To hunt and to hold: Martu Aboriginal people's uses and knowledge of their country, with implications for co-management in Karlamilyi (Rudall River) National Park and the Great Sandy Desert, Western Australia

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Photo i (title page) Rita Milangka displays *Lil-lilpa* (*Fimbristylis eremophila*), the UWA Department of Botany field research vehicle is in background. This sedge has numerous small seeds that were ground into an edible paste. Whilst Martu did not consume sedge and grass seeds in contemporary times, their use was demonstrated to younger people and visitors.

DEDICATION

This dissertation is dedicated to my parents, Dianne and John Walsh. My mother cultivated my joy in plants and wildlife. She introduced me to my first bush foods (including *kurarra, kogla*, 'honeysuckle', *bardi* grubs) on Murchison lands inhabited by Yamatji people then my European pastoralist forbearers.[1] My father shares bush skills, a love of learning and long stories. He provided his Toyota vehicle and field support to me on Martu country in 1988. The dedication is also to Martu *yakurti* (mothers) and *mama* (fathers) who returned to custodial lands to make safe homes for children and their grandparents and to hold their country for those past and future generations.

Photo ii John, Dianne and Melissa Walsh (right to left) net for *Gilgie* (Freshwater crayfish) on Murrum in the Murchison.

[1] *Kurarra ~ Acacia tetragonophylla*, Deadfinish with edible seeds; *Kogla ~ Leichardtia australis,* Silky pear with edible fruit, 'honey suckle' ~ *Eremophila* spp. with nectar; *bardi* grubs ~ edible moth and beetle larvae

Abstract

This ethnoecological study examines land uses by modern Martu Aboriginal people on their country. They occupy very remote settlements—Parnngurr, Punmu and Kunawarritji—in the Great and Little Sandy Deserts. In 1990, their country included Crown Lands and Rudall River National Park. The study investigated the proposition that the knowledge and practices of Martu were of direct relevance to ecosystem processes and national park management.

This research commenced in the wider Australian research context of the late 1980s – early 90s when prevailing questions were about the role of customary harvest within contemporary Aboriginal society (Altman 1987; Devitt 1988) and the sustainability of species-specific harvests by Australian indigenous people (Bomford & Caughley 1996). Separately, there was a national line of enquiry into Aboriginal roles in natural resource and protected area management (Williams & Hunn 1986; Birckhead et al. 1992).

The field work underpinning this study was done in 1986–1988 and quantitative data collected in 1990 whilst the researcher lived on Martu settlements. Ethnographic information was gathered from informal discussions, semi-structured interviews and participant observation on trips undertaken by Martu. A variety of parameters was recorded for each trip in 1990. On trips accompanied by the researcher, details on the plant and animal species collected were quantified.

Martu knowledge and observations of Martu behaviour are interpreted in terms of the variety of land uses conducted and transport strategies including vehicle use; the significance of different species collected; socio-economic features of bush food collection; spatio-temporal patterns of foraging; and, the ‘management’ of species and lands by Martu. The research found that in 1990, hunting and gathering were major activities within the suite of land uses practiced by Martu. At least 40% of trips from the settlements were principally to hunt. More than 43 animal species and 37 plant food species were reported to be collected during the study; additionally, species were gathered for firewood, medicines and timber artefacts. Customary harvesting persisted because of the need for sustenance, particularly when there were low store supplies, as well as other reasons. The weight of bush meats hunted at least equalled and, occasionally, was three times greater than the weights of store meats available to Parnngurr residents. Resources were procured from an area generally within 50 km of the settlements. High flexibility and opportunism characterised resource and land use patterns by Martu, these strategies are interpreted to be responsive to the extreme spatial and temporal variability of their desert environment.

‘Management-type’ concepts expressed by Martu were investigated. The study found one central concept associated with ‘holding and being held by’ (*kanyirninpa*) wherein Martu action was believed to be integral to ecological production. Whilst the study commenced with attention to species-specific sustainability of harvesting, it concluded that ecological sustainability must be viewed at organisational scales ranging from

localised species populations to wider ecosystem processes. Martu identified declines in the production of their lands but attributed this to factors other than hunting. Martu burn regimes and feral animal hunting ameliorated strong evidence for species declines due to over-harvest. The study speculated that Martu practices had differential effects with some of these slowing, if not stalling, declining biodiversity condition trends.

From 1990 to 2007, there was continuity of some Martu practices and major changes on their lands. Changes included land use intensification by non-Aboriginal people, attempts by Department of Environment and Conservation (DEC) to engage in joint management and increased urbanisation of Martu. Extreme trauma was experienced in Martu communities with escalating sickness and death rates. These changes put great pressure upon Martu individuals and their employees which constrained co-management opportunities.

The importance of Aboriginal customary harvest and associated activities remains poorly recognised in wider Australia (Altman 2004). This dissertation concludes that Martu knowledge and practice was not just relevant but integral to the management of Karlamilyi (Rudall River) National Park. However, profound differences between the objectives and procedures of Martu and DEC existed. But there were mutual interests including the land area, indigenous ecological knowledge, wildlife survey and burning regimes. Paradoxically, hunting was a subject of significant difference despite it being the principal activity driving Martu expertise and practice. There is potential for co-management in the National Park but it remains contingent on many factors between both Martu and DEC as well as external to them. The dissertation suggests practical strategies to enhance co-management.

TABLE OF CONTENTS

List of tables

LIST OF FIGURES

ACKNOWLEDGEMENTS

I thank the Martu people who are central to this thesis. Many of them generously shared experiences, knowledge and introduced me to their countries. Martu individuals who contributed to this research are named in Section 3.4. In particular, I acknowledge Lucy Gibbs (deceased), Rita Simpson, Mayipi Robinson (deceased), Nyapi Robinson (deceased), Patricia Peterson, Mack Gardener and Billy Gibbs (deceased). Those who have died passed away far too young. Whilst Martu individuals willingly shared expertise, concepts and ideas, the responsibility for the interpretation of these is mine.

This dissertation has taken longer than most to reach completion. My PhD enrolment at The University of Western Australia (UWA) commenced in 1990, I withdrew in 1994 to accept a stimulating and productive position at Central Land Council (CLC) for whom I worked to 2001. I birthed and mothered two children then re-enrolled as a part-time, external candidate in 2004. When one son unexpectedly died in 2005, I had to defer. Enrolment resumed in 2007. There are many people to thank along the rough road of this journey.

This research was initially encouraged by anthropologist, Bob Lawrence, of Western Desert Land Council (WDLC). His commitment and writings command my considerable respect; he is missed. My first introductions to Martu lands were when assisting archaeologist, Peter Veth. Other colleagues responsible for field work in various disciplines complementing this research included Sue O'Connor, Louie Warren, Bruce Veitch, Nic Thieberger, Michael Gallagher, Sue Davenport, Arpad Kalotas, Guy Wright and Ilan Warchivker. Field assistance specific to my research between 1987 and 1990 was provided by John Walsh, Tia Sharkar, Matthew Wrigley, Gil Craig, Peter Kendrick, and Gavin. Robert and Myrna Tonkinson and Jim Marsh shared their long experience on Martu lands.

The supervisors who supported my first enrolment were William Loneragan and David Bell (UWA Department of Botany) and Neville White (UWA Department of Psychology then LaTrobe University Department of Genetics and Human Variation). On my second enrolment, supervisors were David Trigger (UWA School of Anthropology and Sociology), Mark Stafford-Smith (CSIRO Sustainable Ecosystems and Desert Knowledge Cooperative Research Centre) and again Bill Loneragan (UWA School of Plant Biology). I appreciate the guidance and encouragement from them.

From 1990–93, I received a UWA PhD scholarship. AIATSIS and the UWA Department of Botany provided funds for fieldwork (Ch. 3.3). The UWA Schools of Social and Cultural Studies and Plant Biology and the Desert Knowledge CRC provided funds to support the completion of this dissertation in the second enrolment period. CSIRO allowed a period of leave without pay from my current position as Research Scientist (Ethnoecologist) in Alice Springs. Office space to write up the dissertation was provided by my family, UWA, CSIRO Alice Springs and Charles Darwin University (CDU) School of Social Policy and Desert Knowledge in Alice Springs. Marita

Thompson (CSIRO) provided library support. Lynn Day did copyediting and Vanessa Chewings compiled several of the maps with funds from the Desert Knowledge CRC. Ainsley Calladine voluntarily assisted in formatting the entire dissertation.

Refinement of ideas and information in discussion with past and present colleagues, some whom also commented on early draft chapters included (alphabetically): Carolyn Oldham, Colleen O'Malley, David Albrecht, Glenn Edwards, Jane Walker, Jeannie Devitt, Jo Caffery, Tony Cunningham, Jocelyn Davies, Jock Morse, Josie Douglas, Meg Mooney, Melinda Hillery, Michael La Flamme, Miles Holmes, Paul Mitchell, Peter Johnson, Peter Thorley, Ro McFarlane, Sue Davenport and Victoria Burbank I thank them and other colleagues at UWA, WDLC, CLC, CDU and CSIRO. Several publications have resulted from data presented in this study and earlier (Appendix 1). The invitations and interest of those who organised the conferences and/or edited volumes in which some of these papers are published was most encouraging.

My immediate and wider family and friends provided personal and logistical support. Especially, Allison Foster, Sally Mumford, Ruth Morley, Dianne Walsh, Melissa Walsh and Ilan provided childcare. To my son, Tahl, I trust you will be proud when your mum becomes, as you say, a doctor of people and plants. The times apart have been difficult for you.

I have two core hopes embedded in this dissertation. One is that the strength, adaptation and vitality of Martu people and their culture continues to be grounded in practice and knowledge of those vast and varied lands, their ecosystems and species. The other is that individuals in the Department of Environment and Conservation and other land management organisations will take personal responsibility to act ensuring genuine and equitable collaboration between Martu and themselves to strengthen ecological and cultural diversity.

STATEMENT OF CANDIDATE CONTRIBUTION

The thesis is my own composition and it acknowledges Martu, literature and other sources. No work presented within this thesis has been co-published with other authors. Collaborative research preceding this thesis has been appropriately cited to the co-authors (App. 1). This is a declaration to this effect, signed by me and also by my principal supervisor.

The thesis has been substantially completed during the course of enrolment in this degree at UWA and has not previously been submitted for a degree at this or another institution.

Fiona Walsh 8 December, 2008

Prof. David Trigger 8 December, 2008

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Photo 1.1 Nyapi Robinson returns from a hunting trip on foot with two Cats she has killed east of Parnngurr in 1990. During the study, Cats were commonly hunted by Martu to eat. Ecologists see Cats as a feral species contributing to the decline of native animals. This raises a paradox identified in this research that Martu hunting reduced the immediate abundance of hunted native and feral species but conversely may have slowed declines of native species biodiversity through the reduction of feral Cats.

1 INTRODUCTION AND RELEVANT LITERATURE

1.1 Main thesis and questions

This is an ethnoecological study of resource and land uses by an Aboriginal group, Martu, who occupied very remote settlements, Parnngurr, Punmu and Kunawarritji, on their lands in the Great and Little Sandy Deserts (Fig. 1.1 and 1.2).[2] These lands include Karlamilyi (Rudall River) National Park.

The core thesis posited is 'that the knowledge and practices of Martu have a direct relevance to ecosystem processes and national park management on their lands in the Sandy Desert region of Western Australia'. The three questions central to this dissertation are:

a) What were the land use and management practices and perceptions of Martu people in the study period (*circa* 1990)?

b) What was the likely ecological sustainability of these practices in view of changes in land use patterns and environmental condition?

c) What are the implications of these findings for the ecosystem management of Martu lands including Karlamilyi National Park in the recent past and today?

The above three principal questions loosely align to three research stages; the first question requiring data collection and analysis, the second raising speculations and hypotheses and the third examining the applicability of the findings. Underpinning these questions was consideration of the major continuities and changes in Martu resource use from pre-European times to the 1990 field study. Subsidiary questions open Chapters 4–8.

This is a trans-disciplinary study between the natural and social sciences, in an emerging discipline (ethnoecology), with a cross-cultural topic (Aboriginal–Euro-Australian) and across language differences. These features bring with them opportunities to tackle challenges and to make a unique contribution to understanding of Aboriginal people and environmental management in arid Australia.

[2] One definition of ethnoecology is "a multidisciplinary scientific field of study focused on the dynamic relationships between peoples, biota and the environment." (EWS 2003:1).

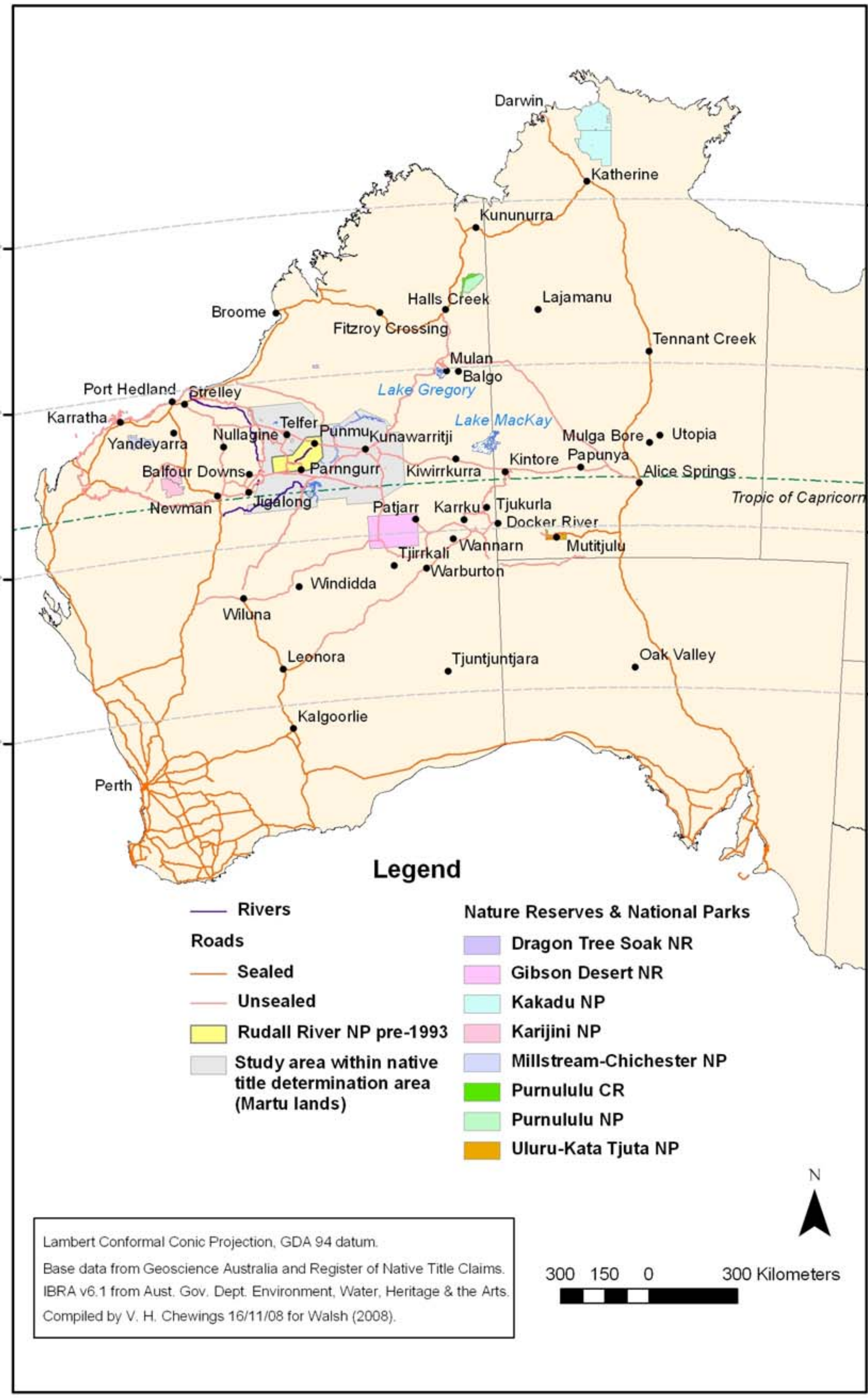

Figure 1.1 Location of study area on Martu lands in Western Australia and and interstate places noted in this thesis

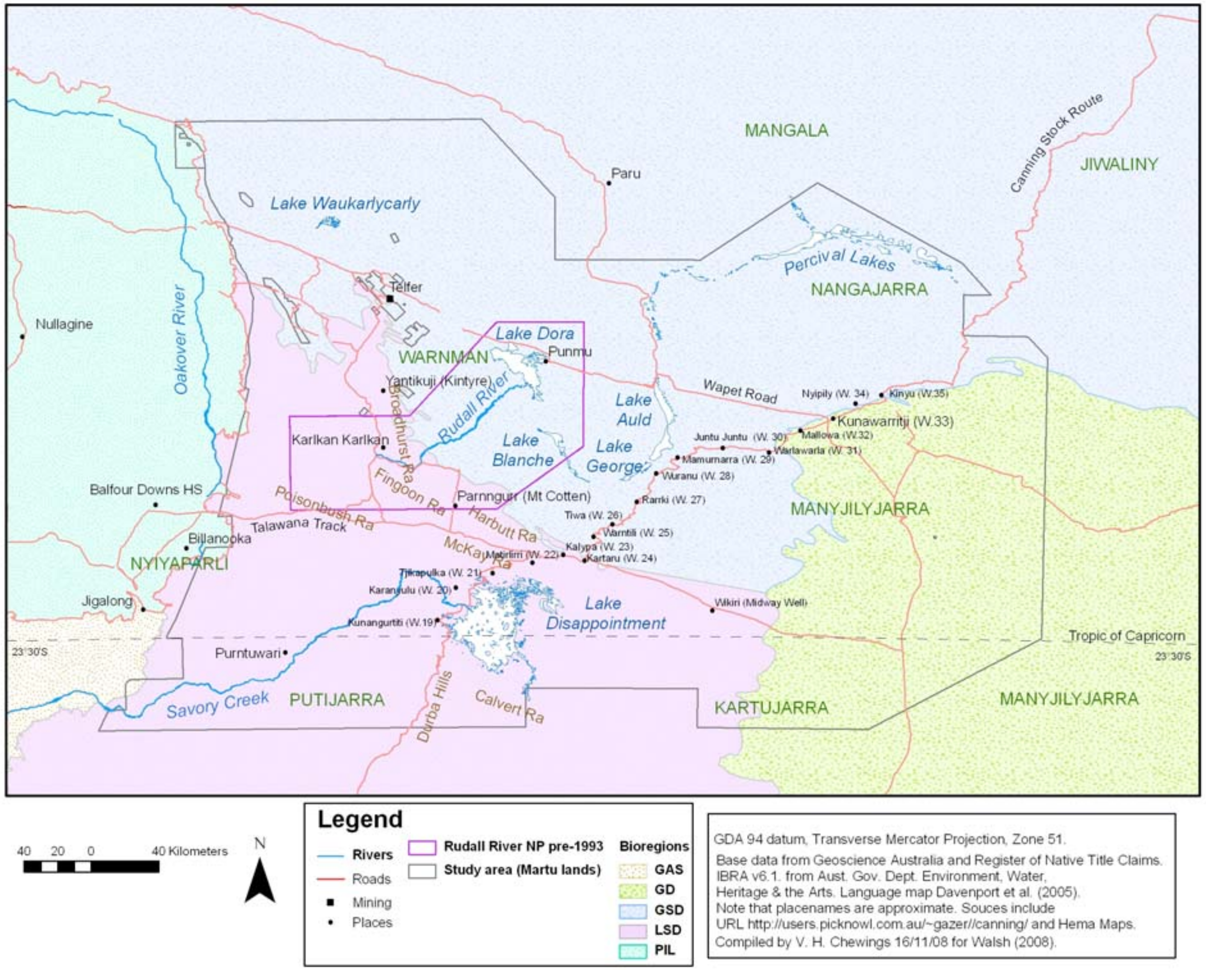

Figure 1.2 Location of Martu lands, settlements and study area with dialect areas of related groups

Bioregions defined in Figure 2.2

1.2 Chronology of field research and writing

It is important to clarify the timing of this dissertation. Table 1.1 gives the chronology of field and office-based research activities. Field research and preliminary writing was carried out in the late 1980s – early 90s and the dissertation writing completed in 2008.

Table 1.1 Chronology of researcher's field times and writing related to Martu-focussed research and this dissertation

Years	Main activities	Relevant outputs[a, b]
1986–1988	Intermittent field time supporting archaeological surveys and conducting ethnobotanical research (see Tab.3.1)	Veth and Walsh 1986 Veth and Walsh 1988 Walsh 1987 Walsh 1988 Walsh 1990 Walsh 1993
1989	Contract writing and socio-political support to Martu	Walsh 1989
1990–1994	PhD enrolment, field research (see Table 3.3), data collation; preliminary analysis and writing; PhD suspended due to Central Land Council employment	Bell and Walsh 1991 Yirapartu et al. 1992 Walsh 1992a Walsh 1992b Walsh 1992c Walsh 1995 Walsh 1994
2004–2008	PhD write-up resumed (part-time, external) then suspended for personal reasons then resumed 2007	

[a] References by Walsh and Walsh *et al.* in App.1; [b] Generally, this dissertation does not cite these papers because its content encompasses and extends them.

The field research was conducted in a socio-political context when Aboriginal people in desert homelands struggled to be recognised in Western Australia. Commissioned reports based on the research, refereed publications and community documents were produced before the dissertation was completed (Table 1.1). Then there were long delays in write-up due to employment and personal reasons. Two major consequences of these delays were, firstly, a substantial evolution in Australian literature and policy associated with indigenous land use and management and secondly, rapid changes in the socio-political and wider context of land uses and tenure on Martu custodial lands. For this dissertation, the research approach was shaped by the literature and context of Martu lands in and about or *circa* 1990.[3] An additional chapter (Chapter 9) was inserted to review relevant changes over 17 years. This dissertation is informed by older as well

[3] There is frequent use of the word '*circa*' throughout this dissertation because of the staggered time periods when the field research was conducted and the dissertation completed.

as selected recent literature. It has been challenging to incorporate literature into a dissertation written over a long time in rapidly developing disciplines. Fortunately, in the early 2000s, it was found that, despite significant national developments, the research remained germane especially because there had been little development in the management of Karlamilyi National Park.[4] Chapters 1, 9 and 10 are also informed by my professional work from 1993 to the present on Aboriginal lands and amongst Aboriginal people and organisations in central Australia.

1.3 A prologue: Three important events prior to 1990 that shaped the field research

1.3.1 'We are not *pujiman* any more'

> At Parnngurr, we were sitting on sand in the lee of a shed sheltering from cold desert winds, it was July 1987. A group of twenty or so Martu adults had gathered to discuss the work we had been doing in recent weeks. 'We' included a group of Martu, mostly women, and me, a visiting researcher. From my perspective, this work was to record plants used by Martu in past times—*pujiman* (bushman) days as Martu referred to it. From Martu views, this provided an additional reason to travel over country, collect *mayi* (food plants), and 'teach up' younger Martu and myself. Mayipi Milangka described to the meeting group where we had been, with whom and what we had collected. I then asked Martu present if I could continue my role as a researcher. Following discussion in Kartujarra with people in the group, the Parnngurr community chairman, Nyaparu Williams, said it was okay and that I should continue working with the women.[5]
>
> After the meeting, Lucy Purungu Gibbs intercepted me. She was a formidable Martu woman of strong presence and intellect; the wife of a recent chairman of the Martu regional representative body—Western Desert Land Council (WDLC). She raised a significant issue about my work. In paraphrase "[the research risked] dragging us backwards … we are not *pujiman* anymore … we still eat *mayi* and *kuka* (bush meat) but not that *pujiman* way. We have a car, we have a house, we go hunting." Her message was that I must consider the present day life of Martu. (FW diary 21/7/87)

Lucy Purungu made her comments in the context of concurrent research projects on Martu lands. There were two archaeologists, two anthropologists, two historians, a linguist and myself, an ethnoecologist, working in the region. These researchers had multiple motivations that included: contributions to their disciplines; support to Martu

[4] Karlamilyi is the Martu name for a long section of Rudall River. To English speakers, the Park was known as Rudall River National Park. Martu and their support staff persisted in reference to the park as the Karlamilyi region (e.g. Wright 1989). In the 2000s, Martu, government staff and visitors use either or both names. Adoption of the Martu name is significant in recognising Aboriginal custodians of the region. In this dissertation, Rudall River is used for the 1990 period as it was the more common name then Karlamilyi National Park is used when referring to the area post 2000.

[5] Kartujarra is one of the Martu languages (see Sect.2.2.1)

and their knowledge; and to gather evidence of the Martu land connection to their land[6]. At the time, the research orientation of six researchers was reconstructive, that is, it was about documentation of many facets of Martu life in past times—not the present. This was the basis of Lucy's frustration.

This remains a seminal event in the course of my field research. It marked a clear directive—to engage with what Martu were doing in the here and now. It had been unusual for Martu to initiate and assert direct comment on the work of *kartiya* (white people). The research direction demanded led to a focus on contemporary land use, consequently, greater attention to animals and hunting rather than plants and gathering.

1.3.2 The demand for Martu recognition and land tenure inside a national park amongst active mineral exploration leases

Martu had established their homeland settlements, Parnngurr and Punmu, on custodial lands in the early 1980s. Subsequently, they learnt that these lands were tenured as Rudall River National Park. Furthermore, they observed widespread evidence of active mineral exploration. Martu and Western Desert Land Council (WDLC) expressed an array of concerns about the processes associated with the park and mining. From 1985–1988 they sought recognition of their custodial rights, land tenure and a coherent government policy toward their residency in a national park amongst powerful mining interests (including CRAE/Rio Tinto who had located uranium deposits).

To further negotiations, Martu and WDLC invited the Western Australian State Premier, Peter Dowding, to their lands in August 1988. This was the first time a government leader had visited them. They had requested: the extension of an existing mining exclusion zone around Parnngurr and Punmu; a regional study to formulate mechanisms for relations between Aboriginal communities and mining companies; and tenure and a park plan of management. As an observer on the outer fringes of the meeting, I later wrote:

> Near Karlkan Karlkan soak on Karlamilyi river, about 30 Martu men emerged from overnight bush camps with their families to greet the Premier, Peter Dowding. The meeting place was also by an unsealed airstrip servicing Kintyre (the mining infrastructure by the uranium lease). The previous day a small delegation of Strelley people and Don McCleod had unexpectedly arrived in anticipation of the meeting. When Dowding's plane landed, Martu men and WDLC staff gathered at the strip. They sat in a solemn circle, listened to and spoke with the Premier. Discussions centred on the proposed study and the exclusion zone around Parnngurr and Punmu. The Premier wanted the zone to be removed then reinstated after exploration. He was unclear about the park's plan of management. At the meeting's conclusion, there were no commitments to the study, the zone or the park. The Premier flew off. Martu and WDLC staff disbanded in an atmosphere of resignation. Widespread cloud and cold rain suited the meeting's atmosphere. (FW diary 5/8/88)

[6] This was after the 1985 Seaman Land Enquiry when Aboriginal land tenure options were being investigated by WDLC and before the 1992 Federal High Court *Mabo* decision and national native title act (Tab. 2.5). Land tenure in the study region was vacant Crown Land and National Park.

In relation to the National Park, WDLC requested amendments to the Conservation and Land Management (CALM) Act allowing for joint management in parks, agreement for Martu to contribute to the Plan of Management for the Park and regulation of increasing tourism (Lawrence 1989:36).[7] Subsequent state funds for the requested study and background information for management strategies resulted in a comprehensive edited report, 'The significance of the Karlamilyi region to the Martujarra of the Western Desert' (Wright 1989). Herein began the task of accurately reporting on Martu use and management of natural resources and land within and beyond the Park (Walsh 1989).

The above meeting typified the impasse on Martu–mining–national park issues that persisted until the early 2000s. A consequence for this research was the recognition that co-management was strongly influenced by a wider political context in which economic priorities, particularly mining, took precedence. To early 2008, no joint management agreement or Plan of Management has been completed (Ch. 9), therefore, this thesis remains topical.

1.3.3 The Traditional Ecological Knowledge workshop

The above events were milestones. A particular workshop was an affirming point. Prior to it, I had always had a commitment to and involvement in nature conservation. However, my undergraduate and employment experience made few constructive links between people and environmental management.[8] Yet, eminent zoologist and natural history author George Schaller reflected my intuitive view in a quote I kept on my wall. In a classic text on the natural history of the Himalayas, he wrote:

> There is a tendency to think of ecological problems as scientific and technological when they are actually social and cultural. (Schaller 1980:99)

In March 1988, Dr David Bellamy[9] sponsored my attendance at a workshop 'Traditional ecological knowledge: wisdom for sustainable development'. This built upon developments by the International Union for Conservation of Nature (IUCN) Working Group on Traditional Ecological Knowledge. The roles of the Working Group and, by extension, the workshop included:

> to promote the use of traditional ecological knowledge and resource management practices as an effective basis for modern and sustainable resource management systems, and for nature and natural resources conservation (Williams & Baines 1993:1)

Other roles of the Working Group related to processes to record, monitor and apply this knowledge.

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[7] The Western Australian government Department of Conservation and Land Management (CALM) held management responsibility for National Parks. In 2006, the department was restructured and renamed Department of the Environment (DEC). In this dissertation, CALM is used for the 1990s and DEC is used when referring to post 2000.

[8] In the 1980s, the zoology, botany or anthropology courses at UWA did not address interrelations between animals, plants and people or their natural environments.

[9] An internationally renowned conservationist from the University of Durham, UK, who visited Western Australia in 1988.

As a fledgling ethnoecologist at the workshop, I met Nancy Williams, Bob Johannes, Neville White, Betty Meehan, Eugene Hunn and other prominent researchers. Their presentations, publications and approaches became highly influential upon my endeavours. Prior to the workshop, I had documented traditional Martu subsistence knowledge and perceptions, concentrating on plant species that were utilised and consumed in various ways (Walsh 1987). However, I had been working in academic isolation with only one biological colleague with cross-cultural experience (Arpad Kalotas). The workshop and concurrent processes stimulated questions about the 'management' of species, ecosystems and the applicability of Aboriginal knowledge to national parks and ecosystem management.

The workshop topics were pertinent in the Western Desert. From a Martu perspective, a national park occupied their lands or, from another perspective, Martu occupied a national park. I saw and accepted the park as an occupied, utilised landscape. However, I also considered parks to be landscapes that warranted focussed care and management. I was not sure if parks should be viewed as uninhabited wilderness and, even as an ecologist, I did wonder if management by people to maintain significant ecosystems was important.

1.4 Different perspectives on 'indigenous' land and wildlife management

The following sections of this chapter provide a literature review. Initially, this review introduces some of the dualities that shape perspectives on 'indigenous land management'. Subsequent sections are structured around the dissertation's three central questions (Ch. 1.1). Within the sections, tables condense some relevant literature. The introduction and conclusions to later chapters present more detail from the literature.

This thesis falls within a broad field now termed 'indigenous land and wildlife management' (Baker et al. 2001)[10]. The field is emerging from disciplines such as geography, ecological anthropology, linguistics, environmental history, economic anthropology and ethnoecology. Conventionally, non-indigenous peoples have done these studies. Obviously, the relations between Aboriginal people and their lands exist without disciplinary tags; to certain Aboriginal people it is their way of life—idealised or actual.

A constant challenge is to recognise and understand the cross-cultural perspectives on 'indigenous' land management. This is true even in a literature review. Who is writing? Interpreting which people? With what personal filters and motivations? 'Indigenous' land management has many dimensions, some shaped by the speaker's or researcher's

[10] In this dissertation, 'indigenous' is used in reference to international examples or Australian Aboriginal and Torres Strait Islander examples; 'Aboriginal' is more commonly used or, better still, the local dialect group or individual within it.

perspective. For example, Davies et al. (1999:4) defined ‘traditional indigenous wildlife management’ as:

> the system of rights and responsibilities for the use and management of wildlife and habitat that derive authority from indigenous customary laws, and that have their origins in practices that predate the European occupation of Australia

By contrast, anthropologist and Yanyuwa translator, John Bradley wrote:

> For many indigenous people there is no separation between the environment and the person therefore such terms as management and control over the landscape can have very different understandings amongst Aboriginal people (Bradley 2001:295).

Bradley reminded readers that the Western tradition of land management and associated concepts is a Western construct. He argued that a concept of ‘negotiation’ was a better representation of Yanyuwa views of their interrelations to the animate elements of their land and seascapes. A third writer might define ‘indigenous land management’ to include the tenure, governance structures, policies and funding that shape it in the 21st century.[11] Different perspectives bring different views on ‘indigenous land management’.

A conceptual illustration of contrasts between Aboriginal and non-Aboriginal views and the filters each has of the other was presented by Downing (2002). Reverend Jim Downing published Figure 1.3 after 40 years of cross-cultural collaboration. In recent years, I have seen his powerful image resonate with Aboriginal and non-Aboriginal audiences.

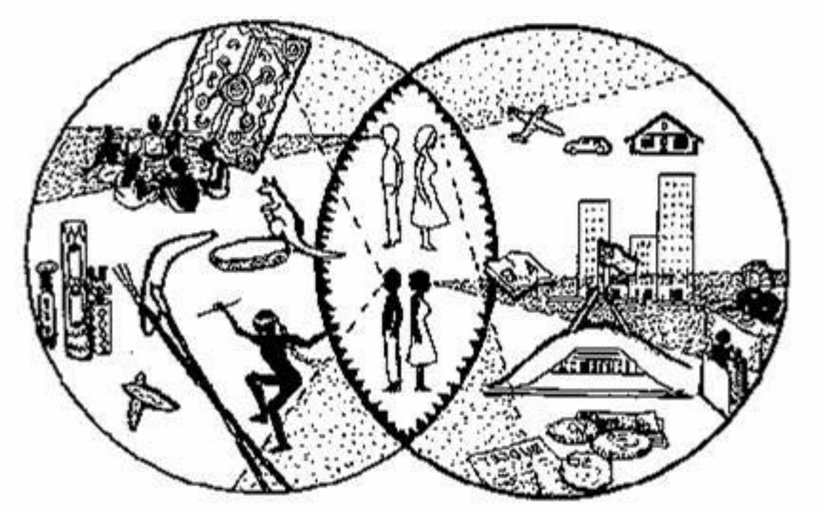

Figure 1.3 Between two worlds: Aboriginal and non-Aboriginal views of their own world and the world of the other (Downing 2002:108)

[11] Whilst findings of this Martu study are in agreement with Bradley’s interpretation, I have persisted with the term ‘management’ because of its widespread acceptance amongst non-Aboriginal people. Land ‘negotiation’ could be misunderstood particularly in relation to cross-cultural tenure negotiations. Thus, Western perspectives on indigenous management—as a one-way process where people apply practices to the land to make it productive so that they can extract resources—need to be expanded to include the notion of ‘negotiation’ with an animated landscape (Ch. 8).

Figure 1.3's first purpose is to emphasise the different elements contained within Aboriginal and non-Aboriginal world views. The contrasts between world-views are particularly strong where the contact history of Aboriginal groups has been relatively recent and where people speak Aboriginal languages as a first language; these two features characterise the Martu study area. In this dissertation, the major emphasis is upon description and analysis of a Martu 'world view' (Ch. 4–8). Then there is preliminary interpretation of the Martu view of 'national parks', a non-Aboriginal construct, that is, Martu interpreting 'the other' (Ch. 8–9). What Figure 1.3 does not show is how the Aboriginal and non-Aboriginal ecological-views interact and adapt over time. Whilst this has been the subject of anthropological research (Chase 1980), it has received little attention within socio-ecological studies. One topic of exception is descriptions of Aboriginal views on animals recognised by scientists to be 'introduced' or 'feral' (Rose 1995).

Figure 1.3 also indicates how the 'beam' of the on-looker or 'outsider' can see only select elements within the 'other' culture. In Australia, non-indigenous people have done the majority of writing about indigenous people. What is written as defining, comprising or being a priority in 'indigenous' land management is shaped by the author's lens. Generally, the beam is wider when the author speaks a local language or has been immersed amongst a language group for a long time. This provides interpretations that are richer, more complex and closer to local Aboriginal realities. A reader of literature about 'Aboriginal people' constantly needs to recognise it written through the lens of someone from another culture and make qualitative judgements about the veracity of interpretation.

Neither Figure 1.3 nor 1.4 shows how discrete cultural domains interact and adapt over time. The intersection between cultural domains is a subject of recent attention within 'indigenous' land management and related research. Anthropologist, Diana James (2005) examined it in her elegant doctorate which juxtaposed A<u>n</u>angu and *piranpa* interpretations of cultural and natural resource management (CNRM) on Pitjantjatjara lands.[12] Fluent in Pitjantjatjara, James compared and contrasted racial perceptions in broad themes associated with ontological, social, economic, ecological and personal spiritual domains of life. It was from within a 'trans-cultural' space mediated by individuals skilled in crossing between cultures that she argued a synthesis of CNRM could emerge. It is likely that, in the near future, we will see greater research into the inter-cultural domain and the perceptions and actions of those who mediate, negotiate or broker across it.

In Australia, the reporting on so called 'indigenous land or natural resource management' is often actually about 'cross-cultural natural resource management' occurring on indigenous-held lands and seas. In the future, progress will be made when there is clearer specification of whose perspective is presented and whose is dominant.

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[12] *A<u>n</u>angu* ~ Aboriginal people of the Pitjantjatjara and neighbouring lands; *piranpa* ~ white people, non-Aboriginal person

The purpose of introducing these previous references and Figure 1.3 is to show readers, particularly scientists, that very different perspectives prevail in cross-cultural research, literature and within the increasingly cross-cultural areas of land and wildlife management. I will now return to interpretations of ‘indigenous’ land management, recognising that these come predominantly from Euro-Australian people.

1.5 Major themes in literature on Aboriginal land management

Just as there is variety in skills and experience amongst non-Aboriginal researchers, there is no single Aboriginal view. An important observation of several major indigenous land management publications is the diversity amongst Aboriginal people in their context, ambition and experience (Woenne-Green et al. 1994; Baker et al. 2001). Below, I draw predominantly upon literature from people who live in regions considered ‘remote’ rather than urban and rural regions of Australia.[13] Furthermore, it concentrates upon desert over tropical studies and terrestrial over marine studies.

To 1990, major sources of literature related to contemporary Aboriginal natural resource use were studies principally within the traditionally-orientated Aboriginal domain. These included Chase and Sutton (1981), F. Rose (1987), Altman (1987) and Devitt (1988). They built upon earlier ethnographies of Aboriginal life at early contact which invariably included descriptions of local economies thus natural resource use (e.g. Strehlow 1947; Thomson 1975; Tonkinson 1978, 1991; Myers 1986; Berndt & Berndt 1992; Tonkinson 1991; Rose 1987). Archaeological studies contributed to the reconstruction of Aboriginal economies and interpretations of material culture by observation of current practices (e.g. Gould 1980; Meehan 1982; Cane 1984; Cane 1987; Veth 1993).[14]

One common theme had been the interplay between environmental determinism and manipulation of the environment. Put crudely, were Aboriginal people simply passive players within an environment that set tight constraints or did they extend and modify environments to suit themselves? The seminal volume ‘Resource managers: North American and Australian hunter-gatherers’ (Williams & Hunn 1986) compiled evidence and initiated an argument for the latter.

Contributors to Williams and Hunn (1986) presented strategies applied by various hunter-gatherer groups employed to both manipulate their resources and control their human activities. This book marked a key turning point in research for three major reasons: it argued that hunter-gatherers were active ‘managers’ of resources and their landscapes; secondly, it suggested Australian ecosystems were more shaped by Aboriginal people than previously recognised; thirdly, it dared to posit that Western

[13] This is, again, an issue of perspective, as a Parnngurr person perceives Canberra to be ‘remote’ and themselves to be in the heartland.

[14] There is circularity in certain Martu-related references cited in this dissertation (e.g. Tonkinson 1991, Veth 1993) because these drew upon the research reported here but were published earlier (see footnote 4).

conservationists and land managers could learn from Aboriginal people. A notable outcome was that it expanded the preoccupation of Australian anthropologists from Aboriginal spiritual concepts and social systems to environmental aspects of Aboriginal life.

Independent of Williams and Hunn (1986), complementary arguments were published by Latz (1982a), [15] Kimber (1983; 1984) and their central Australian colleagues. They were writing in the context of many traditionally-orientated groups involved in the homelands movement, partly facilitated by land claims under the Aboriginal Land Rights (NT) Act (1976). The potential of those lands to support modern Aboriginal economies based on wildlife use was the subject of several investigations (Latz & Griffin 1976; Cane & Stanley 1985; Latz & Johnson 1986). In central Australia, biologists dominated this attention to Aboriginal resource use and management. They were preceded by detailed documentation such as Finlayson (1935) and followed by Newsome (1980), Burbidge et al. (1988), Baker et al. (1993) and others.

Geographically, the relative independence of the national and central Australian research developments is interesting. In Australia prior to c. 2000, there was a scattering of isolated studies across multiple disciplines with little intellectual cohesion or common theoretical frameworks. This scatter partly reflected the high localisation of Aboriginal identity (Chase 1980). In the 1980s – 90s, regional Aboriginal organisations emerged and strengthened, so that comparisons within regions commenced (e.g. Cane & Stanley 1985). Young et al. (1991) undertook one of the first national reviews of contemporary Aboriginal land management and one consequence was a stronger linking of regional issues to the Australian federal government.[16] This dissertation later suggests that these shifts from local to regional to national processes has contributed to greater 'institutionalisation' of Aboriginal land management and increasing dominance of Euro-Australian agendas in 'caring for country' on Aboriginal lands (Ch. 10).

From 1990 to the early 2000s, there was a substantial increase and diversification of studies related to the use and management of Aboriginal lands from local to national scales. Important national reviews have been Young et al. (1991), Birckhead et al. (1992). Smyth (1993), Woenne-Green et al. (1994), Davies et al. (1999), Baker et al. (2001) and Zeppel (2003). Significant regional reviews have included SAMLISA (2000), Walsh (2000) and NLC (2006). There are also many examples of local or language-area review reports (e.g. Breckwoldt et al. 1996; McFarlane 2001). Table 1.2 collates the major issues or themes identified in publications reporting at different

[15] Published as the book 'Bushfires and bushtucker' in 1995

[16] This was through more deliberately targeted funding within the National Landcare Program to Aboriginal people or at least their representative organizations. This land management funding has expanded and diversified into many programs.

geographic scales *circa* 2000.[17] This provides an overview of the different facets of Aboriginal land management, thus positioning this dissertation in the context of major issues.

Table 1.2 reveals that issues associated with hunting and gathering, bush food or subsistence wildlife harvest were a high priority for Aboriginal groups at local scales in the arid zone through to national scales. Other commonalities across the scales included employment, roles for young people, water resource management, infrastructure development, vertebrate pest management and traditional ecological knowledge (or cultural maintenance and teaching young people). McFarlane (2001) and Walsh (2000) collated information from groups who held titles to most of their lands, thus land tenure and governance issues were not stipulated (by contrast to Baker et al. 2001).

Protected area management was identified as an issue at national scales but not at local or regional scales. Ngaanyatjarra and CLC lands both encompassed nature reserves or national parks. It would appear that parks and protected areas were, at the time, low on the local and regional agendas of Ngaanyatjarra and central Australian Aboriginal people despite being high on national agendas (and Aboriginal organisations elsewhere). Notably, Indigenous Protected Areas where not identified as discussions about them were at a preliminary stage.

In relation to this thesis, Table 1.2 indicates that an understanding of Aboriginal land uses including customary harvest and traditionally-derived practices remained pertinent in reviews from local to national scales. Whilst ecological sustainability was unspecified as a major issue, it was implicit in relation to ‘concentrated impacts’ and was discussed in a dedicated section in McFarlane (2001) and also in Baker et al. (2001) as ‘environmental degradation’. One impression from scanning these major themes is an overall emphasis upon practical, applied aspects of Aboriginal land management. There was no identification of the need for plans, policy, reviews or other administrative processes often intended to support ‘land management’.

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[17] Reviews were selected as those that had readily identifiable themes and, for the local and regional scales, those that were most comprehensive, close to Martu lands and recent. McFarlane (2001) was compiled by the Ngaanyatjarra Council Land Management section planner based on previous reports, oral histories and discussions with the Council and some of their constituents. As coordinator of the Central Land Council Land Assessment and Planning section, I compiled Walsh (2000) based on information gathered by nine staff from 200 Aboriginal people from about 10 dialects and settlements between 1996 and 2000. This information was quantified into a list of ‘land issue priorities’; the top ones are presented. Ngaanyatjarra Council represents 2000 people, CLC 17,000 people hence the scale distinction. The major categories of Zeppel’s (2003) bibliography and ‘prime issues’ identified in Baker et al.’s (2001) introductory chapter are tabulated.

Table 1.2 Major Aboriginal land management issues reported in recent reviews at local, regional or national scales

Scale	Local	Regional	National	National
Title of review	Ngaanyatjarra lands—land management needs analysis Key issues' chapter	Land use & management issues identified by Aboriginal people in central Australia	Indigenous wildlife management in Australia: a research bibliography	Working on country Managing country: an overview of the prime issues chapter
Author	(McFarlane 2001)	(Walsh 2000)	(Zeppel 2003)	(Baker et al. 2001)
Main themes in each review	Core land based activities: cultural maintenance, gathering & hunting Protection of sites Vehicles, roads & tracks Non-Yarnangu access to country Community design, landscaping & health Employment Maintenance of rockholes & soaks Maintenance of bores along roads & at outstations Outstation development & projects on homelands Groundwater resources Effects of concentrated impacts around communities Fire & biodiversity Vertebrate pests & weeds	Employment in land based activities Maintain Laws, sites & ceremonies Collect hunt & manage bush foods, medicines etc Teach young people Maintain burning & water sources Pastoral and cattle management Community infrastructure & services Vehicles Training, representation & cross-cultural exchanges	Fauna surveys (traditional ecological knowledge) wildlife research Threatened species recovery Control feral animals, quarantine Fauna reintroductions & translocations, captive breeding Habitat maintenance (traditional ecological knowledge) Indigenous Protected Areas Subsistence wildlife harvests (traditional ecological knowledge) Commercial wildlife harvests & hunting	Regional imbalance (spatial unevenness in indigenous rights to land & resources due to land tenure, land histories & state politic, restricts indigenous people (in urban & agricultural areas) Coexistence (native title negotiations, overlapping claims, joint management in national parks & protected areas) Demography & resource rights (indigenous population, high growth rates, mobility & country links, urbanization) Impact of colonial history (personal links to country persist despite assimilation) Environmental degradation (native species loss, weeds, feral animals) Diversity, difference & management of country (roles of men, women, younger & older people, communication methods)

Table 1.2 does not mention two nationally important and recent developments. Firstly, land management-related programs within Aboriginal organisations (e.g. land councils) expanded in the late 1990s and subsequently Aboriginal ranger groups were established. The omission of ranger groups reflects the recent establishment of less than five in arid Australia (e.g. Lajamanu-Wulaign rangers c. 2002). In desert regions, these groups remain particularly vulnerable to staff and funding changes, whereas in northern Australia they are better established (White 2002; Storrs 2003). Secondly, macroeconomic arguments for government and private support to, or contracting of, Aboriginal land management have become increasingly sophisticated, including market-based instruments (Smyth et al. 2007) and Payment for Environmental Services (Luckert et al. 2007).

All authors cited in Table 1.2 were non-Aboriginal people collating and interpreting the priorities identified by Aboriginal groups at different scales. This process applies various lenses or filters of perception. The priorities thus arrived at may have been different to those identified by Aboriginal individuals or Aboriginal groups themselves. Factors of cultural perspective, geographic scale and integration with national issues shape priority settings for both research issues and applied management.

In synthesis, 'Aboriginal land management' in Australia now encompasses a diverse suite of issues that vary in priority from local to national scales and according to whose perspective predominates. Community development, biological conservation and, increasingly, economic diversification motivations have underpinned these issues, as expressed from non-indigenous perspectives. In the 2000s, subsistence or customary harvest remains one of those issues, as do ecological sustainability and protected area management. The following sections look more closely at literature associated with these three issues which align to the three central questions of this dissertation.

1.6 Literature on indigenous ecological knowledge systems in Australia

Indigenous ecological knowledge (IEK) is a major research topic internationally and increasingly in Australia.[18] My definition is of IEK as a system of knowledge and practice that is orientated toward ecosystem management and/or cultural revival to maintain the bio-cultural diversity upon which people's livelihoods are based. IEK underpins much of this dissertation, but here it is addressed only briefly relative to its scope.[19] Notably, in 1990, the terms 'traditional ecological knowledge' and 'ethnoecology' were not in common parlance in Australian research. In the past two decades, recognition of the terms and associated concepts has broadened. However, studies remain disparate and there seem to be few overarching theoretical frameworks for IEK research.

[18] Also called 'customary', 'local', 'indigenous' or 'Aboriginal' ecological knowledge

[19] An earlier draft of this chapter had 14 pages reviewing indigenous ecological knowledge literature!

There have been several major international reviews of IEK published (e.g. Nazarea 1999; Ruddle 2000; Berkes et al. 2000) and unpublished by professional groups (e.g. EWG 2003). In Australia, there have been few national reviews (Williams & Baines 1993) and several regional reviews (Horstman et al. 2003; Johnson 2006; Hill & Smyth 1999). By contrast, there have been many local studies across the sub-disciplines and applications associated with IEK. There is a strong need for a contemporary national review of IEK systems in Australia.

Three broad purposes to Australian IEK research can be synthesised. Firstly, the application of IEK in relation to ecosystem management; this has been the orientation of the issues and priorities listed in Table 1.2. Secondly, IEK has been transmitted and documented to help maintain or revive the intellectual capital and cultural wealth of Aboriginal and Torres Strait Islander peoples. Thirdly, IEK has been studied to provide an alternative knowledge source that complements Western science and, in some cases, identifies natural resource-based economic development opportunities. For the second point, there has been a strong sense of urgency due to the deaths of cultural experts and strong threats to indigenous languages in which ecological knowledge is encoded (McConvell & Thieberger 2001).

Cross-disciplinary research characterises much IEK transmission and documentation with linguistics, anthropology, history, economics as well as biology being important. Several publications have focussed upon ethnobiological research methods (Cunningham 2001; Nesbitt et al. 2001; Horstman & Wightman 2001). Engagement between indigenous experts and non-indigenous professionals has characterised much of the IEK research and application in Australia. There has been a trend from researchers engaging indigenous ‘informants’ toward stronger collaborations, some exclusively amongst indigenous people.

In Australia, there has been a particular emphasis upon the moral and legal dimensions of IEK associated with its inherent intellectual and cultural property rights (Williams 1998). This has been in a context of strong rights advocacy, insufficient recognition of indigenous sources of knowledge, bioprospecting without fair agreements, inadequate benefit sharing and limited if any governance of research processes by indigenous groups. This context has resulted in the rapid evolution of policies and protocols guiding collaborations involving indigenous knowledge.

Indigenous knowledge has parallels to most fields associated with ecological study including ethnobotany (Clarke 2003), ethnomycology (Kalotas 1996), ethnotaxonomy (Bradley et al. 2006), ethnoentomology (Tindale 1966), fire ecology (Russell-Smith et al. 1997). species specific biology (Kean 1991), spatial geography, and climate systems. However, generally these studies do not portray the connections between each other and their integration within the ontology of indigenous knowledge systems. By contrast, Aboriginal authors tell of an integrated IEK system (e.g. Neidjie et al. 1985; Rose et al. 2002).

This system has been most vividly conveyed through Aboriginal art and story. The natural environment and species within it have been major subjects of these creations (e.g. Sutton 1988; Rockman & Cataldi 1994). The interweaving of elements of land, people and Dreaming domains typifies Aboriginal paintings and verse, especially those from traditionally-derived contexts such as desert Australia. In 1990, a simple concept I had of the relation between these domains is presented in Figure 1.4. It is these domains and their elements that sit within the 'Aboriginal' side of Figures 1.3 and 1.5. This dissertation concludes with a far more detailed representation of the elements within these domains (Fig. 10.1).

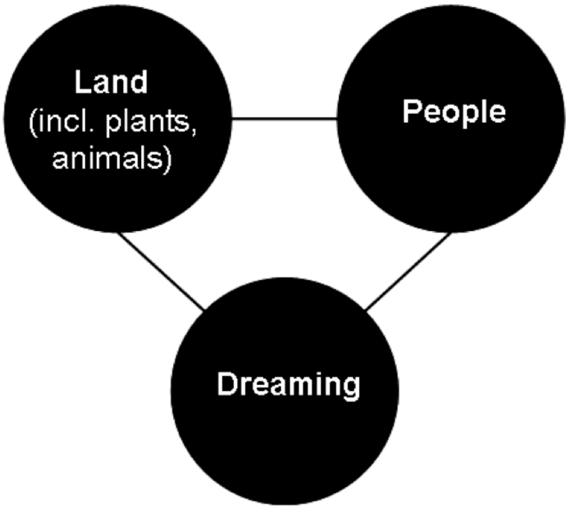

Figure 1.4 Simple representation of major domains within an Aboriginal world view and positioning of plants and animals within it

As with western science, there are limits to the veracity and applicability of IEK, especially within cultural groups or ecosystems undergoing rapid change. Ideally, a complementarity between indigenous and western scientific knowledge systems can balance the limitations. How to more consistently achieve this complementarity is one of the major questions asked internationally and within Australia. The concluding chapter of this dissertation summarises some of the significant challenges in achieving this complementarity and proposes ways to bridge knowledge systems within an applied practical setting. Other major questions relate to the adaptiveness and resilience of IEK systems. Amongst older indigenous people, a major question lies in how to give value and relevance to IEK in the eyes of their youth and facilitate its intergenerational transfer.

Aboriginal knowledge is a vital aspect of protected area and park co-management (Ch. 1.9). The critical issue is how to better incorporate Aboriginal practices into national park, protected area or ecosystem management. This echoes the third question of this dissertation, which examines the applicability of the findings on Martu land use, subsistence and 'management' to park management.

1.7 Literature on customary harvest and land management practices by post-contact Aboriginal people in remote areas

Hunting, gathering and subsistence wildlife harvest were identified as a high priority issue from local to national scales (Tab. 1.2). However, from 1980 to 2007 there have been only four major studies of these practices in the arid zone despite 20,000–30,000 Aboriginal residents and the high geographic and socio-economic diversity. Prior to my research, there had been only three intensive studies of customary harvest practices by desert groups with traditionally-oriented lifestyles (Cane & Stanley 1985; Devitt 1988; Palmer & Brady 1991). These considered the persistence of hunting and gathering within wider Euro-Australian contexts dominated by non-indigenous land uses and systems. By contrast, research into the subsistence activities of tropical Aboriginal groups has been more common (Chase & Sutton 1981; Meehan 1982; Altman 1987; Povinelli 1993; Russell-Smith et al. 1997).

In a descriptive study, Cane and Stanley (1985) reviewed the variety of land uses and natural resources utilised by residents in remote outstations and larger settlements in the Western Desert (excluding Western Australia) with a particular focus on the general economy of the settlements. They found that hunting and gathering persisted as a local land use. They reported that bush foods were of minor to moderate importance at 30 of 32 outstations (based on estimates of 10–15% or 20–30% of food eaten, respectively). The occurrence and characteristics of 'European' land uses (mining, grazing, tourism) on Aboriginal lands was also reviewed. They painted a bleak economic forecast for Aboriginal settlements and outstations, with low employment, reliance on government welfare and the need for substantial grants to support European-derived activities. They predicted the persistence of hunting because of people's need to supplement their incomes and because of nutritional, cultural and recreational advantages.

Devitt (1988) undertook detailed anthropological research over 18 months into subsistence practices amongst women occupying three small outstations in the Utopia region (Fig. 1.1). She questioned the roles of eastern Anmatyerr women under changing socio-economic conditions, particularly where foods were sourced from store rather than just bush supplies. She found that women's hunting and gathering production continued to make vital contributions to settlement life. This was despite the replacement of native seed with store-bought wheat flour. Seed food harvest, preparation and cooking had once constituted a major component of women's work. Foraging complemented women's substantial roles in food preparation, childcare and other domestic responsibilities. Hunting and gathering was central to the personal and cultural identity expressed by Anmatyerr women.

A four-week study by anthropologists Palmer and Brady (1991) concentrated upon the consumption of foods by southern Pitjantjatjara at Oak Valley and its potential health implications associated with radioactive fall out from atomic tests at nearby Maralinga. Bush meats were found to be collected in substantial quantities. They identified multiple points and pathways when people ingested quantities of potentially radioactive dust. In the arid zone, Peterson (1978 496) had earlier synthesised Aboriginal subsistence patterns to give context to reports on people's health status. Other subsistence studies with quantitative data tested optimal foraging strategies associated with plant collections by Alyawarre people (O'Connell & Hawkes 1981; O'Connell et al. 1983).[20]

Two relevant comprehensive tropical studies were Altman (1987) and Povinelli (1992; 1993). The former is an account of the economic anthropology of Gunwinggu peoples in Arnhem Land and the latter a social anthropology amongst Belyuen people west of Darwin. Altman and Povinelli focused on men and women's activities respectively; each is rich in descriptive and quantitative information. Both studies revealed that subsistence was central to the lives of outstation residents. Altman's research over nine continuous months identified hunting to be a major economic activity of people based at Momega. Povinelli (1992, 1993) analysed the shaping of personal identities by women who lived on the Cox Peninsula. Her complex study explained multiple ways in which women's personal and collective identities and social inter-relations were shaped in the course of foraging. Although bush foods comprised only a minor portion of Belyuen people's total diet, the practices associated with harvest had a major influence upon women's sense of purpose and wellbeing. This was despite a long contact history, English as a first language and close proximity to Darwin city.

On Martu lands, the contemporary significance of hunting and gathering had been undocumented prior to this 1990 research. Field observations in the late 1980s indicated customary harvest occurred but there was no evidence of the species collected, the quantities procured or their contribution to the diet relative to store goods and other features that explained the role of customary harvest in Martu life. Cane and Stanley (1985) had shown high variation in the role of subsistence from settlement to settlement. This dissertation sought to extend the arid zone studies.

Methodological decisions needed to be made in the course of this research. Like Meehan (1982), Altman (1987), Devitt (1988) and Povinelli (1993), this study relied upon participant observation as the major data collection method (Ch. 3).[21] It was necessary to identify variables that measured aspects of subsistence activity. These could then be extracted from the detailed primary records kept of Martu activities. Table 1.3 collates variables quantified in subsistence studies of Australian indigenous peoples. This Table also provides a useful overview of subsistence studies and their purpose. It complements Table 1.4 which collates variables used for ecological studies of customary harvest.

[20] The spellings for Aboriginal language names can vary over time due to orthographic changes (e.g. Alyawara v. Alyawarre, Arunda v. Arrernte); where a reference uses an old orthography I have retained it but elsewhere have used current orthographic spellings for the language name.

[21] Notably in the 2000s, there has been a shift in ethnographic method from observation of local people by visiting researchers (participant observation) to semi-structured interview, experimental harvests and/or use of locally-derived harvest records. Researchers now tend to spend less time 'in the field'. An advantage of participant observation was that it could distinguish between what people actually did with what they said they did.

Table 1.3 Research purpose and variables used to quantify species use by Australian indigenous people to contribute to social, economic or dietary studies

Purpose	Measure	Variables	Language group; relevant taxa	Reference	Equivalent variable in this Martu study (but sometimes different purpose)
investigation of optimal foraging theory including patch choice	energy returns by foraging event energy returns by forager hour	energy (kcal) per species kg, gathering plus processing time for each species (hr), total energy in resources gathered per collector, total search time within patch, total gathering time per collector for all resources gathered, total processing time per collector for all resources gathered, kcal/forager/hr	Alyawara; plants	(O'Connell & Hawkes 1983:108)	
relative returns on different species	species energy return per time	collecting and processing times (h/kg), energy value (kcal/kg), (kcal /hr)	Alyawara 8 plant species	(O'Connell et al. 1983:85)	
subsistence patterns of shellfish collection	frequency of shellfish gathering	nos days shellfish collected, percent nos days (%) per month, moon phase	Gidjingali	(Meehan 1982:65)	Ch. 4
patterns of shellfish collection for comparison to midden sites	gross weights contributed by shellfish species to overall harvest each month	percent weight each species per month	Gidjingali 29 shellfish species	(Meehan 1982:77)	Ch. 5 (for field period and year not month)
hunting performances of men and women compared	species specific collecting from home bases; trips, weights, distances and times	nos of trips from settlement, species weight collected (kg), distance walked (km), time collecting (hours)	Gidjingali Tapes hiatana	(Meehan 1982:126)	Ch. 6 (between women harvesters not women and men)
relative returns by gender from subsistence production over a year	-	males vs females, kilocalories, protein per month	Gunwinggu	(Altman 1987:40)	
replacement value of subsistence foodstuffs	-	bush food category, market proxy, weight, average price as proxy value ($)	Gunwinggu	(Altman 1987:50)	

subsistence work effort	-	average hours of subsistence work effort per day, individual band members, month	Gunwinggu	(Altman 1987:109)	
relative values of bush foods and purchased foods compared	daily per capita bush food and store food consumption	total weight (g), percent weight (%), energy (kJ, %) and protein (g, %)	Anmatyere	(Devitt 1988:85)	Ch. 6
nutrient returns from foraging	foraging returns from 3 settlements	total weight (kg), mean rate (kg/work hour), total energy (kJ), mean energy rate (kJ/work hour), total protein (g), mean rate (g/w hour)	Anmatyere	(Devitt 1988:102)	
change in women's work from pre-contact to contemporary	cost/returns from seed processing compared to flour availability	rate (hour/kg), energy value	Anmatyere	(Devitt 1988:139)	
dust and contamination risks from bush food in atomic test area	daily per capita bush food and store food consumption	average weight per person per day by each item	Pitjantjatjara	(Palmer & Brady 1991:5)	
market replacement value for bush harvest / imputed income	-	net kilos of food taxa harvested, dollar value equivalent	Kuninjuku	(Altman unpubl. a:6)	

Table 1.4 Research purpose and variables used to quantify harvest by indigenous Australian people to contribute to ecological sustainability assessments[1]

Purpose	Measure	Variables	Area and relevant species	Reference	This study equivalent Ch. or table
change in total catch over time	annual landings of a species	years, study time period, nos individuals caught	Torres Strait Islands; Dugong	(Johannes & MacFarlane 1991:47)	
change in total catch over time	catch rates	island, year, annual rate, annual rate per capita	Torres Strait Islands; Green turtle	(Johannes & MacFarlane 1991:67)	
species catches	species proportions	total weight each species, month	Boigu Island; Dugong, Turtle, fin fish	(Johannes & MacFarlane 1991:169)	Ch. 5
inventory and fate of species for local customary consumption or local trade	-	taxa, whole weight (kg/yr, % kg/yr), kg/yr to commercial, traditional, exchange, pigs/waste	Yorke Island; ~70 spp	(Poiner & Harris 1991:121)	Ch. 5
commercial catch monitoring	effort value over time and landings	boat days, per quarter over 7 years, catch (kg)	Yorke Island; Lobster, Mackerel, Trochus	(Poiner & Harris 1991:123)	
relative importance of different species (traditional + commercial)	weight and consumption	weight, % kg, gm/person/day (range)	Yorke Island; Dugong, Green turtle, fish, other	(Poiner & Harris 1991:139)	Ch. 5, Ch. 6
exploitation index	relative abundance and catch	weighted nos/site, nos, wgt, index	Yorke Island reef; fish families	(Poiner & Harris 1991:141)	
rate of harvest compared to species population size	catch and relative abundance in one month	nos individuals killed, estimated population size	Mornington Island; Dugong	(Marsh 1996:141)	
average annual harvest compared to species population size	annual catch and relative abundance	average nos fishing boats per day, estimated population size	Torres Strait; Dugong	(Marsh 1996:142)	

species specific harvest model	yield and harvest rate	kangaroos/km^2/year, estimated % harvestable population	modelled based on western NSW; Red kangaroo	(Caughley & Adams 1996:52)	
monthly harvest	-	number individuals harvested by hunters sampled, total nos individuals for community (sample hunt x record efficiency) over 8 months	Mapoon; 8 spp	(Roberts et al. 1996:157)	
sex and age classes of main harvest vertebrates	-	nos individuals, gender and age class	New Mapoon; 4 spp	(Roberts 1996:162)	App. 6
change in wildlife utilisation patterns and sustainability	harvest weight per period	taxa or food group, gross kg, % total wgt in 13 days	Mumeka (Momega); 7 taxa groups	(Altman unpubl. b} 6, Altman unpubl. a: 6), Altman 2003	Ch. 5
change in wildlife utilisation patterns and sustainability	comparative harvest at two periods 23 years apart	presence/absence of species observed to be collected in study periods	Mumeka (Momega); 36 spp;	(Altman unpubl b 10)	
harvest sustainability	harvest rate (experimental not subsistence)	nos collectors, collection time, nos pods collected, weight seed (kg), rate of seed collection	Daly River; Lotus lily	(Whitehead et al 2006:134)	Ch. 5 for four species (observed not experimental)
harvest sustainability	harvest rate (experimental not subsistence)	travel time, search time, weight collected, time required, time to collect 1 kg, individual harvest rate	Daly River region; Long yam	(Whitehead et al 2006: 146)	Ch. 5 for four species (observed not experimental)

[1] This table was compiled before finding the paper by Kwan et al. (2006) thus their techniques are not included.

A wide suite of variables has been recorded for subsistence activities of these six Aboriginal groups. The researcher's choice of variables depended on their discipline and study's purpose. Equivalents to four of the above measures are reported in this Martu study. These contribute to analyses of the frequency of foraging trips, the relative importance of different species by weight, the relative contribution of store as to bush foods and comparative returns from women hunters. The above variables were particular to the animal or plant species that contributed to a subsistence system.

All subsistence studies observed that the availability of species varied in time and space. Chase and Sutton (1981 364) and Meehan (1982) analysed spatio-temporal resource species collection patterns. These patterns apparently responded to the strong partitioning of species across shore and hinterland biomes. They found that seasonal climatic features such as prevailing winds and proximity of access to seasonal resource patches influenced the spatial location of foraging camps. Archaeological interpretations of the distribution of occupation sites and the composition of artefacts within surface scatters or deposits have sought to interpret resource availability within proximity to sites. Arid zone studies have emphasised the availability of surface waters (Veth 1993; Thorley 2001). The influences of spatial patterns of plant and animal resource distribution upon archaeological materials have been much harder to discern in the arid zone compared to tropical or coastal environments.

Whilst the above and other studies identify the continued importance of hunting and gathering to Aboriginal people it remains a relatively unstudied topic. Altman et al. (1995) wryly observed that researchers and bureaucrats know more of the policy and legislation constraining customary harvest than the actual practice of it. Hunting and gathering has been unsupported within government, statutory and non-government programs, with a few exceptions. The lack of support or attention is apparent in the review of community wildlife management by Davies et al. (1999). They identified the importance of customary harvest to indigenous people, but in their discussion, attention to co-management and top-down programs overwhelmed customary harvest and other Aboriginal land use practices that occur independent of institutions. Davies et al. (1999) posited that government programs concentrated on monetary economic aspects of natural resource management, and hunting did not count (despite Altman's estimates of import substitution dollar equivalents). Furthermore, Australian public attitudes commonly condemned the killing of wildlife thus hunting (Ponte 1996). Only recently, with investigations of the commercial potential of bush foods, have government programs seriously taken note of Aboriginal wildlife utilisation. In Australia, customary harvest remains the 'hidden harvest', an oversight or exclusion recognised in other countries from where this term originated (Scoones et al. 1992; Guijt et al. 1995; Campbell & Luckert 2002).

One partial exception was the Aboriginal Rural Resources Initiative (ARRI) program within the Bureau of Rural Sciences (BRS). From 1992–1995, ARRI funded 75 projects that encouraged indigenous people's participation in sustainable natural resource management projects in rural and remote areas. The intention was to support enterprises with monetary economic output, local employment and income and community development benefits. One output of the ARRI program was an edited book aimed at assessing sustainable harvest (Bomford & Caughley 1996). The program review provided a constructive synthesis of lessons across eight case study projects (Desmond & Rowland 2000). Even within this program, however, non-commercial hunting and gathering activities received little to no support.

For contemporary desert settlements, Cane and Stanley (1985) explained some of the inter-settlement variation in hunting and gathering returns in terms of ease of access to resource areas. They presented land unit maps from near some settlements and made the logical suggestion that settlements in richer resource areas secured more bush resources. They recommended both that new outstations be appropriately situated and that a track network be maintained to allow hunting access to wider land areas so that hunting could be maintained as a significant part of local economies. There were no detailed studies of spatial land use to identify the distances people travelled to forage, the travel routes and the spatial intensity of use in relation to different land form types. These were not considered in Devitt's (1988) nor Palmer and Brady's (1991) studies but will be investigated in this dissertation.

Spatial mapping of land types is an essential component of natural resource management programs and national park management. Land uses, burning patterns, management zones and other spatial variables overlay these land types. Internationally, mapping was the basis of the long-term study 'Inuit Land Use and Occupancy Project' (Freeman 1976; Brody 1986) which centred upon subsistence harvest spatial patterns and wildlife movement patterns. The scarcity of spatial land use studies is a major omission in understanding contemporary subsistence harvest in Australia.

Earlier this chapter discussed 'resource management' practices by Aboriginal people (Williams & Hunn 1986), including independent syntheses by Kimber (1983, 1984) and Latz (1982) in central Australia which suggested that resources were managed through burning and a variety of other methods. Williams and Hunn (1986) presented evidence for both the manipulation of resources to promote or maintain their supplies, and for controls that constrained consumers thus limiting over-utilisation. Myers (1982) proposed that social systems linked to specific land areas allowed for negotiated rights of access by neighbouring groups thus constraining exploitation. His reconstructive study was derived from Pintupi people near Kintore and Papunya settlements. To 1990, there had not been any examination of 'resource management' practices within a contemporary desert settlement. The more recent study of contemporary Aboriginal burning patterns in the Western Desert by Bird et al. (2005) adds to analyses of 'resource management'.

Internationally, there have been substantial debates as to motivations behind indigenous 'resource management' and 'conservation'-type practices (Klee 1980; Scudder & Conelly 1985; Hames 1987). These have polarised around whether practices advertently or inadvertently contributed to the maintenance or promotion of resources. After reviewing subsistence practices in small-scale societies, Smith and Wishnie (2000:493) proposed that to qualify as conservation:

> any practice or action must not only prevent or mitigate resource over-harvesting or environmental damage it must be designed to do so.

They argued that evidence for cases of voluntary and deliberate conservation were rare. However, examples of sustainable resource use were widespread and these may have inadvertently contributed to biodiversity preservation. In their line of argument, only those activities that had clear, deliberate intentions to maintain a resource could be termed ‘management’.

Understanding such motivations is important in Australian contexts where indigenous people have responsibility for land and natural resource management, increasingly within Western frameworks with Western ‘conservation’ expectations. Chapter 1.4 noted that ‘management’ does not neatly equate to the Yanyuwa concepts interpreted by Bradley (2001). White and Meehan (1993) cautioned against the dangers of promoting single elements of land strategies (e.g. burning) in isolation from the wider socio-economic and spiritual context in which these co-evolved. In the 1990s, awareness of differences between Aboriginal and non-Aboriginal land concepts resulted in the development of terms such as ‘caring for country’ (Young et al. 1991) but increasingly these appear to be used as synonyms for ‘land management’. This study intends to explore the activities and concepts of Martu resource and land-management-type practices more than mainstream Western land management because there has been less documentation of Aboriginal activities and concepts than Western ones.

Hunn and Williams (1986) identified the criteria under which indigenous resource ‘management’ measures were most likely to be applied. They specified these for species that were valuable, scarce and amenable to management-type methods. ‘Management’ practices have an associated energy (or dollar) cost thus in traditional indigenous societies resources were unlikely to be managed until they were in short supply. A minor debate surrounds the question of whether and how traditionally-orientated people perceived species scarcity. This is a particularly complex issue in arid environments characterised by extreme rainfall unpredictability, stability in the production of some species and high variability in others (Stafford Smith & Morton 1990). Johannes and MacFarlane (1991) stated that Torres Strait fishermen were rarely aware of widespread declines in fish stocks. Similarly, the regional demise of species such as Black-footed Rock wallaby was unrecognised by Ngaanyatjarra people until they travelled with biologists and saw their absence in many places, indicating their range had constricted over a wide area (R. McFarlane, Land use planner, pers. comm. 2000). Conversely, ‘increase ceremonies’, burning and other ‘management’-type measures are interpreted to perpetuate or, at least, maintain species production. The debate is important because it underpins the logic by which ‘management’ is applied. Martu perceptions of scarcity will be examined in Chapter 8.4.

1.8 Literature on the ecological sustainability of indigenous resource and land use

Of pre-European times in Australia:

> It is presumed that a sustainable human-ecology balance existed due to low population pressure and associated mechanisms (Davies et al. 1999:17)

In post contact times, the risks of over-utilisation of bush resources were assumed to intensify due to changes in technology and the adoption of vehicles and firearms, settled populations of erstwhile mobile hunter-gatherers and increasing population concentrations (White & Meehan 1993). The latter may have been particularly influential, as Healey (1990:146) wrote in relation to Papua New Guinea highlands:

> The demography of hunting horticulturalists may have a profound impact on the demography of prey species. Whether this also occurs in hunter-gatherer regimes … is by no means clear as comparable data are generally lacking. Analysis of hunter-gatherer economies have tended to assume implicitly the general principle of 'underutilisation of resources' … this translates into [an assumed] minimal impact of hunters upon prey demography.

In the 1980–90s, several commentators warned of risks of over-hunting near contemporary desert Aboriginal settlements (Latz 1982b; Cane & Stanley 1985; Latz & Johnson 1986; Rose 1992; Rose 1995). These concerns were echoed elsewhere with Altman (1996:91) advocating that nationally:

> There is an urgent need for research on levels of subsistence resources and their use as sustainability is currently impossible to assess

The risks were two-fold, firstly, reductions to food resources significant to Aboriginal people and decline of associated livelihood values and, secondly, potential declines in regional species populations, biodiversity, and associated ecosystem function.

Wildlife population ecologists, Bomford and Caughley (1996) examined sustainable wildlife use by Aboriginal and Torres Strait Islander people in an edited volume. This reviewed ecological aspects of wildlife production systems, economic and policy issues and emerging co-management and community-based wildlife management approaches. Species-specific harvest sustainability was analysed for three species. There was no substantive evidence for species declines attributable to wildlife harvesting, in their view, principally because of challenges in understanding species population dynamics. However, all authors took a cautious approach that recommended active community engagement in wildlife monitoring programs.

The classic book 'Traditional fishing in the Torres Strait islands' (Johannes & MacFarlane 1991) remains the most substantial study of contemporary resource species use by Australian indigenous people. Its purpose was to inform government decision-makers and future generations of Islanders of indigenous fishing practices and beliefs and thus contribute information to guide the protection of indigenous fisheries. As CSIRO fisheries biologists, the authors presented vivid and rigorous descriptions of fishing drawing from ethnographic and scientific research over 5 years in 17 island communities. One important feature of Johannes and MacFarlane (1991) was attention to the suite of resource species. Another overarching feature was that their emphasis was upon fishing practices rather than the population dynamics of fish and marine species. In their view, fishing patterns and catch statistics revealed more about the condition of resources than pure biological assessments of fish stock. Over subsequent years Johannes (1998; 2000) refined the argument that analyses of return for effort needed to precede species population studies. Although based in tropical marine environments, his research had a strong influence upon this Martu study in a desert environment, not least because it advocated the importance of substantial descriptive information from which hypotheses could be generated (also Nabhan 2000).

In terms of species specific sustainability, both Johannes and McFarlane (1991) and Bomford and Caughley (1996) identified the potential vulnerability of Dugong and two species of sea turtle (Green and Hawksbill). In Australia, species-specific studies of the sustainability of customary harvest have included Magpie geese (Brook et al. 2002), sea turtle species (e.g. Kennett et al. 2004) and Northern snake-neck turtle (Fordham et al. 2007). Marine biologist, Helene Marsh, has led longitudinal species-intensive research into Dugong populations and population pressures including that from subsistence hunting (Marsh 1996; Marsh et al. 2004). Whilst in the 1990s populations appeared to be stable (Marsh 1996), more recently there have been strong indications that the Torres Strait Dugong fishery is unsustainable and urgent calls for co-management (Marsh et al. 2004). A pertinent development in this research has been investigation of the human factors underpinning customary hunting (Kwan et al. 2006).

Investigations of species harvested by Aboriginal people for commercial purposes have included artefact timber species traded through Maningrida Arts (Koenig et al. 2005), the tree species *Bombax ceiba* (Griffiths et al. 2003) and the cycad *Cycas arnhemica* (Griffiths et al. 2005). Also, feasibility studies of potential commercial species included desktop assessments of specific vulnerability to over-harvest in central Australia (Morse 2005) and in northern Australia (Whitehead et al. 2006). The latter included case studies of four commercial plant species. In desert regions, the only assessment of the sustainability of customary harvest was for firewood, particularly Mulga (Morse et al. 2002). All these studies utilised biological survey, species catch or harvest data and, for commercial species, longitudinal trade data.

The sustainability of species hunting and gathering in arid regions remains unknown. Morse et al. (2002) could not attribute contractions in Mulga to firewood harvest alone due to confounding effects of roads and other forms of clearing. After a decade long biological survey of Anangu Pitjantjatjara (AP) lands, Copley and Robinson (2003:352) concluded:

> Because Anangu are able to continue to hunt and obtain [Red Kangaroo, Euro, Emu, Bustard, Perentie and Sand Goanna] there is no ‘hard’ evidence that they are doing this in an unsustainable way. However, there is circumstantial evidence from Anangu observations that ‘return for effort’ has gradually been decreasing over the past two or three decades

But the condition of AP lands was not compared to that of other lands where different degradation forces apply. Similarly, there is no capacity in the AP study to separate the effects of hunting from other threatening processes (wildfire, weeds, feral animals). None-the-less, concerns about ecological sustainability have been on-going and the precautionary principle recommended.

In considering ways to do preliminary assessments of ecological sustainability, methodological decisions again needed to be made in relation to the Martu material. Potential variables that measured return for effort to contribute to ecological assessments of harvest impacts were collated from some of the above literature (Tab. 1.4). This Table also overviews some of the above studies and their purpose; it complements Table 1.3 which collated subsistence variables.

Of this array of potential variables that record harvest return for effort, six of the above measures are reported in this Martu study (Ch. 5). These identified species inventory, species proportions by weight within a catch, relative importance of different species by weight, harvest weight per period and harvest rate. Studies of the population dynamics of many desert species are extremely scarce and tend to be for threatened or feral species thus, there are few sources for biological comparison.

Ecological sustainability operates at different ecological scales ranging from the species level to the ecosystem level. It has been common for findings to be inappropriately extrapolated across local to wider scales (Stafford Smith et al. 2000). Most research has been at the species scale (as seen above). Altman (unpubl. a; unpubl. b) and Griffiths (2003) considered ecological sustainability in terms of continued customary harvest across a suite of species. Only two studies have been at regional scales that may equate to ecosystems (incl. Johannes & MacFarlane 1991). Yibarabuk et al. (2001) offered an important study at the ecosystem scale. They compared an area in central Arnhem Land dominated by a customary harvest economy to nearby Kakadu National Park by surveying and applying indicators of ecological integrity for each area. They concluded integrity was higher on the traditionally-managed lands principally due to the burn patterns applied. In this dissertation, the Martu study ranges from the species to the ecosystem scale; it does this partly by deduction, and retrospectively to the field research. Importantly, it cannot be presumed that direct or circumstantial evidence of ecological sustainability on Aboriginal lands in tropical regions is transferable to Aboriginal lands in desert regions.

1.9 Literature on indigenous roles in protected area management

In the past two decades, there has been a significant evolution in indigenous involvement in national parks and protected areas in Australia. Prior to the 1980s, the interests of Aboriginal people in respect to parks and reserves were generally unsought, unknown, unheeded or overridden (Woenne-Green et al. 1994). The ‘wilderness’ national park model prevailed; it excluded Aboriginal occupation and utilisation. In the 1980s, challenges and adaptations of the national park model saw the development of jointly managed national parks; these have continued to evolve. The national Indigenous Protected Area (IPA) program was established in about 1997. When this

Martu research commenced in 1990, national examination of Aboriginal roles in relation to national parks was in its very early stages.

Australian developments have international parallels that have seen increasing involvement of local communities and groups in co-management, wildlife and natural resource management within and beyond protected areas.[22] This has been partly facilitated by modifications to IUCN protected area category guidelines to accommodate greater roles for local people in protected areas. There have been important reviews of international projects and programs (incl. Stevens 1997; Jaireth & Smyth 2003; Borrini-Feyerabend et al. 2004).

The IPA program arose from dual motivations—the appreciation that Aboriginal knowledge and practice may contribute to biodiversity and conservation management, and the recognition that bioregions with low reserve representation commonly occurred on indigenous-held lands (Thackway et al. 1996; Szabo & Smyth 2003). Notionally, IPAs are voluntary declarations by local indigenous groups or their representatives. A feasibility stage is followed by preparation of a plan of management and declaration (or not) then the on-going maintenance of the IPA by ranger or other local groups. A dedicated federal government funding program supports the planning and declaration stages and, in part, the subsequent management of these areas. Alternative funding sources are also required. Research by Muller (2003) analysed the Nantawarrina IPA in terms of local control, improvements in conservation values, community representation and external recognition of the abilities of local people in the early 2000s. A national review of the IPA program from local, state and federal perspectives was conducted by Gilligan (2006).

Unlike national parks, IPAs permit the occupation and multi-purpose uses of the area by Aboriginal people. There are several current and prospective IPAs in proximity to Martu lands (Fig. 9.3). These include declared IPAs on Ngaanyatjara lands (Noble & NCLMU 2002), on Anangu-Pitjantjatjara lands (Wartitina and Walukara), and on Kurinji and Warlpiri lands in the northern Tanami (CLC 2006). Closest to Martu lands is an IPA feasibility study on Walmajarri lands (Lowe & KLC 2003). Chapter 10 notes the potential of an IPA in respect to Martu and their lands. Some commentators report major shortcomings for conservation within the IPA program (Gilligan 2006); others view IPAs as potentially better alternatives for local Aboriginal people's participation in biodiversity management than national parks (Smyth 2001; Muller 2003:543). It is possible that there are lessons within IPA management applicable to national parks. Alternately, findings from this Martu research may aid understanding of Aboriginal priorities within desert IPAs.

There have been several major reviews of Aboriginal participation in Australian national parks (Birckhead et al. 1992; Woenne-Green et al. 1994; Lawrence 1997;

[22] Co-management is the international equivalent term to joint management, the latter being widely used in Australia. In this dissertation, I predominantly use the term co-management because it is shorter and perhaps better conveys the notion of collaboration or cooperation.

Smyth 2001).[23] Dominant themes within these reviews include legislation and policy accommodating joint management, lease arrangements and payments, board structures and membership, plan of management processes, Aboriginal rangers and other Aboriginal involvement. Summaries have generally been compiled state by state (or territory) because of the fundamental influence of different legislations. All states now have different models for Aboriginal involvement in national park management. The principal examples of joint management were federally managed parks in the Northern Territory, Uluṟu -Kata Tjuta and Kakadu National Parks; these remain the most studied parks in Australia.

In 1990, Western Australia had no legislation permitting joint management of national parks. Successive WA governments had failed to make the necessary legislative changes to achieve joint management (Woenne-Green et al. 1994; Smyth 2001). Numerous reports have examined options for Aboriginal roles within WA national parks (e.g. CALM 1991; Anon 2001; WANTWG 2002; CALM 2001; CALM 2003a). Explicit recommendations for joint management have been made and necessary modifications to the *Conservation and Land Management Act 1984* and other Acts identified. In the early 2000s formally-recognised Aboriginal involvement in parks was limited to park councils or advisory bodies, draft plans of management that reflected traditional owner aspirations, Aboriginal rangers and a training and mentoring scheme (CALM 2003a).

Rudall River National Park was gazetted in 1977; there was no explicit recognition of Martu or other traditional owners (Muir 1982). Subsequently, there were recommendations specific to Martu involvement in Rudall River National Park, including joint management recommendations (Wright 1989; Johnston 1990; Newman et al. 1993). RRNPk remains the only park in Australia occupied by two Aboriginal settlements. This context gives pertinence to Question 1.1c of this dissertation and the overall thesis. There is potential for joint management on Martu lands but by early 2008 it had not been achieved.

In 1990, I sketched the following conceptual diagram to aid my thinking about the relation between Martu, their past, present and the national park (Fig. 1.5).

[23] Again, there is some circularity in these references in relation to this dissertation. Two published papers (Walsh 1992 and 1995) used the Martu material to examine the relevance of Aboriginal practice to national parks and they have been widely cited.

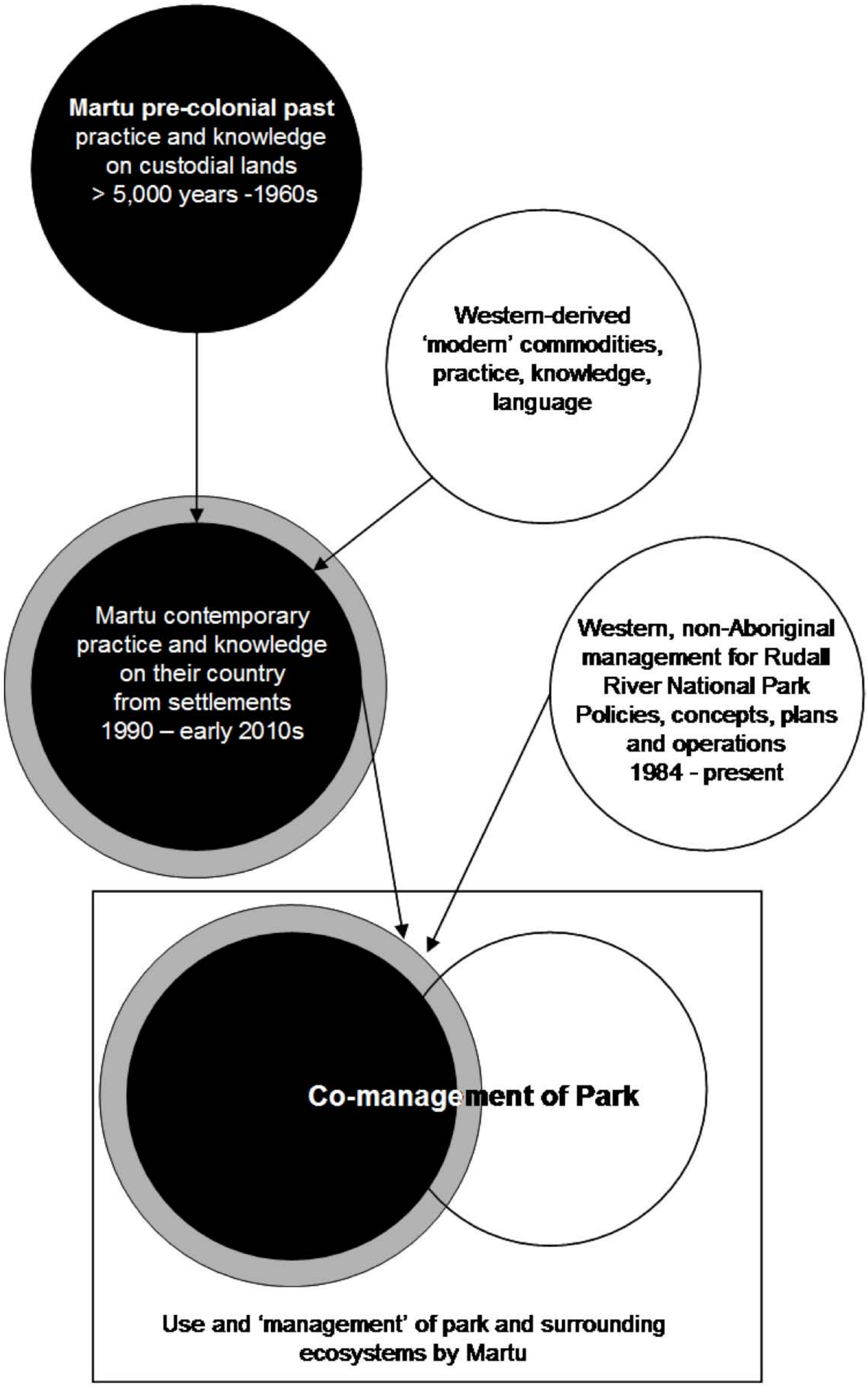

Figure 1.5 Relations between Martu past, present and possible future with co-management involving the Department of Conservation and Land Management
The grey circles mark the major foci within this dissertation

It was a relatively simple diagram with only two main players, Martu and CALM. Whilst the research focus was upon contemporary Martu (central dark circle), there needed to be some understanding of CALM's policies and operations. It was anticipated that within this context the findings of this dissertation could be applied. This schema was modified to recognise more players in a network of inter-relations between agencies involved in conservation and management of Aboriginal lands (Walsh 1995). However, as will be seen, the situation was far more complicated (Ch. 10).

