4. THE ARCHAEOLOGICAL RESOURCE OF THE KARLAMILYI (RUDALL RIVER) REGION

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1:0 INTRODUCTION

The submission is divided into four sections. The first section defines the boundaries of the study area and explains the significance of these boundaries. A definition for archaeological sites is presented and the notion that these sites comprise a cultural resource is introduced. The types of impact that can occur on archaeological sites through different land use practices is examined and the need for management strategies to mitigate this physical impact is noted. The significance of archaeological sites to Martujarra, and to the broader community, is examined as is the scientific significance of these sites. Finally, the deliberate omission of site-specific data in this submission is justified in terms of the concern Martujarra have for confidentiality regarding site location, particularly so when these are also significant mythological, ritual or ceremonial sites.

The second section summarises the evidence for previous use of the land. This includes a discussion of the antiquity of occupation for the region, continuities and changes in economy and population and a review of archaeologically detectable pre-contact technology.

The third section proposes the pre-contact hunter-gatherer strategies employed in the region. A settlement and subsistence model is described which synthesises relevant ethnohistorical, ethnographic, botanical and environmental data. It is in the context of this model that the nature and location of sites can be understood and that the variability in the material remains between sites can be explained.

The final section examines archaeological sites as a cultural resource in more detail. The density of sites within different landscape units is discussed. The role of these sites to Martujarra is described, as is their possible educational value. The scientific significance of these sites is viewed within the context of timely and relevant regional

research questions, some of which are presented by way of example. Finally, a number of management options for the assessment, monitoring and mitigation of physical impact on these sites are proposed. Summary discussion notes for the four sections are presented at the beginning of this submission.

1:1 SUMMARY NOTES FOR SUBMISSION

1. The study area (figure 1) is inclusive of the Karlamilyi (Rudall River) National Park with boundaries encompassing the Broadhurst Range to the west, Durba Hills to the south, Lake George to the east and Lake Dora to the north.

2. Archaeological sites are the material expression of past human activity and range from simple task-specific sites through to large habitation complexes which witness past gatherings of hundreds of people engaged in a wide range of activities. These sites are sometimes also of ethnographic significance, having specific mythological, ceremonial and/or ritual associations.

3. Archaeological sites are defined under the Western Australian *Aboriginal Heritage Act* 1972-80 which makes provisions for the reporting and protection of such sites. It is the statutory responsibility of the Department of Conservation and Land Management under the *Conservation and Land Management Bill* 1984, Section 56(c), to make management provisions for the preservation of archaeological sites within national parks.

4. Different types of archaeological sites are subject to varied impact resulting from tourist activities, mining and natural weathering agents.

5. Radiocarbon dates from five stratified caves and rockshelters in the Karlamilyi (Rudall) region illustrate continuous human occupation from at least 5,000 years ago.

6. Colonization of the Sandy Deserts is seen to represent the emergence of the ethnographic desert economy.

7. Continuities in economy contrast with increases in the occupation of sites from 1,500 to 700 years ago, probably as a result of increased population levels.

8. A seasonally structured settlement/subsistence system characterises these northern inhabitants of the Western Desert and is used to interpret patterning in regional archaeological sites and to provide predictive statements about site types and their density. These predictive statements have been partially verified through detailed sampling.

9. Habitation sites at ephemeral waters can occur within all landscape units and are characterised by small, low density artefact scatters with a low proportion of formal implements and a low diversity of lithic types. In contrast, habitation sites at permanent/semi-permanent waters will be largely located within, or adjacent, the most productive plant communities (i.e. along drainage lines and their flanks) and are characterised by large, high density artefact scatters with a high proportion of formal implements, a high diversity of lithic types and a high intensity of stone reduction. The permanent water sources are assumed to represent major aggregation places both for winter meetings and for groups enduring the local restriction of waters during summer or drought. Rockshelter sites are mainly located in the uplands and generally evidence a low intensity of occupation. Exceptions include several shelters near permanent water sources which have major rock art panels and dense occupational debris within them. Stone arrangements may vary from several upright stones to large meandering and concentric lines. Most of these have secret/sacred meaning and are actively maintained by Martujarra. They show no correlation with landscape unit.

10. Probably less than 10% of the archaeological sites in the study area have been recorded. In areas which have been thoroughly surveyed, the highest density of sites comes from the interphase between uplands, their drainage lines and surrounding sandsheets and dunefields. The lowest density comes from the interior of the uplands and the longitudinal dunefields.

11. The significance of archaeological sites must be established through explicit criteria. These include site significance to Martujarra, to scientific research questions and to their recreational and educational potential.

12. Management options include the use of multi-stage surveys (both archaeological and ethnographic) designed to provide increasing resolution of site types and their significance as the impact of land- users becomes more direct and localised. The initial use of sample surveys within a region to

delineate significant areas is advocated. A formal system of liaison between Martujarra, their elected Executive, the Department of Aboriginal Sites and other regional land managers and users is strongly recommended.

2:0 ARCHAEOLOGICAL SITES

2:1 BOUNDARIES OF THE ARCHAEOLOGICAL STUDY AREA

The boundaries of the study area are shown in figure 1. The corners are located at:

N W	21 degrees	56' lat. 121 50' long.
NE	21 degrees	56' lat. 123 43' long.
S W	23 degrees	55' lat. 121 50' long.
SE	23 degrees	55' lat. 123 43' long.

The study area encompasses the Karlamilyi (Rudall River) National Park and provides a good sample of the varied topography, drainage types, vegetation associations and geological units present at the junction of the Little and Great Sandy Deserts. Importantly, it covers lands exploited by Martujarra, both in pre-contact and contemporary times (cf. Tonkinson 1978). A total of eight months survey, recording and sampling of archaeological sites (usually in the company of Martujarra) has been undertaken by the author in several portions of the study area as part of a doctoral thesis in the Department of Archaeology, University of Western Australia. In addition, a number of surveys have been carried out for W.D.P.A.C., jointly with anthropologists, as the result of mining exploration programmes within and adjacent the study area. Therefore, an accurate appraisal of the extent of archaeological sites from within this region can be made. The deliberate involvement of Martujarra in the field resulted in a number of important ethnoarchaeological conclusions regarding the seasonality and duration of site occupation, the complexity of social groups at these sites and the function (range of activities) associated with each water source. As such, a unique and exciting data base is available, including for the first time in the Sandy Deserts, some chronological control for occupation patterns.

2:2 DEFINITION OF ARCHAEOLOGICAL SITES

Archaeological sites bear witness of past human activity through material remains. This activity may be as simple as the removal of a section of mulga tree involving the opportunistic procurement, modification, use and discard of a tabular piece of fine grained stone outcropping naturally near the tree. It may involve the butchering of a wallaby with the construction of a cooking hearth and the eventual removal of the wallaby for redistribution and consumption. The only tangible remains will be

