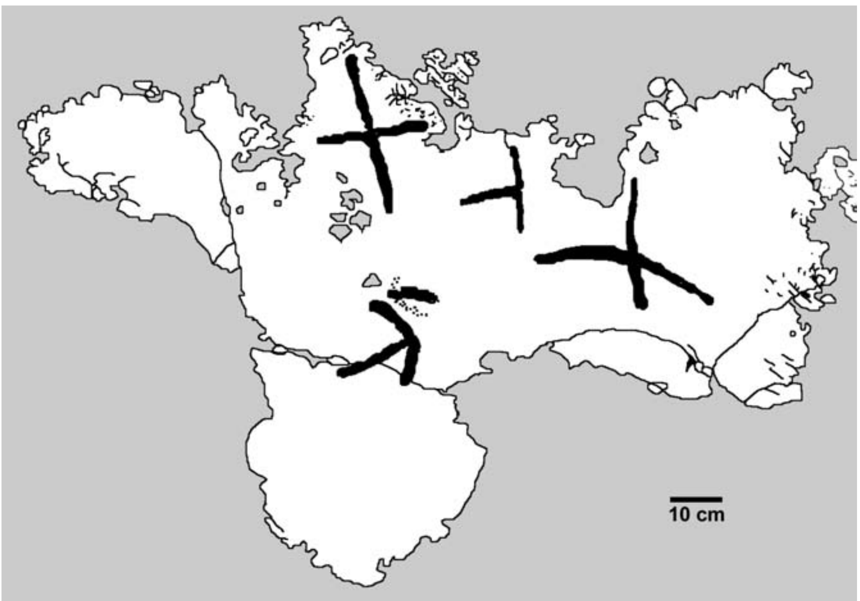

Figure 19. Panel E06 with distinctive 'long-cross' motifs

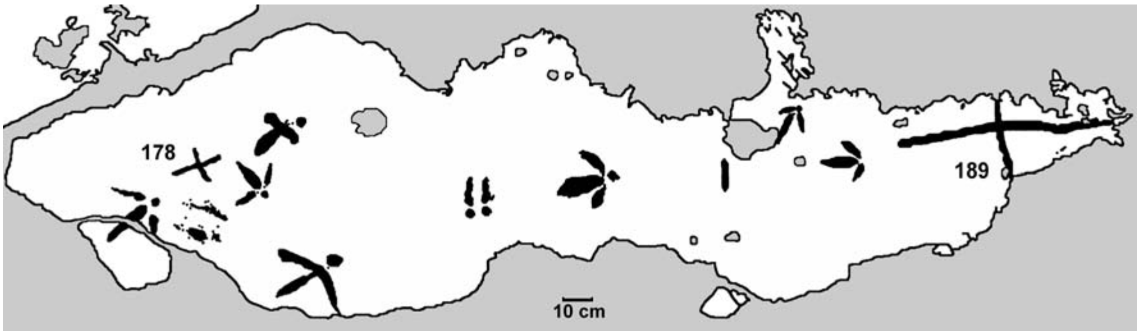

Figure 20. Panel F1 with the largest (0.68m) and smallest (0.15m) of the 'long-cross' motifs

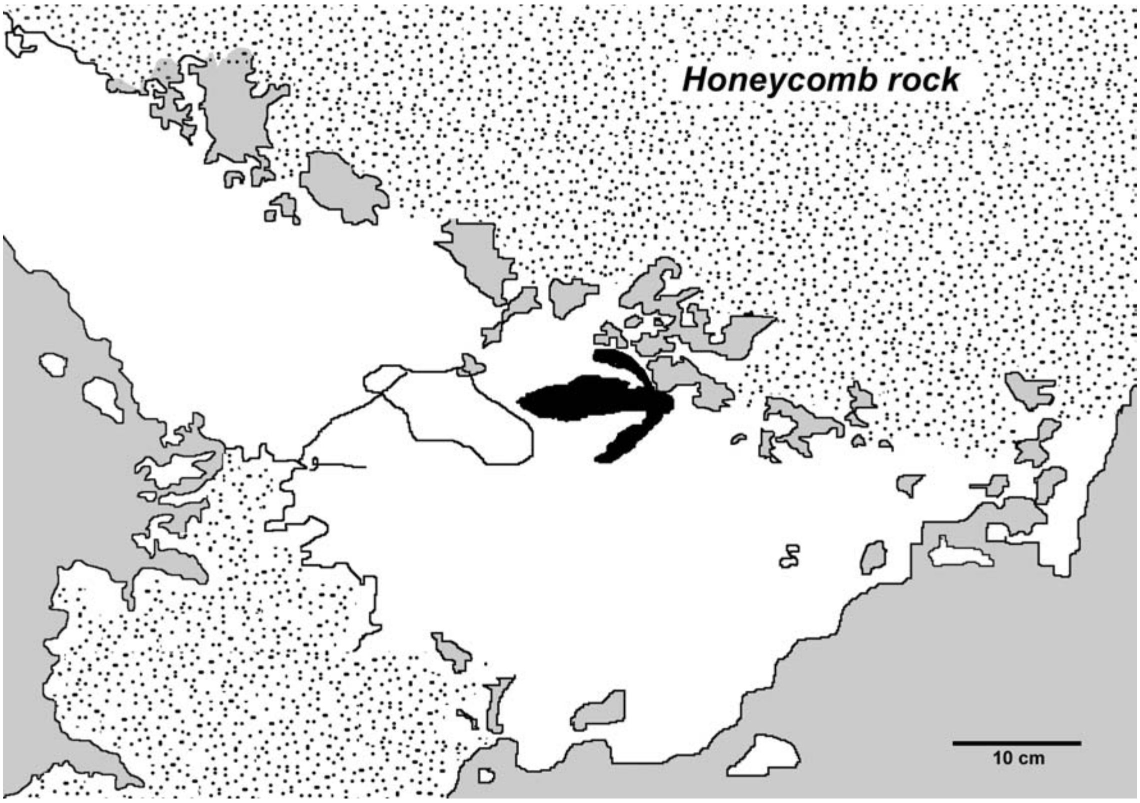

Figure 21. Panel C1: one of the least decorated but more representative panels

"unknown" (unrecognised) types and another for fragments (Table 1; Fig. 11; Appendix 2).

Interpreting a number of the motifs was problematic due to their poor condition and the similarity in colour between the motif and the surface of surrounding rock. Even raking light failed to clearly delineate the shape of some of the motifs. Consequently, a few motifs were recorded differently when drawn at the site and when later traced from photographs. In this instance, it was the field recording that was used in the analysis, although traced photographs more accurately reveal the shape of most motifs and their proximal relationship to other motifs. Also, it was found that by using artificial lighting at night, both the shape and size of a motif could be significantly distorted depending on the placement of the light source.