In his national review, Smyth (2001) provided an important synthesis of the advantages and disadvantages of joint management to all parties involved in Australian parks. He concluded that:

> jointly managed parks in Australia remain an uneasy compromise between sometimes coinciding but often conflicting interests (Smyth 2001:89)

Day-to-day cooperation between Aboriginal and non-Aboriginal staff was countered by reluctant negotiations between traditional owners and government agents. Joint management was essentially a political arrangement in which Aboriginal interests were constrained by established uses and management-systems of the national park agency; for some Aboriginal groups they had few choices about the nature of their involvement (Woenne-Green et al. 1994). Hence, joint management has been typified as an arena of ‘competing interests’.

A recurring issue across these reviews was Aboriginal use of resources within parks (Smyth 2001). There have been diverse opinions on the actual practice of hunting within national parks. Notionally, joint management legislation, agreements and plans recognise that hunting, fishing and gathering contributes to continued cultural identity. Conversely, cultural and governance mechanisms can be used to constrain foraging with the intention of protecting park biodiversity. There are specific provisions for hunting and fishing within present management plans for Kakadu (KBOM 2007). Smyth (2001) reported that areas were zoned for Aboriginal use thus accommodating hunting and fishing. However, a study of fishing in Kakadu National Park revealed a far more complex picture wherein there were tensions and oppositions between traditional owners, non-Aboriginal fishermen and park management (Palmer 2004). Successive Uluṟu Park plans of management (UKTBOM & ANPWS 1991; UKTBOM & PA 2000) have been vague about Aṉangu hunting. At preparatory workshops for the 2000 plan, Aṉangu repeatedly referred to bush foods and medicines (Aṉangu & CLC 1997). However, the final plan made no reference to subsistence practices, hunting or wildlife harvest by Aṉangu, although, actions to support the ‘living culture’ associated with *Tjukurpa* and to support the recording of knowledge associated with flora and fauna were specified (UKTBOM & PA 2000:62 & 67). It was my interpretation that Aṉangu views were ‘filtered out’ in the process of plan writing by non-indigenous Parks Australia personnel.

Davies et al. (1999) specified hunting practices and the protection of wildlife as a major ‘competing interest’ within national parks. They noted that, whilst regulations might condone hunting, indigenous hunters have been constrained by fear for public safety or negative visitor reactions. A north Queensland study found that 60% of the people who were surveyed opposed indigenous hunting in national parks (Ponte 1996 cited in Davies et al. 1999). Smyth (2001) suggested that planning and zoning could resolve such conflicts. Whilst in the 2000s, indigenous people's residence and resource use may be more acceptable in north Australian parks, in central and Western Australia, hunting has not explicitly been incorporated into park planning. Furthermore, it persists as a controversial 'sticking point' in WA government discussions on Karlamilyi National Park (see Ch. 9.1).

Whatever the challenges, small numbers of Aboriginal people continue to be involved in national parks in various roles. Aboriginal individuals intermittently or continuously fulfil roles as board members, rangers, cross-cultural interpreters and guides, assistants on biological surveys and more. Aboriginal knowledge is a central theme in interpretive material within parks such as Uluṟu (Layton 1986; Kerle 1995; Baker 1996). It informs biological surveys (Baker et al. 1993), burning programs (Saxon 1984) and cultural site protection (Kennedy et al. 2001).

As with the above studies, my research was continually grappling with the duality between Aboriginal and non-Aboriginal views on land. When immersed as one 'outsider' amongst a Martu majority, it was possible to learn of Martu practices and perceptions more rapidly than an intermittent visitor might have. And always, I had to be aware of my own filters. Within the research question, the national park question required understanding of Euro-Australia perspectives on national park management. Other dualities are also applicable at varying intensities throughout the thesis. These are simplistically characterised in Figure 1.6.

Aboriginal	⇔	non-Aboriginal
Martu dialects	⇔	English
past	⇔	present
continuity	⇔	change
practice	⇔	knowledge
reality	⇔	ideal
species	⇔	ecosystem
local	⇔	national

Figure 1.6 Major dualities within this dissertation

As James (2005) asserted, the overlap between these dualities is the important space in this new 21st century of cross-cultural collaborative land management. Each data chapter in this thesis concludes by identifying potential commonalities and differences in this space.

1.10 Dissertation structure

The core thesis of this dissertation contends that Martu knowledge and practices are of direct relevance to the management of the park and wider ecosystems on Martu lands in the Sandy Deserts (Ch. 1.1). To examine this thesis, chapters are presented in the following logical order (also Fig.1.7).

Chapter 2 introduces the biophysical and cultural environments of the study region. It describes the geography, climate, flora and fauna of the western Great Sandy Desert and Little Sandy Desert bioregions, identifying environmental changes of the past century and the major threatening processes for wildlife. The culture of Martu is summarised in terms of archaeology and prehistory; significant eras in Martu post-contact history; and Martu skin and kinship social systems and spiritual systems. A short demographic section gives estimates of precontact population densities and presents population numbers recorded by this researcher in and about 1990. Finally, the services provided by, and infrastructure within, Parnngurr, Punmu and Kunawarritji are noted.

Chapter 3 is on research methods. It summaries ethics and protocols respected in the course of research. It speaks of the relationships between the researcher and Martu, processes of payment to Martu and avenues for the return of research materials to Martu individuals and organisations. Martu individuals with whom the researcher worked are identified. Ethnographic methods are described, including participant observation on foraging trips. Martu knowledge and perspectives were interpreted through observation, discussion and listening. Processes of and limits in language interpretation and translation are explained. Data collation and analysis methods are outlined. An example of one accompanied foraging trip is presented to demonstrate how quantitative and qualitative data were extracted.

Chapter 4 is the first data chapter. It looks at the variety of land uses on Martu land, particularly those directed by Martu. Transport means and travel strategies are described. The frequency of travel is quantified. Travels to hunt and gather are examined as a subset of these land uses. This chapter introduces the importance of foraging as a major land use practiced by Martu in 1990. This (and each of the data chapters) concludes by identifying the relevance of Martu practice and knowledge reported within the chapter to co-management of the Park.

Chapter 5 specifies the animal and plant resources used by contemporary Martu and the significance and vulnerability of species. After an overview of Martu ethnotaxonomy, inventories of species utilised are listed then the suite of species reviewed and summarised especially for vertebrate taxa. Quantitative data on the weights and frequencies of species collections are tabulated then analysed. Major resource species are discussed. One section considers the vulnerability of certain species to over-harvest then, by contrast, it identifies potential ecological benefits when high numbers of feral animals were hunted. Sustainability at a species and vertebrate taxa scale is considered here.

Chapter 6 researches socio-economic features of Martu hunting and gathering. The gender composition of foraging groups is analysed and the frequency of male and female foraging is compared. Patterns of cooperation and autonomy amongst women and differences in returns between women are contrasted. The many reasons why Martu continue to forage are collated. The need for sustenance is analysed by comparing weights of bush and store foods available. These socio-economic dimensions of foraging shape parameters involved in assessments of species return for effort and have relevance to differing Martu expertise in the management of their lands.

Chapter 7 is titled ‘Martu spatio-temporal concepts and foraging patterns’. It describes aspects of ecological knowledge that underpin foraging practice. Spatial concepts related to settlements, vehicle tracks, water places, land types, burnt areas and forbidden areas are sketched. Then actual foraging patterns are related to these spatial elements. Temporal concepts associated with intra-annual and inter-annual seasons are interpreted. A diagrammatic representation of the former is presented.

Chapter 8 is the final data chapter. It quantifies and describes resource and land management-type methods applied by Martu, concentrating on burning, water place cleaning and plant species specific techniques. Some of these techniques have waned in contemporary times. A detailed section articulates some of the philosophical concepts interpreted as central to Martu notions of the interrelation between people–wildlife–country. This also draws on ethnographies from groups neighbouring Martu. Profound changes within the regional environment are interpreted from a Martu perspective; this includes their sense of resource ‘scarcity’ and, significantly, their various understandings of the National Park and associated *whitefellas*.

Chapter 9 bridges the study to the present day. It reviews major changes on Martu lands from 1990 to 2007 that have a bearing on the core thesis. These changes contain opportunities and constraints to the applications of the thesis findings within the contemporary context. To 2007, there has been no resolution on co-management within the park due to complex and conflicting agendas amongst Martu and other land users. Also, Martu people live with increasing trauma and dysfunction. Outsiders are sometimes unaccommodating of these difficulties. This places cross-cultural intermediaries in extremely demanding roles. Yet, processes such as co-management can hinge on these intermediaries.

The concluding chapter opens with a synthesis of the main findings of the dissertation. Then it identifies topics of commonality between Martu and Department of Conservation and Land Management interests. This is an intensely complex region with major power imbalances between land users. On the basis of the findings, the chapter argues that practical action on the ground rather than plans and strategies are needed to precede and possibly facilitate co-management. At the least, practical actions that build upon Martu knowledge and practice are likely to slow declines in cultural and biological diversity in the region.

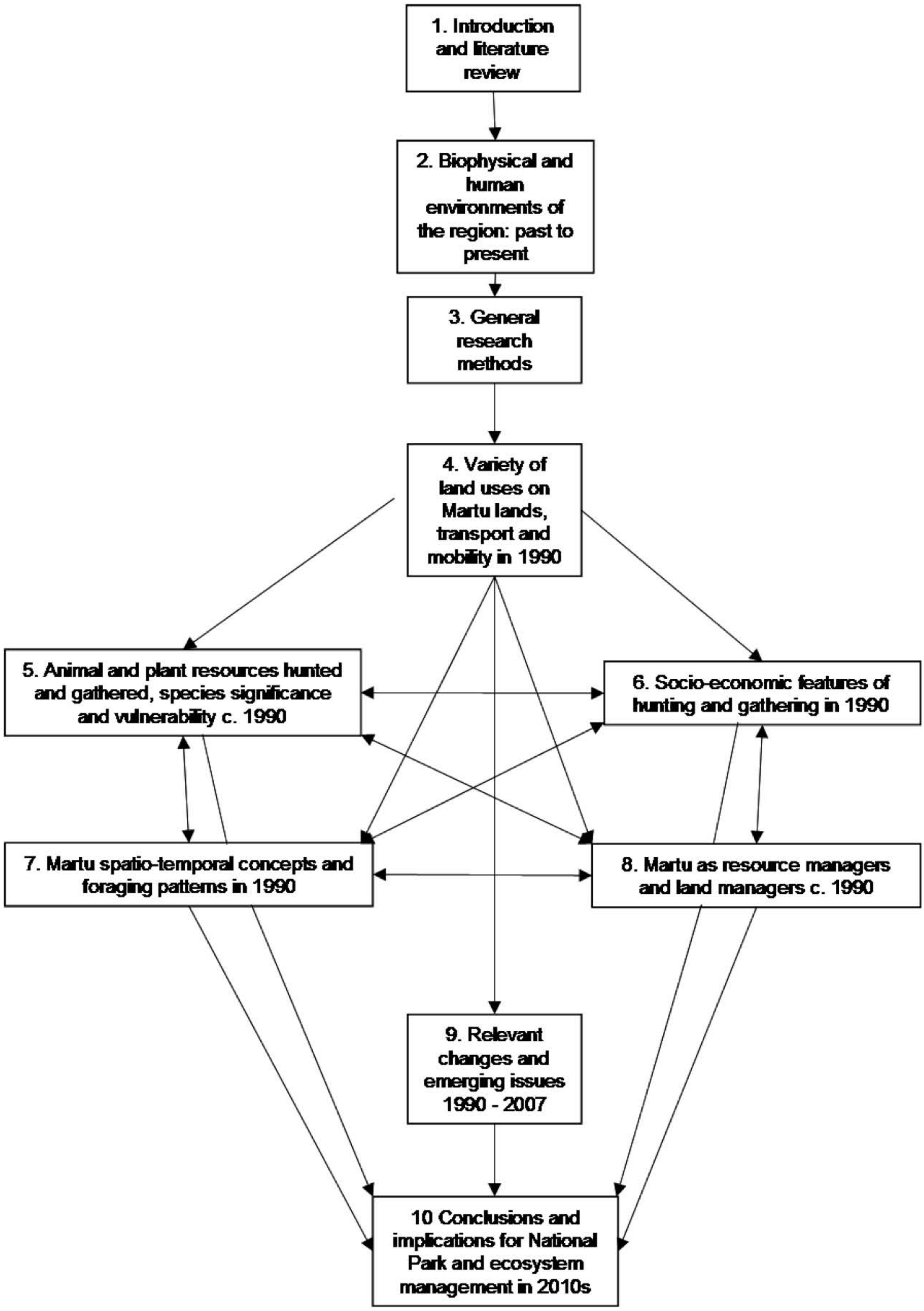

Figure 1.7 Structure of dissertation with the order of chapters and their connections.

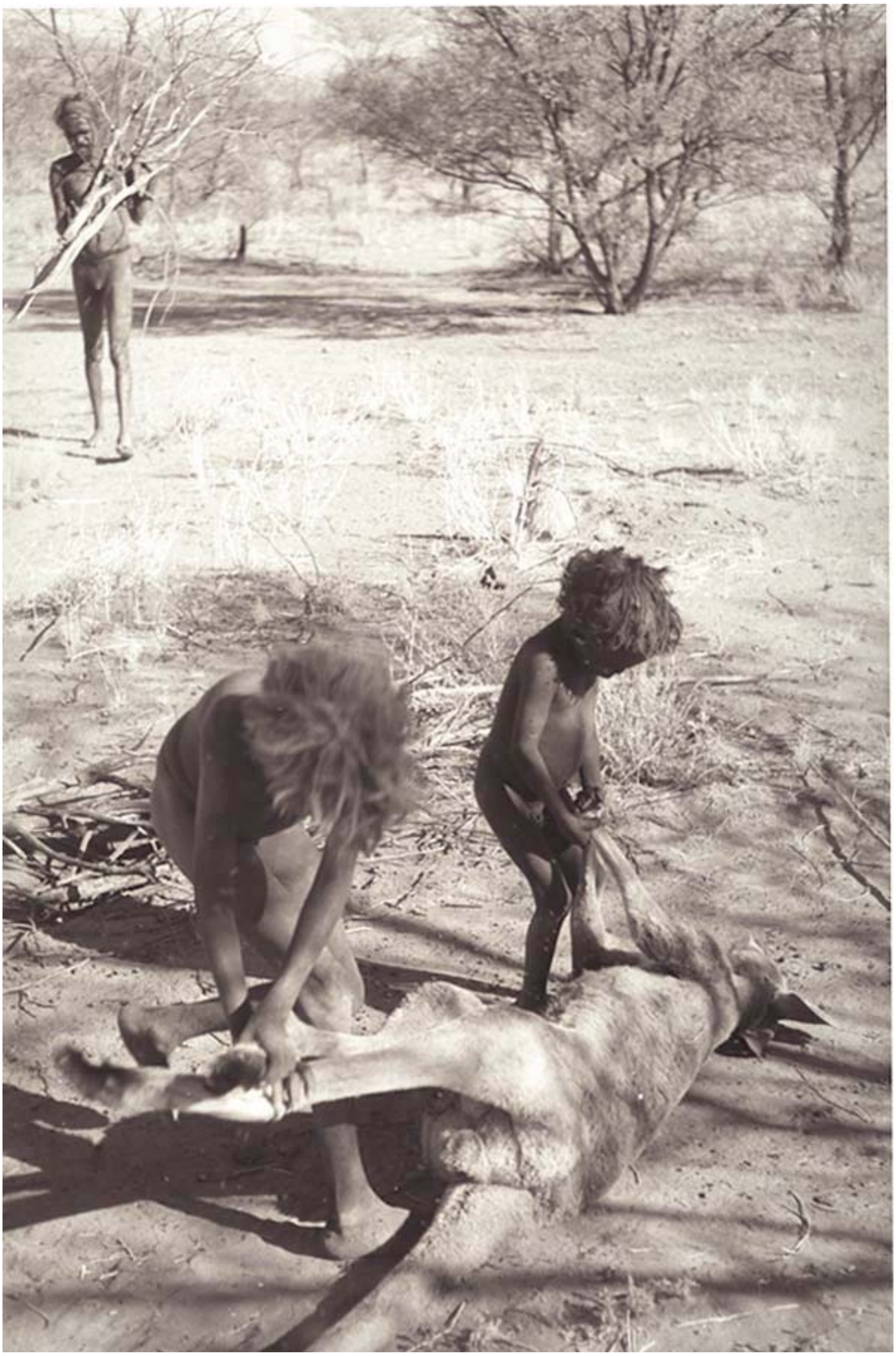

Photo 2.1 A 1965 photograph similar to one in Tonkinson (1991:46) with the caption "While Minmarra prepares a large fire to cook a plains kangaroo (*marlu*), sons Nun and Jambijin play with the carcass." (Courtesy of The University of Western Australia Berndt Museum of Anthropology, WU/P26932)

2 BIOPHYSICAL AND HUMAN ENVIRONMENTS OF THE STUDY REGION

> … it is in the Western Desert, in the most challenging environment, that some of the most intriguing aspects of Aboriginal geography and ecology survive … (Tindale 1981:1855)

This chapter overviews the biophysical and human environments of the study region. It draws upon literature to outline the key features that shape arid environments. It then looks at those features specific to the study area. The second half of the chapter summarises the prehistory and history of Martu in relation to their lands then describes the remote settlements from which Martu access their lands. The separation imposed here between ecological and human processes is a Western, heuristic one that is contrary to traditionally derived Aboriginal perceptions of the interconnectedness between natural and human worlds (Fig. 1.4 and Ch. 8).[24]

2.1 Biophysical environments

2.1.1 Geography

This study was based in two very remote desert settlements occupied by Martu Aborigines, Parnngurr (Mt Cotten) and Punmu (Panaka Panaka); some research was also done in Kunawarritji (Well 33) on the Canning Stock Route. By road, Parnngurr is 250 km east of the Aboriginal settlement of Jigalong which is 170 km east of the mining town of Newman in the east Pilbara. Punmu is 90 km directly north of Parnngurr. Newman is 1200 km NNE of Perth. Parnngurr and Punmu are both situated in Karlamilyi (Rudall River) National Park (Fig. 1.1 and 1.2). This is a region with vast distances.

Culturally, Martu were identified as within the Western Desert culture bloc (Tonkinson 1991). Linguistically, this bloc is recognised as one language group with numerous dialects. Ecologically, Martu lands lay across the Little Sandy Desert and western Great Sandy Desert bioregions. Administratively, these lands were within the East Pilbara Shire.

2.1.2 Ecological frameworks

Stafford Smith and Morton (1990) proposed a framework of the key parameters that shaped arid zone ecosystems. This seminal paper reviewed and postulated key relationships that influenced arid biota. Following a brief review of the paper, the ecological elements identified as most important will be considered in relation to the study area.

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[24] The literature in this section is both pre- and post- the 1990 field study; more recent literature was needed especially for the biophysical section for which there was a very limited literature base in 1990.

Stafford Smith and Morton (1990) presented and justified a list of propositions about the functioning of arid environments based on a synthesis of ecological studies current to the late 1980s (Tab. 2.1).

Table 2.1 Summary list of propositions by Stafford Smith and Morton (1990:259)

Uniqueness of the Australian physical environment
Rainfall unpredictability
Big rains structure the environment
An ancient, well sorted, infertile landscape
Unique physical environment results in unique plant structure and functioning
Highly patterned plant production [both spatially and temporally]
[Extremes of] soil moisture and [so] diversity of life histories
[Low soil] fertility controls digestibility [of plants by herbivores]
[Photosynthesised] carbohydrate is plentiful [nutrients are limiting]
The importance of fire
Consequences of physical environment flow through to unique faunal assemblages
Food rather than water [requirements] governs animal life
Herbivores are constrained by inadequate production
[Soil & plant] infertility favours termites
[Small areas of] continuous production support persistent consumers [e.g. herbivorous mammals] [these areas are drought refugia]
Social insects [prominent especially ants and termites due to] uncertainty and infertility
Patterns of high order consumers [homeotherms limited, ectotherms dominant]
Consumer stability is surprisingly high [as buffered against short term rainfall variation]

Bracketed comments based on full text in paper added for clarification

Stafford Smith and Morton (1990) emphasised the complexity and diversity of ecological structure and function across Australian deserts. Climatic variability and spatial heterogeneity were high. One important conclusion was the need to consider desert ecology by reference to the land type under consideration. In previous research, the vastness of the deserts and apparently uniform topography had, in the eyes of some Western ecologists, masked the spatial heterogeneity and so its affect upon life histories. This Martu study was located in the harshest of arid-zone land types, that is, spinifex grassland landscapes dominated by low moisture and poor soils with low nutrients.

Heterogeneity in time was found to be extreme in the Australian arid zone. Long term ecological variations have been less well researched and understood than spatial ones. Whilst temporal rainfall patterns had a profound influence on ecological function, Stafford Smith and Morton (1990:272) warned against the simplistic characterisation of boom-bust cycles. Certain plant and animal groups had buffering strategies that masked or delayed fluctuations related to rainfall.

Key relationships that were proposed to drive the functioning of Australia's arid lands were represented in a schematic diagram (Fig. 2.1). The elements of this diagram drew upon the propositions and illustrated contrasts such as the consequences of floods compared to droughts. The network of interactions shown was indicative of the complexity but could not demonstrate all of it. Trophic flow in single directions simplified ecological systems highly variable in space and time.

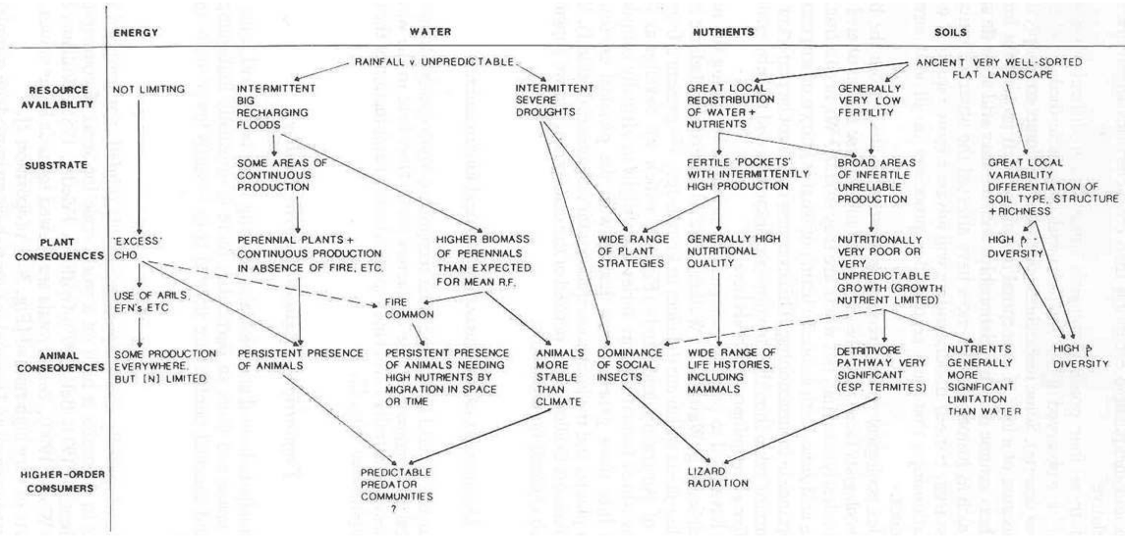

Figure 2.1 Grand summary diagram, showing key relationships posited in Stafford Smith and Morton (1990:258)

Stafford Smith and Morton (1990) did not aim to address the role of people—past or present—in the framework. In 1990, the long history of Aboriginal occupation, their processes of environmental manipulation and changes they wrought in arid regions were poorly understood.[25] For this research, the arid zone ecology framework was useful to identify the ecological conditions in which Martu lived. Its propositions identified some of the influences upon people as ecological components of extreme environments. It identified some factors that influenced Martu directly or indirectly through influence on their resources. For example, contrary to emphasis on opportunistic collection strategies (Gould 1969), this research found that Martu women often targeted particular resource patches in their pursuit of bush foods (Ch. 7). This targeting was influenced by highly patterned plant production (Proposition 4). Alternately, as I learnt, there were certain propositions by Stafford Smith and Morton (1990) that were not applicable to Martu, for instance, the greater influence of water rather than food (Proposition 9) in prehistoric times. Aspects of this framework helped interpret data presented in this dissertation.

2.1.3 Bioregions

In Western Australia, the Great Sandy Desert (GSD) and Little Sandy Desert bioregions and their sub-regions were described in a biodiversity audit compiled by McKenzie et al. (2002). The GSD bioregion extends from the eastern Pilbara to south of the Tanami Desert and west of the MacDonnell range (Fig. 2.2). Part of Rudall River National Park and all of Uluṟu Kata-Tjuta National Park (UKTNP) are situated in the GSD bioregion.

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[25] This omission was well recognised by the authors (MSS pers. comm. 2005). A forthcoming review of this paper will examine evidence to support, refine or dispel the propositions. It will also position the role of ecological impacts by Aboriginal people.

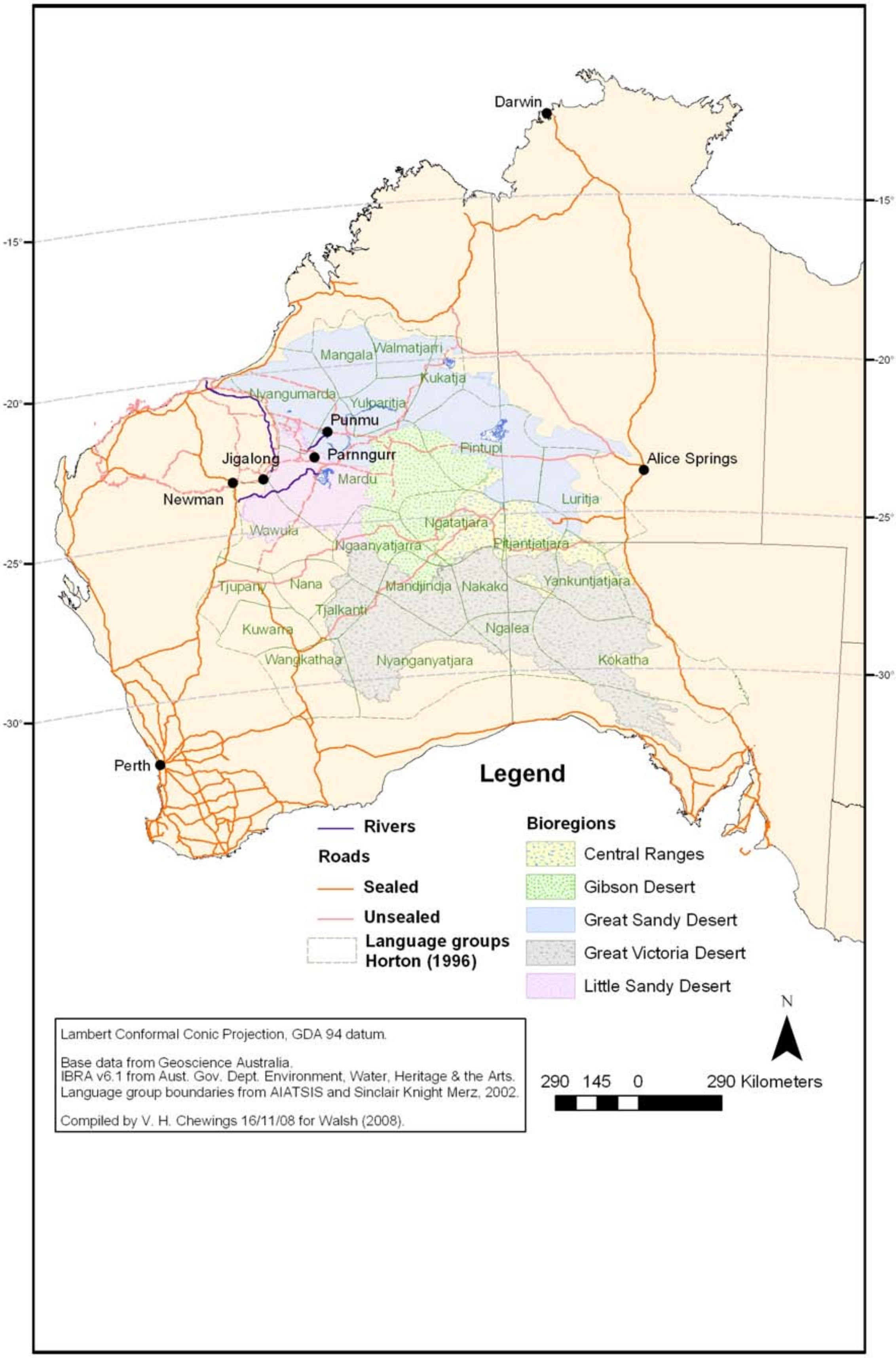

Figure 2.2 Bioregions and the dialects within the boundaries of the Western Desert Culture Bloc and Language group

The GSD bioregion traverses Western Australia and the Northern Territory and biophysical features across this area are similar; however, state agencies and legislation have influenced the nature of biological research and management.

There have been no comprehensive studies of biodiversity in the two bioregions (Whitehead et al. 2001). Scientific biological research in the Great and Little Sandy Deserts has been limited, except within UKTNP. Research has been constrained by the remoteness from Perth, Karratha and Alice Springs and high costs. Studies have included landform, general flora, mammals, birds, amphibians and reptile inventory and descriptions (Muir 1982; Burbidge & McKenzie 1983; Graham-Taylor & Bamford 1996); vegetation mapping and descriptions (Beard & Webb 1974); land unit mapping and description (Phillips 1989), ethnobotanical surveys (Veth & Walsh 1988); ethnozoological survey for extinct, rare or threatened species (Burbidge et al. 1988; O'Malley 2003), wetland classifications and descriptions (Duguid et al. 2002); bird atlas surveys, listings and maps of threatened plant species distributions in the eastern GSD (White et al. 2000) and historical analyses of burn patterns (Burrows et al. 2006). There have been a small number of species-specific studies (including the Northern and Southern Marsupial Mole, Black-footed Rock Wallaby, Mulgara, bats, Great Desert skink, Black-headed python and Night parrot). Ecologists who published their field observations in popular media have also contributed to scientific understanding (e.g. Bamford 1992; Kerle 1995; Gough 1997).

No empirical, long-term or ecological systems research has been done in western parts of the bioregion. Thus, the diversity and variability within the bioregion are poorly understood from scientific perspectives. The most intensive ecological research has been conducted at UKTNP which has been collated in a substantial report (Reid et al. 1993) with regular successive surveys (e.g. Reid 1999). To some extent, research findings from adjoining arid bioregions may be extrapolated to the study area e.g. the ten year biological survey of Anangu Pitjantjatjara lands (Robinson et al. 2003).

McKenzie (2002) summarised descriptions compiled for the GSD McLarty subregion (Graham 2001), GSD Mackay subregion (Kendrick 2001a), LSD Rudall subregion (Kendrick 2001b) and LSD Trainor subregion (Cowan & Kendrick 2001). These more detailed descriptions included published and unpublished data on biodiversity values, dominant land uses, wetland significance, ecosystems and species at risk, management scenarios, conservation actions and identified data gaps. These summaries have subsequently been standardised and incorporated into the National Land and Water Resources Audit (2003).

McKenzie et al. (2002:51) described the Great Sandy Desert bioregion as:

> Mainly tree steppe in the north grading to shrub steppe in the south. The climate is arid tropical with summer rain. The bioregion is dominated by Quaternary red longitudinal sand dune fields overlying Jurassic and Cretaceous sandstones of the Canning and Amadeus Basins. Vegetation comprises open hummock grassland of *Triodia pungens* and *T. schinzii* with scattered trees of Desert Walnuts and Bloodwoods, and shrubs of *Acacia* spp, *Grevillea*

> *wickhamii* and *G. refracta*. *Casuarina decaisneana* (Desert Oak) occurs in the far east of the region.
>
> Gently undulating laterised uplands such as the Ankatell Ridge support shrub steppe such as *Acacia pachycarpa* over *Triodia pungens* hummock grass. Calcrete and evaporite surfaces are associated with occluded palaeo-drainage systems that traverse the desert and these include extensive salt lake chains with samphire lowlands and *Melaleuca glomerata* and *M. lasiandra* shrublands.
>
> Monsoonal influences are apparent in the McLarty subregion. Its dunefields of red-brown sands support savannas that have a greater proportion of bunch grasses than the Mackay subregion, with emergent Desert Walnut trees rather than Desert Oak or Bloodwoods.
>
> The region also contains a number of rare features such as the Mandora Marsh, Dragon Tree Soak, Salt Creek, Rudall River, as well as various soaks and rockholes that are significant local sources of water and serve as seasonal refugia.
>
> Endemic troglobitic faunas are almost certainly associated with calcrete systems along palaeo-drainage lines. The bioregion's arid ecosystems are rich in reptiles, particularly *Ctenotus* and *Lerista*.

And the Little Sandy Desert bioregion as:

> Red Quarternary dune fields with abrupt Proterozoic sandstone ranges of the Bangemall basin. It includes the headwaters and course of Rudall River.
>
> A shrub steppe of acacias, *Aluta* [*Thryptomene*] *maisonneuvei* and grevilleas over *Triodia schinzii* hummock grassland occurs on red sandy surfaces that dominate the desert. There is a sparse shrub steppe over *Triodia basedowii* on stony hills, with river gum communities and bunch grasslands on alluvial deposits in and associated with ranges.
>
> The climate is arid, with summer rainfall. There are two subregions—Rudall and Trainor.
>
> The region includes Savory Creek and the headwaters of Rudall River, two desert rivers with near permanent wetlands along their courses. Small permanent rockholes and wetlands associated with ranges and uplands are locally significant sources and have high biological and cultural significance. Small artificial wells have been constructed as water sources along the Canning Stock Route. (McKenzie et al. 2002:68)

2.1.4 Climate

For this study, raw climatic records were sourced from the Western Australian Bureau of Meteorology microfiche files in 1993 and climatic information summaries from the Australian Bureau of Meteorology website in 2008 (BOM 2005).

The study region is characterised as subtropical desert. Nationally, it falls within a low 200–300 mm annual rainfall zone (Fig. 2.3). It experiences the highest temperatures and pan evaporation rates within Australia exceeding 400 cm pa (Fig. 2.4). Records from Telfer, the nearest weather station to Martu settlements, reported a mean rainfall of 292 mm (1974–1990). Long-term records (1907–1987) from the next nearest station, Roy Hill, had a mean yearly rainfall = 265 mm, SD = 141 mm. Figures 2.5 and 2.6 illustrate the high inter-annual rainfall variations.

Figure 2.6 for Telfer shows the 1990 study was conducted during a below average rainfall year when the total rainfall was 120 mm. A higher than average year occurred in 1988 and a high rainfall period occurred for 1980–1983. The delayed effects of these rainfall periods influenced the productivity of specific plant and animals in subsequent years.

There is a hot season rainfall pattern. This was dominated by subtropical cyclonic events and rain-bearing depressions. Convectional thunderstorms also contributed to the hot season rainfall pattern, these were often intense and highly localised or patchy. In the cooler months, southern depressions occasionally penetrated north inland to bring low volume, widespread rain and/or colder temperatures. Commonly, September and October were the driest months.

Mean monthly maximum and minimum temperatures show an intra-annual pattern with the highest mean maximum is 40.4°C in January and the lowest minimum is 6.4°C in June (Fig. 2.6). The study found that Martu described intra-annual seasons by reference to temperature and wind variables rather than rain (Ch. 7). Temperatures and wind drove the extremely high pan evaporation rates (Fig. 2.4). In the hot season, evaporation rates commonly exceed precipitation rates. In the cooler months, prevailing south-easterly winds dominated the wind pattern.

El Niño – La Niña Southern Ocean Oscillations shaped long term inter-annual patterns expressed in the Roy Hill rainfall data (Fig. 2.5). Extended rainfall periods contributed to the germination and establishment of long-lived perennial plants and other species. For instance, germination and growth of stands of the nectar-resource *Aluta (Thryptomene) maisoneuvii* resulted from successive high rainfall events. It such ways big rainfall events structured arid zone vegetation and associated environments.

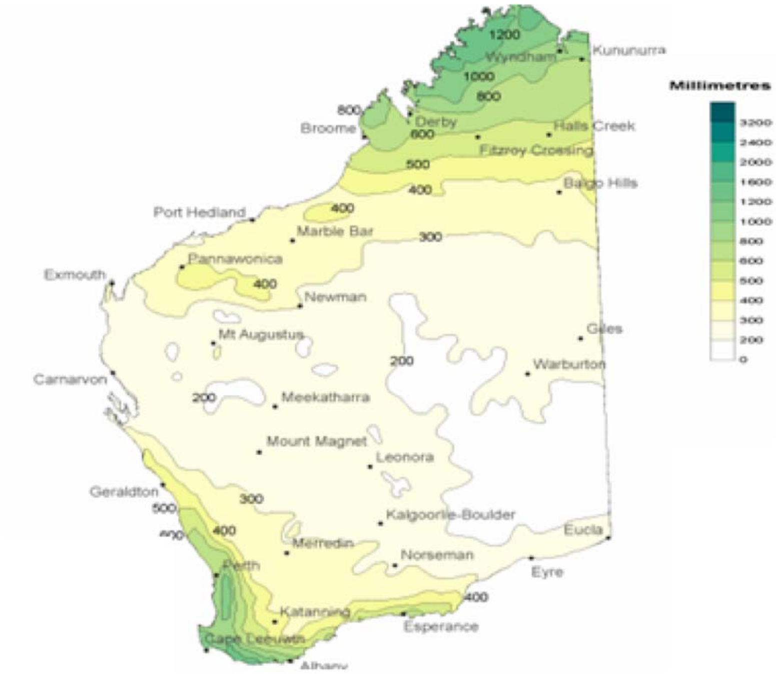

Figure 2.3 Average annual rainfall zones for Western Australia showing Telfer near Martu lands, based on a 30 year climatology 1961 to 1990 (BOM 2005)

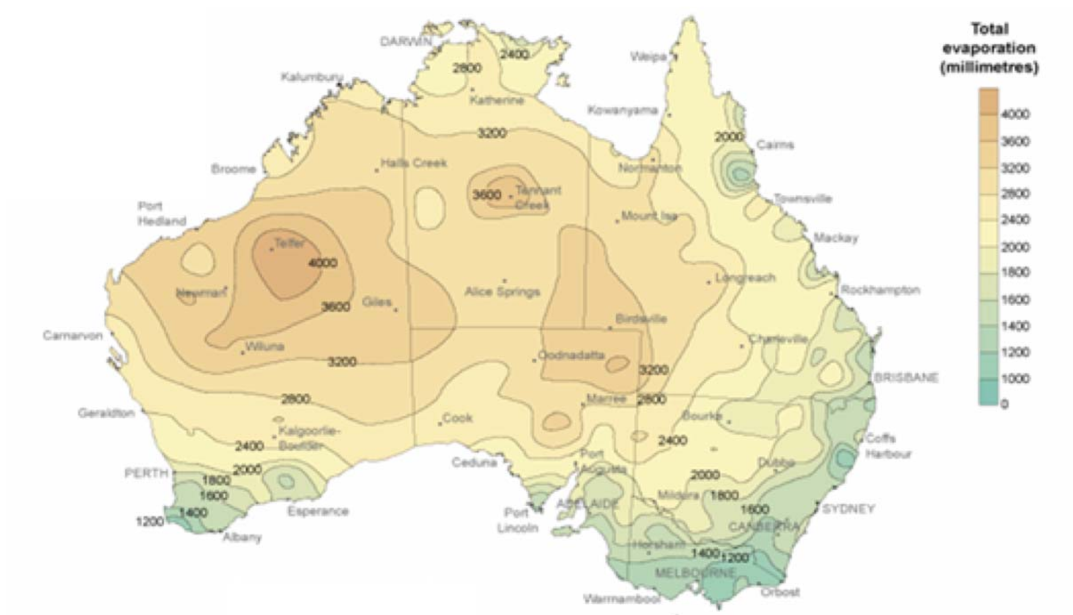

Figure 2.4 Average annual evaporation zones for Australia showing Telfer near Martu lands, based on at least 10 years of records from 1975 to 2005 (BOM 2005)

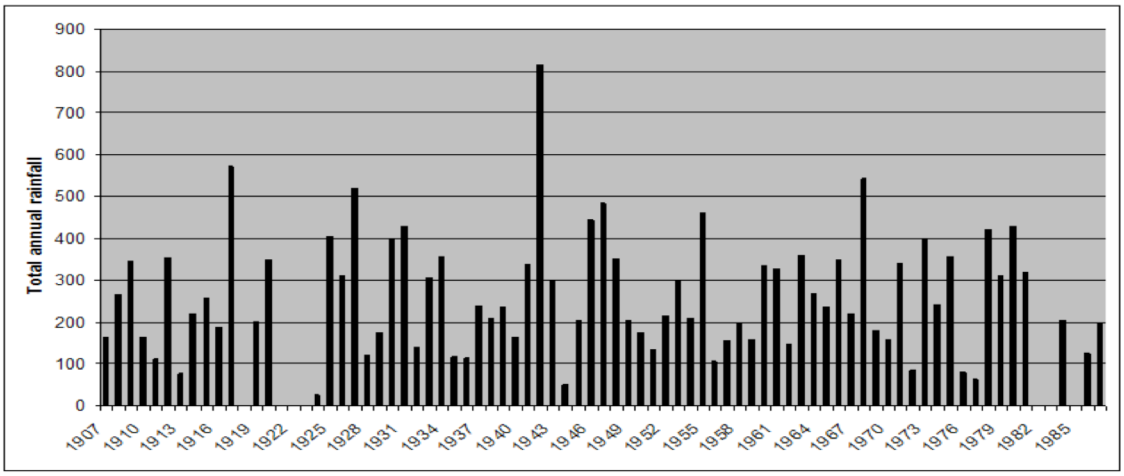

Figure 2.5 Total annual rainfall at Roy Hill 1907–1989, from WA Bureau of Meteorology data in 1991

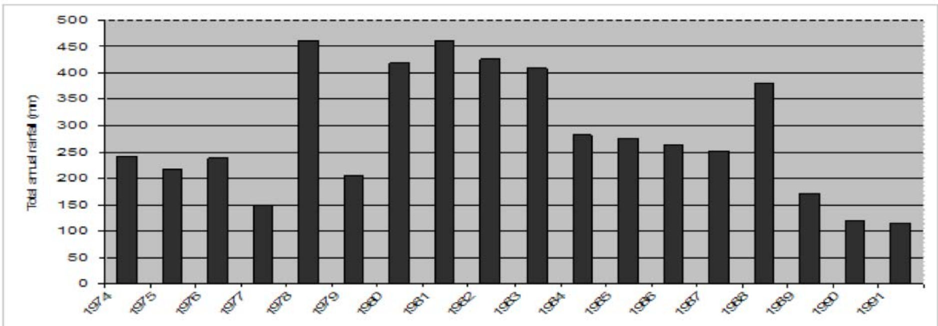

Figure 2.6 Total annual rainfall at Telfer 1974–1991, from WA Bureau of Meteorology data in 1991

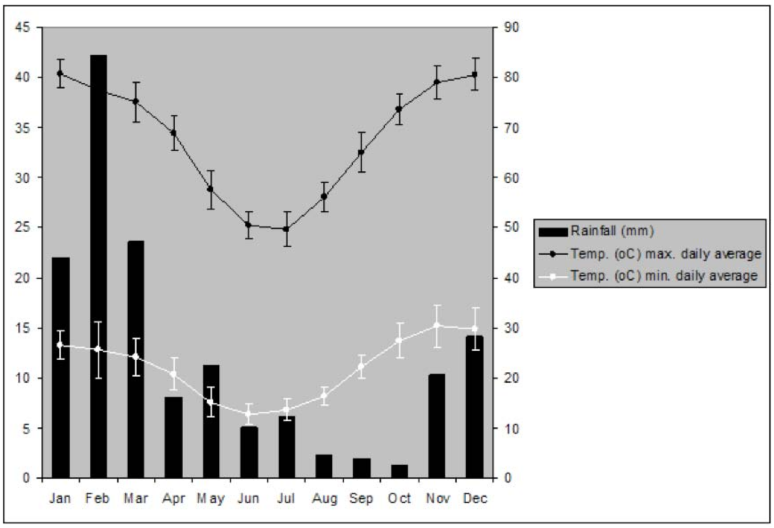

Figure 2.7 Mean monthly maximum and minimum temperatures and mean monthly rainfall at Telfer 1974–1990

2.1.5 Landscape, geology and land types

Unpublished 1:100,000 topographic dyelines were procured for the study area. By 1990, topographic mapping at 1:250,000 had been published for the study region (DNM 1989). Figure 2.8 illustrates the topography of the area from 1:100,000,000 scale mapping of visual features for aeronautical purposes (SKM 2001). Environmental geology/regolith had been mapped for the region at 1:250,000 scale (Chin et al. 1980; Chin et al. 1982; Yeats & Towner 1979). Soil mapping was available at 1:2,000,000 scale (Bettenay et al. 1967).

Land unit mapping has been a standard base for the management of national parks, pastoral properties and other rural land areas (e.g. Allan 1984; Pringle et al. 1994; McDonald et al. 1990). Phillips (1989) prepared a preliminary land system classification and land unit maps at 1:250,000 scale for Rudall River National Park. In 1990, Phillips was contracted through this research project to extend the land unit descriptions to 50 km radii around Parngurr and Punmu; this was hand mapped and colour coded (Fig. 2.9 and 2.10). This mapping provides a base for future ground truthing and digitisation.[26]

Twenty-three land units were classed and mapped at 1:250,000 scale within Rudall River National Park. It was clearly recognised by Phillips (1989) that this scale of mapping masked finer scale spatial features such as land elements (particularly wetlands such as creeks, claypans and soaks) that may have had regional biological significance. These were unmapped. Further, spatial variability associated with post-burn responses and localised rainfall events overlay land unit classes.In this study, Figures 2.9 and 2.10 provide a base for the quantification of spatial land use patterns by Martu (Ch. 7.3).

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[26] Phillips (1989) compiled land unit maps through interpretation of the above topographic and geology maps with vegetation descriptions from Beard and Webb (1974) plus interpretation of 1982 1:80,000 colour aerial photography but no field work was possible. Notably, this mapping was neither rectified nor ground-truthed and, it was done before a Geographic Information System (GIS) platform was available. In future, it would be suitable for digitisation. Kendrick (1990b) identified the absence of regional ecosystem mapping suited to biodiversity assessments and management in the region. They may be unaware of Phillips (1989) and resultant maps.

Figure 2.8 Map of major topographic features in the study region, 1:100,000,000 scale (SKM 2001)

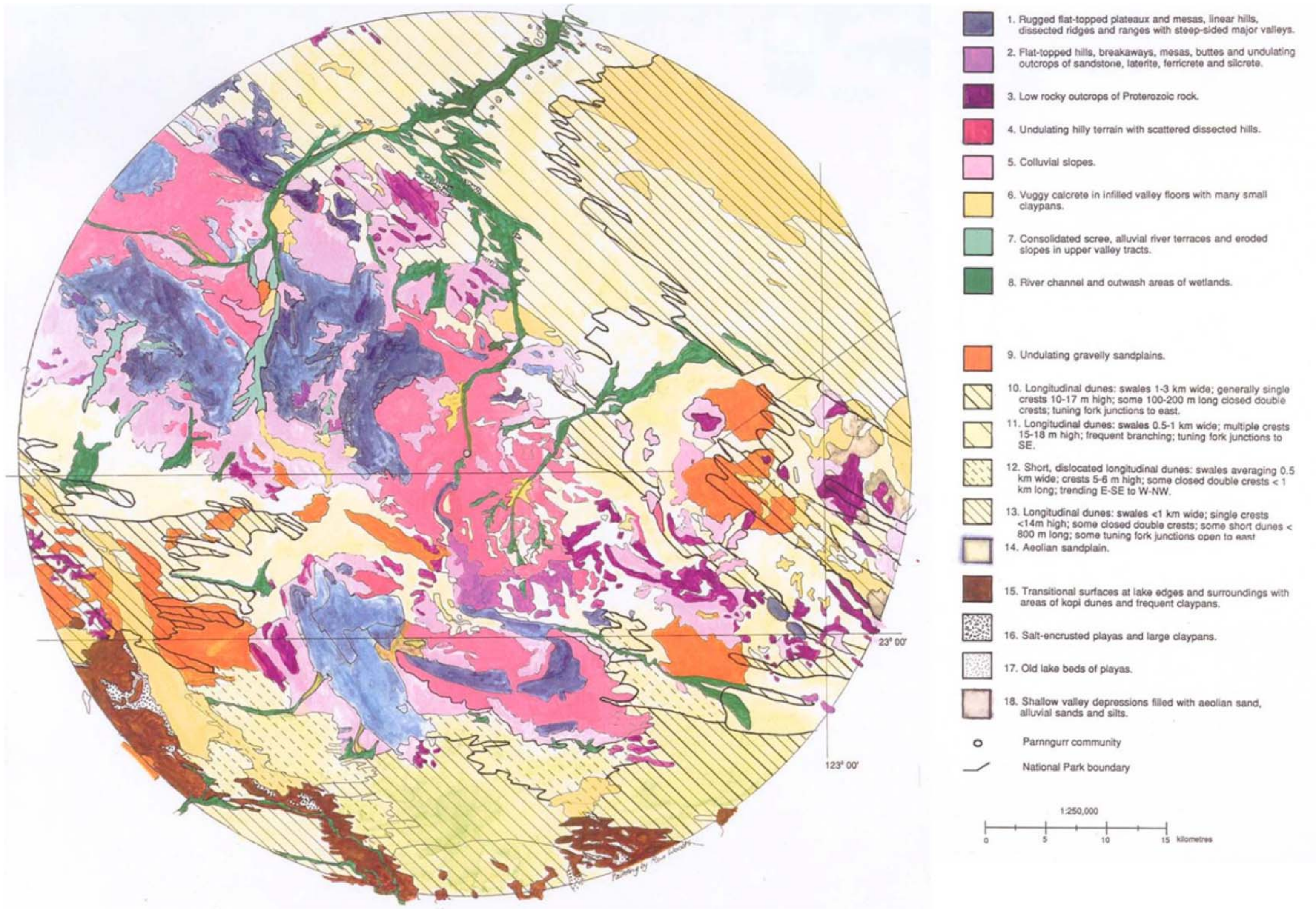

Figure 2.9 Land units within a 50 km radius of Parnngurr (adapted from Phillips 1989)

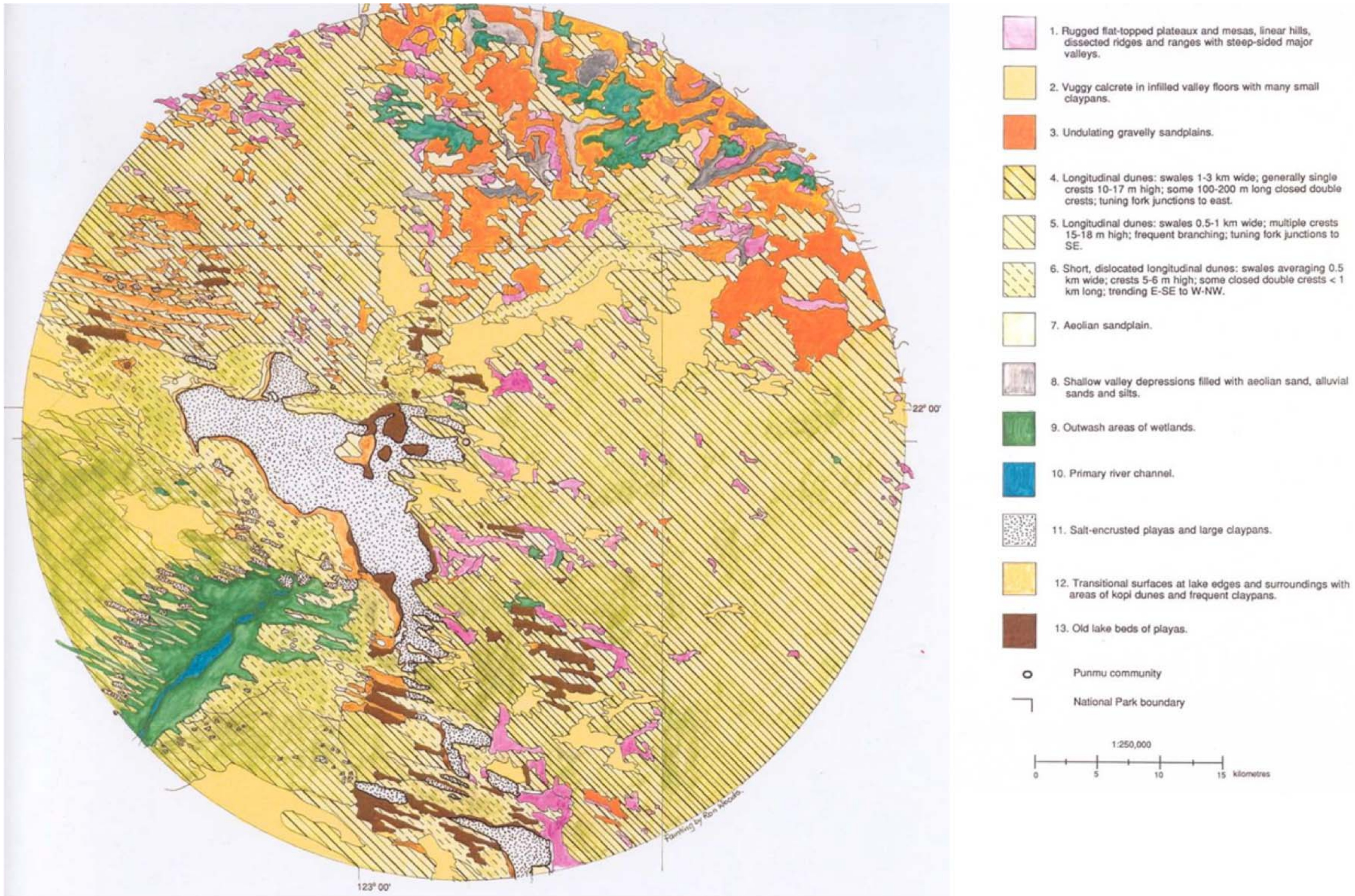

Figure 2.10 Land units within a 50 km radius of Punmu (adapted from Phillips 1989)

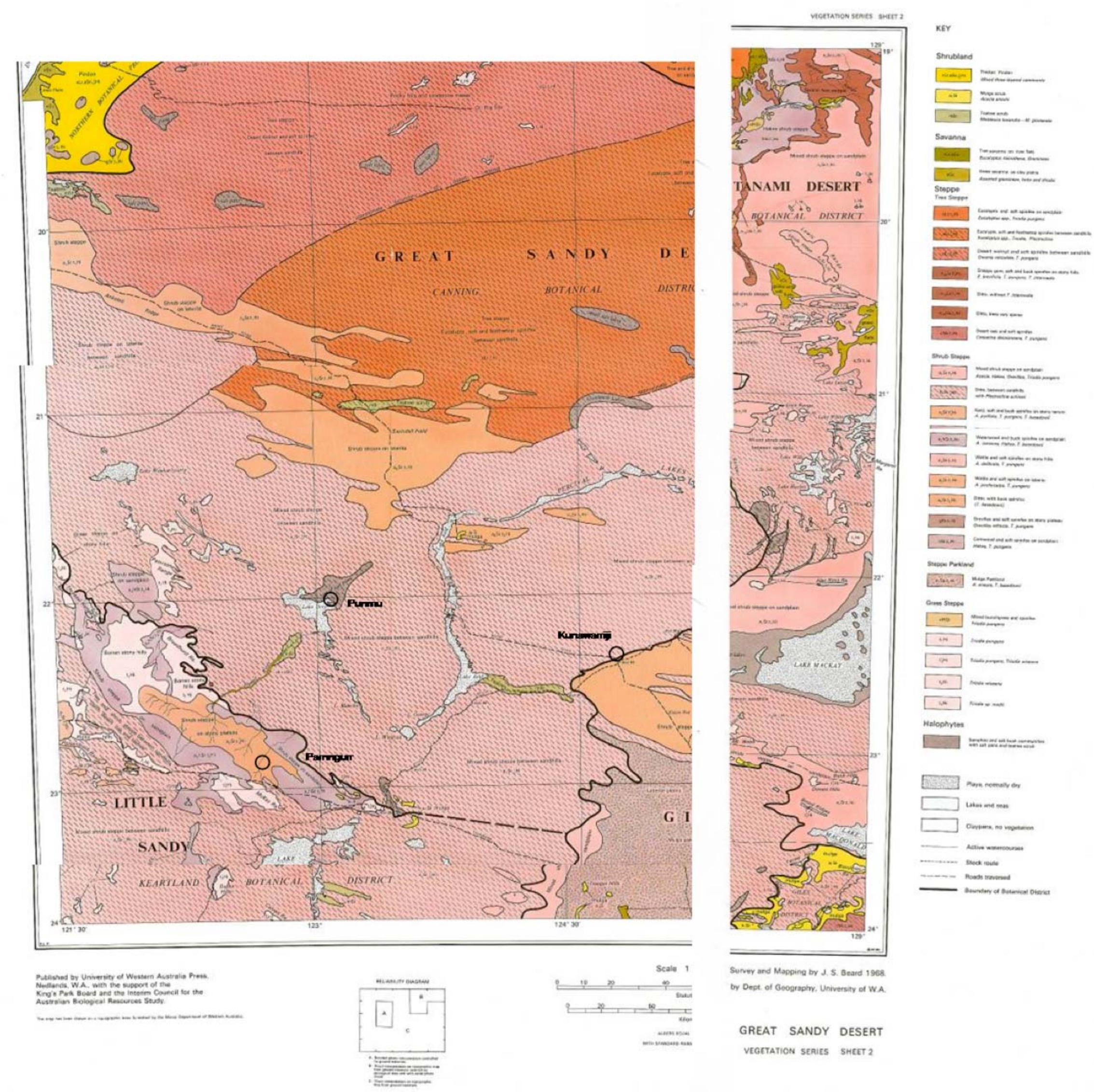

Figure 2.11 Vegetation map of Great Sandy Desert for the Parnngurr, Punmu and Kunawarritji region at 1:1,000,000 scale (Beard 1969, Beard and Webb 1974)
This is a composite of scanned map sections without rectification.

2.1.6 Vegetation structure and function

Vegetation can be well understood by conceptualising descending spatial scales from bioregion to landscape to community and association to patch to individual plant. At the wide spatial scale of 1:1, 000, 000, the botanical surveys of Beard (1974) across Western Australia still provide the primary vegetation mapping of the wider Great Sandy Desert. These have been complemented by a regional survey of eleven sites in the western Great Sandy Desert including plant community and association descriptions at survey sites (McKenzie et al. 1983). Smaller scale surveys in the region have been reported for Martu lands by Walsh (1987) and near Telfer (Goble-Garratt 1987).

Arid zone vegetation is intensely patterned in space and time (Stafford Smith & Morton 1990). The delineation of plant communities in the arid zone belies the intense spatial and temporal variability within and between them. In reality, vegetation boundaries and descriptions shift and change over time scales from less than five years to longer periods e.g. a levee bank may have a *Acacia victoriae* shrubland that in eight years becomes a kangaroo grass (*Themeda australis*) tussock grassland. Climatic and fire patterns are major drivers of vegetation pattern and change. Some of the processes that shape these spatial patterns have been described (Ludwig et al. 1997; Friedel et al. 1990). The movement and settling of water, nutrients and seeds shapes vegetation patterns at different scales from landscape scale such as major wetlands like the Rudall River to local scales such as litter lines deposited by surface water flow under perennial shrubs.

George and Mitchell (1983) provided a preliminary species inventory from a Great Sandy Desert survey. It listed 541 flora species. This list was dominated by perennial species as low rainfall conditions prior to the survey period limited the number of ephemeral and annual species. This inventory was used as a primary guide to species found in the course of this Martu research. In terms of species numbers, grass and acacia species dominated flora of the region (Tab. 2.2).

Table 2.2 Number of species in the larger plant families collected in the western Great Sandy Desert during field survey approximately 40 days 1977–1979 (from George & Mitchell 1983)

Family	No of species
Poaceae [grass family}	74
Mimoseae [acacia family]	44
Papilionaceae [legume or pea family]	39
Chenopodiaceae [chenopod family]	31
Malvaceae [hibiscus family]	30
Amaranthaceae [mulla mulla family]	26
Cyperaceae [sedge family]	22
Myrtaceae [eucalypt family]	22
Goodeniaceae [goodenia family]	16

As a precursor to understanding the distribution of Martu plant food resources, aimed to identify species composition, physiognomy and vegetation patterns at sites ranging from Rudall SSE to McKay Range. Ten sites with a total of 36 nested quadrats at 10 m^2 to 40 m^2 were surveyed. Statistical analysis through ordination and classification of species presence/absence identified a separation between site vegetation on the basis of position on wetlands, on sand plains or sand dunes and on ranges or hills. The statistical separation between sites was weak, post burn responses then soil moisture and landform appeared to be the main determinants of vegetation difference (Walsh 1987).

2.1.7 Fauna

Before European desert settlement, at least thirty seven species of native mammal were thought to occur in the western GSD (Burbidge & McKenzie 1983), 46 species at Uluṟu–Kata Tjuta National Park (UKTNP) (Reid et al. 1993) and 44 native mammals on the Anangu-Pitjantajatjara lands (Robinson et al. 2003). The native mammal fauna of the Great and Little Sandy Deserts had been dominated by small to medium-weight range animals. In modern times, the diversity of desert mammals has severely declined with the demise of critical weight range mammals of 35–5500 g (Burbidge et al. 1988; NLWRA 2003). On AP lands, 27 native and 9 introduced mammals have been recorded for recent times (Robinson et al. 2003:199). Eighteen species are now presumed extinct. Only 17 mammal species had been recorded by the WA Museum in Rudall River National Park (RRNP) (CALM 2003b).

Two hundred and fifteen bird species have been recorded for the GSD bioregion during surveys for the Australian Bird Atlas. Ninety bird species had been recorded for RRNP. All major guilds were found in the region, that is, ground nesters, hollow nesters, ground seed eaters, ground insect eaters, freshwater and grassland species. A proportion of these species were vagrants occurring after rainfall and/or were rarely sighted species. The largest bird species were the Emu that required surface waters being venturing from semi-arid to arid regions and the Australian Bustard which gathered to lek in flocks of 20 and more birds. Large nomadic flocks of the parrots (especially Budgerigar) and finches (especially Zebra Finch) were common (CALM 2003b).

In the extensive spinifex grasslands of the GSD, bird communities were relatively depauperate except where mallee, mulga, melaleuca or other shrub species were dominant. The avifauna was relatively richer in range and riverine country. Fire influenced the composition of bird communities e.g. nomadic species favouring early seral post burn areas (Reid et al. 1993).

Australian deserts contain exceptionally high diversities of reptile species compared to other deserts of the world. In the GSD bioregion, the most comprehensive herpetological surveys have been conducted at UKTNP and Watarrka National Parks (Reid et al. 1993; Reid 1999). The numbers of reptile and frog species recorded for these areas are between 75 and 80 species with species being found in all habitats; skinks were the most abundant reptile group. Relative to the wider GSD and adjoining deserts, Uluṟu National Park has a particularly rich reptile fauna (Reid et al. 1993). In the western GSD, 75 reptiles and 8 frog species have been collected (Burbidge & McKenzie 1983). In RRNP, 3 ground frogs, 5 tree frogs, 7 dragons, 21 skinks, 2 goannas and 5 snakes have been recorded (CALM 2003).

In terms of landscape types, the reptile fauna of spinifex and acacia formations were more diverse that chenopod formations and tussock grasslands (Morton & James 1988). This diversity may have been shaped by sand habitats suited to subterranean dwelling, high termite diversity and less competition with other vertebrate groups.

Habitat partitioning was high in some areas e.g. a distinctive reptile fauna were associated with taller dunes but in other areas there were remarkable levels of sympatry, for example, 12 *Ctenotus* skink species within the spinifex dominated landscapes (Reid et al. 1993). Contrary to the bird fauna, early seral burns were low in reptile species richness as many of the spinifex specialists were absent.

Insects are the dominant fauna in Australian deserts. In particular, social insects such as ants and termites are most abundant by both biomass and species. Insect fauna were not included in Great Sandy Desert surveys (Burbidge & McKenzie 1983; Reid et al. 1993). Many invertebrate species in the arid zone have not been recorded or formally named by Western science. Results of the most comprehensive arid zone insect and arachnid collection was recorded for the Anangu Pitjantjatjara lands biological survey (Robinson et al. 2003), although the authors describe it as a broad scale and low intensity survey. Preliminary analyses were constrained by the need for taxonomic research. Robinson et al. (2003) found more than 280 insect species in 2 years of fauna survey.

Stafford Smith and Morton (1990) identified the key role of ants and termites in the ecology of Australian arid environments. They drew an analogy between their colonies and perennial plants in that the colonies act as storage organs that provide higher order consumers (particularly reptile and bird species) with resources that provide buffers during low production periods. Notably, termite alates were highly prized food sources for Martu in pre-European times and Sand goannas a major part of the Martu contemporary food species inventory (Ch. 5).

2.1.8 Wetlands and refugia

In arid Australia, wetlands are widely recognised to exert a major influence upon biological and human environments. Riverine channels, buried drainage lines and run on areas are places of high fauna consumer abundance (Stafford Smith & Morton 1990). In desert regions, areas of continuous production were refugia to persistent consumers (e.g. herbivorous mammals and insect herbivores). These were vital landscape features for humans reliant upon potable waters, arid zone archeological sites are generally concentrated by wetlands (Veth 1993; Thorley 2001). On a regional scale, these wetlands are often small, scattered patches or strips.

A classification of surface waters in the Pilbara (Masini 1988) was applied and the following seven types identified on Martu lands: springs, pools, headwater streams, primary river channels, adjoining pools, rockholes and claypans; additional to the Pilbara classification were soaks and saline paleodrainage channels (Walsh 1987). Within each of these classes was high variation in the permanency, volume and potable quality of the water. Rudall River was the largest freshwater wetland on Martu lands. Notably, it was the major travel corridor for Martu groups as they moved out of and into their lands from the Pilbara in the 1940–60s (Tonkinson in Davenport et al. 2005). Wetland habitats had a statistically greater richness and diversity of Martu food resource species than sandplain and upland habitats when areas of similar burn age were compared (Walsh 1987).

Australia has listings of wetlands of national significance. Substantial biological survey effort has been focused on desert wetlands (e.g. Duguid et al. 2002). Rudall River draining into Lake Dora and Savory Creek east of Jigalong (Fig. 1.1) are identified as rare features being arid zone rivers with near-permanent wetlands flowing into (not out of) the desert and salt lakes (Kendrick 2001b). Small permanent rockhole wetlands are also locally significant to biodiversity. Rudall River is also listed as a seasonal refuge in the arid zone (Morton et al. 1995). There was congruence between the values of wetlands to Martu and ecological values. Chapter 7 provides interpretations of Martu knowledge and use of wetlands.

2.1.9 Fire and landscape burning

Fire shapes arid ecosystems. It influences the composition and structure of vegetation, fauna communities and indirectly, affects soil surface conditions and hydrological flows (Stafford Smith & Morton 1990; Gill 2000; Allan & Southgate 2002; Burrows et al. 2006; Saxon 1984). Although fire is recognised to be a key driver of ecosystem function (Tab. 2.1), the extent and intensity of ecosystem influence from burn regimes is insufficiently recognised some argue (e.g. Latz 2007)

Spinifex grasslands and shrublands are characterized as having mosaics of vegetation at different seral stages and in different compositions affected by variables within the fire regimes and rainfall patterns. These mosaics or patchworks are spatially and temporally dynamic. Some fauna species display a preference for early post-fire states and others for later states. Generally, the richness of mammals and reptiles is higher in mature spinifex compared to recently burnt areas (Allan & Southgate 2002). Conversely, plant diversity is higher in recently burnt areas (Walsh 1990) in certain fire regimes but declines in other regimes (Latz 1995b). Fire-sensitive species and communities decline under regimes with short intervals and wildfires.

Allan and Southgate (2002) reviewed biological responses to fire in spinifex grasslands. The term ‘fire regime’ summarises spatial and temporal parameters of burns including spatial extent, patchiness, season of burn, intensity, interval or frequency. At a smaller scale, individual burn characteristics are described by, for example, dwell and rate of spread. These are affected by variables such as fuel type, fuel load, wind and temperature (Craig 1999; Allan & Southgate 2002). A fire regime reflects the accumulated impacts of different fires at a landscape scale over time periods relevant to the life cycles of flora and fauna. Specific knowledge of species life cycles is required to understand the influence of fire regimes on species responses.

In pre-European times, lightning strikes or Aboriginal people ignited fires. Links between Aboriginal burning practice and burn regimes remain poorly understood (Gill 2000) despite socio-ecological research into burning in the arid zone (Latz 1982a; Kimber 1983; Walsh et al. 2003; Bird et al. 2005; Burrows et al. 2006; Nash 1990). The widespread demise of small to medium mammals has been partially attributed to changed fire regimes following the retraction of dispersed Aboriginal hunter-gatherers (Burbidge et al. 1988; Bolton & Latz 1978). Questions remain about the nature of ‘traditional’ and contemporary burning practice and associated perceptions of Aboriginal people, for example:

> the regimes of the traditional Aboriginal past [are] unknown in fire-regime terms. Of particular interest ecologically would be to know: the locations of areas selected by Aboriginal people for burning; the proportion of the defined region burnt each year (and the

> variability in yearly extent); the time since the previous fire when burning take place (and the associated accumulated rainfall); and the nature of the fuel array at the time of burning. … Information on locations of areas where burning would not be considered, and areas where fuel conditions would not be suited to burning … would be worthwhile. (Gill 2000:24).

These questions align to the main parameters of fire regime recognised by ecologists. That is, they want to know where and when Aboriginal people burnt. Until recently the purposes of burning have rarely been analysed in terms of their implications for burn regimes (but see Burrows et al. 2006). Burning was a highly practical activity by which Aboriginal people manipulated their environment. Chapter 8 describes Martu burning patterns in 1990.

Major trends in burn characteristics from per-European to modern times are summarised in Table 2.3 from a synthesis of the above literature.

Table 2.3 Generalised trends from pre-European burn regimes to modern burn regime in arid Australia

Pre-European times	Modern times
mosaic patch burns	widespread burns
smaller patches burnt (< 1000 km^2); vast burns rare	vast areas burnt (>1000 km^2, frequently > 10,000 km^2)
cooler burns	hotter burns
more frequent burns, shorter burn interval	less frequent burns, longer burn interval
burns not only in high temperature, low humidity seasons	burns in high temperature, low humidity seasons
no introduced weed fuels	buffel grass and cooch weed fuels
promoted habitat and species richness and diversity at different spatial scales	reduced habitat and species richness and diversity
trend to heterogenous environments	trend to homogenous ecosystems with less habitat and species diversity and even extensive vegetation loss

The effects of changed fire regimes are interpreted at different spatial scales. At the landscape scale, there is speculation, for example, that mulga woodlands are being burnt and replaced by spinifex grasslands; however, empirical evidence remains equivocal. At smaller scales, it has been observed that fire sensitive communities are being reduced, for example, dry jungle patches on hillslopes and gullies are diminishing and vulnerable. Species-specific effects are not well understood but there has been, for example, revision of the Fork-leafed corkwood (*Hakea eyreana*) from fire tolerant to fire sensitive. In recent years, the apparent trend to reduced habitat and species diversity has been implicated in profound and widespread species change (Latz 1995b).

A confluence between improved satellite technology and image interpretation plus high rainfall and plant fuel loads in the late 1990s has contributed to scientific understanding of regime change in the past two decades. Satellite image interpretation during years with high rainfall, fuel build up and destructive burns revealed for example, that in 1999–2001 70% of central Australia was burnt (Allan & Southgate 2002). Invasion by the introduced weed, Buffel grass (*Cenchurus ciliaris*) was one major contributor to changes in burn regime.

In terms of fire management, principles important to ecologists and agency land managers have been guided by the needs to: protect life and limb; protect stock, pasture and property; protect infrastructure, including historic and cultural sites; and, maintain a full range of natural communities and species (Allan & Southgate 2002). There have been assumptions that the main principles that guide ecological and agency fire management were pertinent to Aboriginal people.

Changes in burn regimes has been identified as a major threatening process within the Sandy Desert bioregions (McKenzie et al. 2002) and elsewhere in the arid zone. In the early 1980’s in Rudall River National park the link between people and burning was not apparent to Western park managers who attributed burns only to lightening ignition (see (Muir 1982)). There has been some collaboration between Martu, CALM staff and CRA in trialling buns to add regeneration (Anon 1994). There is active interest in greater collaboration between CALM researchers and desert Aboriginal people in relation to burning (Burrows et al. 2006).

2.1.10 Ecological condition and threatening processes in the late 20th century

From scientific perspectives, the ecological condition of the Great Sandy Desert and Little Sandy Desert bioregions was considered to be declining. This has been recognised from literature in the late 1980s (Burbidge et al. 1988) to early 2000s. Its exact condition is unknown due to scant historical biological data ((Whitehead et al. 2001; McKenzie et al. 2002). For the GSD, these biologists have identified one threatened ecological community and nine ecosystems at risk. (Whitehead et al. 2001) noted that chenopod shrub lands had been particularly affected by camel grazing. A staggering 30 to 40 percent of the bioregions’ precolonial mammals and several of its bird species are identified to be extinct. It is thought that mammal extinctions peaked in the 1950–60s (Burbidge et al. 1988). Reid (1993) and Whitehead (2001) wrote that some extant mammal species continue to decline in numbers and range, whereas (McKenzie et al. 2002) reported that the trend for species at risk is unknown with long term scientific data. Eleven extant mammals are listed as endangered or vulnerable (NLWRA 2003).

Whitehead et al. (2001) noted that patterns in the decline of bird fauna were less clear than for mammal fauna. They attributed this to a very patchy historical record, ‘noisy’ population fluctuations and species-specific range shifts in response to rainfall. Declines have been reported for the Night Parrot and Princess Parrot with the former listed as endangered. In Chapter 5, we will see that the Australian Bustard (*Ardeotis australis*) classified ‘at risk’ (Kendrick 2001b) was a major game resource for Martu. Kendrick (2001b) did not identify hunting as a threatening process, whereas, Whitehead et al. (2001:22) did but concluded there were insufficient data to warrant establishing an associated monitoring system. One reptile species, the Great Desert Skink (*Egernia kintorei*) has declined across much of its range and was listed as vulnerable and likely to become extinct. The Python (*Aspidites ramsayii*) was listed as specially protected (Kendrick 2001b).

In flora terms, the bioregions were not known to have had any extinct plant species and, in the Northern Territory, no plant species which are nationally endangered or vulnerable had been listed for the GSD bioregion (Whitehead et al. 2001). Yet, in Chapter 8 it is noted there is Martu ethnographic evidence for the demise of key plant resource species. Scientific understanding of floristic changes and trends is again limited by the lack of long term scientific data.

The condition of nationally important wetlands in the Great Sandy Desert bioregion was considered to be fair to good. However, wetlands of regional importance were reported to be declining or rapidly declining in condition (McKenzie et al. 2002). Further, the riparian zone vegetation of Rudall River was reported to be only in fair condition and declining.

A complex of biophysical threatening processes have been identified for the Great Sandy Desert and Little Sandy Desert (Whitehead et al. 2001; McKenzie et al. 2002). The major threatening processes identified in 2001–02 being:

- Changed fire regimes with possible impact of extensive hot fire rather than fine-scale cooler burns
- Grazing pressure by feral herbivores (camels, rabbits, cattle, donkeys, house mice and goats in localised areas)
- Predation by feral predators (cats, foxes)
- Exotic weeds (particularly Buffel grass (*Cenchrus ciliaris*) and couch grass (*Cynodon dactylon*)

Additional threatening processes were identified in Kendrick (2001b).They were:

- Altered hydrology
- Damage to surface wetlands by camels
- Localised degradation of camping sites and tracks utilized by tourists
- Wildlife disease

In 1990, there were ethnographic and observational indications of these processes (Ch. 8); however, their spatial extent and intensity was unknown.

2.1.11 Protected areas

The Great Sandy Desert (GSD) and Little Sandy Desert bioregions straddle Rudall River National Park (RRNPk). It is the second largest National Park in Australia at 1,283,706 ha (CALM 2003b) and one of the largest and most remote in the world.[27] RRNPk centres on the Rudall River which drains internally to a dune field that occludes

[27] The largest is Kakadu National Park at 1,980,400 ha.

its course in dry times; in flow periods fresh waters reach the saline playas that are a part of a wider paleodraininge system. The river sheds from uplands in the Broadhurst Range. Sand dune fields dominate the eastern park and beyond. The Park had been recommended as an Australian Biosphere Reserve as it included an entire landscape sequence (Burbidge & McKenzie 1983:124). The ecology and European history of the Park were described in Muir (1982).

Euro-Australian management of Rudall River NPk was absent to very limited from its gazettal in 1977 to 1990 (when this ethnoecological research was conducted amongst Martu). Ten recommendations for park management were proposed by Muir (1982: Section 20). The primary recommendation was for a mobile or resident ranger to visit recreation areas and mining tenements, others were for feral animal and weed control, scientific research, reporting and monitoring and boundary extensions. However, CALM staff worked in the Park for less than two weeks a year to 1990.

Beyond RRNPk but still on Martu lands, other nature reserves were proposed (Fig. 1.2). These included Durba Hills (Lawrence 1989), Lake Auld and the Percival Lakes (Burbidge & McKenzie 1983). These were never gazetted and management of these areas would be minimal by Martu and National Parks standards. In biodiversity terms, reserve management in the western part of the GSD bioregion was ranked as poor even in 2002 (McKenzie et al. 2002:53 also see Ch.9). The implications of resource and land use by Martu for the national park and future planning are a central subject of this dissertation.

2.2 Human environments: prehistory, history and contemporary features of Martu life

2.2.1 Martu people, their language and lands

The definition of 'Martu' means 'Aborigine, a person; people; a man' (Marsh 1992). It is an umbrella term that encompasses people who speak one of several dialects and have connections to countries to the east of Jigalong (Fig. 1.2 and Tonkinson 1991). In this dissertation, 'Martu' refers to the collective of people from Parnngurr, Punmu, Kunawarritji and Jigalong. Linguists and anthropologists recognise Martu as belonging to the Western Desert Culture Bloc (Tonkinson 1991). That is, having family connections, mutually intelligible dialects, connected Law and other similar cultural traits to other Aboriginal people occupying the Great Sandy Desert, Little Sandy Desert, Gibson Desert and Nullarbor Desert (Fig. 2.2). Senior Martu identified their specific country sites, close family and dialect within the wider area of the Western Desert where connections to places and people extended. In modern times, the legal processes of tenure assertion and rights of claim to country have required prescribed definition of Martu and their membership.

Linguistically, 'Martu' encapsulated speakers including Warnman, Nyiyaparli, Putijarra, Kartujarra and Manyjilyjarra dialects, the modern blend of these dialects is named ‘Martu *wangka*’ (Marsh 1992). At the time of study in 1990, Martu people with whom I worked were multilingual in several Western Desert dialects. Most of them spoke a local dialect as their first and often second language. Younger people and children tended to speak with words derived from a mix of dialects. This has been termed Martu wangka (Marsh 1992).[28] Martu rarely used English when they spoke amongst themselves. There was a range of competencies in spoken English; many senior people spoke little or no English whilst younger generations spoke Aboriginal English. Chapter 3 describes the use (or not) of interpreters in this study and associated cross-cultural communication.

2.2.2 Prehistory of Aboriginal occupation in the Western Desert

Archaeological and ethnographic studies in the Western Desert have investigated the occupation patterns, duration and subsistence strategies. These are relevant to this study because they indicate the time over which desert ecosystems have been used and manipulated by Aboriginal people. Also these studies provide a pre-European baseline from which changes and continuity in subsistence and land use patterns to present times may be compared. Notably, ethnoecological research has been reported (Veth & Walsh 1988; Veth 1989; Veth 2005) and contributed to interpretations of the region’s archaeological record (Veth 1989; Veth 1993; Veth 2005).

Veth (2005) distinguished major occupation phases and associated patterns drawing upon research across the Western Desert, Pilbara and greater inland Australia (Tab. 2.4).

Table 2.4 Proposed phases of prehistoric human occupation in the Western Desert (from Veth 2005:141)

Occupation phases	Occupation model
Phase 1 >22,000 BP	Early colonization All land systems in use Broadly based economy
Phase 2 22,000–13,000 BP [late Pleistocene]	Changes in residential patterns Lowlands used more opportunistically
Phase 3 13,000–5,000 BP [early to mid-Holocene]	Climatic amelioration Marginal lands (re)used more systematically
Phase 4 5,000–1,500 BP	Occupation of all desert ecosystems Re-establishment of regional exchange and information networks
Phase 5 1,500–500 BP [late Holocene]	Increased intensity of occupation Accelerated ritual and ceremonial cycles Increase in long-distance exchange systems
Phase 6 500 BP to contact	Increased interaction with social networks in central Australia

Archaeological evidence from stratified deposits in central Australia has shown that by at least 20,000 years ago people had occupied localized areas of the Western Desert. However, the greater proportion of the Western Desert was unoccupied from the late

[28] *wangka* ~ speech, language, story, word

Pleistocene to mid Holocene. Pleistocene occupation was discontinuous in time and space. People (re)colonized wider desert areas from the mid to late Holocene. There was evidence for higher rates of artefact discard in the last 2500 years, indicative of increases in the number of people and their activities (Veth 1993; Veth 2005). Concomitantly, there was evidence for changes in artefact technology such as the appearance of seed grinding implements and small-hafted tools in the mid to late Holocene. The appearance of these tools indicated significant changes in regional economies. Hafted adzes enabled the production of deep wooden bowls suited to bulk food transport and the excavation of soaks and surface waters. In turn, specialized grind stones and bowls enabled more intensive use of seed and other species. In turn, this suggested greater intensity of resource manipulation and management to sustain food (particularly by burning) and water resources and greater capacity to expand into dune fields in low rainfall periods.

Interpretations of archaeology in the arid zone have been drawn from: relatively comprehensive surveys of open scatter sites; excavations of stratified deposits; and, ethnographic extrapolation from areas dispersed across arid Australia. These areas have included sites on present day Ngaangyatjarra lands in the Gibson Desert (Gould 1969), Martu lands in the Great Sandy Desert and Little Sandy Desert (Veth 1993), Gugadja lands in the northern Great Sandy Desert/south east Kimberley (Cane 1984), Luritja lands in the Central Ranges (Thorley 2001), James Range in central Australia (Smith 1993) and the southern Cooper’s Creek system. These archaeological study sites have been situated in distinct arid environments. An emerging feature of the studies has been recognition of regional differences that were, in part, indicative of environmental differences.

On present-day Martu lands, archaeological sites are scattered across the landscape usually in association with water sources of different classes (Ch. 2.1). Stratified archaeological deposits within the Great and Little Sandy Desert dune fields provided mid to late Holocene dates. The Karlamilyi (Rudall River) area has been continuously occupied for at least 5000 years (Veth 1993). The Durba Ranges with permanent springs (Kilujuru and Pinpil) and Calvert Ranges (Kaalpi) were apparently regional foci of occupation as evidenced by deep rockshelters with rich deposits, rock engravings and abundant paintings. These foci were interpreted to be aggregation sites where large Aboriginal groups had repeatedly gathered since the mid-Holocene (Veth 2005). Durba Range is approximately 95 km ESE of Parnngurr and Calvert Range about 40 km east of Durba. Major residential base camps such as near Kilujurru and Kaalpi, contrasted to numerous smaller residential camps that were used for shorter periods by small groups. In addition, regional site patterning indicated there were task-specific and marginal camps that were occupied to access specific resources or as transit places to larger sites (Veth 2005).

Ethnographic and archaeological evidence from the Western Desert has shown a general pattern of population dispersal and aggregation. It is widely agreed that regional populations frequently fragmented into small, highly mobile band groups that were family-focused and fanned out to visit and utilize resources at remote sites under better environmental conditions. This was counter-balanced by regroupings. Archaeological evidence for the nature of these re-groupings has appeared to differ between the Sandy and Gibson Deserts and the Central Ranges. In some areas, indications were that bands gathered at permanent waters in large numbers during high rainfall (Veth 1993). Elsewhere, bands met and gathered at ephemeral waters during high rainfall because local resource abundances could sustain these gatherings, whilst resources at permanent waters were saved as refuges or fall back places (Strehlow 1947; Thorley 2001). It remains unclear whether people within one region used these strategies over time or whether the strategies varied from region to another.

One issue in arid zone archaeology has been determination of the important environmental variables that influenced the artefact signatures of population demography, settlement and movement. It is known that environmental variables interacted with social determinants, including the choices people made to gather in larger groups or fragment into smaller social units. Environmental variables that influenced the location of artifacts indicative of occupation sites included water sources, habitat diversity, availability of plant resources and availability of lithic resources for stone tool manufacture. In addition, subsequent soil erosion and re-deposition, particularly in land units traversed by cattle or other accelerated disturbance, has resulted in the redistribution of stone artefacts thus there have been methodological issues for archaeologists to overcome. It has been argued that water availability and permanency were critical factors that shaped regional settlement strategies in the arid zone; however, whether this outweighed the influence of the other variables has been questioned (Thorley 2001). Archaeological evidence and interpretation of the relative influence of water permanency has varied across archaeological research sites.

2.2.3 Martu pre-colonial subsistence patterns

As indicated by Tindale's quote opening this chapter, the persistence of Aboriginal people in Australian desert environments was intriguing; it remains enigmatic to researchers (e.g. Veth 2005b). These environments being characterized by low rainfall, temperature extremes, little coordinated surface drainage, inconspicuous surface waters and high spatio-temporal resource variability (Ch. 2.1) Reconstructions of Martu pre-colonial subsistence patterns have been presented (Veth 1989, Walsh 1990, Tonkinson 1991, Veth 1993) and more recently (Veth 2005 a and b, Bird et al. 2005). In the wider Western Desert, there have been several major accounts of Aboriginal subsistence at early contact (Gould 1969; Thomson 1975; Tindale 1981; Meggitt 1957; Myers 1982; Cane 1987; Berndt & Berndt 1992). Pre-colonial subsistence patterns are summarised here.