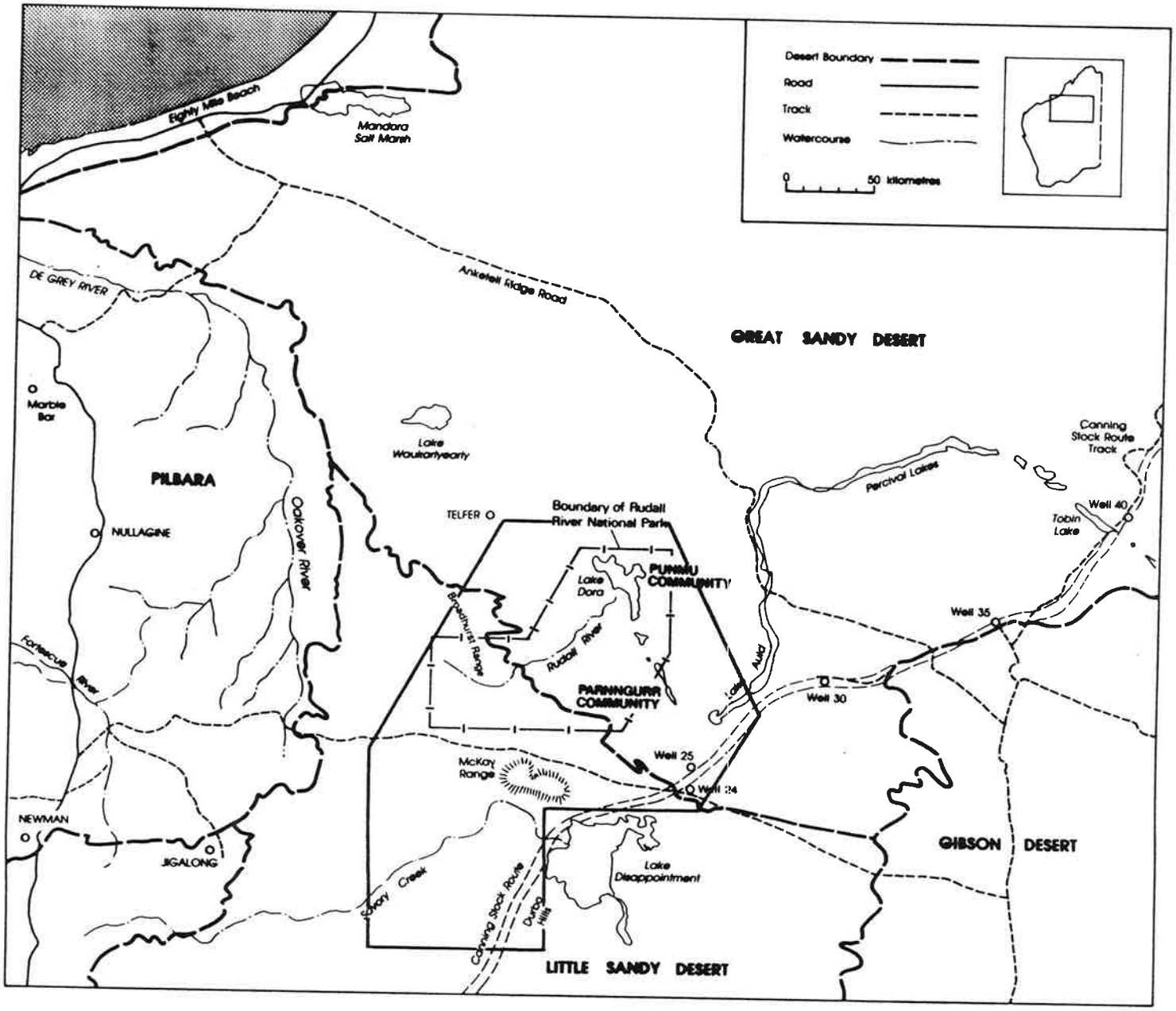


Figure 1: Archaeological study area

charcoal, burnt sediments and fatty residues in the base of the pit. In contrast, a range of complex activities might be expected at a major occupation site where large groups of people have temporarily aggregated. These activities might involve the processing of vegetable foods, the distribution of game, the manufacture and maintenance of wooden extractive items, such as spearthrowers and bowls, and the manufacture, modification, rejuvenation and discard of stone tools. The manufacture of personal apparel, such as sandals and hairstring, the construction of temporary shelters and windbreaks and the execution of paintings and engravings will also result in different material items leaving the living context and entering the archaeological context. Once material has left the living context, many physical factors will act to distort and often destroy it. Clearly not all archaeological sites are of equal significance and, therefore, an explicit set of criteria must be established by which their importance can be gauged.

2:3 ARCHAEOLOGICAL SITES AS A CULTURAL RESOURCE

The archaeological record can be viewed as a cultural resource which is essentially non-renewable. Martujarra currently occupy and use sites with archaeological remains and in so doing they reaffirm continuity of occupation and land use and add to the palimpsest which is their cultural record. Archaeological remains are also often associated with mythological and ceremonial sites and while the criteria applied for assessing significance will be different for the ethnographic associations, the physical integrity of all components of the site complex is paramount. Under the Western Australian *Aboriginal Heritage Act*, 1972-80, Section 5 an Aboriginal site is defined as:

"(1) **any place of importance and significance where persons of Aboriginal descent have, or appear to have left any object, natural or artificial, used for, or made or adapted for use for any purpose connected with the traditional cultural life of the Aboriginal people, past or present;**

(2) **any sacred, ritual or ceremonial site, which is of importance and special significance to presons of Aboriginal descent;**

(3) **any place which, in the opinion of the Trustees, is or was associated with the Aboriginal people and which is of historical, anthropological, archaeological or ethnographical interest and should be preserved because of its importance and significance to the cultural heritage of the State;**

(4) **any place where objects to which the Act applies are traditionally stored, or to which, under the provisions of this Act, such objects have been taken or**

Conditions for the reporting of Aboriginal sites are outlined in Section 15 of the Act, as are the penalties incurred for disturbance, concealment or possession of sites and objects under Section 17. Of relevance to the protection of Aboriginal sites in the Rudall region is the *Conservation and Land Management Bill* 1984, which states in Section 56(c) that management plans will be designed:

"... in the case of national parks and marine parks to fulfil so much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna and *the preservation of any feature of archaeological, historical and scientific interest* " [emphasis mine].

Clearly, it is necessary to accurately evaluate the archaeological resource of a region so that appropriate management strategies may be adopted to avoid interference with sites and to mitigate the impact of tourism, mining and environmental damaging agents.

2:4 TYPES OF IMPACT ON SITES

In brief, different types of archaeological sites will be susceptible to various damaging agents. Several examples are given here;

(i) Frequent visits and camping by tourists can occur at permanent waters such as at Durba Hills or at Well 24 on the Canning Stock Route. Large, diverse artefact scatters will often be collected from. More aesthetically appealing items such as grindstones and formal implements will be selectively removed, therefore, destroying the integrity of the site. Random vehicle access on sites, over a lengthy period, can result in sediment destabilisation, loss of stratigraphic integrity and physical damage to artefacts.

(ii) Exploration activities, particularly drilling grids and seismic lines, cover large tracts of country with bulldozed or graded tracks. The results of previous archaeological surveys along linear transects in the arid zone of Western Australia illustrate that one site may be intersected for each 2km to 8km of survey line (Veth 1982, Veth and Moore 1988). Such regional exploration, therefore, has the potential to interfere with hundreds of archaeological sites,

(iii) Many stone arrangements in the Karlamilyi (Rudall) region are documented as significant ceremonial sites currently used and maintained by Martujarra. These can be inadvertently discovered by tourists, interfered with and photographed. Many stone objects have sacred connotations and a proscription against the public viewing of these objects exists. More seriously, these stone (and sometimes wooden) sacred objects might be entirely removed from their

Other impacts include damage to rock art panels through water seepage removing pigments, mechanical abrasion from humans touching and walking against motifs and devegetation due to recurrent, closely spaced fires causing soil erosion and partial obliteration of open sites. More intensive exploration activity such as the excavation of costeins, closely spaced drillholes and blasting can obviously seriously impact localised sites, such as rockshelters, which may contain stratified cultural remains spanning thousands of years.

2:5 TYPES OF SITE SIGNIFICANCE

The conservation and management of archaeological sites must be based on the assessment of the significance of these resources. The significance of sites can be evaluated from several different perspectives.

(i) Aboriginal significance - Martujarra place great value on some archaeological sites. While rock painings and engravings often depict everyday objects and activities, they also may have meanings which relate to religious and ceremonial life. Mythological beings are depicted in many art panels; some of these are 'open' for public viewing, while others may only be witnessed by appropriate sections of the community. The knowledge of many of the mythological creation events and beings associated with the art is shared by communities across enormous areas of arid Australia; e.g. from Roebourne to Alice Springs to Port Augusta. As noted, many stone arrangements also have religious and ceremonial associations which are equally well known as named entities within large networks of the Western Desert. Rockshelters with evidence of occupation, open artefact scatters with grinding material and the remains of temporary shelters are seen simply as old camping places.

(ii) Archaeological scientific significance - the significance of sites, from a scientific perspective, is established from their ability to address timely and relevant regional research questions and from their representativeness.

Questions may relate to the antiquity of human occupation, the type of economy and the spatial nature of pre-contact settlement/subsistence patterns.

(iii) Educational/recreational significance - some sites, particularly those containing rock art, have been visited by tourists for many years. Some of these are not 'closed' sites and, therefore, the opportunity exists to both protect these sites and educate the public through interpretative signs.