Their deteriorated state also made determining the original form of the motif very difficult. For example some "emu track" motifs have a distinct heel whereas others do not. It is possible that some of those without a heel originally had one but, with weathering, the distinction between the heel and toes has been eroded away leaving a linear shape. In some examples there is variation with depth, presumably due to erosion. In these cases the rim of the petroglyph displays a linear form, but the depth shows the differentiation of the pads. Whether the apparent pads are part of an erosional process of the lower portions of the motif, or the linear shape is due to the erosion of the upper parts is unclear. For this study however, the existing shape is what has been recorded, on the presumption that, for general analysis, such fine-grained sub-division may be meaningless.

Table 2

Emu track motif sub-type percentages

Motif sub-type	No	%
e1a	46	*40*
e5a	16	*14*
e3d	11	*9*
e4b*	10	*9*
e1c	7	*6*
e3a	7	*6*
e2c	3	*3*
e3b	3	*3*
e4a*	3	*3*
e4c*	3	*3*
e4d	3	*3*
e2a	2	*2*
e4e	2	*2*
TOTAL	**116**	*103*

* heels distinct

Numerically (122 or 51%) and visually, the artwork is dominated by bird tracks (*e.g.* Fig. 17). A total of 15 types of bird tracks occur, thirteen of which are generic "emu tracks" (tracks of emu, bustard, waders, *etc*), and two are four-toed tracks (such as heron). The most common variety is the standard "arrow" emu track (type e1a 40%; Table 2), with the second most common the "long-toed arrow" form (e5a: 14%). Those varieties with distinct heels (types e4a, e4b, and e4c) together form only a minor group (15%).

The next largest group, macropod tracks, had seven varieties with the most common being a simple pair of short parallel bars (type r3a: 56%; Table 3; Fig. 12). As with the emu tracks, those tracks with distinct heels are in the minority (11%).

The other types that stand out are "long-crosses" (type e6c), "C" shapes (a4c), and "horseshoe" shapes (a4d). The former occur on three panels (E6, E11 and F1), each in close proximity and all with two examples (*e.g.* Figs 18–21). While all six are the same shape however, they vary greatly in size, from the largest motif recorded here, at 68cm, to small 15cm, with three around 35cm.

Table 3

Roo track motif sub-type percentages

Motif sub-type	No	%
r3a	20	*56*
r1a	7	*19*
r6b*	3	*8*
r6f	3	*8*
r3d*	1	*3*
r7b	1	*3*
r7c	1	*3*
TOTAL	**36**	*100*

* heels distinct

The six "C" shapes (Fig. 11) are widely distributed across the site and show no common motif associations. Along with the three horseshoe shapes, they are the only "circular-shaped" motifs at the site. All are between 8cm and 15cm wide and are neither large nor imposing, and none are central to any of their respective panels.

There is a positive correlation between the number of motifs per panel and the number of types represented (Fig. 22). This suggests that panels were not the focus of particular motif types but rather each was an accumulation of a general suite that operated across the site. Unlike Maynard's finding for Panaramitee sites (1976), where similar motifs tended to form discrete clusters, the reverse seems to occur here. This then suggests the aggregation of the long-crosses mentioned above is contrary to the general arrangement, making it all the more significant.

Techniques and patination

The degree of motif weathering across the site and the nature of the rock makes it difficult to determine the production technique used here, and in most cases it is no longer possible to be definite regarding technique.