The lithic tool kit of Martu predecessors in the late Holocene to contact included a suite of stone tools (adzes, axes, knives) used predominantly by men and grindstones of various types used predominantly by women. The timber tool kit included spears, boomerangs and spear throwers used by men, and at least three types of bowls, digging and hitting sticks used mainly by women. Contemporary ethnography indicates both genders were adept at use of tools generally associated with the opposite gender. All tools were multi-functional and the timber tools highly portable. Dingoes were also ‘trained’ as an aid to hunting by Western Desert women and men.

The customary economy of Martu predecessors was based entirely upon natural resources and most of them were locally procured. Their resource species inventory was very diverse. At least, 120 plant food species and 150 animal species were consumed (Tab. 5.6). Additionally, species were utilised for medicinal, tool, construction, firewood and other purposes. This diverse resource inventory and associated potential dietary breadth was interpreted to be a critical adaptation to an extremely variable environment. Within this inventory were food species that ranged from relatively dependable to highly ephemeral. Plant food staple species and species utilized in drought times were identifiable (Veth & Walsh 1988). Subsistence strategies that combined targeting and opportunism of collection were required.

Typically, Martu women concentrated upon medium to small game species and plant foods. This included mammals, lizards, insects, seeds, fruits, tubers, nectars and gums. They hunted, gathered and processed resources that were relatively more reliable but low volume. Men concentrated upon medium to large game species and opportunistically collected smaller game and snack plant foods. Large species included Red kangaroo, Euro, Emu and Bustard.[29] Men’s hunting returns were greater by weight but less frequent. There had been a dramatic decline and extinction in mammal fauna in the early 20th century (Ch. 2.1.7). The nutritional significance to foragers of this decline must be presumed to have been high. Its loss may have contributed to prey switching by desert people with substitution of feral cats and a greater emphasis upon lizard fauna and presumably an overall decline in available meat resources. Children collected a suite of species that needed minimal processing. Certain foods were preferentially given to young, elderly or infirm people. There was considerable information exchange between male and female foragers relevant to their preferred species.

There were intra-annual seasonal patterns in the collection of food resources on Martu lands (Walsh 1987a, Walsh 1987b, Walsh 1990 and in Tonkinson 1991). Monsoon influences upon northern parts of the Western Desert contributed to greater predictability than in southern deserts described as aseasonal to subsistence foragers (Gould 1969) and with lower rainfall (Fig. 2.3). On Martu lands, for example, Walsh (1990) described how grass seeds were gathered after hot season rains until the early cool season, acacia seeds were gathered in the early to mid hot season, *Solanum* species fruited through the mid to late cool season, specific tubers were collected in the mid to late cool season. Lizards were actively hunted in the early to late hot season before hibernation. Migrant species such as Red Kangaroo, Bustard and Emu traversed the region after widespread rainfall. The seasonality of their presence thus hunting was influenced by inter-annual seasonal patterns.

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[29] Table 5.3 and 5.4 or in the footnotes for Martu, Linnaean and English species names.

Amongst desert groups, there was high residential mobility between camps and associated water places. There was frequent movement from named place to place (see Ch.2.2.6). Movement routes were partially determined by land form types. The Rudall River and Savory Creek were primary travel corridors into and out of wider Martu lands (Fig. 1.2). Riparian habitats were preferred routes as they provided shade and higher diversities of resource species (Walsh 1987a, 1987b, 1990). For residential (between camps) and logistical movements (to and from a camp), creeks and other wetlands were paralleled and/or targeted. Inter-camp travel routes also contoured ranges as pediplains and short alluvial fans received run-on of water and nutrients thus had higher plant diversity (Walsh 1989). Within the extensive dunefields, travel routes were influenced by the location of soaks and claypans and dune height and swales. Saline playas were generally barriers and Martu travels paralleled them. Across all land form types, Martu women selectively foraged in post-fire vegetation of early seral stages, here too, there were high diversity and richness of resource species, ready trackability in exposed sands and accessibility with smaller spinifex tussocks (Walsh 1990; Lowe and Pike 1991). Residential and logistical routes were partially selected by higher probabilities of encountering game and plant species. Diversity was selected at different geographic scales from landforms to vegetation communities to land elements. Additionally, there was select targeting of known patches of highly valued species. These pre-colonial patterns of occupation and mobility shaped the spatiotemporal patterns of natural resource use and manipulation of ecosystems by Martu. This study found they also underpinned the practices of foragers in contemporary times (Ch. 7).

2.2.4 Martu perspectives on their origins: *Jukurrpa*, sacred sites and ceremony

By contrast to archaeological interpretation, in the view of traditionally-orientated Martu their origins were within the *Jukurrpa*. The landscapes originated with associated customs and laws within this epoch. It was a creative period believed to continue to the present. Epics from this creation period were ‘dreamed’ by Martu ancestors who passed stories and rituals on to their children and grandchildren hence the descriptor ‘dreamtime’. Martu originated from and through the *Jukurrpa* as spirit-children (Ch. 8). As for all Aboriginal people, *Jukurrpa* was a foundation of the Martu ontology (Fig. 1.4).

An introduction to the *Jukurrpa*, Laws and ceremonies of Martu was provided by Tonkinson (1991). Other authors have mapped, retold or described the equivalent of *Jukurrpa* verses and chapters and ceremony elsewhere in the Western Desert (Berndt & Berndt 1992; Rockman & Cataldi 1994; Cane 2002; Glowczewski 1991; WAC & Glowczewski 2000). The recent retelling of *Wirnpa* (the rainmaker Snake man) is one of the few published accounts of a Martu *Jukurrpa* (Davenport et al. 2005). All Aboriginal lands were criss-crossed by the tracks along which different *Jukurrpa* characters travelled, camped, did activities and left the marks of their presence (Fig. 2.12). Many of these marks coincided with the named places of Martu geography to create a ‘totemic geography’. Dreaming characters—*Wirnpa*, *Wati Kujarra* (Two Men), *Jakulyukulyu* (Seven Sisters), *Karlaya* (Emu) and many others beings animated the

Martu landscape. The expression of *Jukurrpa* conveyed their travels and activities. These stories held morals, metaphors and messages for those who interpreted them.

Aboriginal individuals, defined by section group and moieties, were responsible for certain *Jukurrpa* story lines and so groups of sites and their interconnected paths and land areas. They had prescribed roles in the organization and conduct of ceremony and ritual associated with the *Jukurrpa* tracks, sites and lands. These roles interconnected the roles and responsibilities of Aboriginal people across the Western Desert and beyond (Figs 2.12 & 2.13). Long and repeated negotiations were required to define and clarify these roles. Notably, the absence of people, such as in the years when Martu numbers progressively declined in the desert, left gaps and holes in this network of rights and responsibilities that the remaining Martu sought to fill.

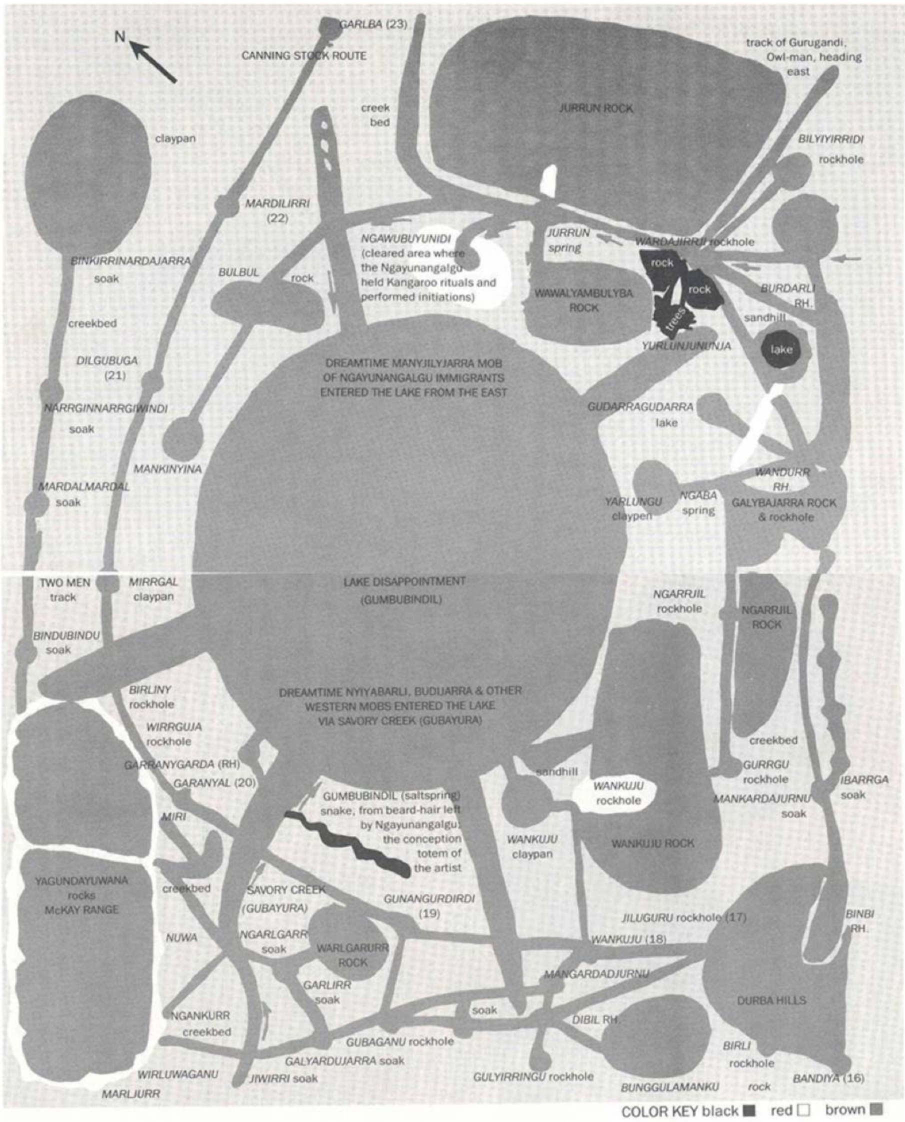


Figure 2.12 Crayon drawing depicting *Jukurrpa* tracks of particular characters connecting sites and water places within the Gumbubindil (Lake Disappointment) area south and southeast of Parnngurr (from Tonkinson 1991:114).

Walking tracks sometimes coincided with these mythological tracks.

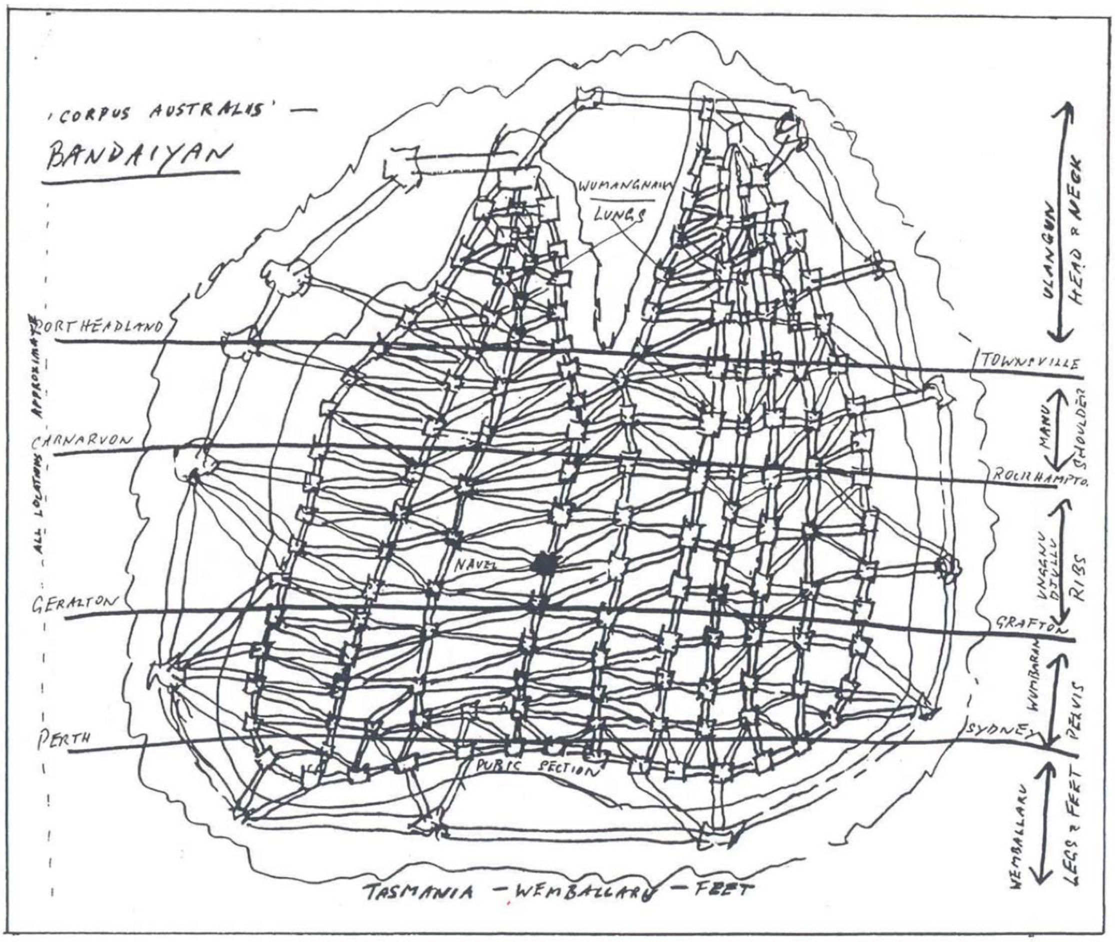


Figure 2.13 Diagram representing the interconnectedness of *Dambun* paths across Australia (from Mowaljarlai 1992:183).[a]

[a]*Dambun* in the NE Kimberley is analogous to *Jukurrpa*.

Martu were often very reserved in their mention of *Jukurrpa* with outsiders. During the study, it seemed that Martu kept *Jukurrpa* and associated ceremonies separate from most *whitefellas*, including myself as a young researcher; this reservation persisted to the 2000s (Tonkinson 2007). It was either scantily noted or reference to it was made in hushed tones. *Jukurrpa* is not an explicit study subject in this dissertation, yet there were sufficient comments and literature to indicate that it shaped the ontological realm of most Martu in 1990. Even without active study into it, *Jukurrpa* was gleaned to be so pervasive in Martu life that it was almost inextricable from Martu subsistence, resource and land use. For example, the presence (but not detail) of ceremonial activity or ceremonial areas was emphasised by Martu. This was to protect the well-being of uninitiated or unknowing people from the power of *Jukurrpa* characters as well as to safeguard the sites themselves. Chapter 8 examines concepts derived from *Jukurrpa* that underpinned the 'care', 'holding' and manipulation of resources by Martu. Contrary to anthropological doctrine of the pre-1970s, *Jukurrpa* was not the exclusive domain of Aboriginal men (or male anthropologists). It is now accepted that Aboriginal women and men both had roles in respect of *Jukurrpa*, country and ceremonies (Bell 1983).For some *Jukurrpa* ceremonies, these roles were segregated for others they were integrated, for others women were support to the men. Women also held their own Laws and ceremonies.[30] Often each knew something of the others but respected gender segregation protocols.

Certain anthropologists have sought to understand how desert Aboriginal interpretations and expression of *Jukurrpa* have changed over time. Peterson (2000) compared travel and initiation journeys of men in the early 1990s with previous accounts of ceremonial practice. Tonkinson (2007) described how even in the early 2000s, the religious life of Martu persisted albeit severely truncated compared to what he observed 40 years earlier. Chapters 8 and 9 consider the implications of these changes.

2.2.5 Family, skin and connections to countries

Networks of interpersonal relationship were another major domain of Aboriginal life, reflected in the ‘people’ domain of Figure 1.4. Social systems have been the subject of intensive anthropological research in the Western Desert (Berndt & Berndt 1992; Myers 1986; Tonkinson 1991)

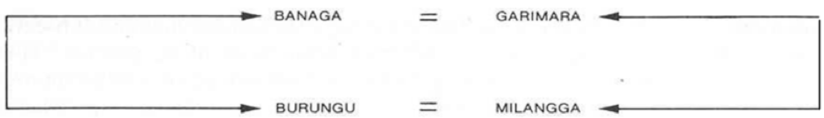
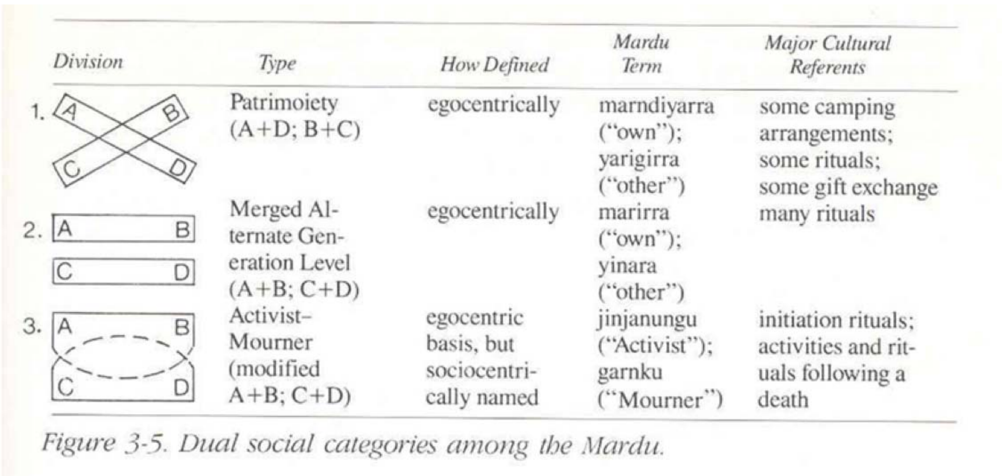


Figure 2.14 Martu sections (from Tonkinson 1991:74) “=” indicates intermarrying pairs of sections, arrows connect the section of a mother and her children (siblings are always members of the same section)



Division	*Type*	*How Defined*	*Mardu Term*	*Major Cultural Referents*
1.	Patrimoiety (A+D; B+C)	egocentrically	marndiyarra (“own”); yarigirra (“other”)	some camping arrangements; some rituals; some gift exchange
2.	Merged Alternate Generation Level (A+B; C+D)	egocentrically	marirra (“own”); yinara (“other”)	many rituals
3.	Activist–Mourner (modified A+B; C+D)	egocentric basis, but sociocentrically named	jinjanungu (“Activist”); garnku (“Mourner”)	initiation rituals; activities and rituals following a death

Figure 3-5. Dual social categories among the Mardu.

Figure 2.15 Dual social categories amongst Martu (from Tonkinson 1991:77)

The Martu classificatory system was based on familial kinship and a four section system. Kinship determined the section or ‘skin’ of an offspring, ideal spouses and

[30] After the field study on which this dissertation is based, in 1993 I was invited to four days of Law and ceremony attended by 60 - 70 women from Martu, Pitjantjatjara, Pilbara and Kimberley settlements. It was held at a remote site south of Kunawarritji. This was a very traditionally-orientated event with less than five non-Aboriginal women present. The all-night and daytime performances of successive song-cycles prevailed.

interrelations between generations (Fig. 2.14). The section system was translatable to near and far neighbours including those with different systems (including the gender differentiated eight-way system of Warlpiri people). Inherent in the section system were moieties that further shaped dualistic forms of social organization. There were patrimoieties and merged alternate generation levels (Fig. 2.15) but apparently not matrimoeities (Tonkinson 1991). For example, a patrimoiety was a ‘father’-’child’ pair (i.e. *Banaga–Burungu* and *Garimarra–Milangga*).[31] These relations determined social combinations of Martu particular to certain sacred and secular events. The social systems of Western Desert people were exceedingly complex and unique. There have been substantial discussions on the operation and purpose of these systems. Their complexity has been interpreted to firstly, provide a socio-centric grid that interconnected people across vast land areas (Fig. 2.12) allowing immigration and emigration due to resource scarcity and secondly, to balance the tension that must exist between individualism and conformity for smooth functioning of a society (Tonkinson 1991:77).

Interlinked to the skin system were obligations to individuals of particular skin. These included relationships of varying degrees of closeness, restraint or avoidance. Avoidance and close relations traditionally influenced protocols to provide, request and/or distribute goods, knowledge and other materials. Most Martu oral history accounts interwove the interrelations and care of family members with the domestic activities of hunting, gathering and using land in other ways (see quote below and PALC 1988; Yirapartu et al. 1992).

In modern times, Martu women placed a strong emphasis on the introduction of ‘outsiders’ to family genealogies and the section system. Section social classifications were also extended to non-Aboriginal outsiders; friend relations, partners or other avenues determined their skin allocations. In my case, two Martu women (Rita Milangka and Mayipi Milangka) designated my Milangka skin because they chose to ‘care for’ and ‘teach me up’. Amongst Martu and other desert Aboriginal women, interrelations to outsiders were clearer and smoother if they could be situated in a social network and their roles and responsibilities were understood.

2.2.6 Histories of Martu and their lands

There are many different perspectives on a history of the same place and time. The features of Martu history as described by Martu individuals compared to that recorded and filtered by Euro-Australian historians often differ. Martu oral histories have been recorded (PALC 1988; Yirapartu et al. 1992). There have been interpretations of Martu history through Euro-Australian eyes (Wright 1989; Lawrence 1989; Gallagher 1989; Newman et al. 1993; Wilson 1989; Tonkinson 1974). The history of white Australians in the region has been well documented (e.g. Beard & Webb 1974; Burbidge & McKenzie 1983; Hewitt 1992). The book ‘Cleared out: First contact in the Western Desert’ provided a new approach to the reporting of historical events with the close

[31] These terms are in the orthography used by Tonkinson but since superseded (App. 2).

juxtaposition of Martu accounts and Patrol officer accounts of contact experiences by Martu and non-Martu authors (Davenport et al. 2005).

Euro-Australian historical accounts speak of contact between Aborigines and drovers, policeman and other Europeans on the Canning Stock Route and adjoining lands. European perceptions have included the theft of cattle and damage to infrastructure at wells by Aboriginal people (Gallagher 1989). Martu perceptions have included damage to essential drinking waters, theft of women and violation of sacred sites by whitefellas. Whilst there were not the large massacres reported elsewhere in Australia, there were occasional killings and reprisals, chaining and incarceration of Western Desert people. Martu suffered under the relative strength and weaponry of Europeans. At first contact with *whitefellas*, friendly relations characterized initial meetings, later some Martu were wary, others terrified but fear was also countered by curiosity and need. At early contact, Martu were faced by dual challenges—on the one hand to hold the integrity of their cultural system as they desired it and, on the other hand, to engage and interact with a Euro-Australian cultural system vastly different to their own. These challenges persist today.

Major themes in some of the Martu oral histories are apparent in the account below extracted from the book '*Yintakaja-lampajuya* : These are our water holes':

> Yes. I will tell a story from Punmu. Long ago we were living. They were taking care of all my family. They were going around—our mothers and fathers. The grandfathers and grandmothers—our relatives [took] them. After that our grandmothers died. Our people took us about and grew us up. We stayed around in the north and grew up. Around Punmu I used to drink. Then I would go along the lake to Karlamilyi—along the river I would be going about. We would kill meat animals and were eating pussycat and other things. We would be eating *kalaru* seeds. They would grind them and give them to us. Then we would be eating grubs from the *ngatuma* trees along Karlamilyi River. We would also eat minta. We would go and stay about at Nyukuwarta. Then we would go south to Parnngurr. We would stay there. We would go west around Yantakuji. After that rain would fall. Then we would go back to Karlamilyi. We would stay there. Then we would go back to Panaka. After that we would go north to another waterhole. We would see aeroplanes. Then we would run and keep quiet in the bushes. We didn't know what it was. We had never seen a whiteman. We didn't know what it was. We went north and stayed there. I was watching the warplanes. Nothing happened so we stayed there where there were no whitemen. We didn't see any motorcars. Nothing. We didn't know about whiteman. We hadn't seen any. We were eating *pura* and grubs. We were eating the grub from the *karnturangu* tree. We would be staying at the main waterplace. Rain would fall. Then we would go on. Because of the rain, we would camp in shelters. Then we would go to another waterhole. Then we would go to Anna Plains [pastoral station]. We would get and pick up flour. Then we would go back to Paru. We would stay along that place. We would go north to Mulyalkirri. After that we would go to Panaka. Then south to Karlamilyi. After that we would go to Balfour Downs [pastoral station]. We would get food. Then we would return to Yantakuji. We would stay there a long time. Then east to Nyukuwarta then back west. We went to Balfour Downs. Then Aborigines

and whitemen got us and took us to Jigalong. That’s all. Translation of Muuki’s Warnman story (PALC 1988:172-175)[32][33][34]

Warnman man, Muuki Taylor’s account concludes in the early 1960s when he was about 10 years old. In it, we hear of: travelling from place to place on Martu lands, family and kin relations and responsibilities, the death of family members, the collection of bush food plants and game, the influence of rain thus drinking water on travel, the sighting and avoidance of planes, travelling to near European habitation, the supplement of bush foods with flour, returns to the desert to continue hunting and gathering, and being brought in to Jigalong settlement. From this and other Martu oral history accounts, some of the major themes that influenced subsistence and land use can be identified for analysis in this dissertation.

Table 2.5 summarises major historical eras and events that influenced Martu people in the time since European contact. It is collated from the above literature. Some of these periods were overlapping or subsets of others; more detail has been given for contemporary times (1980–1990s).

A rapidly changing history of Martu and their lands is apparent in Table 2.5. In 1990, it had been less than fifty years or two generations over which Martu families have shifted from a fully hunter-gatherer life to a life in settlements with varying degrees of integration and understanding of English speakers, Euro-Australian people, Western political, economic and other systems. The shift between a traditional-orientated lifestyle and an increasingly Western-influenced lifestyle marked dramatic differences in the life experiences between grandparents and grandchildren. This pace of change has few parallels amongst cultural groups elsewhere in the world. Yet in 1990, the continuities from a traditional past to present were also strong.

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[32] Translations of species names are a result of my ethnobotanical research. *Kalaru ~Tecticornia verrucosa*, Samphire edible seed; *Ngatuma ~ Eucalyptus papuana*, Ghost gum host to cossid moth larvae; *pura ~ Solanum chippendalei*, Bush tomato; *karnturangu ~ Codonocarpus cotinifolius*, Desert poplar host to insect larvae

[33] Figures 1.2, 7.7 and 7.8 include most Martu place names noted in this dissertation.

[34] This was selected from 25 oral history accounts available in PALC (1988) and ethnoecological histories recorded through this study (Yirapartu et al. 1992). Here, an account that I did not record was deliberately chosen to overcome possible bias in the orientation of the story teller to my ethnoecological interests. Also, it was selected as relatively short and being by a man, later in this dissertation, there are stories from women.

Table 2.5 Major historical eras and events associated with Martu lands

Periods	Events
Pujiman days (Bushman days) of hunter-gatherers lifestyle (pre-1870s)	Prior occupation Continuous human occupation from at least 5,000 BP
Explorer period (1873–1897, 24 years)	Expeditions traverse wider GSD region led by Warburton in 1873, J. Forrest in 1874, A. Forrest in 1879, L. Wells – Calvert 1896–97, Rudall in 1897, Carnegie 1896–97
Canning Stock Route (CSR) Survey & establishment (1906 –07)	Soaks and waters excavated and utilized by Aboriginal people modified as wells to water cattle droves Occasional hunts and reprisals by police against Aborigines e.g. 1911 massacre
Cattle droves on CSR (1929–1958, 30 years)	Wells periodically reconditioned, cattle droves
Ration times (1907–1946, 39 years)	Depot on rabbit proof fence provided intermittent rations, water, medical aid some in exchange for Aboriginal labour in pastoralism, mining, road construction
Droughts	Severe droughts contributed to scare bush food and water resources 1935–40, 1944–45, 1956–59
Exit from the desert (1930s–1964, 20 years)	Pastoral industry rations and/or pay (1930s-40s) Pastoral industry strike (1946) then improved pay and conditions Long Range Weapons (LRW) including Blue Streak missile test launches from Woomera (c. 1947–1964) Prior to 1964, gradual scattering of Martu to Balgo, LaGrange, Jigalong, Wiluna, Warburton & east to Papunya and surrounds
Rounded up and ‘cleared out’ by Native Welfare	Last groups totaling 78 people bought in/rounded up/cleared out in 1963–64 to clear area for LRW tests e.g. Nov. 1963 28 people collected at Parnngurr rockhole; Oct 1964, 1 man, 9 women, 2 young men, 16 children collected & taken to Well 35 then Jigalong
Jigalong mission days (1946–1973, 30 years)	Jigalong mission established 1946 Church, clinic, school, clothing, food provided for Aborigines ‘Round up’ families brought there by welfare Some families came and went east to desert Some individuals and families came and went west to work on pastoral stations, mining leases Jigalong transferred from church to state (1970) Jigalong handed to community for self management by council (1973) Jigalong population estimates: 1947–104 people, 1955–160 people, 1963–117 people, 1964–340 people
Strelley / McCleod’s / Nomads mob (1940s–1980s, 40 years)	Desert & Pilbara Aboriginal people coalesced in 1940–50s; organized Great Aboriginal Strike (1946) Nomads company purchased Strelley station then was granted other pastoral leases between Hedland and desert (1970s) Family movement between Jigalong, Strelley and pastoral stations
‘Thinking about country’ years 1940s – early 80s	All Martu physically isolated from country Stories & travels recounted, ‘dream travel’ to custodial lands Some members of Jigalong families come & go Martu and WA Museum trips to country for Aboriginal site registration (1976,77)

Periods	Events
Opening up the desert–Vehicles and roads (1925 to present)	First vehicle on part of CSR in 1925 Beadell surveyed & graded Gary Junction Road Well 35 to Callewa (1963) Beadell surveyed & graded Talawana Track (1960s) First drive of full length of CSR (1968) ~ six Martu vehicle owners in early 1960's in Jigalong
Airplane traffic over GSD (early WWII to present)	Low flying training & expedition of military aircraft over GSD Aerial surveys for aerial photographs (1960s–present) Australian international flight routes over Martu settlements
Mineral exploration (1949–present)	Mineral exploration access network of 4,000 km (1958–1963) WAPET oil construct Swindells Field (c. 1964) Mining companies expand exploration (late 1960s) Telfer mining camp established (c. 1974) CRAE drilled near Parnngurr rockhole (1984) Prospectable uranium deposits identified in region (c. 1985) Telfer gold mine commissioned WA government changes legislation to allow mining in national parks and sets exclusion zone in RRNPk for mining (1987)
Tourists	First commercial tourist tour of CSR (1977) Rapid expansion of tourism industry focused on CSR then widening to RRNPk Tourist convoy of 11 Toyotas photographs Martu in Parnngurr (1987)
'Wildlife and national park mob'	Vegetation survey and mapping (1964–68) National parks wildlife survey (1977–79) Proposal to gazette Durba Hills as Class A Nature Reserve (1976) Rudall River National Park (RRNPk) gazetted but conditional as open for mineral exploration (1977) RRNPk inventory and management recommendations (Muir 1982) Seaman Enquiry first informs Martu and WDLC of reserve proposal & RRNPk gazettal (1984) CALM accepts CRAE donation for RRNPk management plan (1987) CALM commissioned study on significance of region to Martu (1989) Kintyre mineral lease excised from National Park (1994)
Homelands/outstation movement—Martu return from Strelley, Jigalong and elsewhere to make new settlements (late 1970s–80s)	Camp 61 settled by Martu (late 70s) Panaka springs re-occupied by Martu from Strelley and Jigalong (1981), it was renamed Punmu in the mid 1980s Kunawarritji (Well 33) on the CSR re-occupied (1981) Parnngurr rock hole settled by Martu group (1984) who then moved to Mt Cotten/Parnngurr bore (1985)
Representative and administrative agencies	Jigalong became incorporated Aboriginal community council (1973) Punmu received first Dept Aboriginal Affairs support (1983) Western Desert Land Council established (1984) Parnngurr received first Dept Aboriginal Affairs support (1986)

Periods	Events
Land claims	Negotiations amongst Martu custodial groups (pre-contact–present)
	Crown Land post European contact (1788–2002)
	Jigalong Community Traditional Lands Reserve proposal (1980)
	Seaman Land Enquiry (1984–85) recommendations rejected by WA state government (1985)
	Sacred sites legislation used to prevent further damage to Mt Cotten from exploration drilling by Parnngurr settlement (1986)
	Proposals for Martu tenure recognition through Aboriginal Reserve Lands or other outside RRNPk and 99 year lease or other inside RRNPk (1988–1993)
	Ngaanyatjarra Council lodged native title claim on behalf of Martu (1996)
	Native Title part determination 2002 (excluding National Park, CSR, pre1994 mining tenements), joint recognition with Ngurarra claimants for Lake Percival area
	Negotiation over Martu title for National Park (c. 1988– >2007)
Service provision to Martu settlements	RFDS fortnightly visits by medical staff late 1980's; emergency evacuations by RFDS
	Punmu School built c. 1987
	Parnngurr Clinic built 1989, resident nurse 1992
	Parnngurr School commenced 1989, principal 1989
	CDEP commenced at Parnngurr and Punmu 1988
Research	Anthropological research (1963–present)
(intermittent rather than continuous research)	Linguistic research (1970–90)
	Archaeological research (1986–present)
	Oral histories of CSR and wider Martu lands (1987– present)
	Ethnoecological research Walsh: 1986–1992; Kalotas: 1987, 1992–1995; Bird, Bleige Bird et al. 2000–present
	Solar power and remote area technologies research (1989–present)

2.2.7 Contact history, settlement, dispersal and physical isolation from custodial lands

Traverses of Martu lands by European explorers occurred in the late 1800s (Tab. 2.5). It is likely that metal implements, feral cats and diseases transmitted by Europeans preceded their physical presence (Kimber 1990). The survey of the Canning Stock Route (CSR) was the first major incursion onto Martu lands (Fig. 1.2). Canning and his crew converted surface waters that had been maintained by Manyjilyjarra, Kartujarra and other Martu groups into permanent wells. Cattle droves along the route with horses and camels caused significant draw down on these wells and adjacent surface waters with subterranean connections. Chaining, abduction, rapes and killings of Martu by members of CSR parties were reported (Gallagher 1989). Some Martu families moved eastward away from the CSR to the Papunya region whilst others travelled with the droves northward to Billiluna to the north or southward to Wiluna.

There were multiple contact points between Europeans and Martu individuals on the western fringes of Martu lands. From 1907, a depot on the Rabbit Proof Fence was one point where water, food rations, dingo scalps, medical aid and labour were traded. A few Martu laboured as stock-workers and domestics at Balfour Downs and other pastoral stations in the Pilbara and Gasgoyne regions. Desert and Pilbara people also engaged in tin and gold mining.[35] At the depot site, Jigalong Mission was established in 1946 (Tab. 2.5). Many Martu families settled there over a 25 year period voluntarily, by necessity or by enforcement. Some families moved between Jigalong and their custodial lands, for example, contacting kin and getting metal tools and provisions before returning eastwards to their country. However, due to the progressive depopulation of their lands and absence of kin, the increasing scarcity of water and food resources and the attractions of settlement more and more Martu were drawn to Jigalong and elsewhere. Jigalong was the destination to which Native Welfare staff took the final groups of Martu when they removed them from their lands in the early 1960s. In the 1970s, Martu individuals shifted residence between Jigalong, Strelley, Yandeyarra, LaGrange and other Pilbara, Kimberley, Gasgoyne and southern settlements. There was an intensification of contact and settlement through this fifty year phase.

Jigalong became a base for the largest number of Martu resident in one place. Its Martu history has been described (Tonkinson 1974; Gallagher 1989; Davenport et al. 2005). The Apostolic mission's purpose was

> To evangelize and train the natives whose habitat is between the Rabbit Proof Fence and the Canning Stock Route (Gallagher 1989:162)

It attempted to impose strict Christian principles through dormitory segregation between boys and girls, separation of parents and grandparents from children, school and church attendance, English and a prohibition on Martu languages. It also provided food, water and shelter and medical services to the many Martu who suffered a rapid deterioration in health with settlement.

There were persistent tensions between the mission and the Department of Native Affairs with conflicting objectives such as the Department wanting to reduce ration costs and ensure cheap Aboriginal labour to Pilbara pastoralists, whereas, the mission wanted capital equipment and labour to develop mission infrastructure. Martu were less preoccupied with these tensions than with their own struggles in health and the maintenance of social integrity. There were fractured families and disparate Manyjilyjarra, Kartujarra and other immigrants clustered on lands belonging to Nyiyaparli people.

On either side of Jigalong Creek, was the mission site where Europeans and Martu children lived and 'The Camp' where adults lived. This spatial divide contributed to the persistence of Martu autonomy, society and Law, for example, residents maintained traditional rituals including initiations and marriage. Furthermore, Martu developed strategies such as deliberately misunderstanding English communication thus persisting

[35] For example, by adapting seed yandying skills to clean alluvial fines. Yandying is a highly skilled manual technique of gravity separation. Traditionally it was used to separate seed from sand and dust by rocking and shaking a concave, elliptical container. This technique was adapted to the separation of tin or gold particles. Few non-Aboriginal people and younger Aboriginal people are able to reproduce this technique.

with their cultural identity (Tonkinson 1974). Jigalong came to be recognised amongst Western Desert Aboriginal people as a major centre of traditional Law. Yet, pastoral station and mission staff also shaped Martu perceptions of structures and expectations of the 'whitefella' world. Assimilation was an explicit policy through this 30 year mission era; however, younger Martu neither rejected traditional Martu life nor 'progressed' into mainstream European white society. They lived in-between with disparate elements of two vastly different societies interweaving.

From 1970, the mission withdrew and the WA State Government assumed control of Jigalong (Tab. 2.5). In 1973, a new era of 'self determination' was proposed and a Martu community council elected. This has operated to the present, albeit with varying degrees of government control and non-Aboriginal involvement.

2.2.8 Food and foraging through the contact and mission phases

The Martu material economy rapidly changed through the contact and mission phases. Martu readily incorporated European foods and goods into their world. There were a few initial uncertainties as evident in this recollection on meeting Euro-Australians in the 1950s:

> They would get lollies, apples and oranges from a bag and give them to us. They never explained these things to us. We took them and made a fire for the oranges and apples. We smashed the lollies on a stone and ate them. (Mac Milangka in PALC 1988:150).

For some people there was a temporary abandonment of their own food sources, as Naaju Purungu remembered from the early 1960s:

> We went on to Kinyu. This is when we started eating whitefella food. We weren't looking for our own. … We went on to Nyipil where the bullock was killed. … (Yirapartu et al. 1992:17)

Initial Martu decisions to eat 'whitefella' foods were shaped by their acceptance and curiosity about the 'new', the greater ease of receiving foods that did not need laborious collection and processing and, possibly, a decline in the productivity of their landscapes. They expanded an already diverse resource inventory to incorporate European goods. Above, Muuki's quote described the blending of bush foods and whitefella foods (specifically wheat flour) as his family moved to and fro from their lands to pastoral stations.

Once in Jigalong, the customary economy irreversibly altered. Negotiations between Nyiyaparli people and the immigrants allowed the newcomers access to lands around Jigalong. However, camels, cattle, goats and other stock had also intensively grazed these lands for more than 50 years thus their natural productivity would have declined. The mission operated Jigalong as a cattle station. Typical foodstuffs purchased by Martu in Jigalong in the late 1960s were:

> Mainly flour, tea, sugar, salt, canned meats, milk, fruits and jam, cookies and candy—and fresh meat, fruits and vegetables when they are available

Simultaneously:

> In both the mission and station environments, hunting and gathering for food are no longer matters of necessity yet these activities remain popular (Tonkinson 1974:60)[36]

Metal implements, rifles and occasionally vehicles were incorporated into the foraging tool kit. Notably, whilst Martu hunted and gathered on Nyiyaparli and Jigalong reserve lands, by contrast, their responsibilities to manipulate and manage resources were curtailed and the economic imperative to do so had reduced. *Pujiman*[37] people were distant from their own custodial lands for 20 years (one generation) and longer (Tab. 2.5) whilst younger people grew up on Jigalong lands.

2.2.9 Outstation movement, other land users and tenure in 1980-90s

From the late 70s, Martu groups progressively returned to their custodial lands (Tab. 2.5). In 1981, a group travelled eastwards from Camp 61 northward along Karlamilyi River and the shores of Lake Dora bound for Kunawarritji (Well 33) until the tractor broke down at Rawa springs (Panaka Panaka) (Lawrence 1989). This was to become the site of modern-day Punmu, some of the Martu group were more strongly associated with the ‘Nomads’ or ‘Strelley’ mob than Jigalong. Several families continued eastward to Kunawarritji. In 1984, a Jigalong group settled at Parnngurr rockhole before erecting a windmill on a bore drilled by CRAE by Mt Cotton (present day Parnngurr). Increasing numbers of families moved to these settlements. There are brief accounts of this outstation movement, its rationale and consequent negotiations in Wright (1989).

Significantly, when Martu returned to their homelands, they encountered evidence of a variety of other land users who had expanded their activities over the period Martu had been absent. Table 2.5 also summarises a chronology and the key events associated with non-Aboriginal use of Martu lands. These have been classed as: the survey and grading of roads (thus ‘opening up’ Martu lands), mineral exploration, tourism and the gazettal of a national park. There was intensification of all these activities from the 1960s onwards which resulted in more and more non-Aboriginal people traversing Martu lands. In 1993, the large number of submissions to a Rudall River social impact study was testimony to this intensification (see Newman et al. 1993). Surveyors, miners, tourists and national park personnel bought with them completely different world views that generally failed to recognise or appreciate Martu and their connections to the land.

Whilst Martu saw themselves as returning to lands to which they were the rightful custodians, under Australian law these land were tenured as either Crown land or national park. Numerous mining exploration licenses and tenements overlay both tenures. In 1984, Martu and their representative agencies put in submissions to the Seaman Land Enquiry. Thus began a more than twenty year process of land claims, rejections and negotiations (Tab. 2.5). In 2004, the existence of native title for an area of Crown land, but not the national park, was finally determined. Reviews of the struggle for land tenure by Martu include Wright (1989 particularly Lawrence and Cotton

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[36] Yam ~ *Mata*, *Ipomoea costata*; Flax lily ~ *Minyarra*, *Cyperus bulbosus*, Bush onion

[37] *Pujiman* ~ Bush man, bush people, people who walked on custodial lands before settling in a community

chapters), Warchivker (1991), Newman et al (1993) and Tonkinson et al. (Tonkinson et al. 2001)

2.2.10 The National Park and Martu *circa* 1990

Rudall River National Park (RRNPk) and surrounding lands are a focus of this dissertation (Ch. 1.1). Martu did not know of the National Park and proposed nature reserves at Durba Hills and the Percival Lakes (Fig. 1.2) until the 1984 Land Enquiry (Lawrence 1989). The Park was gazetted in 1977 (Tab. 2.5) before legal requirements or widespread ethical recognition of the need to consult with traditional owners. The first report on the park (Muir 1982) made limited reference to Aboriginal people. It included one observation that:

> the area is visited occasionally by Aborigines who light spinifex fires (Muir 1984:Section 9).

Then briefly noted prehistoric occupation by Warnman people, the “Dreamtime” and registered Aboriginal sites (Muir 1982: Section 14). The only recommendation related to Aboriginal people was for a management presence to aid protection of Aboriginal sites (Muir 1982:19.12). There was no reference in Muir (1982) to occupation, planned settlement or wider land uses by contemporary Martu. It is likely that the National Parks Authority was unaware of this until the mid-1980s due to the remoteness of the Park. The regional Department of Conservation and Land Management Office in Karratha was a 600 km drive from the Park’s western boundary.

From 1984 to 1990 (and to 2007), Martu and their representative agencies negotiated with the National Park Authority then its successor the Department of Conservation and Land Management (CALM). In brief, Martu representatives sought recognition, tenure over the park, joint management and employment. A major edited document reporting the significance of the Karlamilyi region to Martu was commissioned by CALM (Wright 1989). A succession of documents specific to Martu followed (including Johnston 1990; Walsh 1992b; Newman et al. 1993; Tonkinson et al. 2001). Later there were wider recommendations on Aboriginal ownership and joint management of conservation lands (e.g. CALM 2001; CALM 2003a). Chapter 8 examines Martu perspectives on the National Park in 1990. Chapter 9 summarises developments in the negotiation for Martu involvement in the Park to 2007.

RRNPk was gazetted in 1977 subject to it being ‘open for mineral exploration’, in 1993 the Kintyre uranium mining lease was excised from the Park. There was intensive prospecting across the Park. Muir (1982) observed that mineral tenements were approved without reference to the National Parks Authority and no environmental conditions were imposed. In the 1980–90s, exploration was bound by agreements under the Environmental Protection Act; however, these were not publicly disclosed. From the 1980s, Martu were concerned to varying degrees about mining on their custodial lands; they had actively opposed uranium mining. (Martu representatives modified this position in the early 2000s.) Chapters 8 and 9 describe shifting perspectives by Martu on the relation between mining and national parks.

2.2.11 Governance, administration and service support *circa* 1990

Martu negotiations with bureaucracies and institutions, including those related to the National Park, were mediated through an amalgam of traditionally-derived and Western-derived governance structures. Simplistically, senior initiated Martu men had principal authority under traditionally-derived governance. Specific land area matters were determined by multiple connections including the appropriate moieties for a particular site and it's *Jukurrpa*. Tonkinson (1991) wrote of Martu social organisation and decision-making processes. These were overlain by contemporary governance structures that emerged through the periods of supposed 'self determination' then 'self-management' (Tonkinson 2007). Western Desert Land Council was established before the 1984 Seaman Land Enquiry (Tab. 2.5).[38] Additionally, Martu residents of Parnngurr, Punmu, Kunawarritji and Jigalong elected a Martu executive, council and chairperson for the respective settlements. The structure of corporations and councils were based on a Western democratic model rather than a traditional governance model and younger Martu men with higher English-fluency dominated them.

WDPAC was a representative agency for several hundred Martu; it also coordinated some service delivery to the remote settlements. In 1990, WDPAC employed two to five non-Aboriginal staff including a coordinator, land officer or researcher, accountant, CDEP coordinator and lawyer. WDPAC offices were in Hedland far from its constituents (583, 773 and 830 km from Punmu, Kunawarritji and Parnngurr respectively). WDPAC was a rarely a stable organization in that non-Aboriginal staff turnover was extremely high and it's funding and functions frequently shifted over time. Core positions were reliant on government funds. One Martu chairman, Teddy Biljabu, had dominated the organisation in 1989–90 (and to 2008).

WDPAC's early roles focused on securing land title acceptable to Martu. This was done through political lobbying and negotiation, a research program and representation in relation to other interests on Martu lands. Key entities with which it negotiated were the WA state government, the Department of Conservation and Land Management and mining companies. It liaised with the Aboriginal Legal Service and state-based agencies supporting Aboriginal people. Details of the challenges of WDPAC's political negotiations in the late 1980s in relation to the National Park were analysed by Lawrence (1989).

With one exception, WDPAC did not undertake or actively support any formal applied land management activities by Martu. The WDPAC exception related to a small seed harvest and sale project that operated from 1992 to 1998 and intermittently thereafter (Kalotas 1999; Desmond & Rowland 2000). WDPAC had neither the priority nor the resources to support traditional or cooperative land management. Similarly, none of the community councils coordinated land-based projects or enterprises (except Jigalong cattle station). The low priority and lack of resources allocated to Aboriginal land use and management was typical of Aboriginal and government organizations in the 1980s

[38] Later, its title changed to Western Desert Puntukurnuparna Aboriginal Corporation (WDPAC).

(see Young et al. 1991). In the 1990s, support, funding and programs in Aboriginal land management increased at a national scale (Davies et al. 1999). However, this did not filter through to influence WDPAC services until about 2007 (Ch. 9).

2.2.12 Monetary economy and Martu employment on the outstations *circa* 1990

In 1990, Parnngurr, Punmu and Kunawarritji were relatively small settlements or outstations. In the 1980s and 1990s, the Martu economic system was founded upon a customary sector and drew upon the government welfare sector for financial income. In 1990, individuals received income from welfare allowances (i.e. child allowance, pensioner allowance) or earned it through the Community Development and Employment Program (CDEP).[39] Grants programs funded public sector-type services. On the three outstations, fewer than ten Martu individuals received salary or wage payments; these were for school teaching, nursing or administration. Incidental income to individuals came from small, discontinuous payments by researchers and others to cultural experts for site clearances and related roles. There were no income-generating businesses or activities. No income came from mining royalties or other payments on lands to which Martu were custodians.

In 1990, all adult community members were required to be on CDEP thus no unemployment benefits were available to community members. Whilst CDEP recipients worked at Parnngurr and Punmu, the program was coordinated from the WDPAC office in Port Hedland; there were no locally based non-Aboriginal CDEP staff. Payments were made to enrolled individuals to provide municipal services to each settlement. These included raking, rubbish removal, firewood collection, construction and windmill maintenance. Other than firewood harvest, no traditionally-derived land use or management activities were formally recognised by the CDEP. However, because Martu determined the daily operations, payments continued even when customary activities were pursued. Unlike other parts of Australia (see Young et al. 1991), there was no Contract Employment Program for Aborigines in Natural and Cultural Resource Management CEPANCRM on Martu lands, despite the presence of a national park. Nor was there any employment in mining operations.

Personal expenses of Martu were paid for through a number of avenues. Goods from the community stores were purchased through a ‘chuck in’ system whereby $40 was taken from the fortnightly welfare or CDEP payments (~$80) of each adult. These bulk funds were then spent to purchase meat, flour, tinned foods and other store goods. A ‘loading’ was trucked in fortnightly or less often. Stores were allocated on a box-by-box basis to each family roughly proportional to the number of family members. Excess goods were held in a locked store and access to them was negotiated with the chairperson or coordinator on an individual basis. It was relatively common for the supply of store goods to run out. The availability of store goods had a direct influence on the frequency and target species of bush food collecting trips (Ch. 6).

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[39] Prior to 1989–90, individuals received unemployment benefits before a CDEP was introduced in Martu settlements.

All three settlements were ‘dry’ in that no alcohol or drugs (except tobacco) were permitted and thus money was rarely spent on these items; however, they were purchased by some individuals on infrequent visits to Newman. At the time of study, there was no charge to individuals for rental on dwellings, communications, electricity or other utilities. Personal items and clothes, usually second hand, were purchased using money that was available or procured through the redistribution system. The purchase, maintenance and fuel for privately-owned vehicles were a major expense. There were few private vehicles in each settlement (Ch. 4). Most vehicles were associated with programs (e.g. schools) and funded through them. In total, the Martu monetary economy was government-dependant and per capita income extremely low. It was in this context, that the Martu customary economy and ‘employment’ in customary and other activities continued, as will be explored through this dissertation.

2.2.13 Modern infrastructure, utilities and services *circa* 1990

Martu settlements, like most remote settlements in Australia, were heavily subsidized. Infrastructure was funded through federal, state and local government programs and grants; smaller contributions came from non-government organizations such as the Royal Flying Doctor Service (RFDS), Murdoch University Remote Area Development Group and Community Aid Abroad. In the late 80s, Martu and their representative organizations did not have the financial capital to invest in business or other economic enterprises.

In 1990, each settlement had very limited infrastructure compared to Australian suburbs, they were more on a par with remote pastoral stations of the mid-1900s. In each settlement at a minimum, there was a bore, windmill or solar pump and tank, 240V generator, central public HF radio, three public taps, three public pit toilets and one shower block with a hand operated washing machine (clothes were washed in the cement mixer). There were no major public utilities such as sewerage, electricity or telephones or utility provision to individual houses (camps). Punmu and Parnngurr had a single store in a shipping container that was refrigerated on solar power. The airstrips and main roads to the settlements were formed but unsealed; there were no bitumen roads or street lights. There were no resident police, childcare, elderly care or other community services. Local government input was restricted to the maintenance of gazetted roads thus only 2 major roads (the Talawana track and WAPET road).

In 1990, at Parnngurr there was one non-Aboriginal school principal (Sue Hanson) and no other non-Aboriginal staff. At Punmu, public funds employed a non-Aboriginal coordinator (Louie Warren), two school teachers and a bookkeeper. There were no non-Aboriginal staff permanently based at Kunawarritji; however, a mechanic (Brian Kelly) and other service staff visited periodically.[40] Doctors and other health professionals had regular fly in-out trips to each settlement; other installation, maintenance or public service staff (e.g. police) visited intermittently by air or road.

[40] These staff are named as there are personal communications from them through this dissertation.

A school was established at Parnngurr in 1988–89. Until 1992, it operated from a bower shed and caravan with a principal, a Martu teacher aide and Independent Aboriginal Schools funding. There was one school vehicle to enable schoolchildren to go on ‘country visits’ and for private use by the principal. English was the first language in the school; although, some lessons and resource materials were provided in Martu *wangka* e.g. Summer Institute of Linguistics (SIL) publications. A school was set up at Punmu about 1985 and a large school building had been constructed by 1987. The principal was a Martu man, Mitchell Biljabu; additionally there were Martu teacher aides and two non-Aboriginal teaching staff. A strong bilingual program, Martu literacy resource material production and a country visit program operated in the late 1980–90s.

In terms of Western medical services, in the 1980s no medical staff were based at Parnngurr or Punmu or Kunawarritji. The RFDS and Aboriginal Medical Service provided services on a fly-in/fly-out basis. The RFDS stocked a medical chest and did emergency evacuations (as it did for many remote pastoral stations, mining camps and other settlements). This was reliant upon radio-phone communication. Martu also made regular visits to the health clinic at Jigalong. In the early 1990s, clinics and nursing staff were installed at Parnngurr and Punmu.

In 1990, housing in each settlement was limited to 2–4 buildings with cement floors and corrugated iron roof and walls. The other camps were constructed from corrugated iron sections, tarpaulins and bush timbers with earth floors. All camps had outdoor cooking areas. Firewood was the major energy source for cooking, heating and ambience. Water was hand carted to the camps. There were no lights, refrigerators, air conditioners or other electrical goods. Private possessions of Martu women typically included only clothes, bags, storage cans, water containers, pots and billy cans, tin plates, damper bowl, butchering knives, tomahawk and blankets. As in pre-European times, Martu utilised their possessions in multi-functional ways.

Whilst Western service provision was limited, there was on-going services provision through Martu cultural systems. For example, Martu maintained a medical system that complemented the Western one, *maparn* continued to practice through the 1990s.[41] Also, families continued to harvest, process and apply medicinal species but far fewer than in the past.[42] Socially and culturally, the outstations were seen to be thriving settlements, where, as reported:

> Life in these communities is spartan by Australian standards but necessities are provided and people are close to their traditional land where they have a strong sense of duty and responsibility. There is a high level of morale. (Newman et al. 1993:39)

[41] *Maparn* ~ a traditional doctor, object with power for healing or sorcery (Marsh1992:167)

[42] For example, drums of *Nayju* (*Dysphania rhadinostachya*) solution for a skin wash were observed in 1990. This dissertation does not focus upon medicinal species as they were gathered in very low amounts.

2.3 Demographic change: mobility, settlement and population densities

This chapter's final section quantifies and describes post-contact demographic change and the contemporary demography of Martu settlements. Changes in pre-contact to present human population densities are one major factor argued to jeopardise the sustainability of species harvest (Healey 1990; White & Meehan 1993). Contemporary assessments of hunting sustainability also require per capita estimates (Tab. 1.4) thus human population data.

A common presumption has been that Aboriginal population densities are greater in modern than pre-colonial times. This presumption is largely due to the high growth rate of Aboriginal populations in contemporary times (Cane & Stanley 1985:6). It appears to contrast to the following observation by a middle-aged Martu man, Grant Milangka:

> I will tell of the past. There were many of us Aborigines staying around. But now there are only a few of us. It was like that a long time ago, when I kept my father alive. (PALC 1988:162)

How do pre-contact and contemporary population numbers and densities compare in the Western Desert?

2.3.1 Total population estimates and densities in pre- and early contact times

In the arid zone, demographic changes from prehistoric times to the present are poorly understood. Two major factors made it difficult to make comparisons—firstly, interpreting historical data to estimate populations of people who were highly mobile and had fluid and complex movement and settlement patterns, secondly, uncertainty about base population levels at contact times (mid–late 1800s). Veth (2005) and earlier authors argued it was appropriate to make population estimates only at the regional scale, that of the Western Desert. Cane (1990; 2003) reviewed estimates of Aboriginal population sizes and differing densities on Gugadja lands of the northern Western Desert in early contact times, these and other figures indicated pre-European densities across the Western Desert. Estimates of the numbers of people in the Western Desert have ranged from 18,000 to 4,000 people. Cane (1990) argued a case for the lower figure, which equated to a density of one person per 150–200 km^2. Cane (1990:7) noted a mean population density as low as one person per 300 km^2 in a paper that identified the tensions between abandonment and maintenance of country. Cane modelled shifting densities associated with the aggregation and dispersal of people in dry and wet times respectively. He speculated that people gathered for ceremonies in good wet seasons might have occupied localized areas at a density of one person per 8 km^2. This would be equivalent to densities suggested for the ecologically more productive regions of Arnhem Land and Tasmania. Overall, it was likely that regional population densities in the Western Desert were generally very low.

Table 2.6 Western Desert Aboriginal population density estimates in pre-European times

Density estimate	Conditions	Source reference
one person/8 km^2	ceremonial gatherings in wet years at localised areas, Gugadja lands NW Great Sandy Desert	Cane 1990
one person/30–40 km^2	upper density estimate, Gugadja lands NW Great Sandy Desert	Cane 1990
one person/150–200 km^2	lower density estimate, Gugadja lands NW Great Sandy Desert	Cane 1990
one person/300 km^2	mean estimate, Martu lands, W GSD	Veth 2005
less than one person/300 km^2	Ngaanyatjarra lands	Gould 1980

However, these may be underestimates as population densities at pre-contact times (mid–late 1800s) were greatly reduced by widespread, dramatic and high death rates in the pre and early contact period (Veth 2005). Many deaths were due to epidemics. British explorers and settlers introduced smallpox, influenza and other diseases in the late 1800s and onwards. Previously, 16th–17th century contact between coastal Aboriginal people and Dutch shipwrecked sailors, Macassans and other traders may have already resulted in disease transmission. Waves of epidemics dramatically reduced desert Aboriginal populations before records began then continued throughout the contact period (Kimber 1990). The tragic effects of illness was evident in many Martu oral history accounts of the contact period that spoke of sickness, death of young and old people and looking for absent kin (Tonkinson 1974; PALC 1988; Yirapartu et al. 1992). It was possible that Western Desert Aboriginal populations, before Europeans landed in Australia, were orders of magnitude higher than estimates in Table 2.6.

Also, across desert regions there were relative differences in population density. For example, Meggitt (1962:32) indicated that in pre-European times the Arrernte population of the central ranges regions was probably twice that of the Warlpiri in the Tanami Desert. It was likely that fewer people occupied Martu lands than Arrernte and possibly Warlpiri lands due to greater temperature extremes, lower primary production, uncoordinated drainage and fewer permanent waters. Further, it has been said that Ngaanyatjarra lands were even more sparsely populated than Martu lands (Gould 1980).

2.3.2 Martu population totals *circa* 1990

There are substantial methodological challenges in determining Aboriginal population numbers within settlements and across regions (Young 1990; Warchivker et al. 2000; Taylor et al. 2006). Identification of individuals, census techniques, high mobility and frequent residential shifts contribute to the challenges with high incompatibilities with Australian Bureau of Statistics, regional and local data sets. Total Aboriginal population numbers for settlements and towns in the wider Western Desert, including Martu ones, were estimated to be 10,000–12,000 people about 1990 (Warchivker, economist, pers. comm. 2003).

Since the 1980s, Aboriginal populations in remote, arid regions have grown rapidly. Since 1981, population growth in remote settlements has been about 23% compared to negative or stable non-indigenous growth (Taylor et al. 2006:42). In the 1980–1990s, there was a migration trend from settlements to remote and very remote outstations.[43] Such has been the trend from Thus, whilst Aboriginal population numbers have increased population densities at landscape and regional scales may have decreased.

The Great Sandy Desert bioregion was classed as ‘very sparse population’ (Whitehead et al. 2001). In relation to the study area and period from 1988–93, population estimates have ranged widely. Tonkinson (1989) noted that more than 100 adults lived at Parnngurr and Punmu in 1988. Later from 1992, it was observed that:

> Today, Punmu, Parnngurr and Kunawarritji are small but thriving communities. Punmu has around 250 people, Parnngurr 60 and Kunawarritji 30. There is a lot of movement around the area and some visitors may find numbers well below this, particularly when “law business” is occurring. The school at Punmu has around 50 children and at Parnngurr there are around 30 (Newman et al. 1993:38).[44]

Martu were highly mobile between Parnngurr, Punmu, Kunawarritji, Jigalong and then some mobility between settlements where Martu lived at Parnpajinya in Newman, Yandeara, Hedland, Wiluna and elsewhere (Fig. 1.1). High inter-settlement mobility was reflected in the high frequency of vehicle arrivals and departures from the Martu outstations (Tab. 4.6).

During the study periods in 1990, the names and numbers of adults and numbers of children who were present at Parnngurr, Punmu and Kunawarritji were recorded on observed dates by this researcher. This was combined with other information sources and is presented in Table 2.7. On 20/3/90, the Australian Electoral Commission (AEC) recorded 42 voters at Parnngurr plus one non-Aboriginal person and 22 voters at Punmu plus six non-Aboriginal people (Sally Thomas, AEC, pers. comm. 17/12/91).

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[43] in the late 1990–2000s, there has been a reversal in this trend with net migration from remote settlements to larger settlements and regional towns (Taylor et al. 2006), for Martu this migration has been from Parnngurr, Punmu and Kunawarritji to Jigalong and other Aboriginal settlements and to regional towns (e.g. Newman, Port Hedland).

[44] Newman et al. (1993) stated 250 people (including 50 school children) were at Punmu in 1992. This was more than double estimates by Tonkinson (1989) and this field research (1990). It is unknown if 250 was a typographical error or significantly overestimated or based on a period of extremely high population.

Table 2.7 Martu population numbers recorded at Parnngurr on observed dates in 1990[a]

Dates	6 Mar	20 Mar	2 Aug	24 Sept[b]	6 Oct	12 Oct	Mean	SD
Nos adults	30	42	55	65	17	10	30.8	16.3
Nos children	36		42	65		6	28.0	15.7
Total	66	42	97	130	17	16	58.8	32.1
Data source	researcher census	election	researcher census	researcher census	CDEP delivery	researcher census		

[a] Adults were classed as > 20 years; [b] This was the day of opening ceremony for the school. Earlier, Martu had come from Punmu and Jigalong therefore, the September data were excluded from the mean and SD. In addition, there were about 20 non-Aboriginal visitors.

Table 2.8 Martu population at Punmu on observed dates in 1990[a]

Dates	23 Mar	1Apr	21 Sept	16 Oct	Mean	SD
Nos adults	26	24	nr	6	18.7	9.0
Nos children	25	nr	nr	3	14.0	11.0
Total	51	-	49	9	30.0	21.0
Data source	researcher census	coordinator census	researcher census	researcher census		

[a] Adults were classed as > 20 years.

Table 2.9 Martu population at Kunawarritji on observed date in 1990 [a]

Dates	18 Oct
Nos adults	12
Nos children	7
Total	19
Data source	researcher census

[a] Adults were classed as > 20 years.

Table 2.7 shows a mean of about 30 adults and 30 children were resident at Parnngurr. However, these figures were considerably less than school estimates of about 76 children and 60 adults at Parnngurr for the years 1989–91 recorded by Sue Hanson, Parnngurr School Principal (pers. comm. 25/6/91, see Tab. 2.10).

Table 2.10 Numbers and age classes of adults and children usually at Parnngurr in 1990 as estimated by the school principal

Adults		Children	
Senior men	4	Preschool	12
Senior women	8	Primary	40
Men	24	Secondary	11
Women	24	Transients	13
Total	60	Total	76

The basis for the discrepancies in this comparison between Parnngurr population data is unknown (Tab. 2.7 v. 2.10). Populations could have been over-estimated by the school or it may reflect an average inclusive of Parnngurr and Punmu populations. The population composition of Martu settlements fluctuated a lot, as identified in the previous quote and in the high 'transient' schoolchild population (about 20%).

Of relevance to this field study, in early 1990 there was a lot of population movement due to funerals and rituals associated with the death in January of eight Martu in a tragedy on the WAPET road between Hedland and Punmu. Subsequently, there had been a major emigration from Punmu and Parnngurr thus the 1990 Punmu population was about one third its 'average' and at Parnngurr, there may have been as many as half the average number. But it was unknown whether there had been net emigration from the outstation settlements to Jigalong or extremely high mobility between the outstations.

These discrepancies and high standard deviations require considerable caution in single settlement and regional population estimates. Data from the above sources and several others were collated for four Martu settlements and across less than ten years (Tab. 2.11).

Table 2.11 Estimates of Martu outstation and Jigalong populations from multiple sources 1989–1996

Source:	Tonkinson 1989	Warchivker (pers. comm.) in 1988–89	School principal pers. comm. 1990	this research in 1990 adults + school children	Newman et al. 1993	ABS 1996 total population[a]
Punmu	> 100 adults	60–70 adults		19 + 14	250 incl. 50 school children	124
Kunawarritji		20–25 adults		12 + 7	30	
Parnngurr		80 adults	65 + 76	31 + 28	60 incl. 30 school children	198
Jigalong		200–300 adults				

[a] 1992 and 1988 Australian Bureau of Statistic data were not available at a scale suited to this study

These figures again show the wide variations in population numbers and the different zoning methods used by different researchers. For this study *circa* 1990, the total population of remote Martu outstations (excluding Jigalong) was estimated to range from 70–170 adults with a mean of 120 adults.

2.3.3 Martu population densities *circa* 1990

Table 2.6 presented estimates of population densities in the Western Desert in pre-European times. Below, these are compared to population densities *circa* 1990 at different spatial scales. Totals of 120 adults in all three settlements and 100 adults for Parnngurr and Punmu are used to estimate the population density for land areas around the three outstation settlements and in the National Park (Tab. 2.12, see Fig.1.2). A settlement radius of 10 km^2 was identified as the area in which hunting and gathering trips on foot were concentrated and a settlement radius of 50 km^2 was identified as the area in which hunting and gathering trips using vehicles were concentrated (Ch. 7).

The most densely occupied and utilised area was within a 10 km radius of the settlements wherein Martu could walk. This density would be far greater if children's population numbers were included which is pertinent in that Martu children often hunted close to settlements (Ch. 7). The next densely utilised area was in the triangle between the three settlements where the major travel routes were concentrated. The Martu population density of the National Park was about 1 adult/130 km^2. Population densities for 50 km settlement radii were very sparse. These figures show varying intensities of population density across Martu lands, in turn suggesting varying intensities of resource use and management action in space.

Table 2.12 Estimates of adult Martu population density for different spatial areas *circa* 1990 (and in 2002 native title area)

Described area	Martu population estimate	Land area (km^2)	Martu population density
Settlement radius 10 km for Parngurr, Punmu & Kunawarritji combined	120	one settlement area = 986 km^2 3 settlement areas = 2,958 km^2	1 adult/8 km^2
Triangle between Parnngurr, Punmu & Kunawarritji[a]	120	100 x 170 x 240 km = 7,099 km^2	1 adult/60 km^2
Settlement radius 50 km for Parngurr, Punmu & Kunawarritji combined	120	one settlement area = 7,854 km^2 3 settlement areas = 23,562 km^2	1 adult/200 km^2
Rudall River National Park (Parrngurr & Punmu only)[b]	100	1,283,706 ha = 12,837 km^2	1 adult/130 km^2
Martu native title determined area (2002)[c]	1600	136,000 km^2	1 adult/85 km^2

[a] Triangle area square root of 255 (255–100) (255–170) (255–240)]; [b] Park area as in CALM (2003b);
[c] Claimant group size as in FCA (2002) but majority not resident in outstations

Comparisons between estimates of pre or early contact densities (Tab. 2.6) and densities *circa* 1990 (Tab. 2.12) suggest that 1990 population densities were comparable or greater then pre-European estimates. Estimated densities close to the settlements in circa 1990 were similar to Cane's estimate of Gugadja population densities during ceremonial gatherings in pre-European times. Martu densities within the Park and settlement radii may have been similar to Cane's (1990) lower estimates. Population densities for all described areas were at least one third higher than Veth's (2003) mean estimate. These comparisons suggest that Martu population densities increased at spatial scales ranging for settlement to landscape scale from pre-European times to the 1990 study.




Examples of major land units near Parnngurr in the Little Sandy Desert (Trainor and Rudall subregions).

Photo 2.2 (top left) Riparian woodland dominated by *Eucalyptus camaldulensis* near Pultajatja.

Photo 2.3 (top right) Colluvial slopes with a sparse open woodland of *E. brevifolia* near Punamalara.

Photo 2.4 (bottom left) Sandplain with open hummock grassland and occasional *Grevillea* aff. *eriostachya*, *Calytrix carinata* and *Aluta* (*Thyrptomene*) *maisonneuvii* on the Talawana track east of Parnngurr.

Photo 2.5 (bottom right) Deep valley in the McKay Range with sparse open *Eucalyptus victrix* woodland near Yurlpu.




Examples of major land units near Punmu in the Great Sandy Desert (Mackay subregion).

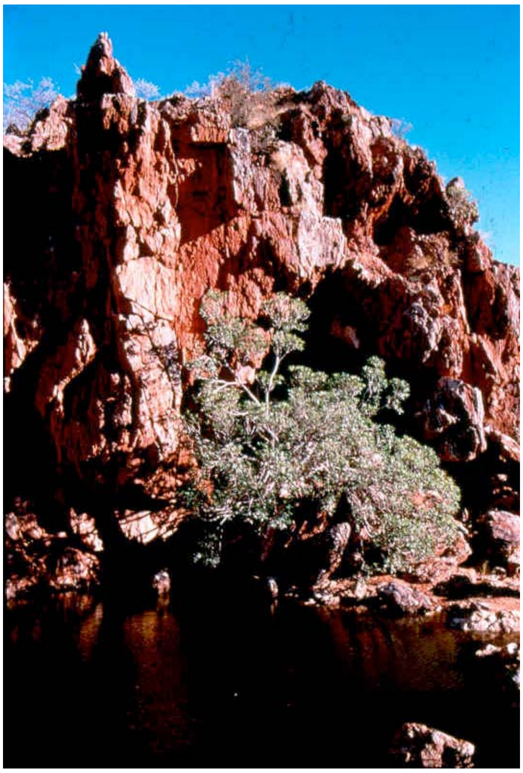
Photo 2.6 (top left) Longitudinal dune and wide swale with *Triodia pungens* hummock grassland and *Acacia dictyophleba* and low *Acacia translucens* (now *A. stellaticeps*) shrubland.

Photo 2.7 (top right) Dislocated dunes on the eastern shore of Lake Dora with *Melaleuca glomerata* shrubland.

Photo 2.8 (bottom left) Flat topped plateau east of Lake Dora with low samphire shrubland.

Photo 2.9 (bottom right) Sparse open *Acacia aneura* woodland near plateau.






Examples of wetland types on Martu lands.

Photo 2.10 (top left) Non-permanent pool in Karlamilyi (Rudall River) primary channel.

Photo 2.11 (top right) Claypans with ephemeral waters at Kurta Kurta.

Photo 2.12 (bottom left) Parnngurr rockhole which has long-lasting water.

Photo 2.13 (bottom right) Kalyir soak NNW of Parnngurr.




Historical photos of Martu life

Photo 2.14 (top left) From Tonkinson (1991:43) with the caption "A satisfied group after a successful day's gathering: note Manggaji's hair twine necklet and the use of emu-feather headpad." Women with wooden bowls (piti) near Tika Tika, 1965 (Courtesy of The University of Western Australia Berndt Museum of Anthropology, WU/P17876).

Photo 2.15 (top right) From Davenport et al. (2005:145) captioned "Giving out rations at Jigalong, photo: Jim Plumb, date unknown." with women carrying sacks of flour in a similar way as wooden bowls had been carried.

Photo 2.16 (bottom left) From Tonkinson (1974:108) captioned " 'Cowboy culture' young men wearing typical station clothing" typical of the 1950–60s period when some Martu families worked on sheep and cattle stations in the Murchison, Gasgoyne and Pilbara regions.

Photo 2.17 (bottom right) Dense surface artefact scatter on Martu lands near Kataru (Well 24) including grindstone pestle and mortars in lower right indicative of a prehistoric residential site, 1986.




Aerial and ground views of Parnngurr and Punmu.

Photo 2.18 (top left) Elevated view WNW to Parnngurr settlement in 1990 from Mt Cotton.

Photo 2.19 (top right) Parnngurr in 1990 with nissen tent shelters in foreground and new school building in background.

Photo 2.20 (bottom left) Aeroplane view WSW to Punmu (centre of photo).

Photo 2.21 (bottom right) Punmu in 1990 with houses in centre and school in mid right.

Photo 3.1 A group of Martu women make an audio-recording whilst on the clinic veranda which was one of my camps during the 1990 study. In the background are the Nissen huts where Martu families lived. In the far right background is the new school under construction.

3 General research methods

This chapter describes the field research methods used in the 1990 study. It presents a summary of my history of association with Martu from 1986–1989, field dates and roles in 1990, the research ethics and protocols that were respected, field equipment and logistics, a summary of the people with whom I worked, a discussion of the significance of language and translation, ethnographic interview and participant observation techniques, and scientific techniques. Parameters recorded on foraging trips are identified. Later chapters have additional detail on methods.

The field methods were initially guided by field collaboration with archaeologist, Peter Veth (e.g. 1989) and ethnobotanist, Arpad Kalotas (e.g. 1993). When the research expanded to consider contemporary resource use it was guided by monographs, theses and reports with relevant ethnographic methods (Altman 1987; Devitt 1988; Liberman 1985; Meehan 1982; Sutton & Walsh 1979; Williams & Baines 1993).

3.1 Field dates and roles prior to 1990

The quantitative data presented in this dissertation were recorded during research at Parnngurr, Punmu and Kunawarritji in 1990. However, my association with Martu people who lived at these places had begun in 1986 (Tabs 1.1 and 3.1). Some of the qualitative information presented in this dissertation was initially recorded prior to 1990; this included interpretations of Martu knowledge and perceptions of plant and animal resources, spatial aspects of landscapes, and seasonality. From 1986 to 1990, there was a progressive refinement of these interpretations through cross-checking and corroboration.

Table 3.1 shows fieldwork between 1987 and 1990 totalled about nine months; the most concentrated periods were almost 3 months in 1990. In 1987 and 1988, the research was dominated by the recording of species by species ethnobotanical use, species ecological characteristics and botanical survey as detailed in Walsh (1987; 1990).

The development of relationships with Martu preceded and continued through the 1990 study. Initial relations were with individuals contracted in 1986 by Peter Veth as ‘scouts’ on archaeological surveys. There was also introduction to senior Martu and younger leaders; in all cases, these were Martu men. In 1987, collaboration with Martu women began. The women I initially worked with were those nominated at a community meeting, later, this group became more self-selecting. Prior to 1986, I had little cross-cultural experience with remote-area Aboriginal people, therefore, the learning curve was steep. Whilst I had no prior experience of desert environments, I was familiar with the mulga shrubland environments of Murchison and Gasgoyne regions (Fig. 1.1) but I knew little of their botany or ecology. My initial perception of the desert as a homogenous, harsh environment was strong. My recognition of the richness, patchiness, spatial and temporal variability of desert environments continues to grow to this day.

Table 3.1 Researcher's dates, locations and major roles in relation to Martu from 1986 to 1990

Dates	Locations	Main roles
1986, April–June	Rudall River, McKay Range, CSR Well 22–26	archaeological survey with some ethnobotanical research
1987, 7 June–28 July	Rudall River, Kurta Kurta, McKay Range; from Parnngurr base	ethnobotanical research and botanical survey for Masters
1988, 7 July–24 August	Rudall River, McKay Range, CSR Well 22–26; from Parnngurr base	ethnobotanical research
1989	Perth	contract writing for WDPAC; intermittent liaison with Martu and support agencies as member of Western Desert Support Group
1989, March–April	Perth, Alice Springs, Canberra	national tour with five Martu spokespeople and leaders
1990, 2 March–4 April 6 August–12 Nov	Parnngurr, Punmu, Kunawarritji	PhD research

3.2 Research expectations, ethics and funding

Nationally, Aboriginal spokespeople have questioned the role of anthropologists and others researching aspects of Aboriginal culture and there has been greater reflection within related disciplines. In response, the development of research protocols and ethics has expanded and become institutionalised (e.g. Williams 1998; AIATSIS 2000; CNCRM 2000; EWG 2003). Topics raised in relation to these research ethics included: useful research, consultation, negotiation and informed consent; benefits to local people and their representative bodies; return of research materials; and intellectual property rights. In 1990, at the time of this field research, I was guided by my personal ethics, the protocols and subtle directives explained by Martu individuals, the standards set by WDPAC and protocols set by recipients of AIATSIS grants.

3.2.1 Western Desert Puntukurnuparna Aboriginal Corporation expectations

In the late 1980s, Martu held no land tenure under Australian law. Martu settlements were notionally accessible to all outsiders. However, as WDPAC were a representative body for Martu, I approached them with a Masters research proposal in 1987. Despite the wariness of Martu toward outsiders on their lands, approval to return to Martu lands was received from WDPAC because of:

> the appropriate conduct, valued relationships and returns [a community resource document] provided by yourself and colleagues (WDPAC correspondence dated 4/5/87).

Subsequently, I undertook field work in 1987, 1988 and 1990 (Tab. 3.1). In 1990, when I upgraded to a doctoral enrolment, WDPAC contributed funds toward the research (Tab. 3.2). They wished to use the ethnoecological research in the context of land claims. From 1987–1993, I had regular and ongoing communication with Martu at all levels. This included with people who lived in the settlements, the chairperson of each settlement, the chair and committee of WDPAC and professional staff of WDPAC. This communication was undertaken formally through meetings, presentations and letters and informally through face-to-face discussions and telephone contact. Prior to each proposed field visit, I would request permission and explain the purposes of the field research via letter and phone. Relevant Martu chairpersons granted permission, although I was sometimes asked to delay the field period due to significant commitments by Martu (e.g. large meetings, Law business, funerals). WDPAC expectations were that I would behave appropriately within the context of Martu culture, pay Martu and provide research reports to WDPAC.

There were benefits to WDPAC, other Martu representative bodies and Martu individuals from the research. The research was the basis for a long chapter in a report to WA Dept of Conservation and Land Management (Walsh 1989). WDPAC presented the research results to a mining warden’s court hearing on alleged damage to a sacred site (Walsh 1992a). Submissions to WA Aboriginal Legal Service were incorporated into negotiations with the WA State Govt in respect to land tenure claims (Walsh 1994). The ethnoecological research was a significant component of the Martu native title claim connection report (Tonkinson et al. 2001). There was a successful determination on native title in 2002. Overall, the longer-term benefits from the research were greater than originally anticipated.

3.2.2 Martu expectations

Martu individuals made choices about how to engage or not engage with the research and myself as researcher. From their perspective, relations with me as a person were more important than the research topic. In total, I collaborated with about 35 people (Tab. 3.4). A core group of Martu individuals (mainly women) had a regular and active role in the research. These people were nominated at community meetings and/or they approached me with requests to take part in the work.

Martu support for the research intensified through the 1990 field period. Notably, there were occasions when decisions made by WDPAC were inconsistent with the opinions of the people on the ground. For example, in June 1990 whilst in Perth, I had been advised and then counter-advised as to when I could again do field work. In August, after being given permission to return:

> On my arrival at Parnngurr, Nyaparu volunteered the information that he wasn’t at the WDPAC meeting in Punmu when it was decided my visit should be postponed. He said “There was a bunch of wild [angry] women when they heard you’d be next time. They humbugged and demanded that you come now”. He said he had no choice but to ignore the recommendation from WDPAC and approve my visit. (FW field notes 90-7, 11/8/90)

My presence and research interests were accepted, even appreciated, by Martu. For example, in March 1990, the boss of Kunawarritji, Roly Williams, invited me to stay there; however, I was unable to go until November 1990. In relation to me as a researcher, Martu participants appreciated a person who valued their knowledge and expertise, provided an additional vehicle and resources to access their country, offered payment, and returned photos and records that could be used to inform others and teach their children.

The nature and direction of the research was partially shaped by the priorities and interests of Martu individuals and WDPAC. In 1990, it refocussed to document contemporary land use practice rather than reconstructions of prehistoric subsistence practices (Ch. 1.3). Day to day decisions on foraging trips were directed by Martu, thus allowing participant observation of ‘normal’ practices. At times, Martu individuals specifically requested that certain information, events or places not be photographed or recorded in other ways; on several occasions, I had a written record of an observation then later someone came back to me and asked that the information not be circulated elsewhere. These requests have been respected.

3.2.3 Personal ethics

My strongest ethical accountability was to Martu individuals. Our relationships were critical to the quality of the ethnographic interview and observational data. I was allowed to repeatedly accompany people on foraging trips because of the strength of this relationship. I tried to work by the common human traits of generosity, humbleness and honesty. These traits were supplemented by the provision of second-hand clothes, sharing of food, transport and other material goods in exchange for knowledge and participation.

My personal ethics were based on respect for individuals and cultural processes, appreciation of the knowledge of local people, a sense of equity, a learning attitude and similar morals. I enacted these through ways including listening carefully, a willingness to learn, asking when appropriate, response to explicit and subtle direction, support for priorities or interests of local people, the provision of help where appropriate, demonstrating what I had learnt when asked, and the return of research results. I understood that engagement with people meant certain cultural obligations, I sought to understand and reciprocate on these to the degree that seemed acceptable but that did not compromise the relatively neutral role needed in research. I recognised where my ethics were at odds with Martu expectations such as their deep orientation to individual and family and emphasis upon being asked rather than offering.

I made mistakes. For example, on one occasion in 1987 I unwittingly violated a Martu protocol. I heard about this third hand, the gravity of the event was apparent but there were no direct repercussions as Martu excused my lack of knowledge. It was a lesson in the importance of asking for directions when in unfamiliar areas, on the divide between men and women and the power of men’s Law. Another, more domestic example related to hearth fire protocols—on finishing a lamb chop I tossed it into the fire, there were no comments but several people looked at me. I realised my action was inappropriate and subsequently observed that Martu did not throw materials into their hearth fires. My interpretation was that Martu cooked many bush and store foods directly in the ashes and coals so hearths had to be kept clean. Thus, I reflected and learnt more.

These relationships between Martu individuals and I resulted in requests for goods, hospitality and assistance over subsequent years. To varying degrees, the requests were fulfilled or occasionally not. Because of them, in 2006, I was asked to support a Martu woman in an extremely distressing situation (Ch. 9.3). Such requests mean cross-cultural research can involve more challenging psycho-emotional demands upon a researcher than pure ecological research (Ch. 9.3.3).

3.2.4 Return of research materials and intellectual property

Results from sections of this research in 1990 and earlier were communicated to Martu in the form of three community reports (Veth & Walsh 1986; Walsh 1992a; Yirapartu et al. 1992). These reports were in plain English and/or local dialects and included photos and/or illustrations. Multiple copies were sent to collaborators, main informants, local schools, community chairpersons and WDPAC.

All publications acknowledged key Martu informants and representative agencies. No publications knowingly presented intellectual property that Martu had requested be kept confidential or could be used for profit by any parties. One publication was authored by Martu women and compiled by myself (Yirapartu et al. 1992); I was sole author of other publications (App. 1). In hindsight, one descriptive publication with a substantial component of local ecological knowledge (Walsh 1990) was suited to joint authorship with Martu or a representative organisation.

Copies of most photographs were returned to relevant Martu individuals. I continue to reprint photos on request from Martu individuals (most recently in January 2007). Copies of photos on CD-ROM were lodged with WDPAC in 1994. Since 1990, multiple copies of professional publications based on the research (see App. 1) have been sent to WA Aboriginal Legal Service, Ngaanytajarra Council and AIATSIS. In 2006-07, photographs, audio-recordings, video recordings and community documents were again lodged with a Martu representative organisation through the *kanyirninpa jukurrpa* project into local and national archival institutes.[45]

An ethnobotanical database of species utilised by Martu was developed and maintained (Kalotas & Walsh unpub.). This database subsequently supported the WDPAC seed retail business based on wild harvest (see Kalotas 1999). Several times, Martu representatives have directed that no ethnobotanical species descriptions were to be published, this has been respected.

The researcher has not sold, traded or used any of these research materials for royalties or profit. Copyright designations to various entities for material in this dissertation are noted on page xxv.

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[45] *Kanyirninpa jukurrpa* Martu History and Archive Project, Western Desert Lands Aboriginal Corporation hold materials locally in a Martu-accessible digital archive and, as appropriate, lodge copies or originals with the National Sound and Film Archive.

3.3 Project funding and Martu payments

Funding for the research project was received from UWA, AIATSIS and WDPAC. Table 3.2 records the amount, source and purpose of these funds.

Table 3.2 Funding allocations for the research

Year	Amount	Source	Research purpose
1990	$2600	Australian Institute of Aboriginal & Islander Studies	informant interpreter fees
1990	$2000	Western Desert Puntukurnuparna Aboriginal Corporation	informant interpreter fees
1990	$5200	The University of Western Australia	vehicle hire, food, field gear
1990–1993	$24,000 pa	The University of Western Australia	PhD research scholarship
2004–2008	$6750	Desert Knowledge CRC	thesis final production

The bulk of field funds were spent on payment to Martu informants and interpreters, fuel and food. The Department of Botany, UWA, loaned a Toyota Troopcarrier vehicle for field work and provided field equipment as required. Personal field gear was purchased from scholarship funds. Martu women who went on foraging trips I accompanied benefited from vehicle access, fuel and food but no payment was made to individuals for their role on foraging trips.[46]

Martu were paid at rates of $10 per hour for being an interviewee and $15 per hour for doing translations, these rates were set by WDPAC. In total, $4600 was paid to Martu for these roles; these payments were by cash or cash cheque. This was provided at the end of each week or when I left the settlement. I clearly stated what I could and could not provide to people, particularly to individuals whom I did not know. This seemed to be accepted for rarely did I get ‘humbug’ for money or use of the vehicle. Most women appeared to engage with me because they wanted to rather than just because they wanted money. Toward the end of each field period, I ran out of consultants’ funds and food (mine included). Even though I had no funds to pay them, women urged me to continue recording because they wanted their knowledge and activities documented.

3.4 Field work in 1990

Field work on Martu lands in 1990 was in two periods, March to April and August to November. The timing, before and after the cool season, was chosen because bush food availability had previously been documented from April to August 1986–1988. Table 3.3 collates the dates of field research, the base settlement and main roles or methods done in each period. The total duration of 1990 field time was limited by the finances I had available (Fig. 3.2). Additionally, in the late 1980’s non-Aboriginal people were

[46] Participant observation by the researcher was a primary field method, payment to people I accompanied on trips was likely to distort ‘normal’ foraging activities. Also, due to the large number of trips funds would have been quickly exhausted thus payments were used for specialist roles and focused knowledge recording.

generally unwelcome on Martu lands when initiation ceremonies were likely to occur (approximately November to March).