2:6 SITE-SPECIFIC DATA

The Aboriginal constituents of the W.D.P.A.C. have often voiced opposition to the dissemination of site-specific information, such as precise details of location, or the specific nature of a site. This data is recorded within a site register of the W.D.P.A.C. and is forwarded to the Department of Aboriginal Sites, as necessary. Since this present submission is a public document, all of the references made to site location will be general, i.e. predictive statements will be made about the landform units and particular contexts in which different site-types may be expected and in what densities they will occur. This should ensure that enough data is presented for management needs without breaching the confidentiality of interested Martujarra.

3.0 EVIDENCE FOR PREVIOUS OCCUPATION AND LAND-USE

3:1 ANTIQUITY OF OCCUPATION

Initial surveys of both open and rockshelter sites in the region indicated that the latter had a greater potential to produce well stratified cultural deposits capable of providing early and consistent dates for Martujarra occupation and that these could potentially illustrate occupation patterns through time. Surveys of over 400 potentially inhabited rockshelters and caves revealed 28 with clearly stratified deposits. The five sites with the deepest deposits were excavated in the company of relevant Martujarra. While some open surface scatters of artefacts within, and near, the dunefield systems show some stratigraphic development, they are unlikely to have yielded statistically adequate assemblages of artefacts for analysis. Brief descriptions of the five excavated sites are given here. Radiocarbon dates with their provenience are presented for each site.

CAVE 1

This site is located at the crest of a quartz sandstone rise, north of Karlamilyi (Rudall River). This rise is part of the uplands which grade to the north into the Broadhurst Range. The floor of the shelter is approximately 35m square in area and the roof a maximum of three and half metres high. The entrance is partially blocked by a wall of

large roof-fall fragments and this 'retaining' wall has produced a well shaded and wind-free living area. It has also acted to entrap sediments derived from *in situ* weathering of the parent material. Artefacts noted on the floor of the shelter included a basal grinding slab, stone artefacts and abundant charcoal. A total of five cubic metres were excavated from the shelter, bedrock being reached at 125cm below the surface. Charcoal and small fauna remains were exceptionally abundant in the upper 50cm of the site. Stone artefacts occurred in the second lowest spit up to the surface with their density increasing in more recent spits. A range of sedimentary, chemical extraction and structural techniques revealed that the mineralogy and source of the sediments had been constant throughout the occupation of the site. The stone artefact assemblages from the excavation show great homogeneity through time in the technology of manufacture, the lithic materials used and the range of implements. The major change noted in the assemblages is the increasing rate of discard of artefacts and other cultural material (e.g. charcoal and seeds) in more recent levels.

Radiocarbon Dates

Date	Depth below surface (cm)	Years B.P.
WK-1092	58-60	1,120±50
WK-1093	117-120	3,180±70

CAVE 2

This is a small cave located on the upper reaches of a creek within the McKay Range. It is well known to Warnman speakers who used it pre-contact and who still visit it today. The cave has two chambers, the first comprising organically rich brown fine-grained sediments with stone artefacts, grinding stone fragments and wooden fragments on its surface. The rear chamber hosts a bat colony and no cultural material was located on the floor. Several painted geometric motifs are located on the roof of the first chamber. Limited excavation reached bedrock at 55cm below surface and exposed three stratigraphic levels. Grinding material, stone artefacts, some ochre and sub-rounded creek pebbles were recovered from all levels. As with Cave 1, a range of formal implements, including the hafted tula adze slug and backed pieces, were also recorded (see below for implement definitions). Density of artefacts again increased in the upper spits.

Radiocarbon Date

Date	Depth below surface (cm)	Years B.P.
WK-1158	43-45	900±70

ROCKSHELTER 3

A small, shallow rockshelter located adjacent the central portion of McKay Range contained numerous grindstone fragments, flaked stone artefacts and charcoal fragments over its surface. It is associated with large rockholes which were frequented during the winter months, when an abundance of seed and fruit could be harvested from the broad sandy valley floors. Martujarra currently visit the rockholes for recreational camping and also to harvest plants. Limited excavation of the shelter reached bedrock at 40cm below the surface and revealed an unconsolidated sediment with minimal stratigraphy. The stone artefact assemblages from the site are consistent with those from other rockshelter/cave sites in that they demonstrate heavy reliance on local lithic materials, such as quartz and quartzite.

Radiocarbon Date

Date	Depth below surface (cm)	Years B.P.
WK-1256	35-37	315±150

ROCKSHELTER 4

This rockshelter is part of a quartz sandstone outlier within the dunefields west from McKay Range. A low density scatter of silcrete and chalcedonic artefacts surrounds the shelter. Paintings are located on four areas of the shelter wall and include anthropomorphic figures, meandering lines, geometric motifs and bird tracks. Excavation reached bedrock at 80cm below surface and revealed six stratigraphic levels. Charcoal and stone artefacts, present in the lowest spits, increased in density in the upper spits.

Radiocarbon Dates

Date	Depth below surface (cm)	Years B.P.
WK-1288	40-42	1020±50
WK-1255	75-77	5030±60

The cultural assemblages of the four stratified occupation sites date to no earlier than the mid-Holocene (5,000 B.P.) and show strong consistencies through time in the technology of artefact manufacture and stone materials utilised. These factors offer an excellent opportunity to examine artefact discard rates as a reflection of intensity of site use and population levels (see below).

The range of basal dates obtained from these stratified sites is consistent with dates for initial occupation in the other dunefield deserts of Australia, e.g. the Simpson Desert. On the western edge of the Simpson Desert, Smith (1988) has excavated a large open occupation site and returned a basal date of approximately 3,000 B.P. On the southern edge of the same desert, Williams (n.d.) has obtained five radiocarbon dates from hearths and shell remains lying on clayey dune cores and pale dunes (both Pleistocene in origin). This material was aged between 3,000 and 300 years B.P. Despite concerted efforts to locate cultural material in these Pleistocene features, the dates are all more recent than the mid-Holocene.At present no published dates for occupation are available from the Great Victoria Desert. The eleven published dates from the dunefield deserts of Australia are all mid-Holocene or younger. These dates stand in contrast to those from adjacent montane and piedmont regions in Australia, such as the Flinders Ranges. In the Hamersley Plateau, two rockshelters have given lower dates of 21,000 and 26,000 years B.P. and these do not date occupation to bedrock (Brown 1987). In central Australia, a large rockshelter has recently given a lower charcoal date of 22,000 B.P. and again cultural material occurs below this date (Smith 1988). In the Flinders Ranges, a large open occupation site has been firmly dated to at least 15,000 B.P. (Hughes and Lampert 1985). Early dates are also noted from other sites in the semi-arid zone, including 25,000 B.P. from North West Cape, 27,000 B.P. from Koolan Island, 19,000 B.P. from Colless Creek (Hiscock 1984) and 15,000 B.P. from near Cloncurry (cf. Veth 1987). Two large karst caves on the Nullarbor are dated to 20,000 and 22,000 B.P. (Marun 1973; Wright 1971). While the dunefield deserts of Australia were undoubtedly used by people before the mid-Holocene, this occupation is likely to have been ephemeral and opportunistic. These areas possibly represented some of the most inhospitable regions for permanent human colonisation in Australia and, therefore, necessarily specialised human adaptations were required. A biogeographic model has recently been suggested for the later colonisation of the sandy deserts (Veth 1987).

