4 THE CLELAND HILLS

The Cleland hills are a complex of low sandstone hills lying in a dunefield 75 km west of the main MacDonnell range system. They are bisected by two clan estates; one including Alala [Thomas reservoir] the site of the famous engraved faces (see Edwards 1968), the other centred on Murantji rockhole and Kaltara [Gill creek]. The latter estate extends east to include the important waterhole at Tjungkupu [Tarn of Auber], the small rockholes at Pira and Welkna, and Mt Solitary. It extends north to Deering creek and possibly includes the important spring at Putarti. Aboriginal informants give consistent accounts of the disposition of these estates, generally referred to as tjatjiku ngurra (father's country), but their historical continuity is uncertain given the major movement of Kukatja people into the western MacDonnell ranges from 1900 - 1940. Despite this limitation Aboriginal statements about landuse and tenure do serve to identify Putarti, Murantji, Kaltara and Tjungkupu as focal points for occupation of the area with Putarti and Murantji as major fall-back waters in time of drought.

PURITJARRA ROCKSHELTER

Puritjarra rockshelter is located close to Murantji on the southeastern end of the Cleland hills (fig. 4.1). This part of the range forms a high sandstone escarpment with numerous shady rockshelters. The excavated site takes its name from the Kukatja place-name; puritjarra, literally shade area. The first European to specifically mention visiting the rockshelter appears to have been J.P.M. Long who undertook a Welfare Branch patrol through the area in 1962 (cf. puridjara Long 1962). A few years later, in 1967, R. Edwards visited the site on an expedition to record the engraved faces at Alala. A few lines in the subsequent newspaper report (The Australian 2.7.69) prompted me to search for the site which I relocated in August 1986.

THE SITE

Puritjarra rockshelter is an enormous overhang (fig. 4.2) providing around 400 m² of level shaded floor. It faces southeast and is in deep shade after 10 am. The site is 30 minutes walk from Murantji rockhole, a deep shady reservoir holding thousands of litres of water and the only permanent water in the Cleland hills. Closer to the shelter there are several small ephemeral rockholes in a gully immediately southwest of the site. The largest of these holds around 100 litres after rain.

The last phase of use of the shelter is recorded by a number of wooden implements laying on the surface. These include parts of composite hunting spears - mulga spear heads and a tail-shaft - and two twigs with frayed ends for use as brushes. The condition of these artefacts suggests that the shelter was used within the last 50 years. This may have been by travelling parties of men for although a ration depot was established at Haasts Bluff in 1942

Overleaf **Figure 4.1 :** Air photo of the southeastern end of the Cleland Hills showing the sandstone escarpment and surrounding sandplain and dune ridges. Arrows indicate the position of Puritjarra rockshelter, which is visible as a dark crescent.
Figure 4.2 : Puritjarra rockshelter. View looking north, October 1986.

only women and children and the infirm were issued with rations. Men were obliged to forage as far afield as the Cleland hills. It seems likely that regular occupation of the area had ceased by the 1930's when increasing numbers of Kukatja were drawn in towards Hermannsburg mission. On his 1962 trip Long does not report meeting any Aborigines in the area.

The focus of the most recent occupation was a flat sandy rock-free area at the southwestern end of the shelter (fig. 4.3). Apart from wooden artefacts there is also a concentration of grindstones here.

In the centre of the shelter the collapse of a rockledge has formed a pile of boulders. Several of these have engravings - pecked circles and incised lines - on their upper surfaces. Several also have battered and flaked edges.

At the northeastern end of the shelter the floor is more compact and rocky and it is clear that water has gently flowed across it. Although the sandy floor dips slightly across the shelter, with a maximum fall of 30 cm towards the northeast, the slight flow of water this has generated at times has not led to noticeable erosion or gullying of the archaeological deposit.

The entire length of the shelter wall has paintings up to 2 m above ground level. These are mainly red handstencils, tracks and non-figurative motifs in red, white or yellow, and some charcoal drawings. The most prominent motifs are several large polychrome emu tracks. As Alala to the north is totemically associated with the emu it is possible that Puritjarra lies on part of the same mythological trail.

Small pieces of emu eggshell on the surface of the site suggest use at the end of the dry season (September-November). The presence of Santalum acuminatum (quondong) nuts also suggests occupation at this time, with the caution that some of these nuts are unburnt and have probably been cached by rodents.

THE 1986 EXCAVATION

Puritjarra was the last of the sites excavated in this project. Although richer archaeological deposits are present on the flat adjacent to Murantji rockhole I judged that an archaeological excavation there would only duplicate the detailed late Holocene sequence already obtained from Tjungkupu and other sites reported in chapters 5-9. Another consideration was that the deposits at Murantji had been disturbed by use of the area as a base camp in the 1930's by bushmen such as Ben Nicker. Puritjarra on the other hand, offered a possibility of extending the Central Australian sequence into the early Holocene. Its size and prominence as a shelter, and its location close to the only permanent water in the range suggested that it would register any use of the surrounding country. An auger hole dug on my initial visit revealed at least 60 cm of stratified archaeological deposits. However it was not until early in 1987 that radiocarbon dates demonstrated that occupation of the site spanned 22,000 years.

The great antiquity of this site requires a more detailed analysis of the sediments and artefacts than I have attempted below. Some questions about chronology, palaeoenvironment and typological evolution require further excavation to resolve. In view of its discovery so late in this project further work at

Puritjarra will be pursued as a separate, post-dissertation, study. What follows is an account of the 1986 excavation and a preliminary analysis of the excavated material.

In late 1986 I established a nominal grid-system across the site and excavated four 1 m^2 pits. Pits N9 and N10 in the northeastern part of the shelter form the main trench (see fig. 4.4). Further excavation here was eventually blocked by interlocking rockfall but in a larger excavation the removal of two or three key rocks would allow the rest to be easily removed. At this point I did not have sufficient time or manpower to both widen the trench and carry the excavation deeper. The excavation had already cut through 1.30 m of sterile deposits below the lowest artefact. I decided therefore to use the remaining time to open pit Z10 at the southwestern end of the shelter to establish whether or not the stratigraphy in N9/N10 was representative of the whole site. A fourth pit was also opened adjacent to the main engravings with the aim of determining upon what layer the boulder rested and to bracket the age of this rockart. This pit straddled the site grid and was designated QR9.

Stratigraphy and chronology.

The deposits consist of three distinct layers (fig. 4.5, tables 4.1 and 4.2). Layer I is a loose, gritty, light brown sand (pH 3.5, Munsell 5YR 5/8) up to 40 cm thick, with intact hearths, lenses of rockfall and well distributed pieces of charcoal. It

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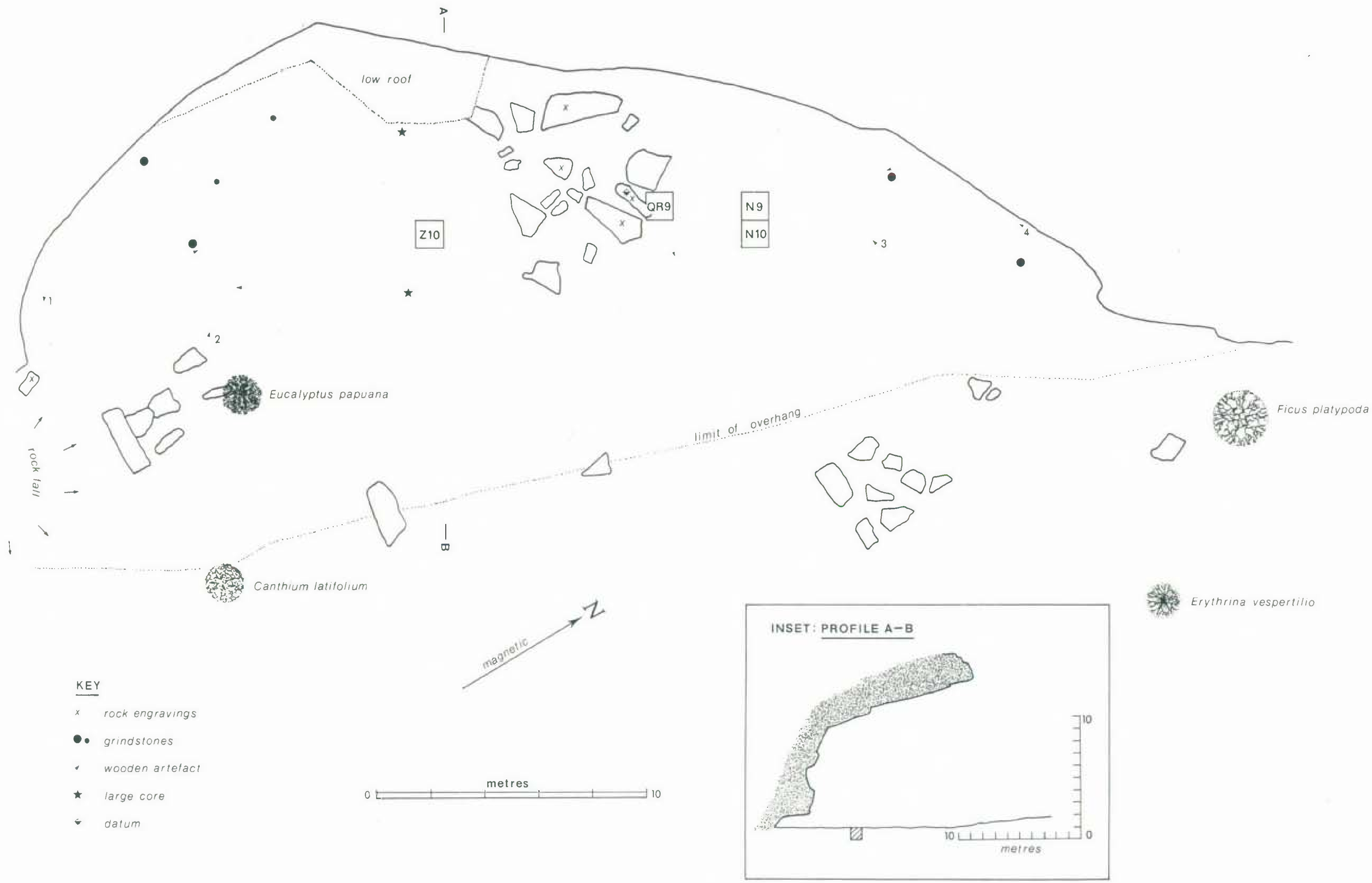
Overleaf **Figure 4.3 :** Plan and profile of the shelter showing the location of excavated pits and the distribution of wooden artefacts and grindstones on the surface of the deposit. **Figure 4.4 :** The interior of the shelter showing the main excavation, Pits N9 and N10, in the foreground. Pit QR9 at the foot of the engraved boulders is also shown.