In the March period, the majority of research time was spent at Parnngurr. In the August to October period, field times were spent at Parnngurr, Punmu, Kunawarritji and a short stay in Jigalong. My movement between the three remote settlements was largely determined by the activities of Martu. In the March period, I had intended to spend an equal period at Parnngurr and Punmu to aid comparison in foraging practices between the two settlements. However, after the deaths of eight Martu near Punmu, most people relocated to other settlements, consequently, I spent only a short time in Punmu. In the August to November period, Martu were still highly mobile. For example, most people left Parnngurr in late September because of their commitments to ceremonial activities. With a scarcity of people in one settlement, I went to another.[47] Sometimes it seemed like I followed Martu as they had reputedly followed rain.

Table 3.3 Researcher field dates, locations and major roles in 1990

Dates	Locations	Main roles
2 Mar–5 Mar	Perth to Parnngurr	travel
6 Mar–20 Mar	Parnngurr	participant observation, ethnography, land unit mapping ground truthing
21 Mar–22 Mar	Parnngurr to Punmu	travel
23 Mar–1 Apr	Punmu	participant observation & ethnography
2 April–3 Apr	Punmu to Parnngurr	travel
4 Apr	Return to Perth via Hedland and Karratha	travel
6 Aug–8 Aug	Millstream	AAPA–CALM meeting (see Tann 1991)
11 Aug–8 Sep	Parnngurr	botanical survey participant observation & ethnography
9 Sep–12 Sep	Parnngurr to Newman to Punmu	travel
13 Sep–21 Sep	Punmu	participant observation & ethnography
22 Sep–24 Sep	Parnngurr	participant observation & ethnography
30 Sep–6 Oct	Newman & Jigalong	replenish supplies, write up, translations, wait for Law business to open road
8 Oct–14 Oct	Parnngurr	participant observation & ethnography
15 Oct–17 Oct	Kunawarritji via Punmu	travel
18 Oct–29 Oct	Kunawarritji	participant observation & ethnography
30 Oct–11 Nov	Broome via Parnngurr	accompany school excursion
12 Nov	return to Perth	travel

As much as possible, field work was devoted to ethnographic research and participant observation of Martu foraging and other land use activities. There was also a substantial amount of travel time. It was a three day drive from Perth to Parnngurr and a one day drive on a formed road from Parnngurr to Newman the nearest service and supply town.

[47] The Martu women identified as companion and skin sisters to me (Ch. 1.4.3) were particularly concerned that I should not stay in a settlement where there were no or few people and none who could 'look after' me.

Although only 90 km apart, it was at least a nine hour drive from Parnngurr to Punmu; the road was unformed and rough, following the Rudall River channel and the shoreline of Lake Dora. The travel time was often exhausting but informative too. It was productive as an aid to my interpretation of the spatial geography of Martu lands and overlying spatial land use patterns.

I rarely took a weekend break as Martu often went on weekend trips that included foraging when there was no school, meetings and other commitments. The collation of notes, plant pressing, equipment repairs etc was done in evenings and quiet periods.

3.4.1 Field equipment—vehicle and other

The logistics of undertaking field work in remote locations for extended periods were substantial. Logistical preparations for fieldwork took several weeks. It was necessary to be relatively independent when in Martu settlements. Fuel, vehicle spare parts, food, medical supplies, camping equipment, research equipment and more had to be acquired, stored and maintained. This was largely my responsibility as there was little technical assistance available and the facilities of urban settings were unavailable in Martu settlements. For example, I could not just pull up at a Parnngurr bowser to refuel; fuel requirements had to be estimated, 44-gallon drums ordered, delivery arranged and then fuel pumped by hand and fuel use monitored. My A4 field diaries each include long lists of financial expenditure, travel distances, fuel calculations, food items and Martu payments.

About one third of the fieldwork budget was spent on food. The food purchased was much the same as that available in Martu stores. However, I bought bulk goods in Perth or Newman to avoid drawing on scarce stores in the remote settlements. The food I ate and provided for Martu on foraging excursions and often at my camp was similar.

The Troopcarrier included a high frequency (HF) radio, long range fuel tanks, water tank and roof rack. The vehicle was used on some foraging trips. I did not encourage its use for other community purposes, although, when there was a medical emergency or the need for an extra vehicle on a school trip or other specific purpose I did allow the use of it. Generally, I was the driver; however, on foraging trips it was better that a local person drove. This provided advantages such as greater control of travel direction by Martu and fewer damaged tyres as they were better at avoiding tyre stakes when off-road.

Field equipment included field diaries, a Sony Walkman Pro tape-recorder, an SLR camera, a pedometer, a set of Pesola weighing instruments, thermometer, rain gauge, 1:250,000 topographic maps and 1:100,000 dyeline maps. This field research was done before laptop computers, Global Positioning System (GPS), satellite images, satellite phones, digital cameras and other electronic equipment that became standard in the late 1990s was available.

The presence of my research vehicle in each settlement had some influence upon daily activities in a settlement. Vehicles were, and still are, highly prized but often scarce resources in remote Aboriginal settlements (Ch. 4). In 1990, I enquired about chartering air flights to transport me to and from Parnngurr; however, the logistics and risks of this were prohibitive. The volume of food and equipment required for several months was substantial. Furthermore, I was reluctant to take up scarce space in Martu vehicles. The decision was to take a vehicle. The recording of accompanied and unaccompanied foraging trip data sets (Ch. 3.6) was a way of accounting for the research vehicle's influence. The use of my vehicle reflected what I took to be the situation if Martu, in particular Martu women, had a vehicle they could use for hunting, gathering and associated activities; rarely, did Martu women actually have a vehicle that was used for their priorities. The unaccompanied trip data reduced the influence of myself and the UWA vehicle.

3.4.2 Me as a researcher and my interests

Chapter 1 and page xxiii noted some of my personal background and skills relevant to the field research. Pertinent were my mix of city and bush upbringing, tertiary studies in biology and interest in other people and cultures. Prior to 1990, my cross-cultural experience included travel in Asia, seed harvesting with Kija men in the east Kimberley and six months doing archaeological and ethnobotanical surveys on Martu lands (Tab. 3.1).

In 1986–1987, field assistance was provided by friends or colleagues (see Acknowledgements). In 1990, I chose to work alone (with the exception of one period) because I wanted to be relatively unobtrusive and thus minimise my influence upon daily Martu activities. Each time I returned to one of the settlements it was with a sense of anxiety and anticipation. Would people remember me? Would they want to take part in my work? What role would I play? Each time I found myself welcomed and offered a place to stay. I retained the role of researcher, partly acknowledged by the local nickname '*mirli-mirli wanti*'.[48]

At each settlement, I camped amongst or close to Martu families rather than with the non-Aboriginal staff (if there were any). My camps were on the Parnngurr clinic's veranda, a bower shed at Yilyara and a shed with other women at Kunawarritji. I took a swag, food, table and field equipment from place to place. In each settlement, I had an outdoor hearth where I cooked. Many visitors, particularly women and children, came to my camp to talk, have a cup of tea, listen to the radio or their previous audio recordings, get first aid items or just for company. We discussed the day activities, who was doing what, what was coming up, people's past life experiences or events in the wider world. Similarly, I visited the camps of those with whom I had relatively close relations. The reality of life in Martu settlements was that I was one player amongst many. To certain Martu, I was a person with mutual interests; to some people I was a person with resources (food, vehicle, money, books, etc); and for others I was just

[48] *mirli-mirli wanti* ~ paper paper girl; writing writing girl

another *kartiya*, so of little interest.[49] These living arrangements allowed me to maintain a close but relatively unobtrusive role in Martu domestic life that included observation of daily movements to and from the settlements.

There were days that were rewarding and productive, other days that felt dismal. The latter came particularly due to extreme heat or sickness. In October 1990, the average recorded maximum was 37°C, November was hotter. There was no air-conditioning in my camps. My field diary records some personal moments:

> 9pm Finally writing, cup of tea at Denison's delayed evening plans. Treat eyes; painful conjunctivitis in right eye. Cook dinner but rice burnt, lost inspiration; instead mixed tinned ham with B&G corn for a treat but too salty. Stomach still has giardia-type cramps. A good day except the aerial bracket weld snapped, aerial broke off, lost; should have insisted they re-weld it when I questioned its strength. No HF communication possible now will have to use Punmu HF to contact RFDS. A praying mantis is considering me for dinner, insects have fallen in my drink, they can have it. Cat guts in 60% alcohol, hope they don't rot before sent to CALM. Dead, cooked cat taste lingers in my mouth; I can't appreciate Rosie's enthusiasm for it. Anyway, the day's report is … [details of Excursion 13 including cat hunt subsequently recorded] (FW diary 90–3:68, 26/3/90) [50]

The physical environment was raw. The constant process of cross-cultural understanding had continual challenges, there was a lot that was unfamiliar to me and difficult to interpret from my past experience and knowledge.

3.4.3 Martu with whom I did research

Table 3.4 lists the Martu people who had a role in the research through foraging excursions, in interviews or doing translations. It identifies their main residence in 1990, the field period they were involved in and a classification of high–low involvement.

In September 1990, I asked the chair and attendees at a Parnngurr WDPAC meeting how to refer to Martu individuals when writing up the research. I offered options—no identification (de-identified), made up names (pseudonyms), numbers, 'whitefella names', or 'bush names'. After discussion, their consensus was that I should use their 'whitefella names' as they had been given for the purpose of administration, whereas, 'bush names' were special and rarely used in the non-Aboriginal domain. Additionally, individuals wanted their skin name used. The notion of made up names, numbers or no reference perplexed those present at the meeting. They made it very clear they did not want to be anonymous even though this was contrary to some institutional ethics standards.

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[49] *kartiya* ~ white person; non-Aboriginal person

[50] HF = High Frequency radio (main communication form from settlements to wider world); RFDS = Royal Flying Doctor Service with whom I had a daily roll call as a safety measure); CALM = Department of Conservation and Land Management

Table 3.4 Martu people who took part in 1990 research

1st name	Surname	Skin classification	Age class[a] Senior Middle-aged Younger	Main residence in 1990	Involvement in Mar–Apr & Aug–Nov field work	Degree of involvement
			Women			
Mayipi	Robinson	Milangka	M	Parnngurr	Mar–Apr	high
Rita	Simpson	Milangka	M	Parnngurr	Mar–Apr	high
Rosie	Williams	Milangka	M	Punmu	Mar–Apr	high
Patricia	Peterson	Purungu	M	Kunawarritji	Apr	high
Nyapi	Robinson	Karimarra	M	Parnngurr	Apr	high
Daphne	Biljabu	Panaka	M	Parnngurr	Mar–Apr	high
Nancy	Chapman	Karimarra	M	Parnngurr	Mar–Apr	high
Nancy	Taylor	Panaka	M	Parnngurr	Apr	high
Jakayu	Biljabu	Purungu	S	Parnngurr	Apr	high
Ida	Taylor	Panaka	M	Parnngurr	Mar–Apr	mod.
Tijin			S	Parnngurr	Mar	mod.
Rosie	Nayju	Purungu	S	Kunawarritji	Mar–Apr	mod.
Beatrice	Simpson	Karimarra	Y	Punmu	Mar–Apr	mod.
Mary	?		M	Punmu	Mar	mod.
Caroline	Bidu	Karimarra	M	Punmu	Mar	mod.
Nora	Ngangapa	Karimarra	S	Kunawarritji	Mar–Apr	mod.
Marjorey	Yates	Karimarra	Y	Kunawarritji	Apr	mod.
Ngamuru	Bidu	Karimarra	M	Parnngurr	Apr	mod.
Topsy	Robinson	Milangka	S	Parnngurr	Apr	mod.
Pukayi	Whyoulter	Purungu	M	Parnngurr	Apr	mod.
Wirnta	Williams	Karimarra	S	Parnngurr	Apr	mod.
May	Brooks	Karimarra	M	Kunawarritji	Apr	mod.
Peggy	Gibbs	Karimarra	M	Jigalong	Apr	mod.
Sadie	Singer?		M	Punmu	Mar	low
Dulcie	Gibbs	Milangka	M	Punmu	Mar	low
Linda	Edwards	Milangka	Y	Parnngurr	Mar–Apr	low
Junju	Judson	Karimarra	S	Parnngurr	Mar–Apr	low
Parnju			S	Parnngurr	Mar	low
Georgina	Jackson		Y	Parnngurr	Mar	low
Manapi	Sammy	Purungu	M	Parnngurr	Apr	low
Nancy	Patterson	Purungu	M	Parnngurr	Apr	low
Daisy	Tinker	Purungu	M	Parnngurr	Apr	low
Rena	Rogers	Milangka	M	Parnngurr	Apr	low
Mary	Thomas	Panaka	M	Parnngurr	Apr	low

1st name	Surname	Skin classification	Age class[a] Senior Middle-aged Younger	Main residence in 1990	Involvement in Mar–Apr & Aug–Nov field work	Degree of involvement
			Men			
Jeffery	James	Panaka	M	Kunawarritji	Apr	mod.
Jimmy	Williams	Milangka	M	Parnngurr	Mar–Apr	mod.
Mitchell	Biljabu	Panaka	M	Punmu	Apr	mod.
Yanjimi	Rowlands	Purungu	M	Parnngurr	Mar–Apr	mod.
Mack	Gardener	Milangka	S	Parnngurr	Apr	low
Smithy	Robinson	Karimarra	M	Parnngurr	Mar	low
Mippy	Richards		Y	Punmu	Mar	low
Benjamin	Itiwanu	Purungu	M	Parnngurr	Apr	low
Minyawu	Miller	Panaka	M	Parnngurr	Apr	low
Pilu	Taylor	Karimarra	M	Parnngurr	Apr	low
Waka	Taylor	Karimarra	M	Parnngurr	Apr	low
Desmond	Taylor	Purungu	Y	Parnngurr	Apr	low

[a] Classes were senior >50 years; middle-aged 30–50 years; younger <30 years. Classifications were based on stated age or age estimated by the researcher.

Table 3.4 identifies the 34 women and 12 men who were involved in the field work in 1990. At Parnngurr, the number of people involved represented about one third of the adult population of the settlement (see Tab. 2.11). In addition to the above people, I had brief interactions with other Martu but related to other aspects of domestic and settlement life rather than foraging. The degree of involvement identifies a core group of nine women with whom I regularly engaged with in relation to the research, a wider group of 15 women and 3 men who were involved periodically and then 11 women and eight men with whom I had intermittent involvement.

The bulk of the research was done amongst Martu women. The information presented in this dissertation is largely based on experiences with and interpretations of the perspective of Martu women, in particular middle-aged women, on foraging trips I accompanied. Data from trips I did not accompany provided information on the foraging practices of men and the hunting of large game animals.

3.4.4 Non-Aboriginal people who contributed to the field research

At Parnngurr, Punmu and Kunawarritji there were few non-Aboriginal resident staff. At Parnngurr in 1990, the only non-Aboriginal person there was the school principal. At Punmu, non-Aboriginal staff included a coordinator, storekeeper, bookkeeper and mechanic. At Kunawarritji, there was occasionally a mechanic. On some days, I was the only non-Aboriginal person at a settlement and no one else spoke English as a first language. Discussions with non-Aboriginal staff about my field observations and life in Martu settlements aided my interpretations of Martu culture and their observations expanded the information relevant to this dissertation.

Table 3.5 Non-Aboriginal people who contributed to field observations and interpretations of foraging and related practices in 1990

Name	Role	Main residence
Jim Marsh	SIL linguist	Jigalong
Sue Hanson	School teacher and principal	Parnngurr
Louie Warren	Coordinator and archaeologist	Punmu
Brian Kelly	Windmill and settlement mechanic	Kunawarritji, Punmu

Four non-Aboriginal people who resided in Martu settlements (Tab. 3.5) provided important observations that contributed to this dissertation. These people had a long history of contact with Martu and/or shared mutual interests in the research subjects; the text identifies personal communications with them.

3.5 Language, interpretation and translation

Western Desert dialects or ‘Martu *wangka*’ (Martu lanugage) were the first language for all Martu participants (Ch. 2.2.1). In 1990, no dictionary or grammar of Martu dialects had been published; the first Martu *wangka* – English dictionary was published later (Marsh 1992). Marsh provided wordlists of major lexical domains but there were few records for wildlife and landscapes.

From fieldwork in 1981–1988, I had recorded, corroborated and learnt a vocabulary of 300–400 words. Records were compiled with the assistance of Martu speakers, English–Western Desert dialect speakers and/or linguists (Marsh, Kalotas and Thieberger) and informed by Sutton and Walsh (1979). The orthography was that used in Marsh (1992:10, App. 2). A researcher’s lexicon was compiled in relation to several major domains (Tab. 3.6).[51] I knew words from other lexical domains such as body parts, kin relations and household items. I could ask simple questions such as “What is the name of that?” “Where is it?” in Martu *wangka*. I could listen and follow a conversation in daily Martu *wangka* where there was reference to words familiar to me; however, I did not develop a working grammar thus could not hold a conversation in a local dialect.

Martu were accepting or appreciative of attempts to speak their dialects. As my competency grew, especially for ethnobotanical terms, individuals would test and correct me as we walked on country. None-the-less, I understood limited Martu *wangka*, whereas, English was a second or subsequent language for all Martu. They spoke with a wide range of fluency in Aboriginal English; generally, younger people spoke it more than older people did. Aboriginal English was the main language with which I had to work.

[51] Throughout this dissertation, Martu names for species are incorporated into the body text. This acknowledges Martu language and reminds the reader of the constant challenge of research in a cross-language environment. Linnaean and common English names and meanings are in the footnotes.

Table 3.6 Major linguistic domains for which words and definitions were recorded

Linguistic domain	Approx. nos of words [a]
plant species names	360
plant parts	55
animal species names	100
animal parts	40
topographic features (soil, landform, land elements, water sources)	90
seasons	65
food preparation	55
tools, implements	55
fire and burning	10
place names; sites	

[a] These are indicative numbers including synonyms, different dialects with records from different Martu individuals combined.

This research interpreted information from two sources—the observation of practice and the documentation of knowledge that underpinned practice. Aboriginal English was spoken when I was mainly fulfilling a participant-observer-recorder role. This was adequate for recording observations of practice and/or information from accompanied and unaccompanied foraging trips. Howeverm greater Martu language skill was required for knowledge documentation. The concepts and perceptions of Martu people were embedded in their language. In 1990, there was one formally trained Martu interpreter (Joshua Booth) and SIL linguist, Jim Marsh, but both lived in Jigalong and rarely visited the outstations. Competent bilingual speakers were contracted to translate and interpret audio-recordings (particularly Patricia Peterson, Peggy Gibbs, Dawn Oates, Mitchell Biljapu and Desmond Taylor); rarely were these people available to do live interpreting. These individuals also had a strong interest in, and knowledge of, traditionally derived cultural practice thus were important informants.

3.6 Photographs

In this study, photographs were important for documentation and reporting back to Martu. Initially, I asked Martu individuals whom I did not know if I could take their photo. Occasionally these people declined or indicated the time or place was inappropriate; this was respected. Generally, people were ambivalent. Occasionally some people would show off for the photographer especially children. Additional permission was sought if photos were to be published, for example, the picture of Wirnta Karimarra digging for *Kunyjamarra* on the 1988 cover of Australian Aboriginal Studies.[52]

[52] *Kanyjamarra~ Vigna lanceolata*, Pencil yam

3.7 Ethnographic interview, participant observation and recording—qualitative data

For this dissertation, the research methods were characterised by time spent with Martu ‘on country’ away from settlements. This time was devoted to travelling, hunting, gathering and doing activities on trips away from the settlements. Whilst settlements were a base where Martu and I camped most nights, the research was grounded in the wider geographic context of Martu lands. This contrasts to the majority of anthropological research in Aboriginal Australia of the late 20th century which has been increasingly settlement-focussed.

Participant observation was a major field method. This entailed observation of Martu subsistence and related practices ‘on country’ and, to a lesser extent, daily life in the settlements. Within this role were contradictory forces; to ‘participate’ meant I was active in doing a task, to ‘observe’ meant I had to step back from a task and learn and record in a more passive way. Often my role oscillated between these two states. For example, I would follow a woman who tracked goanna, and, like her, I would opportunistically gather a fruit species encountered then if a goanna were found I tried to dig its burrow but would often relinquish this role to the expert hunter and step back to observe, take notes and/or photos. So it was really a participant-observer-recorder role with less weight on the former and more on the latter.

In the course of accompanying foraging excursions, I regularly asked questions of those I accompanied—Where are we going? What is the name of this place? What are we looking for? What is that object? After unaccompanied trips, similar questions were asked of travellers on their return to the settlement. These simple, direct questions were usually answered by a few words in Martu *wangka* and sometimes a longer explanation in Aboriginal English; these responses were recorded along with numerous observations. The same questions were asked of different people, in different places or contexts to provide corroboration or identify discrepancies. In the case of plant identification, for example, discrepancies could have reflected multiple names for a single species which was common with many species synonyms or it could have reflected someone offering their best identification rather than responding “I don’t know”. Ethnographic information was more precise, richer and clearer when we were on country or had the object in hand or observing the actual practice. I learnt to be opportunistic in my recording and collecting and not to delay or presume I would encounter another situation again or recreate it. Abstraction, hypothetical situations or future scenario setting were very difficult for me as an English-speaker to convey and local people to respond too.

There were conceptual subjects that I wanted to understand. I would ask – How do you describe different seasons of the year? How do you burn country? Why are such and such done in this way? How do you manage or care for or look after this resource? Often these questions had to be re-worded. Sometimes I just had to wait until a situation arose to observe or listen to a response that seemed oblique before I realised the messages in it.

Observations and statements were recorded in an A5 field diary immediately or as soon as possible. At night, these records were expanded upon, interpreted and collated in an A4 diary. Martu were sometimes reluctant to be tape-recorded in conversation, discussion or interview. On several occasions, when tape recordings were agreed to, these were done in a dialect and later transcribed and translated by an interpreter. The life stories recorded in Yirapartu et al. (1992) are one product from this process. Additionally, there were five audio-recordings of Martu recounting a recent foraging trip they had done (e.g. App. 8).

Most Martu women preferred to meet and discuss subjects when they were in a group, or at least with another Martu woman. Group discussions often involved interjection and discussion amongst group members in a Martu dialect/s before I was given an Aboriginal English summary. I understood this to be as an important process of local control and corroboration. Occasionally, I was given a ‘public’ summary and more ‘private’ detailed information withheld until later. At other times, individuals disagreed with one speaker but remained silent. Group discussions also meant that younger people could learn from senior people. A few individuals were more confident in their authority and knowledge and so, comfortable in one-to-one situations with me as a researcher.

There are many pitfalls and difficulties to semi-structured interview and questioning. Issues associated with leading questions, anticipating answers, missing the point and, following a different line of enquiry are common. These are true when a researcher speaks the same language as the person or people they are interviewing (e.g. Pretty et al. 1995). These challenges are greatly magnified when working across languages. They have been raised by researchers and commentators such as in relation to cross-cultural processes in central Australia (Ellis 2002; Folds 2001; Liberman 1985). Despite more than twenty years of applied research and practice, I still find cross-cultural communication between Aboriginal people in remote settlements and myself challenging and complex.

Anthropologist, Robert Tonkinson, once identified his ‘vacuum cleaner’ approach to ethnography (pers. comm. 1990). He meant that in the field many observations and conversations were recorded and mixed up together. This metaphor seemed appropriate to my raw field records. When in the field, this often concerned me, hence I spent evenings summarising and ‘tidying up’. I know now that field notes which jump from one subject to another reflected the realities of daily life in an Aboriginal settlement and an early-career researcher with limited understanding of cultural patterns. There is a lot going on, a lot to observe and a lot said (and unsaid) by local people. Fortunately, I was systematic in organizing and cross-referencing the data during and after fieldwork. Now, when writing up, it is still possible to track back to raw data relatively easily.

On return from the field, there was a substantial amount of data and material to sort, analyse and synthesise. The qualitative data were managed by setting up a keyword list based on major research themes. Then an index to each field note book was compiled based on this list. Next, each theme was cross-referenced to the relevant field note books. Much of this data management was done manually and with Microsoft Word and Excel software.

There were aspects of the 1990 research methods with which I was dissatisfied. Later colleagues and I started to expand on our repertoire of cross-cultural methods. These led to the participatory approaches summarised in the book 'Planning for country: cross-cultural approaches to decision-making on Aboriginal lands'.[53] The focus of the book is upon improved methods of communication. The participatory approach took me beyond researcher–teacher/informant roles to more equity in collaboration. It resulted in shifts from verbal communication to greater use of visual communication. It contributed to more interchange amongst Aboriginal groups rather than information 'extraction' by outsider researchers. These 'participatory' methods improved upon those used in 1990.

3.8 Participant observation—quantitative data sets and limitations

Participant observations also contributed to the quantitative data set. An important distinction was made between 'accompanied foraging trips' and 'unaccompanied foraging trips'. On the former, I accompanied a forager group and I did not go on the latter trips. The unaccompanied data set provided several benefits: it circumvented the influence of the UWA research vehicle upon 'normal' foraging activity, it provided data on men's foraging returns and it expanded the total data set.

Data for the accompanied data set were recorded through direct observation. Additionally, comments and information from those I accompanied were incorporated. Data for the unaccompanied data sets were recorded by noting both vehicles that came and went from the settlement and the names of passengers then later asking them relevant questions—where do you go? What did you get? Questions were drawn from the parameters listed below.

[53] It is important to distinguish between 'participant observation' and 'participatory approaches'. These similar terms have very different meanings. Participant observation is a conventional anthropological technique whereby the researcher takes part and observes (and records as noted above). In participatory approaches, it is actually the local people, not the outsider (be they researcher, consultant or other) who takes part in the recording and planning. The two terms can be confusing because the participants are opposite.

Table 3.7 Numbers and times of accompanied trips from each settlement during 1990 field research

Settlements	Field months	Period (days)	Nos trips	Total nos trips from each settlement
Parnngurr	Mar, Apr	15,1	8,1	
	Aug–Sep	18	18	
	Oct	6	4	31
Punmu	Mar	11	9	
	Sep, Nov	9,1	6,1	16
Kunawarritji	Nov	11	5	5
				52

Table 3.8 Numbers and times of unaccompanied trips in each settlement during 1990 field research

Settlements	Field months	Period (days)	Nos trips	Total nos trips from each settlement
Parnngurr	Mar	16	33	
	Mar	13	5 *	
	Aug–Sep	28	30	> 68
Punmu	Mar	13	9	
	Sep	10	9	18
Kunawarritji	Oct	13	7	7
				>93

* trips by one informant, does not count trips done by others

A set of parameters was identified for recording on trips; these were kept as a proforma in field note books. Where possible, the full set of parameters was recorded for accompanied foraging trips using observations and questions. It was not always possible to record all parameters. Additionally, records were kept from HF radio or telephone contact with one informant whilst I was not in their settlement.

Table 3.9 lists the parameter data set, associated notes and whether it was recorded on accompanied or unaccompanied trips. The data set was structured in terms of descending spatial scales from landscape scale to resource patch scale (see Figure 7.4). This spatial hierarchy paralleled a trip group – foraging group – single forage pair hierarchy related to the social groupings on a trip. Additional detail on the methods associated with each parameter is in the relevant chapter.

Table 3.9 Data parameters recorded on accompanied and unaccompanied trips with brief description and relevant dissertation chapter

	Parameter	Description of parameter [a]	Recorded for accompanied/ unaccompanied trips	Chapter where analysed
Trips from the settlement—landscape scale				
1	Foraging trip number	trip for purpose of hunting and gathering or where these activities were a major part; trips numbered chronologically	A, U	
2	Date		A, U	
3	Travel mode	vehicle type, walking, drop off, other	A, U	Ch. 4
4	Trip purpose	non-resource, major resource gathering—e.g. firewood, hunt	A, U	Ch. 4
5	Destination location	destination planned, actual or most distant place visited	A, U	Ch. 7
6	Travel departure & return time to settlement	vehicle travel time; approx. for unaccompanied trips	A, U	Ch. 6
7	Mileage out & return		A	
8	Number of people in trip group	nos adults & children in vehicle	A, U	Ch. 6
9	Names of people	some not all for unaccompanied	A, U	
10	Gender & age classes	as in Table 3.4	A	Ch. 6
11	Provisions & equipment carried on trip		A	Ch. 6
Searching for plants or animals—land unit scale				
12	Forage event number	for foraging events within trip with search and/or collection of a plant or animal species	A	
13	Embedded forage event nos			
14	Event location		A	
15	Resource species targeted		A, U	Ch. 5
16	Names of foragers		A	
17	Land form unit traversed	using Phillips (1989) classes	A	Ch. 7
18	Plant community	using vegetation site sheet adapted from ACLEP	A	
19	Post burn age class	visual estimate < 5 yr, 5-10 yr, >10yr	A	Ch. 7
20	Searching time started & finished	Group search times when group departed from vehicle until track interception	A	
21	Non foraging activities	e.g. checking rockhole	A, U	Ch. 4, Ch. 8
22	Burn events—nos, location, purpose	where non-hearth fires ignited	A, U	Ch. 8

Collecting plants or animals—resource patch scale				
23	Names of foragers		A	
24	Species collected		A, U	Ch. 5
25	Collecting time started & finished	Individual collecting times (track & capture)	A	
26	Implements used to collect		A	
27	Species individual weights collected	animals individually weighed using 1 of 3 Pesola spring units; plant weights estimates based on previously calculated averages	A	Ch. 5 App. 6
28	Species individuals nos collected	Numbers of individuals of a species collected	A, U	Ch. 5
Other				
29	Group forage time		A	
30	Processing time	preparation time	A	
31	Radial distance (km)	direct distance from settlement to dinner camp (usually next to vehicle) measured on map	A	Ch. 7
32	Route distance (km)	from settlement to dinner camp measured by odometer	A	Ch. 7
33	Individual distance (m)	From dinner camp (usually next to vehicle) along forage route, measured by pedometer or visual estimate	A	Ch. 7
34	Group distance (m)			
35	Species observed	Based on species track intercept or stated observation of forager	A	Ch. 5
36	Nos of individuals of species observed	Recorded if with forager or recounted by forager	A	Ch. 5
37	Weight per hunter-gatherer hour	Using formula (see Ch. 5)	A	Ch. 5

[a] More detailed definitions are available on request

There were five stages of quantitative data recording and processing with different outputs at each stage:

1. raw data in the A5 field notebooks
2. raw data ordered and collated in A4 field notebooks
3. primary data from A4 and A5 notebooks typed into standard format summaries for each trip (e.g. App.3)
4. secondary data parameters extracted and typed into an Excel spreadsheet (App. 4 and 5)
5. tertiary data in new spreadsheets for specific analyses

There were limitations to the analyses and interpretation of the data recorded (Tab. 3.9). Although quantitative data were recorded in the 1990, these data were generally unsuited to statistical analysis in terms of species sustainability. This was due to spatial and temporal discontinities in data sets which introduced a large number of variables, for example, the data were collated from three settlements with different environmental features (Figs 2.9, 2.10), different human population features (Tabs 2.7 - 2.9) and in two seasonal periods (Tab. 3.3). The initial research design had been planned around residence in two settlements (Parnngurr and Punmu) for continuous time periods. However, this could not occur due to the request of Martu leaders and key participants who generally wanted the researcher resident in the outstation settlement where the majority of participants were. At times, the researcher had to follow participants from one settlement to another. Furthermore, multivariate analysis was confounded by to the large number of influential variables (e.g. Tabs 10.2 - 10.3).

Analyses of the relationships between hunting efforts and species weights harvested (Tab. 1.4) were complicated by the opportunistic nature of desert hunting processes. For example, a woman hunter would set out to dig for Witchetty grubs then switch prey pursuit when a goanna track was encountered thus ‘search’ time would need to be allocated across these species. It was not possible in this study to engage Martu in simple harvest experiments to assess harvest rates and species sustainability. The rates of species hunting could be calculated for only two species, Sand goanna and Cat (Tabs 5.11 and 5.12). In future research, longitudanal comparisons are required to assess the sustainability of hunting these species.

Furthermore, the study could not relate hunting effort in time and space to the relative abundance of species studied. There was, and has been, little relevant research on the population dynamics and densities of the key resource species in the study area or its wider bioregions. This limited the study’s capacity to draw strong conclusions about the sustainability of species specific hunting.

3.9 Example of an accompanied foraging trip

Typically, accompanied foraging trips came about when one or a few Martu women came to my camp in the morning. I would ask—“What are you doing today?” In response, there might be a shrug, a suggestion, or a more assertive reply. “We should go to so and so place today” or, “that mob saw *Yalapara* tracks near Yurlpu, we should go and look for it”. I would then usually enquire “Who should we go with?” The respondent would begin to name who was going or who they would like to go with. Generally, people would want to go early unless there were domestic or other matters to attend too. We would pack up and go. Whilst the vehicle was taken on the majority of trips some accompanied trips were done on foot from the settlement. Sometimes I’d ask a person with a licence if they wanted to drive or I would drive us. As much as possible, I sought direction from those I accompanied.

The data chapters in this dissertation disassemble major components of a foraging trip into different subjects. To give the reader a total picture of one trip, Appendix 3 provides the full records from one trip. To complement it, below is one forager’s account of the same trip. On this trip, we did not take the vehicle at all because I had just arrived back at Parnngurr and the vehicle had not yet been incorporated into a regular pattern. However, all accompanied trips by women involved walking so the difference is not that great.

Rita Milangka was one of the people who went on a trip summarised by data parameters in Appendix 3. Following is a Manyjilyjarra to English translation of her account:

> One morning after we slept we got up and went walkabout. We got our crowbars. We walked along Parnngurr creek. We went north along the creek and over it. We went across to a smaller creek. We kept walking. The other lot of women were in front. They went over the hill. We went along the stony ridges. Fiona and I were digging for a *Parnajarrpa* [Sand goanna]. We were digging, digging, digging it straight. I poked around and finally struck it in the right place. Then we killed it and went away. We went north and met with the other women. We joined one of them. She started breaking *lunki* [witchetty grub] trees. We were looking for *lunki* in the ground. We were breaking the roots. We went to another place and dug more and got some *lunki* out of that one. We went to another plant and I got some more out. We came along a small gulley and kept walking. We came across another shrub and got two *lunki* from that one. We had not come across the other women. They were not where they usually collected *lunki*. We went on a bit further east and saw the others coming on burnt ground. We stopped when we saw them and walked south over the dune. We kept walking and came across our track. We stopped there and the others came too us one after another. We got together. We rested then we got up. We went back across the sandplain, over the rocks and into the little creek. We stopped and rested. We decided to make a fire. We were feeling hungry. We made a fire to have our *pirlkun* [*lunki*] for dinner. We ate them all up. We got up and went. Fiona and I got another *Parnajarrpa*. The others went to camp. They went back and had tea. We two women went back. (FW field diary 90-7:43, 14/9/90)

There are elements of this account that could be analysed. However, relevant here is that Rita's observations is as one forager who is a member, and so subset, of a total forage group. The accompanied trip data sought to record as much as possible from the wider forage group and finer data from the forager I accompanied when walking. In the primary data example (App. 3), details from one forager are recorded in the section for Group 22-1a and these are included in the wider group total. Notably, the capital headings in this example were standard for all records of foraging and other excursions; the non-capitals text is that unique to Excursion 22-0.

3.10 Biological collections

Ecological components of the study region were described in Chapter 2.1. This included a summary of land unit and vegetation description and mapping in the study region. In March 1990, five days were planned for ground-truthing Phillips' land unit maps (1989) and Figures 2.9 and 2.10. Once in the field, I realised that an aerial photography base was essential, a more systematic field survey was required and, ethnographic and participant observation were higher priorities with limited field time.[54]

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[54] My subsequent experience in intensive (1:50,000 scale) land unit mapping on Aboriginal lands (see Gambold 2002) has affirmed this was the right decision for the Martu research.

There was no colour aerial photography accessible for Martu lands in 1990. Phillips had used 1950s black and white photography. I had attempted to source recent photography through mining exploration companies but this was not publicly available. This was a constraint upon spatial mapping for vegetation, land uses and burn patterns.

In 1987 and 1988, I had devoted a majority of field time to vegetation survey (see Walsh 1987; Walsh 1990). This provided a sound basis for field identification of most perennial flora in the region (mainly trees and shrubs) and a smaller proportion of annual and ephemeral flora (mainly grasses, sedges and herbs). Martu plant resource species of uncertain identification were collected, described, pressed and stored using standard botanical techniques. Preliminary identifications were made using standard botanical texts and regional species lists (especially Jessop 1981; George & Mitchell 1983). Herbarium identifications were done on return to Perth. Vegetation classifications were described by reference to (by reference to Beard & Webb 1974; Muir 1982; Burbidge & McKenzie 1983). These sources were used to provide the land unit, vegetation and seral post-burn descriptions parameters required in the foraging trip database. A vegetation site survey proforma was kept on the inner page of field notebooks. Fauna were identified using field guides (see App. 6).

In 1990, I continued to add to species by species ethnobotanical records. Standard techniques were employed (see Kalotas 1993; Cunningham 2001). Scientific species determinations were made through field identification, initially in collaboration with Arpad Kalotas and later with identification books and keys. Plant specimens of uncertain identification were collected for herbarium and expert identification at WA Herbarium.

From 1988 to 1992, a Procite database of plants used by Martu was developed and expanded. In 1993, this database was transferred to ethnobotanist, Arpad Kalotas. He converted it to Filemaker Pro for use in the *Mankuni wilykikaja* project. In 1994, he received a directive from the WDPAC executive that the database was not to be published or circulated in any form. This was due to concerns about public release of Martu intellectual property. The database requires corroboration, refinement and taxonomic updating. In the writing of this dissertation, it was not possible to seek permission to append species names and use summarises from the database. Public access could be sought through Western Desert Lands Aboriginal Corporation.




Aspects of research methods included Martu-researcher relationships, a community base, audio-recording and semi-structured questioning.

Photo 3.2 (top left) Patricia Peterson (left), unknown woman and Billy Gibbs (right) at Parliament House, Canberra whilst on a public and political tour in 1988 (see Tab. 3.1). Lucy Gibbs and Brian Samson in background.The tour was for Martu to express their views on their lands and its 'development'. I was invited to accompany the group on this interstate trip. It became an important step in the development of relations between Martu individuals and I which contributed to this research.

Photo 3.3 (top right) Camp in the bower shed at Yilyara where I was based during the 1990 study at Punmu

Photo 3.4 (bottom left) Mayipi Robinson listens to an audio recording made after a foraging trip. As much as possible, records were checked and cross-checked with Martu individuals.

Photo 3.5 (bottom right) One to one talk with Smithy Robinson about plant species collected that day

Participant observation whilst following groups when they went on foraging trips was a key research method.

Photo 3.6 (top left) Nyapi Robinson and Topsy Milangka return from a short foraging walk at Kurta Kurta. During the 1990 study, this was one of 52 trips when Martu groups were followed and detailed records kept.

Photo 3.7 (top right) Waka Taylor, Muuki Taylor, Minyawu Miller and linguist Nic Thieberger set off on walking trip searching for game near Punamalara.

Photo 3.8 (bottom left) A cat that had been hunted by Martu women is weighed by Gill Craig who provided field support. Most foraging returns were weighed before they were gutted, prepared and eaten.

Photo 3.9 (bottom right) Fiona Walsh photographs *Lunkunpa lunki* (cossid moth larvae from *Acacia dictyophleba*). All plants and animals identified to have resource values were photographed. Where possible, photos of habitat, habit, plant parts used and preparation steps were taken.

Photo 4.1 Martu men travelling southwards from Punmu and Parnngurr in along the levee of Karlamilyi river with 0.22 rifles ready to hunt *en route*, September 1990.

4 MARTU LAND USES, TRANSPORT AND TRAVEL

4.1 Introduction

This chapter investigates the land uses undertaken on Martu custodial lands and within Rudall River National Park in 1990. It identifies the variety of land uses to give a context to hunting and gathering as the land uses of major interest in this study. Transport means and mobility are quantified and described for intra- and inter-settlement travels. These are analysed because they were seen to have a particular influence upon foraging, the spatial collection of resources and the application of land-management type activities.

The main questions asked in this chapter are:

a) What were the major land use activities of Martu in the study period?

b) Was hunting and gathering a significant local land use?

c) What transport means were used for trips? Did these affect the frequency and conduct of land uses and foraging in particular?

d) What travels were undertaken for foraging and other purposes?

In the 1980–90s, Aboriginal lands were sometimes characterised as being dominated by a single land use, for example, vast areas classed as ‘Aboriginal land use’ (e.g. Holmes 1994:169). Cane and Stanley (1985) contrasted ‘traditional land use’ (singular) with ‘European land uses’ in their review of central Australian Aboriginal homelands, within the latter category, identifying pastoralism, art and craft production and horticulture. For Aboriginal-held land, the diversity of modern uses of such as tourism, park management, conservation and wildlife management had been recognised (Young & Ross 1994; Williams & Johnston 1994). However, even these articles tended to collapse ‘subsistence activity’ or ‘hunting and gathering’ into a single category. This representation of Aboriginal lands as being of a single land use persisted in the early 2000s, for example, maps identified extensive areas as ‘Aboriginal land use’ (WADA 2001). In a biodiversity review, Kendrick (2001b) categorised dominant land uses in the Rudall subregion as:

> Conservation, Unallocated Crown land, Mining leases and Urban (Parnngurr Aboriginal Community) (Kendrick 2001b:406).

The latter 'use' suggests to readers both that there were typical urban settlements and there were no other substantive land uses practiced by local Aboriginal people. There was a risk that descriptions of Aboriginal land, subsistence or economies as singular implied they were 'simple' land use systems. The findings of this dissertation challenge such descriptions and interpretations.

Transport means and travel strategies are also researched in this chapter. These have been identified as variables that may have had strong effect on Martu land uses, foraging and sustainability. White and Meehan (1993) raised concerns about the environmental effects of off-road vehicle use by Yolngu to hunt. They asserted that vehicles increased foraging range and species returns, damaged fragile habitats, and archaeological sites but they did not extend these changes to changes in land use patterns. The purported increased hunting efficiency provided by vehicles and other 'modern' technology was referred to in Caughley et al. (1996). Alternative opinions were that the social and cultural rights and advantages of vehicle use were significant and overrode the environmental effects of vehicle use (Davies et al. 1999).

In central Australia homelands in the mid-80s, privately owned vehicles were scarce (Cane & Stanley 1985). They identified Toyotas as a keenly sought after commodity of outstation residents and went on to suggest positive and negative social and economic features of vehicle ownership. One interpretation was that:

> Toyotas … help improve the nutritional status of people by extending their hunting and gathering range (Cane & Stanley 1985:175).

They proposed the need for a minimum of one Aboriginal Benefits Trust Account (ABTA) funded vehicle per outstation camp. Altman (1987) also noted that there were few vehicles in his research area and those present had often broken down. He stated:

> During fieldwork at Momega vehicles did not play a significant role in the subsistence economy (Altman 1987:26)

In his monograph, there was little reference to the use of vehicles for hunting and gathering. Vehicles inched into Devitt's (1988) study. She noted the role of vehicles in terms of contemporary technology used for subsistence and concluded that:

> Women's foraging techniques have been little affected by technological change … however, the total reliance on vehicles has introduced an element of dependence of women and men on them (Devitt 1988:222)

This seems contradictory; however, her focus on foraging methods on foot rather than by vehicle transport explains this difference. In the early 1990s (and to 2007), there had been little research into the role of vehicles influencing Aboriginal land uses and particularly subsistence uses.

However, research into Aboriginal population mobility has expanded, particularly because population mobility has strong implications for service delivery by government and non-government organisations. Vehicles have been identified as critical to this population mobility (Young & Doohan 1989; Warchivker et al. 2000). However, no automobility studies were found to explicitly consider the affects of transport and travel on foraging patterns and associated land management.

This is the first main data chapter in this dissertation. It presents data on land use activities undertaken by Martu. The chapter begins to identify key aspects of Martu land use that may have influence upon hunting, gathering, land management patterns within and beyond Rudall River National Park. The chapter is structured to first provide a general introduction to aspects of life in one Martu settlement and the roles of foraging, travel and vehicles within one day in 1990. Then it classifies land use activities near Martu settlements particularly Parnngurr. Next, the role of hunting in the context of other land uses is considered. Some detail is then given on Martu travels between settlements because this appeared to be an important influence upon land use. The role of vehicles and different transport strategies for foraging were analysed. Then there is a brief summary of other tools used in contemporary Martu hunting and gathering.

4.2 A day at Parnngurr

Martu settlements were a base from which Martu travelled and utilised the surrounding lands (Fig. 1.2). During the study, the movement of people in vehicles and on foot were observed and documented by this researcher.

The following extract from my field diary on Sunday, 5 March 1990 records some of the comings, goings and land use activities around one day. It has been selected as a day at Parnngurr when several families were resident in the settlement. I had just arrived for the first period of field work in 1990 so my influence was relatively small.

> Arrived at Parngurr, large number of Martu here after the funerals. Several families have left Punmu to stay at Parnngurr. Jimmy Williams [chairman of Parrngurr] is due back from Punmu today. Teddy Biljapu [chairman of WDPAC] is due from Jigalong, he and family setting up camp here. Mayipi [a key contact person] and family are in sorry camp.
>
> When I arrived, Mayipi, Noreena and others were playing cards. Noreena [Jimmy's wife] pointed out the school teacher's camp – a caravan and bowershed. The teacher has a young daughter. Noreena affirmed I camp at clinic, as they'd offered in our radio talk.
>
> Later Mayipi came over, she spoke about the funerals and the sorry business process at Punmu, she said it'd be a long time before people went back to Punmu, maybe a year or so. Rita and Ida are presently out collecting bush food. Three plumes of smoke to the SSW mark their route. A Warnman family from Punmu has settled here. Waka, Muuki and another man walked north this morning to go hunting. They returned early, had got no meat; they carried 3 boomerangs and a .22 rifle with them; [the following day they went again to follow a *Yalapara* track they'd observed]. Maypi left as she had to cook dinner and look after an adopted child, Gloria.
>
> Yanjimi Rowlands and several children visited me. He talked about the miners and their roads. Two new roads have been made – one west of Parnngurr from the Talawana track north to Karlkan Karlkan, another east of Parnngurr from Talawana north to Warntili. He wants to check on these roads. They've looked at one of them. Three of his six children are

> here at Parnngurr. Two of them said that lately they'd been eating *Kirti-kirti*, *Kipara*, *Pujikatu* and *Kamalpa*. They'd been on trips to Yurlpu and other places. 55
>
> Later, the Warnman men were seen sitting in the men's camp with a shade shelter by the mulga creekline; they are making spears from *Kurlarta*. Gavin later told me they were for Martu use not for sale.
>
> When Rita returned she said there had been plenty of *Kipara* around. They had got some when they went to Yurlpu a few days ago. Martu had been there on several occasions and the soak had been dug out. They had also been doing trips to Karlamilyi once a week or so.
>
> Sue Hanson [non-Martu school principal] said at Parnngurr that they had a few days when the only water available was that in the canned fruit. The water supply is low due to a wind drought [so windmill doesn't pump] and the solar panels have 'packed up'. People are carrying water drums to their camps as the taps are not flowing. The men have been carting water into Parnngurr. Today, the truck went to get some from a bore north along the creek. Temperature has been in high 30°Cs.
>
> Sue noted that everybody had been out hunting 2–3 times a week in the months she'd been here. They were looking for bush meat in recent weeks. There was little *mayi* except the *Lunkunpa* gum that was ready now and a favourite 'lolly' of the kids. Jimmy Williams has gone to Punmu to collect stores, his trip should take two days. With large number of Punmu people, the Parnngurr stores have finished, there are only onions left. Mayipi said she had a bit of rice in her camp. There's not much food. We counted the families, in total there are 30 Martu adults (>20 year olds) and 36 children here at present. There are only three vehicles based at Parnngurr (the army truck), a new school vehicle (1988 Personnel carrier) and the yellow Toyota utility used by Jimmy Williams. In addition, Teddy Biljabu drives the Jigalong 'women's motorcar' that is here when he visits and stays. (FW field notes 90–3, 5/3/90)

Settlement life was busy. Domestic chores involved childcare, cooking and maintaining a camp or home and its environs. There were periods when vehicles came and went. This involved a flurry of activity as people packed or unpacked and exchanged information and goods. There were days when building and other construction works occupied people. There were often quieter periods in the settlement when people rested, played cards, made artifacts and maintained equipment. Activities within the settlement were not the focus of this study. Description of settlement-focused activities similar to those that observed in Martu settlements have been reported (Altman 1987:76; Devitt 1988:224).

4.3 Classes of Martu land use

> We have come back to our country to live, so that we can kill and eat meat, our bush meat, so that the old people can gather grass seed, so that we can go around on camping trips (Jimmy Milangka, August 1991, recorded, translated and transcribed by Ken Hansen).

Martu had re-occupied their lands less than ten years before this study (Ch. 2). As indicated by the above quote, the interests of middle-aged and senior Martu were to re-establish their connection to and use of their land, a re-engagement with it.

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[55] *Yalapara ~ Varanus giganteus,* Perentie; *Kirti-kirti ~ Macropus robustus,* Euro; *Kipara ~ Ardeotis australis,* Bustard; *Pujikatu ~ Felis catus,* Pussy cat; *Kamalpa ~ Camelus dromedarius,* Camel; *Kurlarta ~ Acacia jensenii, mayi* ~ plant food; *Lunkunpa pira ~ Acacia dictyophleba* gum

The land use activities that Jimmy and other Martu said they wanted to do or did are classified here as ‘traditionally-derived’ ones. In addition, people needed to undertake the activities required to establish and maintain utilities and services in a remote settlement. In 1990, the CDEP was municipal in its focus and other paid employment was limited (Ch. 2.2.12). The activities undertaken by Martu in 1990 are broadly grouped into four classes—domestic and settlement-focused activity; institutional, administrative and socio-political activities meetings; traditionally-derived land use activities and modern land use activities. The latter two categories are the focus of this chapter because these took people out of the settlement onto their land. However, as will emerge through this dissertation, Martu engagement with the first two classes influenced the time, personnel and vehicles available to engage with the latter two classes of activity.

Trips from settlements onto surrounding lands were initiated in a variety of ways. Sometimes, individuals would suggest the resources they wanted to collect. For example, Rita Milangka asserted:

> I’ve got to get some fresh *kuka*, some *Pujikatu*. We’ll go *ngaparti*, no one has been that way *kuwarri*. (FW diary 90/6, 3/11/90) [56]

A short discussion between five women then followed and it was settled that a trip would go that way for the stated purpose. Sometimes a question was raised, simply *kukakarti?* that suggested someone wanted to hunt but had not stated their specific objective. Martu distinguished between *purikarta* and *ngurrakarta*. Hunting and gathering trips were termed *yarrkalpa* that differed from the verb *wartilpa*. There were times when someone wanted to get a specific resource, these trips to collect a species or resource group were also described by the noun and a directional suffix named e.g. *warukarta*. [57] There were occasions when a geographic destination was the stated objective, for instance, when Parnngurr men made repeated trips to the Yurlpu area. Sometimes, one would have to infer what was sought or being done from contextual knowledge. For instance, it was whispered that certain trips involved *ngurlu* (secret, sacred, prohibited) activity and thus one should not enquire further. It was common for non-Aboriginal employees or visitors to initiate trips too, for example, the school excursions.

Table 4.1 lists the major land use categories that were identified during this research. The categories were identified through observation of activities and explanations by Martu of their activities. The classes below identify land uses with material and productive components. The land use array would be wider if social aspects of land use were incorporated e.g. the use of country to enhance group interaction and engagement

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[56] *kuka* ~ animal food, meat; *Pujikatu* ~ *Felis catus*, Pussy cat; *ngaparti* ~ south, southwards; *kuwari* ~ now, recently

[57] *kukakarti* ~ meat, animal toward; *purikarta* ~ going out for a day trip; *ngurrakarta* ~ camp elsewhere toward, camping out, yarrkalpa ~ a hunting and gathering trip; *wartilpa* ~ to hunt; *warukarta* ~ firewood, toward.

(Ch. 6). Intrinsic, amenity or non-monetary values such as the spiritual and psychological use of lands have not been included in Table 4.1 (see Ch. 8).

The study classified eight land uses in which Martu were productive or active and six processes that enabled or monitoring the major lands uses. Some of these classes are explained in the next paragraphs, those cross-referenced are detailed in later chapters.

The re-occupation of their custodial lands was the major land use by Martu. They had established permanent settlements at Parnngurr, Punmu and Kunawarritji. About the time of the study, 70–170 adults (Ch. 2.3.2) occupied each of these settlements. Parnngurr and Punmu were in Rudall River National Park.

Table 4.1 Major land use categories and processes to enable land uses distinguished during the study in 1990

Major land uses	Processes to enable land uses
Re-occupation and settlement of their lands	Travel along major routes between settlements and in proximity to settlements
Hunting and gathering for food (Ch. 5–8)	Monitoring of food and non-food resources (Ch. 8)
Collection of non-food resources (including firewood, water, building materials, medicines, artefacts) (Ch. 5)	Search and exploration to relocate cultural and historical sites (Ch. 8)
Visits to, maintenance and ceremony at *Jukurrpa* and significant sites (Ch. 8)	Monitoring of infrastructure developments (new roads and mineral exploration activity)
Maintenance of soaks, springs and rock holes (Ch. 8)	Monitoring of activities of visitors and tourists
Burning for a variety of purposes (Ch. 7 and 8)	Guiding and information to researchers and visitors
Camping excursions for recreation	
School and educational excursions	

School excursions involved the teacher(s), schoolchildren and some of their carers. At Parnngurr in 1990, each Thursday was timetabled for an excursion, impromptu ones also occurred. Punmu school did not have a regular excursion but they were occasionally organised by the Martu principal, Mitchell Biljapu. On school trips, vehicles drove to a specified destination less than 50 km from the settlement. Other vehicles from the settlement often accompanied these trips. The destination was usually a river, creek or rockhole, with or without water, but with shade and comfortable sand. Trips were half to a full day in duration. A dinner camp near the vehicles was the central point at which some adults stayed, from which children roved and from where foragers (if active) set off. The children rarely walked more than a kilometre radius from the dinner camp. The collection of bush resources was a secondary purpose of these trips but the returns in terms of species richness and numbers of individuals within a species collected were moderate. Rarely were large species weights collected. Some of these features are reported for a trip I accompanied:

> On a Monday, Sue Hanson (school principal) initiated trip to take school children to swim and wash in river. Noreena went because she wanted to meet store truck and husband on

return from Punmu. Left Parnngurr at 2.30 pm and drove via Kurta Kurta claypans to Kunti Kunti waterhole on Karlamilyi (Rudall River). Five *Kipara* sighted near Kurta Kurta, one shot by Yanjimi and retrieved by daughter, one injured but escaped. Continued to Kunti Kunti. *Kipara* cooked in hearth by Rowlands family, distributed to immediate family, three senior men, ribcage to Noreena. Most kids swimming in water. two young women (early 20s) search for *Yurungkura lunki*; I didn't see them get any. Five girls (10–20 y.o.) and older women dig for *Minyarra* in rich patch under *Ngutuma* shade. Boys played with toy spears made from *Jamal*. 5.30 pm people packed & left. three vehicles took different return routes. We arrived Parnngurr 7 pm. Total trip distance 94 km. Others returned about 8 pm and 9 pm respectively. Max. temperature today 38°C. (FW diary 90–3, 6/3/90)[58]

School trips were educational in terms of Aboriginal learning processes reliant on direct, practical experience and observation. They were not information-focused in that specific on-site instruction rarely occurred. However, elements of school excursions were later incorporated into classroom lessons (Sue Hanson pers. comm. 6/3/90).

Table 4.2 shows specific trips were undertaken to collect firewood, timber for building materials and water. Trips were also made to gather other bush products including medicinal plants. The camp hearth fires were essential for cooking, warmth and other purposes were reliant on firewood. There was no alternative gas or electrical sources. In each settlement, young men were supposed to be responsible for bulk firewood collection. It was an identified CDEP task.

Martu camped out when they wanted to visit locations a long way (> 50 km) from the settlements or if work over several days was required at a distant location. Examples in the 1990 study included when a senior and ailing man, Billy Gibbs, visited Wikirr (Midway well) with his family; when Bijuka and his family camped at Kurta Kurta to set up shelters for an outstation there; and, once when a vehicle had broken down and its occupants waited to be found. On the latter occasion, they had broken down near a good *Wamurla* (Bush tomato) patch thus it was intensively harvested. There were no records of camping trips done to intensively forage for a particular species. In and around 1990, there were also occasional camping trips organised and supported by non-Martu researchers. Research vehicles allowed for a larger, more reliable convoy to access places distant from Martu settlements.

In terms of travel along major routes, Martu drove between the outstations of Parnngurr, Punmu, Kunawarritji, Billanooka and the large settlement of Jigalong. Occasionally, they travelled to other settlements and towns in the Pilbara. Reasons for travel recorded in 1990 were to: attend funerals, pick up stores, establish alternative residences (especially if sorry business or conflicts), attend meetings, transport other people, take part in events such as sports carnivals and the school opening, ceremonial gatherings (Law business), to go to hospital, to purchase stores or goods from a larger settlement or town, or to pick up children or relatives. There were many demands. The collection of bush resources was not a principle reason for inter-settlement travel.

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[58] *Kipara ~ Ardeotis australis,* Australian bustard; *Yurungkura lunki ~ Eucalyptus camaldulensis* River red gum moth larvae; *Minyarra ~ Cyperus bulbosus,* Bush onion; *Ngutuma ~ Eucayptus papuana,* Ghost gum; *Jamal ~ Acacia eriopoda*

Martu men went on excursions specifically to monitor infrastructure development on their lands and to observe the activities of non-Aboriginal land users. In the diary extract that opened this chapter, Yanjimi Rowlands shared his observations on new mineral exploration roads. In 1991, Ditch Williams said:

> We are unsuccessfully hunting off the whiteman miners, they are still coming into our country (in Hansen 1991)

The 'hunting' he described was akin to 'checking on' mineral exploration activity and personnel. Monitoring excursions for these purposes often involved long travels, moderate sized groups of men and were a day or less in duration. Martu men sometimes spoke of going on a 'look around' trip.

4.4 Martu land uses near Parnngurr

Jimmy William's quote (recorded above) suggested that the persistence of living on, camping, hunting and gathering were important activities. How frequent were these and other activities in day to day Martu life during the study? What influenced and shaped them?

Table 4.2 was compiled from records of unaccompanied trips undertaken by Martu from Parnngurr during the study.[59]

The results in Table 4.2 indicate three main points. Firstly, it shows that Martu used their land in a variety of ways. They drove on lands surrounding Parnngurr for at least eight purposes within two periods that totalled 44 days. Secondly, it shows that a moderate proportion of Martu excursions in vehicles were for the purpose of hunting and gathering, almost 40% of excursions were to collect bush foods. Thirdly, it shows that vehicle trips from the settlement occurred at every two days and more often. That is, one vehicle trip per 0.6–1.6 days was recorded over the observation periods. This did not include inter-settlement travels. These records underestimated the frequency of Martu trips because many occurred when Martu, especially women, were on accompanied trips with me. It is likely that they would have motivated additional trips if they were not out in the research vehicle.

Martu actively used their lands in a diversity of ways. Fourteen land use or land use processes were identified in Table 4.1; about half were recorded during six observation weeks at Parnngurr (Tab. 4.2). Some of these uses involved the direct extraction or manipulation of biological resources. Other uses were less direct and productive in terms of materials collected. They involved the accumulation of knowledge that may have subsequently contributed to the management of resources. These activities included searching for and monitoring cultural resources (biological and physical) and, by contrast, the monitoring of land users who may affect those resources (also Ch. 8).

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[59] Unaccompanied trips were those I did not participate in but were reported by Martu to me. Accompanied trips were those where my research role was a participant observer (Ch. 3). Unaccompanied trip data are important in overcoming possible biases in Martu activities due to my research interests, as well as increasing the size of the data sets.

Table 4.2 Primary purpose of unaccompanied trips in vehicles in proximity to Parnngurr during 1990 study [a,b]

Dates at Parnngurr	6–21 Mar	12 Aug–8 Sep	Total
Nos days observed	16	28	44
Hunting and gathering for food	8 (31%)	9 (50%)	17 (39%)
School trips	6 (23%)	2 (12%)	8 (18%)
Collecting firewood	2 (8%)	5 (28%)	7 (16%)
Monitoring of mineral exploration and new roads	2 (8%)	0 (0%)	2 (8%)
Collecting other resources (water and building materials)	2 (8%)	0 (0%)	2 (5%)
Camping out	1 (4%)	1 (6%)	2 (4%)
Meet store loading	0 (0%)	1 (6%)	1 (2%)
Recover break-down vehicle	1 (4%)	0 (0%)	1 (2%)
Unknown	3 (11%)	1 (6%)	4 (9%)
Total nos trips	26	18	44[c]
Average nos operating vehicles [d,e]	3.9	3.6	
Average nos of adults[f]	35	35	
Frequency of trips (1 trip/x day)	0.6	1.6	1

[a] It is likely that these figures underestimate the number of logistical vehicle excursions as some were not observed or reported. I would put this underestimate at 10–20%; [b] Travel between settlements is not included in this table. It will be discussed below; [c] It is a coincidence that the total number of excursions is the same as the total number of days observed; [d] This does not identify whether fuel was available to operate the vehicle; [e] see Tab.2.11; [f] Population data S.2.3.2

4.4.1 Hunting and gathering trips near Parnngurr

A moderate percentage (39%) of unaccompanied vehicle trips by Martu was found to be for foraging purposes. The percentage of foraging excursions would be higher if foraging trips on foot were included in Table 4.2 and higher still if the accompanied trip data set were included. Conversely, it was possible that a small number of trips quantified in Table 4.2 were recorded in the hunting and gathering category, whereas, their primary purpose may have been search and exploration or visits to *jukurrpa* sites, thus overestimating trips for hunting and gathering purposes. However, the moderate percentage of excursions for the purpose of hunting and gathering demonstrates that at Parnngurr it was a significant component of the Martu system of land uses.

A major driver for hunting and gathering excursions during the study appeared to be the need for sustenance. Earlier, the collection of bush foods because store foods were low was flagged in the diary extract (Ch. 4.2). However, there were times when a store delivery had just arrived when Martu hunted anyway. Chapter 6 examines sustenance needs and other foraging motivations.

Table 4.2 shows that resource species were collected on a moderate number of excursions including those classed as for purposes other than foraging. This indicates that opportunism was high, that is even if a single trip purpose was stated, Martu collected what they saw *en route*, or tried too. Thus, hunting and gathering as a land use activity also occurs in the context of the other primary purpose land use activities.

4.4.2 Parnngurr school excursions

It was found that school excursions were the second most common purpose of unaccompanied trips (Tab. 4.2). The school teacher initiated almost 20% of the total numbers of vehicle excursions from Parnngurr during the study. It is interpreted that the availability of a large, reliable vehicle (the school Troopcarrier) was also a stimulant for concurrent journeys by other vehicles to the same destination. A reliable vehicle could support less reliable vehicles and grandparents or parents accompany children.

Table 4.2 shows that more school trips were conducted in the March period compared to the August–September period, despite a larger number of vehicles at Parnngurr during the latter. This reduction was explained by the dominance of building work and preparations for the opening of a new school at Parnngurr. These commitments reduced staff time and vehicle numbers available for school trips. This indicates how settlement-focussed commitments reduced resources needed to support traditionally-derived land use activities.

School trips were found to have a moderate influence upon Martu land use and management patterns relative to family-based trips. Principally, because at Parnngurr a moderate number of school excursions occurred and on all but one of them plant and animal resources were reported to be collected by school children or adults. Ceremonial activity and the cleaning of soaks were reported from some school trips but no landscape burns were reported. That is, land management activities in addition to education occurred on school trips.

It is interpreted that, firstly, the school trips identified a direct influence of non-Aboriginal people on Martu land use. Motivated school teachers and school resources initiated or supported trips. Secondly, it identified a possible shift in the learning of Aboriginal ecological knowledge from personal and peer experience and grandparent-focussed learning to school-motivated learning. In terms of ecosystem management, school trips possibly played an important role in intergenerational knowledge transfer and the learning by future generations of Martu land users and 'managers'.

4.4.3 Activities that supported land uses around Parnngurr

Processes that supported other land uses (Tab. 4.1) were unreported in Table 4.2, although they were often embedded within the principal trip purpose. Examples include monitoring resource stocks and burning. On all accompanied trips, Martu walkers or passengers observed and discussed the condition of resource species, especially food resources. These discussions included observation of the tracks of game, notes on the phenological state of preferred plant foods, the pointing out of plant patches in the distance that may yield resources. Chapter 8 identifies monitoring as an essential element of a subsistence system that targets particular resource species. Resource monitoring kept Martu ecological knowledge up to date. It is speculated that as resource monitoring decreased opportunistic rather than targeted foraging increased.

No trips conducted exclusively for the purposes of burning land were reported; however, burning was a common activity on trips (Ch. 7). This may suggest that burning is not a major land use per se but rather that it too is embedded in the context of other land uses. Although, on several occasions senior men noted that they needed to return and burn when conditions were appropriate.

4.5 Hunting and gathering events in the context of other land uses at the three Martu outstations

The above shows that at Parnngurr the number of vehicle trips for the primary purpose of hunting and gathering was moderate. It also shows that foraging events occurred in the course of trips which had other primary purposes. But was this the case at Punmu and Kunawarritji for unaccompanied trips? How common was foraging when walking trips were included?

Table 4.3 quantifies the frequency of resource species collection in each outstation for all unaccompanied trips for all purposes. Another variable introduced in this Table are trips on foot as well as in vehicles. Table 4.4 separates them for foraging trips

Table 4.3 Resource species collection on unaccompanied walk [a] and drive trips for all purposes from each settlement during the 1990 study

	Parnngurr	Punmu	Kunawarritj	Mean
Mean nos adults per vehicle [c, d]	9.5	3.7	7.5	6.9
Nos days observed	44	23	13	-
Nos unaccompanied trips [b]	58	18	7	-
Frequency of trips (1 trip/x day)	0.8	1.3	1.9	1.3
Nos and percent trips when resource species collected	38 (66%)	13 (72%)	5 (71%)	- (69%)
Nos and percent trips when no resource species collected	8 (14%)	4 (22%)	2 (28%)	- (21%)
Nos and percent trips when no record of whether species collected	12 (21%)	1 (6%)	0 (0%)	-

[a] Short walks (< 0.5 km) from the settlements, mainly for firewood collection, were common but unrecorded; [b] No walking excursions by children were recorded in this data set; [c] Population data means from Chapter 2; [d] Vehicle mean based on daily records, this figure includes school vehicles which were removed for some calculations

Table 4.3 demonstrates that the occasions when bush resources were collected on unaccompanied trips by Martu was high. On average, Martu collected resource species on almost 70% of excursions from remote settlements. This was significantly higher than the 40% suggested above because of the inclusion of walking excursions in this data set. All recorded walking excursions from the settlements were identified to be primarily for the purposes of foraging.

Comparison across the settlements shows that the percentage of excursions when bush resources were collected was relatively consistent. Resource species were collected on 66–72% of excursions. Notably, these records did not include the accompanied data set so were relatively independent of my research interests and possible influence.

Further comparison between settlements indicates that the frequency of excursions had a wider range from 0.8–1.9 days per trip. That is, at Parnngurr excursions occurred about once a day, at Kunawarritji they occurred about once every two days during the study. What factors may explain this? The influence of variables such as the population size, number of vehicles and engagement in other land use activities is considered later.

4.5.1 Flexibility of purpose and opportunism in land uses

The above sections may imply that Martu trips onto their lands were singular in their purpose. The land use classes were a heuristic tool to break down and understand a land use system. As already noted, one activity could become embedded in another broader purpose. In reality, the objectives of Martu on excursions often shifted and changed as new opportunities emerged. This is apparent in one unaccompanied foraging trip reported back to me:

> Teddy, Smithy, Michael, Grant and Yanjimi [all middle-aged Martu men] left after dinner [lunch] in Jigalong women's Toyota. Teddy, Yanjimi and others said they wanted to check on the miners. They drove to Lalapakujarra via Kurta Kurta. On the way they killed a *Kipara*. They noted rain to the north. Saw rain and waters had filled second creek to Lalapakujarra. Observed *Wamurla* coming up [plants growing, fruit maturing] in burnt area. Saw young *Yalapara* shot it. It was fat all over. Others followed a different *Yalapara* track not far but nothing [missed it] only small *Winyjikirti*. Cooked *Kipara* and *Yalapara* and ate there. Five men then went to Pilakumarran rockhole and had a good drink. Didn't see miners but fresh vehicle tracks on the Karlamilyi and Talawana to Karlkan Karlkan roads. Observed several *Kipara* in creek west of Parnngurr. Another one shot, returned to Parnngurr with it. (FW field diary 90-3, 12/3/90)[60]

Notably, this trip was also the day after a store loading was delivered to Parnngurr, indicating that the need for sustenance and hunting was not the primary goal of the trip. I classified this trip as 'Monitoring of mineral exploration and new roads'. However, other land uses that are apparent in it are the monitoring of rainfall and water resources, the monitoring of plant and animal food resources, hunting and, possibly, visits to significant sites. In this case, there appeared to be four or five other land uses embedded in the context of the primary use. Sometimes it was difficult to discern the primary purpose. Flexibility and opportunism in foraging were also apparent on all Martu trips.

Mark Stafford-Smith (PhD supervisor, pers. comm. 2004) pointed out that this opportunism has a parallel in the way non-Aboriginal pastoralists describe a 'bore run' as the primary purpose of a trip. That is, they drive to check on and, if necessary maintain bores; however, *en route* they may also observe the state of fences, alter arrangement of gates, note abundance of pasture, monitor condition of cattle. This may

[60] *Kipara ~ Ardeotis australis*, Australian bustard; *Wamurla ~ Solanum diversiflorum*, Bush tomato; *Yalapara ~ Varanus giganteus*, Perentie; *Winyjikirti ~ V. acanthurus*, Ridgetail monitor

be visual observation with occasional physical activity. The multi-tasking analogy is apt albeit with the difference that Martu observed a wider resource species array (Ch. 5) than the cattle, water and pasture requirements of pastoralists.

The subset of unaccompanied non-foraging trips was examined (Tab. 4.3). It was found that Martu collected biological food resources on 37% of non-foraging trips. This figure underestimated the collections as the raw data did not distinguish no species returns or no records of species returns. It was estimated that Martu at Parnngurr during the study collected food resources on at least 40% of trips for purposes other than hunting and gathering. Opportunistic hunting and gathering events by Martu appeared to be frequent.

4.6 Absence of 'Western' land uses conducted by Martu

This study found an absence of 'Western' land uses managed by Martu at Parnngurr, Punmu or Kunawarritji, traditionally-orientated land uses dominated in 1990. Besides the settlements, no 'modern' land uses had yet been established by Martu or their representative agencies on their homelands. That is, there were no Aboriginal run cattle enterprises, tourism enterprises, ranger programs, national park management, mining operations, commercial wildlife harvest, commercial artefact or art production, horticultural enterprises or other land uses such as those that have been trialled or operated in central Australia (e.g. Cane & Stanley 1985; Young & Ross 1994; Williams & Johnston 1994). [61]

During the broader study period (1986–90), on only two occasions did Martu individuals volunteer interest in engaging with monetary-based natural resource economies. Despite some of them having previous experience on Pilbara cattle stations, homestead gardens and mining leases (Tonkinson 1974). In 1988, an older Nyanumarta man Billy Dunn said he wanted cattle to put on Rudall River. In the 1960s, whilst working for a European pastoralist he had dispersed Buffel grass seed along the river to provide feed (see Wilson 1989), twenty years later, Dunn still wanted to stock the area. On another occasion, in September 1990, a young Punmu woman showed me a plastic bag with nine live *Kataputa* (Thorny Devils) that she intended to send to Broome for a whitefella who reputedly bought them, it was unlikely the animals were either sent or survived.

In relation to the National Park (thus the core thesis), Martu and their representative agencies challenged its existence and/or were uncertain of its purpose (Ch. 8). In 1990, the Park was not seen to be a potential land use or employment opportunity for Martu. Later, land-based Martu employment opportunities were briefly suggested in relation to national park management and tourism (Newman et al. 1993); however, no substantive discussions with Martu or potential employers had occurred. Western enterprise

[61] In 1989, funds were put into the establishment of a hydroponic lettuce farm at Punmu. It was short-lived.

opportunities on remote Martu lands were rarely addressed prior to 1990.[62] Land tenure, political and mining matters dominated priorities of WDPAC. CDEP employment remained settlement focussed.

Whilst Martu did not operate any modern land uses in 1990, they did actively monitor the activities of other land users. Table 4.2 shows that a low percentage of trips from Parnngurr were to 'look around' and 'check on' mineral exploration personnel and tourists. Louie Warren (Punmu community coordinator, pers. comm. 26/1/90) observed that this was more common at Parnngurr than Punmu, Parnngurr was closer to both mineralised areas where exploration activity was more intense and tourist access to the Canning Stock Route via the Talawana track.

In hindsight, Martu involvement in research initiated and managed by non-Aboriginal people could have been more explicitly included in this analysis of land uses. From 1986–1990, at least seven researchers worked on Martu lands beyond the settlements for periods from weeks to months (Tab. 2.5). At any one time, they employed one to five Martu adults, engaged a wider group of people and travelled extensively. Martu undertook traditionally-orientated activities in the course of these research trips. Martu approved and took part in the research but none of it was formally initiated or managed by them. Non-Aboriginal researchers resourced trips that widened the spatial patterns of Martu land use and management.

4.7 Transport and mobility

This chapter questioned the means of transport used by Martu to travel over their lands and particularly to hunt and gather. Transport options were walking and vehicles. Questions about travel strategies or mobility patterns were raised because these were precursors to understanding spatial patterns of Martu land uses (Ch. 7).

4.7.1 The persistence of walking to hunt and gather

Earlier sections have clearly identified that in 1990 Martu made substantial use of vehicles to travel and use their lands in a variety of ways. However, the study observed that Martu also often walked particularly when on foraging trips. Walking was still a major means of travel, at least when foraging.

It is important to remember that certain middle-aged and older Martu had spent formative years walking across their lands. These people had regularly walked tens of kilometres on some days. Individuals had covered hundreds of kilometres in some weeks. Martu often referred to 'foot walking times' as a synonym for *pujiman* (bush man) times i.e. pre-contact times.

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[62] In 1992, I was contracted by ATSIC to facilitate discussions amongst Martu about the establishment of a commercial seed harvesting enterprise. There was considerable interest in these options. In 1993, commercial harvesting to provide seed for mine site rehabilitation was established and operated on a small scale for a few years (Kalotas 1999).

In 1990, all Martu walked far less than they or their forbearers had done earlier. There was no inter-settlement travel on foot. [63] However, for certain individuals it was a preferred way to undertake specific land uses. Hunting on foot rather than driving allowed people to better intercept and track medium to small-size game animals. Walking was the only means to gather from concentrated and dispersed stands of plant resources. It also enabled access to land areas distant from existing vehicle tracks or inaccessible to vehicles. It was the only transport means available to people who did not have ready access to vehicles, particularly women and children.

4.7.2 Walking and driving strategies for land uses near a settlement

The study identified four general transport strategies applied by Martu for trips near a settlement. These were:

1) Vehicle only transport; no, or relatively little, walking;
2) Vehicle transport to a dinner camp site and radial walking from and return to there;
3) Vehicle transport to a drop off site, walking, then vehicle pick up;
4) Walking only transport.

Examples of the different strategies are apparent in some of the ethnographic quotes reported above. Strategy 1 (drive only) was characterized by the driving trip of six Martu men via Lalapakujarra (FW field diary 90-3, 12/3/90). Strategy 2 (drive – walk) typified the majority of accompanied foraging trips. One example of strategy 4 (walk only) is described from two perspectives, that of Rita Milangka (Ch. 3.7) a forager and myself as an observer-recorder (App. 3).

Strategy 3 (drive & drop off) was first described to me by Louie Warren (pers. comm. 26/1/90). In his role as Punmu Coordinator with a vehicle, Martu, particularly women, frequently asked him to drive them to drop them off at location more than 10 km or so from the settlement. The group would hunt and gather, have a dinner camp, do other activities, and then be picked up by the vehicle at the same place, at a prearranged location or elsewhere on a road, sometimes foragers walked back to the settlement. Commonly, small fires were lit to identify people’s location to the driver. Non-Martu staff, Brian Kelly and Sue Hanson, later affirmed they regularly used the vehicles they managed in the same way. Similarly, Martu who required a vehicle for other purposes would drop off and later pick up a foraging group. This strategy was important because it extended foraging despite the limited availability of vehicles.

The above were general strategies. There were excursions that combined elements of each strategy. For instance, after dropping off some foragers a vehicle sometimes continued to drive only (strategy 1) then return to pick up the foot foragers. Table 4.4

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[63] In 1988, a non-Aboriginal employee of WDPAC suggested a group of Martu men walk from Parnngurr to Punmu in the cool season, a direct distance of only 90 km or about 120 km following the river and water routes. The men carefully considered this idea, it attracted a lot of discussion but it was not done. It cannot be presumed that this was due only to physical limitations such as low fitness; cultural perceptions such as wariness of *mamu* (harmful spirit beings, monsters) possibly restricted walking long distances.

combines the incidence of strategies 1–3 because data on the unaccompanied trips did not separate the transport strategies used.

These strategies characterised land uses for all purposes. Table 4.4 compares the incidence of walking and combined walk-drive strategies on the unaccompanied trips for the purpose of foraging.

Table 4.4 Transport mode and gender on unaccompanied foraging trips from Parnngurr, Punmu and Kunawarritji in 1990

Gender[a]	Parnngurr	Punmu	Kunawarritji	Percent average
Walk only (strategy 4)				
all female	5	6	1	12 (67%)
all male	6	0	0	6 (33%)
mixed gender	0	0	0	0
Total nos walking trips[b]	11 (40%)	6 (36%)	1 (17%)	18 (31%)
Drive only or drive & walk (strategy 1-3)				
all female	0	0	0	0
all male	7	5	2	14 (42%)
mixed gender	10	6	3	19 (58%)
Total nos walk-drive trips	17 (60%)	11 (64%)	5 (83%)	33 (69%)
Mean nos adults per vehicle in settlement [c, d]	9.5	3.7	7.5	

[a] identified adult gender only, does not refer to gender of children; [b] Population data means from Chapter 2; [c] Vehicle mean based on daily records, this figure includes school vehicles; [d] As the research vehicle was available for accompanied trips, it is possible that the percentage of excursions on foot was underestimated compared to situations when there was no research vehicle.

In analysing Table 4.4, of 51 unaccompanied foraging trips, about one third were conducted by walking alone and about two-thirds used vehicles by one strategy or another. Clearly, vehicles were an important means of transport for foraging. However, Martu also persisted in foraging from their settlements on foot.

Altman (1987) quantified the use of vehicles for subsistence production in Australia. In the mid-1980s, he observed that Gunuwinggu (Kuninjku) people used vehicles on less than 10% of subsistence production days (Altman 1987:29). The measures are not directly comparable to this study but it was clear that in 1990 Martu made more frequent use of vehicles to forage than had Gunuwinggu people. The difference could be partly explained by the greater availability of vehicles in Martu settlements. Also relevant would have been the richer environment of lands in northern Arnhem Land where people got higher forage returns from hunting, fishing or gathering on foot. Altman returned to examine Kuninjku customary harvest in 2003. He commented that vehicles were used to hunt and gather more often than they had been in the past (Altman unpubl. a). His paper did not compare vehicle use to walking.

Table 4.4 introduces the significant variable of gender to these data. Throughout this dissertation, we will see that resource species and land use patterns were profoundly influenced by the gender of foragers. The gender ratio of women to men based on population census for all three settlements was about 1:1 (Ch. 2.3.2). Table 4.4 shows that the majority of walking only excursions was undertaken by women. In Punmu and Kunawarritji, men did not go on foraging trips on foot during the study. At Parnngurr there were records of men foraging only on foot. The difference between Parnngurr and Punmu, can be partly attributed to a core group of four Warnman men who had recently moved to Parnngurr, had no vehicle associated with their households and were keen hunters thus they walked or were dropped off.

4.7.3 The scarcity of vehicles

Brian Kelly (a non-Martu mechanic and long-term resident on Martu lands) and I were talking about the use and possible decline in bush food availability, he diverted to comment that:

> The scarcest resources at Punmu and Kunawarritji are motor cars (FW diary 24/9/90)

Martu frequently lamented the lack of a vehicle with which they could travel, hunt or do other activities.

Table 4.3 showed that there was an average of about 7 passengers per vehicle on 83 unaccompanied trips. The study found that vehicles were scarce relative to the adult population size. At Parnngurr, there were about 9.5 adults per vehicle. This figure was derived from an average of 30 adults and four operating vehicles at Parnngurr during the study periods. It did not include the school vehicles as the school teacher controlled them.

Table 4.5 Types of vehicles based at Parnngurr in 1990 study periods [a]

March	August to September
Army truck	Kunawarritji (Roly's) Toyota
Parnngurr Landrover trayback (yellow)	Landrover trayback (yellow)
Jigalong Toyota Station wagon women's vehicle	WDPAC Toyota
6WD Mazda trayback	Tip truck
Parnngurr school Troopcarrier 1	Parnngurr school Troopcarrier 1
	Parnngurr school Troopcarrier 2

[a] Rarely were all these vehicles were present at one time due to the high inter-settlement automobility

All vehicles in Martu settlements in 1990 were four-wheel drive. These were essential for access along tracks that were unformed, sandy, rocky and/or boggy. Traybacks, Stationwagons and Troopcarriers were preferred for foraging trips. Vehicles with larger passenger capacity such as Troopcarriers and the Army truck were used for school trips. In 1990, there were no two-wheel drive vehicles at Martu outstations.

In 1990, most vehicles at Parnngurr, Punmu and Kunawarritji had been purchased from public funds for particular purposes. The Punmu school principal was the only Martu person known to own a private vehicle. However, it was common for the use of 'community' vehicles to be dominated by one family, for example, in March 1990 the Jigalong 'women's motor car', that is a vehicle that had been funded to support women's projects, was driven exclusively by the chairman of WDPAC. None-the-less, others would ask and be loaned a vehicle for their use.

It was observed that men dominated the use of vehicles. Lucy Gibbs from Jigalong and Marjorey Yates from Punmu were two of the few Martu women who regularly drove. Several younger women could drive (and did for some accompanied trips) but rarely did they drive 'publicly', get a driver's license or claim control of a vehicle. The management of a Parnngurr vehicle by the school mistress was somewhat responsive to the priorities of women. Also, women used particular strategies to enhance their influence on vehicle use. The control of vehicles by men appeared to shape Martu land and resource use patterns in relation to the social composition of foraging groups (Ch. 6) and spatial land use patterns (Ch. 7).

Passenger numbers were another variable that affected the resource species returns from trips. At the time of this study, there were no legal constraints on passenger numbers recognised by Martu. The numbers of vehicle passengers were sometimes huge, in one extreme example, on a school trip reported above:

> School Troopcarrier had 22 kids, 3 adults; army truck 9 kids, 23 adults; and research vehicle 5 kids and 4 adults. (FW diary 90-3, 6/3/90)

Never were Martu seen to drive alone.

Vehicle breakdowns were common. This exacerbated the scarcity of operating vehicles available to undertake trips for foraging and other purposes. A vehicle sometimes stopped in disrepair at a settlement until the need for it was sufficiently urgent or the parts, skills and motivation to fix it were available. Martu men showed great innovation in their mechanical trade. Vehicle scarcity was compounded by breakdowns, diesel shortages and the absence of vehicles due to travels away from the settlement.

An accompanying vehicle often remedied vehicle breakdowns 'on the road'. Records for a 90 km drive between Punmu and Parnngurr described a regular occurrence:

> A tedious stop-go trip. Ditch's Toyota utility stopped, we couldn't jump start it from Mitchell's vehicle. Uni vehicle tow started it but then we got bogged on dune flank. Next dune, Ditch's ute stalled on crest. I towed again but no spark in his ute's battery. We put the uni vehicle's new spare battery into Ditch's car and all OK. (FW diary 90-6, 21/9/90)

Table 4.2 recorded one rescue of a breakdown in a 44 day period at Parnngurr.

The study found that vehicle breakdowns had a direct influence on the spatial foraging patterns and also on burn ignitions. On the above trip between Punmu and Parnngurr, small volumes of *Lunkun lunki* and *Punara* fruit were collected as women waited whilst the vehicles were rescued.[64] On wider travels, it was common for Martu to point out the site of a vehicle breakdown, associated camp and to recount the resources collected nearby. People walking in the vicinity of breakdowns found 'new' resource patches

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[64] *Lunkun lunki ~ Acacia dictyophleba* insect larvae (witchetty grubs); *Punara ~ Eucalyptus chippendalei*, Sandhill bloodwood

such as the *Wamurla* noted earlier. Sometimes, Martu travellers ignited fires specifically to alert Martu elsewhere as to the whereabouts of their vehicle breakdown.

4.7.4 Martu travels between settlements

How frequent were travels between settlements? We saw above that opportunism in collection of resources on non-foraging trips from Parnngurr was moderate. Was there evidence for the collection of bush resources on travels between settlements?

To ascertain inter-settlement mobility, the arrival and departure of vehicles from the settlement was recorded. This quantifies the frequency of vehicles traversing lands along the main inter-settlement travel routes. Vehicles that came and went on the same day (i.e. intra-settlement travels) were excluded from the data.

Table 4.6 Vehicle arrival and departure for inter-settlement travels from Parnngurr in March and August to September 1990

	March	August–September
nos of record days	16	20
mean nos of vehicles	3.9	4.1
total nos arrivals & departures	11	39
frequency of inter-settlement vehicle travel/day	1.4/day	0.5/day

Table 4.6 shows that at Parnngurr in the two record periods, a vehicle came or left to travel to another settlement at 1.4 and 0.5 trips/day. This equates to about one vehicle per day travelling one of the major routes between Martu settlements or towns. A high turnaround of vehicles from Parnngurr is evident in the following record:

> Well 33 Toyota arrived Parnngurr last night, came from Jigalong via Nullagine and Woody Woody. Tip truck also arrived with a stores loading. Next morning 8.30 am, Well 33 Toyota and tip truck left Parnngurr for Punmu and 33 (Kunawarritji). Colin Peterson driving tip truck with 12 passengers, Toyota had 6 passengers. (FW diary 90-6, 7/9/90)

At Kunawarritji, the number of inter-settlement trips was markedly lower. In a 14-day observation period in November 1990, only 4 arrivals or departures occurred, i.e. one inter-settlement trip/3.5 days. Several factors may explain this difference. Parnngurr was a ‘transit settlement’ for some Martu whereas Kunawarritji was at ‘the end of the line’; the Kunawarritji vehicle and Martu populations were significantly smaller than Parnngurr; and, no large gatherings occurred at Kunawarritji during the study. In total, across the three settlements and the $2^1/_2$ month record period, on average there was an inter-settlement trip each 1.7 days.

I had expected that the frequency of inter-settlement trips would be less than the frequency of intra-settlement trips. In total, across the three settlements and the $2^1/_2$ month record period, on average there was an intra-settlement vehicle trip each 1.1 days. Fewer than the 1.7 noted above but not as wide a difference as anticipated. Martu vehicles were ‘on the road’ a lot. Clearly, travel was a major activity of Martu and a process that facilitated a variety of land uses. This high mobility has been found to be common to Aboriginal residents of outstations in central Australia (Young & Doohan 1989).[65]

The collection of biological resources on trips between settlements was not recorded. However, Martu men regularly travelled with a rifle ready to hunt (Photo 4.1); this implied that they anticipated game species. When I travelled between settlements accompanying Martu or encountering Martu, I often enquired as to whether they had collected bush foods. On most occasions, people said they had and described them, for instance:

> Driving from Kunawarritji to Punmu, we passed Jeffrey James and family. They'd stopped at Punmu–WAPET turnoff. Bushfire burning from cat hunt. They'd got one cat. (FW field notes 90-6 30/10/90)

Inter-settlement trips were long and often included children and people who needed respite from the roughness of road travel. These breaks provided opportunities to collect resources.