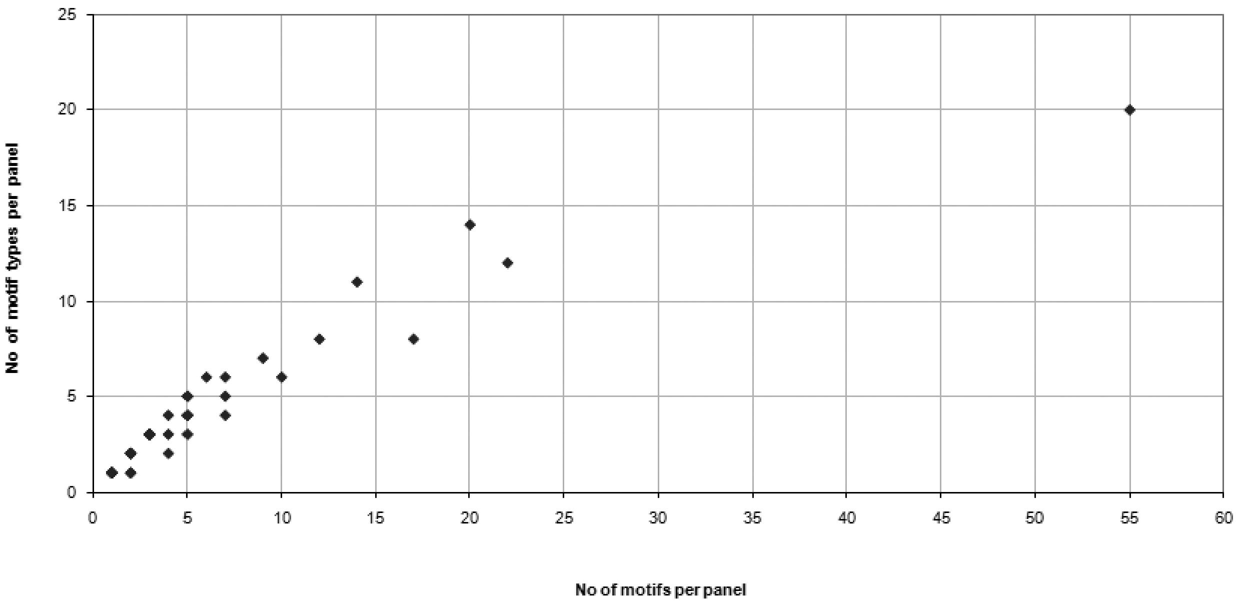

Figure 22. Motif types numbers by the number of motifs per panel

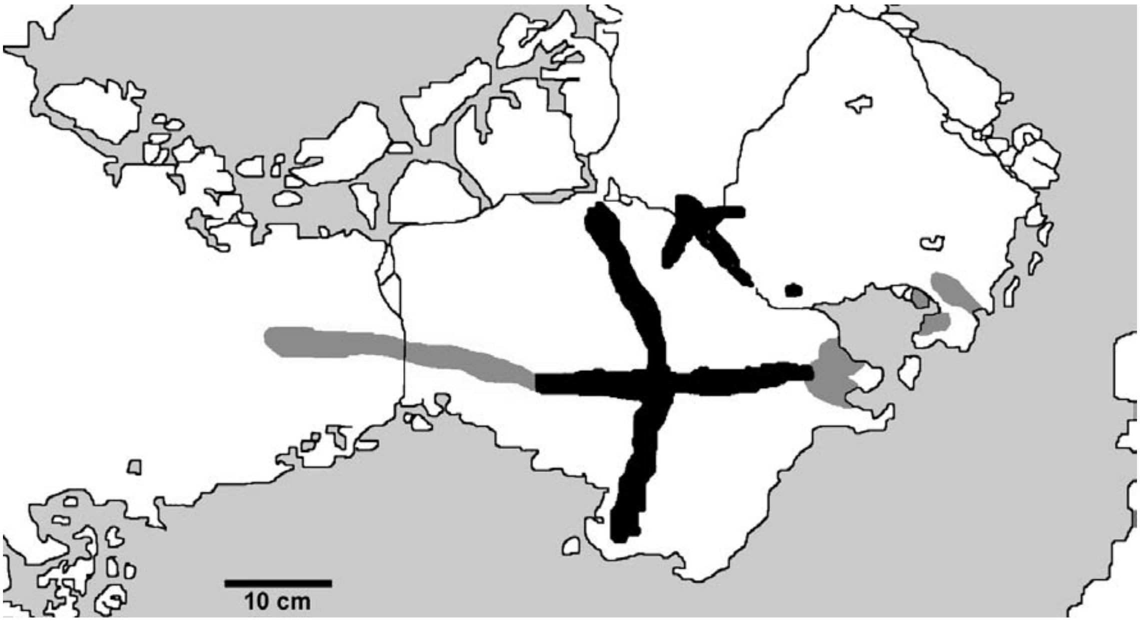

Figure 23. Panel A5 with superimposed or partially altered motif

The presence of a few motifs with distinct heel pads depicted suggests that the motifs were pecked. Although pounding could have been used, elsewhere in Australia there is no record of it being used for such deep motifs. At least five of the motifs were produced by abrasion, however, as in many petroglyph sites, the abrading appears to be a reworking of earlier pecked motifs.

All of the motifs have weathered back to the colour of the surrounding rock (Fig. 7), however none contain any patina. The lack of patina may be the result of either the rock type, inappropriate climate for patina formation, or subsequent degradation by weathering.

Forms

Motif form is the manner in which it is constructed: dotted, linear, solid, outline, outline plus infill, or any combination of these. The repertoire here was limited to six different form types (Table 4). These consisted of four basic types: linear (78%), solid (18%), outline, and dot (each <1%); and two combination forms: linear+dot and solid+linear (both <5%). The dominance of linear motifs is clear and appears to be a hallmark of the repertoire that contrasts with the pattern of the Panaramitee which tends to have a high proportion of outlined, circular motifs (circles, concentric circles *etc*.).

Table 4

Form frequencies

Form type	No	%
dot (d)	2	*<1*
linear (l)	186	*78*
l+d	3	*1*
outline	1	*<1*
solid (s)	43	*18*
s+l	4	*2*
Total	**239**	***100***
fragments	28	

The single outlined motif is a 29cm, irregular circle on panel A6, although one other motif in the same area (panel A4) may have had a similar outline form that has since deteriorated.

Sizes

The motifs ranged from 3cm to 68cm in length, with a mean of 13cm, a median of 12cm, and a standard deviation of 8cm (n = 213). Most were less than 20cm (92%), and only 3% (6) were greater than 30cm. These largest motifs consisted of:

- four long-crosses: 34cm, 38cm(x2), 68cm (motif type A6A),
- a simple design 38cm, and
- an unknown linear type 52cm (superimposed and utilised by a subsequent motif).

As the size of available panels was not a limiting factor, the homogeneity of the majority of motif sizes and types again points to a very singular repertoire.

Condition

Motif condition ranged from fair to very poor, with none in an excellent or good condition. The overall weathered condition suggests either a rock type unsuitable for the long-term preservation of petroglyphs or, alternatively, a considerable age for the motifs. In a few cases the weathering of the motifs has broken through the crust rock into the underlying sands with the result that only a negative outline of the original motif remains. It is highly likely that other motifs have been totally destroyed in this manner.

Superimposition

Several examples of overlapping motifs occur but, due to the poor preservation of the motifs involved, no sequence of superimposition can be determined. For example, all of the large "linear emu tracks" are superimposed by smaller "standard emu tracks" (Fig.

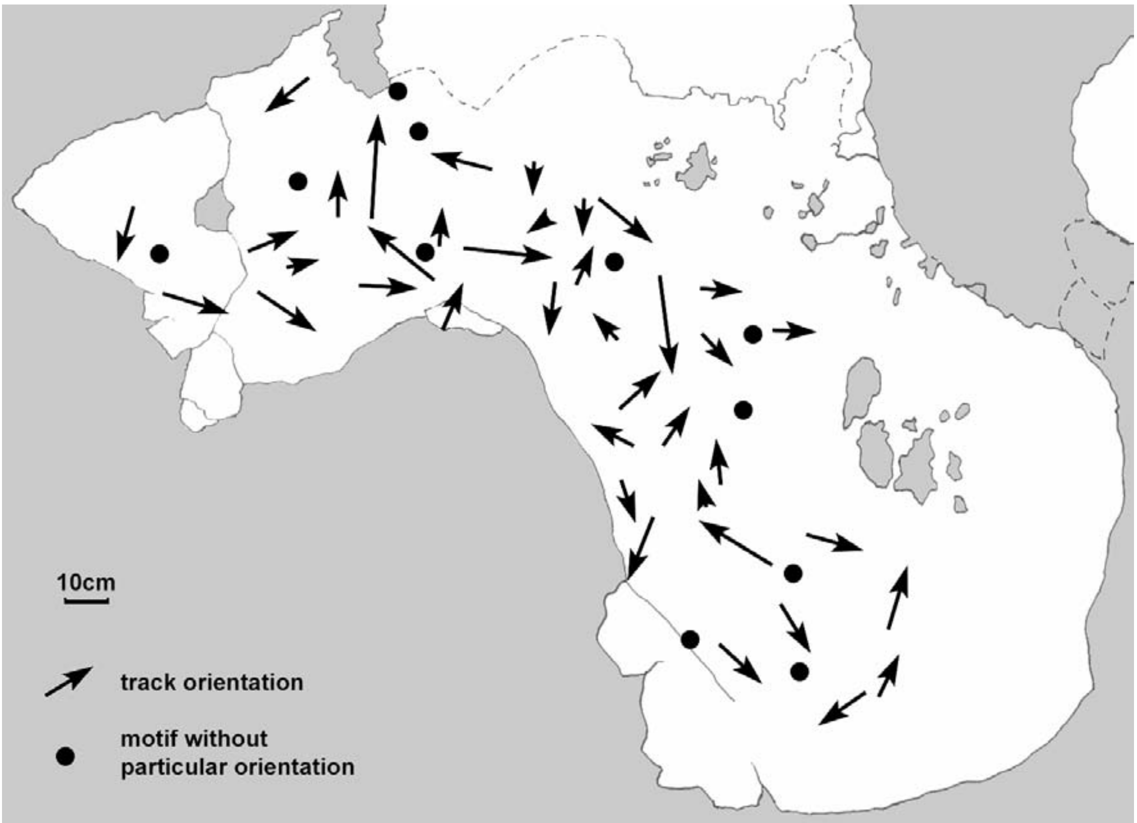

Figure 24. Motif orientation on Panel E02.