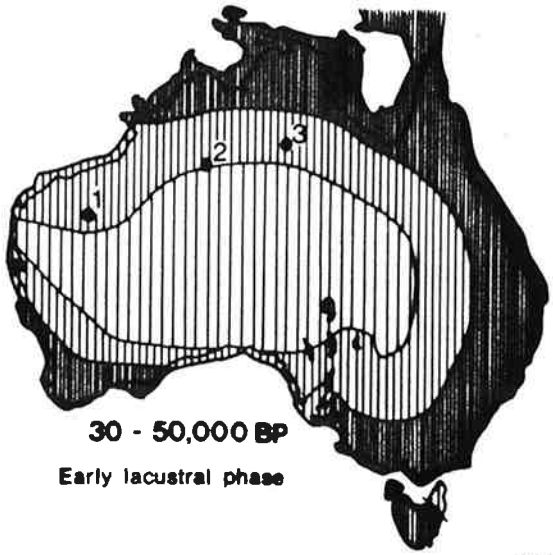
3:2 PALAEOCLIMATE

According to several palaeoclimatic reconstructions (cf. Jones and Bowler 1980; figure 2 here) during an early lacustral (wet) phase from approximately 30-50,000 B.P., the study area would have been situated near a transition zone from semi-arid to savanna lands. During this phase high water levels are recorded, in northern Australia from expanded shorelines of Gregory Salt Lake (figure 2, no.2), a high strandline on Lake Woods (no.3) and evidence for subsequent transgression of longitudinal dunes across drainage lines and basin floors of the same lake (Smith 1986). Following the lacustral phase, there is evidence that between 25-13,000 B.P. the interior experienced lowered

Figure 2 Palaeoclimatic reconstructions for the lacustral phase, glacial maximum and for the present

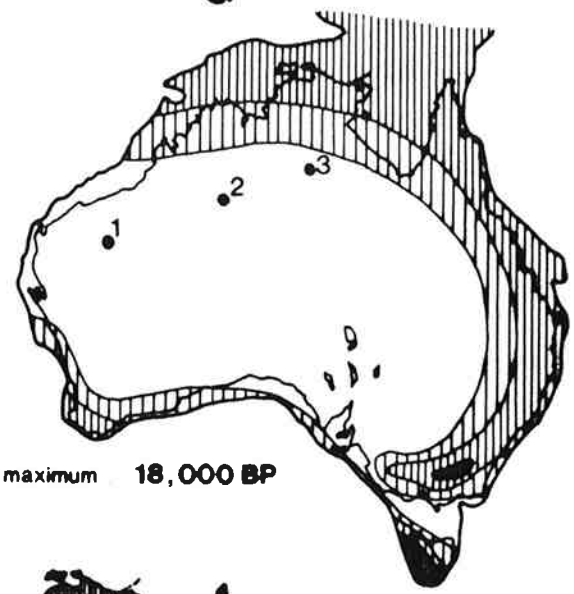
CLIMATIC INDEX MAPS

(after Jones and Bowler 1980: 10)

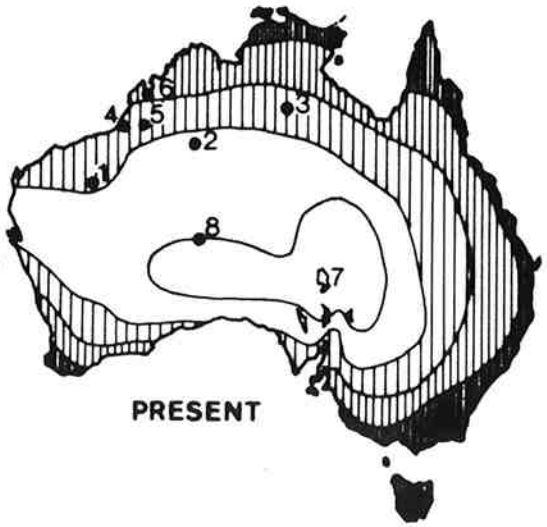


30 - 50,000 BP

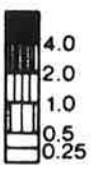
Early lacustral phase



Glacial maximum **18,000 BP**



PRESENT



Reconstruction of climatic index maps using Prescott's (1946) Index $\left[I\ {}^{P}/_{E}{}^{0.7}\right]$

1 Newman Rockshelter
2 Gregory Salt Lake
3 Lake Woods
4 Mandora Salt Marsh
5 Dragon Tree Swamp
6 Fitzroy Estuary
7 Lake Eyre
8 Puntutjarpa

temperatures and precipitation, increased evaporation and increased seasonality (Bowler and Wasson 1984). Concomitant decreases in lake levels are also noted. Analysis of organic sediment accumulations at two spring sites within the Great Sandy Desert (no.4 and no.5) suggests that this last *major* arid phase, for this area of the north-west, may have continued to as late as 7,000 B.P. (Wyrwoll et al. 1986). Uninterrupted deposition of peat at these sites over the last 7,000 years is seen to reflect general climatic stability. Holocene climatic fluctuations noted from southern Australia (cf. Smith 1988) are not registered within the region (see, however, McKenzie 1981). The most significant climate change in the region would certainly have been the period of reduced precipitation at the height of glacial maximum (20-16,000 B.P.) resulting in dramatic dune mobilisation, lowered water tables and a restriction in permanent surface waters.

3:3 CONTINUITIES AND CHANGES IN ECONOMY & POPULATION

In a series of publications Richard Gould has characterized the prehistoric economy of the Western Desert as being conservative and unchanging (1974,1977,1980). This has been largely based on data from the large rockshelter site of *Puntutjarpa* , located near Warburton. On the basis of continuities in formal implement types, unchanged proportions between implements and similar spatial configurations in living areas over the last 10,000 years, he argued for a stable and unchanging pattern of land use. More recent work on this and other stratified sites within the arid zone has suggested that significant changes in population, technology and possibly social organisation have occurred before and during the last 10,000 years (Hiscock and Veth n.d.; Smith 1986,1988; Veth 1987). In summary, significant new technologies such as hafting were introduced into the Western Desert by 5,000 years ago. Hafted adzes are extremely efficient for working hardwoods and would have enabled the standardised and more rapid production of important wooden extractive items such as spearthrowers and bowls. Although seed grinding is in evidence before 5,000 B.P. in Australia, the basal stones are always minimally abraded; their use can be described as opportunistic. It is only by 3,000 to 1,500 years ago that intensive seed grinding becomes part of the desert economy, as evidenced in formal seed grinding bases and millstones. Most importantly, the rate of discard of cultural material, including stone artefacts, charcoal, faunal remains and ochre, increases substantially during the last 2,000 years - possibly as a result of higher population densities.

Increasingly, it appears that the numerous changes in human occupation over the last 5,000 years in the arid zone are not simply due to a single factor, such as climate or technology, but rather a suite of presumably cultural and environmental factors. The

so-called 'small tool tradition' enters the desert assemblages after 5,000 B.P. These technologically distinct implements include the tula and burren adzes (known ethnographically to be hafted) the pirri graver and marni wadna (specialised wood engraving implements which were also hafted), backed pieces and the production of small blades.

The discard rate of artefacts have been calculated from three of the stratified occupation sites in the Karlamilyi (Rudall) region. These are presented in figure 3. It is clear that accelerated discard occurs between the same time bracket of 1,500 to 700 B.P. as that noted for central Australia. The quantities of charcoal retrieved from the stratified sites also show a concomitant increase during the same period. Similar patterns have now been reported from the north-west of the Simpson Desert (Smith 1988). The prehistory of arid zone inhabitants, such as the Martujarra, must be seen as dynamic with variations in population, settlement patterns, technology and possibly social organisation occurring both in space and through time.

3:4 PRE-CONTACT TECHNOLOGY

Some of the technological attributes employed by Martujarra before contact can only be inferred from material objects which are differentially preserved in the archaeological record. However, many so-called traditional technological components have been studied and recorded from the region this century. These technological components, in altered form, are still often part of the contemporary culture of Martujarra.

The detailed and complex knowledge held by people relating to the location and nature of water sources and the timing and method of plant and animal procurement, was undoubtedly the major technological tool employed by Martujarra in their successful desert adaptation. The great complexity displayed in this 'knowledge as technology' finds little expression in the simple material culture associated with the economic sphere. The more obvious items such as the spearthrower, the digging stick and the hardwood bowl can be seen, however, as extremely versatile, and portable, multi-functional extractive items. For example, the spearthrower, in addition to launching projectiles, included a stone flake set in a resin haft. The resin could be either from spinifex or *Xanthorrea* and often had plant fibre, hair and grit mixed in as temper. The stone flake was usually modified through retouch and could include a range of formal implements with differing functions. One common type is the tula adze, a flake with a prominently curved (ventral) undersurface and a semi-circular edge which is retouched (figure 4). The specific shape of these implements and their robust