In 1990, there were few travel route options between the settlements, Punmu and Kunawarritji had only one road each, two routes into Parnngurr were possible. The high frequency of opportunism in bush resource collection reported above suggests the dispersal of hunting, gathering, burning and other activities along major travel routes. Chapter 7 maps the location of foraging and burning events on accompanied trips in relation to roads.

4.8 Notes on traditional and modern tools for hunting and gathering

In addition to vehicles, changes in technology need to be considered in assessments of the ecological sustainability of species harvests (Altman & Allen 1992; White & Meehan 1993; Bomford & Caughley 1996). Metal implements were considered to increase the efficiency of hunting or gathering. In the late 1980s, the plant-derived material culture of Aboriginal people had been poorly researched (Kamminga 1988), similarly, there was little published on modern foraging tools. Devitt (1988) wrote a chapter on the contemporary technology of Anmatyerr women foragers which identified the metal crowbar as the most significant item.

Table 4.7 summarises some of the modern tools observed during this study to aid Martu hunting and gathering. It also identified their equivalent in pre-European times, the main purposes and gender use of them.

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[65] In recent years, Aboriginal mobility between settlements and towns has become the subject of considerable study, partly because of challenges in the delivery of health, education and other services to Aboriginal people.

Table 4.7 Main tools used by Martu foragers in 1990 and the pre-European equivalents

Traditional tools	Modern tool equivalents	Main purposes	Main gender
none	vehicles*, fuel*	transport people and produce	men
spears, spear thrower	0.22 rifle with or without scope, bullets*	to kill, wound	men
boomerang (three types)	none	to kill, wound	men
wooden *wana*	metal *wana*, 'crowbar'*	to 'sound' hollows, dig, kill, prise, gouge, chop	women
stone and timber axe	metal and timber tomahawk *	to chop, carve, pound, kill	both
hair belt	leather belt, handbag*, flour bag	to carry small game	both
stone knife	metal knife*	to cut, scrape, prise	both
wooden or bark bowl	billy can*, tin can, shovel, bag	dig, excavate, carry produce	women
broad, shallow timber bowl	metal form e.g. shaped hub cap	to yandy	women
deep wooden bowl	plastic water container*	carry water or produce	women
grindstone and mortar	none	to grind, pulverise, pound	women

* tools most commonly used in 1990

It appeared that Martu had readily adapted and incorporated metal implements into a traditionally-derived tool kit. During the study, most foragers preferred modern tools but readily fashioned a wooden tool if a metal one was not available. Certain men continued to also use traditional tools including spears and boomerangs (Ch. 4.2) but this was not common. Martu tools were often multi-functional being used in a variety of ways to procure and prepare bush foods. Additional to the identified tools were a suite of minor implements that were fashioned for a specific task and then discarded. Amongst women foragers, these included specific sticks and grass with a barb used to hook animals from narrow crevices such as *lunki* from tree trunks. Wire was occasionally used as a material substitute for these hooks.

Martu men coveted rifles to aid their hunting, those of a 0.22 gauge were standard and telescopic sights were preferred. During the study, there were at least three rifles in each settlement, considerably fewer than the number of men. However, on most vehicle hunting trips there was at least one rifle taken. In 1990, legal regulations required gun holders to maintain licences, whilst there were police checks on rifles these regulations were not as prohibitive as new firearms regulations of the late 1990s. Like Anmatyerr, Martu women made intensive use of *wana*, metal ones commonly made of windmill rods were preferred but wooden substitutes applied as needed. *Wana* were essential to the hunting of varanid species and feral Cats, common species within the women's resource inventory.

It was likely that modern implements increased foraging efficiency per unit time if other factors such as the forager's expertise remained constant. The numbers of certain species hunted were probably higher due to rifles and metal *wana*, for example, Bustards and Sand goanna respective to each tool. However, as explored in later chapters, it was not possible to isolate tools, vehicles or any single factors in relation to species sustainability.

4.9 Chapter conclusions and their relevance to co-management

The objectives of this chapter were to identify the major land use activities of Martu, identify the frequency of hunting and gathering in the context of these land uses and determine the means of transport used by Martu and its role in foraging. The study found multiple land uses occurred on Martu lands and within Rudall River National Park. Eight classes of land use were identified and six processes undertaken to support these uses. Martu occupation in settlements was a major land use. However, to classify a dominant land use simply as "Urban" Aboriginal settlement (as in Kendrick 2001b) ignored the diversity of other Martu land uses and potentially gave precedence to 'Mining' and 'Conservation' land uses by non-Aboriginal people in the Rudall area.

From the settlements, trips were taken out onto custodial lands for a wide variety of purposes. Trips principally for the purpose of hunting and gathering were found to be most common (~40%) in the quantified period. Customary harvest, predominantly for food, was a major land use in 1990. Resource collection trips to provide firewood, building timber, artefacts, medicine and other uses also occurred (~20%). School excursions were another major purpose for trips and an important land use. Ceremonial activities and land use may have been under-reported in this study. In Western equivalents, these lands were akin to a 'supermarket', 'pharmacy', 'forestry allotment', 'classroom' and more. This diversity of uses expands when the diversity of food species utilised by Martu is identified (Ch. 5).

Western land uses of mining, tourism and the national park occurred on Martu custodial lands. Whilst Martu were neither directly involved nor employed within them, they observed and monitored personnel and infrastructure associated with them. Unlike Aboriginal lands in central Australia, there were no modern land uses such as pastoralism, tourism, ranger programs or commercial wildlife harvest operated and managed by Martu or their agencies in the vicinity of Parnngurr, Punmu and Kunawarritji or within the National Park.

In the chapter, there were preliminary findings of high opportunism in land use activities. Whilst a trip had one purpose stated by a Martu informant, other land uses were embedded within that trip. Sometimes the initial purpose was put aside to pursue another resource or opportunity. It was found that on about 40% of trips for non-foraging purposes, species were still collected. It appeared that Martu were flexible and adaptive as resource and other opportunities arose. This was probably a strategy responsive to the relative unpredictability of desert ecosystems (Stafford Smith & Morton 1990). Two important implications of this opportunism are relevant to co-management. Firstly, in terms of foraging and associated activities (including burning), opportunism disperses these activities across a landscape and through time. Secondly, the necessity for high flexibility makes planning challenging, even difficult, for example, who could anticipate where rainfall would occur to make an attractive location for a school excursion?

This study focussed on land uses ‘out on country’. The study showed that subsistence activities occurred regularly but no comparisons were made to settlement-focussed activities. Time allocation studies by Altman (1987) and Devitt (1988) indicated that about 25 and 40% of women’s time respectively was spent on subsistence-related production (these figures included foraging on lands and food processing in the settlement).

From their outstations, Martu had reapplied a system of traditionally-orientated land uses. This included adaptation to modern settlements and the adoption of contemporary technologies (particularly vehicles). The study found that the majority of foraging trips from settlements were done in vehicles. However, a third of them continued to be exclusively on foot. Walking concentrated land uses close to settlements or ‘drop off’ points. Driving dispersed Martu land uses across a wider area. The trend over time is likely to be increased transport by vehicles and a decline in walking. The spatial patterning of foraging and associated activities is illustrated in Chapter 7. These patterns have implications for the spatial intensity of biological resource collection within National Park areas.

Australian literature on the role of vehicles has been ambiguous in terms of their influence on subsistence patterns. So far, this study has indicated that vehicles were a major driver of the contemporary land use including hunting and gathering. Notably, Martu men dominated control of vehicles; however, women had a variety of strategies that took them onto country. Aboriginal people have consistently argued for the need to have vehicles and be mobile so as they can undertake land use and management activities (Walsh 2000). Service providers within Aboriginal land management organizations have been well-aware of the crucial and central role played by vehicles (e.g. McFarlane 2001). A substantial amount of financial and human resources goes into the management of motor vehicles for the management of Aboriginal lands.

In 1990, the frequency of land use trips by Martu was high. On average, every day a Martu group travelled and undertook activities before returning to their settlement. The study also found inter-settlement travels to be common with about one transit per day between the settlements. Travels around Parrngurr and Punmu invariably took Martu through the Park and close to its boundaries. These travels influenced the likelihood of Martu encounters with National Park visitors.

This chapter concludes that a multi-use system existed on Martu lands even when dominated by traditionally-orientated activities. Singular terms such as ‘Aboriginal land use’ mask the diversity of uses and are inappropriate descriptions. They imply a ‘simple’ land use system which in turn runs the risk that outsiders will consider ‘simple’ approaches to be sufficient. In co-management terms, National Park staff need to assume a complex system of land uses were practiced by Martu.




Examples of Martu land uses not directly focused on hunting or gathering

Photo 4.2 (top left) Martu children explore and play whilst on a school trip east of Parnngurr to Winakarujurnu creek

Photo 4.3 (top right) Mothers and school teachers on same trip to Winakarujurnu creek. Creek beds were a common destination for dinner camps as they provided clear ground and soft sand to sit on.

Photo 4.4 (bottom left) Children from the Williams family telling Jukurrpa stories about Sturt Desert Peas flowers. Martu children daily went on exploring walks from the settlements and collected small game and food plants as they walked.

Photo 4.5 (bottom right) Martu men at a day camp near Parnngurr making boomerangs.

Martu traveled from distant settlements to large community events such as openings, sports carnivals or funerals.

Photo 4.6 (top left) Push starting Mitchell Biljapu's motorcar in Punmu. This was the only vehicle privately owned by a Martu person in Punmu. Mitchell or his family used it for hunting trips on most weekends. It was occasionally used by others during the week.

Photo 4.7 (top right) Martu travel in convoy between Punmu and Parnngurr for the school opening. There were four Punmu vehicles carrying 39 adults and children plus my research vehicle. There were several vehicle breakdowns and an overnight camp. At these stops, resources collected included Sandplain wattle moth larvae, Bean tree seeds, Ridge-tailed monitor and Sandhill bloodwood fruit. A search for a Perentie was commenced but abandoned due to imminent darkness. One small hunting fire was lit. It was more common for inter-settlement travels to be done in one or two vehicles.

Photo 4.8 and 4.9 (bottom left and right) The opening of the Parnngurr School on 24/9/90 attracted Martu and visitors from Punmu, Jigalong and Hedland. The construction of the school occupied many people so vehicle foraging excursions declined during the period before the opening. Sports carnivals and events such as this happened once or twice a year in a settlement and influenced land and resource use patterns. There were 40–50 adults at this event and 15 adults a week later. Note the *Kurlarta, Acacia jensenii* ceremonial spears used for this event.

Photo 5.1 Mayipi Robinson sits by array of species collected by six Martu women hunters in about four hours hunting from sandplain east of Parnngurr. Species were *Pujikatu* (Cat), *Parnajarrpa* (Sand goanna), *Winyjikirti* (Ridgetail goanna) and *Kanaji* (Woma python).

5 TO HUNT AND GATHER: ANIMAL AND PLANT RESOURCES, SPECIES SIGNIFICANCE AND SPECIES VULNERABILITY *CIRCA* 1990

5.1 Introduction

This chapter quantifies the animal and plant resources hunted and gathered by Martu in the late 1980s and 1990. It analyses the significance of species within contemporary Martu life. The harvest of biological resources is often portrayed as an area of impact upon regional ecologies and is considered to have a bearing on the management of lands, particularly those considered to be designated for the Western purpose of 'conservation'. By contrast, the killing and consumption of plants and animals was seen by Aboriginal people to be linked to the renewal and rejuvenation of those same plant and animal species (Ch. 8).

The previous chapter documented how hunting and gathering persisted to 1990 as a significant land use activity undertaken by Martu. People travelled from their settlements explicitly to hunt and gather. Animal and plant foods were deliberately sought or incidentally collected on more than 60% of trips done by Martu near a settlement. Additionally, species were collected on inter-settlement routes. Martu used vehicles and walking in a combination of transport strategies that expanded their foraging range.

The main questions asked in this chapter are:

a) How did Martu name and classify plants and animals?

b) In contemporary times, what resource species did Martu collect?

c) What were the harvest patterns of species in terms of quantities, frequency and classification groups?

d) What factors explained these patterns?

e) Did hunting and gathering appear to be ecologically sustainable?

The data presented here were animals and plants used for food purposes because, with the exception of firewood timbers, this was the dominant resource use category. However, contemporary Martu, also gathered plants for medicine, artefact, timber and other purposes (Ch. 4).

This chapter is significant because there have been few inventories of resources collected by contemporary desert people. The value of inventories is two-fold: they provide a basis for identifying the species which are important to a modern-day Aboriginal subsistence system; and, they can indicate which species may be vulnerable to over-harvesting and thus require specific management. This disertation later argues that trends of continuity and change in the resource species inventory subsequently influenced burning patterns and other ‘management-type’ practices applied by Martu (Ch. 8).

The suite of species actually utilised by an Aboriginal group over a given period has to be a subset of a much richer suite of species that they could utilise. The documentation of inventories of potential resources has been common in desert Australia, with Latz (1995a) being the principle reference for plant resources, Burbidge et al. (1988) for mammal resources, and many other complementary references. From the 1980s to mid 2000s, just three major studies of contemporary desert subsistence had been conducted (Cane & Stanley 1985; Devitt 1988; Palmer & Brady 1991). The Martu study presented here was followed by Bird et al. (2005) on burning and hunting strategies.

One research theme considered by Devitt (1988) was the proportion of plant as to animal foods consumed in the diet of traditionally-orientated desert people. Archaeologists and optimal foraging theorists had argued as to the overall proportions. Some asserted that plant foods dominated the diet by weight[66] (Gould 1980; Pate 1986; Smith & Smith 1999). More documentation of plant resources (perhaps unintentionally) reinforced this bias. For the Pintupi, eastern neighbours to Martu, it was reported after a two week visit to Kintore that:

> Traditionally there were about 100 economically important plants used by the Pintupi. Many of these have since been supplemented or replaced by European goods. Most obviously, the production of unleavened bread from wild seeds has virtually ceased with the introduction of flour. Also many of the traditional medicinal plants have been superceded by European medicines and plants while more utilitarian functions such as rope and sandals have been replaced by better European products. Nevertheless, many of the traditionally important plants are still in use in the Kintore region. These include a variety of food plants and plants for making wooden implements. (Cane & Stanley 1985:44)

They noted the use of more than 16 plant species or plant hosts—three edible *Solanum* species, bush potato, bush coconut, witchetty grubs, nectar species, spinifex resin, bush onion, bush plum, konkleberry, coolibah, bean tree, mulga, fig and wild tobacco. Then observed that:

> Large animals are relatively scarce in the Kintore region. The most commonly encountered and frequently caught are bush turkeys …Goannas are still very much a staple part of the diet in the Pintupi homelands (Cane & Stanley 1985:45)

and subsequently described the hunting of Emu, Red Kangaroo and two varanids. In addition to providing a contemporary inventory, Cane and Stanley (1985) made preliminary comparisons between the resource array of traditional times and the time of the study. These comparisons aid identification of changing trends in resource species use.

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[66] This chapter refers to animal ‘weights’ whereas, technically in zoological terms this is ‘mass’, however the former word is retained because of its greater familiarity to non-ecologists.

Devitt (1988) concluded that the range of food items obtained from the bush by women of the Utopia region was much reduced relative to the range known to be used in the recent past. She also found that foraging in the 1980s contributed less than 5% of per capita food intake, even though foraging was a regular activity. She observed that Anmatyerr women:

> had selected from the known traditional resource inventory, a number of items which they highly valued in terms of taste: meat, fats and honey (Devitt 1988:128)

Amongst these women, there had been significant changes, not just in a reduction in the total number of species used but also in the patterns of use across animal taxa and plant food groups.

What factors influence the choice of some species over others? As the above quote from Devitt suggested, Aboriginal women valued different resource species for different reasons. Her research emphasised taste as one major influence on the choice of food taxa by Anmatyerr women. Another factor she examined related to effort or labour required to process items for consumption. She found Anmatyerr women continued to use bush food species where no desired, tasty substitutes were available and they avoided labour-intensive species where store-equivalents were available. Devitt did not describe ecological factors that influenced species choice such as abundance, distribution and seasonal availability.

In the 1980-90s in desert Australia, concerns about the sustainability of Aboriginal hunting and gathering were reported by non-Aboriginal people (Latz 1982b; Latz & Johnson 1986). Whilst these concerns persisted, they were countered by arguments as to the rights of Aboriginal people and comparisons to extensive ecological damage resulting from pastoralism and other European land use practices. Aboriginal people also observed the demise of game animals (Rose 1995), they attributed declines to causes other than hunting. Rose (1995:41) recommended research into the sustainability of resource use and bush tucker collection around communities. In the early 2000s, desert ecologists occasionally identified Aboriginal hunting as a factor reducing specific populations (Robinson et al. 2003:352). By contrast, other arid zone biodiversity and conservation assessments did not identify hunting as a major threatening processes (Whitehead et al. 2001 402; May & McKenzie 2003).

For protected areas in desert regions, written opinions on the role of hunting and its sustainability have been ambiguous. In the Uluṟu-Kata Tjuta National Park plan of management (UKTBOM & PA 2000), there was no reference to subsistence practice by Anangu and no recommendations associated with wildlife harvest.[67] For Indigenous Protected Areas, investigation of sustainable harvest levels for certain species was

[67] By contrast, at workshops in preparing the plan of management, Aṉangu repeatedly referred to hunting and gathering (Aṉangu and CLC 1997). I speculate that the omission was due to the inability of the plan's authors to recognise the presence or desire of Aṉangu hunting or an uncertainty as to how to resolve it with the ideals of federal park management or possibly its previous exclusion from activities Anangu undertook within the park to which they were joint managers.

proposed (Noble & NCLMU 2002:23) whilst Robinson (2003:355) recommended hunting be excluded or seasonally controlled in Indigenous Protected Areas.

In central Australia, only two studies on the sustainability of Aboriginal harvest have been published. Morse et al. (2002) conducted a vegetation and ethnographic survey of the availability of firewood and assessed the sustainability of its harvest. They concluded there was some evidence for localised vegetation thinning around Aboriginal settlements but that the spatial contractions of mulga woodlands was not clearly attributable to overharvesting. Burns and road networks contributed to woodland clearing near settlements and were confounding variables. Morse (Morse 2005), in a feasibility study, reviewed the vulnerability of plant resources with commercial potential to over-exploitation.

This dissertation's second data chapter presents data on biological resources, particularly food resources, used by Martu. It does not expand on activities focused within Martu settlements such as food preparation and distribution. This chapter begins by providing a brief insight to Martu taxonomy for plants and animals. Martu classification also explains aspects of species collection and avoidance. The chapter then describes the species that Martu hunted and gathered then provides some quantitative data and analysis. It collates a contemporary species resource inventory, identifies significant resource species, compares changes in the resource inventory from pre-European to contemporary times and speculates on the sustainability of species-specific harvesting.

5.2 Martu classifications of plants and animals

Ethnotaxonomy is a subdiscipline of ethnoecology. It can be explored in intense detail through combined ethnographic, linguistic and biological research. The most comprehensive published Australian ethnotaxonomy, detailed the depth and complexity of Yanyuwa classifications of the ecological world near the Gulf of Carpentaria (Bradley et al. 2006). Amongst Western Desert people, Baker et al. (1993) summarised Pitjantjatjara taxonomies that paralleled Linnaean ones. Here, a brief synthesis of information recorded amongst Martu in this research is presented. Its purpose is to identify Martu perceptions of species groupings. These perceptions were found to integrate wildlife and human classifications in ways often unfamiliar to those trained in scientific taxonomy. Later, groupings that provide a basis for subsequent summaries of resource species harvested are identified.

In the early stages of this field research, substantial effort was put into recording and corroborating Martu names and synonyms for species (Ch. 3.5). This was essential in the absence of a dictionary for dialects in the region. My effort in this area slowed as a working vocabulary sufficient to communicate on ecological interests was acquired.

Martu identified many plants and animals to a level equivalent with the Linnaean system. All resource species had at least a single name in each Martu dialect. Within dialects and between dialects there were many synonyms. Synonymy in the Western

Desert appears to be the highest of any Australian indigenous language (John Henderson, linguist, pers. comm. 12/3/07). For example, Peile (1979) reported eleven Gugadja names for *Moloch horridus*.[68] Plants and animals with no resource value to Martu were generally under-differentiated relative to scientific systems. These taxa were referred to by generic names such as *warta* (tree or shrub), *mingkiri* (small mouse-like mammal) or *parla parla* (small lizard including *Ctenotus* species); sometimes these were grouped as *puta* (rubbish). However, resource value was not simply a utilitarian value for there were species that were not eaten but for which there was *Jukurrpa* and these had specific names.

As found with other indigenous groups who relied directly upon natural resources, there were examples where Martu identified plants at taxa levels equivalent to variants or subspecies. For example, as two 'same but different' plants *Pura* and *Piljiwin* associated with sandplain and rocky landforms respectively were, at the time of research, botanically identified as a single species of *Solanum chippendalei*. Comparison between scientific and Aboriginal taxonomy has provided constructive contrasts that can be used to explore potential scientific taxonomic refinement (Nabhan 2000).

For highly significant species, certain life stages were also differentiated by Martu taxonomy. For example, for major game animals, *Kirti-kirti and Marlu*,[69] lexical equivalents distinguished female with joey (*japunjara*), female without joey (*lapali*), joey (*malangkayanku*), old male (*puma*, possibly a derivative of 'boomer') and young male (*pakalikara*). This refined differentiation was uncommon for plant resources, although a few exceptions were recorded for species with multiple uses of high value where different names were given to the entire plant and its particular parts (e.g. *Solanum centrale* and *Acacia sericophylla (ex coriacea)*.

As in many oral traditions, amongst Martu there was a lot of word play and jousting of names to demonstrate an individual's knowledge. A multilingual individual could interchange several names for one species. For example, Rita Milangka, a Manyjilyjarra speaker, readily skipped from *Yalapara*, *Nyintarka* to *Punganalyu*, *Ngarlyiwilirr* for Perentie.[70] There appeared to be wide variation in this inclination and expertise amongst individuals.

Like any language system, species names need to be practiced to maintain their familiarity. It was harder for people to remember the names of species rarely collected or seen. During the study, there was evidence for changes in species nomenclature. These changes included the dominance of particular Martu dialect names and the reduced use of others (e.g. the Manyjilyjarra *Parnajarrpa* more than the Kartujarra

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[68] *Moloch horridus ~ Thorny devil* agamid lizard

[69] *Kirti-kirti ~ Macropus robustus*, Euro, Hill kangaroo; *Marlu ~ Megalia rufus*, Red Kangaroo

[70] Perentie ~ *Varanus giganteus*

Parnapunti);[71] the incorporation of English derivatives into Martu *wangka* or Kriol (e.g. *Kakipuwi* from Cocky boy for Galah; *Plakpiri* from Blackberry for Bush Currant);[72] the application of Martu derivates to introduced species (e.g. *Murtitikirlpa* lit. lips, dry for Camel); and the replacement of specific terms with generic ones (e.g. *Yumpal wama* or *Jalpinpa wama* becomes simply *wama*).[73] These changes were particularly obvious in the species lists of resources recorded from younger Martu and children.

In addition to their specific synonyms, a single species could be referred to in multiple ways. One significant means was by classificatory social sections. Whilst Martu women travelled on their land they often shared observations of wildlife. For example, once when driving across a watercourse and seeing a goanna a senior woman, Wirnta Karimarra, exclaimed:

> There's that *Purungu*. (FW diary 90/1:85)

Purungu was one of the four sections of Martu society (Fig. 2.14). The goanna was more commonly called *Winyjikirti* or *Mulyamaru* (literally 'black nose').[74] The application of a section name was unfamiliar to me as a biologist; however, it is widely reported in anthropological literature. After Wirnta's observation, I asked a group of five senior and middle-aged Martu women about this reference to animals by section. This stimulated a long and vigorous discussion of *Jukurrpa* stories and different characters within them.[75] The group deemed the section membership of some example animals could be reported (Tab. 5.1). Notable was a section name for *Pujikatu* perhaps contributing evidence to its long incorporation into Martu cosmology by contrast to scientific views of it as a feral animal.[76] In their discussion, the women did not offer section names for plant species. However, plant species characters in *Jukurrpa* also belonged to different social sections.

Classificatory section names of *Jukurrpa* characters that are specific animals and plants have been recorded elsewhere in desert Australia. For example, in studies of Warlpiri *Jukurrpa* and kinship the travel routes and experiences of animal–plant–human characters have been detailed (e.g. Rockman & Cataldi 1994). In ceremony, people of one section group aligned themselves with the group of their same or complementary animal section. In dance or song, they expressed the character of their animal–human kin, thus, human and wildlife social classifications transposed. This shaped a metaphysical connection thus a strong integration between human individuals and animal species. Martu relations to wildlife were far more intertwined and complex than the straightforward consumption of a certain plant or animal.

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[71] *Parnajarrpa* (Manjilyjarra) ~ *V. gouldii*, Sand goanna; *Parnapunti* (Kartujarra) ~ *V. gouldii*

[72] Bush currant ~ *Canthium latifolium*, *Nganungu*

[73] *Yumpal wama* ~ *Hakea suberea* nectar; *Jalpinpa wama* ~ *Grevillea. aff. eriostachya* nectar

[74] *Winyjikirti*, *Mulyamaru* ~ *Varanus tristis*

[75] *Jukurrpa* ~ dream, story, dreamtime, dreaming, origin period of landscape customs and laws, creative period that continues in the present

[76] *Pujikatu* ~ Pussy cat, Feral cat

Table 5.1 Examples of social section names cited by Martu women for specific animals

Kinship section name[a]	Martu name	English common name or Linnaean name
Milangka	*Yalapara*	Perentie
Milangka	*Parnajarrpa*	Sand Goanna
Milangka	*Kipara*	Bush Turkey
Milangka	*Lungkurta*	Centralian blue-tongue
Milangka	*Winyjakirti*	Ridgetailed Monitor
Purungu	*Mulyamaru*	*Varanus tristis*
Purungu	*Maruntu*	*Varanus panoptes*
Purungu	*Mulyamiji*	Great Desert Skink
Karimarra	*Kirti Kirti*	Euro
Karimarra	*Pujikatu*	Feral Cat
Panaka	*Karlaya*	Emu

[a]The greater number of *milangka* animals probably reflected the dominance of the three *milangka* women in the group.

This study found that Martu used multiple classification systems. The social system reported above was one type. Another related to food groups (Tab. 5.2). Another grouping separated *mirrka jijilu* (children's foods) discussed by Bird and Bleige Bird (2004). Snack foods, drought foods, staple foods, opportunistic foods have been other classes identified in the Australian literature also applicable to Martu foods (Gould 1969; Veth & Walsh 1988).

Table 5.2 Main groups of bush foods distinguished by Martu

Martu name	English equivalent	Scientific classes equivalent
kuka	animal foods, meat, game	mammals, birds, reptiles
lunki	insect larvae	witchetty grubs, caterpillars, gall larvae
mirrka	plant foods	fruits, tubers, seeds
wilyki	edible and inedible seeds	acacias, grasses, herbs
pira	edible gums	gums from acacia species
wama	sweet, rich, prized food items	nectar, sweet insect and plant exudates, termite aeletes, lerps (also tobacco and alcohol)

The main groups of bush foods recognised by Martu (Tab. 5.2) were similar to those categorised by other desert tribes (Devitt 1988; Turner & Henderson 1994). A small number of species fell outside of the main food groups. When Martu individuals recounted resource species lists, they commonly clustered species in the same group, for instance, listing nectar species together. By contrast to scientific and Western phylogeny, within the Martu food class terms there were not lexical equivalents to taxa such as phyla, class or order until the species level; that is, there were no terms equivalent to birds or eucalypts for example. A contextual reference could identify the taxa or food group more broadly. For instance, older Martu women made an important distinction between *mirrka wilyki yampalpa* and *mirrka wilyki laja*.[77]

A combination of the above Martu food groups and the scientific classes is used to tabulate and present summaries of food resource use below. Animals are by Linnaean taxa and plants are by plant part/s used.

5.3 Inventory of food species used by Martu in the study period: a rich resource base

This study applied a variety of methods to identify the plant and animal food species used by Martu. These methods were interview and comments from Martu and non-Aboriginal people who worked with Martu and records from accompanied and unaccompanied trips (Ch. 3).

Here is one example of a list recorded. After my request, linguist Jim Marsh asked the questions of a young Martu woman, Ivy Attwood.

> J.M.: What bush food plants have you eaten now?
>
> I.A.: *Karlkula, Kujupa karlkulanyuku* (the long skinny one), *Mata, Wamurla, Jinyjiwirrily, Pura, Pilyjiwiny, Munyurnpa, Nganungu, Minyarra, Kunyjaru, Kanyjamarra, jiji wilyki* (don't know its name), *lunki, wuukarta,* 3 sorts of *wama, Jalpiny, Patupajal* (orange flower), *Yumpalypa* (white flower), *Tarrun, Waranu, Jawirli, a red-yellow fruit that grows on hills, pira, Jima,* a little sweet fruit, *Ngaputa, melon, seed from Kurata, Minturu* (cook seeds in fire), *Mankurrka, Pipijarli, Milyulyu, Wintamarra wilyki.* [78]
>
> J.M.: What bush food animals have you eaten now?
>
> I.A.: *Kirti-kirti, Marlu, Pujikatu, Karlaya, Jarrki, Wurruyura, Parnajarrpa, Maruntu, Yalapara, Kataputa, Lungkurta, Papanyji, Kakipuwi, Minguwa,* fish from *Jigalong Creek,* budgie, pigeon, finch, rabbit, camel, *Winyjikirti.* [79](Jim Marsh pers. comm. 2/10/90; Marsh's comments in brackets)

Thus, Ivy identified 33 plant or plant related food species and 21 animal food species. In terms of species richness, her most commonly identified plant food group was fruits (14 species), there was a much smaller, and evenly spread array of species in the other plant food groups. Reptiles and birds were the most common animal food groups she

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[77] *mirrka wilyki yampalpa* ~ seed food for cooking; *mirrka wilyki laja* ~ seed food as raw paste

[78] *Karlkula ~ Marsdenia australis* fruits*; Kujupa karlkulanyuku* ~ tuber unknown species*; Mata ~ Ipomoea costata; Wamurla ~ Solanum diversiflorum; Jinyjiwirrily ~ S. centrale; Pura ~ S. chippendalei* (sandplain) *Pilyjiwiny ~ S. chippendalei* (rocky habitat)*; Munyurnpa ~ Santalum lanceolatum; Nganungu ~ Canthium attenuatum; Minyarra ~ Cyperus bulbosus* tubers*; Kunyjaru* ~ tuber unknown species*; Kanyjamarra ~ Vigna lanceolata tubers; jiji wilyki* ~ small seed, *lunki* ~ witchetty grub*; wuukarta* ~ honey ant*; wama* ~ nectar*; Jalpiny ~ Grevillea aff. eriostachya; Patupajal ~ Hakea juncifolia; Yumpalypa ~ Hakea suberea; tarrun* ~ mulga apple*; waranu ~ lerp, Jawirli ~Santalum acuminatum* fruit*; pira ~ Acacia* gum, *Jima* ~ unknown species, *Ngaputa ~ Cucumis melo* fruit, melon ~ *Citrullus lanatus* fruit, *Kurata Acacia tetragonophylla* seed*; Minturu ~ A. corieacea* seed, *Pipijarli ~ Calandrinia sp* tuber, *Milyulyu ~Amyema* or *Lysiana* fruit, *Wintamarra wilyki ~ Acacia paraneura* seed

[79] *Kirti-kirti ~ Euro; Marlu* ~ Red Kangaroo*; Pujikatu* ~ Pussy cat*; Karlaya* ~ Emu*; Jarrki* ~ Turkey*; Wurruyura* ~ unknown*; Parnajarrpa* ~ Sand goanna*; Maruntu ~ Varanus panoptes; Yalapara ~ V. giganteus; Kataputa* ~ Thorny devil*; Lungkurta* ~ Centralian blue-tongue*; Papanyji ~ Mulgara; Kakipuwi* ~ Cocky boy, Galah*; Minguwa*~ Echidna*; Winyjikirti* ~ Ridgetailed goanna

identified. Her lists wove introduced plant and animal foods without discrimination. Ivy's list was indicative of the array of food species one individual could recollect having eaten recently. I repeated the above questions in interviews with six women from middle-aged and younger groups.

Tables 5.3 (animals) and 5.4 (plants) collate these data and species collected on accompanied trips or reported to be collected on unaccompanied trips (Ch. 3.7). Both tables list species collected or reported to be eaten about the time of the study in 1990.

In total, Martu harvested, or recollected harvesting, more than 46 animal species and parts of more than 37 plant species about the time of the study in 1990. In Table 5.3 the distribution of the 45 animal species across taxonomic groups shows a dominance of reptilian fauna in the customary harvest with 14 reptile species collected compared to nine bird species, five eutherian and only four marsupial species. Of the 37 plant species recorded to be eaten by Martu (Tab. 5.4), the majority (17) were fruit-bearing species. Nine seed-bearing species, four tuber or root species and five nectar producing species were observed or said to be collected.

It is likely that the number of species was under-reported in this study. Three months is a short observation period within the extremely variable environments of Australian desert ecosystems, although the period was expanded by interview with people who remembered resources collected over a longer time. Under-reported were species productive and collected in either the very hot months (e.g. wikirri 'sugar') or under climatic conditions that did not occur in 1990 (e.g. pukara wama).80 Unreported here were species harvested in traditional times but only collected for demonstration to younger Martu or researchers. An earlier list of plant species collected by Martu between 1986 and 1988 compiled by Walsh (1989) recorded more seed species and insect host species than in this 1990 study.

As proportions of the known Rudall River National Park fauna, the species numbers hunted (Tab. 5.3) represent about half the known mammal species, and about one quarter the known 43 reptile species. Only a tenth of the known bird species were reported to be hunted. Caution is necessary in analysing these proportions because of the very low levels of biological survey in the region (Ch. 2.1) and under-reporting of species hunted. However, the records indicate that Martu had an applied knowledge of a moderate proportion of the vertebrate fauna through customary harvest. In reality, Martu, particularly keen foragers, observed many more species.

The total number of species collected in the study period was more than reported for any other Australian desert Aboriginal groups in the 1980–90s (compared with Cane & Stanley 1985; Devitt 1988; Palmer & Brady 1991). The latter reported only 13 plant and animal species consumed by southern Pitjantjatjara at Oak Valley. Table 5.5 compares species in food groups used by eastern Anmatyerr and Martu people.

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[80] *wikirri* 'sugar' ~ sweet exudate from *Allocasuarina decaisneana* (Desert oak) cones; *pukara wama* ~ *Thyrptomene maisonneuvei* nectar

Table 5.3 Inventory and names of animal species collected by Martu *circa* 1990

Taxa (no. species)	Common English name	Linnaean species name	Commonly used Martu *wangka* names
Eutherians (5)	One-humped Camel	*Camelus dromedarius*	*Murtitikirlpa, Kamalpa*
	Dingo	*Canis lupus dingo*	*Papa*
	Feral cat	*Felis catus*	*Pujikatu*
	Rabbit	*Oryctolagus cuniculus*	*Rapita*
	Fox	*Vulpes vulpes*	*Waltaki*
Marsupials (4)	Mulgara	*Dasycerus cristicauda*	*Papanyji, Langamarlu*
	Euro, Hill Kangaroo	*Macropus robustus*	*Kirti-kirti*
	Greater Bilby	*Macrotis lagotis*	*Mankarrpa*
	Red Kangaroo	*Macropus rufus*	*Marlu, Parlkarranyja*
Birds (9)	Duck generic		
	Black duck	*Anas superciliosa*	*Jipulyuku?*
	Australian Bustard, Bush turkey	*Ardeotis australis*	*Kipara*
	Galah	*Calyptorhynchus roseicapilla*	*Piyarrku, Kakipuwi*
	Emu	*Dromaius novaehollandiae*	*Karlaya*
	Pink-eared duck	*Malacorhynchus membranaceus*	
	Budgerigar	*Melosittacus undulatus*	*Kilkilkari*
	Crested pigeon	*Ocyphaps lophotes*	*Jaratapalpal*
	Zebra finch	*Poephila guttata*	*Nyiringi*
	Little button-quail	*Turnix velox*	*Punmarra?*
Monotreme (1)	Short-beaked Echidna	*Tachyglossus aculeatus*	*Minguwa*
Tortoise (1)	Tortoise unknown species	*Cheledonia* sp	*Tartlpa*
Frogs (2)	Frog unknown species	unknown species	*Pulayarlypa?*
	Desert spadefoot toad	*Notaden nichollsi*	*Nyatpuka*
Fish (1)	fish generic	unknown sp	*Wipu wipu*

Reptiles (14)	Stimson's python	*Antaresia stimsoni*	*Nyanjarn, Jarpajal, Palyjal ?*
	Black headed Python	*Aspidities melanocephalous*	
	Woma python	*Aspidites ramsayii*	*Kanaji, Puruyurra ?*
	Great desert skink	*Egernia kintorei*	*Mulyamiji*
	Night Skink	*Egernia striata*	*Jarlurli*
	dragon lizard	incl. *Ctenotus isolepis*	*parla parla*
	Thorny devil	*Moloch horridus*	*Kataputa*
	Centralian blue-tongue lizard	*Tiliqua multifasciata*	*Lungkurta*
	Western blue-tongue lizard	*Tiliqua occipitalis*	*Marlparta*
	Ridgetailed goanna	*Varanus acanthurus*	*Winyjikirti*
	Perentie	*Varanus giganteus*	*Yalapara*
	Sand goanna	*Varanus gouldii*	*Parnajarrpa*
	Yellow-spotted monitor	*Varanus panoptes*	*Maruntu*
	Black-headed goanna	*Varanus tristis*	*Mulyamaru*
Insects (9)	moth and beetle larvae generic		*lunki*
	moth larvae (Sandplain wattle host)	species name unknown; *Acacia dictyophleba*) host	*lunki*, specific Martu name unknown; *lunkun* host
	moth larvae (Coolibah host)	species name unknown; *Eucalyptus victrix* host	*lunki*, specific unknown; *Tinjirla* host
	moth larvae (Desert poplar host)	species name unknown *Codonocarpus cotini*folius host	*lunki*, specific unknown; *Karnturangu* host
	moth larvae (River red gum host)	species name unknown *Eucalyptus cama*ldulensis host	*lunki*, specific unknown; *Yurungkura* host
	termite alates	3 unknown spp	*pilarrpa*, 'flying *lunki*'
	honey ants	probably *Camponotus* spp under *A. aneura* or *Melophorus bagoti*	*Yukarta, Wuukarta*
	wasp larvae in bush coconut	*Cystococcus pomiformis (E. chippendalei host)*	*Mankurrka, Jalkata*
	wasp larvae in mulga gall	unknown wasp sp (*A. aneura* host)	*Tarrun*

a In the research I could not make consistent distinction between names from different dialects although these distinctions were important to older Martu. The name apparently most commonly used by Martu is given. ? denotes uncertainity over correct spelling or species application of Martu language names.

Table 5.4 Inventory and names of plant food species collected by Martu *circa* 1990

Taxa (no. species)	Common English name	Linnaean species name	Commonly used Martu *wangka* names
Fruit (17)	mistletoe generic	including *Amyema quandang & A. sanguinea*	*Milyulyu*
	Native currant	*Canthium latifolium*	*Nganungu*
	Bush orange	*Capparis umbonata*	*Parntalu*
	Wild watermelon	*Citrullus lanatus* (introduced species)	*Pikimilan*
	Ulcardo melon	*Cucumis melo*	*Ngaputa*
		Cynachum floribundum	*?*
	Rock fig	*Ficus brachypoda*	*?*
	Wild pear	*Marsdenia australis*	*Karkula*
	Bush bean	*Rhyncharrhena linearis*	*Muntulypa?*
	Quandong	*Santalum acuminatum*	*Jawirli*
	Bush plum	*Santalum lanceolatum*	*Munyurnpa*
		Scaevola parvifolia	*?*
	Bush raisin	*Solanum centrale*	*Jinjiwirrily*
	Bush tomato	*Solanum chippendalei*	*Pura*
	Bush tomato (rocks)	*Solanum chippendalei*	*Piljiwin*
	Bush tomato	*Solanum diversiflorum*	*Wamurla*
Tuber or root (4)	Parakeelya	*Calandrinia ? balonensis*	*Pipijarli*
	Bush onion	*Cyperus bulbosus*	*Minyarra*
	Bush potato	*Ipomoea costata*	*Mata*
	Pencil yam	*Vigna lanceolata*	*Kanyjamarra*
Seed (8)	Weeping mulga	*Acacia aneura*	*Wintamarra*
	Dog wood, Wirewood	*Acacia coriacea*	*Mulunturu*
	Dead finish	*Acacia tetragonophylla*	*Kurata*
	Native woolybutt	*Eragrostis eriopoda*	*Yuwinji*
	Sandhill Grevillea	*Grevillea stenobotrya*	*?*
	Samphire	*Tecticornia verrucosa*	*Kalarru*
	seeds generic	2 unknown species	*wilyki*
Nectar / sweet exudate (5)	lerp	*? Psylla eucalypti (E. camaldulensis host)*	*waranu*
	red scale	*Austrotachardia acaciae (A. aneura* host*)*	
		Grevillea aff. eriostachya	*Jalpiny*
	Honey Grevillea	*Grevillea juncifolia*	*Patupajal*
	Corkwood	*Hakea suberea*	*Yumpalypa*
Honey (1)	bush honey	*Trigona spp (*Native bee*)*	*kunyjaru*
Gum (2)	gums generic		*pira*
	gum	*Acacia dictyophleba*	*lunkun*
	gum	*Acacia pruinocarpa*	*marntila*

a In the research I was unable to make consistent distinction between names from different dialects although these distinctions were important to older Martu.

Table 5.5 Numbers of species in food groups recorded to be used by eastern Anmatyerr 1980–82 and Martu in 1990 and 1986–88

Food groups distinguished by Anmatyerr and Martu people (language names following respectively)	Numbers of species used by		
	Anmatyere 1980–82 [a]	Martu 1986–88 [b]	Martu about 1990 [c]
Animal foods excluding insects (*kere, kuyu*)	11	no record	37
Insect grubs of host species (*tyape, lunki*)	10	13	7
Sweet substances including from host species (*ngkwarle, wama*)	7	10	6
Plant foods excluding seeds (*merne, mirrka*)	21	21	22
Seed species (*ntange, wilyki*)	1	17	6

[a] summarised from (Devitt 1988:98-101); [b] (Walsh 1989); [c] Tables 5.7 and 5.8

The number of insect, sweet and plant food species was consistent between Anmatyerr and Martu groups despite their wide geographic separation and different bioregions. More seed species were collected and eaten by Martu. This may be due to the inclusion of interviews from younger children who snacked on seeds e.g. Kurata.81 The most dramatic difference between Anmatyerr and Martu lay in the number of animal species. Martu hunted about three times as many animal species as that reported by Devitt (1988). This could reflect her focus on Anmatyerr women and their activities or it may be that beef cattle grazing on Anmatyerr lands constrained native animal production and hunting activities.

Martu individuals often spoke of their desire for 'a mix up' of foods. On 51 accompanied trips, a mean of 5.5 species (SD 2.5) was collected per trip (mean 4 collectors); it appeared that women collected more species than men did. The variety of species returned was apparent when Nyapi Karimarra recounted an unaccompanied trip with 3 men, 6 women and 5 children near Parnngurr:

> We went after dinner (lunch). On the way, we left Muuki and Benjamin at Wanal Creek. The two men walked east to the hills looking for *Kirti-kirti* and back to Wanal crossing. We got them there [later]. The men shot a *Yalapara*, it was skinny, an old one. They left it. Linda and Muni were dropped off near the sharp bend on Wanal creek. They chased and got two *Pujikatu*. The others kept going. They stopped at the *Wamurla kurru*. They collected *Wamurla*. They got one *Lungkurta*, one *Winyjikirti*, one *Parnajarrpa*. (31/8/90, FW diary 90/5:45)[82]

Some species were targeted (above Kirti-kirti and Pujikatu) and some collected opportunistically (five other species above). Opportunism was a necessary strategy in an unpredictable, variable environment. Like many societies, Martu also wanted a food array that provided varied taste and interest. It provided the means to procure an array of nutrients and dilute or offset the affects of specific food toxins. The pursuit of a diverse species food inventory is a common strategy in many environments.

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[81] *Kurata* ~ *Acacia tetragonophylla*

[82] *Kirti-kirti* ~ Euro; *Yalapara* ~ Perentie; *Pujikatu* ~ Cat; *Wamurla kurru* ~ *Solanum diversiflorum* patch, Bush Tomato; *Lungkurta* ~ Centralian bluetongue; *Winyjikirti* ~ Ridge-tailed goanna; *Parnajarrpa* ~ Sand goanna

In comparisons with tropical environments, 66 species of fish, molluscs, crustaceans, turtles, mammals and birds were caught by indigenous people on Yorke Island in Torres Strait over 23 months (1984–86); two-thirds of the catch weight was for local consumption (Poiner & Harris 1991:126). Eight plant and 25 animal species were harvested by Eastern Kununjku people in a 13 day period in 1980 (Altman unpubl. a). Martu collected 15 plants and 14 animal species in 80 days. It is difficult to interpret these comparisons between groups because of the differing survey durations. However, they indicate that the number of species Martu harvested was less than half the animal species but possibly twice the plant species number harvested in tropical areas. The wide resource base of Martu was probably a necessary adaptation to a highly variable and low biomass environment.

5.4 Changes in the Martu food resource inventory from pre-European times to study period

The literature recognises that the resource inventory utilised by Aboriginal people has narrowed substantially since pre-European times. Reasons for the use of fewer bush resources have commonly been attributed to the relative ease and accessibility of ration, station then store goods (Smith & Smith 1999). For instance, Devitt (1988) and others showed that the high energetic costs required to harvest and process grass and acacia seeds explained why they were supplanted by a choice for processed wheat flour. Reasons for shifts from bush to store goods has also been attributed to changes in regional land use where Aboriginal people such as Anmatyerr were excluded from access to bush resources due to pastoralism (Devitt 1988).

In the Western Desert, the demise of the small to medium size marsupial fauna known from the 1930s onward was likely to have had a major influence upon subsistence patterns of desert people. Many of these species were well known to Aboriginal people (Burbidge et al. 1988), they provided food and other resources. For Martu, this study estimated that about 20 native mammal species could be hunted in pre-European times compared to just five native mammal species hunted in and about 1990. The extent of ecological change that would have enforced and reinforced subsistence change was probably profound.

Comparisons between the number of food species potentially collected by Martu in pre-European times and contemporary times indicate significant declines in the number of species used (Tab. 5.6). Species numbers in pre-European times were collated from literature records for neighbouring Aboriginal groups then extrapolated where species distributions were likely to cover the study region. The total number of species used in and about 1990 was estimated from 1986–1989 field records (Veth & Walsh 1988; Walsh 1989) and 1990 quantification (Tabs 5.7-5.8). Whilst these estimates were derived from different sources they provide some basis for long-term temporal comparisons in the Martu resource species inventories.

Table 5.6 Comparative estimates of number of species in animal taxa and plant food groups collected by Martu in pre-European times and *circa* 1990

	Nos spp used in pre-European times	Nos spp used 1986-1990
Native mammals	21	5
Monotreme	1	1
Birds	60	9
Reptiles	21	12
Frogs	4	0
Insect larvae	43	10
Total nos animal species	150	37
Seeds	73	8
Fruits	22	17
Green leaves	1	0
Tubers and roots	6	4
Nectars and exudates	14	5
Gums	4	3
Fungi	3	0
Total nos plant species	123	35

There appeared to be declines in the number of species used across all animal families and plant food groups, these ranged from 40–80% fewer species in the present compared to the past across different phyla and categories. Table 5.6 indicates the number of animal species hunted had declined by about 75% and the number of plant species gathered declined by about 70%. Whilst these figures are approximate, they indicate a large magnitude of change. The narrower resource inventory in the late 20th century was likely to have influenced altered burning and other practices associated with the collection and 'management' of those species populations (Ch. 2.1.9. and Ch. 8.2.2). Even though Martu continued many of these practices in 1990, the spatial and temporal pattern of their application may have been very different partly because the resource inventory was very different.

Later we will see that feral Cats and Rabbits were important small to medium sized game items. Over decades in the early 20th century, hunters switched to these as native fauna declined. Also, there was intensive hunting of varanid reptiles in 1990, perhaps more so than in the past when the total species suite was richer. Desert people by necessity responded to ecological change by several strategies including prey-switching, more intensive hunting of alternative small game species, and/or seeking European foodstuffs. Social scientists have often overlooked ecological change as a force that drove changes in desert Aboriginal subsistence patterns (e.g. Tonkinson 2007:43). Declining numbers of species used was likely to be an ongoing trend. Its reasons will be examined in later chapters.

5.5 Contemporary harvest patterns of food species

5.5.1 The suite of food species utilised

Despite the narrowing of the species resource inventory from past to present, a large number of species continued to be collected during the study period. But which were the more significant species by different measures? Tables 5.7 and 5.8 present several measures of the relative importance of different animal and plant species. These measures are derived from the number of individuals of a species collected and the number of times a species was cited in interviews and discussions. These were converted into a rank for each species from each data source.

Tables 5.7 and 5.8 raise a methodological issue. Different methods yield different data and different results. Records of interview and comments yielded more than twice the number of species than records from excursions. This reflects the longitudinal depth of knowledge held by resource users by contrast to the observed and reported species collections over the three months of 1990. Again, the contrast in results can be explained by extreme variations in the availability and collection of desert resources from year to year. Martu remembered eating plants and animals that a short-stay researcher was unlikely to see collected. For resource inventory compilation, ethnographic interview is an effective method with appropriate questions, repetition and corroboration.

In terms of overall species significance, the number of times a species was cited can be taken as one marker of ‘significance’ (Ch. 6 analyses socio-economic factors behind this). It was found that Euro, Sand goanna, Bustard, Cat, Yellow-spotted monitor, Red Kangaroo, Emu and Perentie were, in order, the most frequently cited animal species (Tab. 5.7). Whilst Red Kangaroo and Emu loomed large in Martu recollections, neither species were killed on the accompanied or unaccompanied trips.

5.5.2 Mammals

All mammals will be discussed in separate subsections except Rabbits, Foxes and Dingoes. These species appeared to be of relatively low or seasonal significance in contemporary customary harvest but are of interest to ecologists.[83] It is coincidental that the three are recent or Holocene introductions to Australian fauna. Scientifically, the former two are classified as feral animals, to my knowledge, prior to 1990 neither had been previously reported in Rudall River National Park but are now known in the GSD bioregion (Whitehead et al. 2001; NLWRA 2003).

Rabbits occurred in hollows, particularly in the calcrete land type and close to saline playas and springs. Martu said that occasionally they were abundant west and south of Punmu. Only one Rabbit was collected during the study period. Numbers were probably scarce as it had been a low rainfall period (Fig. 2.6) and Rabbits had been heavily

[83] Considerably more ecological and traditional knowledge of individual species was recorded and is available from author if required.

hunted when Punmu was settled in the early 1990s. Martu described foxes as "good medicine" they were said to occasionally be eaten. They were intermittent visitors. In 1990, Fox distribution had been not been reported this far north-east into the Great Sandy Desert. Notably, Fox numbers had increased by 2004 and joint Martu–zoologist research attributed Bilby declines near Parnngurr to greater Fox predation (Nano & McGuire 2006). The eating of Dingo by Martu was recollected twice in the citations; independently there were two occasions during the study when Dingo pups were collected for senior Martu to eat (Tab. 5.3 and 5.7).[84]

5.5.3 Birds

Unexpectedly small numbers of bird species were reported to be collected in the 1990 study (Tab. 5.7). Ninety bird species have been sighted on biological surveys in the region (Burbidge & McKenzie 1983). None of the Pigeon family was collected in 1990 despite their occurrence and being good eating. On one occasion, Nyapi Karimarra pointed out but did not collect eggs of the Common Bronzewing (*Phaps chalcoptera*). Of the Cockatoo family, only Galahs and Budgerigars were cited as eaten (Tab. 5.3); chicks and adults of both species were observed to be eaten in the 1986–89 field work. Several children recollected using shanghai to kill budgies, finches and other small birds, often as target practice, sometimes to eat. Birds and other small animals (less than about 2.5 kg) that could be killed without a rifle were generally overlooked by men who searched for larger game targets. Women actively pursued small game that could be caught on foot with crowbars (Ch. 6.2). Emu and Bustard hunting is discussed later.

5.5.4 Reptiles

Five varanid species were reported to be eaten by contemporary Martu (Tab. 5.3). Of the smaller varanids, at least 33 Ridgetail goannas were collected, this was about half the number of Sand goannas, and these will be described later. The larger varanids (Perentie and Yellow-spotted monitor) were also hunted. Chapter 6.2.4 recounts one Perentie hunt and the skill required to hunt the species. The vulnerability of Perenties to over hunting will be discussed below. At least three python species occurred on Martu lands (Black-headed, Stimson's, Woma); all were highly favoured food items and cited in bush food lists (Tab. 5.3). Each species was observed to be hunted and eaten in the 1986–89 field period. In 1990, three Woma pythons were caught on accompanied and unaccompanied trips at Parnngurr and Punmu.

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[84] These were said to be pure Dingoes. The Dingo pups were collected more than 15 km from the settlements where Dogs were abundant. Martu observed that Dingoes were interbreeding with their Dogs and told of how these mixed 'Dingos' had pups at least twice rather than once a year. Modifications to breeding patterns of Dingo X wild Dog crosses were well-known by Martu before independently found in scientific population and genetic studies in central Australia. In precontact times, Dingoes fulfilled many roles in Martu society (e.g. warmth, protection, hunting assistance, excavating water sources (Ch.8). At contact, groups had to leave their Dingoes when 'bought in' by non-Aboriginal people adding to the emotional wrench of the time (Davenport 2005:126).

Table 5.7 Species and number of animals collected during study on unaccompanied and accompanied trips and number of times cited in interview with ranking of three measures

		Unaccompanied trips		Accompanied trips		Interview and comment [a]	
Phyla	Common English name	Nos individuals collected[b]	Rank (9 most–1 least)	Nos individuals collected	Rank (16 most–1 least)	Nos citations	Rank Nos citations (42 most–1 least)
Eutherians	One-humped Camel	3	1	0	0	5	29
	Dingo	7	6			2	17
	Feral cat	13	8	25	11	7	38
	Rabbit	0		1	1	5	29
	Fox	0				1	1
Marsupials	Mulgara	0				1	1
	Euro, Hill Kangaroo	6	5	2	3	9	42
	Greater Bilby	0				1	1
	Red Kangaroo	0				6	35
Birds	Duck generic	0				1	1
	Black duck	0				1	1
	Bustard, Bush turkey	30	9	2	3	8	41
	Galah	0				5	29
	Emu	0				6	35
	Pink-eared duck	0				1	1
	Budgerigar	0				4	27
	Crested pigeon	0				3	21
	Zebra finch	0				3	21
	Little button-quail	0				1	1
Monotreme	Short-beaked Echidna	0				3	21
Turtle	Unknown turtle species	0				1	1

Frogs	Frog unknown species	0				1	1
	Desert spadefoot toad	0				1	1
Fish	fish generic	0				1	1
Reptiles	Stimson's python	0				4	27
	Black headed python	0				1	1
	Woma python	3	1	1	1	5	29
	Great desert skink	0		4	5	2	17
	Night skink	0				1	1
	dragon lizard generic	0				1	1
	Thorny devil	0		16	9	3	21
	Centralian blue-tongue lizard	3	1	15	8	5	29
	Western blue-tongue lizard	0				1	1
	Ridgetailed goanna	12	7	21	11	5	29
	Perentie	4	4	5	7	6	35
	Sand goanna	34	10	156	15	9	42
	Yellow-spotted monitor	3	1	4	5	7	38
	Black headed goanna	0				1	1
Insects	moth and beetle larvae generic	0				3	21
	moth larvae (*A. dictyophleba*)	0		206	16		
	moth larvae (*E. victrix*)	0		92	14		
	moth larvae (*C.cotinifolius*)	0		31	13		
	termite alates generic	0				1	1
	honey ant generic					2	17
	wasp larvae in bush coconut	0		25	12	2	17
	wasp larvae in mulga apple	0				3	21

[a] Number of times cited in interview and comment data has been calculated from citation in 7 Martu interview lists (84 citations of animal species) and citation in miscellaneous comments from Martu and non-Aboriginal staff of Martu settlements (51 citations of animal species). [b] It was estimated that for unaccompanied trips there was under-reporting by at least 20%

Table 5.8 Species and number of times plants collected during study on unaccompanied and accompanied trips and number of times cited in interview with ranking of three measures

	Species	Unaccompanied trips		Accompanied trips		Interview and comment [a]	
		Nos times collected	Rank 6 most – 1 least	Nos times collected	Rank 12 most - 1 least	Number of citations	Rank 33 most - 1 least
Fruit	*Amyema quandang & A. sanguinea*					3	23
	Canthium latifolium					4	29
	Capparis umbonata					1	1
	Citrullus lanatus (introduced sp)					1	1
	Cucumis melo					3	23
	Cynachum floribundum			1	1		
	Ficus brachypoda					3	23
	Marsdenia australis					4	29
	Rhyncharrhena linearis					1	1
	Santalum acuminatum					2	20
	Santalum lanceolatum	1	1	1	1	3	23
	Scaevola parvifolia			1	1		
	Solanum centrale			1	1	6	32
	Solanum chippendalei (pura)	2	5	3	10	6	32
	Solanum chippendalei (piljiwin)					1	1
	Solanum diversiflorum	1	1	8	12	8	34
Tuber or root	*Calandrinia ? sp*					1	1
	Cyperus bulbosus	4	6	2	8	7	33
	Ipomoea ? costata					3	23
	Vigna lanceolata			1	1	4	29
Seed	*Acacia aneura*					1	1

	Acacia coriacea					1	1
	Acacia tetragonophylla					1	1
	Eragrostis eriopoda					1	1
	Grevillea stenobotrya			1	1		
	Tecticornia verrucosa					1	1
	seed generic *wilyki*					1	1
Nectar / sweet exudate	*? Psylla eucalypti (E. camaldulensis)*					1	1
	Grevillea aff. eriostachya	1	1	2	8	3	23
	Grevillea juncifolia					1	1
	Hakea suberea			3	10	1	1
	*Trigona sp (*Native bee honey*)*					2	20
Gum	*Acacia dictyophleba*	1	1	1	1		
	Acacia pruinocarpa					1	1
	pira	2	20				

[a] Frequency of reference in interview and comment data have been calculated from citation in 7 Martu interview lists (9 citations of plant species) and citation in miscellaneous discussions with Martu and non-Aboriginal staff of Martu settlements (79 plant citations of animal species).

5.5.5 Amphibians

For frogs, one generic frog and *Notaden nicholsii* were cited in 1990 (Tab. 5.3). None were collected on trips (Tab. 5.8). Peile (1978) recorded the methods used to collect and cook eight frog species eaten by Gugadja people in past times; four species had earlier been recorded as eaten by Martu (Walsh unpubl.). Adults of several species of desert frogs live without standing water bodies; they absorb rainfall moisture and burrow for long periods to stay cocooned in water impermeable membranes before emerging when soil moisture at depth increases. A Martu woman, who recollected eating frogs as a child, gave an insight into the past productivity of the area and people's response to it:

> We went back down into the [Karlamilyi] river where the water had gone from amongst the trees. We went back because it was the time of edible gum. So we went down and we were eating gum and frogs. The old people used to collect them in a wooden dish. There was no [edible] seed. Dishes were empty so [they were] putting frogs in them. We were getting sandhill frogs. … We were eating pig melons and fat frogs. We used to eat them, eat them. Then we moved west. (Daisy Purungu in Yirapartu et al. 1992:15).[85]

This also typifies one of many quotes about resource species that could be extracted from oral history records.

5.5.6 Aquatic fauna

Aquatic fauna was rarely cited in bush food species lists (Tab. 5.3). Single generic and Aboriginal English words for a fish and a tortoise species respectively were noted. The paucity reflected the ephemeral or small size of surface waters, the scarcity of aquatic fauna sufficiently large to eat and the relatively dry period of the study. Elsewhere in desert Australia, Aboriginal people did (and do) collect species of freshwater fish, tortoise, crustacea and mussels (e.g. Gambold et al. 1998). Although it was possible that contemporary Martu did; it would be for short periods determined by weather conditions and subsistence factors.

5.6 "Mostly get bushtucker as *kuka* now": predominance of meat over plant food

The relative dietary contribution of plant as to animal foods in 'traditional' desert Aboriginal diets had been the subject of reconstruction, speculation and debate by past archaeologists and anthropologists (Gould 1969; O'Connell & Hawkes 1981; Pate 1986). It was of past interest in examination of optimal foraging theory and its relation to mobility, settlement and archaeological patterns. The statement that plant foods contributed 70–80% of the diet of Warlpiri and Ngatatajra people (Meggitt 1957; Gould

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[85] Frog species was probably *Limnodynastes spenceri*; the pig melon, the introduced watermelon *Citrullus lanatus*; the gum of *Acacia dictyophleba*. This quote also implies the large number of frogs present and eaten by people. In 1990, Martu occasionally spoke of the relative paucity of resources compared with past times (Ch. 8), however, there is no known scientific evidence for long-term declines in desert amphibian fauna. It is known that large numbers of frogs emerge from aestivation after penetrating rainfalls. Also, Martu like other groups in sandy deserts excavated aestivating frogs.

1969) was a key area of inquiry. In the 1980s, an apparent emphasis on desert plant resources continued (e.g. Latz 1982a; O'Connell et al. 1983; Goddard & Kalotas 1988). By contrast, there were few equivalent inventories on edible animal species, except in ecological research by Baker et al. (1993).

The consumption of animal foods by Aboriginal people on desert outstations had been reported (e.g. Cane 1984; Cane & Stanley 1985). However, questions about the relative proportion of customary harvest were not addressed or were considered only in terms of species numbers, by which measure, more plant foods than animal foods were identified. The persistence of ‘a hunting heritage’ for Anmatyerr women was strongly argued by Devitt (1988:263). The major contribution of animal foods was also identified in a later report from southern Pitjantjatjara lands stating:

> Oak Valley residents are great meat eaters… vegetable foods form an insignificant part of the diet [7 species] (Palmer & Brady 1991:38)

Animal foods were of greater significance than plant foods in the contemporary Martu customary harvest. In the research in 1990, this came through loud and clear in statements from women and men and in quantitative data (Tables 5.7 and 5.8). By the measures used—frequency in citation of species lists, frequency of harvest, and weight of harvest returns—animal foods rated higher than plant foods. Statements from two men, the Martu Punmu school principal and the non-Aboriginal Punmu community coordinator, best expressed this, respectively:

> Punmu, [we] mostly get bush tucker as *kuka* now. Get turkey, *Kanaji, Lungkurta, Mulyamiji, Parnajarrpa*. No *wilyki* nowadays. Little bit *Wamurla, Pura, Minyarra* those women. (Mitchell Panaka, 22/3/90, FW diary 90/3:59)

> I only saw Punmu people get meat, people are only interested in meat. That was Blue-tongue, *Parnajarrpa*, lizards and a variety of them. Sometimes birds, but it has to be right time of year of course … there might be plant foods eaten but not much. … I’d drop off some of the old people and they’d spend the whole day going north, south and west into dune country. Mainly getting snakes, lizards, pussy cat, no vegetable foods. Some days they’d have really good days, they’d open up their bags and each lady would have a minimum of 10 lizards, *Lungkurta, Parnajarrpa* up to a foot long. … The only time I saw people digging for root crops was for *Minyarra*. They’d dig for it in Punmu where it occurred and at Ilyara there were lots. (Louie Warren interview by Walsh 26/1/90).[86]

But, as indicated by these statements, plants persisted as taxa for customary harvest and could not be ignored. Martu, particularly middle-aged and older women and children, actively sought certain plant foods. Some species were targeted when ‘in season’ and others were opportunistically collected.

5.6.1 Total weights and frequency of animal species hunted

The total weight of a species harvested provides one measure of its subsistence importance relative to other species (Tab. 1.4). The measure contributes to ecological

[86] *kuka* ~ animal food, meat; *Kanaji* ~ Woma python, *Lungkurta* ~ Centralian blue-tongue lizard; *Mulyamiji* ~ Great desert skink, *Parnajarrpa* ~ Sand goanna; *wilyki*~ seed; *Wamurla ~ Solanum diversiflorum*, Bush tomato; *Pura ~ S. chippendalei*, Bush tomato; *Minyarra ~ Cyperus bulbosus*, Bush onion;

assessments of rates of harvest that can be compared over time or to standing population sizes of the species. It also contributes to quantification for economic or dietary investigations into customary harvest contributions to Aboriginal society (Tab. 1.3).[87]

On trips accompanied by the researcher, individual species collected were weighed as whole animals prior to gutting (except Cats, App. 6). These weights were collated to calculate mean species weights, also, average weights cited in literature were recorded (App.6). These average weights were then used to estimate weights of species collected on unaccompanied trips. The actual weights on accompanied trips and estimated weights on unaccompanied trips were totalled. The frequency of collection on accompanied and unaccompanied trips was also totalled (Tab. 5.9).

Table 5.9 Numbers and weights of animal species collected on accompanied and unaccompanied trips from Parnngurr, Punmu and Kunawarritji during 80 days in March and August to November 1990 from approximately 3,000 km^2 [a]

Common name	Total nos individual animals harvested	Nos trips harvested n=138	Percent trips when harvested (%)	Nos individual animals per trip harvested	Total wgt harvested (kg)	Average weight per trip when harvested (kg/trip)
One-humped Camel	3	3	2%	1.0	1650.0	550
Dingo pups	7	2	1%	3.5	7.7	3.8
Feral cat	38	26	19%	1.5	129.1	5.0
Rabbit	1	1	1%	1.0	2.0	2.0
Euro	8	7	5%	1.1	188.5	26.9
Bustard	32	14	10%	2.3	131.6	9.4
Woma python	3	3	2%	0.3	1.65	0.5
Great desert skink	4	1	1%	4.0	0.5	0.5
Thorny devil	16	8	6%	2.0	0.8	0.1
Centralian blue-tongue lizard	18	12	9%	1.5	3.7	0.3
Ridgetailed monitor	33	17	12%	1.9	4.9	0.3
Perentie	9	9	7%	1.0	25.4	2.8
Sand goanna	190	43	31%	4.4	71.9	1.7
Yellow-spotted monitor	7	5	4%	1.4	8.1	1.6
moth larvae (*A. dictyophleba)*	206	6	4%	34.3	1.2	1.2
moth larvae (*E. victrix*)	92	5	4%	18.4	0.8	0.2
moth larvae (*C.cotinifolius*)	31	1	1%	31.0	0.2	0.2
wasp larvae in bush coconut	25	1	1%	25.0	0.2	0.2

[a] Area from the 10 km radius around 3 settlements (Tab. 2.11); [b] 55 accompanied trips, 83 unaccompanied trips conducted over 80 days (Ch.3.8)

The study found that, over 3 months in 1990, Martu people hunted about 2.23 tonnes of animals on 138 trips from the three settlements (Tab. 5.9). These settlements had a combined population that averaged 66 adults plus children during the study who hunted

[87] In detailed dietary or socioeconomic studies, weight is used as a basis to estimate energy and nutrient content (see Tab. 1.4).

over an estimated 3,000 km^2 (Tab. 2.11, Ch. 8.3.2). This hunted weight was dominated by three Camels that were killed. The weight of smaller animals hunted totalled 0.58 tonne with Euro, Bustard and feral Cat contributing the greater species weights. The weight of Camels was excluded from this figure to better distinguish the weight contributions of much smaller species that were also more frequently collected.

Per annum weights can be one measure calculated to identify the total amount of a harvest. Future researchers could compare these figures to identify change in catch over time on Martu lands, an index of species abundance on Martu lands, or comparative harvest by other indigenous groups. However, neither longitudinal subsistence harvest data on Martu lands nor quantitative species population data were available for the region or areas nearby in 1990.[88]

If scaled up to a year's harvest for comparative purposes, the Martu data equated to about 10.1 tonne of animals including Camels or just 2.6 tonne of animals excluding Camels. However, there are significant problems in accepting the scaling up of these figures. One is the high temporal variability in species supply. For example, Bustard are highly mobile and flock in large numbers then fly elsewhere, perhaps beyond the harvest range of Martu. So they were an inconsistent resource within a year. Another problem is that Martu populations and the subset of hunters also fluxed in population number. We know from Chapter 2.3.2 that the three outstation populations were particularly fluid in the 1990 study months and in 1990 may have been half to a third of population numbers in previous years. However, in terms of scaling, these are the only figures available.

In making tentative comparisons to other Australian indigenous groups, it appeared the total weight of animals killed by Martu was relatively low. For another Western Desert group, Palmer and Brady (Palmer & Brady 1991:120) estimated that in 1987–88 about 65 Southern Pitjantjatjara people at Oak Valley killed 806 Red Kangaroos per annum (based on 106 animals killed in 48 field days). This surprisingly high figure converts to at least 18.5 tonne pa (based on a gutted weight of 23 kg per animal). Compared to Kangaroo, a much smaller proportion of Bustard (9 birds in 48 days) and Rabbit were killed at Oak Valley. With the assumption that Oak Valley people accessed a similar spatial land area to Martu i.e. within a 50 km radius from settlements, this difference between Martu and Oak Valley people of about twice the animal weight hunted at Oak Valley was unexpected. [89] The difference could have been real or it could be due to methodological issues or it could have been accurate for the study period but not an entire year or or it could indicate very different subsistence patterns or environmental settings.

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[88] Chapter 10 proposes longitudinal comparisons are made with unpublished 2003–2007 data collected by Douglas Bird, Rebecca Bleige Bird and colleagues.

[89] Chapter 7.3.2 found that the majority of foraging trips occurred within a 50km settlement radii. This was largely determined by the distance a group could travel and return before nightfall. It is assumed that the vehicle types, their roadworthiness and road condition (influencing travel speed) were similar on Martu and Pitjantjatjarra lands. .

In the Torres Strait, Poiner and Harris (1991) reported that about 50 tonnes per year of marine animals were fished and hunted on Yorke Island with a population of 180–200 people. Mackerel and Green turtle weights dominated this catch. In the tropical hinterland of north Arnhem Land at Momega Altman (Altman unpubl. a) reported that in 1980 a mean population of 41 Guninggu people hunted over 30 days in the Dry season and 13 days in the Wet and harvested 1000 and 235 kg of animals respectively. He did not scale up these figures but they equate to 12.2 and 6.6 tonne pa respectively. Devitt (1988) and Altman (1988) had presented hunting-derived data as kilocalories and nutrients consumed per capita or percents of total species weights.

Despite these uncertainties and difficulties, preliminary comparisons suggest a substantial contrast between the animal weights killed by Martu compared to other groups. It appeared that Martu killed less than half the amount of bush meat (including Camel) per person compared to the other groups. This was unexpected given the relatively strong skill and knowledge base amongst Martu. Possible explanations include that other groups were technologically advantaged by better access to vehicles, rifles and powerboats or they had access to more productive ecosystems.

5.6.2 Weights and frequency of food plant species gathered: the persistence of plants

Table 5.8 showed 37 plant food species were reported to be harvested about 1990. It indicated that in interview and comment, the number of food plant species cited by Martu (with a sample bias to women) was about three quarters the number of animal species. However, Table 5.10 shows that the frequency of collection was dramatically lower than for animal species. Martu mostly got *kuka* (as per statements above).

Yet in 1990, Martu continued to gather fruit, gums, nectar, seeds and tubers to eat. The quantities in unaccompanied trips were under-reported in the research. Weights for plant species collected on unaccompanied trips were not estimated. On accompanied trips, when edible plant parts were returned to the dinner camp, the researcher weighed them, volume equivalents were estimated e.g. a cupful of gum globules. Weights could not be measured for some plant parts e.g. nectars. Small plant parts that did not require cooking were generally eaten whilst foraging thus were not quantified.

On accompanied trips, edible plants were collected about once every two trips (Tab. 5.10). Only 36.3kg of edible plants were collected on the accompanied trips (compared with 578 kg animals, without Camels). The weight of plant parts was about 6.2% of this weight of animals taken. This is a relatively small amount; however, in terms of micronutrients, plants may have played an important role in the Martu diet.[90] The Bush tomatoes *Solanum chippendalei* and *S. diversiflorum* comprised the bulk of edible plant foods collected in the 1990 study.

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[90] In 1987–88, I did nutritional analyses of energy, protein and micronutrients on 32 plant species collected by Martu. This was done under the guidance of Judy Gideon and Pat Maggiore. The results from this laborious work were not used in this study. However, they were included within the tables on the nutritional composition of bush foods (Brand-Miller et al 1993),

Table 5.10 Numbers and weights of plant species collected on accompanied trips from Parnngurr, Punmu and Kunawarritji during 80 days in March and August to November 1990 from approximately 3000 km^2

Food group	Species	Nos times harvested (n=55 trips)	Percent trips when collected	Total weight harvested (kg)	Average weight per trip when harvested (kg/trip)
Fruit	*Cynanchum floribundum*	1	2%	0.16	0.2
	Solanum centrale	1	2%	0.06	0.1
	S. chippendalei	3	5%	20.45	6.8
	S. diversiflorum	8	15%	15.23	1.9
	Santalum lanceolatum	1	2%	0.07	0.1
	Scaevola parvifolia	1	2%	0.01	0.0
Gum	*Acacia dictyophleba*	1	2%		
	A. pruinocarpa	2	4%	0.05	0.0
Nectar	*Grevillea eriostachya*	2	4%		
	Grevillea stenobotrya	1	2%	0.02	0.0
	Hakea suberea	3	5%		
Seed	*Portulaca oleracea*	1	2%		
	Stylobasium spathulatum	1	2%		
Tuber	*Cyperus bulbosus*	2	4%	0.23	0.1
	Vigna lanceolata	1	2%	0.05	0.1
Total		**29**	**55%**	**36.33**	

The number of times plant food species were cited by Martu ranked Solanums as the most often cited species (Tab. 5.8). There were other often cited species not weighed and so unquantified in the table or only low amounts were weighed. The tubers *Cyperus bulbosus* and *Vigna lanceolata* and the other fruits *Canthium latifolium*, *Ficus brachypoda, Marsdenia australis* and *Santalum lanceolatum* were often noted and appeared to be highly significant plant foods (as in Walsh 1992b).

Amongst the food groups, nectars were highly prized by Martu, especially *Grevillea aff. eriostachya*. In cooler months after rain, it has abundant sweet nectar and grows in stands (unlike the sparse scattered distribution of *H. suberea*). Of tuberous plants, Table 5.10 under-represents the quantities of *C. bulbosus and V. lanceolata* collected. Walsh (1992 b) reported that *C. bulbosus* tubers could be collected by the billycan full (mean rate 495 g/hr, SD 228 g/hr, n=7 events); *V. lanceolata* took longer to collect (mean rate 330 g/hr) but larger quantities could be gathered. Notably, in the study region, there were no large edible tuber species. The Bush potato, *Ipomoea costata,* occurred only on the fringes of the GSD bioregion, it was collected and known to Martu at Jigalong and Billanooka but not to the east near the outstations. By contrast, it was a major plant food of Gugadja (Cane 1984), Anmatyerr (Devitt 1988), Warlpiri and other central desert groups. The absence of this large, abundant tuber on Martu lands contributed to regional differences in subsistence patterns.

5.6.3 *Pura* and *Wamurla*: two *Solanum* species and their significance

Solanums were a highly favoured plant food during the study period. There was continuity of their importance from pre-colonial times (Peterson 1979). *Pura*, *Wamurla* and *Jinyjiwirrilyi* were the flora species most often cited (Tab. 5.8). *Pura* and *Wamurla* were also collected in the largest weights (Tab. 5.10).[91] *S. chippendalei* and *S. diversiflorum* are closely related Bush tomatoes and the largest native fruit on Martu lands; *Wamurla* was more preferred being sweeter and softer. Inside the pericarp of both species are bitter black seeds which required careful scooping out and the inner flesh was wiped to remove bitter residues.

During field research at Kunawarritji, *Pura* was abundant. Four women on just three trips (mean rate 0.9 kg/person/hour) harvested a massive 20.4 kg of fruit (vs Tables 5.11 and 5.12 for Sand goanna and Cat). Over a month or more, they had regularly visited two extensive *Pura* patches. At Parnngurr, about 8 kg of *S. diversiflorum* was gathered on 4 of 33 accompanied trips. The patches were less productive than at Kunawarritji. Both species are fire response plants requiring rainfall for fruit production and are frost sensitive.

The harvest of large quantities occurred over several months. At all settlements, fruit was returned to camp and consumed over several days after collection. Groups of women who played cards snacked on *Wamurla* fruit (or *Minyarra* at other times). At Kunawarritji, excess fruit was dried and stored or packed in bags for delivery to relatives elsewhere. Inter-settlement trade in bush meats and plant foods was common, this being just one example.

5.7 High value animal species by weight or frequency of hunting

During the study, the animal species of highest significance to Martu for their food value were Euro, Bustard, Cat and Sand goanna. These species were most often cited in interview and comment on the Martu bush food inventory (Tab. 5.7), most frequently collected (Tab. 5.9) or, additional to Camels, contributed the greater weights of species collected (Tab. 5.9). Aspects of the hunting of each of these species will be outlined below. Examples associated with hunting strategies, species specific knowledge on seasonality or habitat are also recorded to give insight into the depth of Martu knowledge and its interrelation with hunting practice.

5.7.1 *Kirti-kirti* ~ Euro

Kirti-kirti was the species most often targeted by Parnngurr and Punmu men during the study. They were the fourth largest animal in the region with a mean total body weight of 21.2 kg (App. 6). The ethnographic and customary harvest data suggest they were

[91] *Pura ~ S. chippendalei*; *Wamurla ~ S. diversiflorum; Jinyjiwirrilyi ~ S. centrale.*

more abundant near Parnngurr at the time of the study than the other preferred heavy animals, Emu and Red Kangaroo. *Kirti-kirti* are neither migratory nor herd species, and populations are persistent in drier phases (Ealey 1967). Eight *Kirti-kirti* were killed in 80 days by average group size of 3.1 male hunters. Calculated hunting rates ranged widely from 1.8–28.2 kg/hunter hours (n=3). Additionally, a Parnngurr resident said that in a 7 day September period when I was at Punmu another seven animals were hunted at Parnngurr (this was not included in the data sets as I did not have records for other food species collected).

Kirti-kirti were killed on 5% of all reported trips (Tab. 5.9); however, in the subset of unaccompanied trips, six animals were collected on 14% of trips, which were dominated by men. Whilst often targeted there was a high percentage of trips when men were unsuccessful in hunting *Kirti-kirti*. There were about 30 men at Parnngurr during the study periods (Tab.2.10), but a smaller subset hunted; there were three or fewer suitable vehicles and fewer than five rifles (Ch. 4.7). In 1990, Martu women did not hunt *Kirti-kirti*, no women possessed rifles and fewer than five drove vehicles.

At times, hunting increased in intensity for periods of several days to weeks. For instance, on 23 September 1990, a group of men went to Yurlpu, an area in McKay Range that had recently become prohibited to non-initiated men, three *Kirti-kirti* were killed in the course of 'men's business' activities there. Bush meats play a well-recognised role in ritual feasts associated with men's ceremonies (Tonkinson 1991). Tonkinson and this study identified that certain species were required for specific rituals. Designated species such as Red Kangaroo were eaten by people in mourning, whereas, others species such as Sand goanna could not be eaten. These were social determinants of the species sought.

Kirti-kirti were restricted to rocky outcrops and adjacent ranges. This determined their greater abundance on pediplains near Parnngurr; they were scarcer around Punmu where they occurred near isolated mesas. They were hunted by vehicle and/or walking with rifles and fire used as tools. In the late 1980s, several Martu men occasionally speared Euros but this was not reported in 1990. Burns were lit to direct animals, for instance upslope along a rocky creek line or sometimes the opposite to keep them away from uplands. Mitchell Panaka, a middle-aged man and proficient hunter, described one hunt from Punmu:

> An older man [Ditch Williams] and I were driven east of Punmu, dropped off at Ngakilajikujarra. We walked south, flushed a male and female *Kirti-kirti* from the Mulga stand. We followed them, Ditch had to slow down, I walked on alone. The *Kirti-kirti* pair went from thicket to thicket. I made a fire to move them. I was walking steadily. They stopped in the shade, I had a rest. One time they stopped, I crept in close; I shot the male and followed this one. It went over ground with small stones and in Mulga. Tracks were hard to see. I directed it away from the hill. The male did a big circle back to near where we had first seen it. The motor car saw that fire, it picked us up. We followed the *Kirti-kirti*, it got tired. Its feet burnt on the sand. I shot it from the car. It was a long day. It was a hot day. (paraphrased in FW diary 16/9/90).

This took about six hours on a day with maximum temperature of 38°C. The skill and stamina required to track was apparent. The above extract also indicates Martu hunter's knowledge of aspects of *Kirti-kirti* ecology—its sex differences, habitat preferences, other observations would also have been made associated with the species it ate, seasonal condition and more. Effective hunting relied upon this knowledge. In turn, the act of hunting refreshed and refined a hunter's knowledge. The point is that indigenous ecological knowledge of a species was integral to the practice of hunting and killing it. Practice and knowledge reinforced each other.

5.7.2 *Kipara* ~ Bustard

Kipara were also of high importance to Martu subsistence patterns. People frequently spoke of them, they were often cited in bush food lists (Tab. 5.7). *Kipara* were collected on more trips than *Kirti-kirti*. But with a mean weight of 4 kg (App. 6) Bustards were about one fifth the mean weight of a Euro. Yet, due to the high number (32 birds) collected, an estimated total weight of 132 kg was shot compared with 188 kg Euro (Tab. 5.9) during the observation periods.

Generally, vehicles were critical to the hunting of *Kipara* as the hunter required vehicle cover to get sufficiently close to shoot them. They were very wary of people on foot and flew off. On occasions, they landed and were pursued again. In pre-colonial times, they were stalked and maimed whilst taking off; non-returning boomerangs were used. Birds were often seen in pairs and hunters tried to shoot both animals, not always successfully. At times, Bustards also gathered in large flocks, thus it was possible for Martu to shoot large numbers of them. As Christine Sammy recollected at Parnngurr:

> We had a big mob of turkeys in winter time. There was one mob stopping over there [NW beyond creek], another mob near Karlkan Karlkan way. We had a freezer full. Don't get many Bush turkeys in summer, sometimes you get them but have to go a long way. They don't stop here around camp. (18/10/90, FW diary 90/7:80)

On one occasion, a group of eight people from Parnngurr had killed 28 birds in one trip with one rifle in one vehicle (12/8/90 S. Hanson, school teacher, pers. comm.). These were not included in Table 5.9 as they were hunted in the cool season when I was not in the region. Available refrigeration, the need for food and an abundance of a prized game species were suggested to explain the large number killed.

Kipara were attracted to the early seral stage of burn areas. The fruiting plants *Kipara* sought were well known to Martu as several of the fruit species such as *Solanum centrale* and *Scaevola parvifolia* were also eaten by Martu, particularly by children. This quote conveys the interplay between game, its food species and a hunter-gatherer:

> Bush turkey going for hunting. He's looking for a feed. He is sniffing and looking for berries, this is his favourite feed, *Jinyjiwirrilyi*. When you go out there you can see the turkey tracks, then you know the berries are around at the same time. You can eat lots of them. He's nice and fat. This is a good feed time. (Tinker 2006:8)[92]

[92] *Jinyjiwirrilyi ~ Solanum centrale,* Desert raisin

During the study period, early seral burns were common in proximity to Parnngurr and Punmu where Martu had lit them whilst hunting (Ch.8.2.2). Thus, certain Martu practices contributed to the promotion of food resources for *Kipara*. The positive ecological consequences of these actions for Bustards contrasted to the population pressure imposed by hunting them. Martu subsistence was a complex system where there was an interplay between positive or negative effects on biodiversity and species conservation.

5.7.3 *Parnajarrpa* ~ Sand goanna

Parnajarrpa was the most consistent and reliable resource species collected by Martu, particularly Martu women. It was the species most frequently remembered as a bush food and most frequently collected (Tab. 5.7). *Parnajarrpa* were reported to be collected on 31% of unaccompanied trips and 64% of accompanied trips. An average of 4.4 animals was collected per trip. More than 190 *Parnajarrpa* were killed during the 80 day study period. (Tab. 5.9).

Calculations for rates of Sand goanna hunting by Martu women hunters were based on a subset of data from foraging trips where the largest weight or the only species sought were Sand goanna (Tab. 5.11).

Table 5.11 Rates of Sand goanna hunting on foot by Martu women hunters in 1990

	Mean	SD
search, track, collect & return time (hr)	3.0	1.0
numbers of hunters in foraging group who got goanna	3.3	1.3
numbers of goanna/hunter/hr	0.7	0.2
kg goanna/hunter/hr	0.3	0.1

n=93 Sand goanna; Only goanna hunts that had no or few embedded activities were included; No goanna opportunistically collected during driving were included; Search, track, collect and return time to and from dinner camp (i.e. not including drive time to and from dinner camp or time at dinner camp); Nos hunters in foraging group who hunted goanna (rather than the nos hunters/goanna or total size of the group at a dinner camp. On-site weighing for un-gutted goannas.

On average, Sand goanna were hunted at a rate of 0.3 kg/hunter/hour (Tab. 5.11). This is substantially less than the slowest rate recorded for Euro and a third of the rate recorded for Cat hunting (Tab. 5.12). These differences are to be expected because of the relatively small size of Sand goanna. Notably, there was a comparatively low standard deviation indicative of the relative reliability of success in Sand goanna hunting.

Detailed ethnoecological information on the species (weights, gender, body lengths, seasonal patterns, behaviour and habitat distribution) was recorded during this study from Martu and researcher observations. For instance, it was found that the mean weight of male *Parnajarrpa* was 446.9 g and females 301.5 g (n = 75 males, 46 females) and that the sex ratio of captured animals was females to males 1:1.6. The mean weight of 121 animals weighed was 387 g. They were smaller than the other major bush meat animals discussed here. The reliability and predictability of their distribution compensated for their small size. They were widespread and appeared to be abundant in sand plain and dune habitats, both dominant land types in the Sandy Desert bioregion.

Parnajarrpa hibernated in the cool months. In 1990, they emerged from hibernation when temperatures warmed in August. During the study, it was noted that either side of the emergent period the greatest temperature change was in the minimum temperature (10.1–15.8°C) suggesting this was a hibernation release cue.[93] Martu referred to the Spring-like period as *Tuulparra* and a subperiod within it was *mulyatumal* (*mulya* literally nose) i.e. '*Parnajarpa* sticking their noses out the ground' *Parnajarrpa* were active after hibernation and, although they were leaner, keenly hunted by Martu. The prime season for collecting fat *Parnajarrpa* was soon after one of their favoured food resource, termite alates flew and dispersed, this was after *kuluwa* extended periods of rain in the hot season. Other insects including moth larvae and grasshoppers were found in their guts. Gravid *Parnajarrpa* females burrowed deeply in dune slopes and sand drifts near the end of the hot season, Martu favoured these too.