16), but in some instances the linear forms appear more recent while in others they appear less well preserved. The clearest example of superimposition occurs on panel A5 where a cross motif appears to overlie an earlier long-cross (Fig. 23). It is not clear, however, whether the more recent motif has simply "revitalised" a previous small section of the long-cross, or whether it represents a completely new motif (in which case the earlier motif may not have been a long-cross at all).

Compositions

No clear examples of composition were recorded. While some panels show aggregates of the same motif type, in many cases these exhibit different forms suggesting either that they were not contemporary or that they in fact represent different species (Figs 16–18 and 20). Even given the possibility of erosion producing some of the differences, the variable states of weathering would also indicate chronological differentiation. Examination of the orientation of the track motifs on the largest panel (Fig. 24) shows no consistent alignment or associations (such as track trails). It also suggests that the motifs were not produced as a series (such as by the one artist sitting in one spot or several artists working together). The lack of any such compositions, particularly involving trails of animal tracks, is another aspect where this site differs from a classic Panaramitee site.

Chronology

No chronology of the artwork can be provided as yet. On the basis of the rocks weathering potential, Clarke (1983, 1989) suggested that if the motifs were of Pleistocene age then they would have had to be preserved under a protective layer of sand (sand dune) or, if they had not been covered, they must be of late Holocene age.

On the basis of the superimposition and differential weathering states of the motifs across the site, it is likely that the suite of petroglyphs represents development over a considerable time rather than during a single episode or short period. However, at this stage, no limits can be put on the age of either the earliest or latest of the petroglyphs.

Inspection revealed a scatter of stone artefacts and charcoal on the surface and in excavations on the eastern slopes of the dune bordering the plain. Given the swampy nature of the plain, this is the most likely place for Aboriginal people to have camped when visiting the site and hence these scatters should be seen as part of the overall site complex. Consequently, as the charcoal was dated to the last 3000 years, it is possible that the petroglyphs were produced during this period of occupation, although the association remains speculative at present.

Conclusion

To the Nyoongar people, the area of the site was the home of *Kybra*, a giant white bird who at some time in the distant past flew westward out to sea where its wings could still be seen on the horizon from time to time. The association of the petroglyphs with this belief gives them a very high significance from a Nyoongar perspective.

From an archaeological perspective, as the Kybra Aboriginal place is the only petroglyph site reported from the south-western corner of Western Australia, it is again accorded a very high significance.

The motifs are dominated by "emu track" motif types (51%), with smaller numbers of "roo tracks" and "geometric elements". While these are elements of the Panaramitee Tradition, the total lack of any figurative motifs (lizards, stick figures, snakes, *etc*), trails of track motifs, and other elementary compositions, along with the almost total lack of circular motifs (circles, concentric circles, starred circles, *etc*), indicates that this they do not constitute a classic Panaramitee repertoire.

Further study of the calcite rock and direct dating of the rock itself will greatly assist in the interpretation of this very significant site.

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Appendix 1

Kybra motif list
List of all motifs recorded by panel indicating their form type*, motif type and size (length)

Panel	Motif No	Form	Type	Size (cm)	Panel	Motif No	Form	Type	Size (cm)
A01	1	s	r3a	6	E02	66	l	m7d	26
A01	2	s	r3a	6	E02	67	l	b1	7
A02	3	l	e3d	8	E02	68	l	e1a	11
A02	4	s	r6f		E02	69	l	m7d	21
A03	5	s	e3d	8	E02	70	l	r3a	10
A04	6	l	e1a	12	E02	71	l	e1a	14
A04	7	s	e5a	7	E02	72	l	a4a	10
A04	8	sl	e4a	13	E02	73	l	r3a	
A04	9	l	a4a	12	E02	74	l	r3a	
A04	10	l	b1	8	E02	75	l	e1a	14
A04	11	l	f	23	E02	76	s	e1a	13
A05	12a	l	m7a	30	E02	77	l	e3d	
A05	12b	l	x	52	E02	78	l	m7d	21
A05	13	f	f		E02	79	l	e4b	10
A05	14	s	d1	3	E02	80	l	e1a	11
A05	15	s	e1a	10	E02	81	l	b1	8
A06	16	s	r3a	6	E02	82	l	e3d	11
A06	17	l	a9a		E02	83	l	e5a	15
A06	18	o	c2b	29	E02	84	l	m7a	13
A07	19	l	e1a	10	E02	85	l	e3a	13
A07	20	l	r7b	10	E02	86	l	a8a	24
A08	21	s	r3a	7	E02	87	l	e3b	
A08	22	l	e3d	18	E02	88	l	e2a	9
A08	23	l	j1e	15	E02	89	l	e2a	11
A08	24	l	k1a	20	E02	90	l	e1a	13
A08	25	l	k1a	17	E02	91	l	m7a	21
A08	26	l	j1e	18	E02	92	s	e3b	14
A08	27	f	f		E02	93	l	r1a	15
A09	28	l	k1a	38	E02	94	s	r3a	5
A10	29	l	e1a	19	E02	95	s	b1	4
A10	30	s	e1a	8	E02	96	l	e1a	7
A10	31	s	f	16	E02	97	l	e1a	11
A10	32	s	r3a		E02	98	s	e4b	14
A10	33	l	m7b	20	E02	99	l	a3	19
A10	34	l	a4c	12	E02	100	l	e3a	9
A10	35	f	f		E02	101	l	b1	6
A10	36	l	e5a	16	E02	102	l	e1a	13
A10	37	f	f		E02	103	l	a6a	18
A10	38	l	e1a	11	E02	104	f	f	
B01	39	l	b1	6	E03	105	l	m7b	14
B02	40	s	r6f	11	E04	106	s	e4b	
B02	41	s	r3a	11	E05	107	l	e1a	
C01	42	l	e1a	10	E06	108	l	a6c	38
C02	43	l	e3d	9	E06	109	l	a1b	18
C02	44	l	e1a	13	E06	110	l	a6c	38
C02	45	f	f		E06	111	l	f	
C02	46	f	r7c		E06	112	l	e3d	13
D01	47	l	e4e	14	E07	113	l	b1	4
D01	48	l	e5a	12	E07	114	s	b1	7
D01	49	l	r1a	4	E08	115	l	e4b	14
E01	50	l	r1a	13	E08	116	l	a4c	13
E01	51	l	e5a	13	E09	117	l	e1a	
E02	52	l	m7d	17	E09	118	l	b1	10
E02	53	d	d1	3	E09	119	f	f	
E02	54	l	e1a	20	E09	120	l	e1a	12
E02	55	l	e1a	17	E09	121	l	r1a	
E02	56	l	e1a	7	E09	122	l	e3a	
E02	57	l	e1a	15	E09	123	s	d1	
E02	58	s	d1	4	E09	124	l	m7d	29
E02	59	l	m7a	14	E09	125	f	f	
E02	60	l	a9a	16	E10	126	l	b1	
E02	61	l	m7b	16	E10	127	l	r3a	7
E02	62	s	r3a	9	E10	128	l	e1a	11
E02	63	l	f		E10	129	l	m7d	13
E02	64	l	f		E10	130	l	e1a	12
E02	65	l	e1a	12	E10	131	f	f	