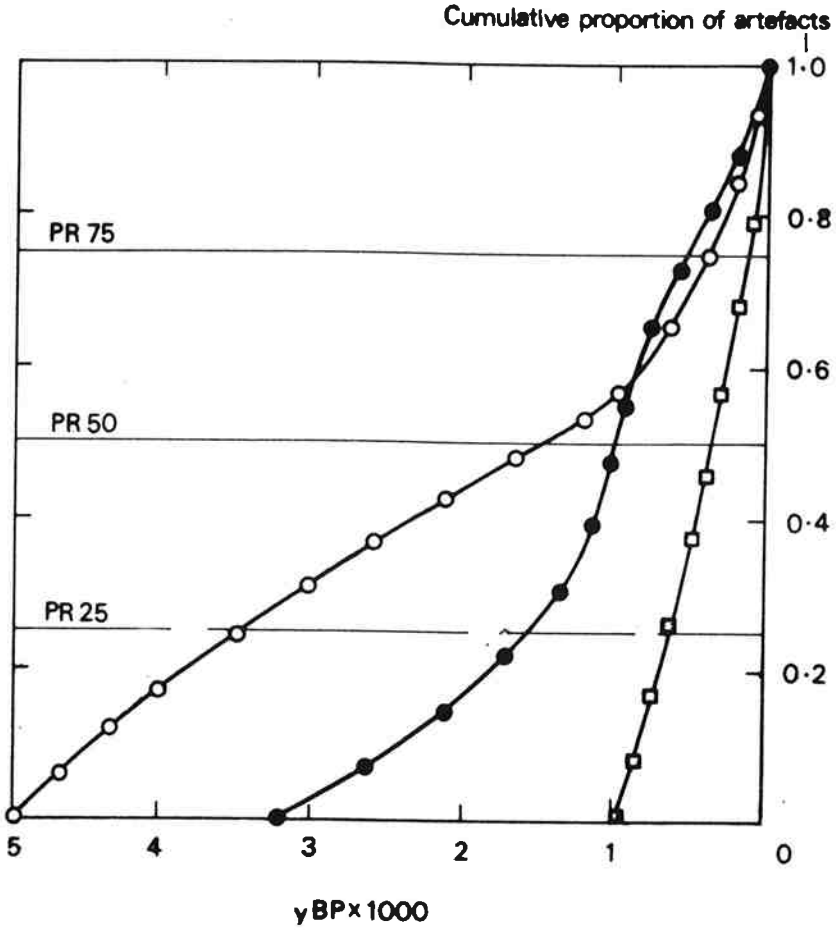


Figure 3: Rate of stone artefact discard through time from stratified sites.

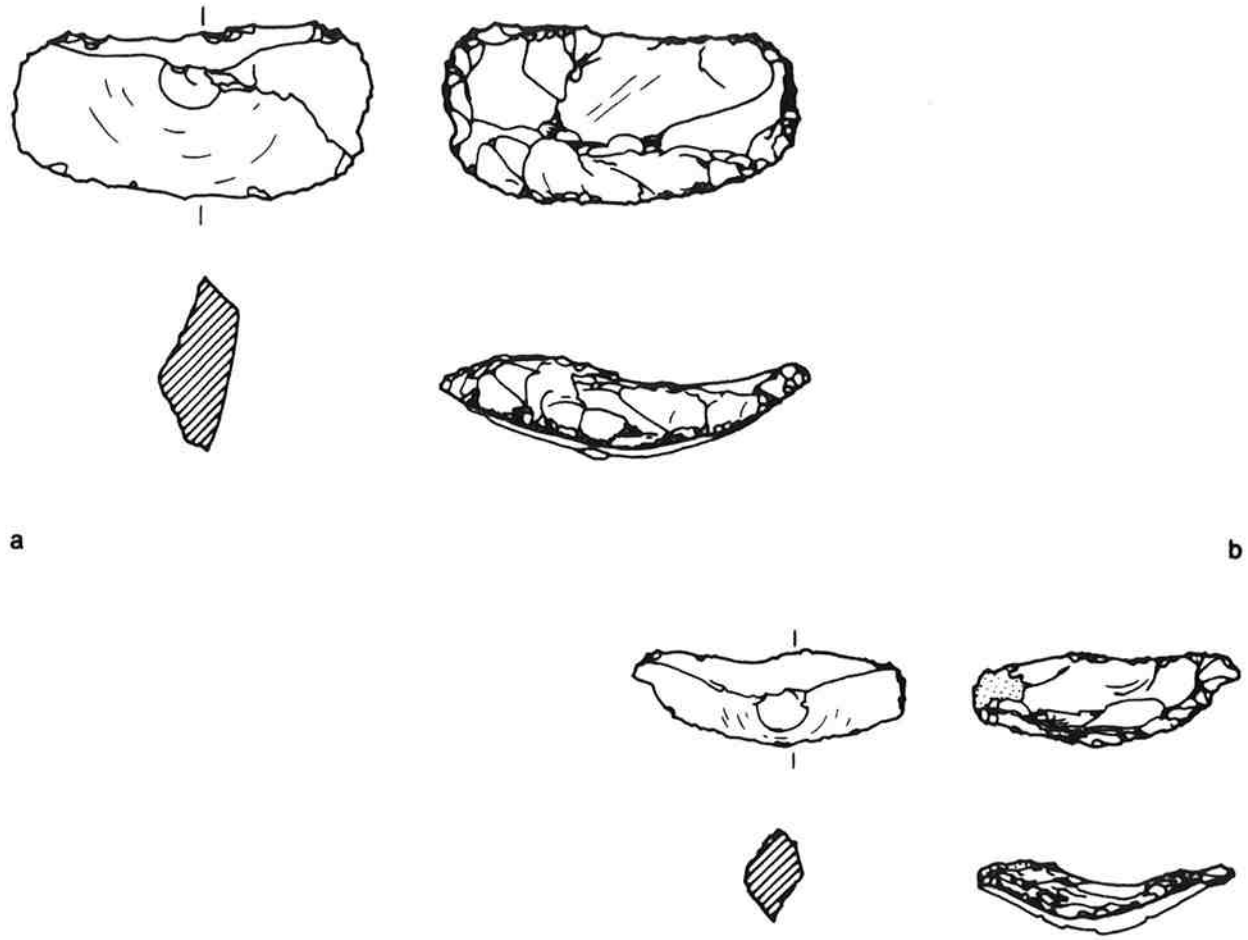
retouched edge allows them to withstand severe impact on hardwoods and stay in the haft. These implements are rejuvenated after periodic dulling by retouching and rotation in the haft. They are discarded in a slug form (figure 4). Another type of adze, the burren, comprises a long flake which is hafted along one of its lateral margins. It is poorly suited to gouging hardwoods and more adapted to scraping and shaving motions.

Two other types of implements, the pirri graver and marni wadna, are also sometimes found in composite tools within the arid zone. They are basically stone chisels set end-on in resin to produce both the V shaped and semi-circular grooves often decorating bowls, spearthrowers, shields and other wooden objects. Although some of the functions of these hafted tools can be carried out with hand held tools, they essentially represent a new and specialised technology for the efficient working of hardwoods and particularly for the gouging and shaping of concave surfaced wooden items.

The other major class of formal implements, which are also assumed to have been hafted, are backed implements. These are generally small segments of blades or flakes with backing along part, or all, of the margin opposite a sharp unaltered edge. Although the use of these implements has not been recorded ethnographically, they are generally thought to have acted as barbs on spears. The three most commonly found types of backed implements in the Rudall area are backed points, obliquely truncated points and segments (figure 5).

A range of other retouched/utilised implements, generally less specialised than the formal types discussed above, are also found at occupation sites. These artefacts most likely served to cut, scrape and shave wood (Hayden 1979). A wide range of these artefacts, loosely described as scrapers and retouched flakes, can be found in recurrent shapes, i.e. with notches or denticulations, on working margins. They are found in stratified occupation deposits in arid Australia before 10,000 B.P. and continue in use after the introduction of hafted implements by 5,000 through to the present.