A
B
low roof
Z10
QR9
N9
N10
1
2
3
4
rock fall
Eucalyptus papuana
Canthium latifolium
limit of overhang
Ficus platypoda
Erythrina vespertilio
magnetic
N
KEY
rock engravings
grindstones
wooden artefact
large core
datum
metres
0
10
INSET: PROFILE A–B
10
0
10
metres

has a sharp texture boundary with layer II. The latter consists of very compact, fine red clayey sand (pH 3.5, Munsell 5YR 5/8 grading to 2.5YR 5/8) 60 cm thick and with rocks and artefacts horizontally bedded within it. The earliest occupation occurs in the middle part of this layer. No artefacts were recovered from the lower part where the sediment matrix is much harder and where large rocks form a greater proportion of the deposit. Layer II has a sharp boundary with layer III which consists of large rocks and well-rounded rubble in a matrix of loose, fine dark red sand (pH 3.5, Munsell 10R 5/8). No voids were noted within layer III. The thickness of this layer was not determined but the excavation penetrated just over 100 cm. The maximum depth reached in the excavation was 2.13 m. in Pit N10.

Layers I and II are represented in all four pits. Layer I appears to have a roughly uniform thickness of 40 cm across the site. In both QR9 and Z10 there are lenses of rubble in the upper part of layer II (see fig. 4.5). These are presumably the foot of the cone of rockfall in the central part of the shelter.

Five radiocarbon dates are available from Pit N10 and two from Z10 (table 4.3). All of these except Beta-18883 were obtained on samples of scattered charcoal pieces recovered from the respective excavation units by flotation. Beta-18883 dates a single large lump of charcoal found embedded within layer II sediments during excavation. Figure 4.6 presents an age/depth graph for the site showing that although the archaeological

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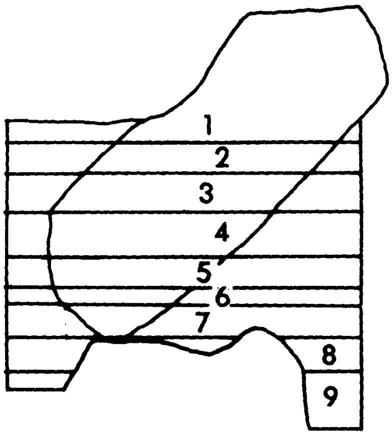
<u>Overleaf</u> **Figure 4.5 :**Section drawings showing the stratigraphy in the four pits. The overlay shows the disposition of excavation units.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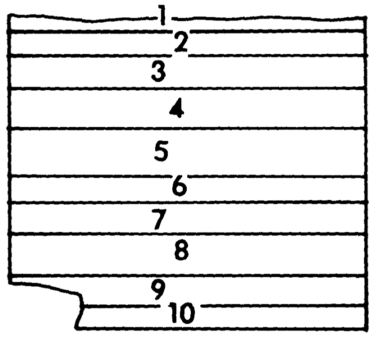
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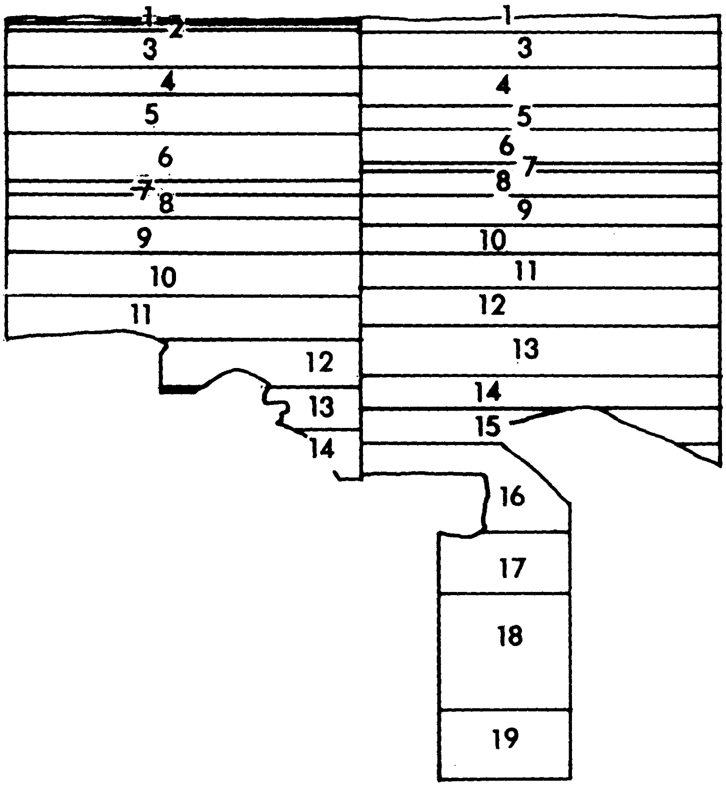
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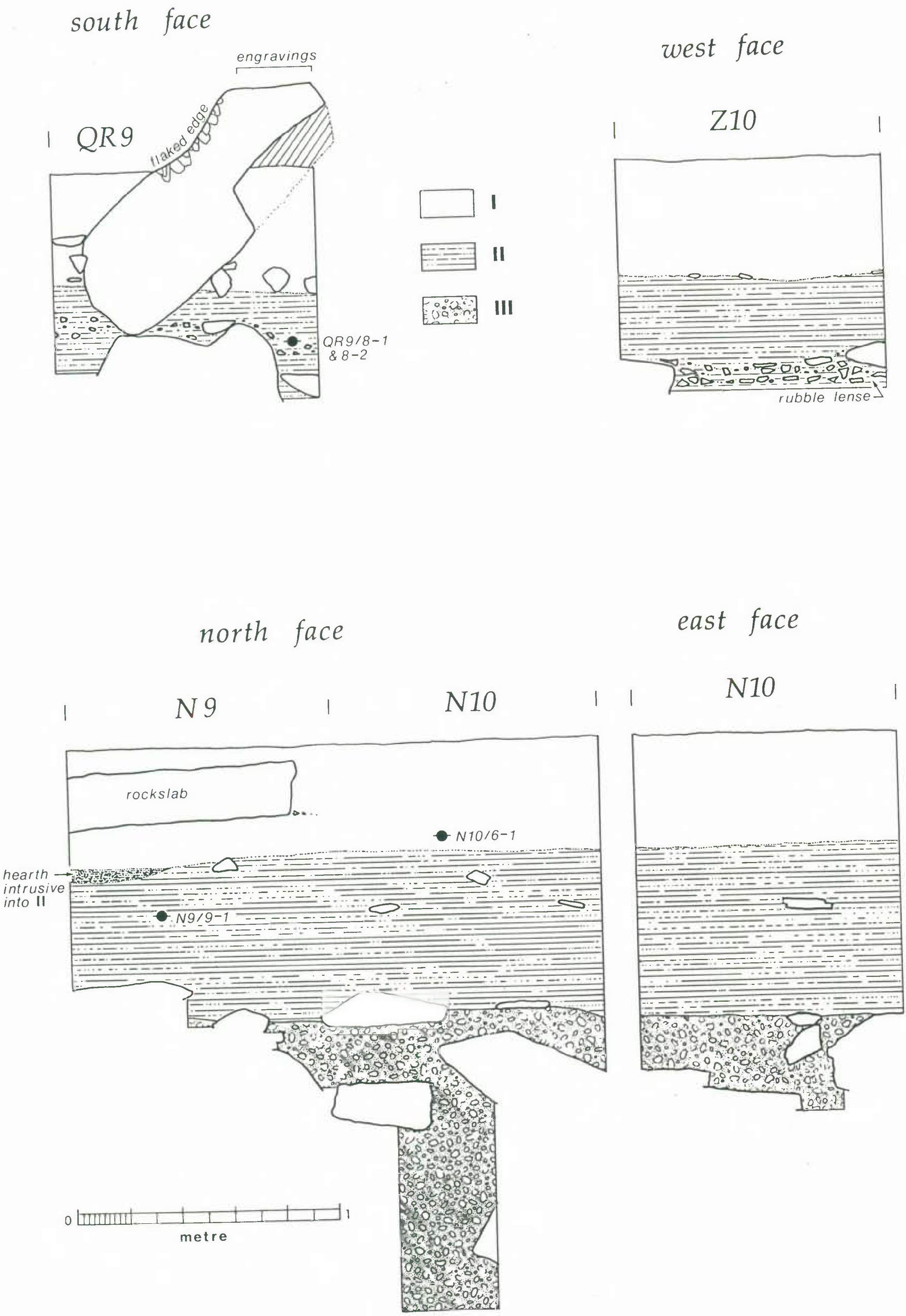
south face
engravings
QR9
flaked edge
QR9/8-1
& 8-2
I
II
III
west face
Z10
rubble lense
north face
N9
N10
rockslab
N10/6-1
hearth
intrusive
into II
N9/9-1
east face
N10
0
1
metre