Panel	Motif No	Form	Type	Size (cm)
E10	132	l	f	
E10	133	l	e2c	
E10	134	l	b1	4
E10	135	l	a4d	8
E10	136	f	f	
E10	137	l	r6b	12
E10	138	s	b1	7
E10	139	sl	r6b	12
E10	140	l	b1	10
E10	141	l	a6a	24
E10	142	l	b1	8
E10	143	l	r3a	
E10	144	l	d3b	
E10	145	d	r1a	
E10	146	l	b1	6
E10	147	l	e3b	15
E11	148	sl	x	18
E11	149	s	a1c	
E11	150	f	f	
E11	151	l	j6a	13
E11	152	l	f	
E11	153	l	b1	
E11	154	l	e5a	15
E11	155	l	e4b	8
E11	156	sl	e4c	18
E11	157	l	a6c	34
E11	158	l	e5a	7
E11	159	l	r1a	16
E11	160	s	d1	4
E11	161	l	m7a	18
E11	162	l	e4b	10
E11	163	l	a6c	27
E11	164	l	a4d	14
E11	165	l	b1	7
E11	166	l	e5a	
E11	167	l	a4c	12
E12	168	l	e4b	13
E12	169	l	j1e	13
E12	170	s	a4a	7
E13	171	l	e1a	9
E13	172	l	e1a	13
E13	173	l	e3a	13
E13	174	l	e3a	15
E14	175	l	a6a	16
F01	176	l	e4a	12
F01	177	l	r3a	13
F01	178	l	a6c	15
F01	179	s	e4d	
F01	180	l	e2c	15
F01	181	s	d1	3
F01	182	s	b1	5
F01	183	s	e4e	15
F01	184	l	r6b	14
F01	185	s	e3d	18
F01	186	l	b1	9
F01	187	l	e4a	17
F01	188	l	e1a	14
F01	189	l	a6c	68
F02	190	l	r3a	10
F02	191	l	e4b	11
F02	192	l	e4b	18
F02	193	l	f	
F02	194	l	x	13
F02	195	l	f	
F02	196	l	r3a	8
F03	197	l	a9a	6
F03	198	s	d1	3
F03	199	f	f	
F03	200	s	d1	3
F03	201	l	b1	7

Panel	Motif No	Form	Type	Size (cm)
F03	202	s	c4	8
F03	203	l	e1a	5
F03	204	s	d1	3
F03	205	l	b1	4
F03	206	l	e5a	13
F03	207	l	e5a	13
F03	208	l	e4b	8
F04	209	l	e1a	11
G01	210	s	r3a	11
G01	211	l	e1a	12
H01	212	l	e5a	16
H01	213	f	f	
H01	214	l	e3d	8
H01	215	l	e1a	9
H01	216	ld	e4c	17
H02	217	l	e1a	10
H03	218	l	e4d	7
H03	219	l	e5a	13
H03	220	l	e5a	12
H03	221	l	e3a	11
H03	222	l	e3a	11
H04	223	l	b1	8
H04	224	l	e1a	12
H04	225	f	f	
H04	226	l	b1	6
H04	227	f	f	
H04	228	ld	r3d	10
H04	229	l	a1b	17
H04	230	l	e1a	7
H04	231	f	f	
H04	232	l	r3a	6
H04	233	l	e1a	7
H04	234	l	e1a	10
H04	235	l	e1a	9
H04	236	s	r3a	
H04	237	s	b1	
H04	238	ld	e4c	13
H04	239	l	e5a	16
H05	240	l	a4c	8
H05	241	l	a4c	8
H05	242	l	a4d	10
H05	243	s	r6f	10
H05	244	l	e2c	14
H05	245	l	e1a	13
H05	246	l	e4d	9
J01	247	l	e1a	10
K01	248	l	a4c	14
K01	249	l	b1	9
E15	250	l	e1a	
F05	251	l	r3a	6
F05	252	l	e5a	16
F06	253	l	b1	7
F06	254	l	a9a	10
F06	255	s	e1a	10
F07	256	s	d1	5
L01	257	l	e3d	15
L01	258	l	r1a	6
L01	259	l	e3d	9
L01	260	l	e5a	13
L01	261	f	f	
F08	262	l	f	
F08	263	s	d1	
F08	264	l	e1a	
E02	266	l	e1a	12
E02	267	l	e1c	