A major class of highly visible artefacts are the grindstones commonly associated with occupation sites at more permanent water sources. These can take a variety of forms depending on their function and the intensity of their use. The most spectacular are the millstones which comprise the basal grinding slab used for the wet milling of seeds. These have large flat surfaces with one or several long grooves often 80 to 120mm wide and 10 to 25mm deep. These surfaces often have a reflective, finely abraded surface. The slabs are shaped by flaking and hammer dressing. Mullers, or topstones, are



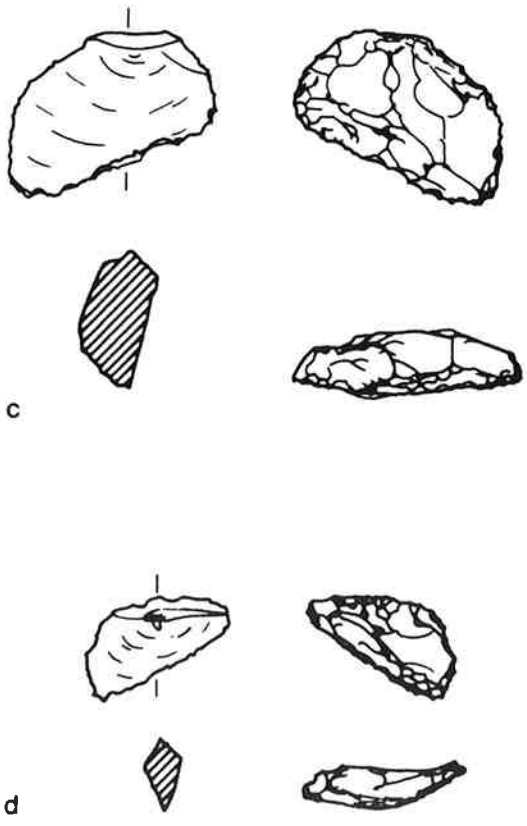


Figure 4: Tula adze slugs

a + b: Parallel reduction to striking platform

c + d: Oblique reduction to striking platform

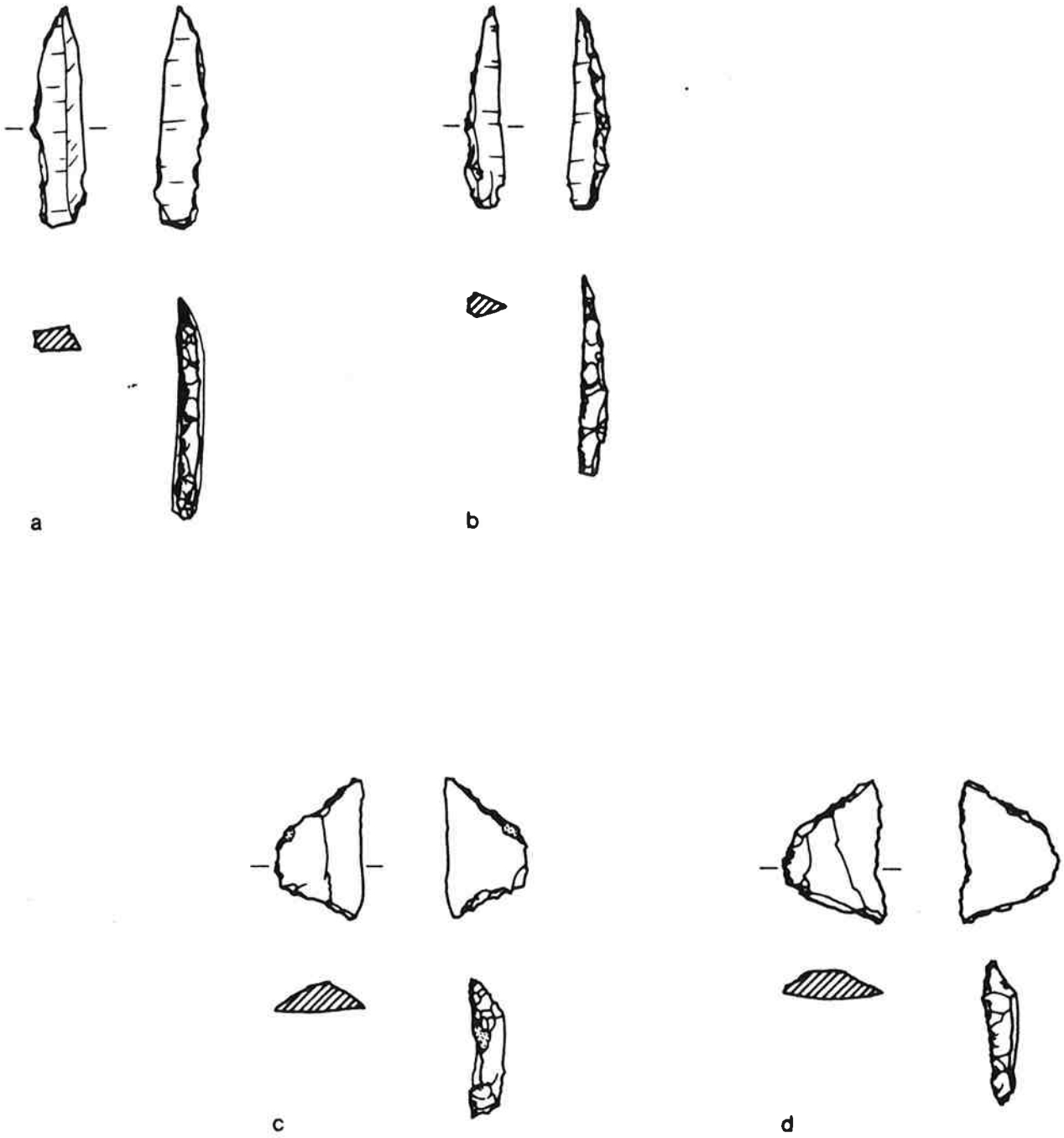


Figure 5: Backed pieces

a + b: Backed points
c: Trapeze
d + e: Segments

hand held forming abraded facets through continued use. A range of amorphous basal grindstones are often found at sites and these usually only have evidence for light abrasion. The worked surface differs from the above, in that there are no signs of manufacture or evidence for rejuvenation. These have likely been used for a range of activities, including the pulverising of small game, cracking of nuts, preparation of pigment, resharpening of wooden implements and the preparation of bush tobacco. Finally, at some sites the remnant hardpan bases of termite mounds have been used as processing platforms for hard coated seeds. A number of sub-rounded quartzite pebbles may be found around these platforms.

The by-product of stone reduction, core production and the manufacture of tools and tool preforms, comprises numerous flakes, broken flakes and debris which often comprise 90 to 98% of stone tool assemblages. The opportunistic and ad-hoc use of naturally sharp flakes for various cutting functions has also been verified through use-wear studies.

Martujarra have knowledge of the use of many of these implements with specific names for adzes, cutting flakes, chopping implements and grinding stones. They also commonly manufacture the resins used in hafting and can replicate in sort the stone/wooden composite artefacts.

Evidence for other technological attributes can be found in rockshelters and sometimes on open sites. The two main components of fire making apparatus comprise a lower section of corky stem, often split so as to accommodate dry grass and dung, and a hand-held, edge-sharpened splinter of wood, which is rubbed vigorously at right angles over the tinder. Sections of the lower corky stem are often found with score marks on their surface. Flames can usually be produced with these implements in less than one and a half minutes.

The two types of shelters used by Martujarra can be found at some of the larger water sources in the region. The winter-time campsite is essentially a windbreak, comprising rows of acacia boughs laid flat on the ground. While these are generally poorly preserved, hearths and grindstones associated with these sometimes remain intact. The summer-time shelters are comprised of an oval to circular arrangement of upright boughs which are tethered in the centre to approximate a small dome. These were sometimes roofed with spinifex and termite mud. They served essentially as shelters from the intense summer heat and could also resist sub-tropical downpours. Grindstones and hearths are commonly associated with these. Their remains are often found near wells on the Canning Stock Route

Although much of the material culture is expedient there were particular strategies used to invest energy to offset future environmental hardships. The deliberate storage of seeds *(Amphipogon coricinus, Brachiaria miliiformis* and *Panicum australiense)* and fruit *(Solancum diversiflorum* and *S.chippandalei)* in rock crevices, hollows of trees and under spinifex hummocks provided reserves of carbohydrates, protein and vitamins at times when plant foods might be scarce (Veth and Walsh 1988). The construction and maintenance of wells, often lengthy sloping tunnels up to 30 feet long, was essential for ready access to the more permanent waters.