Martu women's hunting techniques for *Parnajarrpa* varied according to the seasonal phase of the animal. In warmer months, when animals were active, Martu tracked and excavated them from their burrows; when animals were hibernating women spent more time sounding and digging burrows to locate which, if any, burrow in a burrow complex they were in. Metal *wana* had replaced timber digging sticks as the essential tool. Fire was the other tool commonly used to hunt *Parnajarrpa*. Small burns were lit to clear vegetation, expose burrows, allow for access to walk and track readily, and to provide diverse regenerating habitats for more *Parnajarrpa* and other species. The frequency and size of these burns created a fine-grained mosaic.

Parnajarrpa hunting was interwoven with other activities. *Parnajarrpa* rarely needed to be active pursued (unlike Cats), if foragers saw another desired resource species they diverted to collect that species then returned to Goanna hunting. Also, women moved from collecting solo to working in pairs or small groups when necessary. For instance, if one person was digging *lunki* then another needed assistance to sound and watch *Parnajarrpa* burrows they would combine their labour. This opportunism in multiple species collection and shifting cooperation were typical of women's foraging patterns.

5.7.4 *Pujikatu* ~ Pussy cat, Cat

Cat hunting by Aboriginal people had been poorly researched before this field work which revealed that Martu women actively hunted *Pujikatu*. By weight, they were the largest species hunted by women (mean 3.6 kg, n=16) (App. 6). In total, an estimated 129 kg were hunted during the 80 day period on accompanied and unaccompanied trips (Tab. 5.9). *Pujikatu* were collected on 19% of all hunting trips. They had a lot of meat and their fat content often evoked cries of glee. Cat hunters were much admired amongst the Martu population.

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[93] Based on my daily field recordings of maximum and minimum temperature.

Thirty eight *Pujikatu* were killed during the study (Tab. 5.9). At times, the incidence of *Pujikatu* hunting was high e.g. at Parnngurr, during 28 days in August/September, 23 animals were killed on trips with an average of 2.2 hunters. By contrast, at Parnngurr in March and April only two Cats were killed. The fluctuating intensity of *Pujikatu* hunting was partly determined by the availability of other bush meat species. This identifies the influence of one species upon another in the subsistence system and again, the high variability in species collection patterns over time.

The rates of cat hunting by Martu were calculated (Tab. 5.12). By contrast to hunting Sand goanna, hunting Cats was a more focussed activity as less prey-switching occurred. Thus, the search, track and collect times were easier to add than for goannas.

Table 5.12 Rates of Cat hunting on foot by Martu women hunters in 1990

	Mean	SD
search, track, collect & return time (hr)	3.5	1.3
number of hunters in foraging group who caught Cat	2.2	0.9
number of Cat/hunter/hr	0.3	0.3
kg Cat/hunter/hr	0.8	0.8

n=23 cats; Search, track, collect and return time to and from dinner camp (i.e. not including drive time to and from dinner camp or time at dinner camp); On-site weighing of gutted, uncooked cats.

On average, Cats were hunted at a rate of 0.8 kg/hunter/hour (Tab. 5.12). This per kilo rate is about two-thirds higher than that for Sand goanna (Tab. 5.11) but it was far more variable with a wider standard deviation. The reason for this high standard deviation in Cat hunting rates was unknown. It was not strongly influenced by season or number of cats hunted in one trip. Cat behaviour, hunting terrain and possibly hunter skill may have influenced it. Notably, fewer women hunted Cat compared to Sand goanna (Ch. 6.2.4). *Pujikatu* hunting required strong tracking skills, stamina and fitness. The fastest hunting time and rate was four Cats killed by 2 women in 9 person hours (time from dinner camp search start to kill = 0.4 Cat/hunter/hr, 1.4 kg/hunter/hr).

Pujikatu were found across many land types, they required thick shade, particularly in hot periods. In the Punmu region, Martu women said they were densest in *Piwulkurru* on the eastern margins of Lake Dora palaeodrainge line.[94] They were preferentially hunted on sandy areas due to the ease of tracking. Trips were made specifically to hunt Cats. At times, there were repeated visits to an area where a litter of younger *Pujikatu* had dispersed. For instance, in September 1990, three trips were made to the Kunji Kunji area. Sand tracks were the main identifier that an animal was present (as with most Martu game species).

[94] *Piwulkurru ~Melaleuca glomerata* stands

Pujikatu were generally hunted on foot. Fire and domestic Dogs were the main hunting aids.[95] Burns were lit to flush a *Pujikatu* from its cover in a thicket, log, tree fork, termitaria or other hollow and sometimes to direct animals. They were tracked until the animal tired; the hunter closed in then gave chase and ran until the Cat went to cover. The final chase was usually less than 200 metres. Encircling fire, crowbars or other tools were used in the final kill. Sometimes, Martu women used Dogs to hunt Cats. Dogs would remain at heel then be sent forward to find, flush and chase an animal to cover. Dogs could not be used in the hot season as they burnt their pads; however, Cat chases were shorter at this time as Cats too burnt their pads on hot sand. Appendix 8 records a detailed account of a trip by Martu women using fire and Dogs to hunt Cat.

5.7.5 *Kamalpa* ~ Camel

Three Camels were killed for meat during the 80 day study period (Tab. 5.9). These kills were at times when meat was in exceptionally short supply at Parnngurr and Punmu as fortnightly store loadings were too small or late. The weight of other bush meats was insufficient for the numbers of people present or the effort of collecting other bush meats was a deterrent. The former reason explained the killing of two Camels at Parnngurr and the latter reason the killing of one Camel by a small group of young men at Punmu.

Martu men hunted and shot Camels from vehicles. Camels were butchered on site and selected meat cuts returned to the settlement. In 1990, the animals were frequently seen, particularly near Parnngurr where they sought water and feed along the Rudall River. On one occasion in September 1990, I observed a herd of more than ninety animals at Kurta Kurta claypans.

In 1990, many Martu disliked camels and camel meat. As Patricia Purungu said:

> Camel is bad meat, it’s only for when you are hungry. It gets stuck, too dry, a strong taste (FW diary 14/8/90, 90/7:42)

Women foragers were afraid of them, they avoid areas where they were known to be and quickly returned to their vehicle if tracks were seen when they alighted (see App. 8).

Conversely, from the safety of their vehicles, Martu expressed a fondness for the animals and often spoke of the association between Camels and Christmas. In view of the abundance of Camels and people’s need for food, it was surprising that more Camels were not hunted in 1990. Better preferred bush meats took precedence during the study.[96]

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[95] Not all Domestic dogs (*Jarntu*) were suitable. The Taylors and two other families had deliberately bred Dogs to hunt Cats. These were Blue-heeler - terrier crosses that were medium-small, agile, hardy, and obedient yet independent. These *Pujikatu Jarntu* were much sought after by other Martu.

[96] By contrast, on a recent webpage, the butchering of Camels for meat by young Punmu men is described as a regular event (Punmu school teacher c. 2007) indicating Camel has become a more popular bush meat.

5.7.6 *Marlu* ~ Red Kangaroo and *Karlaya* ~ Emu

Marlu and *Karlaya* were cited a moderately high number of times in bush food lists or other records (Tab. 5.7). They were the largest of the native large game animals, 46 and 38 kg respectively (App. 6). Yet, neither species was hunted during the 1990 study. No tracks or sight of Emu was observed or reported; only one Red Kangaroo was reported to be seen by Martu. In 1986–89 field work, tracks and sightings of Emu and Red Kangaroo were also rare and the animals were not recorded to be killed. However, Punmu coordinator, Louie Warren (pers. comm. 26/1/90) reported that nine Emu had been killed in one week at Punmu in 1989. These observations indicated that both species were uncommon or intermittent visitors to the region and were relatively more common in the East Pilbara.

On one occasion in 1990, Martu and the researcher sighted a Red kangaroo north-east of Parnngurr. All people in the vehicle became silent; unusually neither *kuka* nor *Marlu* was mentioned. We quietly watched the large, male animal as it bounded close by but no interest in hunting it was expressed. Later, when enquiring about this incident, the brief whisper was it was a *ngunu* (spirit). I did not ask more. Possibly, this animal was associated with a senior Martu leader who had passed away the previous year. Records of *Marlu* associated with a reburial and in men's Law business are mentioned elsewhere in this dissertation. On these occasions, the animals were killed near Jigalong. Tonkinson (1991) noted the role of *Marlu* and other specified animals in burial and reburial rituals.

5.7.7 Firewood (*waru*) and other non-food plant resource species collected during the study

Food species constituted the main resource group consumed by Martu, thus their collection was most intensively examined in this study. However, Martu utilised biological resources for a variety of other purposes. Walsh (1989) described medicinal, tobacco and ash, artefact, firewood, shelter, decorative and other plant uses observed to be utilised by Martu in 1986–88.

Waru was the major non-food resource collected by estimates of frequency and volume.[97] At the time of the study, Martu predominantly cooked on hearth fires and most households had several hearths for warmth, sociability, security and other purposes. Sixteen percent of the unaccompanied trips from Parnngurr were principally to collect firewood (Tab. 4.2). Firewood collection was a specific job of CDEP workers, individuals independent of CDEP also collected firewood. Timber species collected at Parnngurr were mainly Mulga and Desert bloodwoods.[98] *Senna* spp and other shrubs were collected for small fires or kindling. Firewood quantities collected ranged from an armload by someone on foot to a trayback load in a one tonne utility vehicle. Vehicle

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[97] *Waru* ~ firewood; hearth fire; bush fire

[98] Mulga ~ *Wanari, Acacia aneura; Warlji ~ Corymbia opaca,* Desert bloodwood; *Junturu~ C. deserticola,* and *Punara ~ C. chippendalei*, Sandhill bloodwood. *C. opaca* collected in greatest weight, *C. deserticola* uncommon and *C. chippendalei* on dune crests often inaccessible to vehicles.

trips to pull and transport timber occurred at least once a week from Parnngurr. Parnngurr vehicles transported an estimated 1.75 tonne in a six week period during August–September 1990. Martu appeared to be conservative in their use of timber compared to tourists who lit large campfires. Martu consistently had small hearth fires being cautious about burning people and wary of firelight attracting *jinakarrpil* (evil spirits). Firewood appeared to be one resource used thriftily in contemporary times.

In 1990, the impact of firewood harvesting near settlements was dispersed. There was visual, on ground evidence for some localised thinning of Mulga near Parnngurr. However, this was not uniform; in particular, the Mulga-dominated creek line just east of the settlement was undisturbed as it was prohibited to non-initiated people. Most vehicle collection was done more than ten kilometres from the settlement. Only dead, dry timber was taken; standing trunks were sometimes pushed with a vehicle. The provision of dead timber was possibly a purpose of some ignitions with fires penetrating Mulga stands. At Punmu, firewood timbers were scarcer than at Parnngurr. One of the few stands of Mulga at Punmu was by the airstrip; by 1990 it was observed to have been heavily harvested and therefore the patch was likely to be highly vulnerable. Mulga is an abundant, widely distributed species but relatively slow growing. The Mulga populations harvested by Martu were on the north-east boundary of the species distribution in the southern Great Sandy Desert bioregion (WAH 2007). In this study, the weight of firewood gathered by Martu was estimated to be about four times greater than the weight of native animals killed. In terms of biomass conversion (i.e. changing biological material from one form to another e.g. timber to ash or animal to human and faeces), firewood collection may have had a more significant impact than hunting.

The impact of firewood harvest has long been a concern in central Australia (Cane & Stanley 1985). Morse et al. (2002) found evidence for over-clearing due to firewood removal difficult to identify as it was confounded by clearing due to the intense vehicle track network near a settlement. He surmised that vegetation loss due to firewood collection was mainly an issue near long-established settlements with large populations such as Yuendumu. For Aṉangu at Mutitjulu, inside Uluṟu – Kata Tjuta National Park, Morse recommended a managed program of firewood collection but saw no evidence to justify exclusion of firewood harvesting. The need for firewood was recognised to be high, particularly for elderly people.

Timber artefacts were made by Martu men for customary purposes, to maintain their skills or sell on request to visitors. The incidence of collection of the raw materials was very low and unreported on accompanied or unaccompanied trips. *Wanari*, *Yilykunpa*, *Mulunturu*, *Yurungkura* and Bloodwoods were seen to be crafted as boomerangs, various dishes, hitting sticks and other artefacts.[99] Generally, it was branches or roots but occasionally single stems were cut. *Mulyarti* was valued for ceremonial and punishment spears and trade. Men travelled long distances into off-road areas to source

[99] *Wanari ~ Acacia aneura,* Mulga; *Yilykunpa ~ A. rhodophloia,* Minnieritchie; *Mulunturu ~ A. sericophylla* ex *A. coriacea,* Wirewood; *Yurungkura ~ E. camaldulensis,* River Red Gum; *Mulyarti ~ Acacia jensenii*

patches of this species and more than 20 stems were cut on one trip (L. Warren, Punmu coordinator, pers. comm. 26/1/90). It is a single stemmed plant and is killed by harvest. On Martu lands during the study, it was one of the few plant species likely to be over-harvested in targeted areas; however, it is widely dispersed through the Great Sandy Desert bioregion and so unlikely to be vulnerable to over-harvest on a regional scale.

Timber was also collected by Martu to provide shelter. Groups of Martu men and women sought shade and protection in windbreaks and bowers away from the fixed structures of their houses. Additional shelter was needed at Parnngurr in early 1990 to house people who had left Punmu following the accident that killed eight people. *Wanari* trunks and *Piwul* stems were cut to form uprights.[100] One utility tray load was reported in March, but the frequency of collection was low, the total volume of wood used for shelter was a small proportion of that taken for firewood.

Martu adults frequently collected tobacco and ashes to activate nicotine absorption. They were the most highly prized and coveted plant resources used by Martu. *Juntilarr* was gathered in large armfuls after rainfall. Bark from burnt *Tinjirla* trees was preferentially collected for ashes. Other substitutes were also occasionally gathered.[101] Quantities were unrecorded in this study, partly because they were so were jealously guarded and often hidden. Medicinal plant collection did not occur on accompanied trips and was unreported from unaccompanied trips. However, at Parnngurr, solutions of *Warlji*, *Kalpari* and *Nayju* were observed in drums in preparation as skin washes.[102] At least twenty-five species of medicinal plants have been recorded as used in pre-colonial times on Ngaanyatjarra lands to the south of Martu (Reid & Betts 1979).

In 1990, there was no regular commercial production by Martu based on timber products. This was unlike other Western Desert groups who through the 1990s regularly produced and sold timber artefacts (Nugent 1998). In the late 80s and 90s, Martu occasionally took artefacts to Newman for trade and sale or one-off commissions of timber artefacts were made to researchers and other visitors. Senior Martu men actively discouraged commercial trade of significant artefacts (similarly, sale of paintings and craft that portrayed *Jukurrpa* were frowned upon). There was a strong reign of cultural conservativism in the late 80s and early 90s; Martu elders worked hard to maintain authority and traditions. Consequently, with little or no commercialisation, risks of species overharvesting were reduced.

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[100] *Piwul ~ Melaleuca glomerata. Piwul* is a dominant and abundant species fringing the saline playas.

[101] *Juntilarr ~ Nicotiana benthamiana*; *Tinjirla ~ Eucalyptus vitrix*, Coolibah. Other *Nicotiana* species were collected for chewing tobacco.

[102] *Warlji ~ Corymbia opaca*, Desert bloodwood kino exuded from bark; *Kalpari ~ Dysphania kalpari and Nayju ~ D. rhadinostachya.* The *Dysphania* spp are both ephemeral, disturbance response species common after rainfall. Martu recognised the two as closely related and described *Kalpari* as the ‘male’ and *Nayju* as the female.

5.7.8 Reasons for selection of one species relative to another

Why were Camel, Euro, Bustard and Feral Cats the major species harvested during the study? Was it cultural value, ecological availability or other factors? Explanations of people's reasons for selecting different species contribute to both the identification of species that may be intensely harvested and understanding of changes in the resource inventory over time.

The above discussion of significant species collected by Martu introduced an array of reasons why they chose certain species. Inter-specific choice was greatest in times of both relative resource abundance and when there were sufficient people and vehicles to harvest. Individuals had preferences for certain species and made choices based on a variety of factors. These preferences contributed to the targeting of different species. Alternately, when resources were relatively scarce, opportunistic collection appeared to increase.

Decisions not to collect a certain species or individuals of that species were the antithesis of the reasons identified. These too were informative in terms of the choices Martu made. Some of these were speculated upon in this statement:

> Martu don't eat everything called *kuka* all the time, once when I was out with some Martu men they picked up a *Kataputa* (Thorny Devil), said it was *kuka* but left it, I asked "why didn't you eat it?", "no good" they said. It could have been too skinny or too small or it would have been better for their status to get a large snake (Louis Warren, Punmu Coordinator, pers. comm. 22/3/90)

This suggested that the size, fattiness and weight of an animal affected decisions that may have contributed to a hunter's status.

During the study, numerous reasons were found to shape species specific choices. The reasons that explain why Martu people chose one species over another have been summarised (Tab. 5.13). Chapter 6.2 will examine the involvement of different groups and individuals in customary harvest and motivations for their involvement. There was some overlap between these species specific reasons and wider motivations to hunt and gather. Socio-ecological reasons related to the availability of animal species in time and space will be expanded upon in Chapter 7.

These reasons had an influence on the species targeted or the species opportunistically collected. In turn, they influenced the spatial and temporal patterns of subsistence and associated land use. It was these factors that underpinned the utilisation of the resource species array and the way that array changed over time. Conversely, the other land use and management activities of Martu and other parties on Martu lands (e.g. mining personnel, tourists, national park staff) had an impact on these factors which filtered through the subsistence system to influence the species and species quantities harvested by Martu.

Table 5.13 Socio-economic and socio-ecological reasons for choices between species by Martu

Socio-economic reasons
Taste—fat, sweet, moist
Weight—high weights sought (relates to sustenance need and hunter status)
Ease of collection / effort (sought low effort for high weight or nutrient return)
Ease of preparation
Historical association or nostalgia
Specific species required in rituals
Taboos or restrictions on other species
Storage and refrigeration suitability
Socio-ecological reasons for the choice of one species over another
Proximity and accessibility of habitat
Spatial availability
Abundance
Seasonal availability (within a year and between years)
Amenability to wildlife management

5.8 Ecological sustainability of species hunted

Scientific assessments of the sustainability of species hunting require two major sources of data—hunting parameters and wildlife population parameters. This study has gathered data relevant to the former. Information for the latter is descriptive based on field observations and ethnography or sourced from the literature. Quantitative data published for specific native wildlife populations in desert regions are scant. Specific faunal population studies have generally been for threatened species or feral species. The paucity of population data means that it is necessary to speculate on the sustainability of harvest with available information.

It is important to remember that Martu had returned to their lands in the early 1980s (Tab. 2.5). Therefore, at the time of this study, wildlife populations had endured the negative effects of hunting for less than a decade, conversely, had probably benefited from the positive effects of Martu feral animal hunting, burning and other landscape manipulation for this time too.

Relationships between hunting rates and species population responses are complex and not a direct correlation (Caughley et al. 1996). Certain species are resilient to hunting at particular intensities whilst other species are vulnerable. Population characteristics including high fecundity, young-maturation, short generation times and widespread distributions contribute to species resilience. Certain Australian species can withstand sporadic reductions in population numbers through hunting or other perturbations because density-dependent population processes compensate for losses of juveniles or adults (Fordham et al. 2007). These density-dependent processes are possibly an adaptation to high variability in ecological conditions where perturbations such as dry periods or flooding are common. However, each density-dependent population has a point at which it can no longer compensate individual losses.

5.8.1 Hunting rates and methodological issues in their calculation

Hunting rates (kg animals/hunter/hour) were presented above for Sand goanna and Cat (Tab. 5.11 and 5.12) and average weights per trip when harvested for 18 species (Tab. 5.9). Changes in hunting rates or 'return for effort' are commonly accepted measures of the sustainability of hunting over time (Tab. 1.4). Future comparisons on Martu lands with the rates above identified for these species may indicate changes in the species populations. However, caution is required.

Several methodological issues were encountered in the course of these calculations. These have a bearing on Australian arid zone studies using hunting rates. Although, these issues are a consequence of foraging strategies that may occur amongst other Aboriginal groups, they could be particularly amplified in the case of Martu living in a highly unpredictable environment. The Martu strategy of high opportunism ('collect something when you encounter it') resulted in frequent prey species switching ('leave that track because this better species is here now'). Consequently, time estimates for a single species were confounded as often several species were monitored, pursued or collected. Secondly, there was high opportunism whilst driving and/or trips for other purposes. Consequently, there was no walking search time within these collections whereas, it was in other collections. Thirdly, Martu women demonstrated a socio-economic strategy of high fluidity between group and solo hunting (Ch. 6.2.3, App. 8). Women foraged alone ('I'm going after this animal') and cooperatively ('come and help me get this animal'). Consequently, time estimates for one animal sometimes included one hunter, and at other times included up to four hunters. These issues were dealt with above by the exclusion of opportunistic or embedded ('switched') species collections and use of hunter group size. Finally, harvest rates for species collected by men could not be recorded as the female researcher could not go on trips with men. Comparisons with other existing or future studies of species foraging rates must recognise these factors that shape the data sets. Furthermore, longitudinal comparisons must be cautious about social changes (particularly hunter-gatherer skill levels and motivations), technological and other changes (Tab. 10.3) in comparing rates from one point of time to another.

The complexity of real life subsistence harvest in a diverse, extremely variable desert human environment confounds calculation of species harvest rates. This is why some ecologists chose an experimental harvest method to assess potential rates and their sustainability (Whitehead et al. 2006) whilst others analysed commercial trade figures for harvest assessments (Griffiths et al. 2003; Koenig et al. 2005) and most focussed only on a single species.

5.8.2 Martu views on wildlife declines and hunting as a causal factor

During the study, Martu frequently expressed concerns that there was not enough *kuyu* and *mayi* to be found.[103] In their view, in comparison to *pujiman* times, there was less

[103] *kuyu* ~ animal meat, animals, meat food; mayi ~ plant food; *pujiman* ~ bushman

bush tucker; they said there were fewer animals and plants. As Grant Judson, a middle-aged competent Martu hunter, said:

> Years ago, when my father was alive there was plenty of meat for everyone, but now it's finished. We'd go around and eat *Jangan*, seed and nuts, we'd hunt for snakes and cats, we'd kill and eat them, also *kitirru* (Grant Judson c.1987 Thieberger & Gallagher 1987:12)[104]

Martu never volunteered hunting as a principal cause of species declines. When explicitly asked if there were fewer animals due to hunting intensity, individuals commonly responded that they just needed to hunt somewhere else further away. This was one attraction of new vehicle tracks for mineral exploration. It also explained the regular off-road routes of hunting trips and instigation of 'new tracks' by Martu drivers (Ch. 7.2.4). One Martu leader lobbied for the grading of a new major hunting track between Punmu and Parnngurr (Ch. 8.4.1).

Expert women hunters also attributed species shortages to insufficient burnt ground. For instance, when I asked Nyapi Karimarra about our poor returns from a hunting trip near Kunji Kunji she replied:

> no *Parnajarrpa*, no *nyurnma*, not enough burnt ground, got to burn that *warta* (1/9/90 FW field diary 90/5:51)[105]

Individuals identified multiple causes for these declines. People were very familiar with a highly dynamic landscape due to rainfall and fire patterns. Also, middle-aged and older people spoke of substantial species declines experienced for small to medium-sized mammals which had been major meat sources. Their views were affirmed by the information in Table 5.6, which was collated from historical literature sources and this study. Martu explanations alluded to profound and recent changes in their cultural systems and landscapes (Ch. 8). Whilst they observed the link between the 'old animals' declining and Cat and Fox predation, this was accepted as a part of a natural order; their interpretations were based on processes within the *Jukurrpa* with a very different ontological basis to scientific interpretations. Furthermore, they attributed the scarcity of bush food species to factors other than hunting. In their view, the converse was true, traditionally-orientated people believed hunting, gathering and the manipulation of country and resources to be critical to their perpetuation (Ch. 8).

5.8.3 Potential vulnerability of significant native animal species to customary harvest

During the 1990 study, Martu killed eight Euros in 80 days (Tab. 5.9) by an average group of 3.1 hunters (Ch. 5.7.1). Considerable caution must be used in converting this to an annual figure because of temporal variability in hunting (e.g. an additional seven Euros were killed in an intensive 14 day hunting period but could not be included in the data sets Table 5.9). From these two figures, it is estimated 36–182 Euros were killed

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[104] *jangan* probably *tjananga* ~ *Trichosurus vulpecula*, Common brushtail possum (see Burbidge et al. 1988); *kitirru* unknown animal species

[105] *Parnajarrpa* ~ *Varanus gouldii*, Sand goanna; *nyurnma* ~ recently burnt ground or area where charcoal is visible and regrowth small; *warta* ~ plants, senescent plants

per year within an estimated 2000 km^2 area around Parnngurr and Punmu. Euros had persistent rather than boom-bust populations. However, the actual area would be considerably less as Euro habitats in hills, ranges and pediplains were more limited. In a 50 km radius of Punmu, mesas and rocky areas were restricted land units (Fig. 2.7). Near Parnngurr and associated uplands of McKay and Broadhurst Range they were more widespread. Euro populations near Punmu were particularly vulnerable to localised over-harvesting.

Comparative figures for Euro are scarce. Across Western Australia from 1991-2004, commercial kangaroo hunters took an estimated 15,805 Euro pa (Thomsen & Davies 2006:37). In SA, ten harvesters each took an average of 2.6 Euros each night for an average 152 harvest nights per annum (Thomsen & Davies 2006:51). On the Anangu Pitjantjatjara (AP) lands, Euro were reported to be widespread, locally common and particularly abundant (Robinson et al. 2003:209).

Bustard was a bush meat of high significance to Martu. During the study, thirty-two birds were hunted over 80 days (Tab. 5.9) of those, 27 birds were killed near Parnngurr in March 1990 (App. 4). Additionally, 28 birds were killed in a one or two day period outside the study time. The species is highly nomadic and sometimes flocked in large numbers (up to 30 birds); at other times, only one or two birds were seen. With annual hunt estimates for this species, considerable caution must be used but scaling up from the quantified period, at least 146 birds were killed per annum, probably considerably more. Grice et al. (1986) mapped Bustard density indices in the northern GSD in two classes 1–4% and 4–10% frequency km^{-2}.[106] A rough comparison of Martu offtake compared to these densities indicates the Martu figures to be orders of lower than the Bustard density indices. Furthermore, there was a complex interaction between hunting, Martu burning and the creation of suitable feeding habitats for the birds. This confounded a simple relationship between Martu and the species. As a nomadic species, other threatening processes (wildfire, predation) influenced Bustard vulnerability across its range, including hunting by Pintupi, Kukatja and other neighbours to Martu (Fig. 1.1).

In the 2000s, Bustards are classified as ‘near threatened’ nationally, ‘vulnerable’ in Western Australia and in the arid zone was one of 29 bird species of major conservation concern (Whitehead et al. 2001). Its regional status on the AP lands was designated ‘endangered’ (Robinson et al. 2003). Based on the above evidence of Martu hunting, it should be a high priority species for further research and, possibly, management in the region. By contrast, Bustards were considered to be secure in the GSD bioregion and of a lower priority for future research (McKenzie et al. 2002:327).

Sand goanna were enigmatic because of their apparent resilience to intensive Martu hunting. They were the species hunted in the greatest number by Martu during the study (Tab. 5.9). It is estimated that at least 867 animals per year were killed in areas near Parnngurr and Punmu. Hunting frequency was relatively consistent throughout the

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[106] Derived from aerial surveys of kangaroos between 1976 and 1984.

study periods. They appeared to be abundant. No estimates of Sand goanna demographics or range size in desert regions could be found in the literature. On the AP lands, Sand goanna were widespread and abundant (Robinson et al. 2003:306). They are unlisted as a species of conservation concern. Potential declines were likely to be localised around Martu settlements but perhaps initially ameliorated by medium to fine-grain burn patterns, Martu said they were a species that were more plentiful after rainfall on early burn seral stages.

Of other varanid lizards, nine Perenties and seven Yellow-spotted monitors were collected in the study observation periods (Tab. 5.9); by contrast, another six Perentie were collected in 14 days when I was at Punmu. Estimates of 41 Perentie per annum and 32 Yellow-spotted monitors per annum killed were made (the latter probably being an underestimate). Perenties are the second largest lizard in the world. Mean weights recorded in the study were Perentie 2.9 kg (n=4) and Yellow-spotted monitor 1.2 kg (n=3) (App. 6). Both varanids were keenly hunted despite the danger and skill required to get them, especially without a rifle. Their tracks were clearly visible and always pursued by Martu when walking or driving. Both species were associated with rocky areas and appeared to be restricted in the region. In the early 2000s, neither was listed as a vulnerable species; however, it is likely that localised depletions occurred due to intensive hunting. Prior to this study, Yellow-spotted monitors had been unreported so far eastwards (L. Smith, WA Museum pers. comm. 1991); it is likely they were on the eastern margins of their distribution.

Of the three python species hunted by Martu (Tab. 5.7), three Woma pythons were killed during the 80-day quantification periods (Tab. 5.9). All species were uncommon but prized. Stimson’s and Black-headed python were also killed when tracks were sighted (1986–90 observations). In the early 2000s, Woma has been listed as a species at risk and specially protected (Kendrick 2001a:407). All pythons were probably of moderate vulnerability to Martu hunting.

An additional species of conservation concern on Martu lands was the Echidna. Ethnographic information reported this to be a highly prized species that was once common but rare during the study. No animals were reported to be observed or collected by Martu during the field study. None of its distinctive tracks were sighted by the researcher in the 1986-1990 field times. On AP lands, it was widespread, at low densities, apparently secure but with little information on threats (Robinson et al. 2003:207). This was a species requiring further research attention on Martu lands.

Five species reported to be hunted by Martu were scientifically listed as species at risk (Kendrick 2001a) that is, Great desert skink, Greater bilby, Mulgara, Bustard and Woma python. Hunting of the first three species appeared to be incidental during the study and principally for demonstration or nostalgic purposes rather than sustenance need (Ch. 6.3). The effort of excavating them was a major deterrent to more frequent hunting. Notably, warrens, scats, burrows and tracks of the three species were commonly observed within 50 km of Punmu and Parnngurr and further afield including between Wells 22 and 26 on the Canning Stock Route. [107]

In March 1990, Great Desert Skinks were collected on one accompanied excursion near Punmu. The location of warrens near Punmu was well-known to Martu hunters. One warren was surface cleared by fire then a team of five (including the researcher), systematically excavated holes 1.5 m wide to 1 m deep. They interchanged so only one person dug under the direction of Rosie Milangka; total digging time was 4 hours 5 minutes. The warren yielded 2 juveniles, 2 adults with a combined weight of just 500 g (Tab. 5.9). This was an extremely low return for effort. The elder who had instigated the burn and dig explained:

> I want to see *Jakura*. They are good *kuka*. I haven't seen Jakura for a long time. (Mary Panaka 25/3/90).

One Bilby was reported to be excavated by two women from Parnngurr in the cool season of 1990. This rare event attracted a lot of interest from Martu because an actual Bilby (rather than its tracks) had not been seen for a long time; no others were known to be collected (S. Hanson pers. comm. 23/9/90, 90-6:19). Ethnographic and observational research suggested that the three threatened species (Great desert skink, Bilby and Mulgara) were irregular hunting targets of Martu.

5.8.4 Weights of feral compared to native animals hunted

As distinct from harvest sustainability at the species scale, sustainability can be considered across vertebrate taxa. During the study, the largest hunted weights were for Camel, Euro, Bustard and Cat. It may be significant that two feral species were hunted. Total weights of feral and native animals hunted by Martu over the observation period were compared (Tab. 5.14). Feral Camels and Cats were separated because of the disproportionate weight difference between the two species. By contrast to the total weights, three individual Camels compared to 38 Cats were killed.

Table 5.14 Total weights of feral and native animals collected on accompanied and unaccompanied trips from Parnngurr, Punmu and Kunawarritji during 80 days in 1990

	Total weight (kg)	Percent of total weight (%)
Feral Camel	1650	74%
Feral Cats	129	6%
Native animals (all spp)	449	20%

Dingo was classed as a native animal

Table 5.14 shows that Martu killed dramatically greater weights of feral rather than native animals (1779 vs. 449 kg respectively). Camels contributed 74% of the total weight of animals hunted. Feral cats comprised a proportion of the total animal harvest

[107] Importantly, observations from this 1990 field work contributed to surveys on Martu lands by the Threatened Species Network (see O'Malley 2003) these are on-going to present (R. Paltridge pers. comm. 16/12/07).

weight (6%). The remaining 20% of weight was native animals. Feral Cats contributed 22% to the weight of animals hunted when Camels are excluded from the figures.

It could be suggested that Martu hunting positively contributed to the sustainability of native wildlife by removing a greater biomass of feral compared to native animals. However, potentially beneficial impacts at the species level were proportional to the impact on animal populations and probably varied from species to species. In the 1980s, Camel numbers were counted in low intensity aerial surveys of WA, NT, SA desert regions (Short et al. 1988). Of total estimated population, 50% was in WA (NT 30%). Aerial surveys conducted in the NT (1986, 1994, 2001) found ~10% population growth pa or a doubling of population every eight years (Edwards et al. 2004) which presumably could be applicable to Martu lands. The very low number of Camels killed by Martu in 1990 probably had a negligible affect in limiting local (e.g. 90 animals in one herd), regional or desert-wide Camel populations.

Feral cats have long been considered a major threat to desert ecosystems (Burbidge et al. 1988). They have been identified as widespread and secure (McKenzie et al. 2002; Robinson et al. 2003). The high intensity of Cat hunting by Martu women probably reduced feral Cat populations in proximity to the settlements and along primary travel routes. By extension, this may have reduced Cat predation pressure on native species contributing to the persistence of animal species threatened in part by carnivore predation (including Bilby, Mulgara and Great Desert Skink). These species are known to be threatened elsewhere in desert regions but were observed within 50 km radii of Martu settlements in 1990. This was also the speculation of several non-Aboriginal staff who lived in the settlements and were aware of threatened species and feral Cat effects (L. Warren and S. Hanson pers. comm. 1990) and later, Nano and McGuire (2006). Paltridge (2005) has independently affirmed this in predator–prey research in the Tanami Desert. It appeared that Martu feral Cat hunting had at least localised benefits for species biodiversity.

Criteria have been identified to assess plant species vulnerability to overharvesting (Cunningham 2001; Whitehead et al. 2006). All the plant species identified in Table 5.10 were abundant and widely distributed; entire plants were not taken and none were of rare or threatened status. Consequently, the above plants were ranked as low to very low susceptibility to overharvesting at 1990 harvest rates. In contrast to the threat of overharvesting, evidence in Chapter 8.2.5 suggests that fine-scale burning, soil tilling, thinning and seed dispersal practices associated with harvest by Martu had been critical to maintaining specific plants and plant part production.

5.9 Chapter conclusions and their relevance to co-management

The core subject of this chapter was the plant and animal resources collected by Martu. It brought the biological character of this dissertation into focus. Plants and animals are major points of mutual interest between Aboriginal people and Western ecologists. Similarly, biological resource management is one key topic critical to ecosystem and national park management. Overall, the chapter concludes that the intensive use and associated knowledge of plants and animal resources by Martu was of relevance to the management of Rudall River National Park and its ecosystems. It is later argued they should be a central topic of co-management collaboration (Ch. 10).

The objectives of the chapter were to document the biological resources harvested by Martu in contemporary times and to understand the patterns of species use in terms of numbers of individuals, weights and frequency of harvest. The study sought to explain the factors that shaped these patterns. Somewhat ambitiously, the chapter also asked whether hunting and gathering was ecologically sustainable. Two perspectives divide the answer to this question—human processes and resource species processes.

These objectives first required description of the species nomenclature and taxonomic groups recognised by Martu. Their concepts and language were found to be dominant on their lands in 1990. Familiarity with Martu names for plants, animals and their body parts was critical for the researcher and anybody who engages with Martu about them. Yet most ecologists, including this researcher, were trained in scientific concepts and Linnaean taxonomy. An early and essential step in co-management is the learning and articulation of Martu species names and taxonomies. Dictionaries, wordlists, interpreters and linguists now offer vital aids to cross-cultural ecological translation.

In 1990, these references were unavailable. The study learnt direct from Martu. They had many names and multiple ways of referring to a single species. Different language groups and several different classification systems shaped these ways. It was found that one system, the four way skin classification of people was extended to, or sourced from, certain animal species. A more utilitarian Martu classification system based on food groups was described. This system broadly grouped meat and plant foods then distinguished resources at equivalent to the species level. There were minor categories that were not subsets of kuka / mayi for example, caterpillar and grubs or sweet and highly prized goods. The Martu utility classification system was consistent with that reported for other desert groups (Cane 1984; Devitt 1988). There appeared to be a trend amongst younger Martu toward a simpler nomenclature that also incorporated English names and taxa with fewer Martu species specific names remembered.

Significantly, this research revealed diverse utilisation of natural resources by Martu in modern times. More than 43 animal and 37 plant species were collected in and about the study time. A mean number of 5.5 species were collected per accompanied trip (trips that were dominated by women foragers). Martu deliberately sought a variety of species. Reasons for this dietary breadth were manifold. A species rich resource inventory was a strategy suited to the unpredictability of desert environments where a species may be abundant for a short period then not available for weeks to years. Species switching and opportunism were both essential. The abundance of larger species appeared to be relatively low, so smaller more abundant species contributed the sustenance bulk required. Presumably, a diversity of nutrients and counter-toxins was sourced from diverse species. Chapter 6 examines motivations for customary harvest, especially the need for bush food compared to store supplies. These strategies appear to have contributed to the dispersal of harvest pressure across the suite of potential species. One implication of these findings for co-management is the need for Western ecologists and park planners to appreciate the importance of biological resources to Martu ecological knowledge, sustenance (Ch. 6), and land management-type practice (Ch. 8). National park management proposals to place heavy conditions on hunting (Ch. 9.2) potentially jeopardise Martu knowledge, practice and well-being.

The species richness of the 1990 Martu inventory was greater than that documented for other Aboriginal people in arid regions in the 80–90s. This may have reflected higher species diversity and wider habitat access on non-pastoral lands in Martu country compared to the Anmatyerr pastoral context of Devitt's (1988) comprehensive study amongst women. Men's foraging returns expanded the Martu data set. It is also speculated that the traditional skills and knowledge of Martu were exceptionally strong due to their recent contact history thus they were able to procure more species.

Of relevance to Park and ecosystem management was that Martu hunted a moderate proportion of vertebrate fauna in the major families. This flagged a potential influence upon this fauna. Alternately, it demonstrated that Martu had an applied ecological knowledge of this fauna, particularly mammals, and a wider suite of species observed in the course of customary harvest and other land uses. Undoubtedly, Martu utilised more biological resources than any other land user group in the region (i.e. miners, tourists, national park managers). It could be presumed that, in 1990, they had more detailed local knowledge of current (rather than extinct) species than even Western ecologists and land managers legally responsible for the region.

The relevance and application of indigenous knowledge of plants and animals to ecosystem survey and management has been argued in Australia and internationally (Williams & Baines 1993; Baker et al. 1993; Berkes et al. 2000; Horstman & Wightman 2001). A common recognition is that faunal knowledge is derived from *Jukurrpa* (Baker et al. 1993:82). It has rarely been stated, and perhaps is insufficiently recognised, that ecological knowledge was heavily reliant on active hunting and gathering. Therein is a dilemma for some ecologists. They desire the recording of ecological knowledge but raise concerns (even objections) about the activities through which that same knowledge is acquired and refined. This paradox needs recognition by Western ecologists and ecosystem managers in Australia. An outstanding feature of this Martu ethnoecological study was its focus on the practice as well as knowledge of hunting and gathering.

To the 1990s, attention to plant foods, medicine and other plant uses dominated literature on the utilisation of resources by desert Aboriginal people. There had been past debates as to the relative contribution of plants as to animals in the traditional subsistence desert diet with the belief that plant foods were dominant (e.g. Pate 1986; Smith & Smith 1999). However, contemporary studies identified the greater importance of animal foods in desert regions (Devitt 1988; Palmer & Brady 1991). This dissertation supports the latter findings.

In the 2000s, Aboriginal hunting in desert regions has rightly received some management and policy attention. Hunting pressure was identified as one of a suite of conservation and management issues on Anangu Pitjantjatjara lands (Copley & Robinson 2003). A project ‘Caring for bush meats’ to promote the sustainability of hunting was to be implemented on Anangu lands (Wilson 2004), its results were not published to 2008. Recent research into burning patterns in the Western Desert found hunting to be an underlying influence upon these patterns (Bird et al. 2005).

This chapter identified the animal species of highest significance to Martu to be Euro, Bustard, Sand goanna, feral Cat and Camel. These were both targeted species and opportunistically collected. Copley and Robinson (2003) independently listed Red Kangaroo, Euro, Emu, Bustard, Perentie and Sand goanna as species regularly hunted by Anangu. The lists differed in that Emu and Red Kangaroo were less often reported or hunted by Martu during the 1990 study. Large weights and/or high frequency of return (indicative of species abundance) seemed to be the major factors shaping Martu people’s species choice. Socio-economic and socio-ecological influences upon species choice are examined in Chapters 6 and 7.

Quantitative records showed the high significance of varanid reptiles with five species hunted, two in large weights (V. giganteus, V. gouldii). Sand goanna were also a major resource species to Anmatyerr women (Devitt 1988), it was half their total weight of bush meat. Later, we learn that goanna hunting played a major role in spatial land use patterns and associated burning practices by women (Ch. 7). Martu men and women generally collected very different suites of species, as also found by Devitt (1988). Women hunted cats, goannas and smaller game; men hunted larger game.

Like many desert Aboriginal groups, the species inventory of plant foods gathered by Martu had narrowed dramatically yet the consumption of plant species persisted. Sweet, moist plant foods were favoured. Relatively large quantities of Solanum chippendalei and S. diversiflorum were collected. Of the plant resources utilised for other purposes, firewood species (especially Acacia aneura) were taken in large volumes. It was the main plant species to be destructively harvested (although gathered as dead timber).

The ecological sustainability of hunting is a key consideration in National Park and ecosystem management. Many Aboriginal people including Martu wanted a continued abundance of bush resources. Ecologists identify a decline in ‘return for effort’ as a marker of hunting pressure (e.g. Copley & Robinson 2003). Chapter 1 identified sixteen measures to assess return for effort. Four of these measures were applied in this study: documentation of the resource inventory, species proportions of the total catch, species harvest weights over a period and harvest rates for two species (Cat and Sand goanna).

Substantial methodological challenges lie in getting rigorous data that allow comparisons of these measures over time for one group and between Aboriginal groups.

Major limitations in temporal scaling up of harvest data for an 80 day quantification period in three settlements were identified. Also, issues in the estimation of harvest rates were specified. It was learnt that Martu hunting was changeable, highly variable over time and influenced by many different human and ecological variables. In this study, potential baseline quantitative data have been provided. Equally importantly, some of the major socio-economic and socio-ecological variables that influenced customary harvest rates were identified. It was argued that considerable caution is required in inter-group and longitudinal comparisons of 'return for effort' and associated parameters.

Martu recognised reductions in 'return for effort' but did not accept hunting pressure as a causal factor (Ch. 5.8.2). Individuals occasionally identified the need for new hunting areas but species declines were attributed to many factors other than hunting. To foreshadow an important finding, Martu believed their hunting was critical to the perpetuation of the plant and animal species (Ch. 8).

In terms of ecological sustainability at the species specific level, it is surmised that Martu hunting weighed most heavily upon populations of Euro, Perentie and Sand goanna. These were low mobility species within the daily hunting range of Martu (Ch. 8). Whilst they were persistent rather than boom-bust populations, they were also subject to persistent hunting pressure during the study. Species that were less frequently hunted but vulnerable to localised overharvesting were Echidna and Yellow-spotted monitor. Martu hunting may have negatively impacted upon regional populations of Bustard, a nomadic species classified as 'near threatened' (McKenzie et al. 2002). Impacts upon other nomadic and seasonal migrants, Red Kangaroo and Emu, were intense for short periods. Martu hunting of three python species of conservation interest may also have negative impacts on local populations.

In this study, ecological sustainability was considered at taxonomic levels higher than species, that is, across the vertebrate species inventory. An important and unique finding of this chapter was the proportionally large weight of feral animal species hunted by Martu. About 80% of the total weight of bush meat was feral animals. Camels were the major contributor; even putting them aside, approximately 1 kg of Cat was killed for each 4 kg of native animal. Hunting off-take of Camels would have had negligible effects compared to the size and rapid growth rate of populations (Edwards et al. 2004). However, Martu hunting of feral Cats may have reduced Cat populations, possibly to the localised advantage of certain native species threatened by carnivores. This is the subject of on-going quantitative research on Martu and neighbouring Pintupi lands (R. Paltridge, Desert Wildlife Services, pers. comm. 16/12/07). In terms of biodiversity conservation, Martu hunting appeared to bring direct costs to some species but there were possibly indirect benefits to other species.

It is predicted that from 1990–2010, there has been a trend for at least, localised species declines for those game animal populations in the vicinity of Martu settlements. However, the trajectory and rate of declines may be slowed by Martu practices (particular burning patterns and feral animal hunting) which benefit certain species within the settlement radii. It cannot be assumed that localised declines are faster than those experienced by populations remote from Martu settlement which may be more subject to threatening processes such as wildfire, feral herbivores and feral carnivores which are ameliorated by Martu practice within about 100 km of the settlements (Ch. 7). Notably, Bird et al. (2005) reported on-going hunting by Martu but to 2007 had not yet published quantities or rates of species harvested. In future research, potential comparisons could be made with their data sets.

In Australia, firm evidence for terrestrial species declines due to Aboriginal harvest has been scant. Comparing hunting returns over a 20-year period, Altman (unpubl. b) speculated on the overall sustainability of subsistence hunting (rather than species specific sustainability). Presenting the same study, Griffiths (2003) stated that contemporary returns were very similar to historical ones suggesting sustainable harvesting levels in the context of on-going ecosystem management practices.

In the 1980s, comprehensive research into customary fishing in the Torres Strait concluded that:

> despite high rates of consumption of local seafood, Islanders could harvest from their waters at least an order of magnitude more seafood than they do today (Johannes & MacFarlane 1991:198)

However, recent syntheses of Dugong population research indicate that hunting in the Torres Strait is unsustainable (Marsh et al. 2004; Kwan et al. 2006). On the basis of models of Magpie geese population dynamics, Brook et al. (2002) concluded that harvests by the combination of recreational hunting and indigenous off-take may be unsustainable. An observation has been that specific impacts of other resource users have outweighed customary harvest impacts, or at least confounded the specificity of indigenous harvest. Furthermore, species declines have been attributed to major ecological changes due to pollution, introduced species competition, disease etc (Davies et al. 1999). Most researchers have taken the precautionary principle and recommended education for resource management and monitoring, or in the case of Dugong, collaborative management between local hunters and government agencies.

Assessment of the ecological sustainability of customary harvest are influenced by the scale addressed, whether one is considering impacts at a species specific population level or impacts across a taxonomic group. Chapter 10 presents conclusions on ecological integrity at landscape scale to local settlement scales.

In conclusion, I argue that hunting and gathering must be viewed as an activity of central relevance to co-management. Wildlife is a most important nexus between the interests of Martu and Euro-Australian natural resource managers. Martu manipulation of ecosystems hinges around plants and animals (Ch. 8). Collaborative research and co-management should initially be directed to biological studies and management actions for those species in Table 5.9. Much Australian wildlife research is dominated by threatened species and feral animal studies, by contrast, I propose that the species of collaborative interest should be those resource species of highest utility value to contemporary Martu. Attention to these species will be most valued to Martu and thus more effectively introduce concepts relevant to co-management (Ch. 10).




Examples of animals collected by women.

Photo 5.2 (top left) Nancy Chapman inserts burning grass into a hole she has chopped to flush out a *Winyjikirti* (Ridgetail goanna) from a Coolibah (*E. victrix*) tree at Kurta Kurta.

Photo 5.4 (top right) Rosie Williams with a *Mulyamiji* (Great desert skink) excavated from a warren south of Punmu. Mary Thomas holds two other skinks excavated from the same burrow complex. This collection was for nostalgic purposes rather than physical sustenance.

Photo 5.3 (bottom left) Ida Taylor excavates a *Parnajarrpa* (Sand goanna) from a burrow exposed by a burn lit to hunt, in the background is her dog searching for other game.

Photo 5.5 A collection of *lunki* (cossid moth larvae) dug from *Acacia dictyophleba* roots.

Examples of animals and plants collected by Martu men.

Photo 5.6 (top left) Flaki covers the cooking hearth of a *Kipara* (Bustard) killed south of Kurta Kurta.

Photo 5.7 (top right) The *Kipara* is plucked whilst a toddler looks on and holds the edible fruit of *Wamurla* (*Solanum diversiflorum*).

Photo 5.8 (bottom left) Waka Taylor displays a *Maruntu* (*Varanus panoptes*) excavated from a crevice near Punamalara, north-west of Parnngurr. Three of the men worked as a group to excavate the varanid. (Photo by Nic Thieberger, 1988).

Photo 5.9 (bottom right) In 1987, Mac Gardener collects an armful of *wama* (*Nicotiana benthamiana*) bush tobacco from its common habitat on rocky slopes or caves, this was the most highly prized plant species.

Examples of plant foods gathered by women.

Photo 5.10 (top left) A wild Watermelon (*Citrullus lanatus*) is prepared for cooking by Carol Williams in March 1988. The introduced species was common along Rudall River. It was cooked in warm ashes in a sand hearth then cut in half and a tin of jam mixed through the pulpy flesh then eaten.

Photo 5.11 The clear, sticky globules of *Acacia dicytyophleba* gum called *pira* or in English 'lollies'. These were gathered especially for, or by, children.

Photo 5.12 (bottom left) Wirnta Williams digs for the tubers of *Kanyjamarra* (*Vigna lanceolata*) in levee banks along the Karlamilyi River in 1987.

Photo 5.13 (bottom right) Array of plant foods that could be harvested in June–July in pre-contact times after certain climatic conditions. Of these species, the tuber and fruit species continued to be gathered in contemporary times.[108]

[108] (top left to right) *Ngurjana* (*Eragrostis eriopoda*), *Paractaenum novaehollandiae*, *Ral-ral* (*E. tenellula*), *Kirtirr* (*Yakirra australiensis*), *Panma* (*Portulaca oleracea*), (centre left to right) Nayju (*Dysphania rhadinostachya*), *Minyajurru* (*Urochloa subquadripara*), *Kuntara* (*Dactyloctenium radulans*), *Pinarti* (*Erythria vespertilio*), (bottom left to right) *Minyarra* (*Cyperus bulbosus*), *Wamurla* (*Solanum diversiflorum*), *Nyitu* (*Stylobasium spathulatum*), *Ngapurta* (*Cucumis melo*), *Kanyjamarra* (*Vigna lanceolata*).

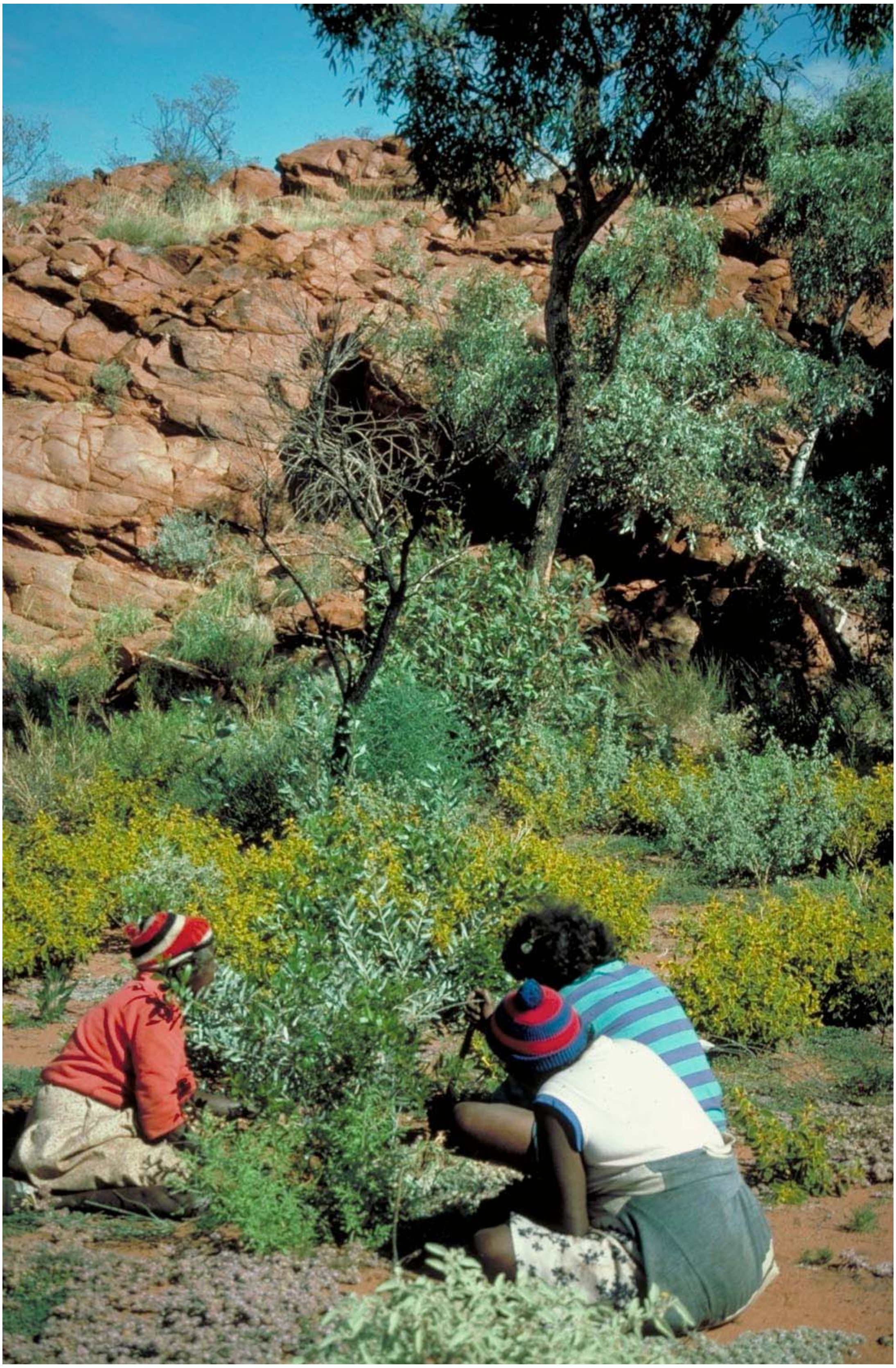

Photo 6.1 Parnngurr women dig in search of *lunki* from *Lurnkun* (*Acacia dictyophleba*) on sand patch burnt in the past two years near Yurlpu, 1987. Digging for *lunki* occurring amongst close plants was a social event enabling women to talk whilst they worked.

6 Social organisation of Martu people's hunting and gathering

6.1 Introduction

Chapter 5 quantified the total weight, species richness and number of species that were collected by Martu during the study. But it cannot be assumed that the entire adult population had to hunt and gather for sustenance. This chapter asks about Martu—who foraged and why—by addressing the questions:

a) What proportion of the Martu population hunted and gathered?

b) What was the gender composition of foraging groups?

c) How did patterns of foraging returns by different groups and individuals compare?

d) What were the factors that motivated Martu individuals to hunt and gather?

These socioeconomic questions are relevant to the thesis because the social profile of land users may have an impact on the species they use and practices they apply.

Conventionally, it has been rare for park and ecosystem managers in Australia to consider social aspects of land use; their orientation has principally been to the natural resources of an ecosystem rather than the social resources. However, in the past decade, the human element of park or ecosystem management has had increased attention. This has been oriented in three directions: toward staff, governance bodies and land users. Governance has been through structures such as a board of management or advisory committee. 'Representatives' of land title holder groups and government agencies have been members of these governance structures. Land users of protected areas have tended to be viewed as homogenous groups i.e. 'tourists', 'Aboriginal people'. Land user needs, primarily those of tourists, have dominated applied management and day to day work on parks. There has been little recognition of diversity within these land user groups. It is the diversity amongst Martu hunters and gatherers as the major land user group that will be examined in this chapter.

The governance of parks and protected areas on Aboriginal lands or involving Aboriginal people has received substantial attention in the Australian literature (e.g. Jaireth & Smyth 2003; Smyth 2001; Langton 1998; Woenne-Green et al. 1994:224). Management options and structures relevant to Martu, Rudall River National Park and CALM have been presented (see CALM 2003a; Anon 2001; Cotton 1989). These discussions on governance have been couched within the dominant Western systems that influence co-management or in Aboriginal organisations accountable to government financial and legal systems. This is by contrast to governance predominantly by and amongst Aboriginal land users and managers themselves when operating mainly within their customary domain.

Sociality is well-recognised by anthropologists to be a key driver of Aboriginal life. Multiple socio-cultural variables, including those based on kin relations, section groups, inter-generational groups, gerontocracy, gender relations and others, traditionally governed the use of land and resources (Tonkinson 1991; Myers 1982; Williams 1986). The expressions of these systems varied across desert regions and between desert and tropical environments. Over time, these systems have changed but their general features have remained remarkably resilient within settlements (Tonkinson 2007:49) and as expressed on visits to custodial lands (Sutton 1996).

Subsistence studies by Altman (1987) and Devitt (1988) concentrated on social patterns in terms of how the distribution and sharing of bush resources and the composition of residential groups and camps interrelated with the kinship system. There appears to have been no recent studies on the actual influence of these factors on bush visits among contemporary Aboriginal resource users in desert regions. Altman (1984) and Devitt (1988) examined modes of production by men and women from the subsistence and store or market domains. Contrary to Altman, Devitt argued that the economic contribution of women was far from insignificant and its value was recognised when appropriate measures used. Their attention to gender has been extended to this study not because of anthropological questions about women's role in society, but in an endeavour to understand the wildlife returns of women and men in terms of their wildlife and ecosystem management implications.[109]

Povinelli (1992; 1993) provided one of the most sophisticated syntheses of the meanings that interwove and explained the purposes of foraging in contemporary Aboriginal Australia. She teased apart the reasons why Belyuen women hunted, fished and gathered even though bush foods constituted only about 12% of the Belyuen diet. Povinelli argued that the dismissal of foraging by government and others because of its minor energetic contribution overlooked the multiple benefits Belyuen people gained from the land's resources. She did not name or classify foraging groups by kin or another social paramter perhaps because in the 'tangled web of Belyuen kinship' (Povinelli 1993:224) social patterns of foragers were indecipherable. In conclusion, she advocated for better integration between research in economic, historical, ecological and cultural domains of Aboriginal life.

The first half of this chapter examines the social organisation of foraging in terms of the variety of Martu people's engagement in hunting and gathering, gender composition of foraging groups, a comparison between men and women of the species weight returns and a comparison in returns between two women who were frequent foragers. The second half of this chapter looks closely at the need for sustenance as a motivator of hunting. This was done by contrasting weights of store and bush meat returned and available per capita then other factors that motivated foraging were identified. The

[109] There is an emphasis on women as, being a young unmarried female researcher, Martu spokespeople directed and reinforced my relations with women more than men (Ch. 3.4).

chapter concludes by linking the relevance of socioeconomic findings to ecosystem and national park management in the region.

6.2 Foraging groups and individual characteristics of foragers

6.2.1 Degrees of consistency in foraging interest and activity amongst Martu

When singular terms are applied to groups of people there is a tendency for those who do not know that group to presume it is homogeneous. This can be the case for terms such as ‘Aboriginal’ and more specifically ‘Martu’. In terms of hunting and gathering activities what consistency or difference was observed amongst Martu during the study? This chapter will interpret qualitative material from talks and informal interviews with Martu and quantitative information from records of accompanied and unaccompanied trips (Ch. 3.7).

The complex expression of social patterns through Martu kin and skin sections categories was not examined in this research on Martu subsistence. However, it was a common thus important discussion topic amongst women foragers. The skin group of most people on accompanied foraging trips was known (Tab. 3.4) and Martu women regularly pointed out generational relations such as grandmother – granddaughter or elder sister – younger sister.

‘A day at Parnngurr’ (Sunday 5/3/90, Ch. 4.2) described hunting trips by a group of three men who walked north and two women who walked south-west. Of the 30 adults at Parnngurr, the remaining 25 people remained in camp. They played cards, rested, talked and did a variety of domestic tasks. Some people waited in anticipation of the arrival of a new family who were relocating to Parnngurr. The activities of about 36 children at Parnngurr on that Sunday were not noted. The particular features of foraging on that Sunday were that only a small proportion of adults were out collecting bush foods and that those people had gone in separate gender groups. However, the next day had a different character; everybody at Parnngurr had gone to the river in three vehicles for a day’s excursion. The school teacher had initiated this trip; bush foods were hunted *en route* and consumed at the dinner camp. One day later, five young men drove south and returned with a Euro whilst a family group went east. These examples within a week indicate that the social mix of foraging groups or groups doing other activities was variable.

6.2.2 Trips by men, women and families: gender composition of foraging groups

Records were kept of the social composition of groups who went on foraging trips to and from each settlement. These records identified the gender, at least the main families and where possible the individuals who went. The gender composition of foraging groups is tallied for all unaccompanied foraging trips in Table 6.1. Trips for other purposes (Tab. 4.2) were excluded from the data.

Table 6.1 Gender of Martu groups on 51 unaccompanied foraging trips from Parnngurr, Punmu and Kunawarrriji during 1990 study period.

Nos of gender specific or mixed groups	Parnngurr	Punmu	Kunawarritji	totals
men	13	5	2	20 (39%)
mixed	10	6	3	19 (37%)
women	5	6	1	12 (23%)

Table 6.1 shows that more than a third of foraging trips were male-only groups. A slightly lower number of trips were done by mixed gender groups, these were generally family or household groups. The number of trips done by women was under-represented because of the separation between the unaccompanied and accompanied data sets. Of the 55 accompanied trips, 76% were women-only groups,[110] 13 were mixed gender groups. If the unaccompanied and accompanied data were combined it showed women went on more than twice the number of trips than men, although this figure was inflated by the researcher's presence. Independently, it was reported that women went foraging more often than men even when the researcher was absent (Louie Warren pers. comm. 26/1/90, Sue Hanson pers. comm. 8/3/90). Similarly, Belyuen women also foraged more often than men (Povinelli 1993).

This study has found that the mode of transport had a major influence on the gender composition of foraging parties (Ch. 4.7). Women walked to and from the settlement on twice as many unaccompanied trips as men (67% vs. 33 %, n=18). This was attributable to the fact that there were women who were keen foragers but they could not drive or they did not have control over use of a vehicle. Several men were also keen foragers and did not have ready access to a vehicle; they walked to and from the settlement but less frequently than women did. Women also used other strategies to overcome their lack of a vehicle; either they combined with mixed gender groups or were dropped off and later picked up (Ch. 4.7.2).

6.2.3 Most women foraged weekly

The description of a Sunday in Parnngurr (Ch. 4.2), noted that two women went to collect bush foods whilst about 12 women stayed in camp. However, some of those latter women foraged on subsequent days. What proportion of the population was active?

Martu clearly distinguished the keen foragers. For instance, when Christine Sammy (~20 y.o.) was asked about differences amongst Martu she replied:

> Only the old people get a big mob of *kuka* [meat], they'll go a long way for it ... Munipa, she'll go hunting everyday, the other [women] only sometimes ... [of the men] Minyawu and Pilu they go mostly ... [the hunters] they'll eat some and they'll bring some back and share it around (9/10/90 FW diary 90-7:79)

[110] Although called 'women-only' the trips included girls and occasionally young boys less than about seven years old.

When asked if she went hunting, Christine shrugged:

> Yeh, sometimes, in winter time when it's not too hot

then she recounted two occasions when she had hunted with other women.

In this study, the names of the 35 women older than 20 years and present at Parnngurr in October 1990 were listed and classed as individuals who hunted and gathered 'frequently', 'sometimes' or 'occasionally' was based on observations over 57 days. Individuals classed as 'frequent' foragers went a few times a week, additionally, they initiated trips, sometimes on foot and they were active foragers when on trips. 'Occasional' foragers tended to go less than once a week, rarely initiated trips and were relatively inactive on trips i.e. spent most time sitting at the dinner camp.

Table 6.2 Number and percent of Parnngurr women more than 20 years old in classes of foraging frequency (October 1990)

Class	Frequency of foraging	No. women
frequent	more than twice a week	6
sometimes	one or two times per week	14
occasional	less than once per week	10
unknown		5

a Based on 35 women present; b Observation over 57 days; c The 'unknown' class of women were visitors to Parnngurr

A minority of women at Parnngurr hunted and gathered more than twice a week (Tab. 6.2). These were women about 40–60 years old, who had been 'foot walking on country' before sustained European contact and settlement and two of the women were widows. There was some overestimation in Christine's earlier comment, for example, Rita Milangka (Muni), although classed as a frequent forager, did not hunt every day. The majority (40%) of Parnngurr women foraged once or twice a week. These middle-aged individuals had demanding family responsibilities, part-time commitments in the clinic, school or store or only moderate interest in foraging. The 'occasional' foragers were young women, several had care of young children and some had low interest in hunting and gathering. The frequent foragers were generally older people but not the oldest at Parnngurr as could be interpreted of Christine's comment above.[111] Elders such as Topsy Milangka, Wirnta Karimara, Jakayu Purungu and others older than sixty were keen on foraging but did not go frequently partly due to frailty.

6.2.4 Autonomy and cooperation by women on foraging trips

Chapter 3.9 and Appendix 8, described a single foraging trip on 14/8/90 from two perspectives respectively, firstly, that of a regular forager, Rita Milangka and secondly, the primary data records detailing who did what, where, for how long and what species were collected. Five Martu women and two researchers were on that trip, women separated into four groups of two or three members. *Acacia dictyophleba,* grubs

[111] Amongst Martu, the term 'old people' connoted respect as well as a cohort of people. Christine also implied a divide between the interests of older and younger generations.

(*Lunkun lunki*) and Sand goanna were the only resources collected. *Lunkun lunki* digging was a particularly social event. Whilst digging did not require assistance, it was common for pairs of women to chat whilst they dug; initially the pairs were close until the distance widened as they moved bush to bush. In her account, Rita noted that the others had not been seen then she mentioned that we reconnected with them. This 'looking out' for the whereabouts of others was typical of all foraging trips. On that particular trip, the need for cooperation was low due to the specific resource collected. From another trip, independence and interaction between foragers is clear:

> 14/3/90 Left Parnngurr drove east to Wanal creek area. Party was 7 women each with a crowbar, 6 y.o. boy, researcher. 10.45am arrived, Mulyatingki and Nancy's son stayed by car. Rosie Nayju and Ida walked west, Tijin headed SW, Ida and Rosie went south, Rita and I north, didn't see Nancy and Daphne's direction. Rita searched for *Parnajarrpa* tracks her route went from mallee to mallee where burrows occur in the mounds. No tracks. Walked west to dune and along crest. Saw Rosie and Ida in mid-distance, Tijin separate. Rita dug three relatively deep burrows in 18 mins; got one *Parnajarrpa* on the third. 1.00pm returned to dinner camp. Others back except Tijin and Nancy. Daphne had stayed nearby to look after Nancy's son. Rita went again. 2.30pm Smoke marked Tijin's whereabouts. 3.30 pm Nancy, Rita returned together then Tijin from SW.
>
> Resources collected counted and individually weighed. All got *Parnajarrpa*: Rita - 3; Tijin - 2; Daphne - 3; Nancy - 2; Ida - 2. Rosie - 2 and 1 *Lungkurta*. Total Sand goanna weight 6.5 kg.
>
> 3.15–3.45pm *Parnajarrpa* singed then cooked in coal and ash bed by Mulyatingki. Each woman ate one animal and took another back to Parnngurr. They were evenly distributed including to Mulyatingki who had not hunted but looked after Nancy's son. Rosie took the *Lungkurta*. 4.15pm headed home.
>
> 4.30pm *Yalapara* track seen on road at Wanal creek. All except Mulyatingki and Daphne alighted to track it along creek sands. Long claw and strong tail marks in sand. Women were alert and wary. 4.45pm located mid sized *Yalapara* under exposed Paperbark roots. Rosie anchored its head with a crowbar, Tijin held it by the tail, Rita dug a pit adjacent to its belly. Concentration was intense. When pit complete, Rosie released head, quickly passed crowbar to Rita, Tijin steadily pulled tail and animal backwards. As its head reached the pit it lunged sideways into it, Rita whacked it on the head. It took off to a nearby spinifex hummock, with squeals of caution all followed it. Rita killed it with a second hit to the upper spine. 5pm *Yalapara* ungutted weight 4.5 kg, snout to vent 78 cm, vent to tail 90 cm, over 1.5 m long! (FW field diary 90-3, 14/3/90).[112]

On this trip, social aspects of hunting can be characterised. At the dinner camp, at least one adult woman stayed with the children, childcare was a vital role that freed the 'mother' to hunt sometimes this role was shared or done in shifts. Hunters walked in nearby pairs or alone as they searched for and dug Sand goanna. The membership of these pairs was consistent through the hunt. On this trip, no cooperation to dig *Parnajarrpa* was observed; on other trips it was sometimes required. The relatively limited cooperation to hunt *Parnajarrpa* contrasted to the intense cooperation and coordination required to extricate and kill a medium-sized *Yalapara*. They were

[112] Detail on times, habitats, distances etc are excluded from this account. *Parnajarrpa ~ Varanus gouldii*, Sand goanna; *Lungkurta ~ Tiliqua mulitfasciata*, Centralian blue-tongue lizard*; Yalapara ~ V. giganteus*, Perentie

considered dangerous, when a solo woman hunter encountered a Perentie track they usually called for assistance. Cat hunting sometimes required cooperation of a similar kind though not as concentrated as the animals were less dangerous. Women shared returns from cooperative efforts. The above Perentie was taken to a home camp not by a hunter but given to Daphne Panaka, perhaps because she had remained in the car with the child and her elderly mother. Resource rewards were not solely proportional to foraging effort but allocated according to other criteria too.

The social patterns on foraging trips by Martu women oscillated between solo effort that contributed to the autonomy of individuals and cooperative work that contributed to group cohesion. Individual women liked to choose where to go, what to do, how to distribute their returns. They also valued the companionship, information exchange, improved productivity of hunting and resource sharing that was part and parcel of cooperation. This oscillation between interdependence and independence in hunting, on much smaller social and temporal scales, paralleled the aggregation and dispersal of Martu in traditional times that was detailed by Tonkinson (1991).

6.2.5 Differences in returns from individual women

Considerable differences in the ways individual Martu women hunted and gathered were observed on all foraging trips. Some women foraged intensively. Immediately on arrival at a dinner camp, they headed off, looked carefully and consistently for tracks and did not talk much with other foragers except to discuss the subjects of their search and the local environment, whereas others were more relaxed, walked slowly with less concentration and did not pursue prey as keenly as their colleagues did. The latter women often finished foraging sooner and returned to dinner camp.

Table 6.3 compares the foraging returns of two Martu women classed as ‘frequent’ foragers (Tab. 6.2). The species collected by Rita Milangka and Nancy Karimarra were totalled for ten accompanied trips they both went on. Rita and Nancy were selected because of the large number of common trips they went on (n=10).

Rita collected considerably heavier weights of species than Nancy did (Tab. 6.3). Rita caught two Cats and twice as many Sand goannas; she preferred large, mobile species. By contrast, Nancy showed a general preference for more sedentary species. On two trips she opted to focus on *lunki* (chopped from *Tinjirla* trunk and from *Karnturangu* pulled roots) rather than hunt Cat or goanna. Rita was also a more efficient collector of *Lunkun lunki* (dug from roots and requiring more effort than the other *lunki* species). Nancy also collected small amounts from food plants and the *Pinarti* seed for string decorations. [113]

[113] *Lunki* ~ witchetty grubs; *Lunkun ~ A. dictyophleba*, Sandplain wattle; *Tinjirla ~ Eucalyptus vitrix,* Coolibah; *Karnturangu ~ Codonocarpus cotinifolius,* Desert poplar; *Pinarti ~ Erythrina vespertilio*, Bean tree

Table 6.3 Comparison of the numbers of each species collected by two women on the same ten accompanied trips

Species [a]	Rita	Nancy
Feral cat	2	0
Sand goanna	10	4
Ridgetail goanna	2	0
E. vitrix trunk grub	2	37
A. dictyophleba root grub	112	18
C. cotinifolius root grub	0	31
S. parvifolia fruit	1 handful	0
C. bulbosus	0	1 cupful
Vigna lanceolata	50g	0
A. dictyophleba gum	0	1 handful
Erythrina vespertilio seed	0	1 jam tinful
Estimated total weights	>16.2 kg	>3.6 kg

[a] Species order from heaviest to lightest

The differences between these two women can be explained partly by age, personal experience and family commitments. Rita was about 10 years older, grew up walking on country and had no children in her care. Nancy had school age children who went on two of the ten trips. In addition to these differences, it was apparent that some individuals were expert hunters. As Christine Sammy indicated earlier, Rita was a regular and accomplished hunter. Martu recognised these experts; certain individuals were known to be *wartilpa nintipuka* (knowledgeable, able at hunting) or 'clever for bushtucker'. For example, Jeffery James of Kunawarritji was nicknamed *Kukan-kukan* (game animal–game animal; meat–meat) in reference to his love of hunting.

6.2.6 Foraging group sizes

Martu women were never observed to go on trips alone. The group size on accompanied trips was 4.7 women (mean, SD=2.0, n=43). Women sometimes separated more than 500 metres apart; they communicated by shouts, hand signs or smoke plumes. Women needed companions to cooperate, socialise and provide the cultural safety necessary, particularly on longer travels from the settlement. Trips were undertaken by men in smaller groups (mean=3 men, SD=1.8, n=5).

Vehicle types and transport options also had a major influence on group size. When vehicles were used in what ever combination of strategies (Ch. 4.7.2), then group sizes were generally larger than walking-only groups. This partly explained the bigger group size of accompanied excursions. However, it was observed that when men went hunting in groups the vehicle was not always full to capacity; by contrast, on trips with women and family groups, vehicles were full beyond recommended passenger limits.

Whilst there was gender separation on a majority of trips, 37% of unaccompanied trips were mixed gender (Tab. 6.1). On five of the accompanied trips, a husband-wife pair collected together. For example, Ida and Muuki Taylor returned with *Yalapara* and *Parnajarrpa* and, Mippy and Beatrice gathered *Warmurla* side by side. Alternately, on one of the same trips, Nancy Taylor remained at the dinner camp to look after Mayika whilst her husband Waka hunted alone and returned with a *Kirti-kirti*.[114]

Foraging trips or trips for other purposes were popular for Martu family groups, particularly on weekends when there were no school and meeting commitments. On these trips, the vehicle/s parked at a dinner camp location. Most people offloaded. Some foragers then went in search of bush foods. Often, the men continued in the vehicle to hunt. These trips often had large groups. For example, a trip to Kunti Kunti had 36 children and 30 adults in three vehicles (Ch. 4.2). A single family trip on 31/8/90 comprised three men, six women and five children in one utility. Foraging trip sizes ranged from two to many people.

6.2.7 The main hunters: men by game weight—women by reliability

It was possible to closely describe foraging by women because I went on many trips with women. It was found that women were active foragers; they hunted, went in large groups and went more frequently than men went. The role of ‘man the hunter’ and ‘woman the gatherer’ has been widely stereotyped. By contrast, Devitt (1988) found Anmatyerr women were keen hunters of Sand goanna. Similarly, Sand goanna were a major resource hunted by Martu women (e.g. Ch. 5.7.3, Tab. 6.3). By contrast, Anmatyerr women did not hunt Cats and nor did Devitt (1988) compare men’s and women’s returns. How did the proportions of game animals hunted by Martu women and men compare?

The unaccompanied and accompanied data sets were sorted to distinguish trips made by men, women or mixed gender groups.[115] The weights of species collected by these groups and the number of trips were summed (Tab. 6.4).

Table 6.4 indicates that men killed more than three times the weight of animals than women (men = 9.4 kg/trip, women = 3.1 kg/trip) for a similar number of trips (31 and 38 respectively). The former measure excluded the weight of Camel killed by men. Of the men’s total 264 kg (Tab. 6.4), just 4.8 kg was Cats or goannas. In terms of weight returns, the hunting of Euro and Bustard gave men a major advantage over women. Comparative hunting returns by men and women have not previously been quantified in desert regions.

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[114] *Yalapara ~ Varanus giganteus*, Perentie; *Parnajarrpa ~ V. gouldii*, Sand goanna; *Warmurla ~ Solanum diversiflorum*, Bush tomato; *Kirti-kirti ~ Macropus robustus*, Euro

[115] Accompanied trips being those which the researcher accompanied and kept detailed quantitative and qualitative records and unaccompanied trips done by Martu without the researcher present but from which less detailed records were recorded by enquiry or report back (Ch. 3).

Table 6.4 Combined weights of major animal species collected by gender groups on unaccompanied trips and accompanied trips in 1990

Trip type [b]	Gender group	Total species weight (kg)	Total nos individual animals	Nos trips	Counted spp [c]
unaccompanied	men	1650.0	3	3	Camel
unaccompanied [a]	men	264.3	46	28	Euro, Bustard, Cat, 3 varanid spp
unaccompanied	mixed gender	44.2	33	20	Cat, 3 varanid spp
unaccompanied	women	18.6	25	12	Cat, 3 varanid spp
accompanied	women	80.4	118	26	Cat, 3 varanid spp

[a] Assumption that on unaccompanied trips men killed all Euro and Bustards as no women were said or observed to use rifles; [b] unaccompanied trips = 51; accompanied trips n = 26; [c] 'counted species' weights did not include infrequently collected or smaller game animals; [d] weight of game collected on unaccompanied and accompanied trips was proportionally lower as the former involved more walking trips and smaller groups.

Yet, whilst men collected more game by weight, it was observed that women provided Cats and goanna species more consistently and frequently than men did. This is seen by one measure in Table 6.4 where 118 individual animals were collected and so distributed by women compared with 46 animals killed and shared by men. Groups of women were always successful, if they searched, in collecting animal foods (getting at least *lunki*), yet there were trips when men returned empty-handed.[116] Two instances were recorded earlier—when two Warnman men armed with a rifle and two boomerangs returned with no meat (Ch. 4.2) and when men sought but killed no Euro then discarded a Perentie deemed too skinny (Ch. 5.3). There was an essential interplay between large weight but irregular animal provision by men and small weight but reliable animal provision by women.

The practical complementarity and symbolism in the tool kits of collectors was highlighted by C. Berndt (1978) and affirmed by Devitt (1988) who comprehensively surveyed the tools of Anmatyerr women foragers. Amongst Martu, the use of rifles or, much less often, spears by men, and the use of crowbars by women were significant in determining the species hunted and a major point of distinction between genders (also Ch. 4.8).[117] Martu men were observed making wooden *wana* and metal crowbars for women but men rarely carried them, preferring to get a quick substitute stick as needed. Vehicles were the other critical tool in men's hunting kit. The majority (70%) of foraging trips by men used vehicles (Ch. 4.7).

[116] *lunki* ~ cossid moth larvae, witchetty grubs

[117] It is my view that the common translation of *wana* as digging stick (Marsh 1992) contributes to the perception that women were not hunters. Like many Aboriginal tools, *wana* were multifunctional. Martu women also used them to restrain or hit game (as with the Perentie above), throw at game, prod animals out of hiding places, whack bushes to flush or injure game, prise open logs and other hunting applications. They were also used to dig animals and plants. Martu referred to *wana* in Aboriginal English as 'crowbar'.

Sometimes foraging trips were gender specific and sometimes they were mixed gender. Chapter 5 noted that men exclusively hunted certain species and women preferred certain species. However, there was a suite of species, particularly medium weight ones, that could be killed without a rifle and with a *wana* that were collected by either gender (including Perentie, Yellow-spotted monitor, Cat). When on foraging trips and in camp foragers discussed signs of the species they had seen. There was a lot of information exchange between men and women. Information from one person aided the hunt and returns of another person. The exchange of bush food was common and formalised. This included repayment by the hunter to the person/s who had pointed out the species they captured or assisted to get it. Devitt (1988) observed there was an essential interdependence between men and women in the pursuit of a satisfactory diet. She argued that the separate roles of men and women in foraging were a necessary but not exclusive division of labour.

6.2.8 Notes on the duration of foraging trips

Like other subsistence studies (Tab. 1.3), regular records of foraging times on accompanied trips were kept.[118] The duration of unaccompanied trips was estimated. On accompanied trips, the mean trip duration was 6.9 hours (SD = 2.2 hr, n = 55); this included travel to and from a dinner camp.[119] As described above, most accompanied trips went to a dinner camp base and foragers radiated out from there. The mean time spent on site was 4.4 hr (SD = 2.2 hr). The actual time spent foraging varied greatly from person to person. Keen hunters spent as long away as they could or as long as it took them to return with full hands (shoulders, belts or other means of portage).

The duration of accompanied trips was long (fortuitously similar to a Western working day of 7.5 hours).[120] In cold seasons, Martu people waited by hearth fires or in sun patches until the day had warmed then headed off about 10 am. In hot seasons, those who went foraging got going soon after sunrise. Trips were occasionally timed to leave or return for an anticipated meeting, rare doctor’s visit or other event in the settlement. Martu preferred to return to settlements after sunset but before dark, except on the rare occasions when there were distant overnight camps. Certain species, particularly Euros, were sighted at dusk.

Unaccompanied foraging trips were about an hour shorter than accompanied ones. Those in a vehicle were 5.9 hours (mean, SD = 2.7 hr, n = 21). There was a suite of trips by Martu classed as various other land uses (Ch. 4.3) on which species were collected. These were often considerably longer than six hours because they often involved long

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[118] The hour of departure, arrival at dinner camp, minutes spent on search, collection and preparation time, the hour of return to dinner were recorded (see Chapter 3).

[119] ‘Dinner camp’ was a location where: Martu alighted from the vehicle; left children, tools and other goods; radiated from and returned to during foraging; prepared bush resources collected; shared and consumed foods.

[120] This was the participants’ choice not the researcher’s. The research did not slow foraging activities.

distance travel. Unexpectedly, unaccompanied trips on foot (n=19) were about the same six hour duration as those in a vehicle.

6.2.9 Many different Martu hunters and gatherers

Considerable variety amongst Martu in hunting activities has been revealed. This variety was seen in different social groupings—between individuals, amongst women, and between genders. Martu were not homogenous people within the socio-economic domain of collecting bush resources yet ecological literature often implies universality of Aboriginal practice and knowledge. Similarly, Martu and their representatives were often compelled to portray themselves to ‘outsiders’ as ‘one mob’.[121] This presentation of apparent uniformity extended to the collection of bushfoods. To extract from an earlier quote:

> We have come back to our country …so that we can kill and eat meat, our bush meat (Jimmy Williams Milangka)

During the study, this reality faltered, as the Williams adults were ‘occasional’ hunters (by Table 6.2 parameters). For Jimmy Williams, factors that worked against this ideal were his obligations as community chairman to travel, attend meetings and respond to community matters. The family had greater food security through their control of and ready access to store goods. A key family member was from distant lands and perhaps did not have ready rights of access or familiarity with the Parnngurr region and a keenness to re-explore it. Family members also maintained a good cash flow and often preferred to play cards. Yet, by contrast to their parents, the Williams children were regular and resourceful observers and collectors of wildlife. These factors introduce the next section of this chapter. It explores reasons for, and some constraints on, why Martu hunted and gathered bush foods.

6.3 One important reason why Martu hunted: the need for sustenance

Before settlement, the economic base of Martu, their ‘bush supermarket’, was entirely based on natural resources that were mostly sourced locally. Bush foods were their only sustenance option. When Martu returned toward Kunawarritji:

> it was December 1981, they’d gone back on a tractor, it broke down near Panaka Panaka, they camped near the springs. For the first six months, there was nothing. Not even tea, flour, sugar, no whitefella tucker. They lived entirely off the bush, went hunting every day. (Brian Kelly, pers.comm. 21/10/90)

In 1983 a ‘store’ was installed at Punmu. In 1990, store buildings remained storage spaces for dry goods with one freezer, no managers or check-outs. Chapter 2.2.12 described the collective purchase, fortnightly delivery and household distribution of

[121] ‘Outsiders’ being non-local people mostly non-Aboriginal people who have a role or interests in relation to Martu or other Aboriginal groups or their land areas (see Young and Ross 1994).

store goods. Whilst supposed to be fortnightly, the timing was more erratic, the communal store was often empty. On return to Parnngurr, I wrote:

> Checked out the store, there are only onions, nothing else! Mayipi said some families kept rice in their camps, everyone had been eating mostly *kuka*.[122] (FW diary 3/3/90).

And Rita remembered:

> Last week, we run out of tucker, only little bit tea and flour. We went hunting. Got Camel, *Parnajarrpa* The radio [was] broken (FW diary 3/3/90).

By the reference to the radio she meant that they could not place an order for goods to be sent.

After a store delivery, favoured produce (e.g. oranges, apples and beef) were finished in two or three days then tinned meats, potatoes, cabbage and other goods diminished. Individuals hoarded caches as long as possible. Supplies would dwindle until the staple diet was tea, sugar and flour for damper. The stores delivered on two occasions were itemised in this study. It showed flour products and tinned foods dominated by volume and weight on both occasions.

At Parnngurr, certain Martu women periodically complained there were neither the amounts nor type of required store goods. Stores were ordered and purchased by WDPAC or the community coordinator by taking a deduction from CDEP and welfare payments to Martu recipients (Ch. 2.2.12). In September and October 1990, public arguments flared about the distribution of goods, women's unfulfilled expectations and their disappointment. The subtext was their critique of perceived inequalities and favouritism in allocations. Supplies were scarce across the Parnngurr population and, apparently unequally distributed. Concurrently, there were people who did not engage in these arguments. They went hunting.

To determine whether the need for sustenance was a critical factor that drove hunting or not, the weight of meat available from store and bush sources was estimated. Data from two store audits (App. 7) and the weight of animals harvested on unaccompanied trips for a fortnightly period were summed in Table 6.5.

Table 6.5 shows that the weight of bush meat available to Martu was at least equal to, or three times, the weight of store meat available at Parnngurr over two fortnights in March and August 1990 respectively.[123] Independently, a Punmu coordinator had estimated that 70–80% of the meat eaten by Punmu people came from bush animals (Louie Warren pers. comm.). On the basis of the quantification and the estimate, undoubtedly, bush animals made a substantial contribution to the diet of Martu and played the major role in providing sustenance to people in 1990.

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[122] *kuka* ~ meat, edible animals; *Parnajarrpa* ~ *Varanus gouldii*, Sand goanna

[123] The percentages of meat available differ from those actually consumed due to wastage, spoilage, and food for, or thieving by, dogs.

Table 6.5 Store and bush meat available to Parnngurr people over fourteen days in March and August 1990 [a, b]

	March	August
Total wgt animals killed (kg) [c]	172	577
Edible wgt animals killed (kg) [d]	103	236
Edible wgt meat and meat products in store (kg) [e]	51	72
Total wgt meat available (bush + store) (kg)	154	308
Percent store meat (%)	33	23
Percent bush meat (%)	67	77
Approximate number of adults present	42	30
Total available weight of meat (g/adult/day)	262	733

[a] Fourteen day period selected to approximate fortnightly store replenishment interval; [b] Unaccompanied excursions over 14 days: 5-18 March, 12-25 August. Periods selected on basis of continuous daily records and as close to store delivery time as possible. Stores delivered on 12 March, 6 October. Store delivery and foraging excursion period 6 weeks apart. October store delivery assumed to be same as August delivery as standard order; [c] Figures for bush foods available were from unaccompanied trips minimum weights; no 20% under-reporting allowance; [d] Estimates of percentage edible animal tissues: Red kangaroo 61%, Bustard 60% (Palmer and Brady 1991); reptiles 70% (Altman 1987:44); other species 60%. Except Camel 40%; [e] Meat products were tinned meat goods e.g. Braised steak and onions. Tinned meat content of 30% from ingredient list was used to calculate meat contribution.