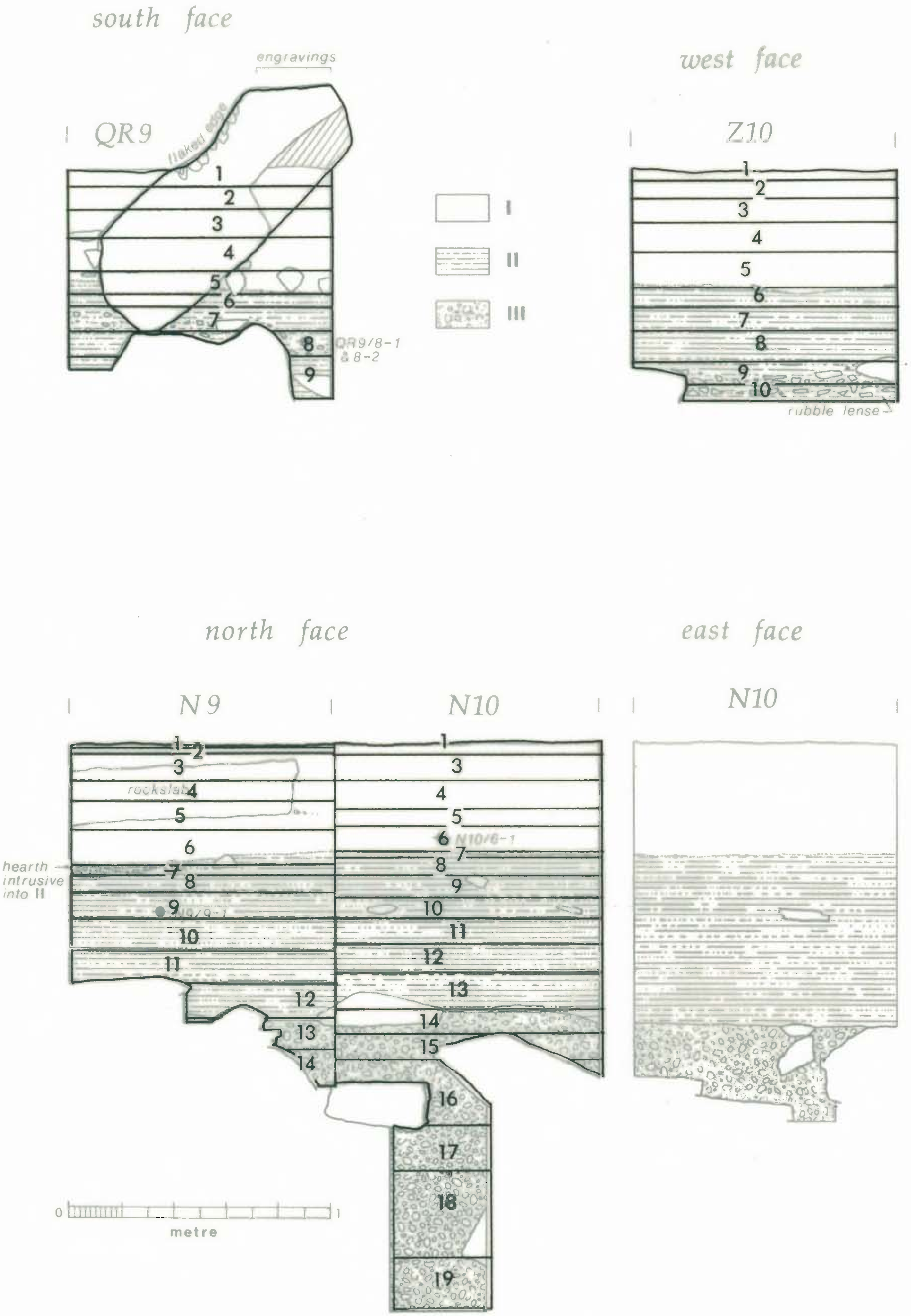
south face
engravings
QR9
flaked edge
QR9/8-1 & 8-2
west face
Z10
rubble lense
I
II
III
north face
N9
N10
rockslab
hearth intrusive into II
N9/9-1
N10/6-1
east face
N10
0
1
metre

Table 4.1 : Composition of the deposits. The terms rocks and rubble are defined in chapter 3. The 3mm sieve residue can be included as a measure of the proportion of sandstone grit as bone is absent and lithics rare. Depths are in cm below datum.

unit	mean depth cm.	sediment gross wt unit kg.	rocks no.	rocks wt. kg.	rocks %	rubble wt. kg.	rubble %	3mm residue wt. kg.	3mm residue %
N9:layer I									
1	39	19.8	5	1.6	8.1	3.60	18.2	0.4	2.0
2	41	37.9	2	0.6	1.6	5.10	13.5	0.9	2.4
3	47	118.6	14	1.1	0.9	10.60	8.9	2.6	2.2
4	58	137.1	50	13.7	10.0	13.30	9.7	2.1	1.5
5	68	154.7	67	15.2	9.8	23.30	15.1	3.1	2.0
6	80	204.2	162	22.8	11.2	25.30	12.4	2.6	1.3
N9:layer II									
7	88	35.4	26	2.6	7.3	1.60	4.5	1.0	2.8
8	92	61.1	51	7.1	11.6	2.60	4.3	0.4	0.7
9	100	180.5	129	22.2	12.3	16.80	9.3	0.4	0.2
10	113	131.7	17	6.1	4.6	4.60	3.5	0.7	0.5
11	125	85.9	8	3.6	4.2	1.60	1.9	0.2	0.2
12	138	100.0	35	16.7	16.7	3.10	3.1	0.3	0.3
N9:layer III									
13	150	39.0	30	12.7	32.6	0.60	1.5	-	-
14	162	116.9	173	43.4	37.1	5.60	4.8	0.1	0.1
N10:layer I									
1	42	58.4	16	1.6	2.7	7.60	13.0	1.6	2.7
2	48	10.1			-	0.82	8.1	0.4	4.0
3	48	101.8	6	0.6	0.6	5.10	5.0	2.6	2.6
4	58	148.1	11	0.6	0.4	10.20	6.9	4.6	3.1
5	68	124.4	23	4.1	3.3	11.70	9.4	3.6	2.9
6	77	125.5	24	6.6	5.3	12.80	10.2	4.6	3.7
N10:layer II									
7	83	30.3	13	1.6	5.3	2.60	8.6	0.9	3.0
8	88	102.9	52	11.6	11.3	7.60	7.4	1.2	1.2
9	95	107.9	79	7.6	7.0	10.50	9.7	1.3	1.2
10	103	113.4	38	10.6	9.3	6.60	5.8	0.9	0.8
11	112	141.7	75	8.6	6.1	4.69	3.3	1.1	0.8
12	123	149.4	14	2.1	1.4	3.10	2.1	0.4	0.3
13	135	163.8	68	43.8	26.7	4.60	2.8	0.2	0.1
N10:layer III									
14	146	124.1	106	30.8	24.8	11.20	9.0	0.3	0.2
15	155	89.7	280	45.6	50.8	2.60	2.9	0.2	0.2
16	172	154.1	492	124.2	80.6	22.40	14.5	0.2	0.1
17	194	151.2	248	95.0	62.8	27.90	18.5	1.4	0.9
18	220	148.1	163	34.8	23.5	20.20	13.6	3.6	2.4
19	244	50.9	106	19.2	37.7	13.10	25.7	0.6	1.2

Table 4.1 : (continued from page 105).

unit	mean depth cm.	sediment gross wt unit kg.	rocks no.	rocks wt. kg.	rocks %	rubble wt. kg.	rubble %	3mm residue wt. kg.	3mm residue %
Z10:layer I									
1	30	31.3	0			3.60	11.5	2.4	7.7
2	35	109.4	20	1.1	1.0	8.50	7.8	5.3	4.8
3	43	150.1	0			14.60	9.7	4.3	2.9
4	53	133.5	0			16.39	12.3	5.9	4.4
5	65	188.3	16	7.1	3.8	27.64	14.7	8.6	4.6
Z10:layer II									
6	76	118.9	44	9.6	8.1	18.52	15.6	3.8	3.2
7	85	119.4	50	7.1	5.9	14.78	12.4	2.9	2.4
8	95	127.5	44	5.1	4.0	13.70	10.7	2.1	1.6
9	106	101.2	53	20.7	20.5	11.60	11.5	1.4	1.4
10	114	71.5	111	31.9	44.6	14.20	19.9	0.3	0.4
QR9:layer I									
1	38	68.0	39	4.1	6.0	12.51	18.4	1.4	2.1
2	46	93.7	33	3.6	3.8	7.60	8.1	1.8	1.9
3	57	125.9	23	NA	NA	14.20	11.3	2.9	2.3
4	68	123.4	73	5.6	4.5	16.50	13.4	2.0	1.6
5	77	97.3	100	8.6	8.8	10.63	10.9	1.4	1.4
QR9:layer II									
6	84	33.3	20	2.6	7.8	3.60	10.8	0.3	0.9
7	91	72.1	57	5.6	7.8	7.20	10.0	NA	NA
8	100	40.3	27	2.6	6.5	3.49	8.7	0.9	2.2
9	111	27.8	8	1.6	5.8	0.60	2.2	0.4	1.4

Table 4.2 : Summary of the differences between layers in Pits N9 and N10.

layer	mean individual wt. rocks	% rocks	% rubble	% 3mm residue
I	180.3 g	5.5	10.4	2.3
II	238.3 g	10.3	5.0	0.6
III	253.9 g	46.4	11.9	0.7

deposits are shallow they have excellent stratigraphic integrity. For the Holocene deposits this is expressed in a correlation coefficient of 0.995 for the depth and age of the four radiocarbon samples.