4.0 MODELLING PRE-CONTACT SETTLEMENT AND SUBSISTENCE

4:1 PROPOSED MODEL FOR SETTLEMENT/SUBSISTENCE

A seasonally determined pattern of resource use and mobility patterns has been suggested for the region (cf. Veth 1987). Group size appears, from ethnographic accounts, to have fluctuated from less than 30 individuals comprising the basic land using group, up to 200 individuals during meetings. Two periods of aggregation are noted, the first during winter months (a resource-rich time) and the second during the Dry as all but the few permanent waters are lost. This cycle of gatherings based either on 'feast or famine' has also been noted for the Pintupi (Hayden 1977) and the Kukatja (Cane 1984), both of the northern desert. Aggregations during winter and summer are likely to have occurred at the permanent waters, which would also be used intermittently by bands in intervening periods. Gatherings would sometimes have been of considerable duration, involving lengthy ceremonial and ritual cycles. Semi-permanent waters were also used for winter gatherings. Finally, ephemeral water sites are assumed to have been largely used following summer rains mainly by small land using groups.

Ethnobotanical work in the region has documented more than 175 uses of 155 plant species, 105 of these being food plant species (Veth and Walsh 1988; Walsh 1987a; Walsh, this vol.). The favoured landform type for collecting plant foods are watercourses and their flanks, the uplands being generally depauperate in economic plant species. From December to February few plant foods are available. This is the period when stored seeds, bulbs and fruits are utilised. The most productive period of the year is during the winter months when a rich array of seeds, fruits and rootstock are available and most palatable. The dynamics between people's fragmentation into bands (gabudur) and their coalescence during temporary aggregations (djabal) constitutes a fluid social structure set against a changing backdrop of seasonally changing resources (cf. Tonkinson 1978). Martujarra acknowledge these seasonal alterations in resource availability and the specific patterns of movement adopted by

groups to optimise these resources. A trend is observed in which gatherings tend to be larger, and more complex, as a function of increased water permanency. The annually staggered availability of seeds, fruits and rootstock results in a state of resource flux, peaking mid-year, with the optimum period for water availability occurring somewhat earlier. Plant usage is characterised by the procurement and processing of an extremely broad suite of species which are targeted within the highest productivity landform/vegetation associations, i.e. areas with the highest indices for species diversity and richness. These are the water courses and their flanks, ecotones and recently burnt sandplain (Walsh 1987b). Occupation sites are primarily chosen to optimise access to water and a variety of targeted plant communities.

In considering settlement dynamics, the period of most frequent residential moves follows summer rains. From this time on, residential movements retract towards known and more permanent water sources. As the year progresses, the timing between residential moves increases. Consequently, the average foraging radius will increase around more permanent base camps.

4:2 PREDICTIVE STATEMENTS FOR SITE LOCATION AND TYPES

On the basis of sample surveys within the Rudall region a number of predictive statements can be made about the location of different archaeological sites. The site types discussed here include open surface sites, rockshelters, rock art complexes and stone arrangements.

OPEN SURFACE SITES:

Discrete scatters of stone artefacts, including implements and debris, are inevitably associated with water sources of varying permanency. The location of habitation sites is not always directly adjacent water sources are often found in an optimum position between the most productive plant communities, yet within easy (<2km) access of water. The types of artefact assemblages produced from habitation at waters of varying permanency are substantially different to each other. These are inferred to be the result of different sized groups of people occupying sites for different lengths of time and at different times of the year. These differences in site patterning can be discussed in terms of regional site patterning, assemblage composition and artefact attributes.

(i) <u>Regional site patterning:</u>

During and after summer rains, habitation will occur at a wide variety of temporary water sources and will be largely independent of preferred landform/vegetation units. At ephemeral water sources such as small rockholes, claypans and clay-lined salt lake

margins, the results of low intensity and short-lived occupation may be found. These sites occur around the periphery of ranges and sometimes within their interior valleys, on the extensive sandsheets and dunefields and around the edge of some salt lakes.

By early winter, and for the majority of the seasonal cycle, habitation sites are located to optimise access to more reliable (and often named) waters and a variety of targeted plant communities. These 'core' sites are mainly associated with drainage courses, their flanks and ecotones. Permanent waters located away from drainage lines, such as springs at salt lakes, may also have evidence for more intensive occupation. The ratio of core sites as opposed to those associated with ephemeral waters is high, i.e. 0.80:1.00. Task-specific activities can leave small scatters of artefacts or isolated implements scattered across the countryside away from water sources. These task-specific implements are rare for the Karlamilyi (Rudall) region, however, and it is assumed that many task-specific activities employed implements which were curated and discarded back at habitation sites.

(ii) Assemblage composition

The intensity of stone reduction appears to be largely a product of group size and their permanency of occupation, and hence is a function of water permanency. The diversity of economic activities is also tied into water permanency. Sites near permanent waters on average have a higher number of artefacts, a higher density of artefacts, have more grinding material and a greater diversity of lithologies than those at semi-permanent waters and considerably more so than sites at ephemeral waters. Sites at permanent waters generally have a greater proportion of artefacts manufactured from stone which is not locally (< 5km radius) available than sites at semi-permanent waters and these, in turn, have a greater proportion than those at ephemeral sources.

A greater proportion of modified implements (tools) are found in assemblages at permanent and semi-permanent water sources than at ephemeral sources. Formal implements, such as adzes and backed pieces, will represent a higher proportion of all modified artefacts at permanent versus semi-permanent and ephemeral water sites. The production and modification of implement blanks becomes more opportunistic with decreasing intensity of occupation. The settlement/subsistence model predicts that the occupation of rockshelters and caves occur predominantly during summer rains and that the use of these sites is ephemeral. The characteristics associated with habitation sites near ephemeral waters are shared by the shelter/cave sites. Indeed, the

artefact assemblages from both types of site exhibit the dominant use of a low diversity of stone material types which generally are locally available.

(iii) Artefact attributes:

As a result of increasing intensity of stone reduction at more permanent water sources, there are a number of consistent differences in the attributes of artefacts. Cores in similar raw materials are smaller and increasingly rotated at more permanent waters. Average weight of flakes in similar raw materials is also smaller. The average weight and size of flaked formal implements in the same raw materials decreases as a function of increasing water permanency. This is seen to be the result of the conservation of stone by groups coping with increased demand on both local and exotic stone sources.

ROCKSHELTER SITES:

As noted, the artefact assemblages of the rockshelters are similar to those at ephemeral waters, displaying the predominant use of locally available stone sources. Rockshelter/cave sites are found within the range/uplands such as the McKay, Broadhurst and Throssell Ranges. They are also occasionally located in small rocky outliers within dunefields and on sandsheets. Generally, the rockshelter/cave sites tend to have a wider variety of cultural material within them when they are located within several kilometres of a major water source. For example, several medium sized rockshelters in the vicinity of Yandicoogee Creek, Karlamilyi (Rudall) River and McKay Creek contain abundant quantities of charcoal, numerous flaked stone artefacts and grinding slabs, often have some seeds and faunal remains scattered on the surface and sometimes have painted and/or engraved motifs on the shelter walls. Smaller shelters, which comprise the majority of shelters, and which are not located near major waters, may often have only one or two art motifs, a few scattered artefacts on their surface or simply charcoal fragments mixed into their sediments.

ROCK ART COMPLEXES:

In addition to rock art within shelters, there are also major rock art panels in the uplands often showing repeated superimposition of motifs. These motifs often depict mundane themes and activities, although in several notable cases they depict mythological beings and creation events which are part of the sacred realm of Martujarra. Apart from several minor studies, the art of the region is poorly described in the literature and little is known of specific conservation requirements for its preservation.

STONE ARRANGEMENTS:

The majority of stone arrangements recorded in the study area have living mythological and/or ceremonial associations. These arrangements may simply comprise a few tabular or sub-rounded pieces of stone, sometimes placed in upright position, through to large meandering or concentric lines of stones covering areas of over 25 square metres. They are found within a range of environments including rockshelters, near rockholes and springs in the ranges, on the edge of salt lakes or near features on the extensive sandsheets. There is no noted correlation between stone arrangements and specific landform/vegetation units.

5.0 ARCHAEOLOGICAL SITES AS A CULTURAL RESOURCE

5:1 DENSITY OF ARCHAEOLOGICAL SITES IN THE RUDALL REGION

It is clear from the foregoing discussion that different types of archaeological sites have different distributions and densities across the landscape. Overall, however, the greatest density of sites occurs within or adjacent the drainage landform unit and especially so where drainage discharges from range/uplands onto sandsheets. The lowest density occurs within the major longitudinal dunefields, where water sources are lacking.