*** Form types:**

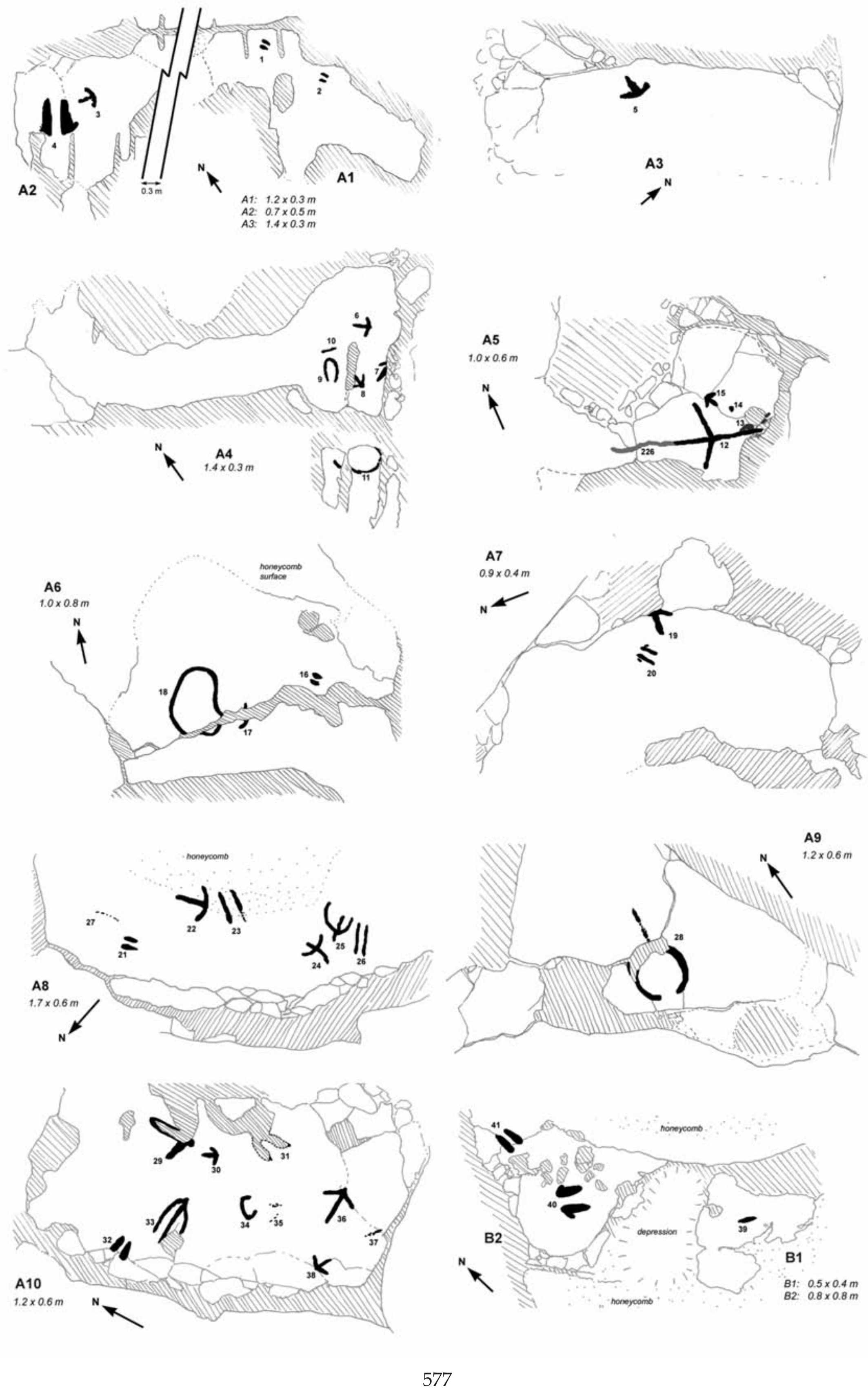
l = linear; ld = linear + dot; s = solid; sl = solid + linear; f = fragment.