The radiocarbon chronology shows that layer I began to accumulate between 6000-7000 yrs BP and continued into the ethnohistoric period. Layer II appears to have begun to accumulate well before 25,000 yrs BP - perhaps as early as 35,000 yrs BP - and to have ceased shortly after 7000 yrs BP. Layer III is undated but must be of considerable antiquity.

In this chronological framework I have discounted Beta-18884 as too young. At even one standard deviation it substantially overlaps the stratigraphically younger sample Beta-19901. The arithmetic difference between the age of these two samples is less than the combined error indicating that there is no significant difference between their ages. Beta-19901 (21,950+/-270) is clearly the more reliable of the two as it has a smaller statistical error and is on a relatively large (10 g) sample of charcoal with a narrower vertical spread. In retrospect it is possible that Beta-18884 (22,440+/-1370) represents some contamination during excavation of the lower part of layer II by a few grams of charcoal from the relatively charcoal rich sediment encountered in N10/11.

The rate at which sediment accumulated at _Puritjarra_ was substantially lower than at other Central Australian sites. For

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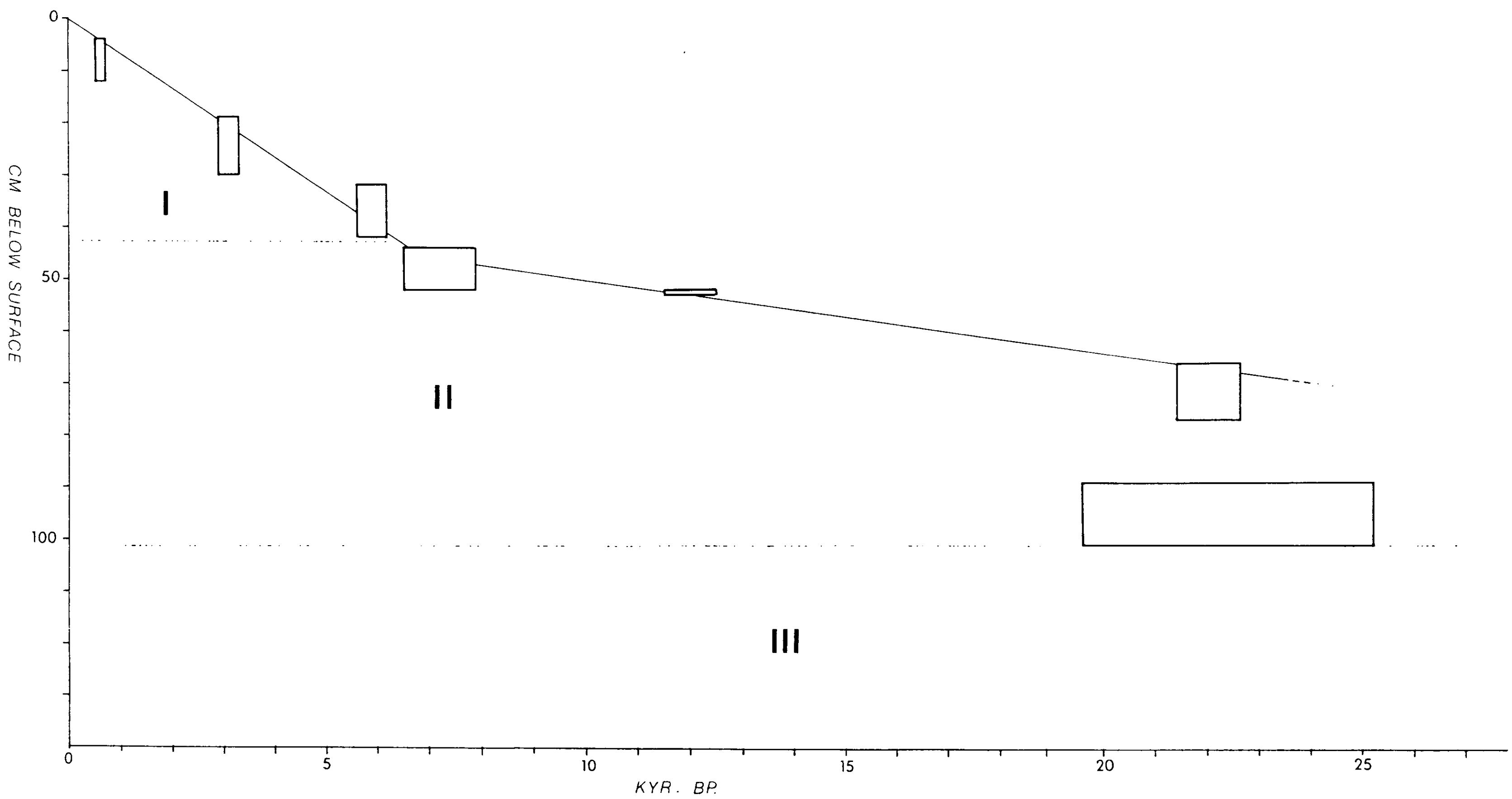
Overleaf **Figure 4.6 :** Age/depth graph for radiocarbon dates from _Puritjarra_ rockshelter. The size of the box reflects the "envelope of uncertainty" derived from the statistical error attached to the dates (at two standard deviations) and the vertical spread of the sample.



CM BELOW SURFACE
0
50
100
KYR. BP.
0
5
10
15
20
25
I
II
III

Table 4.3 : Radiocarbon dates from Puritjarra. Depths are cm below datum. Figures in brackets give depths below surface.

layer	unit	depth cm.		lab. no.	yrs. BP.
Ia	N10/3	44-52	(4-12)	Beta-21273	570+/-50
Ib	Z10/4	48-58	(20-30)	Beta-21274	3120+/-100
Ib	N10/6	72-82	(32-42)	Beta 18882	5860+/-150
II	Z10/6	72-80	(44-52)	Beta-21275	7170+/-340
II	N10/9	93	(53)	Beta 18883	12020+/-240
II	N10/11	106-117	(66-77)	Beta 19901	21950+/-270
II	N10/13	129-141	(89-101)	Beta 18884	22440+/-1370

Table 4.4 : Comparative density of chipped stone artefacts in layers I-III, in Pits N9 and N10. Layer I has been subdivided into a) the upper 10-14 cms, representing the period after about 600 yrs BP and b) levels dating between 600-6500 yrs BP. Layer II has been divided into a) the upper half containing artefacts, dating between 22,000-6500 yrs BP and b) the lower half which is sterile. The figures are for artefacts from the 6mm sieve only.

				estimates		
layer	volume m^3	no.	total wt.g.	no./m^3	no./kyr	no/m^3/kyr
Ia	0.26	1252	1981.8	4815	2087	8025
Ib	0.64	860	2888.9	1344	146	228
IIa	0.55	92	2575.2	167	6	11
IIb	0.49	-	-	0	0	0
III	0.55	-	-	0	0	0

instance, Beta-18882 shows that layer I built up at about 6mm/100yr, compared with rates of 50-100mm/100yr at other excavated sites (see chapters 5-9). The rate of accumulation of layer II was lower still, at about 2mm/100yr. A possible explanation for these low rates is that the particular orientation and morphology of the site has created dead ground inside the shelter where breezes rarely reach. This has excluded the aeolian sand normally deposited by the strong winds from the southeast or west. Instead this sand has formed a low mound, up to 80 cm high, at the mouth of the shelter.

On present evidence the sediment inside the shelter is mainly derived from the slow weathering of the rockshelter walls. The differences in texture and colour between the layers presumably reflect changes in the conditions under which this took place and the degree of oxidation of the older deposits.

Charcoal.

Charcoal is well preserved in the stratigraphic sequence, albeit in small hard pieces scattered throughout each excavation unit. Table 4.5 shows the concentration of charcoal throughout the deposit. A good correlation with peak artefact densities is evident, suggesting that much of the charcoal is the product of human activities. N10/2, which shows a high concentration in table 4.5 is a hearth dug into the surface of unit 3. Other features warranting mention are the peak densities for the top 10-14 cm of layer I, and the minor peak in N10/11 and N9/9-N9/10 which heralds first use of the shelter. The presence of a peak in charcoal density associated with first use of the shelter is significant because it strengthens the argument that the dated charcoal sample is contemporary with the initial occupation. This is an important point given the the low rate of deposition postulated for layer II.