Bush meat weights hunted in the March and August fortnights were very different (172 kg vs 577 kg in Table 6.5)). The weight was largely comprised of Bush Turkeys in the March fortnight when there were abundant Turkeys and 42 adults at Parnngurr. Regular foraging trips occurred before and after the next store delivery. In August, there were fewer adults and fewer unaccompanied trips. The greater weight was due to the Camel killed. When its edible weight was subtracted, just 16.2 kg of bush meat were available, less than the 72 kg store meat quantity that approximated that period. The Camel was killed on 12/8/90 when a large group returned to Parnngurr after a week’s absence. There was no store meat and no loading due soon so some young men shot the Camel. Following this kill, there were no recorded foraging trips for seven days. This suggested that the Camel satisfied community demand at that time. Refrigeration increased the number and weight of medium–large game species that Martu could kill and adequately store.

The daily weight of bush meats available was calculated based on estimates of edible animal tissue (Tab. 6.5). This was measured as grams per adult at Parnngurr with and without Camel for two fortnight periods. With Camel included, 733 g/person/day was available; without Camel, 262 g/person/day was available. In another period, with Camel there was 562 g/person/day and without 175 g/person/day. These figures did not include a meat allocation to the ~30 children at Parnngurr so amounts available to adults were overestimates by at least one third. These figures indicated a fluctuating availability that was at times low and for meat lovers like Martu—not enough! In comparison, southern Pitjantjatjara adults and children consumed an average of 550 g/person/day of bush meat (92% Red kangaroo) and 237 g/person/day tinned meat (Palmer & Brady 1991:54) Yorke Islanders had 191-214 g/capita/day marine species (93% turtle and fish) which was lower than reported for two other Torres Strait islands (Poiner & Harris 1991:139).

Camel was significant to this study in several ways. From the perspective of older Martu, it was a lowly favoured substitute for large game such as Red Kangaroo but valued by younger Martu for the large weight of meat available for little effort. Whilst Martu killed Camels they did so infrequently during the study. However, it is predicted that increased need would increase the hunting of them (see Punmu school teacher 2007). From an ecological perspective, the very low numbers killed would not have reduced the growth of feral Camel populations, thus, not curtailed the ecological damage caused.

Table 6.5 shows the total weight of bush and store meat available to Martu adults ranged from 262–733 g/adult/day. Australian national recommendations for lean meat intake are now 114 g/adult/day (Noakes & Clifton 2006), in 1990 the recommended amount was about 200 g/day. For Martu, the per capita consumption would have been consistently higher than current national recommendations, even with the needs of children and wastage unaccounted for in the above range. At other times, Martu meat intake greatly exceeded national recommendations.

6.4 Hunting and gathering continued for many other reasons

At times, Martu hunted large weights of animals, in particular Camel, demonstrating that the need for sustenance was strong. At other times, they chose to forego this large, abundant, edible species. If sustenance was the sole need then they could have had plenty of meat. This indicated that other factors played a significant role in continued hunting practice. In the course of earlier field work (1986–1989), Martu had alluded to these factors. They continued to be expressed through subtle or overt ways that were observed, heard and recorded on accompanied foraging trips in 1990 and or expressed in transcribed talks with Martu, particularly women. Motivations that were commonly recorded are reported in Table 6.6. The importance of understanding these reasons was affirmed by Povinelli (1992) who warned researchers, government agents and others:

> As long as we continue to focus simply on the quantity of food captured or foraged, we fail to grasp other benefits of these activities. (Povinelli 1992:180).

6.4.1 "Because we always have"

When asked the question "why do you collect bush tucker?" older Martu often seemed nonchalant in their reply "because we always have" was a common response. Bush foods had always been a part of their lifestyle, chronologically from time on their lands through the period of dislocation and then in the return to country.

In recollections by Martu of their past lives, bush resources were vivid and central features (Yirapartu et al. 1992; Thieberger & Gallagher 1987; PALC 1988).[124] In the 1988 reference '*Yintakaja-lampajuya*, These are our waterholes', the majority of the 17 oral history accounts referred to bush foods as a major subject. For example, one story opens

> *Ngarnilpayi-laju mirrrka. Yangkarnu-laju. Mirrka-laju yungkara ngalkupayi. Taampa. Bush tucker. Mirrka jiinya nyaapa? Yungkarnu-laju. Yungkarnu-rna …Yungkarnu-laju.*
>
> We were gathering food. We ground it. We used to grind it and eat it. Damper. Bush tucker. What was that food? We ground it. I ground it …We ground it. (Ngayiji 1988:68)

And her six page account went on to depict collecting, preparing or eating other seed foods, Feral cat, Thorny devil, Blue-tongue lizards and Sand goanna. Similarly, Yirapartu *et al* (1992) each detailed the roles of dozens of species in their daily lives as children or young adults.

The significance of bush resources continued through the eras when Martu were isolated from their lands and lived in Jigalong and the Pilbara:

> [hunting and gathering] remain popular. Most older people have not lost the skills of the desert, and they greatly enjoy the opportunity to get away from the constant noise and the large numbers of people who live in the Camp. They are also prompted by a strong desire to vary and augment their diet. They all love meat, and large pieces of kangaroo or emu are always preferable to small ration-size portions of mutton. In certain seasons, women dig large quantities of yam and flax lily bulbs and gather grass seeds and wild fruit, but food gathering is now secondary to meat getting. (Tonkinson 1974:59)

Tonkinson then described daily and weekly hunting activities around Jigalong. Notably, by contrast to Tonkinson's comment, we have seen that necessity, that is, the need for sustenance did drive hunting activities at Parnngurr during the study period.

Accounts that are more recent have made direct and deliberate connections between the past and present. For example:

> We've been living around this country for a long time before whitefellas came. Lots of us were living on bush food, snake, rabbit, kangaroo, lots of meat and other bushtucker. People moved around this country in the old days. Now there are lots of whitefellas. Then there were Aboriginal people living wild who didn't know anything about whitefellas.
>
> We went to live in houses but some went away from there to live the old way again. Others lived in town for a long time.
>
> We could find water in soaks, sometimes springs, we can live there forever. Now our children are following on and keeping these places where the water and the meat are good (Miller 1987).

During the study period, older Martu speakers often emphasised the ideal of a continued and continuous life of living on bush foods. In some families there were two generations of *pujiman* (bushman) people who were still alive and active foragers (Jakayu and Mitchell Biljapu, Nantuwirta and Nyapi Robinson, Junju Judson and

[124] This was true of accounts recorded by researchers who had no predominant interest in bush resources; as well as ethnohistorical accounts recorded by this researcher (Yirapartu et al. 1992).

Marcia to name a few). If socio-economic limitations were alleviated these people would probably maintain the practice until they were infirm or died. People who ‘lived on country’ and made heavy use of its resources have been termed ‘the ecosystem generation’ (T. Cunningham pers. comm. 30/4/06); this seems an apt term that contrasts to subsequent settlement generations. For the former, at its simplest rationale, foraging was just a normal, vital part of life, an activity taken as a given.

6.4.2 Recreation, picnic and escape

When Martu expanded on the reasons why they hunted and gathered, some spoke of the recreational aspects they appreciated. Their reasons indicated a desire for alternatives to the routine or busyness of settlement life. When the question was asked of one person she replied:

> when (I am) tired of playing cards then [I will] go hunting do something different (Daphne Panaka 14/8/90 FW diary)

The conduct of foraging trips on weekends reinforced the recreational rationale. On weekends there was no school, no CDEP or paid work also men such as the Parnngurr chairman who controlled a vehicle had fewer obligations. Some Martu, particularly children talked about going on a ‘picnic’. Whereas non-Aboriginal people take their food with them on a picnic, Martu preferred to get it ‘on the wing’ so to speak; people took tea and damper along if anything.

Other people went on foraging trips to escape the demands and humbug of children.[125] They would mutter “them *jiji* too much nuisance” as they commanded a space in a departing vehicle with apparently little notice to their family. Furthermore, on at least two occasions as we headed off on a trip, individuals jumped onboard to escape an antagonist. Social life in the settlements was often intense; a lot of people lived in close quarters and arguments were common.

By contrast to the density of settlements, foraging trips allowed smaller groups of people to interact with greater freedom and independence. On trips, people seemed comfortable in each other’s company, no arguments were recorded and the atmosphere usually felt calm and relaxed. Jokes, teasing and laughter were common. For individuals, it was fun and rewarding, and for groups it appeared that hunting and gathering strengthened social bonds amongst Martu through shared experience, cooperation and exchanges.

6.4.3 Preferred tastes: fat, moist, sweet

Middle-aged and older Martu preferred to eat bush meat to tinned, packaged and frozen meats. In particular, Martu, like many Aboriginal groups (McDonald 2003), showed a strong preference for what were thought of as fatty, sweet and/or moist foods. Whilst store meats contained fats, older Martu relished and defined unique qualities in the fats

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[125] Humbug ~ an Aboriginal English term referring to persistent nuisance or annoyance from other people and their demands.

of bush animals—discrete lobes, yellowness of colour, the organ it was associated with, and its juiciness—qualities for which store meats were poor substitutes.

Jinyji was one of the earliest Manyjilyjarra words one learnt when hunting with Martu. As Beatrice Simpson Karimarra exclaimed when she set out hunting one day:

> Lets go! [my husband] likes his *jinyji*. [126] (FW diary 28/3/90)

in anticipation of treats to share with him. On most occasions when people captured an animal they immediately checked its fat content. Fattiness was indicated by, for instance, the plumpness of a varanid's tail base or the texture of flesh along a Cat's spine. Fattiness was a significant feature that drove the choice of one species over another in time and/or place (e.g. varanids after termite alates had flown or *lunki* rather than *Parnajarrpa* in the cool time).

The following event exemplifies the love of fat that was common amongst Martu:

> Jeffery James (JJ), Marjorey Yates, Patricia, Ngangapa and I drove SSE from Kunawarritji, E from Well 32 to Yurrunun a breakaway with Miniritchie [*Acacia rhodophloia*] on the ridge … 11.20am JJ walked off to hunt, Marjorey and Ngangapa headed downslope to the dune. Patricia and I stayed on the ridge, we followed JJ's route by the plumes of smoke. 2.30 pm JJ arrived back with a Kirti Kirti. He gutted the animal; put aside the liver and heart then stripped fat lobes from the stomach and intestine. JJ cut a 40cm section of large intestine, turned it inside out, rinsed it in water, stuffed the fat lobes into it then knotted off each end. Patricia and I attended to singeing the Euro then put it in the cooking pit. Whilst waiting she cooked the 'fat sausage' in a hot ash bed. After ~ 8 minutes it sizzled and spat. It was put to one side. When cooked, JJ pulled the Euro from the hearth, as he cut it open, Patricia held a pannikin under the belly cut and drained 2 cups of blood, juice and fat. JJ formally divided the Euro into 10 pieces and the sausage into four pieces. Marjorey and Nganapa had arrived back at 3.50 pm with one *Pujikatu* and two *Parnajarrpa*. The Euro meat and sausage were shared; there was much lip smacking and comment about 'JJ the hunter' as the women relished the sausage, gravy and meat. The remaining meat and the Cat and Sand goanna were returned to Kunawarritji. The day's maximum temperature at Kunawarritji was 41°C. (FW diary 90-6:121, 26/10/09)

In my reading, I have not encountered similar reports of desert people making sausages of pure fat. Nor had I seen Martu make these previously. Patricia explained that this was a particularly fat Euro. In the desert environment, Martu savoured all food moisture, the careful collection of gravy illustrated this, and mammal meats were often very bloody when deemed cooked.

As with meat, moist plant foods were highly prized too, also, the sweeter the better. The continued gathering of nectars, Bush tomatoes and other fruits was described in Chapter 5.6.2, although the quantities collected were dramatically smaller than meat foods and they were less frequently reported to be collected due to opportunistic gathering. If a driver whizzed past a stand of *Jalypinypa* dripping with nectar (sometimes indicated by flocks of honey-eaters), passengers shouted "Stop" so they could alight to get it.[127]

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[126] *jinyji* ~ animal fat

[127] *Jalypinpa ~ Grevillea aff. eriostachya*

A particularly sweet and interesting combination of store and ‘bush’ food was observed on two ‘non-foraging’ trips to Karlamilyi (for school and a large meeting). In the primary river channel, occasional vines of *Pikimilun* occurred.[128] Children collected and cooked these large fruit in the ash and hot sand bed of a fire then split the melon in half, and mixed a tin of jam into the pulp before spooning it out to eat. This was a prized, sweet, moist treat. During the study, store equivalents to nectars and fruits were absent or scarce. As noted above, all store fruits were quickly consumed so leaving weeks without oranges and apples. Bush and store fruits were eagerly sought especially by children.

6.4.4 Sharing, trade, ceremonial, taboo, and other needs fulfilled by bush foods

Another significant reason for the collection of bush food generally and specific species was so they could be shared and traded. Some of these were gifted at a domestic level among kin, others were offered in more formal situations as determined by obligations to social sections. Certain species were required for certain rituals. Other species had to be avoided during certain Martu life stages and alternative species sought.

The formal butchering and sharing of macropods and buffalo has been described by (Altman 1987) and many Aboriginal groups had such protocols. Martu described the proper way to butcher different species. In the study, these were recorded for Euro, Bustard and varanids. Prescribed cuts of meat were distributed to particular people. The distribution of body parts was guided by protocols influenced by who was present, who took what role in the hunt, kin relations, skin relations and/or persons of co-residence. Amongst Martu, it was found that butchering rules extended even to smaller game collected by women. *Yalapara* for instance, was supposed to be divided into eight parts for distribution (Fig. 6.1) with the division of larger *Parnajarrpa* being the same.[129] In comparison, there were more than 20 Euro meat cuts and at least ten pieces from a Bustard.

Distribution and sharing permeated every foraging trip and events immediately on return to the settlement. The anticipated sharing of bush meats was conveyed in Christine Sammy’s earlier comment (Ch. 6.2.3). On nearly all accompanied trips, the participants had a dinner camp near the foraging site at which they cooked, distributed and ate some of the produce collected. Foragers wanted a decent share for themselves, each other and then their family. In this study, records were kept of who received what portion of the produce; social analysis of the allocations required more detailed information on kin and other relations within the foraging party. A proportion of bush produce was also taken back to the settlement. This was noted in the above description of Trip no. 5 where women returned with a Sand goanna each and the entire Perentie

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[128] *Pikimilun* ~ *Citrullus lanatus*, Wild Watermelon. Botanically, this is classed as an introduced species in Australia. Martu consulted did not recognize it as such; however, their name *Pikimilun* is probably a derivative of ‘piggy or paddy melon’. The species was a naturalized form of Watermelon; cultivar features such as red flesh had receded.

[129] Butchered cuts and distribution represented an ideal that was observed to be waived such as occasions when there were smaller animals and fewer people present.

went to Daphne’s household. When a foraging group returned to a settlement a clamour of children and dogs sought the returning produce together with their family members. It was my impression that some active foragers such as Rita Milangka placed a high value on bush foods as a currency to contribute to exchange networks. There were several women, including her, who did not play or gamble on cards and so did not participate in this exchange network. Hunting, like gambling, appeared to facilitate the movement of exchange items between social groups.

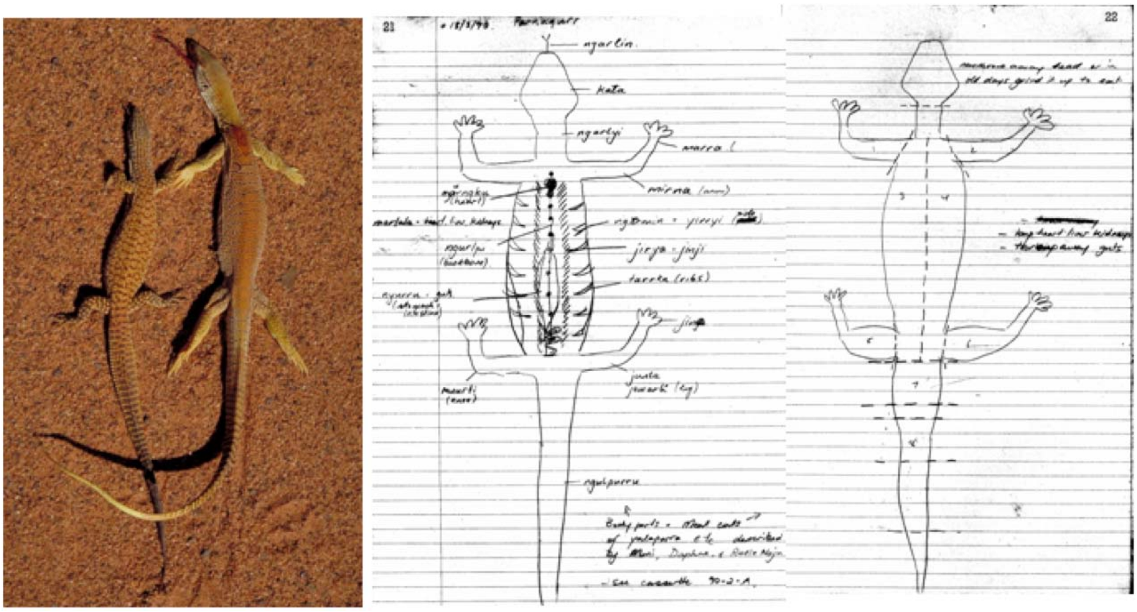

Figure 6.1 Left: *Parnajarrpa* (*Varanus gouldii*) and *Winyjikirti* (*V. acanthurus*). Right: anatomical terms and meat cuts for *Yalapara* (*V. giganteus*) recorded in field diary Described by Rita Milangka, Daphne Panaka and Rosie Purungu.[130] Before cooking, the intestine was removed from the dead animal by insertion of a twig through the mouth or anus and twisting to catch the throat or lower intestine respectively then pull out the stomach and intestine. These were discarded. After cooking, the head was discarded (in past times head and bones were ground to a paste and eaten). Heart, liver and kidney (*marlala*) were eaten too.

When men returned from hunting trips with game, the animals were usually entire and uncooked. A family member would do the preparation and cooking. There were large game cooking hearths near most family camps in the settlements. Generally, the hunter determined who got what piece. In terms of a Euro, for example, formally the hunter’s mother in law should receive a full thigh, the hunter’s wife half a thigh and some backbone and so on. If certain kin were absent then those in residence took priority. Whether these protocols were consistently followed was not observed; however, it seems likely they represented an ideal manner of distribution. On unaccompanied trips, particularly those with large groups, it was common for all bush foods to be consumed at a dinner camp.

The gifting of produce from one person to another also occurred between settlements. For example, in October 1990, I was asked to freight from Kunawarritji and deliver to

[130] FW diary 90(3):22 and Cassette 90-2-a

Punmu, billycans and pillow cases full of *Pura*.[131] On another occasion, I was asked to deliver a 7 kg Emu thigh from a Jigalong to a Parnngurr family. Reciprocal exchanges were a well-established part of Aboriginal life.

There were strong links between the life stages of Martu men and women and particular species. An example given in Chapter 5 was the intensive hunting of Euro in a period when men's Law business was active. Red Kangaroo was also said to be hunted during men's initiation rituals. The role of game in the ceremonies of men was not considered in this study; however, special feasts were a common and integral part of these rituals (Tonkinson 1991).

There were a variety of constraints on the consumption of particular species by various Martu. In Chapter 5.7.8, we saw food restrictions were a factor that influenced choices between species. There were food taboos applicable to adults in an early stage of mourning. Protocols dictated which species should not be eaten for a certain period following the death of a relative. For instance:

> At present, due to mourning Ida and Muuki can't eat *Parnajarrpa*, Camel, *Pujikatu*, milk, tin of meat. They can eat fish, *Kirti Kirti* and *Lungkurta*. They had gone hunting specifically for *Kirti Kirti* but been unsuccessful and returned empty handed; whereas others had collected *Parnajarrpa* and Cat but these couldn't be shared with them. (3/9/90 FW field diary 90-5:68)[132]

Individual hunters intermittently collected species explicitly for people who could not eat the fare that was returned. In 1990, due to the accidental deaths of eight people near Punmu, there were many Martu in mourning. On one trip, Daisy Purungu could not eat the *Pujikatu* that had been killed, so Rita Milangka made a specific effort to find a *Lungkurta* for her before returning to the dinner camp. Similarly, the sole *Lungkurta* caught by Rosie Purungu on 14/3/90 (reported early this chapter) was for a *jaminypa*.[133] During the study, there was no ethnographic evidence for restrictions associated with plant foods. Notably, Martu incorporated modern day substitutes into this avoidance protocol. Consequently, with a trend toward more store goods, alternatives were created enabling the continuation of a customary practice with different materials.[134]

Some taboos such as the mourning one were concluded with specific rituals associated with animal meats. For instance, during the reburial ceremony at Jigalong of a widely

[131] *Pura* ~ *Solanum chippendalei*, Bush tomato. A staggering 20 and 40 kg were gifted to Punmu and Parnngurr individuals respectively. These total quantities were not included in collection records in Chapter 5, Table 12 as they were collected on unaccompanied trips.

[132] *Parnajarrpa* ~ *Varanus gouldii*, Sand goanna; *Pujikatu* ~ Cat; *Kirti Kirti* ~ Euro; *Lungkurta* ~ Centralian blue-tongue lizard

[133] *jaminypa* ~ a funeral activity, someone in mourning who could not eat certain meats; or *daji* in Tonkinson (1991:104)

[134] The basis for the taboos could not be determined because of apparent consistency in the species from person to person, it did not seem to be associated with personal affiliations between individuals and their *Jukurrpa*. It appeared some species were more widely associated with this protocol than other species e.g. everyone recognised the avoidance of *Marlu* (Red kangaroo).

respected Martu man, his kin hunted and butchered *Marlu*.[135] The meat and fat were then ritually fed to his close family. This broke their abstinence from eating this special animal.

Other specific restrictions were applicable at particular Martu life stages. For instance, it was said girls should not eat *Yalapara* until they had reached puberty and pregnant women should avoid *Lungkurta*.[136] Other taboos were supposed to be respected for the duration of one's life. One protocol meant that individuals should not eat their *jarrin* (Ch. 8.3.2). Another protocol related to avoidance of the animals whose skin classification identified them as *yumari*.[137]

The obeisance to these protocols varied. Some older Martu said that younger generations did not follow the Law on these matters. It was possible that younger people sought to escape the strictures of tradition. But the argument that they were simply not interested appeared to be too limited. More insightful explanations came such as when Peter Tinker lamented that:

> The old ways of sharing *kuka* are breaking down. Now us Martu live in houses. The kids are hungry. The kids don't have enough food. They eat what they can. (FW diary 90-7:33)

This poignant comment indicated that shortage and need were some drivers of cultural change to socio-economic patterns.

6.4.5 Better diet and health

Martu also said they gathered bush foods to improve their health. People who had been *pujiman* (bush men) were often nostalgic about the better health of themselves and family in the past:

> …Life was changing. I started eating white food like flour, sugar and tea and I forgot my bush food. I was 8 or 9 years old when we went back to the stock-route for a year. We were happy in that country, no sickness, no humbug, it was peaceful. But when I took a taste of white food I lost my goodness. (M. Biljaba 1987:5)

Some justified a resumption of hunting and gathering as an endeavour to improve poor health which they clearly linked to changes in diet and lifestyle:

> In the old ways, my mother and father were living on bushtucker. They never got sick, only they'd get cold sick, maybe a runny nose. … When we went to town so we have tea with sugar, some people get diabetic, some people get high blood pressure … whitefellas' chops, beef make us sick. When we boil and eat those people get sick. Not like that before out in country so now we live in Parnngurr and be normal. We eat plenty of bushtucker. (Nyapi Robinson Karimarra 6/9/90)[138]

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[135] *Marlu* ~ *Macropus rufus*, Red kangaroo

[136] *Yalapara* ~ *Varanus giganteus*, *Perentie*; *Lungkurta* ~ *Tiliqua multifasciata*, Centralian blue-tongue lizard

[137] *jarrinypa* ~ spirit-child, conception totem (plant or animal); *yumari* ~ mother in law or mother's brother's wife

[138] Nyapi's husband Daylight Robinson had Type II diabetes that was managed through diet control; as she intimated, he preferred to eat bush rather than store meats. Nyapi was a frequent, active and productive hunter.

The Robinsons and other families saw a clear connection between store foods and sickness and conversely, bush foods and health. Martu and many other Aboriginal groups often asserted these connections. Evidence-based medical research that affirmed this view has been published. Traditionally-orientated lifestyles reduced Aboriginal health risks (O'Dea et al. 1988; Burgess et al. 2005). Importantly, a ten year comparative study in central Australia of health profiles in a large Aboriginal settlement and a scatter of small, family-based outstations found the latter to have significantly better health indices (Rowley and Brown 2006). Ready access to custodial lands, foraging activity and a high intake of bush foods were identified as some in a complex of factors that contributed to better health of the outstation populations. Recently, multidisciplinary research evidence has linked human health and ecosystem health (Garnett & Sithole 2007).

6.4.6 More reasons why Martu foraged

Above are a few of a myriad of reasons that Martu explicitly or implicitly conveyed to explain why they hunted, gathered, went on foraging trips and/or ate bush foods. Table 6.6 collates those for which evidence was gathered during the study. These have been loosely grouped by different sustainability domains but some cross several domains. Some have been expanded upon in this chapter.

The expression of these factors varied from person to person and over time. The value of these motivations needed to be appreciated in the context of day to day settlement life and people’s wider life experience in Jigalong and Pilbara towns. In settlements, Martu often endured hardships e.g. boredom, tension, violence; in the Pilbara they had suffered racism, attempted assimilation and misunderstanding (McGrath 2007; Tonkinson 2007:50). Hunting and gathering provided alternatives to these experiences.

Table 6.6 Reasons why Martu collected and ate bush foods

Ontological / Metaphysical
• follow the Dreaming • cultivate familiarity between hunter and the sentient landscape “you give me *lungkarta*!” • reproduce resources by their collection and consumption • continuity with the recent past • teach children about bush foods “lead *jiji* to *mayi*” • respect food restrictions “follow *jukurrpa* for *jaminypa*”
Economic
• sustenance, the physical need for food • eat tasty, known foods • contribute produce to sharing, gifts and socio-economic exchanges • provide alternatives to specific taboos and restrictions • to work and occupy foragers

Table 6.6 continued

Social
• strengthen social groupings and cohesion through cooperation and shared activities
• provide topics of conversation
• respite from children
• escape from antagonists and arguments
• break from tensions, intensity and routine of settlement life
• expression of and context for Martu languages detail e.g. spp names
Political
• assert Martu rights to the use of land and its resources in relation to Western institutions and entities (esp. CALM and miners)
• teach whitefellas about Martu ways and knowledge
• pursue activities that are initiated by Martu rather than whitefellas "we follow our ways now"
Personal
• improve health through dietary change and possibly exercise
• intellectual stimulation and interest
• reinforce or shape individual identity
• independence and autonomy
• status and prestige
• enjoyment and relaxation
• excitement and thrill
• enhance well being and happiness

6.5 Limits on Martu people's capacity and interest in hunting and gathering

Despite all the benefits of hunting, gathering and eating bush foods identified by Martu, about 35% of the population of women at Parnngurr foraged once a week or less (derived from Tab. 6.2). There were also men and women in all settlements who rarely foraged. Obviously there were external and internal reasons that constrained them going more often.

Some constraining factors were the opposites of those above. For example, contrary to hunting to improve health, it was common to hear that someone was not going collecting because they were sick or in pain. Above I had emphasised that it was necessary to appreciate hunting by contrast to the intensity of settlement life yet there were Martu who had grown up in settlements who were more comfortable in them and/or spent little time 'on country' where they felt alienated or wary. Other factors reflected modern interests and needs overriding traditional ones, for instance:

> In Parnngurr, Christine Sammy was on the HF radio to Mippy in Punmu. During their chat "*Kukakarti?*" she enquired "No, been watching video. No motor car" he replied.[139] (18/10/90 FW diary 90-7:79)

[139] *kukakarti* ~ meat, toward; hunting

Video was a stronger lure and the absence of a vehicle a further constraint. After the radio chat, I asked Christine about the young men and hunting, she pondered her answer:

> Mippy and the other boys, Winston, Yuwinji, not old enough for hunting. When [they are] older they might go. (18/10/90 FW diary 90-7:79)

She speculated that these men who were in their early twenties would hunt more often as they aged.[140] This belief reiterated the notion of hunting being an activity preferred by older generations, however, it overlooked the continuous acquisition of knowledge and skill required to effectively hunt and gather. Another notable constraint on the practice of collecting was the time available to do it. We have also seen above that some Martu had commitments to young families or commitments to meetings and negotiations associated with their roles as 'representatives'. These travel and time commitments were substantial (Ch. 4.3) and reduced people's opportunities to go collecting bush foods. It can be inferred from the relatively large proportion of the population who foraged less frequently that the socio-economic factors that limited foraging were perhaps more numerous and varied than those that enabled it.

6.6 Predictions on future foraging motivations and their trends

It is likely that the overall trend is one of reduced foraging. The strongest socioeconomic change has been reduced economic dependence on bush foods as store supplies become more reliable and substitutes such as store meat more accepted. Ontological motivations to hunt and gather may diminish as the 'ecosystem generation', those *pujiman* who provided continuity of practice ages and passes away.[141] Practical knowledge of the spatial landscape (resource patches, tracks) was critical to the ontological productivity and physical procurement of resources this knowledge invariably narrows as people's travel on lands was increasingly constrained by roads. Chapters 8 and 9 also identify that ecological production of bush resources has and will diminish due to ecosystem degradation, curtailed resource management and localised specific over-hunting.

Interrupting the overall trend, there will be occasions when Martu revitalise foraging in response to external pressures and outsider interests. Political statements of Martu rights to hunt may flare where their land tenure rights remained unrecognised and as the perceived incursion of 'whitefellas' who do not respect Martu land protocols (e.g. tourists, government staff) grows. It is likely that certain Martu will continue to generously demonstrate their knowledge of bush resources to more benign 'whitefellas' such as teachers, settlement staff and researchers. Martu may, like many other Aboriginal groups isolated from the regular practice of foraging, seek to affirm and document their knowledge of animals and plants as a part of their heritage, identity and

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[140] Tragically, Mippy died the following year and Yuwinji was killed a few years later.

[141] *Pujiman* ~ Bush man, bush people, people who walked on custodial lands before settling in a community

the process of teaching children ‘culture’ (see Blythe & Wightman 2004; Povinelli 1992) but these processes have become reliant upon the resources of external researchers. It is predicted that social and personal factors rather than economic ones will become the strongest motivators to go hunting and gathering.

This is a grimmer forecast of customary harvest motivations than that found for Kuninjku over a 24 year period (Altman 2003; Altman unpubl. b). It may also be that socio-economic constraints and limitations on foraging are fewer in Arnhem Land and adjacent regions. Lands are held through the Aboriginal Land Rights Act (Northern Territory) 1978. There is greater income, more cross-subsidy of subsistence through the private sector economy and other regional characteristics that support indigenous land management (Davies et al. 1999). Also, coastal and hinterland environments of Arnhem Land are enormously more productive and predictable than the Great Sandy Desert bioregion. A greater biomass means it is more rewarding to hunt, gather and fish in tropical ecosystems. Life in the desert is harsher.

6.7 Chapter conclusions and their relevance to co-management

This chapter enumerated and described aspects of the social organisation of foraging. It brought the ‘people’ aspect of hunting and gathering into sharper profile. Conventionally, Western park and natural resource managers have had limited interest in and understanding of the social profile and motivations of Aboriginal land users. Their attention has focussed on the governance structures and processes of co-management rather than resource users. This chapter has argued that knowledge of the social features of a hunter-gatherer system is essential to an understanding of hunting and gathering practice, species harvest rates and wider aspects of ecosystem management in the Rudall River National Park region.

The objectives of the chapter were to identify the proportions of Martu populations who foraged to determine the numbers of people collecting wildlife resources. The chapter sought to identify the gender composition of foraging groups and the comparative species weight returns from foraging by men and women. It then aimed to describe the factors that motivated different Martu to hunt and gather. A particular goal of the chapter was to assess whether the need for bush food compared to store food produce was a major motivator of foraging.

The results showed that women went foraging more often than men both whether the female researcher was present or absent. Mixed gender groups were also a common feature of foraging trips and characterised about one third of the unaccompanied trips. Men killed more than three times the weight of animals than women (excluding Camel kills done by men) despite men’s lower foraging frequency. Men irregularly provided large weights of mainly Euro and Bustard. Women consistently supplied small weights of mainly Sand goanna and Cat.

Tonkinson observed in his ethnographic reconstruction that:

> the use of section terms … have little relevance to mundane hunting and gathering activities (Tonkinson 1991:77).

By contrast, this field research indicated that Martu's skin section relations were relevant to contemporary foraging. For example, skin classifications influenced who did or could not travel in vehicles, who requested a particular portion of foraging returns or what species a person of one skin group collected for another; it appeared that familial and residency relations were dominant. Further, patrimoieties shaped the association of Martu to specific areas within the landscape thus the groupings of people who utilised nearby resources and were responsible for them (Ch. 8.2.6).

These findings are relevant to national park and ecosystem management in at least two ways. If Western natural resource managers were to develop species specific management or educational programs then they should seek to collaborate with the major users of the species of interest. Should they want, for example, to undertake regional inventories of fauna and flora taxa (rather than specific species) then they would benefit from collaboration with women who were more frequent foragers and so had longer periods of wildlife observation.

This study found that, of the total population of Martu women in one settlement (Parnngurr), about 40% foraged one or two times a week. A minority of women (17%) were frequent foragers and one third of the women's population went less than once a week. Thus only a small proportion of the women's population were active hunters; further, the individuals who foraged less frequently changed over time. Similar proportions were likely to be found across the male population. The minority group had the strongest influence on the harvesting of wildlife in the region. The number of hunters is one parameter needed to quantitatively assess ecological sustainability of species harvest, and hence is relevant to wildlife management.

Foraging practice was highly variable across the female population. This variability was further apparent in a comparison between the species returned by two women who were both frequent foragers. One individual compared to another collected four times the species weight. Some specialisation in the species targeted by individuals was observed. Martu recognised those people with strong expertise in hunting and gathering. Individual autonomy and high productivity were valued but so too was cooperation in groups by women. Women foraged in larger groups than men did (but smaller than mixed gender groups). Group cooperation in hunting particular animals, caring for children and other aspects of foraging trips was a key feature of women's trips.

Again, this is pertinent to collaborative management. There were Martu experts in particular activities and species just as there are scientific experts in particular topics or taxa.[142] Whilst Martu distinguished these specialists, most women tended to see

[142] The recognition of Martu experts in particular species involves more than those who are efficient and knowledgeable hunters of that species. There are also Martu custodians of particular species who have species relations determined by *jarrinypa* (spirit-child, conception totem) or other *Jukurrpa* connections.

themselves as a part of a wider foraging group. Thus, potential Western liaison with Martu women experts also requires recognition and involvement of their hunting colleagues.

Younger people appeared to hunt less frequently for fewer returns than older people did. However, intergenerational differences in foraging practice were not closely examined in this study. This is a critical area of future research requiring focussed interview and observation.[143] The parental and other responsibilities of people vary at each life stage. Do younger Martu forage and capture fewer resources than older people capture? Or do they have life stage responsibilities that take time away from these activities that they may do in later life? It is common to hear young Aboriginal people denigrated or dismissed for ‘the knowledge they have lost’ about plants, animals and country. Yet, it is important for outsiders to recognise that young Aboriginal people in remote settlements generally know far more about local environments than their urban counterparts including some ecologists. Altman (unpublished b) noted concerns about the possible decline in hunting skills amongst younger generations of Kuninjku people but optimistically concluded that a new generation was likely to succeed present day harvesters.

The second half of this chapter examined some of the reasons why Martu hunted and gathered. Contemporary Aboriginal people’s motivation to hunt and gather has been documented in only a few intensive studies (Povinelli 1992; Devitt 1988; Altman 1987). The list of reasons why Martu hunted, affirmed and extended their findings. Nationally, there has been a widespread lack of appreciation for the complex of meanings that underpinned foraging by Aboriginal people and the interconnections between Aboriginal economy, labour and culture (Povinelli 1993:3). Generally, recognition by the natural resource management sector of the sophistication behind foraging and Aboriginal resource use has been limited. For example it received little attention in planning documents on lands where foraging was a significant but overlooked land use (e.g. UKTBOM & PA 2000; LNT 2005). Important contrasts were Davies et al. (1999) and Whitehead et al. (2006) yet even their reviews are focussed mainly on the monetary economic value or commerical potential inherent in foraging (being responsive to government policy and perceptions of indigenous need). Yet it was a much wider suite of motivations that drove and shaped all aspects of Martu food collecting from species selection to, as we will see in the next chapter, the distance that people will travel for resources.

Unlike Belyuen people in the late 1980s (Povinelli 1992), Martu often needed to hunt if they wanted food. Larger weights of bush foods were hunted in periods when the supply of store goods was low relative to population needs. When the settlement populations were extremely hungry, male hunters killed Camels. This sustenance imperative fluctuated in relation to delays in store deliveries and population fluxes. It was

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[143] Bird and Bleige Bird (2004) investigated Martu children’s hunting strategies but have not yet published intergenerational comparisons. However, they did conclude children were active and independent hunters who operated within the constraints of their height and walking speed thus age.

predictable that if the quantity and quality of stores improved proportional to population size the need for Martu to forage would decline. This has been the trend across remote Aboriginal Australia. In 1990, sustenance needs were a powerful force that shaped Martu use of wildlife and 'management' practices associated with the collection of species.

In addition to the need for sustenance, many and varied motivations were interpreted to inspire and direct Martu hunting and gathering activities. More than 25 reasons were identified (Tab. 6.6) and loosely grouped into ontological, economic, social, political and personal domains. The specific number of reasons is less relevant than the point that many motivations and benefits underpinned modern foraging practice. These factors would have shifted and changed from one person to another and over time. In 1990, continuity and ontological reasons persisted but with the outstation movement 'our ways' were deliberately reinstated by Martu and there was greater political assertion of them in the Australian public arena. Martu asserted hunting as a statement of their identity and power to 'outsiders'. The strength of analogous motivations had been well-observed amongst Belyuen people who were also arguing land claims (Povinelli 1992, 1993).

Historical and socio-economic factors underpinned the subsistence practices of Martu. They were a major determinant of trends that influenced wildlife resource use generally and at the species level. I argue that an understanding of Martu reasons for hunting is highly relevant to hunting practice; later, I will extend this to propose that if the sustenance imperative declines, then people's imperative to 'manage' their lands to maintain a richness and abundance of bush resources may also diminish.

An important matter of direct relevance to park and ecosystem managers is the need to recognise Martu rationales for foraging, and respect them when shaping ecosystem management recommendations and actions. That is, they should be cautious not to undermine or jeopardise the customary economy and livelihoods that people maintain through their multiple motivations. For instance, the removal of feral stock including Camels and Cats is a management action recommended to maintain biodiversity in the Great Sandy Desert bioregion (Graham 2001), yet both species were essential to Martu sustenance. The removal of these species by government agencies would have dire consequences for Martu subsistence livelihoods. It would be critical that Martu and ecosystem managers collaborate to develop species management strategies that resolved divergent needs in common agreements.[144]

[144] The development of strategies would need to be preceded by the identification and weighing up of the cultural and natural resource management costs of Camels e.g. jukurrpa site and water source damage.

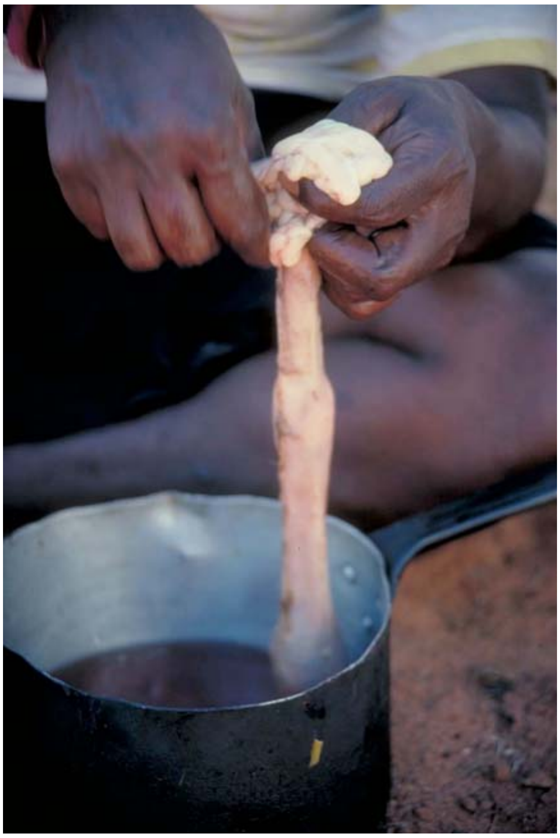
The division and distribution of bush foods was a major impetus for their collection.

Photo 6.2 (top left) In 1987, Parnngurr women dig in search of *Minyarra* (*Cyperus bulbosus*), another species growing in dense patches that allowed women to talk whilst they work. Older women said the species should only be dug by loosening the soil with a pounding stone rather than poking a stick. In their interpretation, this reduced thunder while in a biological interpretation; it may have also kept root systems more intact to allow regeneration.

Photo 6.3 (top right) Nancy Taylor and Mayika watch closely whilst Muuki and Waka Taylor prepare a *Kirti Kirti* (Euro) before it is singed for cooking.

Photo 6.4 (bottom left) Nganapa, Nayju and Shirleyanne with bags and buckets of *Pura* (*Solanum chippendalei*) collected near Kunawarritji in November 1990. After being cleaned, two of the bags of fruit were sent to family at Punmu and Parnngurr. Bush foods contributed to exchanges of material good through social networks.

Photo 6.5 (bottom right) Jeffrey James butchers a *Kirti Kirti* (Euro) after it has been cooked in the hearth. Patricia and Marjorey look on to await their portion. Parts of the cooked animal were returned to Kunawarritji and shared amongst other kin folk.



Preferred tastes in bush foods and the mix of bush and store goods eaten by Martu.

Photo 6.6 (top left) Fat sausage made from Euro small intestine with intestinal fat stuffed into it before knotting off and cooking. Bush meats that were fat continued to be highly prized amongst Martu and preferred over and above store meats.

Photo 6.7 (top right) The blood and fat from singed but uncooked Euro is drained before cooking.

Photo 6.8 (centre left) Fire hearth with mix of bush and store foods cooking including *Lungkurta* (Centralian blue tongue lizard), *Pujikatu* (Cat) and potatoes.

Photo 6.9 (bottom right) The solar powered refrigerator container at Parnngurr in 1990 that served as a store where meat, dry goods, other goods and excess bush meats were kept.

Photo 7.1 Two women on spinifex sandplain between dunes south of Punmu in September 1990. They search the edges of a burn less than six months old to intercept the tracks of Sand goanna, Cat or other species. Several regeneration or seral stages can be identified in the vegetation. Fine scale burn mosaics such as here provided a diversity of habitats for bush food species utilised by Martu.

7 Spatio-temporal concepts and foraging patterns of Martu

7.1 Introduction

Chapter 5 found that a large number of plant and animal species continued to be utilised by Martu. But from what land area were these species hunted? How extensive was this area relative to areas that were less accessible to Martu? Chapter 5 also presented quantitative data from a total of three months research in three different settlements. Can species hunted from this period be extrapolated to a full year? Were species returns consistent through a year? Or did they vary seasonally? These questions are pertinent to understanding the ecological sustainability of hunting and gathering. Analysis of spatio-temporal patterns is relevant to co-management of a national park where there are potential interactions in space between different land users, such as Martu and tourists. Explanation of these patterns is aided by interpretation of the Martu concepts that underpin them. Chapter 6 demonstrated the variety in social aspects of foraging revealing considerable differences between individuals in both their practice and motivations. Did these motivations stimulate people to utilise particular parts of their landscape that were not the most resource productive?

This chapter addresses the broad question of whether there were patterns to the spatio-temporal collection of bush resources by Martu specifically by asking:

a) What were the spatial concepts of Martu relevant to hunting and gathering?

b) Where did Martu hunt and gather on their lands?

c) What were the temporal concepts of Martu relevant to hunting and gathering?

d) When did Martu collect resource species within a ‘year’?

e) How were the spatio-temporal concepts and patterns of Martu relevant to ecosystem and park management?

This chapter is unique because spatio-temporal patterns of hunting and gathering activity had never previously been described for contemporary desert Aboriginal people. Archaeologists have put considerable effort into the reconstruction of pre-contact land use patterns to explain the spatial patterning of sites across landscapes and artefact assemblages within them (e.g. Cane 1984; Veth 1989). The spatial movement patterns of nomadic desert groups have been described in early ethnographic accounts (Ch.2.2.2 & Gould 1969; Thomson 1975; Tonkinson 1991). However, to the time of this research, no analysis of spatial and temporal activity patterns in the context of settlements and modern life had been done. Studies of contemporary desert Aboriginal subsistence by Devitt (1988) and Palmer and Brady (1991) did not extend to spatial or seasonal features of foraging.

By contrast, in desert Australia, traditional concepts (rather than practices) that related to desert Aboriginal people's view of their spatial landscape and its elements have been described. For example, in some of the abovementioned ethnographic accounts and embedded in Western Desert linguistic research (e.g. Goddard & Kalotas 1988; Hansen & Hansen 1992; Valiquette 1993). Rarely were spatial concepts singled out for focussed attention (Munn 1996 being an exception) and spatial land concepts associated with resource use have had less attention.

For coastal and hinterland indigenous groups of northern Australia, the partitioning of resources in spatial and temporal dimensions has been documented in studies of traditionally orientated groups. These studies found spatial mobility patterns were strongly associated with environmental use, wet season/dry season camps and ceremonial obligations (Chase & Sutton 1981; Meehan 1982) For instance, the former documented movements of three coastal Cape York groups in relation to habitats, resource species distributions and seasonal accessibility of land and its resources. Whilst they described distinct patterns of mobility, they emphasised the flexibility of hunting and gathering systems for exploiting highly diverse biophysical habitats.

Month by month schedules or annual cyclical calendars illustrated the seasonal availability of resources in tropical environments (Chase & Sutton 1981; Smith & Kalotas 1985). These highlighted the predictability and reliability of ecosystems governed by regular rainfall patterns, although, Chase and Sutton contrasted certain species as 'highly predictable and extremely specific in calendar time' with 'less predictable, more general' seasonality patterns. Within these calendars, 'indicators' were identified whereby one biophysical feature indicated the availability of a resource species (e.g. D. Rose 1988). The seasonal ecological knowledge of Aboriginal people has often been argued to demonstrate a powerful sensitivity to ecosystem processes and to reflect an Aboriginal land ethic.

Within Australian deserts, the scant literature on seasonal resource availability was of varied opinion. The Western Desert was said to be an aseasonal environment with "no predictable season when plants are expected to ripen" (Gould 1980:66); conversely, Cane (Cane 1984:72) asserted "there was a sequence of several traditionally defined seasons through which particular seed and other resource species could be expected to ripen". In central Australia, Latz (1982a) did not document plant resource schedules, his main reference was to long-term, inter-annual seasons such as 'drought' seasons or 'exceptionally good' seasons. At the time of field research reported in this dissertation, the recognition of seasonal patterns by desert Aboriginal people was still unclear and in need of investigation.

The present study was also informed by the detailed, extensive and long-term mapping undertaken through the Inuit Land Use and Occupancy project in circumpolar regions (Brody 1986; Freeman 1976). This included mapping of settlement areas, major game animal sites, hunter trapping locations and travel routes. Land use patterns were interpreted by sophisticated insight into concepts, ceremony, ritual and spiritual associations between Inuit, hunting places and game species (Brody 1986). The project contributed to sustainable resource management, Inuit health and settlement life and land and compensation claims.

Spatio-temporal mapping and scheduling of land and resource use practices by Australian indigenous groups were recognised to be relevant to natural resource management, protected area and ecosystem management (Johannes & MacFarlane 1991; Williams & Hunn 1986). Biophysical mapping (e.g. landform, vegetation or habitat maps) provides essential information for protected area and ecosystem management. Spatial resource management measures such as exclusion zones, restricted use zones and road routing are, ideally, based on synthesis between biophysical and spatial land use parameters. Similarly, seasonal resource schedules influence resource management measures such as 'open' and 'closed' hunting, fishing or collecting seasons. Such measures also benefit from a synthesis of knowledge from species population dynamics and temporal behaviours of resource users. The questions that guide this chapter are partly directed toward these ideals of better understanding spatio-temporal land use so that it can contribute to improved park and ecosystem management on Martu lands.

This chapter has five major sections. Firstly, it introduces Martu spatial concepts, with traditionally-derived and modern components relevant to hunting and gathering. Secondly, it applies a conceptual framework, derived from landscape ecology, to analyse quantitative and qualitative data associated with spatial land use patterns. This re-interprets some of the data used in Chapter 5. Thirdly, it interprets Martu temporal or seasonal concepts within a period equivalent to a year. Fourthly, it describes changing patterns in foraging and species use over a year in contemporary times. The concluding section identifies the implications of these concepts and patterns for park and ecosystem management in the region.

7.2 Spatial concepts of Martu relevant to hunting and gathering

Martu spatial concepts were investigated in this study through semi-structured interviews, discussion and participant observation in 1990 and information recorded from Martu people in the earlier field periods (Ch. 3). Notably, the interpretations have been refined through my subsequent experience in land survey and mapping with Aboriginal people on their lands in central Australia (incl. Mahney et al. 1996; Gambold et al. 1998; Gambold 2001). This work included some transfer to Geographic Information System (GIS) platforms.

In this study, Martu spatial concepts are interpreted to be horizontal 'layers' with vertical interconnections between these layers.[145] These incorporated traditional and

[145] It is also reported that Martu and other desert groups conceptualised spatial dimensions within subterranean and aerial media. For example, Jukurrpa characters were known to travel underground and through the air (Tonkinson 1991) and Martu neighbours had sophisticated interpretations of subterranean water aquifers and their flows (Yu 2002). However, these media are not discussed here.

modern landscape features. In sum, the layers are presented in Figure 7.1. Heuristically, the layers were conceptualised to range from greater to lesser spatial stability (conversely, less spatially dynamic to more dynamic). These layers are detailed below, in part sequentially.

It was interpreted that these layers were of differing spatial stability over time. However, interpretation of 'stability' varied between generations. For instance, in the eyes of senior Martu, *yinta* were more 'conspicuous' and 'fixed' than motor car tracks because the former was embedded within a *Jukurrpa* network, whereas younger Martu saw the vehicle tracks as more stable. Here, the representation synthesises a traditionally-orientated viewpoint.

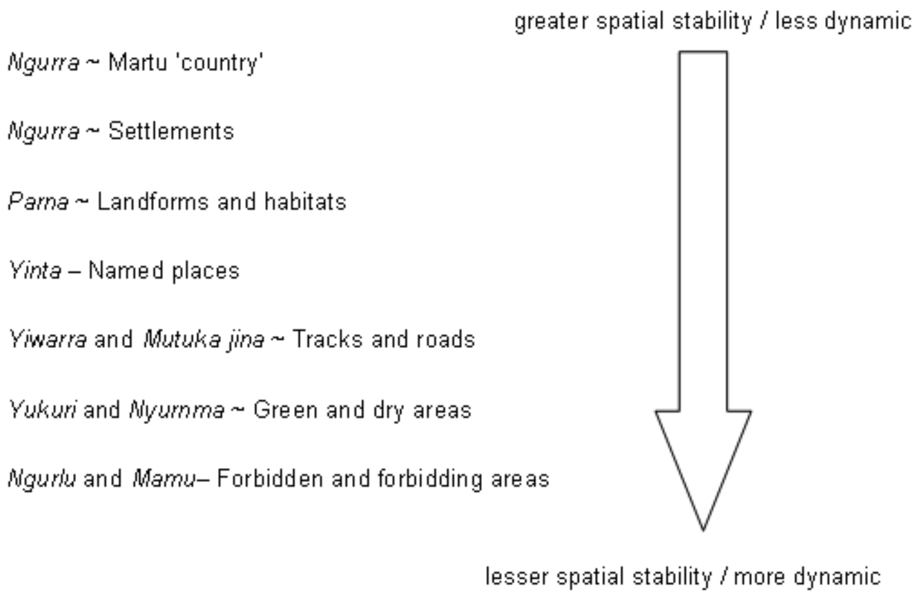


Figure 7.1 Schematic interpretation of environmental-human paramaters in layers that contributed to Martu spatial concepts

These layers are interpreted sequentially in the following chapter sections.

7.2.1 *Ngurra* ~ country, camp, homeland, home

The concept of *ngurra* is central to historical and contemporary Martu life. Equivalent concepts have been widespread in Aboriginal Australia. They are known to be complex with meanings that range from where 'country lies' to where a 'house stands' (Wilkins 2002:28), the range paralleling wide to localised geographic scales. At its widest, *Ngurra* encompassed all of the layers in Figure 7.1, not a singular one. The definition of *Ngurra* was shaped by the location of the speaker. For example, a Martu person in Perth spoke of *ngurra* as their entire country from which they were now distant.

Parnngurr, Punmu and Kunawarritji settlements were the spatial foci of contemporary Martu life on their custodial lands (Fig. 1.2). This study observed that daily outward and return foraging trips radiated from the settlements. People spoke of these places as *ngurra*. When hunting on country someone would say "we'll go *ngurrakutu kuwarri*" or description of a trip started from their *ngurra*.[146] These settlements had become synonymous with living on one's own country (*ngurrara*). *Ngurra* continued to also refer to specific sites on lands away from the settlements. These were sites associated with their family or where individuals had visited, thereby maintaining a custodial connection. *Ngurra* had several old and contemporary meanings. English synonyms for settlements included 'community' and 'outstation'. Martu settlements were now central to spatial foraging movements. This is widely recognised by Martu and researchers as a major distinction between pre-colonial and contemporary subsistence patterns.

Settlements were named by reference to nearby cultural sites (not necessarily the closest ones). The initial Parnngurr settlement was by the rockhole of the same name (Ch. 2.2.9); Kunawarritji (~ contents of the intestines) was named after a nearby site; 'Panaka Panaka' (a named spring) was superseded by the name 'Punmu'. Younger Martu also referred to English placenames (Cotton Creek, Well 33). As with animal species nomenclature, synonyms were common for single point locations. These characteristics are typical of place names on many Aboriginal lands (Hercus et al. 2002).

In the late 1980s and in 1990, certain Martu groups attempted to establish outstation settlements away from Parnngurr and closer to their custodial lands. The two Warnman Taylor families set up a camp at Kurta Kurta (between Parnngurr and Karlamilyi river) and the Gibbs family reconnoitred a homeland camp at Wikirri about 120 km SE of Parnngurr (Fig. 1.2). Neither camp was established with permanent infrastructure or regular residents. These initiatives signalled on-going attempts by Martu individuals in the 1990s to establish outstations closer to their custodial lands irrespective of the National Park boundary.

7.2.2 *Parna* and other terms ~ Landforms and land elements

During field research, a vocabulary of Martu terms for landforms, a land elements and species habitat was compiled. As with Martu language names for species, existing word lists were sparse. Marsh's (1992) dictionary had limited entries for landform domains. Yet in the 1990 study, Martu were found to have an abundant lexicon for land forms, types, elements and species habitats. These descriptors gave form and detail to people's discussion of their landscape.

From a Martu perspective, *parna* was bare ground upon which landscape features were constructed.[147] It also represented the raw state of the country before being moulded by *Jukurrpa* characters. This bare ground continued to be exposed in the present with potential for it to become 'something else'.

[146] *ngurra* ~ country, homeland, settlement, outstation, camp, cultural site, community; *ngurrakutu kuwarri* ~ camp, toward now

[147] *parna* ~ bare ground; earth; country; dust; sand

Upon the *parna*, three major landforms were distinguished on Martu lands: *yapu, pila, tuwa.*[148] Within each of these landforms, particular elements were named with Martu language equivalents for cave, valley, breakaway, plateau and so on. Substrates were further distinguished by colour terms (red, black, yellow and white). For example, *parna pilya* was the soil near white quartz outcrops and *pilyarri* a synonym for white quartz areas. As predictable for a water-scarce region, Martu vocabulary for water-related elements was detailed. Examples of wetland types and elements additional to those above included more than eight terms.[149]

Figures 7.2 and 7.3 illustrate the landform terms applicable to 'typical' stylised landscapes in the Parnngurr and Punmu environs. These figures can be compared to land unit maps in Figures 2.9 and 2.10. Only two of more than 13 land units were directly equivalent to the Martu terms, these were land unit 6 calcrete (*pulpurr*) and Unit 10 undulating gravelly sandplains (*rirra*). The limited congruence between Martu and land unit descriptors reflected different scales of description rather than major cross-cultural differences in description of the actual physical land forms. A more important difference was the use of boundaries in scientific land unit mapping, whereas, like many desert groups, Martu rarely identified land unit or vegetation boundaries at coarse scales.

7.2.3 *Yintakaja* ~ Many waterholes and other named places on Martu lands

Settlements and tracks were situated within an extensive network of sites and other named places, particularly *yinta.*[150] Martu continued to describe their spatial land use by reference to a subset of those places. They provided an essential template for orientation in space when using land near sites or when speaking about them.

Martu place names situated and described *yinta*. The term had multiple meanings: water sources, *Jukurrpa* sites, historical camping sites and places that were at the heartland of country held by individuals and their kin (PALC 1988; Tonkinson 1991). In terms of water source types, *yinta* were generally soaks (*jurnu*), occasionally springs (*jililyinpa*) and rarely rockholes (*wirrkuja*) thus they were more perennial watersources. In precolonial times, their reliability was more significant than the water quantity (Lowe and Pike 1990); they outlasted pools, claypans and other surface waters in extended dry periods (a few years).[151] All these wetlands plus rock features, sandy ridges and most land form elements had been named in past times. During the study, older people listed

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[148] *yapu* ~ uplands, hills, stony areas; *pila* ~ sand plains, interdunal plains; *tuwa* ~ sand dunes

[149] *karru* ~ primary river channel; sandplain stream; *warli* ~ creek; small gulley on stony ground; *jarrrpa*~ watercourse pool; *warla* salt lake; saline playa; *linyji* ~ claypan; pavement termitaria; extremely hard, flat ground; *jijimarra* ~ flood on areas adjacent to watercourses; full lake; levees; *talypurr* ~ mud; boggy place; *parntu parntu* ~ shallow depression; run on zone. [check for inclusion in Figs then delete 2 footnotes]

[150] *yinta* ~ water source in home country; birthplace; Jukurrpa sites; historical camping sites; places that were at the heartland of country held by individuals and their kin.

[151] The knowledge of surface and underground water sources and hydrological flows held by Nganyumarta and other groups in the northern Great Sandy Deserts has been reported in Yu (1999).

dozens of *yinta* in the order that the walking routes criss-crossing the landscape encountered them and/or the songlines of particular *Jukurrpa* intersected the *yinta* (see Figs 2.12`, 2.13 and Tonkinson 1991; Cane 2002).

Martu had many names for the places on their lands, like all Aboriginal groups (Hercus et al. 2002). Historically, Euro-Australians applied their own names across Australia and its deserts. In the view of a senior Martu leader and WDLC chairman:

> [Whitefellas] made the stock-route at the time that I was a kid … There were plenty of our soaks along the stock-route then they came and made them wells. [Whitefellas] gave them names, but it was our place around that area, and there were Martu names for all those places. We have asked the whitefellas to give that land back to us so that the kids can learn to look after their father's place and their grandfather's place and their grandmother's place. (Nyaparu Gibbs 1987:11)

During the study, Martu lamented that their place names were overridden by English ones or that the few Warnman (or other dialect) derivatives that were mapped were incorrect in location, pronunciation or wrong in other ways (see DNM 1989). They wanted to see these maps corrected. Concurrently, they wanted younger Martu to learn of these places now distant from settlements and modern travel routes. Paradoxically, they and their advisors worried that paper mapping may attract outsiders to cultural sites and expose the sites and visitors to damage or danger.

In 1988, people at Punmu created a wall map of named places on their lands; an approximate boundary of the national park was later taped over it (Fig. 7.4)[152]. This was an incomplete representation of named places; there were many names missing especially in southern areas as custodians for these areas were absent during the mapping process. Figure 7.1 reproduced this map. It is contrasted to a conventional map of the Karlamilyi (Rudall River) national park region (DNM 1989). The density of named places can be compared by cross-reference to the salt lakes and rivers common to both maps.

In comparing the two maps, two points become obvious: Martu place names were far denser than Western equivalents, and, the intensity of Martu knowledge of their land and its cultural significance is well demonstrated. Whilst Martu place names within the national park were only partly mapped, at least 110 places are shown on Figure 7.4 compared to 45 place and range names on 1:250,000 topographic sheets in a land area of 12,827 km^2.[153]

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[152] School teachers, Mitchell Biljaba and Ray Valance, with support from historian, Sue Davenport, facilitated this mapping process. It was originally intended to be a teaching resource but later became a tool used at meetings with government and mining companies to demonstrate Martu knowledge of their lands. Extracts from the map were included in the book 'Yintakaja lampajuya' (PALC 1988). About 2007, this map came into public circulation and has since been transferred by hand onto a topographic base that remains unrectified thus (deliberately) of low geographic accuracy (S. Davenport, Kanyirinpa Jukurrpa archival project, pers. comm. 12/4/08).

[153] Western topographic naming was often used coarser scale whereas Martu naming was finer-scaled e.g. the 'McKay Range' encompassed at least twelve Martu place names but there was no single proper noun for the range.

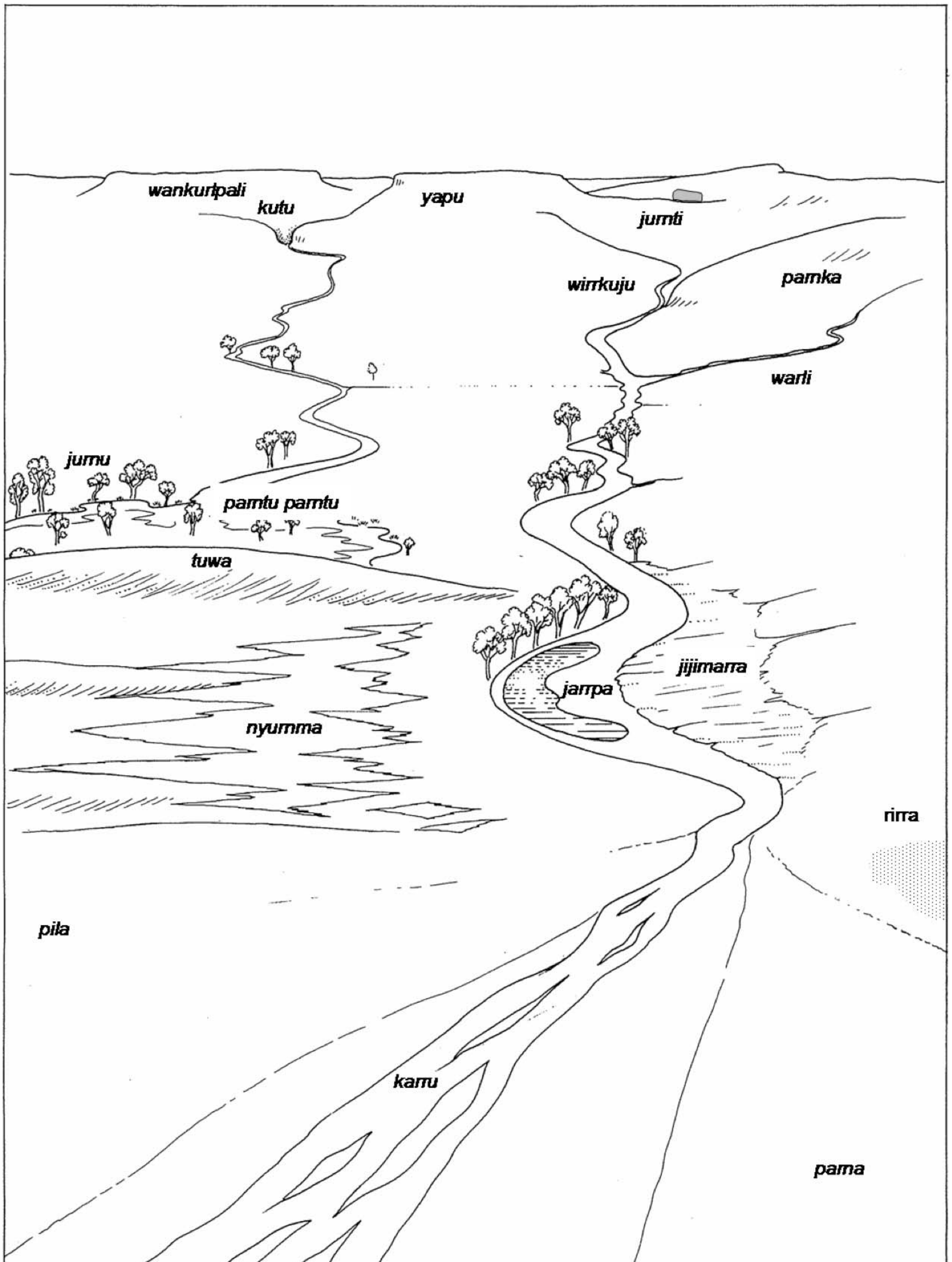

Figure 7.2 Martu terms for landforms and habitats typical of the Parnngurr area

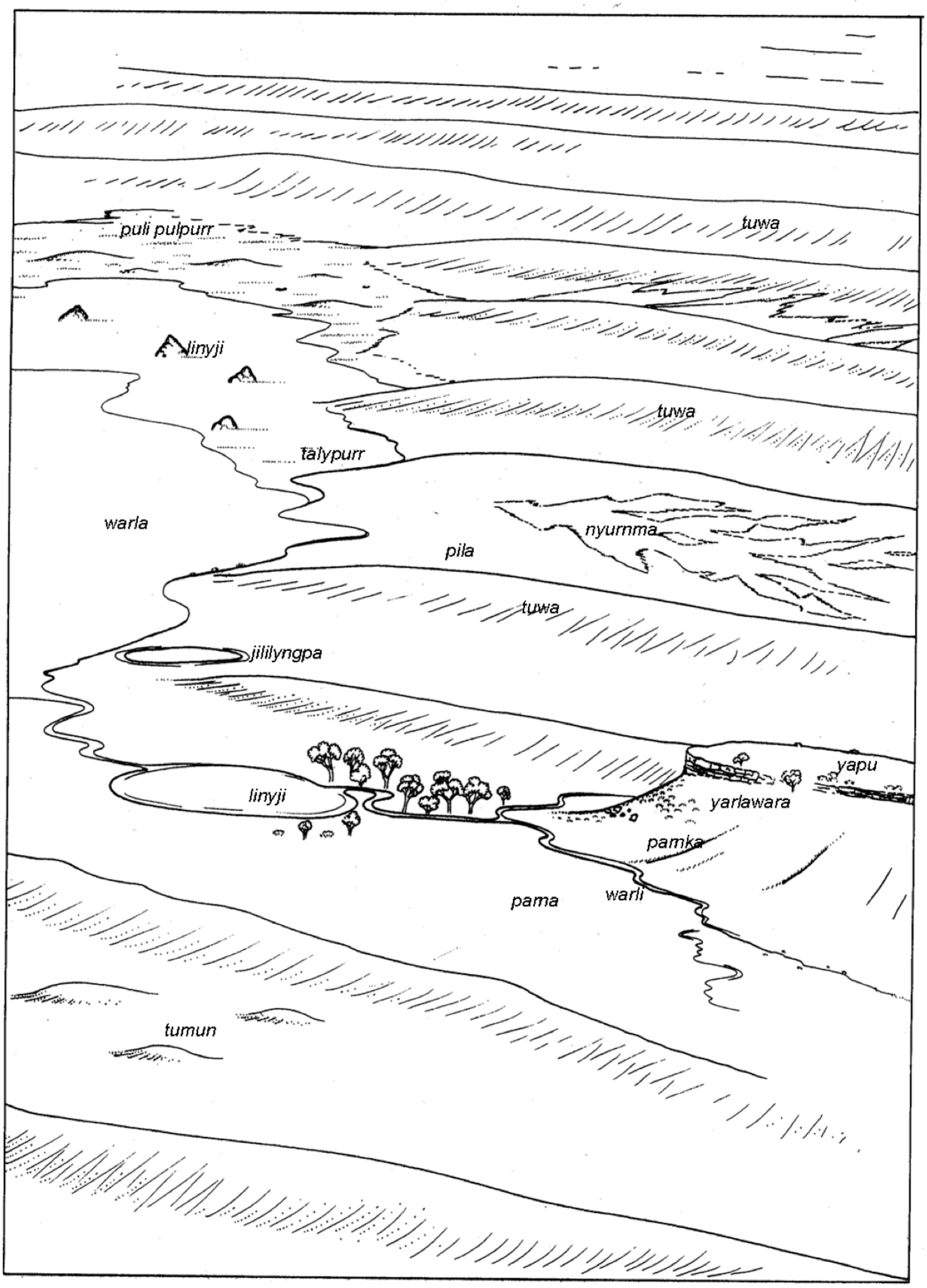

Figure 7.3 Martu terms for landforms and habitats typical of the Punmu area

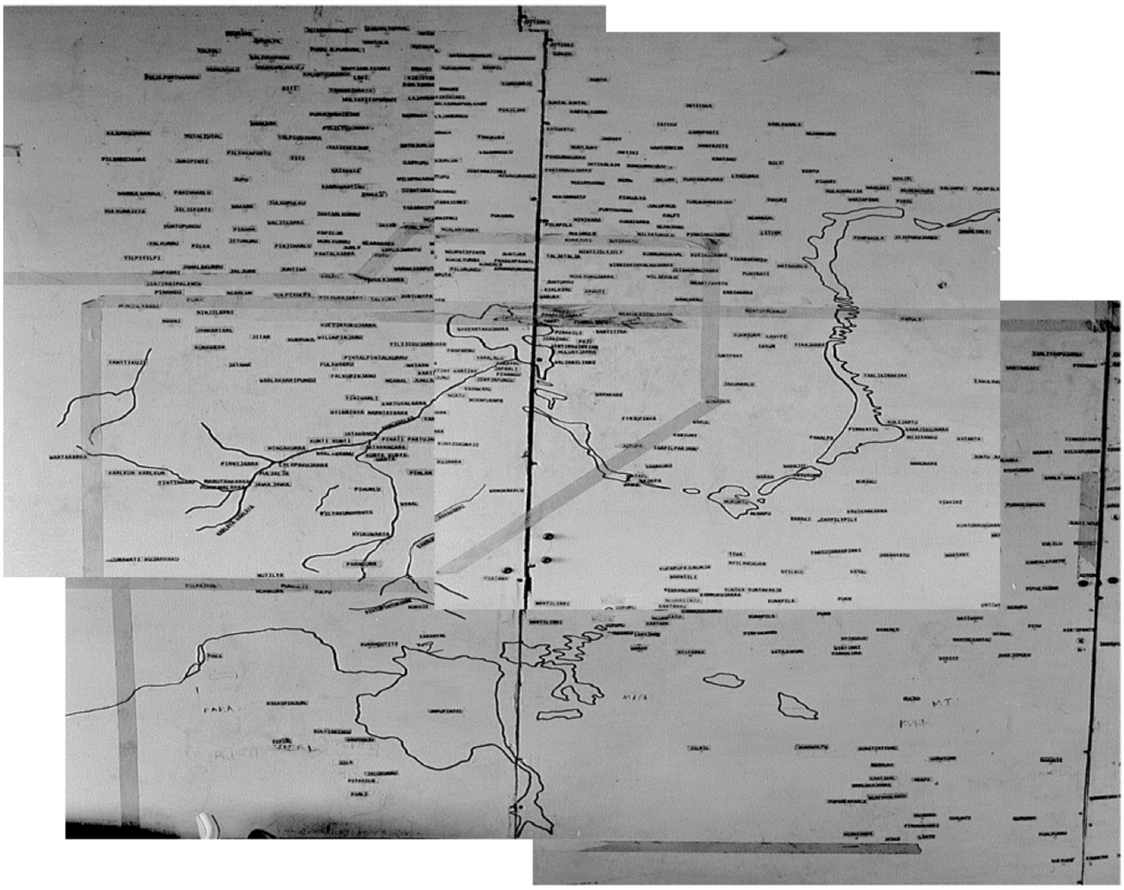

Figure 7.4 Distribution and density of named places on Martu lands in photo mosaic of a wall map prepared by Martu and staff.

Parnngurr, Punmu, Kunawarritji and the park boundary are marked; Greater detail in northern Martu lands reflected the custodial orientations of those who did the mapping. The legibility of place names is not relevant here; To at least 1993, Martu leaders and their advisors requested that exact place locations not to be mapped (i.e. latitude and longitude or detailed topographic features).

In 1990, *yinta* and other named places continued to be the geographic reference points by which Martu described hunting and gathering areas. Frequently, the specific sites were also a focus of foraging and other land use trips. Named places provided an essential template for the travel and use of Martu lands. In the view of Martu, when place names were forgotten, the country became unfamiliar and ‘wild’; two consequences were that people became wary of those places and effective means of communication about country and its resources diminished.

7.2.4 *Mutuka jina* ~ Motor car tracks

By 1990, vehicles had become an integral part of Martu foraging and land use. There was frequent travel between the settlements with averages of 1.4 vehicle departures and arrivals per day in March and 0.5 departures and arrivals per day in August–September (Tab. 4.6). About 70% of unaccompanied foraging trips were in vehicles (Ch. 6). The spatial location of roads and tracks had a major influence on the route of foraging trips, the places targeted, and the locations of opportunistic species collections, burning and other activities done *en route*.

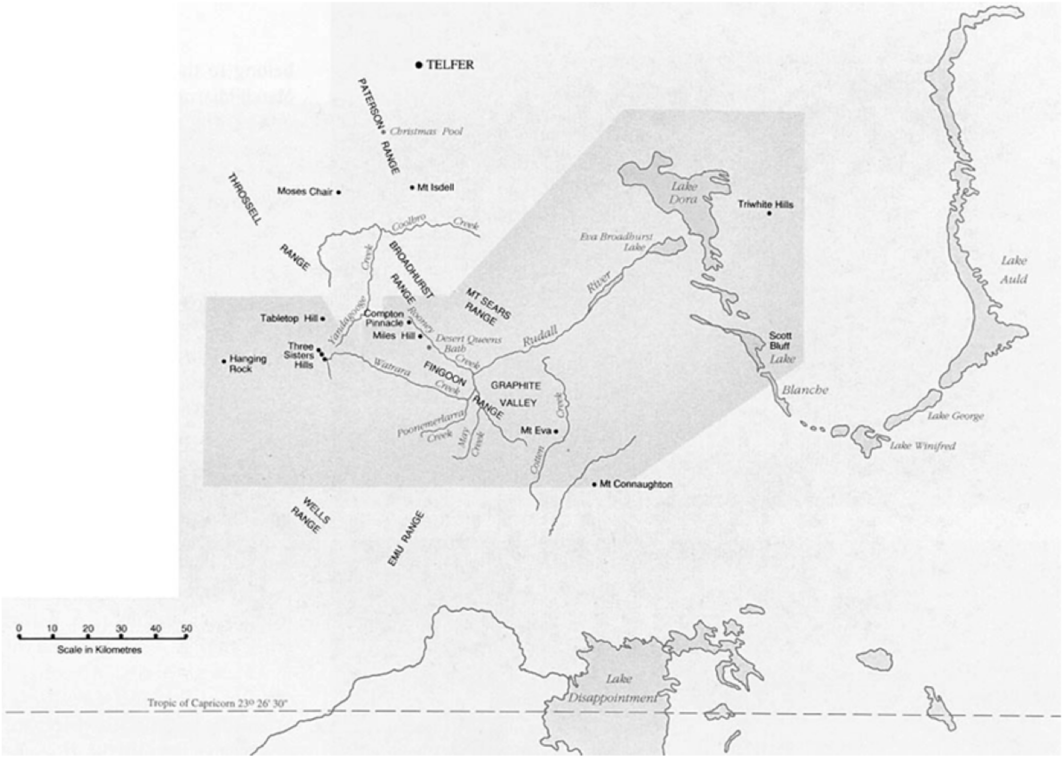

Figure 7.5 Distribution and density of named places on a conventional map of Rudall River National Park and surrounds.

Comparison between Figures 7.4 and 7.5 is aided by orientating from Karlamilyi River in the centre.

Prior to 1981, the road network in the region was very limited. Martu returned to their country in vehicles rather than on foot and through the 1980s they were active in re-exploring and expanding the road network. People spoke of *mutuka jina* in reference to vehicle tracks.[154] A synonym, *yiwarra*, incorporated foot and vehicle travel in its meanings. In Aboriginal English, they spoke of the 'Martu highway', hunting tracks, 'bicycle' tracks and terms that indicated tracks of different type.[155] In this study, three classes of track were distinguished and described (Tab. 7.1). Tracks in each class were used on foraging trips in different ways that influenced spatial land use patterns.

During 1990, Martu continued to search for cultural sites that were recollected from *pujiman* (bushman) times. New vehicle tracks that crossed kilometres of uncleared land were pushed through in these searches. These were subsequently revisited to hunt and gather. Concurrently, mining companies dissected the landscape with exploration tracks subsequently used by Martu.

[154] *mutuka jina* ~ motor car tracks; *yiwarra* ~ path, track, road

[155] 'Bicycle tracks' was a metaphor in Martu English that referred to a single 'skinny' track made by one vehicle driving cross-country

Table 7.1 Classes of vehicle tracks and characteristics of their use by Martu

Primary tracks 'Martu highway'
• e.g. Talawana track; WAPET track to Punmu and Well 33; east-west river road
• surveyed by whitefellas not Martu
• relatively straight, generally on sandplains and dune corridors
• graded and/or surfaced, suited to fast driving (~80 km speed)
• used for settlement – town travel; access to 2° and 3° tracks
• other users included tourists and mining personnel
Secondary tracks 'Martu roads'
• e.g. Talawana–Parnngurr–Mt Eva–Punamalara; Kurta Kurta–Punmu 'river road'; Punmu–Pirrkilyi–Paji
• initiated by Martu and/or traverses of past mineral exploration lines
• ungraded or graded in past but regularly travelled (30–60 km)
• not straight as routed around landform features and between cultural sites
• some followed *yiwarra* from *pujiman* times (walking tracks between sites)
• occasional use by mining personnel
Tertiary tracks 'Hunting tracks'
• large number radiated from settlements and 1° and 2° tracks
• initiated exclusively by Martu or as site clearance guides
• ungraded, often traversed calcrete, colluvial slopes, dense vegetation so rough (<30 km)
• not straight as routed to cultural sites, around landform features
• often used as foraging routes, for dinner camps or foraging drop offs
• exclusive use by Martu

Figures 7.7 and 7.8 map some of these tracks.

The deliberate expansion of the track network by Martu has occurred within, beyond the national park boundary, and irrespective of it. Conventionally, national park management minimises roads, particularly those deemed to contribute to ecosystem degradation. In 1990, one mineral exploration company scarified and closed several tracks east of Parnngurr. This caused consternation amongst Martu who continued to traverse it to keep it 'open'. On the issue of tracks, conventional national park and Martu concepts were in opposition.

7.2.5 *Warta* ~ Vegetation and habitats

Plants (*warta*) also played a prime role in assisting the spatial positioning of Martu in their landscape. This is evident in the following quotation from a woman speaking of her experiences when she migrated from custodial lands to Jigalong:

> *Wirrilingka pararrangkarni-laju yankupayi. Wikirrmarrangka. Wikirrpa jii yikira wanarni. Warta. … ngalangu-laju pararrangka pararrangka pararrangka pararrangka …Wanajakurrungka-laju julyjulyu yanurni. Yanurni-rna, Jitirrjitirrawa.*
>
> From far away we came across the spinifex country. Then across the desert oak tree country. Desert oaks trees were standing all along. Trees. ... We travelled along the spinifex country, spinifex, spinifex, spinifex. …We passed through the 'blackboy' country long before I came here [Jigalong] through Jitirrjitirr. (Kitty 1988:90)[156]

[156] Desert oak ~ *Allocasuarina decaisneana*; 'Black boy', Grass tree ~ *Xanthorrhoea thorntonii*

Plant communities or associations were described by species names and a suffix such as -*kurru* to signify dominance of the reference species. The species designated as 'dominant' depended on the speaker's viewpoint; it could be the main resource species, the most visually conspicuous species or the most abundant species. For example:

> Joy Jackson pointed out all the *Minyarra*, I asked how she would talk about the *warta* [plants] in this area. She said it might be *minyarrakurru,* might be *tinjirlakurru*, might be *karakarakurru*). (17/6/87 FW diary)[157]

Terms to describe vegetation structure were limited; just *punu* and *punti* were recorded.[158] Species names and on-ground experience were sufficient to evoke vegetation structure (equivalent to grassland, shrubland, woodland). Use of general terms like *punu* was increasingly common by younger Martu less familiar with plant uses and species names. It was noted above that Martu did not seem to identify clear boundaries within a landscape including vegetation boundaries (by contrast to scientific vegetation mapping). It is interpreted that Martu conceptualised species distributions resource species as concentrations of relatively higher density and then diffuse distribution from those points rather than bounded distributions. For example, a *Tinjirlakurru* was where many Coolibah trees grew within a few metres of each other; however, isolated *Tinjirla* also occurred elsewhere and no 'boundary' could be inclusive of them.

Animal habitats were characterised by reference to where the species was found in land type, element or vegetation. To these was added a locational suffix -*karrayija* (dweller, native of), e.g. *yurltukarrayija* (a hollow log dweller).[159] About ten suffixes located the species in relation to habitat e.g. -*jarra* (associated with) or the species in relation to space e.g. -*janu* (out of, from, cause) or the person in relation to the species e.g. -*angka* (across, through) (Marsh 1992; Valiquette 1993). The specificity of habitat terms depended on a hunter's expertise and/or the acuity of observation in the particular event described.

7.2.6 *Yukuri parna* and *Nyurnma parna* ~ Green ground and Burnt ground

Desert vegetation communities are extremely dynamic in space and time. Bushfire and rainfall are two major drivers that interact to create a highly patchy distribution of plant and animal species (Ch. 2). Traditionally, the complementarity between fire and rain was central to the ethnoecological concepts of Martu and other desert groups (e.g. Nash 1990). Within their belief systems, Martu had been rainmakers and firemakers; ritual and practice perpetuated both elements (Tonkinson 1991). In 1990, whilst burns continued to be a conspicuous feature of their country, Martu frequently bemoaned the passing of the rainmakers, less rain and the reduced productivity of country.

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[157] *minyarrakurru* ~ *Minyarra* patch, *Cyperus bulbosus*, Bush onion, a short, inconspicuous sedge; *tinjirlakurru* Coolibah tree stand, *Tinjirlpa, Eucalyptus victrix,* Coolibah; *karakarakurru* ~ abundant, rippling Wind grass, *Karakara*, *Aristida contorta*, Wind grass.

[158] *punu* ~ open, traversable plant stands; *punti* ~ dense, impenetrable plant stands; *punti* also refers to *Senna helmsi S. oligophylla* and other dense *Senna* shrubs

[159] e.g. *Winyjikirti*, *Varanus acanthurus*, Ridgetail goanna

Before trips, women foragers queried each other as to where they might find *yukuri parna* or *yukuri-yukuri*[160]. This referred to vegetation that had greened and regenerated following rainfall and/or fire. Martu contrasted green plants with *tikil punu*. It was possible finer stages of vegetation greenness or dryness were differentiated, because this influenced plant production and flammability; however, if so, these have not been recorded.[161] Martu distinguished post fire seral stages. During the study, three terms were consistently described: *nyurnma*, *waru-waru*, and *yurnara*.[162]

Martu's Warlmajarri neighbours named five seral stages (Richards and Hudson 1990) so there were likely to be more Martu terms. These stages were distinguished by the presence or absence of charcoal, the extent of exposed ground, the breadth and height of spinifex hummocks, and the suite of seral species present or absent. These characters influenced the ease with which a forager could spot and track game signs (Lowe & Pike 1991; Lowe 2002).

7.2.7 *Ngurlu* and *Mamu* ~ Forbidden and forbidding places

The preceding descriptions emphasised spatial land features that attracted foragers thus where foraging and Martu land use was concentrated. Conversely, there were land areas that were forbidden or forbidding to certain groups of Martu, consequently, foraging and other activities were reduced or excluded from these areas. In 1990, there were several such land areas. These were loosely defined and dynamic in that they shifted even in the course of a year. Land areas that excluded hunting and gathering are of interest to ecologists because they potentially offered refuge for wildlife.

Martu women and children whispered of *ngurlu* or sacred areas. The word also means fear, sacred object, sacred ceremony, taboo (Marsh 1992). *Ngurlu* areas were absolutely avoided by uninitiated people; groups of initiated men visited them. The size of *ngurlu* areas varied. In 1990, there was a *ngurlu* area amongst mulga trees on the eastern side of Parnngurr settlement. Men there were sometimes in full view of residents but non-initiates did not venture into an area at least 0.5 km^2. A more extensive *ngurlu* centred on a site in central McKay Range south of Parnngurr; women foragers avoided an area greater than 10 km^2. At Punmu, Martu non-initiates and visitors could not venture north of the settlement or cross the tall sand dunes due to *ngurlu*; this restricted foot foraging in a ~100° arc north from Punmu. *Ngurlu* areas were bounded in a general rather than cartographically precise way; non-initiates avoided travel in the general direction rather than stopping at a particular point.

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[160] *yukuri parna* ~ fresh ground; *yukuri-yukuri* ~ green, green [areas]; *tikil punu* ~ dry plant stands

[161] Kukatja people refer to *palytalarriwa* ~ become fresh after rain (Valiquette 1993) [possibly cold season rain]; this is the only term recorded to have further distinguished green or dry stages of vegetation for that neighbouring group.

[162] *nyurnma* ~ recently burnt where charcoal is visible and regrowth small; *waru-waru* (fire fire (plants); fire weeds; areas burnt in past months with regenerating plants; *yurnara* (dense, long established spinifex hummocks; unburnt for a decade or more; needs burning)

Areas believed to be occupied by *mamu* or *jinakarrpil* were also avoided.[163] Following the Punmu tragedy, (Ch. 3.4) Martu were extremely wary and suspicious of sorcery, omens and associated evil spirits. For example, in 1990 on two occasions at Parnngurr at night, unexplained bushfires were seen north and north-east then attributed to *mamu*. Mixed groups and women foragers subsequently avoided these areas. Other spatial avoidance protocols were respected near areas where people had passed away or where the sites of deceased custodians were located. These avoidances persisted for two years and often longer for important people and/or multiple deaths.