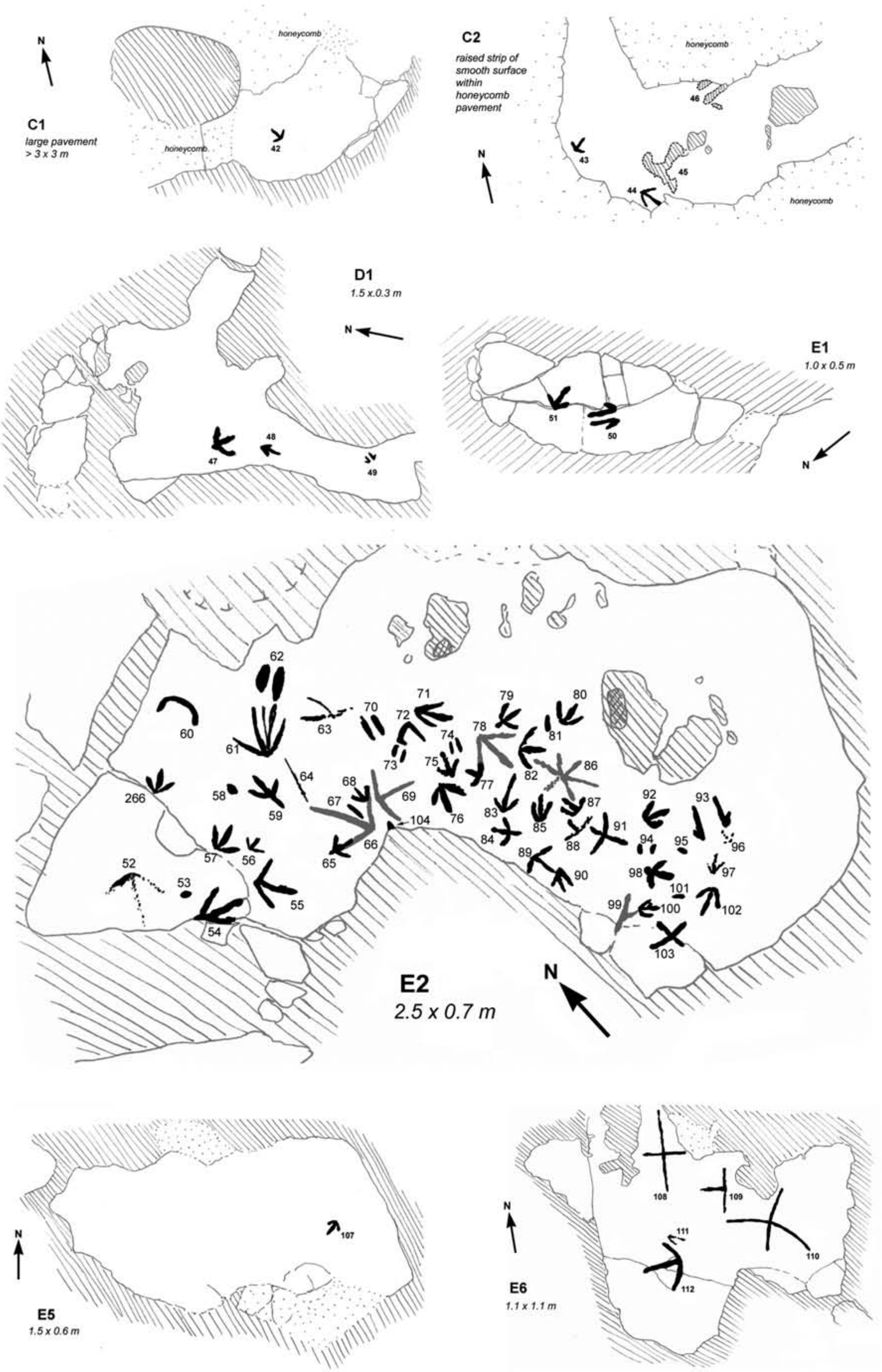
Appendix 2

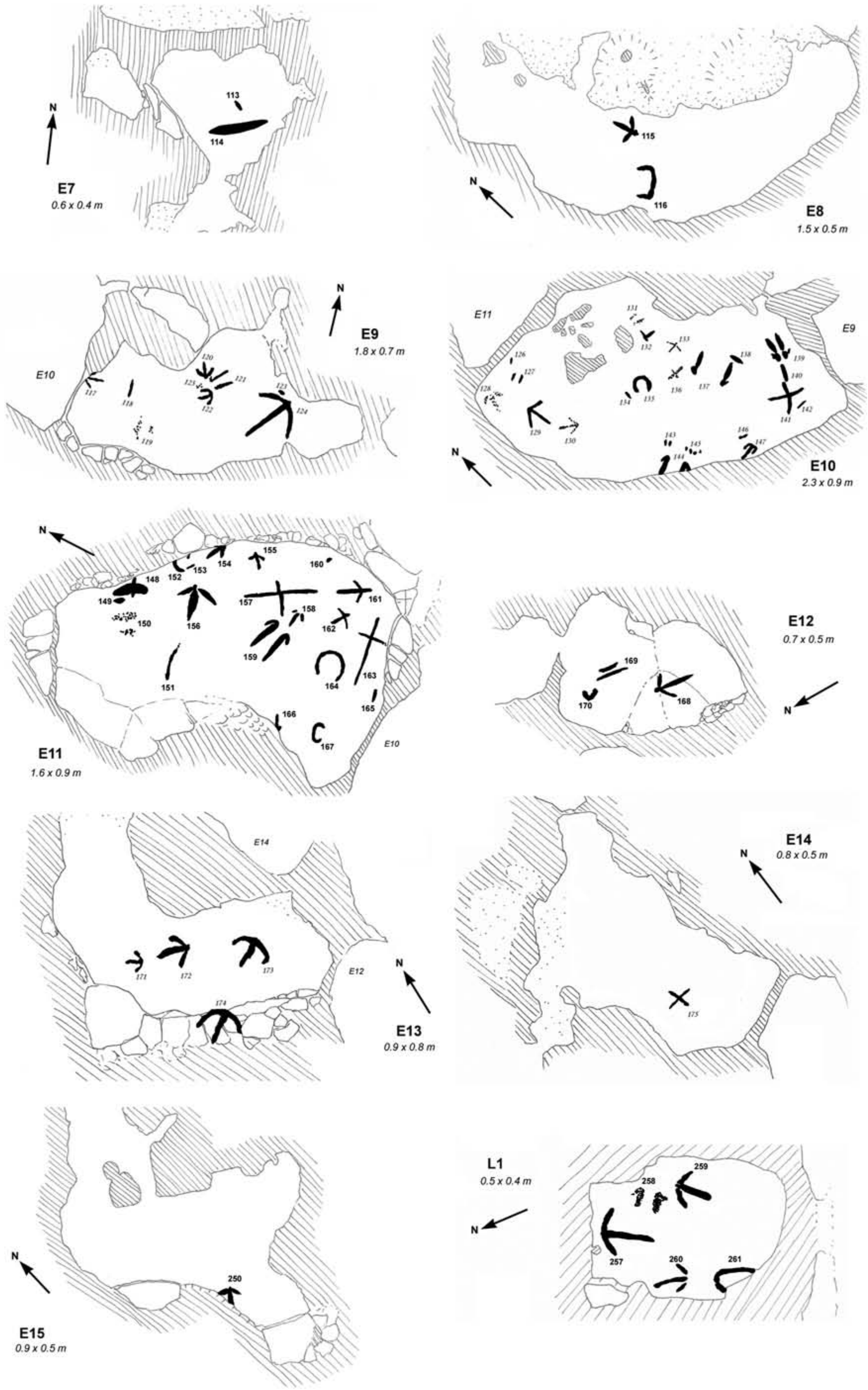
The art panels

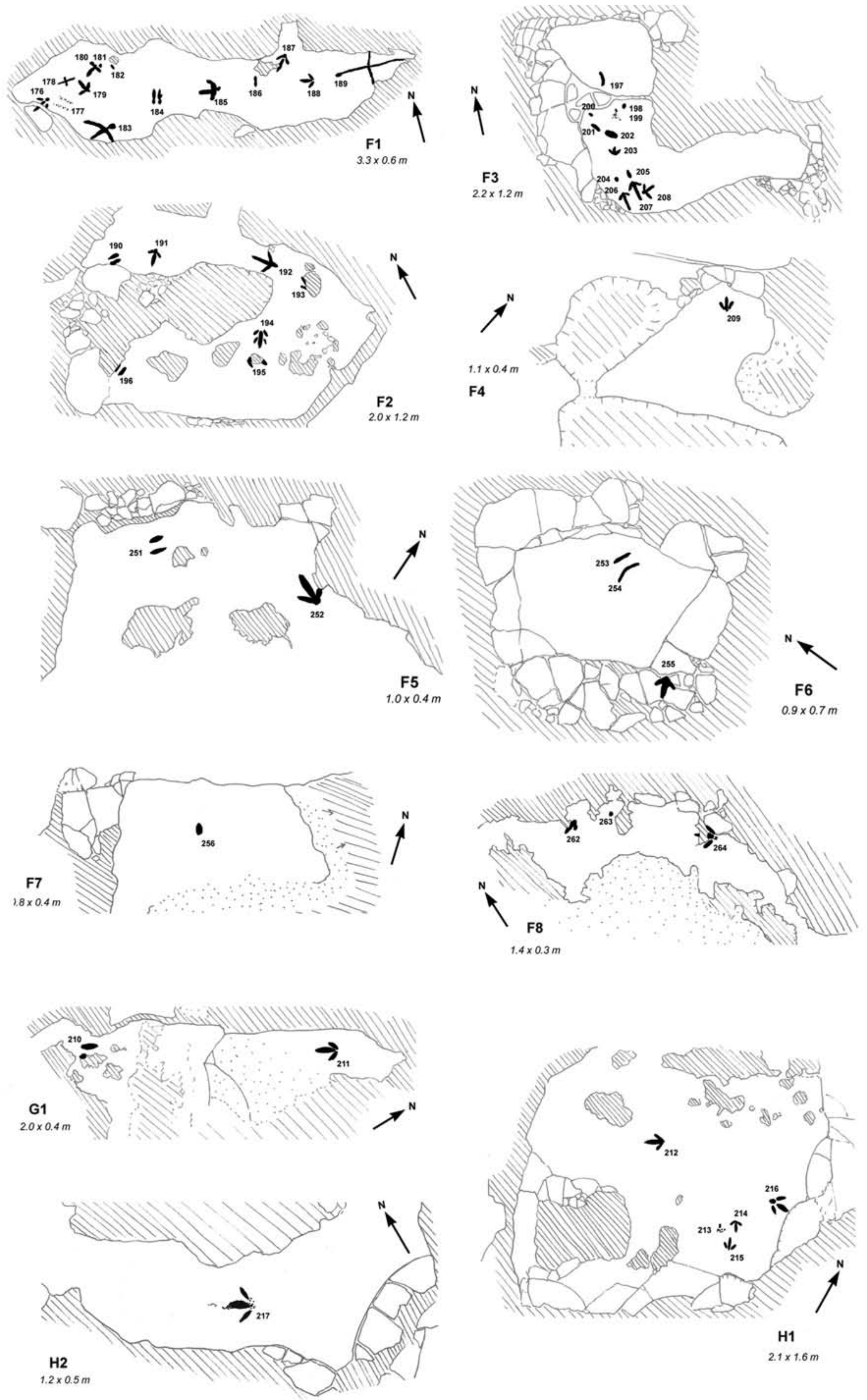
The appendix illustrates freehand sketches of all petroglyph panels showing panel designation (A1, E7, *etc*) their sizes and motif numbering.