Chipped stone artefacts.

The antiquity of the assemblage from layer II raises the question of whether the intensity of occupation during such ancient periods can be measured using the same parameters as for the Holocene ? For example, the intensity of occupation would be underestimated if both maintenance and extractive artefacts were of wood or shell. Admittedly this is unlikely given the constraints of a desert environment. However, as outlined in chapter 3, changes in the processes of manufacturing chipped stone artefacts - in type of raw material, in the availability of raw material or in flaking techniques - could produce major changes in per capita rate of discard. The analysis presented below leads me to conclude that in this case such factors do not substantially alter the overall pattern of changes in site use.

density

The distribution of chipped stone artefacts, by layer and by unit, is shown in tables 4.4 and 4.5 and graphically in figure 4.7. In all four pits the highest concentration of artefacts and debitage is in the top 10-14 cms of layer I. This represents a sharp increase in use of the site from about 600 yrs BP. In this pattern, Puritjarra registers a widespread regional change, one that is better reflected in the more detailed late Holocene sequences from other Central Australian sites (see chapters 5-9).

In layer II the density of artefacts is lower than in any part of the overlying layer (table 4.4). In figure 4.7 I have plotted both weight/kg. and number/kg. as measures of site use. A comparison of the two curves will show that the former does not give an accurate reflection of the changes because the average weight of artefacts is significantly higher in layer II. Initial use of the shelter is recorded in N10/11 associated with a radiocarbon date of 21,950+/-270 yrs BP. Use of the shelter increased slightly around 12,000 yrs BP. but the scale and timing of this increase is not consistent between the four pits. Nor is it reflected in the curve for charcoal density. Therefore there is no reliable evidence to suggest increased use of the shelter during the early Holocene - a time when I would have expected, from palaeoenvironmental reconstructions, an increase in local population levels.

The pattern is further emphasised if the figures for artefact density are recalculated as numbers of artefacts discarded per millennium (see table 4.4). For the period 600-6500 yrs BP the discard rate is about 20 times greater than that during the Pleistocene. The late Holocene records a further increase, by a factor of about 30. However, given the small percentage of the site excavated, these figures give only a relative trend not absolute rates of discard.

The distribution of small flakelets in the 3mm sieve fraction, the fine debitage from knapping, confirms the pattern observed for the larger artefacts (see table 4.6). I have

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Overleaf **Figure 4.7 :** Puritjarra, Pits N9, N10 and QR9. Graphs showing the distribution of chipped stone artefacts in g. per kg. of sediment and in number of artefacts per kg. sediment; and of charcoal expressed in g. per 10kg. of sediment. For QR9 the values for artefacts in g./kg. have been omitted for layer II as they could not be plotted at this scale. Depths are in cm below zero datum.

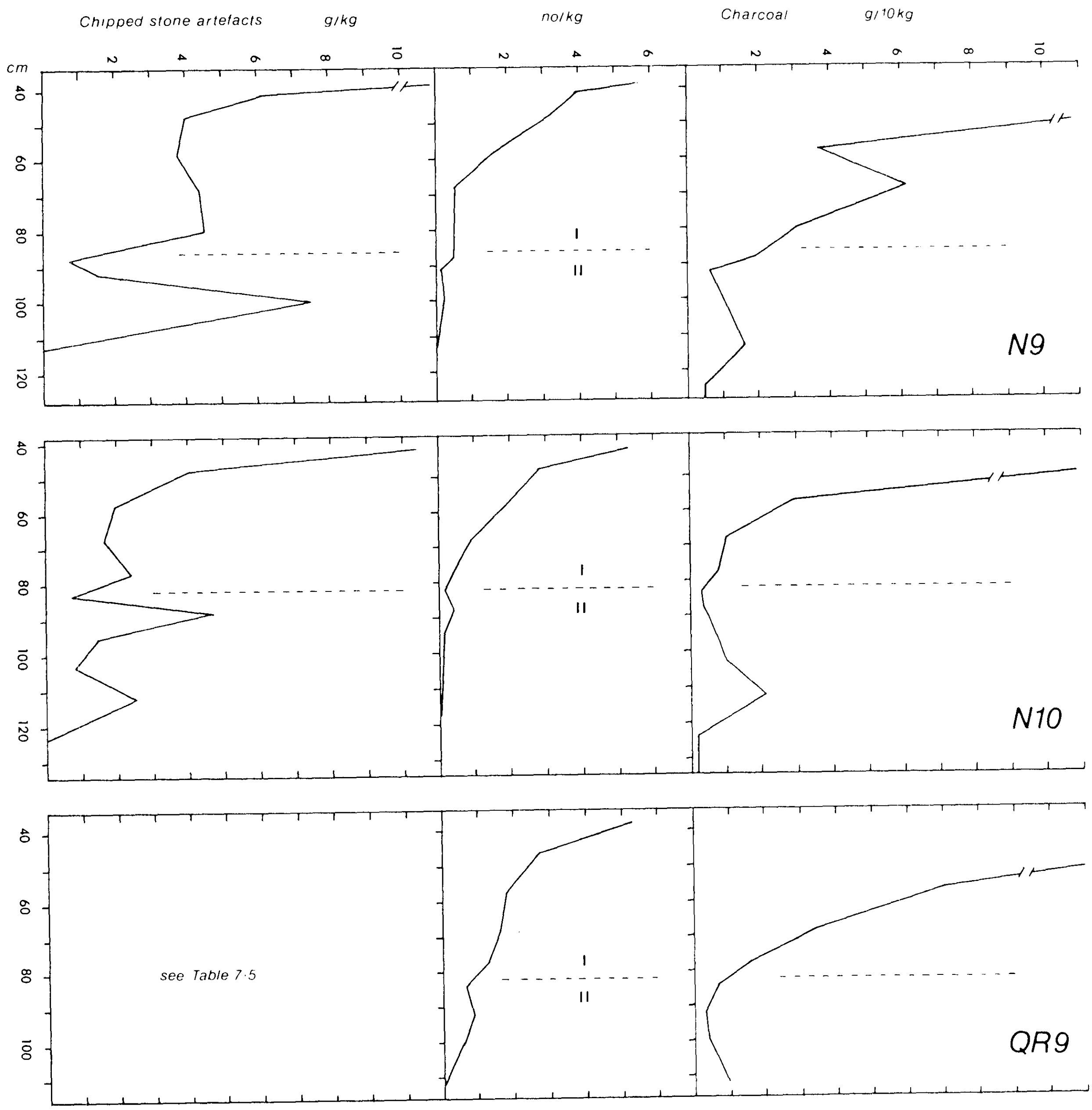
Chipped stone artefacts g/kg
no/kg
Charcoal g/10kg
cm
N9
N10
QR9
see Table 7·5
I
II

Table 4.5 : Distribution of stone artefacts (6mm fraction) and charcoal.

		chipped stone artefacts					grindstones		charcoal	
unit	mean depth cm.	no.	wt. g.	wt. g/kg. sediment	no/kg.	mean wt. g.	no.	wt. g.	wt. g.	wt. g/10kg. sediment
N9:layer I										
1	39	112	220.2	11.1	5.7	2.0	1	41.3	204.3	103.2
2	41	146	232.8	6.1	3.9	1.6	1	11.8	345.3	91.1
3	47	378	476.7	4.0	3.2	1.3			309.4	26.1
4	58	216	518.6	3.8	1.6	2.4	2	995.5	50.9	3.7
5	68	77	677.7	4.4	0.5	8.8			95.3	6.2
6	80	97	912.2	4.5	0.5	9.4			62.7	3.1
N9:layer II										
7	88	19	24.7	0.7	0.5	1.3			7.0	2.0
8	92	3	92.2	1.5	-	30.7			3.5	0.6
9	100	18	1359.0	7.5	0.1	75.5			17.7	1.0
10	113								21.2	1.6
11	125								4.1	0.5
12	138								5.4	0.5
N9:layer III										
13	150								0.2	0.1
14	162								0.1	-
N10:layer I										
1	42	300	606.6	10.4	5.1	2.0	3	381.9	403.8	69.1
2	48	26	41.3	4.1	2.6	1.6			431.6	427.3
3	48	290	404.2	4.0	2.8	1.4			138.7	13.6
4	58	281	280.7	1.9	1.9	1.0	1	181.0	42.8	2.9
5	68	139	203.7	1.6	0.9	1.5	1	5000.0	12.2	1.0
6	77	50	297.0	2.4	0.4	5.9			9.9	0.8
N10:layer II										
7	83	11	21.4	0.7	0.1	1.9			1.0	0.3
8	88	13	481.3	4.7	0.4	37.0			4.3	0.4
9	95	13	150.5	1.4	0.1	11.6			7.5	0.7
10	103	10	88.6	0.8	0.1	8.9			10.9	1.0
11	112	5	357.5	2.5	-	71.5			29.8	2.1
12	123								2.2	0.2
13	135								3.3	0.2
N10:layer III										
14	146								0.9	0.1
15	155								0.2	-
16	172								0.1	-
17	194								0.3	-
18	220								0.1	-
19	244								-	-

Table 4.5 : (continued from page 112).