A review of previously recorded archaeological and ethnographic sites held on site files by the Department of Aboriginal Sites, Western Australia Museum, indicates that there are 43 sites recorded within the present boundaries of the Karlamilyi (Rudall River) National Park and 121 sites recorded outside of the Park boundaries, yet within the study area (Table 1).

TABLE 1

Number of Aboriginal Sites Within The Karlamilyi (Rudall River) National Park Presently Recorded with Department of Aboriginal Sites, Western Australian Museum

1:250ooo MAP SHEET	ETH	ARC	ETH ARC	TOTAL
SF51-6	-	-	-	
SF51-7	-	-	-	
SF51-10	5	21	13	39
SF51-11	1	1	2	4
TOTAL	6	22	15	43

Number of Aboriginal Sites Within The Study Area - Including & Exclusing The N.P. Presently Recorded with Department of Aboriginal Sites, Western Australian Museum

1:250ooo MAP SHEET	ETH		ARC		ETH ARC		TOTAL	
	Study Area Inc. Park	Study Area Exc. Park	Study Area Inc. Park	Study Area Exc. Park	Study Area Inc. Park	Study Area Exc. Park	Study Area Inc. Park	Study Area Exc. Park
SF51-6	-	-	28	28	-	-	28	28
SF51-7	-	-	-	-	-	-	-	-
SF51-10	15	10	27	6	23	10	65	26
SF51-11	1	-	3	2	3	1	7	3
SF51-14	13	14	17	17	17	17	47	47
SF51-15	4	4	8	8	5	5	17	17
Total Study Area Inc. Park	33		83		48		164	
Study Area Exc. Park		27		61		33		121

(Compiled by Lee Atkinson, Dept. of Aboriginal Sites)

These sites represent only a portion of known and unrecorded sites in the region. For example, the site files of the W.D.P.A.C. list additional site complexes within the National Park, within the McKay Range, along the Taliwana track and east of the Canning Stock Route. Areas which the author has intensively surveyed include

portions of the McKay and Broadhurst Ranges, the middle Rudall catchment, water sources along the Canning Stock Route and salt lakes including Lakes Dora, Winifred and George. It is common for the density of sites to be up to ten times greater than those lodged on existing site files, after thorough survey of an area.

This is partly a result of only partial survey work in the past and the lack of systematic community and research-oriented recording programmes. It is estimated that the 131 archaeological sites which have been recorded at present represent less than 10% of all archaeological sites in the study area, i.e. a total of more than 1,300 sites exists. Clearly, not all of these sites are significant and it is this issue which must be addressed.

5:2 SIGNIFICANCE OF SITES

(i) Significance of archaeological sites to Martujarra:

In addition to the mythological, ritual and/or ceremonial importance attached to some archaeological sites, the majority are seen to be old camping places. These are places which have often been used in living memory and in which known individuals have carried out particular tasks in addition to general residency. As such the material remains found on these sites, such as grinding bases, stone and wooden artefacts, are said to belong to these 'old people.' Martujarra often express their desire that other land users, including researchers, must seek consent to examine, record or photograph this material.

Named waters are frequently visited by Martujarra today for camping and recreation and a common scene involves older members illustrating aspects of past occupation and use of land to children by pointing out fireplaces, art and artefacts. Martujarra involved in the fieldwork have noted that the networks of old camping places are the material evidence of past land use and management. A tapescript made in Warnman and English with accompanying slides at the excavation of a rockshelter north of Karlamilyi (Rudall River) records how Martujarra interpreted the charcoal, grinding bases, stone artefacts, faunal remains and hearths uncovered at this 3,000 year old site.

(ii) Scientific significance of archaeological sites:

As noted in Section 1, scientific significance of sites is determined by their ability to address timely and relevant regional research questions. Some of the most important research questions that can be currently addressed include;

1. What are the variables responsible for the initial occupation of the Sandy Deserts; e.g. demographic pressure, new technologies, a shift in economy, change in social structure?

2. In addition to the operation of a seasonally determined settlement /subsistence system, what are the other major differences in economy and technology between the northern Western Desert and less seasonal regions of the Western Desert?

3. An increase in the intensity of site occupations is noted between 1,500 and 700 years ago. Can this be related to a regional increase in population, more efficient technologies for energy extraction or an amelioration in climate?

4. The presence of backed pieces in the artefact assemblages from the Karlamilyi (Rudall) region marks the most northerly presence of this formal tool type yet recorded in the desert.. Pressure flaked projectile points are not found in the study area, yet they were manufactured in the Kimberley and to as far south as the Stansmore Ranges of the Sandy Desert. Somewhere in the northern Sandy Desert is a boundary between these two major functional/technological classes. What is the significance of this 'boundary' and does it in any way demarcate a transition from desert to semi-arid adaptations?

5. For how long has the intensive exploitation of seeds as a major staple group operated in the Sandy Deserts? Does the practice predate the introduction of formal seed grinding slabs in stratified assemblages or is it purely a phenomena of the last 2,000 years?

(iii) Recreational/educational significance:

A number of major sites in the region have been regularly visited by explorers, tourists and mining personnel for many years. The anonymity of several of these sites has resulted in partial disturbance and in some cases partial destruction. Little could be lost, and possible a great deal gained, if interpretative signs were erected at some of these places. These signs could state the general significance of these sites to Martujarra, the communities role to protect those sites under the *Aboriginal Heritage Act 1972-1980* and a discussion about why features (e.g. rock art) are important to Martujarra culture. Some of the major water courses along the Canning Stock Route and within the Rudall River National Park are particularly in need of such measures.

This issue has *not* been canvassed in detail with Martujarra and would require community involvement and management.

5:3 MANAGEMENT OPTIONS

In order to mitigate against the destruction of archaeological (and ethnographic) sites, it is imperative that the different land users take adequate measures to formally consult with communities located in the region through the W.D.P.A.C. Surveys for sites should be carried out for the varied stages of development from the generalised reconnaissance/exploration stage - often involving a Notice of Intention - through to the stage of localised impact involving intensive drilling and/or mining - often involving an Environmental Impact Statement or Environmental Review and Management Programme.

(i) Surveys for sites have focussed, until the last few years, on demarcating specific areas of significance where development is to be limited or prohibited. Increasingly, the approach of delineating 'dots on the maps' is seen to be limited, both from the perspective of Martujarra and from a site management point of view (cf. Berndt 1981). Sites can be seen as nodes, often linked by tracts of land which served as prehistoric and contemporary access areas. Often important food resource zones are located within those tracts. If surveys for sites are to be successfully integrated with community aspirations for access to sites and to important food resource zones, then they must take into account the preservation of the integrity of sites. **Surveys for archaeological and ethnographic sites should be carried out by suitably qualified and professionally accredited personnel (e.g. full members of the Australian Association of Consulting Archaeologists). One of the most difficult and time consuming aspects of site protection and management is monitoring the physical integrity of the sites on a regular basis. Martujarra have suggested that community based rangers could fulfill this role.**

(ii) It is generally acknowledged that the impact of early types of 'passive' reconnaissance is minimal in comparison to later 'testing' stage involving sampling and drilling. **It is, therefore, suggested that a multi-stage survey strategy be employed where the detail of site recording increases with degree of direct impact. The practice of clearing thousands of square kilometres of land for all types of impact in one survey is unacceptable and can only result in the destruction of many sites.**

What is recommended is an initial regional appraisal (e.g. of exploration licenses) in which the most sensitive areas are designated as no-go areas. For archaeological sites, this might involve sample surveys of different landform/geomorphic units in a region, to provide basic predictive statements about site patterning and significance. When direct impact areas are delineated by a land user these can then be surveyed in more detail, if this is warranted, and management recommendations made for any sites within these. Sites can be assessed as insignificant through to highly significant, within the different categories of significance defined above. **It should be clear that not all archaeological sites are significant either to Martujarra, scientific research or to the broader community. It is, therefore, essential that a set of explicit criteria are used to make these management decisions.**

It is to be hoped that a formal system of liaison between the W.D.P.A.C., Department of Aboriginal Sites, Department of Mines, C.A.L.M. and east Pilbara Shire can be established to ensure that adequate procedures are implemented for the protection and management of sites in the region, both within and outside the Karlamilyi (Rudall River) National Park.

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