Panel locations shown on Figure 10.

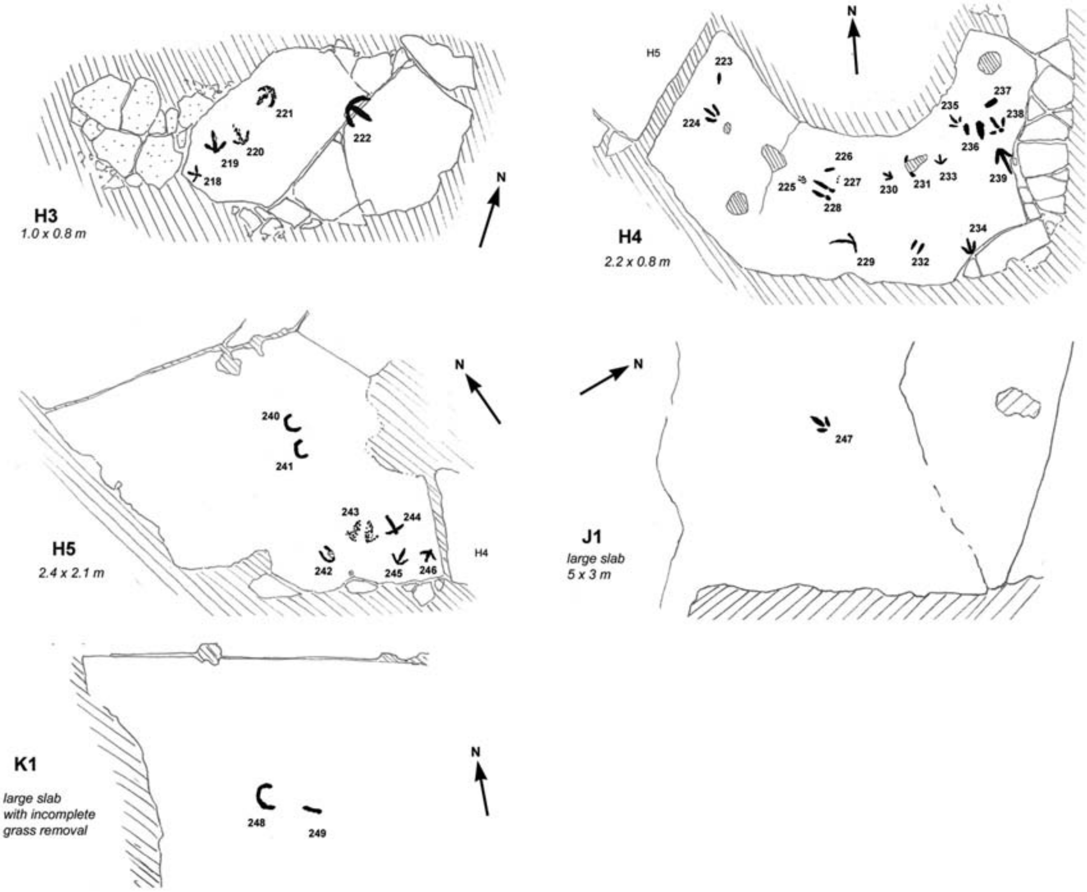



N
C1
large pavement
> 3 x 3 m
honeycomb
honeycomb
42
C2
raised strip of
smooth surface
within
honeycomb
pavement
honeycomb
43 44 45 46
honeycomb
D1
1.5 x.0.3 m
N
47 48 49
E1
1.0 x 0.5 m
51 50
N
60 62 61 63 70 71 72 73 74 75 78 79 80 81 82 86 266 58 59 64 68 67 69 104 66 65 77 76 83 84 85 87 88 91 92 93 94 95 96 57 56 55 52 53 54 89 90 98 97 101 100 102 99 103
E2
2.5 x 0.7 m
N
N
107
E5
1.5 x 0.6 m
N
108 109 110 111 112
E6
1.1 x 1.1 m


E7
0.6 x 0.4 m
N
113
114
E8
1.5 x 0.5 m
N
115
116
E9
1.8 x 0.7 m
N
E10
E10
2.3 x 0.9 m
N
E11
E9
E11
1.6 x 0.9 m
N
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
E10
E12
0.7 x 0.5 m
N
168
169
170
E13
0.9 x 0.8 m
N
E14
E12
E14
0.8 x 0.5 m
N
E15
0.9 x 0.5 m
N
250
L1
0.5 x 0.4 m
N
257
258
259
260
261



176
177
178
179
180
181
182
183
184
185
186
187
188
189
N
F1
3.3 x 0.6 m
N
197
198
199
200
201
202
203
204
205
206
207
208
F3
2.2 x 1.2 m
190
191
192
193
194
195
196
N
F2
2.0 x 1.2 m
N
209
1.1 x 0.4 m
F4
251
252
N
F5
1.0 x 0.4 m
253
254
255
N
F6
0.9 x 0.7 m
256
N
F7
262
263
264
N
F8
1.4 x 0.3 m
210
211
G1
2.0 x 0.4 m
N
212
213
214
215
216
N
H1
2.1 x 1.6 m
N
217
H2
1.2 x 0.5 m


H3
1.0 x 0.8 m
218
219
220
221
222
N
H4
2.2 x 0.8 m
H5
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
N
H5
2.4 x 2.1 m
240
241
242
243
244
245
246
H4
N
J1
large slab
5 x 3 m
247
N
K1
large slab
with incomplete
grass removal
248
249
N