		chipped stone artefacts					grindstones		charcoal	
unit	mean depth cm.	no.	wt. g.	wt. g/kg. sediment	no/kg.	mean wt. g.	no.	wt. g.	wt. g.	wt. g/10kg. sediment
Z10:layer I										
1	30	148	249.6	8.0	4.7	1.7	1	38.9	96.2	30.7
2	35	362	549.3	5.0	3.3	1.5			69.2	6.3
3	43	238	226.9	1.5	1.6	1.0			9.9	0.7
4	53	271	391.4	2.9	2.0	1.4			6.5	0.5
5	65	145	264.0	1.4	0.8	1.8			4.5	0.2
Z10:layer II										
6	76	33	136.7	1.4	0.3	4.1			2.3	0.2
7	85	62	253.3	2.1	0.5	4.1			0.1	-
8	95	283	722.3	5.7	2.2	2.6			0.1	-
9	106	15	28.2	0.3	0.1	1.9			0.1	-
10	114	2	353.4	4.9	-	176.7			0.1	-
QR9:layer I										
1	38	362	1699.1	25.0	5.3	4.7	2	4163.8	314.3	46.2
2	46	249	1151.6	12.3	2.7	4.6	1	36.0	300.0	32.0
3	57	225	1220.0	9.7	1.8	5.4			88.7	7.0
4	68	203	520.5	4.2	1.6	2.7			43.6	3.5
5	77	130	577.8	5.9	1.3	4.4	2	205.2	15.3	1.6
QR9:layer II										
6	84	21	754.0	22.6	0.6	35.9			2.4	0.7
7	91	61	501.6	7.0	0.8	8.2			2.3	0.3
8	100	23	1599.6	39.7	0.6	69.5			1.8	0.4
9	111	1	0.7	-	-	0.7			2.5	0.9

Table 4.6 : Distribution of fine flaking debitage (3mm sieve fraction) in Pit N10. Depths are in cm below datum.

unit	mean depth cm.	wt. sample g.	% of total 3 mm.	fine lithic debitage wt. g.	no.	mean wt. g.	estimated total no/kg.
1	42	1136	71	11.9	204	.058	4.9
2	48	345	100	2.6	45	.058	4.5
3	48	929	36	10.0	164	.061	4.5
4	58	1316	29	12.1	215	.056	5.1
5	68	1295	36	5.2	92	.057	2.1
6	77	1337	29	3.5	65	.054	1.8
7	83	856	100	2.5	38	.066	1.3
8	88	1153	100	1.3	20	.065	0.2
9	95	1226	100	0.6	8	.075	0.1
10	103	874	100	0.9	9	.100	0.1
11	112	860	78	0.5	10	.050	0.1
12	123	375	100	0.3	3	.100	-
13	135	224	100				
14	146	251	100				
15	155	161	100	0.1	1	.100	-
16	172	208	100				
17	194	1351	100				
18	220	1100	31				
19	244	589	100				

discounted a single flakelet from layer III, from N10/15, which could possibly have been introduced to this otherwise sterile layer during excavation. The lowest unit with significant numbers of flakelets is N10/11. The three flakelets from N10/12 may have come from the top of the unit and therefore do not necessarily provide evidence of occupation below unit 11. However, their presence does confirm that artefacts are distributed throughout the full depth of N10/11 - an important point given that the unit could span some 5,000 yrs if my estimates of the rate of deposition are correct.

raw material

The dominant raw materials in this assemblage are a fine-grained silcrete and a poorly silicified sandstone. Both are widely available in the region. The silicified sandstone occurs as a low quality silcrete on the top of the escarpment. Its ability to keep an edge ~~are~~ is poor. Its flaking properties depend upon its freshness and weathered material does not have a good conchoidal fracture. The silcrete varies from light grey, semi-translucent, high-quality material grading into material which is impossible to consistently distinguish from the silicified sandstone. Weathering of the artefacts in layer II has added further problems. Thus in table 4.7 I have lumped silcrete and silicified sandstone together.

Chert and chalcedony are important components of this assemblage. The presence of several artefacts in which the white chert occurs as a rind around the chalcedony shows that these materials derive from the same source. This white chert forms the bulk of the chert together with very small amounts of red chert, grey/green chert and banded chert. The sources of these raw materials are not known though chert and chalcedony are potentially available in the Inindia beds 40-50 km southeast of Puritjarra.

The remainder of the assemblage is made up of an ironstone, listed as 'other' in table 4.7.

Table 4.7 shows that although the proportions of chert/chalcedony and silcrete/silicified sandstone fluctuate throughout the deposit there is no obvious chronological trend. Nor can the changes be correlated with changes in site use though one might expect that greater use of the local stone would have occurred during periods of intensive occupation. An analysis using narrower categories of raw material will be required to plot these changes in more detail. Although chert and chalcedony are absent from N10/11 it should be noted that many of the fine flakelets in this excavation unit are of these materials. Table 4.7 presents data from Pit N10 but a rough sort of artefacts from the other pits confirms that no obvious trend in the use of these raw materials exists.

size

The mean weight of chipped stone artefacts in each unit, calculated for all artefacts regardless of whether a flake, core chunk or flake fragment, is given in table 4.5. The difference in size between layer I and II is striking but is strongly influenced by two factors; a) the large amount of fine debitage in layer I and b) the small number of artefacts from layer II. The effect of these is to over emphasise the effect of a few large artefacts upon values for mean weight in layer II. Thus the gross

Table 4.7 : The proportion of different raw materials, calculated as % weight, in each excavation unit for Pit N10. (6mm sieve fraction only). N10/2 is a discrete hearth and has been omitted.

unit	chert/chalcedony	silcrete/silicified sandstone	other
1	18.1	78.4	3.5
3	17.5	78.7	3.8
4	37.6	55.9	6.4
5	26.4	70.6	3.0
6	7.4	87.8	4.8
7	14.7	83.9	1.4
8	5.6	93.9	0.4
9	11.7	88.3	-
10	34.4	65.6	-
11	-	100.0	-

differences in size are partly a product of more knapping in the shelter during the accumulation of layer I. This is not the sole explanation for the differences in mean weight as several of the artefacts in layer II fall well outside the size range of layer I artefacts.

The pattern is repeated if the analysis is restricted to cores or to amorphous retouched artefacts (tables 4.8 and 4.9). I have included the latter because changes in the mean weight of "scrapers" have been identified in other studies (eg. Mulvaney and Joyce 1965). As table 4.10 shows the trend is also independent of the type of raw material.

manufacture

To establish whether the changes in size between layers I and II amount to a shift towards producing smaller artefacts, or whether they are simply a reflection of greater reduction of cores and more re-sharpening of implements, it is necessary to briefly examine the processes of manufacture.

cores: The 1986 excavation recovered 45 cores (see table 4.12). These can be divided into four basic groups. Firstly, there are cores with unidirectional flaking from a striking platform. These range from lightly used single-platform cores, with less than 5 flake scars (11), to more extensively flaked single-platform cores (17), to multi-platform cores (4) in which a core has been rotated after the original platform has given problems. Secondly, there are discoidal, or bifacial, cores (6) in which flakes have been removed from alternate faces using one edge as a platform. Ultimately this method produces a disc-shaped core with a sinuous edge. In this assemblage only one core has reached this stage. The

Table 4.8 : Mean weight of cores in g. Figures in brackets give the number of cores in the sample. One incomplete core has been omitted from layer Ia in N9.

Pit	N9	N10	QR9	Z10
layer Ia	9.3 (2)	8.2 (1)	82.0 (10)	-
layer Ib	90.3 (8)	89.5 (2)	52.3 (3)	6.4 (3)
layer II	239.6 (5)	192.7 (3)	270.2 (3)	117.2 (4)

Table 4.9 : Mean weight of amorphous retouched artefacts in g. Figures in brackets give the number of artefacts in the sample.

Pit	N9	N10	QR9	Z10
layer Ia	6.9 (21)	8.0 (6)	37.7 (16)	14.1 (8)
layer Ib	18.2 (13)	8.0 (9)	10.8 (1)	8.0 (10)
layer II	17.0 (1)	75.5 (2)	691.7 (2)	104.1 (4)

Table 4.10 : Mean weight of artefacts in g. in Pit N10, comparing the different raw materials.

Raw material	chert/chalcedony	silcrete/silicified sandstone
layer Ia	0.7	2.3
layer Ib	1.1	3.5
layer II	15.3	24.0

remainder have less than 5 flake scars. Thirdly, there are amorphous cores (5) which have numerous flake scars but no discrete striking platforms. None of these three groups is restricted to any particular time period. The fourth group comprises cores which reflect special techniques with some chronological significance. There are only two of these in this assemblage; a bipolar core from N10/3, and a small blade core from N9/9 in levels dating between 12,000 - 22,000 yrs BP.

Table 4.11 shows the differences between layer I and II in various attributes chosen to give some indication of the extent to which cores have been flaked. It also gives the average maximum length of flake scars[1] for the cores from both layers. These measures are crude but show some interesting results. Firstly, although the cores in layer II are larger they have not produced substantially larger flakes. Secondly, most of the cores from layer II are only lightly flaked. Thirdly, the proportion of cores with a) more than one platform, b) a platform reduced by heavy step flaking or c) with a platform/core face angle of 90° or more, suggests that the layer I cores are more intensively utilised.

The form of the cores from layer II is strongly influenced by their raw material. All but one are silcrete or silicified sandstone. Large size and casual flaking are characteristics of this material irrespective of layer. For instance, compare the mean weights given in table 4.8 with the following figures for cores of silicified sandstone from layer I : N9/113.3g; N10/165.6g; QR9/96.3g. The presence of fine debitage of chert and

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1. this is the maximum length of flake that has been struck from a particular platform. The average value for each layer is calculated as the sum of these lengths divided by the number of platforms in the sample.

Table 4.11 : Selected core attributes. All Pits.

	layer I n=30	layer II n=15
no. cores with <5 flake scars	15 (50%)	11 (73%)
no. cores with >1 platform	3 (10%)	1 (7%)
no. cores with platform angle of 90° or more	3 (10%)	3 (20%)
no. of cores with platform area reduced by heavy step-flaking.	6 (20%)	1 (7%)
average maximum L (mm) of flake scars.	24	28

chalcedony, and of a single core of chalcedony, shows that these materials were also flaked on the site and suggests that the rarity of such cores is a product of a small sample skewed in favour of the most common raw materials.

The most remarkable of the Pleistocene cores, N9/9-2 (see fig. 4.8), is a small blade core of high quality silcrete, weighing 30.2 g. The platform on this core has been prepared by flaking, and the removal of flakes has extended around the circumference of the core. A series of small stacked scars around part of the platform show that the overhang has been removed to facilitate knapping. The scars from the removal of blades show that these ranged from 22-25 mm in length with length/breadth ratios from 2.2-2.8. The presence of such a diminutive core, in striking contrast to the other specimens, serves to add emphasis to my comments about the small sample size from layer II.

flakes: I have not attempted an analysis of flake size or shape as the sample from layer II is too small to permit a comparison between layers. Similarly, flakes with attributes reflecting core preparation, core maintenance or core rotation - such as true blades, redirecting flakes, flakes with extensive stacked overhang removal scars and flakes with dorsal scars deriving from older platforms - are too few to permit a quantitative analysis. However, some qualitative observations about the flakes from layer II will serve to round out the description of the assemblage.

Firstly, from N10/8 and N10/11 there are two small elongate flakes of high quality silcrete with length/breadth ratios of 1.6. Both have parallel margins and twin parallel dorsal ridges showing that they are the product of cores similar to the blade core from N9/9. Their respective weights and lengths are 2.1g and 2.8g, and 29mm and 33mm - dimensions comparable with the blade core.

Secondly, there are five large flakes of silcrete or silicified-sandstone, 3 from N10/8 and 1 each from N9/9 and N10/10. These range from 44-65 mm in length and from 18-85 g. in weight and have length/breadth ratios of around 1.1. All have been struck from well established cores as they each have several scars from earlier flake removals on the dorsal surface and none have any cortex. Four of the five have dorsal hinging and stepping around the platform. One has several flake scars on the platform. Another has dorsal scars which derive from an earlier platform. The significance of these artefacts is that they indicate the deliberate production of large flakes - an aspect of the industry not recorded by any of the cores recovered in the 1986 excavation. There are no comparable flakes from layer I, where similar sized flakes of these materials appear to be either de-cortication flakes or to have been struck off blocks of stone without much preparation.

typology

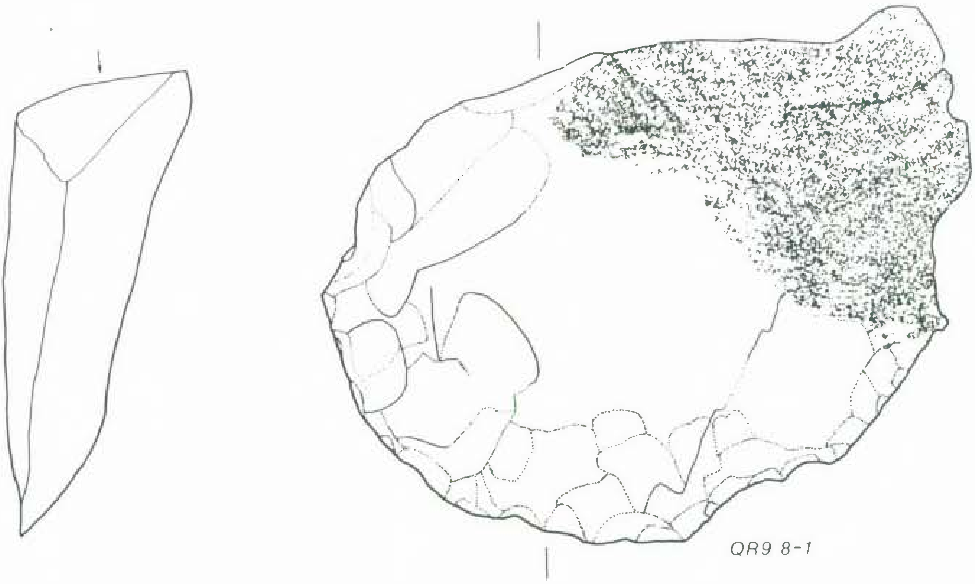
Tables 4.12 and 4.13 show the distribution of retouched artefacts.

backed blades: The earliest of the backed blades in this assemblage is from N10/4. This gives an estimated age of between 2000 and 4000 yrs BP for the appearance of these artefacts at *Puritjarra*. The specimens from this site appear to have been made on segments of blades. The process is illustrated by QR9/2-1 (see fig. 3.7) which is a blade with backing along the distal end. Any fine grained or cryptocrystalline material seems to have been suitable for manufacturing these artefacts. Two specimens, QR9/2-1 and N9/3-4, are made on types of chert not otherwise present in either the assemblage or in the fine debitage suggesting that they have been brought into the shelter as finished artefacts. Another specimen, N9/3-3, is a silcrete backed blade with usewear along the chord, akin to the use-polished flakes present in the assemblages at Intirtekwerle (chapter 7) and Therreyererte (chapter 9).

tula adzes: The earliest tula adze is also in a level estimated to date to between 2000 and 3000 yrs BP. As with backed blades, these artefacts are most common in levels after 600 yrs BP, corresponding with the most intensive occupation at Puritjarra. Five of the tulas are worn down to the slug form and are made on chert. The exception, from Z10/2, appears to have been discarded without registering much use and it is significant that this is one of the few examples in any Central Australian assemblage made on silcrete.

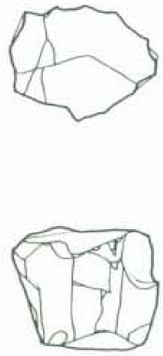
retouched artefacts from Pleistocene levels: Three large flake implements from the Pleistocene levels of layer II warrant mention (fig.4.8). The first, N10/9-1, is a large flake implement with a serrated edge, made on silicified sandstone. QR9/8-1 is a very large flake of silicified sandstone, weighing 547.0 g, with shallow invasive retouch to create a smooth curved edge. QR9/8-2 is another large flake of the same material, weighing 835.9 g, with a short length of steep retouch.

Overleaf **Figure 4.8 :** A small blade core and three large flake implements from the Pleistocene levels of layer II, Puritjarra.

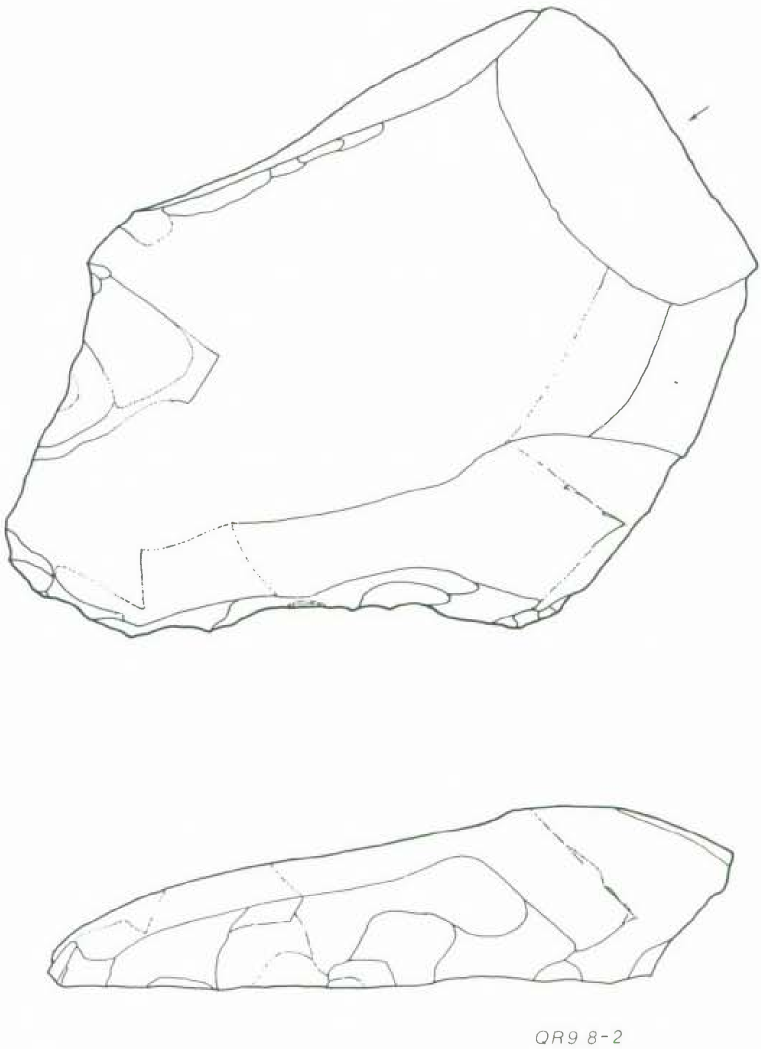


QR9 8-1

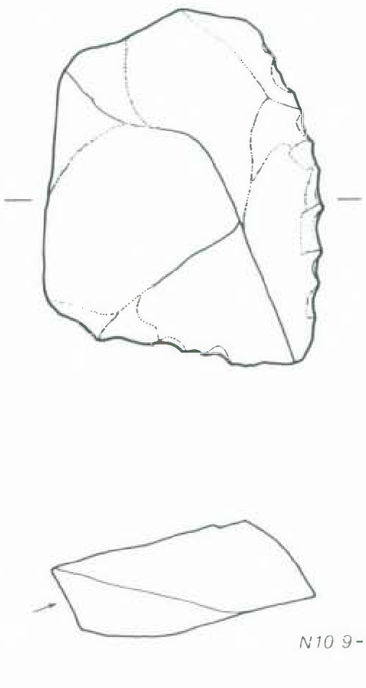
cm



N9 9-2



QR9 8-2



N10 9-1

Table 4.12 : Distribution of retouched artefacts, cores and redirecting flakes by excavation unit.

unit	backed blades	tula adzes	endscrapers	amorphous retouched	cores	redirecting flakes
N9:layer I						
1	–	1	–	6	–	–
2	1	1	1	5	–	–
3	5	2	–	10	3	–
4	–	–	–	5	3	1
5	–	–	–	1	3	2
6	–	–	–	7	2	4
N9:layer II						
7	–	–	–	–	–	–
8	–	–	–	–	1	–
9	–	–	–	1	4	–
N10:layer I						
1	–	–	–	4	–	1
2	–	–	–	–	–	–
3	1	–	–	2	1	–
4	1	–	–	3	–	–
5	–	–	–	5	–	–
6	–	–	–	1	2	1
N10:layer II						
7	–	–	–	–	–	–
8	–	–	–	1	2	–
9	–	–	–	1	–	–
10	–	–	–	–	–	1
11	–	–	–	–	1	–
QR9:layer I						
1	–	–	–	6	6	1
2	1	–	–	3	3	–
3	1	–	–	7	1	–
4	–	–	–	1	1	–
5	–	–	–	–	2	–
QR9:layer II						
6	–	–	–	–	1	–
7	–	–	–	–	1	–
8	–	–	–	2	1	–
9	–	–	–	–	–	–

Table 4.12 : (Continued from page 125).

unit	backed blades	tula adzes	endscrapers	amorphous retouched	cores	redirecting flakes
Z10:layer I						
1	1	-	-	2	-	-
2	-	1	-	6	-	-
3	-	1	-	4	2	-
4	-	-	-	3	1	-
5	-	-	1	3	-	-
Z10:layer II						
6	-	-	-	-	1	-
7	-	-	-	2	2	-
8	-	-	-	1	1	-
9	-	-	-	-	-	-
10	-	-	-	1	-	-

Table 4.13 : Distribution of retouched artefacts, cores and redirecting flakes by layer. All pits.

layer	backed blades	tula adzes	end-scrapers	amorphous retouched	cores	redirecting flakes
Ia	10	5	1	51	14	2
Ib	1	1	1	33	16	8
II	-	-	-	9	15	1

Grindstones.

The sandy surface of the shelter is littered with grindstones. A rough tally showed that seedgrinding implements were represented by at least nine faceted mullers. Several other grindstones - amorphous slabs used to grind up pigment - were also present. The excavation recovered 15 grindstone fragments. Of these only three, all from the uppermost excavation unit, are positively identifiable as seedgrinding implements. The distribution (table 4.14) also shows that most grindstones are from layer Ia. None were recovered from layer II.

Other occupation debris.

Only small amounts of bone, egg-shell and ochre are present in this deposit. Table 4.15 shows the distribution of these materials. Whereas the bone and egg-shell are concentrated in the main occupation level, most of the ochre comes from the underlying levels.

The poor preservation of bone can probably be attributed to two factors a) the acidity of the deposits, pH 3.5, and b) the very low rate of sediment accumulation. The few identifiable fragments are macropod teeth, from small, medium and large animals. Some of the egg-shell is burnt but where it is identifiable its distinctive texture indicates that it is emu egg-shell (*Dromaius novaehollandiae*).

The ochre is a hard, fine-textured pigment ranging from red to pink to purple in colour. A piece of yellow ochre was recovered from Z10/6. Not shown in table 4.15 is a tiny piece of fine red ochre, barely weighing 0.1g, found in the 3mm sieve residue from

Table 4.14 : Distribution of seedgrinding implements and other grindstones by excavation unit.

unit	millstone	faceted muller	amorphous artefact	undiagnostic fragment
N9/1	-	-	-	1
N9/2	-	-	-	1
N9/4	-	-	2	-
N10/1	-	1	2	-
N10/4	-	-	-	1
N10/5	-	-	-	1
QR9/1	1	1	-	-
QR9/2	-	-	-	1
QR9/5	-	-	-	2
Z10/1	-	-	-	1

Table 4.15 : Distribution of bone, egg-shell and ochre (6mm sieve only). All pits.

	bone.	egg-shell	ochre
layer Ia	6.5 g	2.8 g	3.2 g
layer Ib	3.8 g	0.4 g	16.7 g

N10/11, associated with the radiocarbon date of 21,950+/-270 yrs BP.

The only evidence of ground-edge artefacts on this site is a small flake of basalt preserving part of a ground surface. This was also recovered from the 3mm sieve residue, from N10/1.

The age of the engravings.

Pit QR9 was excavated primarily to establish the age of engravings at this site and was laid out next to a boulder bearing both pecked circles (patinated) and incised grooves (unpatinated). This is of considerable interest given that Puritjarra is the nearest excavation to the site of the famous Cleland hills engraved faces, often presumed to be of great antiquity. Unfortunately the results are equivocal. As figure 4.5 shows, the base of the engraved boulder extends into layer II where it rests upon other more deeply buried boulders. Therefore the rock has probably been in its present position throughout the span of human occupation. An age for the engravings of 20,000 years cannot be ruled out. However, as the engravings are restricted to the top of the boulder and as no engravings were uncovered on any of the buried surfaces it is likely that their age lies somewhere within the last 6,500 years - the time span of layer I.

THE CLELAND HILLS SEQUENCE

The Puritjarra sequence has obvious implications for the pattern and timing of human settlement in the arid zone and for the model put forward in chapter 2. These issues are more appropriately discussed in chapter 10. Here I will simply summarise the details of the sequence.

The age of the remarkable engraved faces at Alala in the Cleland hills has been a matter of considerable speculation, with claims of some antiquity supported by circumstantial evidence such as the general deterioration of the rock outcrops and the patination of the engravings. In this respect the discovery of Pleistocene occupation at Puritjarra is tantalizing for it demonstrates that the range was in fact occupied in the remote past.

The excavation at Puritjarra - the first to be carried out in the Cleland hills - has yielded a long but relatively compressed chronological sequence showing progressively more intensive use of the shelter. Initial occupation began at about 22,000 yrs BP, well before the last glacial maximum. During this early period occupation was sporadic and is represented by the deposition of only a few artefacts per millennium. Further work will be necessary to establish whether use of the shelter between 22,000 and 6500 yrs BP was essentially continuous or whether the artefacts cluster in two or three discrete occupation horizons. On present evidence the former seems most likely. After 6500 yrs BP the shelter was used more frequently. However, intensive occupation only appears to have occurred during the late Holocene, from about 600 yrs BP. This is reflected not only in an increase in chipped stone artefacts and charcoal densities but also in the concentration of grindstones, bone, and egg-shell in these levels. The overall impression is of stadial rather than gradual change as the contrast in the density of occupation debris between layers Ia and Ib, and between Ib and II is quite marked.

Changes in the chipped stone artefacts show a trend towards increasing stone working in the shelter and greater reduction of cores. However, there is also evidence to suggest that the Pleistocene assemblage reflects the production of larger flakes and implements than in the subsequent levels. The presence of a small blade core, and of blade-like flakes from a similar core, show that this early material should not be simply characterised as a large flake industry. In fact, although the assemblages are distinct none of the differences amount to a fundamental change in industry. This is not unexpected as many scholars have pointed to the long-term technological continuities in the manufacture of chipped stone artefacts (eg. Mulvaney and Joyce 1965; Morwood 1981; Flenniken and White 1985).

Backed blades and tula adzes, components of composite tools, first appear at Puritjarra between 2000 and 4000 yrs BP. The low rate of sediment accumulation does not allow a precise date to be placed on their appearance but this estimate is in line with dates for these artefacts from Ilarari (see chapter 6) and Kwerlpe (see chapter 7). I have not attempted to determine whether other technological changes accompany their appearance. The Puritjarra assemblage, with low artefact densities and a compressed stratigraphy, is far from an ideal test case. However, it is worth noting that the first appearance of these artefacts is independent of the changes in site use.

The directions that further work at Puritjarra should take are fairly clear. A high priority is analysis of the sediments to establish under what conditions layer II was deposited and to determine whether there are are sedimentary structures within layer II that can be correlated with the harsh conditions postulated for the last glacial maximum. The possibility that pollen, or phytoliths, in the sediments might provide data about local environmental trends requires investigation. Further excavation is also required to a) establish whether there are any artefacts in layer III, or any underlying deposits, b) to establish whether or not the artefacts in layer II are clustered in discrete horizons and c) to provide a larger sample of artefacts from the Pleistocene levels for analysis.