The dynamic nature of *ngurlu* areas was evident in the McKay range area.[164] In March 1990 and previous years, Yurlpu and its surrounds had been a favoured and productive foraging location for mixed gender groups. Mid-year, men re-located an *ngurlu* site and subsequently women's access to the area was restricted. This avoidance remained for at least a year; by 1993, mixed groups were returning to the area.[165]

In ecological terms, the avoidance of these areas provided partial respite from foraging pressure. Hunters did not go near *mamu* areas at least for periods of several weeks to months. Women and non-initiates totally abstained from foraging in *ngurlu* areas. This offered only short-term respite to wildlife from hunting pressure as men still hunted in them and they were temporarily rather than permanently defined. In terms of co-management, this profound Martu practice of avoiding particular areas is a major contrast to the perceptions non-Aboriginal users that crown lands and national parks permit unfettered open access by everyone. This is a major contrast in perception between two land user groups.

7.3 Spatial land use patterns of hunting and gathering by Martu during the 1990 study

A visitor to a Martu settlement would see people leave and return but where had they been? One mark of people's travels was sometimes the direction of distant smoke plumes. Questioning usually revealed the cardinal direction taken, the places people passed and landforms traversed or targeted.

7.3.1 Foraging at different spatial scales: a conceptual hierarchy

Senft et al. (1987) proposed an ecological hierarchy suited to investigations of the behaviour of species seeking widely dispersed, low quality foods. The former feature characterised the resource species collected by Martu women. The ecological hierarchy involved resource selection at increasing scales: selection of preferred species within

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[163] *mamu* ~ evil spirit, wild, savage spirits; *jinakarrpil* ~ wrapped foot, featherfoot, evil spirit

[164]; *ngurlu* ~ sacred object, sacred ceremony; taboo, fear

[165] The on-going relocation of sites was a feature of land use associated with the outstation movement. Remembered sites were relocated through the recollection of geographic experience, song and story by individuals and groups. Nash (2002) provided an account of these processes.

micro-patches; targeting of certain plant communities; and, use of particular landscape types and habitation within wider regions.

Senft et al.'s (1987) ecological hierarchy was adapted for the spatial study of Martu foraging, particularly women's. It is not to imply hunter-gatherer activities were environmentally determined but rather it is a heuristic tool to aid spatial description. Figure 7.6 illustrates an adaptation of the hierarchy in descending spatial scales,that is, from landscape level to habitat level. This order better reflects the stages of decision-making by Martu foragers from within a settlement then as their route and events unfold. Figure 7.6 identifies four spatial scales, the choices women made at those scales relative to named places and associated foraging areas, land types and land elements, animal habitats and plant communities and, resource species. An example of scalar decisions in a single foraging trip is given. Features of foraging at three of these scales will be discussed in the following sections. Level (c) and (d) are combined as only accompanied walking routes were recorded.

7.3.2 Settlement-focused areas and foraging radii

Figures 7.7 and 7.8 are centred on Parnngurr and Punmu settlements. Major uplands and wetlands are shown. The national park boundary, all primary and most secondary roads are charted. Spatial information derived from accompanied trips during the study was then plotted. This locates the tracks, dinner camps and, opportunistic resource collection and non-foraging events *en route*.

The locations of camps and events on thirty one accompanied trips from Parnngurr were mapped.[166] All but three of these occurred within 50 km distance from the settlement. All but one accompanied trip occurred within 30 km of Punmu (Fig. 7.8). In 1990, there were still extensive land areas that had not been or were rarely revisited by Martu. Whilst circular areas are mapped here and identified as a land use area, in reality, spatial land use within them was not uniform. Landforms and tracks shaped the spatial land use pattern.

It was found that landform influenced track locations and choices of foraging areas. Tracks were generally routed through the most accessible terrain, for example, plains rather than uplands particularly those tracks made by Martu (who did not have roadwork machinery). Near Parnngurr, there was a greater scatter of foraging trips to the north and north-east; this reflected the preference of women foragers for sand plains rather than uplands and colluvial plains due to easier tracking and more productive habitats. At Punmu, accompanied foraging trips were predominantly in the south-east quarter (Fig. 7.8). Northerly trips were constrained by 12 m high dunes and *ngurlu* areas.[167]

[166] At this scale, dinner camps and foraging areas are indistinguishable.

[167] *Ngurlu* ~ sacred areas, fear; sacred object, sacred ceremony; taboo

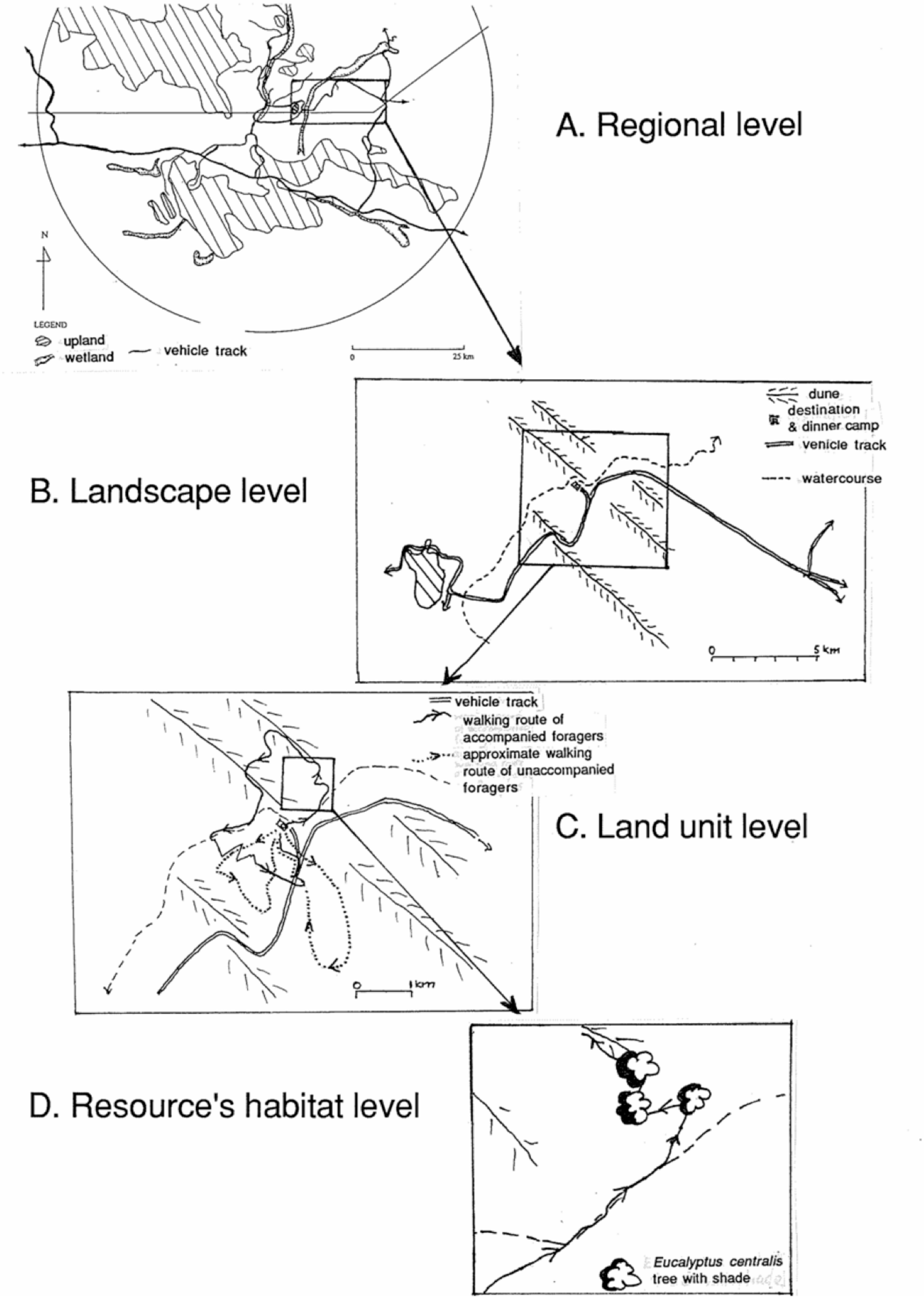

Figure 7.6 Schematic diagram of foraging by Martu women at descending spatial scales
Route from trip on 14/3/90 is mapped as an example; it is also described in Chapter 6.2.3.

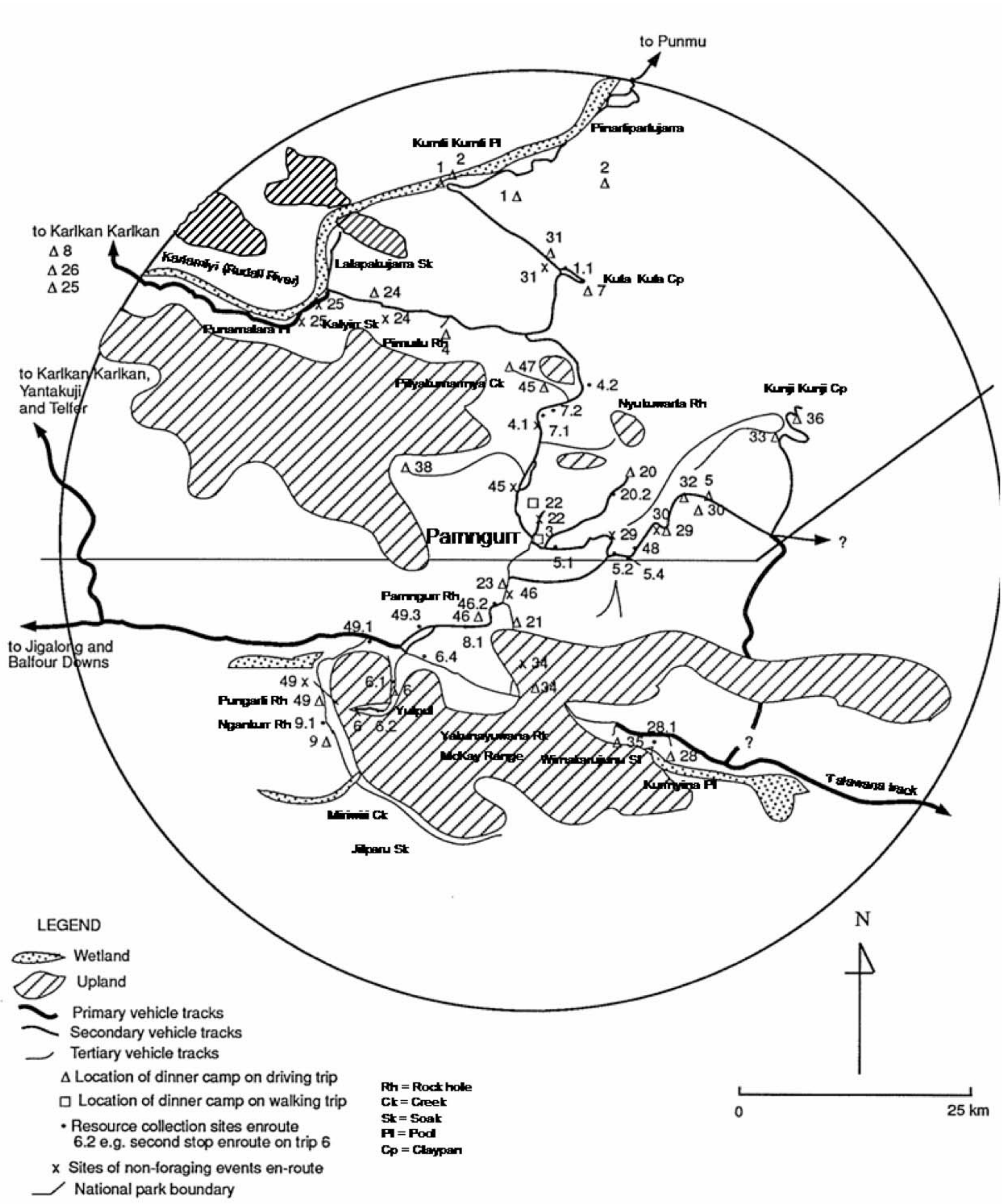

Figure 7.7 Location of events on accompanied foraging trips from Parnngurr

Parnngurr accompanied trips: n= 9 in March 1990; n= 22 August and October 1990

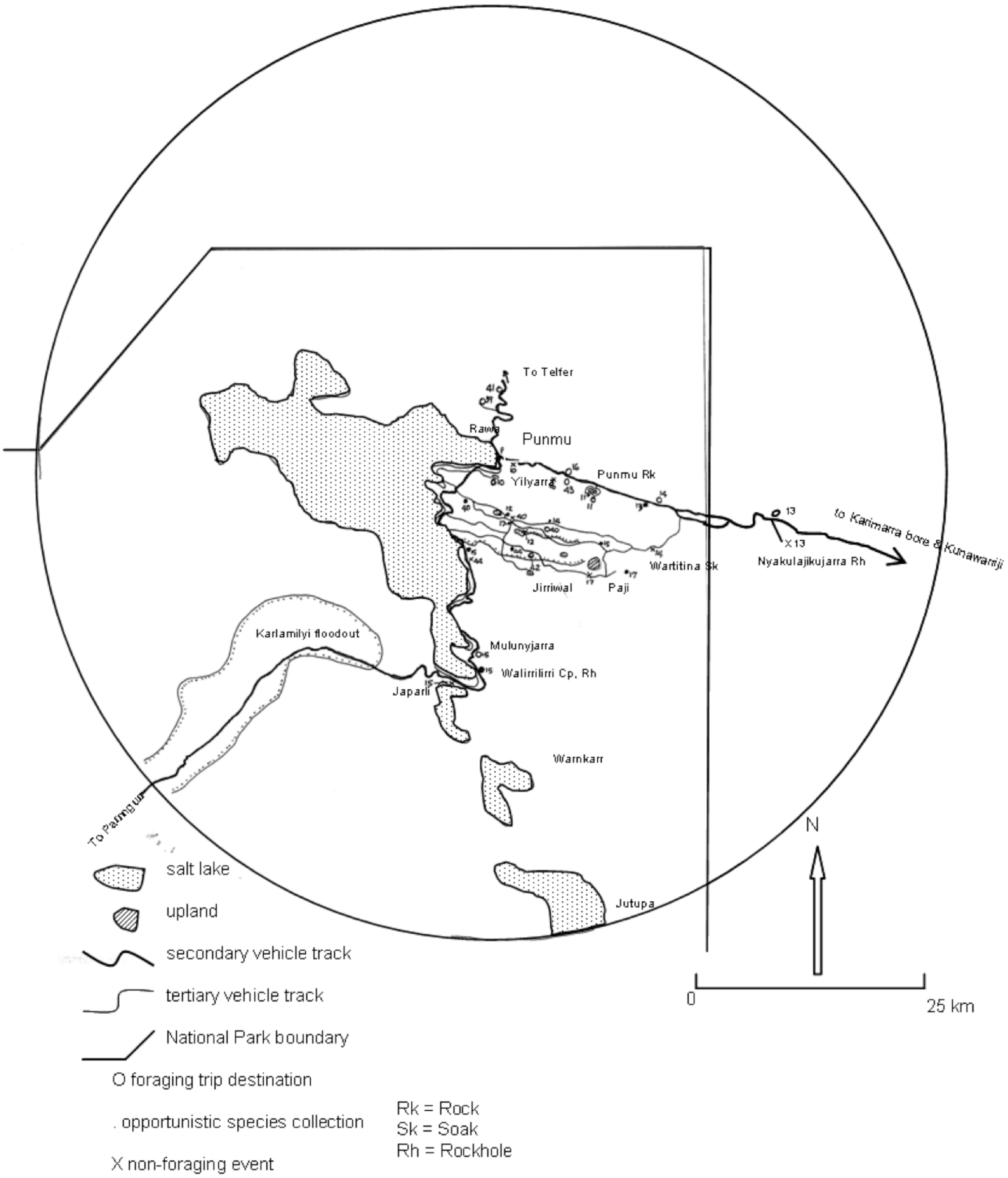

Figure 7.8 Location of events on accompanied foraging trips from Punmu

Punmu accompanied trips: n= 8 in March 1990; n= 6 September 1990

Track type also had a strong influence on the location of dinner camps, foraging areas and events. A small proportion of dinner camps were near primary tracks. The greater number was along secondary tracks. Fewer dinner camps were situated along tertiary ('hunting') tracks than the name suggests.

Female groups deliberately avoided primary tracks to reduce the likelihood of encounters with non-Aboriginal people. Additionally, there may have been fewer animal resources along primary tracks due to greater hunting pressure. It appeared that women used hunting tracks less than men did; male hunters took routes to Euro habitats and nearby cultural sites. Women preferred routes on lands that were more familiar and 'safer'.

Figures 7.7 and 7.8 locate species collections and non-foraging events that occurred *en route* of accompanied trips. These were scattered along the tracks. If valued resources were seen whilst driving, Martu generally stopped immediately to collect them. Thus, opportunistic hunting pressure was concentrated along tracks, particularly secondary and tertiary tracks which were driven at slower speed. The non-foraging events involved burning and site visits (Ch. 8.2.1).

Extensive unvisited areas occurred more than 25 km northeast and east of Parnngurr, south of McKay Range and on colluvial plains west of Parnngurr. The absence of tracks was the major impediment to accessing these areas. It was anticipated that the track network would expand into some of these places as men sought more remote sites. However, the dunefields NE of Parnngurr may have remained impenetrable and haunted by *mamu* (evil spirits). Foraging and associated land 'management' did not directly affect these areas.

Figures 7.7 and 7.8 identify a 50 km radius around each settlement. The radial distance from the settlement to the dinner camp and/or foraging area location on accompanied trips was measured (Fig. 7.9).

The data behind Figure 7.9 showed that of accompanied foraging trips in vehicles, 91% were within a 50 km radius of Parnngurr; the modal distance was to locations about 26 km from the settlement. The maximum radial distance to a dinner camp was 56.5 km. From Punmu, the majority of trips were less than 10 km from the settlement; the maximum radius there was to a site 46.5 km south of Punmu. During the study accompanied and unaccompanied trips were concentrated within 50 km radius of each settlement. This identifies the land area that was subjected to the most intensive use on Martu lands and within the national park in 1990.

The strongest determinant of the 50 km radius appeared to be the distance that could be travelled within a day plus time for the establishment of a dinner camp, hunting and gathering, game cooking and consumption then return to the settlement by nightfall (Ch. 6.2.8).[168] Travel on secondary and tertiary tracks was at speeds of less than 60 km/hr

[168] Overnight camps from either settlement were rare during this study.

(Tab. 7.1), thus longer trips required at least two hours return travel time. Male groups travelled longer distances than female and mixed gender groups. Twenty eight percent of unaccompanied trips were beyond the 50 km radius and men did all of them because they rarely made dinner camps it is interpreted that they had more travel time available so could go longer distances.

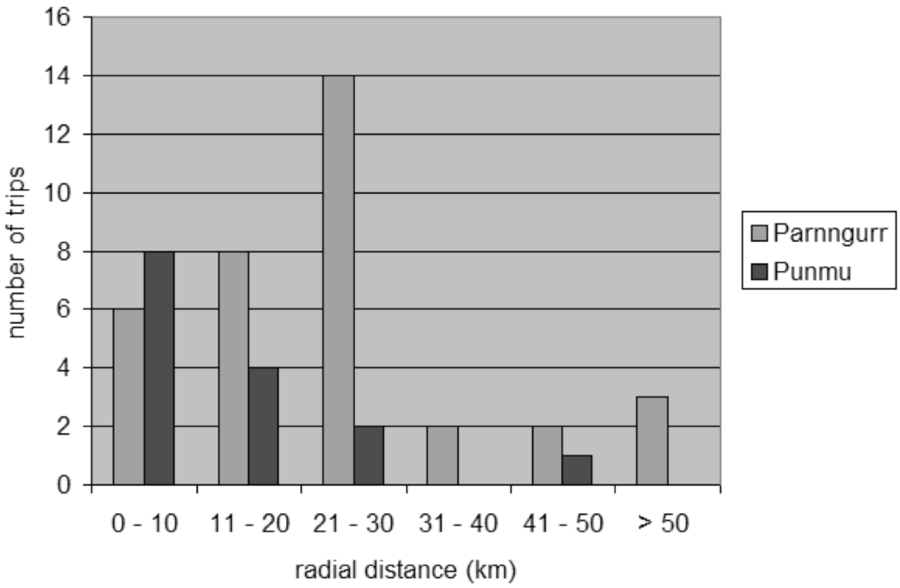

Figure 7.9 Radial distances from Parnngurr and Punmu to dinner camps on accompanied vehicle trips during March and September to October 1990
Trips from Parnngurr (n=35) and Punmu (n=15)

At Punmu compared to Parnngurr, the spatial foraging pattern was far more localised. There were several reasons for this but their relative influence was not well-understood. Shorter travel distances could have reflected the smaller number of trips, constraints from prevailing landforms, fewer available vehicles to support long-distance trips, poorer road condition and/or Punmu people's anxiety in 1990 about distant travel in the aftermath of the road deaths.

The majority of walking trips were within 8 km from the settlements. Occasionally, Martu would go much longer distances, for instance when Warnman men walked to a location about 12 km northeast. On some of these longer trips, a vehicle would pick hunters up on their return (Ch. 4.7.2).

The boundary of Rudall River National Park near Parnngurr and Punmu settlements is mapped in Figures 7.7 and 7.8. It was found that on accompanied trips 74% of dinner camps (n=31) near Parnngurr and all but one dinner camp near Punmu (n=11) were within the national park boundary. Spatially, Martu did not discriminate lands within and beyond the park on the basis of legal tenure. There were no signs, grids, fences or other markers of the park boundary—it was just a line on a map unseen by all on the ground. The implication is that spatial land use and resource use were conducted within and beyond the park and were shaped by variables other than tenure. In sum, major variables that influenced spatial land use patterns at the settlement scale were land form types, track locations and distance from settlement.

7.3.3 Dinner camps and foot foraging areas

Before people in a foraging party left a settlement, they discussed the objectives of their trip—what place they wanted to go to, what species of bushfood they sought or what type of land they wanted to search. At other times, one individual made a singular decision and others accompanied them with little input on the direction. Martu planned trips to varying degrees; however, opportunism was high and if an important animal track or other object of interest needed to be investigated *en route* then their direction would change responding to that new and immediate need.

It was found that Martu associated certain named places with particular hunting and resource attributes. In the settlements, regular hunters were asked about the main foraging destinations. For example, as listed by a man aged in his 30s, some of those described near Punmu were:

> Paji soak, east in hills and sandplain have a dinner camp; Pirrkilyi go there a lot; Wartitina that’s a main dinner camp; Januwa soak, Janet Sharp found that marked by the hill, made the road there; Jutupa, Warnkarr go there sometimes a little bit long way, Jutupa a good place for Rabbits; Karimarra bore stop overnight, hunt there; Ngakulajikujarra; Watitina, Paji, Pirrkilyi old people walk there (Mitchell Panaka 1/4/90 FW diary 90/3:84)

Martu women foragers expressed clear preferences for particular land types. For instance, consider the comments of Nyapi Karimarra, who spoke about the land close to Parnngurr:

> This area not much meat, no bushtucker [because] its hard ground, you know, can’t find it. Might be you go to Pimurlu. You hunt for *Parnajarrpa* get a *Parnajarrpa*, a *Pujikatu*, go across the *pararra*, *langa* ... got to go in *pararra*. You after something special might be *minyarra*, might be *wamurla*, *pura* you not go to this country [indicating west of Parnngurr], you’ve got to go *pararrangka*. All this *pulikaja*, that’s kangaroo country. (9/90 FW diary) [169]

Nyapi’s distinction between soft and hard ground was that between sandy substrates (plains, dunes) and harder substrates (colluvial slopes, hills). The softer and more extensive the surfaces the easier it was to see tracks and follow game. Her statement also made strong links between women’s specific resources and the species’ preferred land types.

Dinner camps were a mid point of all accompanied foraging trips in vehicles and unaccompanied trips by mixed gender groups in vehicles. A dinner camp was next to where the vehicle stopped. On most trips, this was within two kilometres of a named site. Foragers radiated from the dinner camp in their search for resources (Fig. 7.6).

In this study, the landforms that were selected for foraging were investigated by recording the land type where a dinner camp was established on accompanied trips.

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[169] Pimurlu was on sandplain between longitudinal dunes. *Parnajarrpa* ~ Sand goanna; *Pujikatu* ~ Cat; *pararra* ~ spinifex; *langa* ~ sandplain; *Minyarra* ~ *Cyperus bulbosus*; *wamurla* ~ *Solanum diversiflorum*; *pura* ~ *S. chippendalei*, *parrarangka* ~ in the spinifex; *pulikaja* ~ many rocks

Land types rather than vegetation types were used to describe and analyse Martu spatial foraging because existing vegetation description and mapping was insufficient.[170]

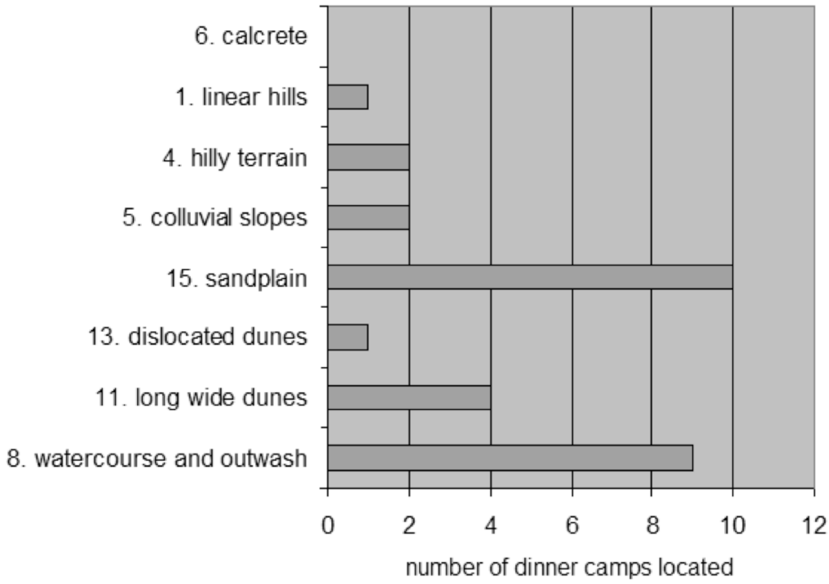

Figure 7.10 Number of times accompanied dinner camps were located on different landform types near Parnngurr
Accompanied foraging trips by women from Parnngurr, March (n=9), August–September (n=20) 1990. Land type names and numbers adapted from Phillips 1989 (Fig. 2.9).

Of 29 accompanied trips from Parnngurr, about 15 trips (50%) went to land types with sandy substrates (Fig. 7.10). This explains the higher density of dinner camps to the northeast of Parnngurr (Fig.7.7). It was the presence and greater ease of tracking Cats and Sand goanna on sand plains and dunes that shaped this preference of Martu women foragers. Fire could more readily be used as a hunting tool on these sandy surfaces too (Ch. 8). As Nyapi indicated, rocky substrates were less preferred with only 5 of 29 trips to hills or slopes despite these being the dominant land type around Parnngurr (Fig. 2.8), small-game hunters preferred other land types. By contrast, for men seeking Euro, there were plenty of suitable habitats in the Parnngurr area.

Figure 7.10 indicates that 9 trips (about 30% of accompanied foraging trips) by women were to river channel and outwash areas of wetlands. Although these comprise a low proportion of the Parnngurr land area (Fig. 2.9), they were important targets on accompanied and unaccompanied trips. The targeting of wetlands was actually higher than represented in Figure 7.10 as many dinner camps were made near creeks that traversed sand plains.

Historically, the Karlamilyi channel was a major foci for Warnman custodians and neighbouring groups (Taylor in Thieberger 1989; Tonkinson 1989). During the study, approximately 20% of accompanied trips and a smaller percent of unaccompanied trips from Parnngurr were to the river. It took about 2 hours one-way to drive there thus

[170] The best available vegetation mapping was Beard's 1: 1,000,000 maps; vegetation communities and associations in the park and surrounding subregions have not been described (Ch. 2 and McKenzie et al. 2002). Also, they appeared to be so patchy that foragers moved quickly in and out of them.

distance and time were prohibitive factors for foot foragers who wanted hunting time. However, the only vehicle route between Parnngurr and Punmu closely paralleled and traversed the river. As inter-settlement travel was high, opportunistic hunting along the river in the course of transit was also high (Photo 4.1). Overall, the river continued to be intensively utilised by Martu.

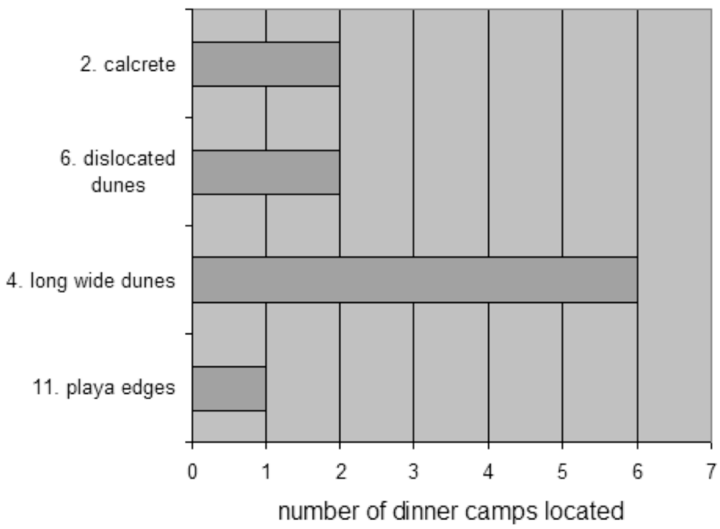

Figure 7.11 Number of times accompanied dinner camps were located on different landform types near Punmu

Accompanied foraging trips by women from Punmu in March (n=5), September (n=6) 1990
Landforms names and numbers adapted from Phillips 1989 (Fig. 2.10).

At Punmu, the majority of foraging trips were within long wide dunes (Fig. 7.11). This was the most extensive land type in that area (Fig. 2.10). Only one or two trips were made to calcrete, playa edges or dislocated dunes. There were wetlands and mesas near Punmu that were targeted by Martu but these were too small to be mapped at landform scale and do not appear in Figure 2.9 or Figure 7.11.

At Parnngurr and Punmu, the few occasions when dinner camps were on hilly areas were when women foragers explicitly sought the large varanid lizards (Perentie and Yellow-spotted monitor) which inhabited the mesas near Punmu or they planned to visit named rockholes. Dinner camps were occasionally on colluvial slopes near Parnngurr, these provided access to smaller areas (< 2 km^2) of softer, sandy surfaces within the uplands on which people could track.

Wetland land types and elements offered multiple resources to Martu women foragers. They were frequently used as camps on accompanied, unaccompanied and overnight trips. They provided shade, clear ground, wind protection and soft, comfortable surfaces. For instance, in windy periods, people chose to camp in deeply incised gullies so they were sheltered and could maintain a safe hearth fire. The routes of secondary and tertiary vehicle tracks made by Martu often deliberately paralleled watercourses and/or targeted lines of *yinta.*[171]

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[171] *yinta* ~ watersource in home country; birthplace; past camping place, named place

In an earlier quote, Nyapi Karimarra spoke of going to particular places to get 'special' resources and she noted *Minyarra*, *Wamurla* and *Pura*.[172] Elsewhere the targeting of *Lunkun lunki* and *Jalypinpa* patches was noted. Desert Aboriginal people achieve greater foraging efficiency in denser resource stands where economies of scale influence harvest effort. Resource concentrations or 'patches' were scattered on broad or narrow land types. The targeting of specific resource patches appeared to influence the location of dinner camps on a minor proportion of foraging trips.

Areas of *yukuri parna* were another spatial land character that attracted foraging parties.[173] These areas could be localised due to convectional rainstorms. In March 1990, several Martu said that in previous months they had gone hunting to the west of Parnngurr because heavy rain had fallen there. However, in March no accompanied or unaccompanied trips went in that direction. 'Rain chasing behaviour' was said to be a characteristic of traditional Western Desert hunter-gatherers (Gould 1969) but we see in this section that rainfall and green areas was only one of many spatial variables that shaped contemporary spatial mobility patterns. Important to this thesis was that green areas and burns were spatially and temporally dynamic; correspondingly Martu spatial land use was dynamic. Thus, in future Martu-conservation agency co-management contexts, adaptive planning and management action would be required.

Repeated visits to certain areas were another feature of the spatial foraging pattern. Clusters of dinner camps are apparent on Figure 7.7. At Parnngurr, of 24 trips in the August–September and October field periods, five places were visited twice usually within a week. Often when women arrived at a familiar place, they recounted previous occasions when they had been there, who had been present and the numbers of larger species collected. Return visits were often motivated by the presence of a known resource patch or the observed tracks of a desired game species. On unaccompanied trips, return visits also reflected camps near places that were known and liked by Martu particularly the camps associated with wetlands (e.g. Karlkan Karlkan, Kurta Kurta, Karrukukarra) or where significant sites required revisiting (e.g. Yurlpu). In sum, the major socio-ecological variables that influenced spatial land use patterns at the scale of dinner camps and foraging areas were: named places, land types, preferred resource patches and green areas.

7.3.4 Walking route choices

Foraging areas walked by Martu women and mixed gender groups were centred on a dinner camp (Fig. 7.6). Certain members of a foraging party remained at or near the camp whilst individual, pairs or groups of foragers radiated from the camp (Ch. 6.2.4). Typically, foraging individuals or groups radiated in different directions to broaden the land area they searched. A common feature was that foragers took circular or looped routes and rarely retraced their steps (Fig. 7.6), again this maximised the land area they

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[172] *Minyarra ~ Cyperus bulbosus, Wamurla ~ Solanum diversiflorum, Pura ~ S. chippendalei; Lunkun lunki ~ Acacia dictyophleba moth larvae; jalypinpa ~ Grevillea aff. eriostachya*

[173] *yukuri parna* ~ green ground

searched. In the hot season, a *yurril* was kept at the dinner camp and collectors returned part way through their foraging to drink then continue their search for resources.[174] In cooler seasons, collectors did not seek water and spent the whole foraging period away from the camp.

From dinner camps, foragers made minute by minute decisions about the route to take. For frequent foragers (Tab. 6.2), these decisions were primarily shaped by the habitats where they were likely to encounter target species. Once fresh animal tracks were located then the forager's route was determined by those tracks for as long as they were visible. Other variables also influenced the walking routes of foragers (e.g. encounters between members of a foraging group, they were sought if needed or distanced if too many were in a close area) or the choice of land element where animal tracks were clearer (e.g. the leeward slope of dunes where wind had not smoothed tracks). Foraging routes were adapted to the immediate context and rarely closely followed a predetermined path.

The landforms that were selected by women for foraging were investigated in more detail than indicated in Figure 7.11. This was done by recording the minutes spent on each land type traversed by an accompanied forager pair who searched tracked or collected resources (Ch. 3.9). Figure 7.12 presents the results.

Figure 7.12 shows that of the total walking time 945 hours), one foraging pair from Parnngurr spent 50% of their time on dunes and sand plains, about 30% on slopes and hills and about 20% of time in wetlands. These time periods were proportionally similar to the location of dinner camps within these land types. Interpretation of the use of rocky and sandy substrates is given above.

Freshwater wetlands also guided the routes of foragers on foot who chose routes within, parallel to or that transected wetlands. These wetland types included the Karlamilyi primary river, secondary and tertiary channels (creeks and gullies respectively), claypans, floodouts and soaks. Except for waterholes, these wetlands were dry in 1990 (only 120 mm rain fell in 1990 Fig. 2.6). However, women continued to target and traverse them. Sandy channel floors allowed for ready tracking. Many animal and plant resource species were found in wetland habitats with a few species being confined to them (e.g. *Tinjirla lunki*, *Winyjikirti*) and many game species utilised wetlands within their range.[175]

Wetlands in arid regions are well recognised to be more biologically productive habitats than adjacent land types (Masini 1988; Duguid et al. 2002). In a quadrat-based survey of past and contemporary Martu plant food resources, watercourses were found

[174] *yurril* ~ water carrying container. In traditional times this would have been an elongated timber or bark bowl. In modern times, the word was extended to include plastic containers. A *yurril* extended people's foraging range by enabling them to exploit waterless areas. *Yurriljarajara* ~ land area around where a water carrying bowl was located.

[175] *Tinjirla lunki*, ~ *Eucalyptus victrix* cossid, Coolibah moth larvae; *Winyjikirti* ~ *Varanus acanthurus*, Ridgetailed goanna

statistically to have a significantly higher species richness and diversity of resources than sand plains and dunes, and range areas (Walsh 1990). Several contemporary plant food resources were confined to wetlands (e.g. *Minyarra*, *Kanyjamarra*, *Ngapurta*, *Munyurnpa*).[176] Martu women foragers spent time in wetlands because the likelihood of intercepting resource species was high.

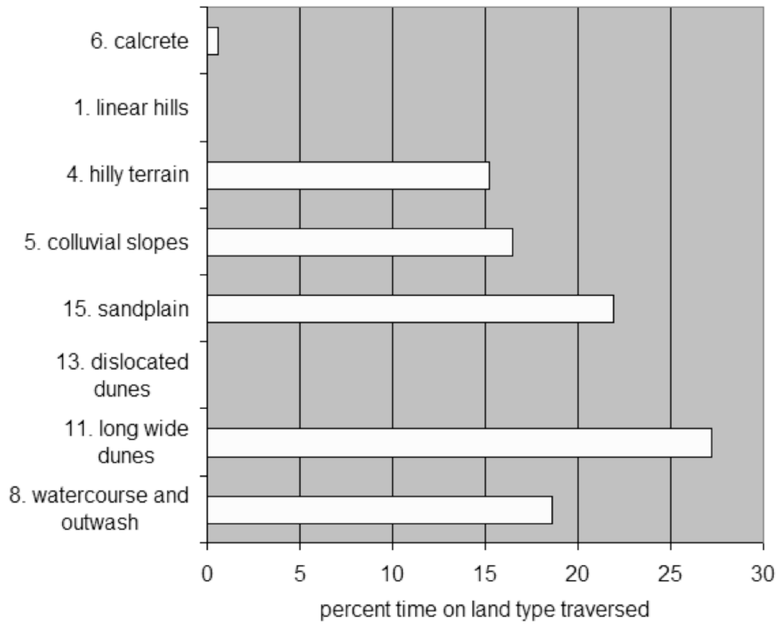

Figure 7.12 Percent time one pair of women spent foraging on foot in different land types on accompanied trips from Parnngurr in 1990

Percentages of search track and collect times totalling 2,693 minutes (45 hours) in different land types on 5 trips in March and 14 trips in August–September 1990 by one foraging pair

Unlike freshwater wetlands, women did not target or traverse salt lakes on foraging trips. Men would target them only when sufficient rain pooled and attracted waterfowl; then Black duck and other species were hunted (L. Warren pers. comm.). However, three land features that abutted salt lakes attracted foragers to their margins, these were springs, *Melaleuca glomerata* stands and termite mounds. Concentrations of *Minyarra* were associated with the springs. *Piwul* and *tiipa* provided microhabitats for the major game species, *Pujikatu* and *Parnajarrpa*.[177]

Burn areas were also observed to play a major role in micro route choice by Martu women foragers. Hunters deliberately walked the margins of *nyurnma* and *waru-waru* areas.[178] On the edges of current burns, they looked for game that was being flushed by

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[176] *Minyarra ~ Cyperus bulbous*, Bush onion*; Kanyjamarra ~ Vigna lanceolata*, Pencil yam, *Ngapurta ~ Cucumis melo*, Wild cucumber*; Munyurnpa ~ Santalum lanceolatum*, Bush plum

[177] *Piwul ~ Melalueca glomerata*, *tiipa* ~ large termite mounds; *Pujikatu* ~ feral Cat; *Parnajarrpa* ~ Sand goanna

[178] *nyur*nma ~ recently burnt where charcoal is visible and regrowth small; waru waru ~ fire fire (plants), fire weeds, areas burnt in past months with regenerating plants; yurnara ~ dense, long established spinifex hummocks, unburnt for a decade or more, needs burning.

the fire and on recent (~ few months) or regenerating burns, they sought to intercept tracks as animals moved from one seral community to another (Photo 7.1). Hunters also spent considerable time walking within early seral vegetation stages where tracks and burrows were more readily visible than in *yumara* and other later seral stages. Some of these habits are evident in this Manyjilyjarra–English translated extract, from a skilled hunter in her early forties whose family emigrated to the Pilbara when she was a girl:

> [Near Karrukujarrakarru] We went. On the dune we saw three turkey tracks. Then we went east in the recent burn patch. … I was going on the west side of the burn. I was calling out to her. Ngutuma went to the east side. When I got to Ngutuma I said "We'll go this way there are two people over there"… Then we made a fire burn. We were walking on either side … we walked west; we went on the stony ridges. … (Nyamaru Karimarra August 1990, full translation in App. 8).

In addition to the greater ease of tracking provided by burn areas, Martu believed that burn areas attracted larger game (e.g. Bustards, Euro, Red kangaroo) seeking fruit and seeds of burn response plant species such as *Solanum centrale*, *Yakirra australiensis*, *Scaevola* spp, *Sida* spp. Also, Martu made strong associations between mid seral stages (including *waru-waru*) and the presence of significant bush food plants, particularly contemporary fruits such as all edible *Solanum* species (Ch. 5.6.3). At Parnngurr, Punmu and Kunawarritji, recent burns and associated *Pura* and *Wamurla* patches were targeted on foraging trips and/or traversed in the course of foraging walks targeted at these species.[179]

In the earlier study based on vegetation quadrat surveys near Parnngurr, it had been demonstrated that on each of the major landform units surveyed the species richness and diversity of Martu plant resource species was statistically significantly greater on areas burned less than five years previously compared with areas burnt more than five years previously (Walsh 1990). Critical links between burning and the regeneration of bush resource plants that are fire responsive are now well recognised within desert ecological studies (Latz 1995a). It has been estimated that in central Australia about 70% of Aboriginal plant resource species regenerated following fire.[180] There were thus several good reasons for Martu women foragers to route their walking travels over burn areas of early seral stages. In sum, the major variables that influenced spatial land use patterns at the scale of foraging walking routes were land types, wetlands, burned and green patches.

7.4 Martu temporal concepts related to hunting and gathering

Seasonal perceptions were investigated in this study through semi-structured interview and observation in 1990 but information was also recorded from Martu people in the earlier fieldwork periods; particularly important was a detailed explanation by senior

[179] *Pura ~ Solanum chippendalei*, Bush tomato; *Wamurla ~ S. diversiflorum*, Bush tomato

[180] More recent research in central Australia has refined scientific knowledge of the burn regimes that encourage or reduce plant regeneration (Ch. 9).

Kartujarra woman, Wirnta Karimarra.[181] Elements of her explanation were extended and corroborated by other Martu and aided reconstruction of traditional concepts.

Martu seasonal notions were found to be multifaceted. In this study, they were conceptualised as being of six major ‘series’ of information (Fig. 7.13) that ran concurrently. It was found that, unlike Aboriginal groups in tropical Australia, Martu concepts were not predominantly focussed on the availability of resource species, but instead the concepts were framed around more stable parameters associated with the movement of constellations and temperature. These approximated a ‘year’ cycle in the Gregorian calendar and will be explained by reference to it. The time series was conceptualised with parameters ranging from greater to lesser reliability (Fig. 7.13).

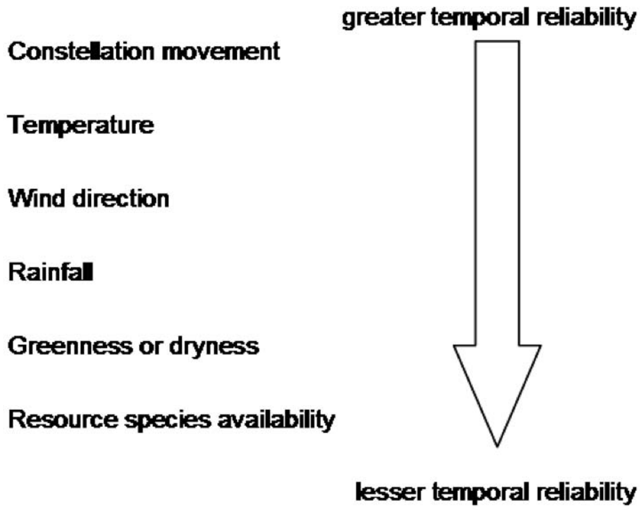

Figure 7.13 Schematic interpretation of astronomical and environmental parameters in series that contributed to Martu seasonal concepts

7.4.1 Constellation and climatic series

Martu temporal concepts were paced by the movement of *Jakulyukulyu* (the Pleiades or Seven Sisters) through the northern night sky (~August to March, 8 months).[182] *Jakulyukulyu* is one of the brightest constellations in the southern hemisphere summer and being an equatorial constellation could be readily interpreted in relation to the horizon.

The cycle commenced with *Jakulyukulyu pakalku* when the constellation was visible before dawn in the north-eastern sky (early August).[183] Its time of ascent was

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[181] These concepts were summarized in Walsh (1990) and incorporated into the revised Tonkinson (1991).

[182] *Jakulyukulyu* were also major totemic beings who, as in many cultures, were seen by Martu to be sisters. They were intermittently chased by, or chased back, a ‘man’ (*Yurlu*) star who followed them. Their earthly travels and exploits traversed the Western Desert and beyond (Tindale 1959) (The Martu landscape continued to be enlivened at the many cultural sites where Juklyukulyu camped, ground seeds and conducted other activities. At least four of these sites continued to be visited by Martu women during the study. There were many synonyms for the Seven Sisters and man’s name.

[183] *pakalku* ~ arise, get up, start, begin; *ngarnawarra* ~ become high, overhead; *nyirrirringu* ~ become lower; *pakirringu* ~ become finished, ended

progressively earlier until *Jakulyukulyu ngarnawarra* when close to its zenith and visible in the northeast soon after sunset setting to the northwest in early morning (December and January, about 3 am, 1 January 1990). Then the constellation descended and set soon after dusk so this period was named *Jakulyukulyu nyirrirringu* (~ February and March). The period of *Jakulyukulyu pakirringu* was when the constellation was not visible in the southern hemisphere (April to early August). Again, it rose in the predawn skies (August) and this cycle of astronomical events continued.

In a paper discussing the totemic significance of the Pleiades, Tindale (1959) briefly reported a link between this constellation and the passage of time:

> [I]n the sky of autumn, the early morning appearance of the Pleiades, low in the east, marks the beginning of the Aboriginal New Year and the commencement of the season when dingo pups (*papa*) give birth to their young (*ibid*:305).[184]

But Tindale did not elaborate upon it. Tindale's record was read following field work amongst Martu, thus the recognition of a 'new year' could be neither corroborated nor negated with them.

The appearance and ascent of the Pleiades was a marker to Martu of the ending of the cool season (August). The relative position of *Jakulyukulyu* in the sky was seen by Martu to define and monitor periods of time across other temporal series too. For instance, someone would say *"Kanyjamarra palya Jakulyukulyu pakalku"* to flag that Pencil Yam were good and ready to gather when the constellation rose in August.[185] This major astronomical pattern provided the most reliable and consistent parameter by which Martu followed the passage of time equivalent to a year.

Climatic periods were another temporal parameter that dominated Martu intra-annual seasonal descriptions (see scientific descriptions of climate in Ch. 2.1.4). Three main seasons Martu identified were *tuulparra*, *yalijarra* and *wantajarra* which loosely equated to spring, summer and winter. These seasons were characterised by temperature and, to a lesser extent, prevailing wind direction. Other climatic events especially rainfall were predicted to occur during these seasons but they did not always eventuate. A detailed vocabulary for various types of rainfall, cloud formations, wind and other weather phenomena was said to convey Martu knowledge of climate (Tonkinson 1991), although this is unpublished. Notably, Valiquette (1993) listed 28 Gugadja cloud terms (with 18 English translations).

Tuulpara was the season when *Jakalyukulyu* reappeared and began its ascent, akin to spring; Martu welcomed warmer temperatures (mean minimum ~ 25°C).[186] It was a relatively short period (~August to September.) It was the driest period of the year (*tikirlurru*). The transition from *tuulpara* to *yalijarra* occurred with a rapid increase in

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[184] Rather than autumn, Tindale presumably meant spring when the Pleiades rise in the northeast. Whether he was using a northern hemisphere seasonal frame, or if it was simply an error on his part is unknown.

[185] *Kanyjamarra* ~ *Vigna lanceolata*, Pencil yam

[186] *tuulparra* ~ 'spring'; *tikirlurru* ~ dry time

temperature. Another common seasonal term, *purinyina,* referred to people's need to now sit in the shade.

Within an 'annual' calendar, *Yalijarra* was the longest Martu season (ranging ~ October to March).[187] Mean maximum temperatures peaked in December at 41°C. Heat shimmers (*puyulurru*) showed that the hottest days were forthcoming. Often there was no wind and still air (*pirtirr-pirtirrpa*) prevailed unless whirlwinds (*karlalara*) blew.[188] Rains were anticipated in *Yalijarra*. Dust storms (*yulpurru*) preceded some rainstorms. Thunderstorm clouds (*ngangkalyira*) heralded conventional falls that contributed patchy rainfall across Martu lands. In this subtropical desert, north-westerly wind shifts followed by widespread cloud heralded more extensive rain associated with cyclonic depressions penetrating Martu country. *Yukurijarra* (green time), greened the red sands when there had been rainfall. Alternately, *tikirlkarra* (dry time) persisted for months or years. Although average annual rainfall was ~300 mm, like all Australian deserts, annual falls were extremely variable (Ch. 2.1).

About April, the descent of *Jakulyukulyu* and wider temperature fluctuations marked the coming of *wantajarra.*[189] July was the coldest month with mean minimum of ~10°C often this was further lowered by wind chill. Crisp, clear days were common in May–June. Frost cooled people and damaged plant foods.[190] Between April and July, widespread cloud (*mujungu*) sometimes brought several days or more of rains (*kuluwa*) or light, misty rains (*jiljilpa*) from southwesterly weather depressions. The prevailing south-easterly trade winds that 'blow through you' prevailed (~ July to August). Meetings between individuals were often prefaced with grumbles about the cold and its delay on hunting and the day's activities. They sought to sit in the sunshine (*jirntunyina*). Wind shifts from southeast to northwesterlies marked a change of season, but were reputedly 'cold sick winds'.[191] The rising of *Jakulyukulyu* was welcomed as the coming of warmth again. From 1986–1990, older people were heard to complain more often about being cold (*yalta*) than being hot in *yalijarra*.

7.4.2 Seasonal resource species availability

Proficient hunters and collectors knew the influences of climatic seasonal variables upon the ecology and productivity of animal and plant species. Temporal variations in movement, microhabitat, breeding, fat content, and phenology were some aspects of

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[187] *yali* ~ hot; *yalijarra* ~ hot weather, summertime; *puyulurru* ~ time of heat shimmers; *puyu* ~ smoke; *pirrtirr-pirrtirrpa* ~ hot (weather), still (no movement of air); *puri ~ shadow,shade; nyina ~ sit; tikirlurru* ~ dry times

[188] These 'wind droughts' frequently required Martu at Parnngurr to transport water as no windmills pumped; a common Australian dilemma without mechanized pumps. Martu were wary of *karlalara* and threw sand in their direction to ward them off; they were interpreted as omens of other events.

[189] *wantajarra* ~ winter; cold weather time

[190] Although about one degree north of the Tropic of Capricorn even Kunawarritji had occasional frosts.

[191] A wind that contributed to runny noses and other sicknesses were attributed to a mythological character that lived in Roebourne and blew ill-health to Martu lands (Nantuwirta Karimarra).

resource species ecology known to people (Ch. 5).[192] This was complemented by modifications of people's hunting and gathering practices to suit particular climatic periods. For example, the use of dogs to hunt in cooler periods (Ch. 5.7.4), delays in foraging trips due to cold winds (Ch. 6.2.8), and choice of shady foraging routes in hot seasons (Ch. 7.3.4).

Like Aboriginal groups in tropical and temperate region, it was found Martu did identify biological seasonal indicators. However, there appeared to be fewer harbingers than for instance in the case of coastal Bardi to the northwest (Smith & Kalotas 1985). Specific indicators recognised by Martu included *yurata-yurata* (tetigonid cricket sp.) that chirrup just before the hot season; the chatter of Budgerigar chicks indicated grass seeds maturation and the warkwark of Galah nestlings when Acacia seeds greened and filled out.

In traditional times, Martu used resource cues to situate themselves in time. As a senior Martu woman, Jakayu, recollected:

> We went to Jiman then to another named place where we got Sand goanna. There were plenty of them running around in *yalijarra*. The Sand goanna were busy because it was *yurankarra*. *Parnajarrpa* were eating those *yuran*. Martu were eating them too. We arrived at Warntili. We got a wooden dish and collected *kalarru*. We stopped there until *wantajarra* (Yirapartu et al. 1992).[193]

In 1990, Martu continued to refer to their seasonal concepts when speaking about contemporary resource species.

Martu also associated specific resources with seasonal periods. For example, someone would say "*lurnkun wilyki kampalku tuulparra*" in reference to Sandhill wattle seed being 'cooked' (ready) in 'spring'.[194] There were many of these associations with the three main seasonal periods. There were surprisingly refined temporal indicators for a desert environment too:

> *yumpalwama* getting ready when high and light clouds, wind comes from the west like in tuulparra. (Nyapi Karimarra, FW diary 1990/2:117).[195]

Knowledgeable Martu listed the temporal sequencing of species. As Mayipi marked off on her fingers:

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[192] Examples given included varanid hibernation, emergence and egg-laying; Emus following rainfall; Cats reduced stamina when hot (Ch. 5).

[193] *yalijarra* ~ hot weather; summertime ; *yurankarra* ~ winged termite time; *yuran* ~ winged termites (alates); *Kalarru* ~ *Tecticorna verrucosa*, Samphire. Three Martu names for alates were recorded which may be different species. Termite alates were a prized Martu food, they flew after rains soaked soil depths, small night fires were lit on hard, clear ground to attract alates which near the heat fell to the ground from where they were collected by Martu, yandied, winnowed and dried before eating. Samphire seeds were a valued seed resource collected from the flotsam line of claypans or harvested and rinsed to remove salts then seed cleaned and ground to an edible paste. An important *Jukurrpa* was associated with *Kalarru*.

[194] *Lunkunpa ~ Acacia dictyopleba*, Sandhill wattle

[195] *Yumpal wama* ~ edible nectar of *Hakea suberea; tuulparra* ~ 'spring'

> *wantajarra,* get *jakata* then *jalypinpa* and *yirrimilyi* same time, they finish in *wantajarra*, then *yumpalpa* in *tuulpara* then *wirarajartu.*[196]

This identified the flowering succession of certain nectar species. Acacia seeds and grass seeds were similarly listed. Sequencing of resource species appeared to be a mnemonic device employed by Martu; again, this appears to be unreported for Western Desert groups.

Certain desert plant species are extremely variable in their phenology and productivity as demonstrated in a long term study of Acacia spp (Friedel et al. 1994).[197] The seasonal associations made by Martu for even relatively predictable species seemed to be based on probabilities and periods of weeks to months. For example, whilst *Muluntu*r*u* could be harvested for only a couple of weeks in early *Yalijarra*, those weeks fell within a 1–2 month span.[198] Expert Martu were far more specific about the seasonality of plant species than animals. Of animals, they would often say "that [specific] *kuka* you get it anytime" but as noted with goannas and cats, greater specificity in temporal ecology was known and hunting techniques modified.[199] Martu said that 'green time' was when the highly favoured but rarer species (Red Kangaroo, Emu, and Bustard) were found as the preferred green grass species for Kangaroo and the fruits for these large birds were described. In comparison to tropical environments, Martu seasonal indicator associations in the Great Sandy Desert appeared to be less refined and 'looser'.

7.4.3 Temporal concepts at different time scales

As with spatial scales, different temporal scales can be conceptualised. The above descriptions were at scales equivalent to years down to months then weeks. In contrast, Latz (1982a:127) distinguished central Australian seasons as "exceptionally good, average, poor and severe drought". Obviously, these were longer seasonal cycles than those described or encountered in this study. These varied in duration, such as the good season he mentions that was four to six months long; other seasons were shorter or longer. Latz implied there were no predictable sequences of seasons but we now know them to be linked to the shorter ENSO and longer IPO cycles.[200] High rainfall periods with consequent pulses of ecological production are now recognised by scientists to be key phases in desert ecosystems, for example, driving the recruitment of perennial plant species. These punctuated the dominating arid periods that differed in duration and intensity. High rainfall spells would also have had profound influences upon Martu

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[196] *wantajarra* ~ winter; cold weather time; *Jakata ~ Grevillea wickhamii*, Holly grevillea; *Jalypinpa ~ Grevillea aff. eriostachya; Yirrimilyi ~ Hakea rhombales,* Pincushion hakea; *Yumpalpa ~ Hakea suberea; tuulparra* ~ 'spring', *Wirarajartu ~ Hakea chordophylla*

[197] Other Acacia species have predictable flowering and seeding periods during seasons. Acacia species phenology is related to the biogeographic origins of taxa.

[198] *Muluntu*r*u ~ Acacia coriacea,* Wirewood with edible dry seed; *yalijarra* ~ hot season

[199] *kuka* ~ meat, game animal

[200] The ENSO (Southern Ocean Oscillation) of El Nino and La Nina with average periodicity of four years and longer cycles such as the IPO (Interdecadanal Pacific Oscillation) with average periodicity of 20 years.

ecology in pre-European times in influencing gatherings, fertility and other population dynamics. Martu recollections or conceptualisation of such periods could be investigated in future research.

At much shorter and more manageable temporal scales, Martu traditionally used time markers associated with moon and sun phases (like people worldwide). These distinguished time periods equivalent to months and days (but not weeks).

Modern Martu temporal concepts were noted in this study. For many people, these adopted concepts overlaid traditional ones. Over longer time periods, events such as people's birth or the year when they first saw whitefellas were recollected by Gregorian years or reference to key events e.g. 'when we moved to Parnngurr'. Recent time was punctuated by Christmas, Easter and other events familiar from Christian experiences in Jigalong mission. School holidays and weekends now shaped the foraging pattern. Rarely did middle-aged and older Martu refer to the names of months or days except to say 'weekend'. Seasonal, lunar and solar references still appeared to dominate the concepts of Martu who hunted and gathered in 1990.

7.4.4 Martu seasonal calendars: circular and sequential

Figure 7.13 and the above paragraphs presented the times series that aided interpretation of Martu temporal concepts; but how to build these into a conceptual hierarchy? It is common to see Aboriginal seasonal calendars illustrated as circular diagrams approximating the 12 months of a year particularly in tropical environments (e.g. Smith & Kalotas 1985). This illustrative style was replicated then adapted for Martu plants in Walsh (1987). However, it implied that year to year, the same species were available in the same months. Yet field work on Martu lands from 1986–1990 indicated this was not the case as it was observed that certain resource species available in a month of one year were absent or scarce the following year. High temporal variability driven by rainfall that shapes plant production is recognised as a distinctive feature of arid ecosystem function (Ch. 2.1.2; Stafford Smith and Morton 1990).

I argue that a seasonal calendar for Martu lands needs to be represented by both annual circular and inter-annual sequential illustrations. The circular illustrations are suitable for time series elements of greater reliability and consistency (see Fig. 7.13 and Walsh 1987). Circular illustrations have public appeal because of their relative familiarity. By contrast, sequential, horizontal illustrations are more appropriate for rainfall patterns and species that exhibit greater variability. They help portray inter-annual variations. Figure 7.14 presents a schematic view of the latter; it is constructed from the time series discussed above with both intra and inter-annual variations and consistencies in abiotic and biotic events.

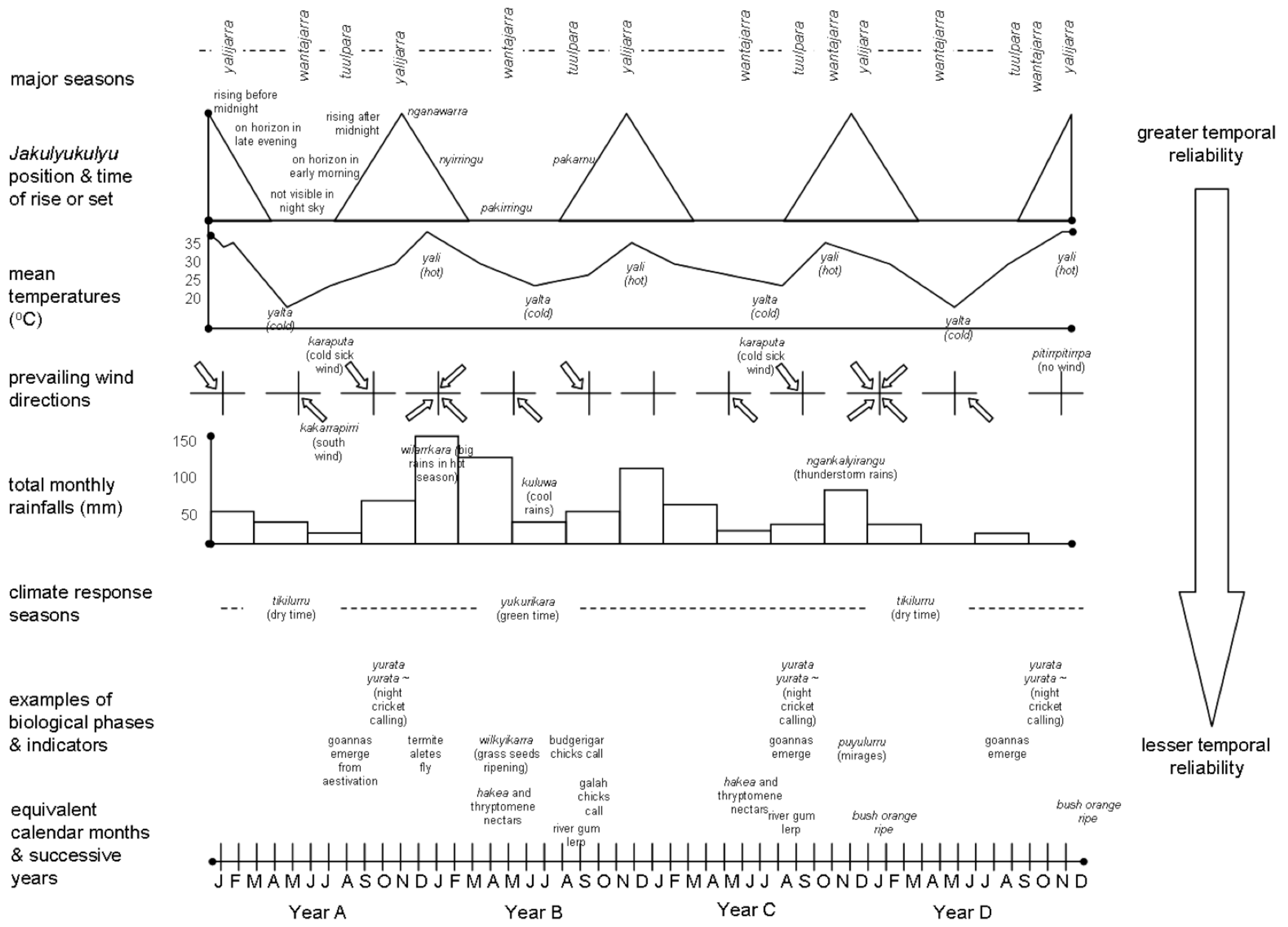

Figure 7.14 Schematic diagram of seasonal events over successive years distinguished by Martu with the series (vertical) and sequences (horizontal)

The inter-annual rainfall and temperature patterns are from data in Chapter 2.1.4.

7.5 Temporal patterns of hunting and gathering in 1990

What was the annual pattern of foraging by Martu? Were there intra-annual seasons when foragers were more active? In this study, Martu temporal land use was documented from records of the dates that species were collected on accompanied and unaccompanied trips over the three months of quantitative field survey. These data were extended to a longer period by use of ethnographic information from 1986–90 provided by Martu and non-Aboriginal staff (Tab. 3.5) and from my own records (see Tab. 3.1). In 1988 and 1990, plant resource species phenology was also recorded. Interpretation of these data were constrained by the relatively short proportion of the annual cycle quantified in 1990 and the comparison of data derived from different sources.

Results of the temporal study indicated that seasonal species availabilities had only a weak influence upon Martu foraging patterns. Temporal patterns were unlikely to be strongly defined and species specific foraging returns were highly variable over a year. Examples of environmental variables that influenced the timing of foraging events were rainfall temporal variability, changes in the seasonal habits and breeding of animal species, shifting effects of hot and cold weather upon the desire to forage and the influence of wind upon the readability of tracks. There were indications that non-environmental variables had a stronger influence upon the timing of foraging trips including: the availability of vehicles; the need for sustenance; weekly constraints of school times; and, weekends without commitments that detracted from foraging time. Such variables interacted to give the impression of a disordered timetable of hunting and gathering. This impression was reflected in quantitative records for species collected over six discontinuous weeks at Parnngurr when no general patterns were apparent.[201] However, use of qualitative rather than quantitative data allows the description of a generalised pattern observed over several years.

In summary, for Martu, *yalijarra* in 1989–90 was dominated by men's 'Law business' and funerals.[202] When I returned to Parnngurr in March, these were the main events that Martu women spoke of when they recounted the past year. The 'law business' had taken them and their families away from Parnngurr to Jigalong over December and January so that 'nobody' was at this settlement and possibly few people were at the others during this time. Thus local foraging was suspended during these periods. These long absences of almost entire outstation populations were yearly features of *yalijarra*. However, if ceremonies were near that settlement, then hundreds of people could inundate the

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[201] These data are not presented here but are available on request.

[202] *Yalijarra* ~ hot time, summertime, ~ November to March. 'Law business' times were periods of ceremonial and ritual activities associated with the stages of initiation for young men. These rituals involved kin and skin mothers, sisters and other women family members as well as men. (see Tonkinson 1974, 1991). The main locations of the rituals varied from year to year (including Kintore, Kiwirrkura, Balgo, Wiluna and Yandeyarra) and required travel of several hundred kilometres. Commonly many people (sometimes hundreds) gathered at main settlements then commuted from them to the ceremonial sites on country away from the settlement. Funerals also required large numbers of Martu to travel, often to Jigalong. In 1990, following nine eight there were a series of funerals in February.

settlement and its surrounding lands. The collection of large game increased during periods of men's ritual activity. There was a lot of inter-settlement travel in *yalijarra*, consequently foraging and associated activities along primary travel tracks were common. In *yalijarra,* there was also three months of school holidays and an absence of 'whitefella' meetings as it was too hot for visitors.

In *yalijarra* when Martu were at the home settlements, foraging occurred in the early morning or evening to avoid peak temperatures. Game species that tired readily were hunted including Cat and Euro. The productivity of contemporary plant food resources diminished through the hot season. Following rains, animal species dispersed and encounters were fewer. The study could not determine whether foraging increased or decreased in frequency or other parameters in the hot season.

In March 1990, when mean maximum temperatures were 40.2°C, Martu at Parnngurr were active in foot and vehicle foraging (Ch. 4.7) although foot foraging was closer to the settlement due to water requirements. Telfer had recorded 123 mm rainfall in the preceding three months. Varanid reptiles and Bustards were the main game species in March. Bustards had flocked at regenerating burns and following summer rainfall, this was the only period in the 1990 study months when they were hunted. On accompanied and unaccompanied trips, more *Winyjikirti*, *Yalapara* and *Maruntu* were collected in this month than any other month and fewer *Parnajarrpa* were collected although fat at this time.[203] This orientation to certain varanids reflected the greater proportion of time foragers spent in cooler wetland habitats than sandplain habitats.

Wantajarra was the season when reptiles hibernated and were more difficult to locate.[204] Other game animals could be found. Foraging days were shorter due to day length and as people waited to warm in the sun before venturing out. Mean minimum temperatures dropped to 6.4°C in June. Later in *Wantajarra* on days when the southeasterly tradewinds blew strongly, tracks were obscured by wind which also discouraged tracking and hunting. Nectar resource species began to flower in the cool season and yielded nectar when there had been adequate rainfall. This was a preferred season to dig or collect moth larvae (*lunki*). The smaller *Solanum* fruit, *Jinyjiwirrilyi,* [205]were ripe in this season.

Martu spoke of *tuulpara* as 'the hunting season'.[206] This was consistent with its translation as 'spring' and Tindale's (1959) description of *Jakulyukulyu pakalku* as the Aboriginal 'new year'.[207] It was a season when resources were productive and the weather conducive to foraging. In *mulyatumal* the emergence of reptiles from

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[203] *Winyjikirti ~ Varanus acanthurus,* Ridgetail goanna; *Yalapara ~ V. giganteus,* Perentie; *Maruntu ~ V. panoptes, Parnajarrpa ~ V. gouldii,* Sand goanna

[204] *Wantajarra* ~ cool season, wintertime, ~April to July.

[205] *Jinyjiwirrilyi ~ Solanum centrale,* Desert raisin

[206] *tuulpara* ~ 'spring', ~August - October

[207] *Jakulyukulyu pakalku* ~ Seven Sisters rising, August

hibernation reinvigorated women's hunting.[208] The largest weights of *Parnajarrpa* and *Lungkurta* were collected in this period after minimum temperatures increased rapidly (Ch. 5). The bigger varanids emerged later from hibernation. During the study, Cats were hunted in largest numbers in this season. Dingo pups, Galah and Budgerigar fledglings and gravid Thorny-devil lizards were some contemporary animal resources particular to *tuulparra*. The sequence of nectar-bearing species continued; *Minyarra* and *Kanyjamarra* were suitable for harvest.[209] At Parnngurr, in September 1990, a new school was opened. This attracted Martu from other settlements for a week of celebrations and associated activities. Then most people left Parnngurr to Billanooka and Jigalong for meetings. Events such as these interrupted a regular foraging pattern.

Temperatures increased from October onwards. Significant seasonal events in these warmer months were the ripening of *Pura* and *Wamurla*.[210] In early *yalijarra* in 1990, both species were collected in the largest quantities particularly from an extensive patch near Kunawarritji. In late October 1990, most Martu departed Parnngurr to again engage in ceremonies that continued over the hot season.

In summary, intra-annual temporal foraging patterns were not strongly defined and best recognised at a time scale approximating the three main Martu seasons. All reptiles and certain plant resource species exhibited stronger seasonal availability than persistent residents such as Euro and Cat. Nomadic game (e.g. Bustard, Red kangaroo, Emu) were only present for relatively short time intervals. Temporal patterns of harvesting were offset by major events that took Martu away from settlements for extended periods of time or detracted from the time that settlement residents had available for foraging.

The temporal patterns of foraging returns on Martu lands appeared to be much less seasonally defined than tropical groups. By contrast, Altman (1987) reported significant differences between the weights of game collected by Kuninjku people in the mid-dry and mid wet (0.8 cf 0.5 kg game per capita per day). Whereas, on desert lands species resource production was highly variable and Martu foraging intensity varied greatly month to month due to external events that detracted from foraging time.

7.6 Chapter conclusions and their relevance to co-management

In 1990, traditional Martu spatial concepts continued to define and underpin their spatial patterns of land use. Their country, named places, camps and landforms continued to be critical to the location and description of themselves in space. In their adaptation to settlement life, younger Martu now anchored spatial mobility descriptions on their modern places of residence. Significantly, modern roads also structured their spatial concepts. These were more fixed than the walking tracks of olden times; however, the

[208] *mulyatumal* ~ seasonal period when Sand goanna stick their noses out of the ground (*mulya* ~ nose); *Parnajarrpa ~ V. gouldii,* Sand goanna; *Lungkurta ~ Tiliqua multifasciat*a, Centralian Blue-tongued lizard

[209] *Minyarra ~ Cyperus bulbosus,* Bush onion; *Kanyjamarra ~ Vigna lanceolata,* Pencil Yam

[210] *Pura ~ Solanum chippendalei*, Bush tomato; *Wamurla ~ S. diversiflorum*, Bush tomato

road network continued to be expanded by Martu and other land users. These spatial land features were an integral part of hunting and gathering on their lands.

It is argued that Martu spatial concepts are critical to the co-management of Karlamilyi National park and its surrounds. Martu place names offer a fine grain spatial template in an area that is relatively deficient of Western named landmarks and signposts. They potentially provide common points of reference between Martu and visitors including Western land managers. However, processes for the mutually agreed documentation of place names would need to be sensitive to the *Jukurrpa* and cultural values inherent in all named places; some may not be suited to public identification and site damage risks would need to be assessed. Also, the correct locations and spelling of places and choice of synonyms need to be ensured. At Uluṟu – Kata Tjuta National Park, places named by Aṉangu provide an important management basis for park staff and a part of the cross-cultural experience for visitors (UKTBOM & PA 2000). In terms of national park relevance, knowing Martu place names provides a basis for discussions about co-management and more generally, fine scale place naming provides an essential basis to plan and act on management in a spatially refined way.

Also at Uluṟu and elsewhere on the Aṉangu-Pitjanjanjatjara lands, landform and habitat descriptions of Aṉangu, in part contribute to the biological survey and ecological management of those lands. For instance, Pitjanjanjatjara habitat descriptions are the basis of visitor interpretation at Uluṟu. This is largely attributable to the research of zoologist, Lynn Baker, Aṉangu colleagues and translators (Baker et al. 1993). However, because English and scientific methods persist as the dominant form of documentation, Aṉangu concepts continue to be overlooked and not integrated, for instance, in recent fire history mapping of the national park. Yet, it is possible to undertake mapping (such as land unit mapping) that better conveys indigenous knowledge than purely scientific approaches (see Gambold 2001).

Roads and tracks were an essential component of the modern Martu spatial land use pattern; this was also recognised by Cane and Stanley (1985) in central Australia. Tracks warrant special attention in co-management for multiple reasons. They provided the major corridors that dispersed the ecologically positive and negative effects of Martu resource use, manipulation and burning across the landscape. For Martu, they facilitated essential access to the majority of sites on their lands and often paralleled *Jukurrpa* and historical walking routes. Roads aided modern day land re-exploration and monitoring by Martu. Ecologically, roads can contribute to land degradation through profound effects on surface hydrology, soil erosion and deposition processes. The road network was being actively expanded in 1990 and it is likely this trend continued. Collaborative mapping of the road network using a system of road classes such as that in this study is recommended.

Chapter 7.3 applied an ecological hierarchy to describe hunting and gathering patterns at different spatial scales. It found that the hierarchy was a useful tool in representing land use at the settlement, dinner camp and foraging area, and walking route scales. It aided the identification of major variables that shaped land use and resource collection at these different scales. Those scales are synthesised to represent the cumulative land use pattern on Martu lands.

Spatial land and resource use by Martu was found to be extensive between the three settlements, intensive within settlement radius and road corridors but diffuse in areas remote from settlements and tracks. Nearly all daily foraging trips occurred within the National park boundary. In 1990, there were predictable places within the settlement radius or just beyond them that Martu returned to regularly. Often these places were associated with larger watersources or sites. Beyond the immediate settlement environs (>10 km) these targeted places were also intensively used. In 1990, the settlement radius of moderate land use was estimated to be about 50 km wide from Parnngurr but much less from Punmu. It is possible that as road or vehicle condition improves and the road network expands, these radii will lengthen thus expanding the settlement area of moderate land use.

Co-management issues associated with Martu land use within the settlement radii include the likelihood of encounters between Martu foragers and visitors to the park. During the study, Martu women preferred to avoid visitors. Martu hunters needed to shoot where there were no risks to visitors. The probability of encounters was greater close to the settlements and along the primary river channel and other wetlands. In 1993, Martu requested visitors be excluded from settlement areas (Newman et al. 1993). Martu may choose locations for designated visitor camping sites that avoid their cultural sites and preferred places. Conversely, it would be difficult and inappropriate to designate Martu foraging areas. The spatial foraging pattern required high flexibility to respond to spatial dynamic elements such as green and dry areas, burns, sacred areas and ‘evil spirit’ areas. Alternately, within the park, hunting exclusion zones could be proposed. However, the potential to alienate Martu would be high and enforcement near impossible. Alternatives to spatial zoning to protect species and biodiversity would need to be investigated with community education and responsibility a preferred approach (Johannes & MacFarlane 1991).

Is it ecologically better to concentrate resource use or disperse it? From a land management perspective, dinner camp locations and associated foraging areas dispersed land use effects across the settlement radius with certain areas receiving more visits than others did. This was a dispersal of hunting pressure but also a dispersal of burning and other Martu ‘management’ measures (Ch. 8.2). With the benefit of hindsight and seeing the extremely poor condition of lands surrounding larger Aboriginal settlements in central Australia (albeit often heavily grazed by cattle and horses), it is now my view that low intensity, spatially extensive land use is better suited to arid zone ecosystems.

Martu intra-annual temporal concepts are perhaps less obviously applicable to park management than spatial ones. Many parks do not have prescriptive management on a month by month basis. Martu seasonal concepts may be of interest to park staff and visitors and they are more locally relevant than the four European seasons. Many non-indigenous park staff stay for short periods (e.g. less than two years) thus they cannot accumulate the experiential knowledge of temporally variable desert environments. Aboriginal concepts can assist park staff in the recognition of species temporal phenology and production. Aboriginal circular seasonal calendars have become popular features of cross-cultural interpretative signs in Australian national parks. They are now better documented in central Australia than in 1990 (e.g. Baker 1996). The use of Martu concepts would aid cross-cultural collaboration and assist in refining, for example, the timing of biological surveys or burning programs.

There was considerable predictability in the availability of resource species utilised by Martu. This was consistent with Cane’s (1987) finding amongst the Gugadja to the north and in opposition to Gould’s (1980) documentation of aseasonality of resource use by Ngaanyatjarra people to the south. These contrasts highlight the spatio-temporal variability across the Western Desert (an area now defined by seven bioregions). Coarse seasonal patterns in Martu resource use were documented but these were overlain by an erratic pattern of cultural events that variously detracted from or stimulated foraging. Importantly, there were periods from weeks to months when foraging pressure near settlements waned due to the absence of Martu residents (especially in the hot season); contrarily, there were periods of days or weeks when species specific hunting was frequent. These arrhythmic events were not influenced by species breeding cycles or other ecological processes. In terms of co-management, plans need to be adapted at different temporal scales. In the longer or inter-annual term, being mindful of the pulse-reserve or green-dry period of months, and intra-annually working in the cool season and less rarely the hot season.




Routes and microhabitats traversed by Martu women foragers

Photo 7.2 (top left) Women search on a sandplain north east of Parnngurr in the early stages of a short foraging trip, 1987. This area had been burnt less than six months ago and had received rainfall. There was a relatively high diversity of plant resource species on it.

Photo 7.3 (top right) Rita Simpson and Rosie Williams check a termite mound whilst following a Cat track, 1990. This was one of many niches that Cats and other game would occupy and thus were checked by foragers.

Photo 7.4 (bottom left) Women search the margins of a small creek near Karlamilyi for *Kanyjamarra* (Pencil yam) or patches of *Minyarra* (Bush onion), 1987. Three edible grass species were also identified on this trip. Foraging routes were often directed along creek beds and the margins of wetlands.

Photo 7.5 (bottom right) At dusk, Punmu women return to the vehicle after a short foraging trip, again following the margins of a recent burn in sandplain for ease of walking and greater probability of intercepting tracks of animals that use the bare ground and older seral spinifex.

Seasonal indicators on Martu lands

Photo 7.6 (top left) *Jakulyukulyu* left marks at Pimurlu before travelling eastwards. The engravings and seed grinding patches were in the low outcrop near a gnamma hole.

Photo 7.7 (top right) The Pleiades Star Cluster known as *Jakulyukulyu* or *Minyapurru* to Martu people. Its astronomical position was the most stable indicator of seasonal changes in Martu concepts associated with seasons. (Photo from website: commons.wikimedia.org, author: NASA/ESA/AURA/Caltech)

Photo 7.8 (bottom left) Fat lobes in a *Parnajarrpa* (Sand goanna) collected by Martu women in the weeks before animals burrow and hibernate over the cold season, late March 1990. This time when *Parnajarrpa* were fat was one seasonal descriptor.

Photo 7.9 (bottom right) Carol Williams sucking the nectar of *Jalypinpa* (*Grevillea* aff. *eriostachya*). Nectar was abundant in Wantajarra after high rainfall. The succession when different nectar species were available could be listed by expert Martu.

Photo 8.1 Breakaways bordered by sandplains with sand ridges to the south in an area east of Kunawarritji. A line of fires marks the route of Jeffery James whilst he searched solo then hunted *Kirti-kirti* (Euro) partially by using burns to flush and direct them.

8 To hold and be held: Martu as resource managers and land managers

8.1 Introduction

This chapter analyses the practices and concepts of Martu that were interpreted to reflect resource and land management techniques and philosophies. There have been studies into the environmental perceptions of remote area Aboriginal people in desert Australia (Rose 1995). However, their ontology and the practices had generally been poorly documented. The chapter also introduces Martu perspectives on non-Aboriginal land management in a national park, that is, it interprets a Martu view of the 'other' (Fig. 1.3). The chapter responds to a pervasive dilemma about similarities and differences between indigenous and Western management practices. This issue is highly pertinent to the collaborative management of parks, protected areas and increasingly to Aboriginal-held lands receiving government natural resource management funding.

Particular questions asked in this chapter are:

a) What were their beliefs and practices employed by Martu to 'manage' resources, hunting and gathering and their lands?

b) How were these practices applied during the study?

c) What socio-ecological changes were identified by Martu on their lands?

d) What were Martu opinions of Rudall River National Park?

e) How were these beliefs and practices of Martu relevant to park management?

Chapter 8 links the material realm of plant and animal resource use (Ch. 5) with practical tools applied by Martu to procure, manipulate and perpetuate those resources. In turn, this connects to philosophical notions underpinning that use and practice. A key challenge in this and concluding chapters is the identification and explanation of continuity and change in Martu management practices and the ideological basis of those practices. As with previous chapters, this one introduces literature topical at the time of field research and concludes with studies that are more recent.

The title of this chapter is prompted by the edited book 'Resource managers' (Williams & Hunn 1986). One of the book's purposes was to demonstrate hunter-gatherer environmental relations that would be instructive for industrial societies. Although, in that volume none of the contributors proposed particular ways that the insights from hunter-gather groups were applicable in environmental management, potential applications lay with the reader's interpretation. [211]

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[211] In later publications, Williams and Hunn were each more explicit about applications of indigenous knowledge and practice to environment management (e.g. Williams and Baines 1993, Williams 1998, Hunn et al. 2003).

The book contained two case studies from the Western Desert region at the time of early-settlement when Aboriginal orientation to traditional systems was strong. One study focussed on resource-sharing between people as a strategy that allowed Ngaanyatjarra to later reduce risk and secure resources in low-production periods (Gould 1982). This was ‘resource management’ to secure consumption rather than an implicit method directed to the resource species themselves.

Myers (1982) offered a sophisticated synthesis of traditional tenure over land and resources held by Pintupi people. His paper identified the interplay between individual autonomy, fluid band organisation and territoriality. Processes of high mobility from and return to *ngurra* were critical to this system.[212] Simplistically, it could be summarised as protocols whereby within one’s own country one had the right to collect resources without asking anyone and its opposite that visitors were compelled to “always ask” when on another’s country (Myers 1982). The desert’s socio-ecological necessity of wide-ranging travels to procure patchy resources and meet people required a frequent oscillation between these protocols. ‘Being asked’ allowed custodians to monitor the location and numbers of people at resource areas and to plan one’s own travel and foraging strategies accordingly.

Myers’s paper remains an important discussion of an Aboriginal resource management strategy in the Western Desert region but leaves at least two questions open. Firstly, although he states “boundaries are seen to be permeable [for access] to some resources but not others” (Myers 1982:173), it was not clear which resources required negotiation and which did not and why some not others.[213] Secondly, did the right to burn (or not) follow similar principles? Myers (1982, 1986) did not discuss Pintupi adaptation of this system to land uses from a residential base in a town settlement.

For the Simpson Desert, Aboriginal resource use and management strategies were reconstructed by Kimber (1984) from ethnographies and historical accounts. He documented methods by which people protected and stored food and water resources, including the designation of game reserves, herding and penning of birds, storage of food for months in caches, seed broadcasting, and, water diversion to sown and ‘natural’ areas. He suggested the scale and intensity methods represented a form of incipient agriculture and species domestication. In conclusion, Kimber (1984) speculated that to secure life in a drought-prone area the Diyari had to develop more management practices than their neighbours in better watered and more hilly areas. His speculation was in contrast to assumptions that Australian Aboriginal resource management was more intense in ecologically higher productive environments where relatively settled groups utilised smaller land areas.

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[212] *ngurra* ~ country, named place, camp

[213] The only specific resources Myers (1982) referred to were Euros, *Mungilpa*, wild yams and *Mulyarti*. The latter three were probably Samphire (*Tecticornia verrucosa*) seed, *Ipomoea costata* and a spear tree, *Acacia jensenii*. These would be highly valued species so by inference they were ones that were ‘asked for’, presumably there would be other species.

In the 1970s and 80s, the use of fire by Aboriginal people to manipulate habitats received attention from desert researchers (Gould 1971; Latz 1982a; Latz & Griffin 1976; Kimber 1983). Kimber (1983) again provided a carefully researched paper, it was about the use of fire by central Australian and Western Desert Aborigines to improve the productivity of their country. Through historical accounts and a decade of field observations in the 1970s, he detailed fire mythology, purposes, controls, habitats, seasons, and sizes. Latz (1982) reconstructed the interrelation between plant species and burning in a work about pre-European burning practices.[214] He highlighted how:

> Judicious use of fire was, in the past, the single most important aspect of the desert economy (Latz 1995a:2).

In the north-western Great Sandy Desert, Lowe and Pike (1991) independently described the use of fire amongst Walmajari people. None of these works focussed on contemporary burning patterns.[215]

Desert ecologists sought to understand spatio-temporal mosaic burn patterns of past Aboriginal people so that land managers could emulate them, particularly in national parks and reserves (Saxon 1984; Burrows et al. 1991). In the 1980s and 1990s, patch or mosaic burning was seen to be a driver of habitat diversity and a vital feature of ecosystem function; it was necessary to reduce the risk and spatial extent of wildfires.[216] The major scientific questions in spinifex landscapes were about fire size and extent (patchiness), distribution, fire frequency, heat intensity and season to burn (Griffin & Allan 1984; Burrows & Christensen 1990). Ignition patterns that, presumably, continued to be applied by desert Aboriginal people received little research attention. Notably, few ecologists were explicitly asking—Why did Aboriginal people burn? Why do they continue to burn?

In the mid-1980s, there was a broad research shift from Aboriginal modes of production and their relation to incipient agriculture (Kimber 1983; Williams and Hunn 1986) to Aboriginal-environmental interactions (Young et al. 1991). This was in the context of both an expanding Australian concern about environmental conservation, and assertions for greater Aboriginal engagement in land use planning and management. A lead paper “Exploring an Aboriginal land ethic” (D. Rose 1988) synthesised multiple elements that, in her interpretation, contributed to this ethic, particularly amongst Yarralin people of the Victoria River District. She also proposed that a collective people–land consciousness could contribute to Western views of land. Young (1991) drew upon this material in pragmatic ways to argue for better government recognition and integration of Aboriginal land management into funding programs; subsequently, the term ‘caring for country’ became institutionalised within government and non-government agencies

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214 This was later published as the classic text ‘Bushfires and bushtucker: Aboriginal plant use in central Australia’ (Latz 1995).

215 Since my 1990 study and drafting this chapter, Doug and Rebecca Bird have published on burning regimes by Martu people in the early 2000s (Bird et al. 2005). In the future, this would provide useful comparisons to the 1990 research.

216 The term ‘wildfire’ refers to large, relatively hot fires that burn vast areas over many days.

(e.g. B. Rose 1995). The term ‘caring for country’ or its assumed synonym ‘looking after country’ persists to the present but rarely is it ‘unpacked’ to understand its cultural foundations and integrity.

This chapter has four main sections. The first identifies major resource and land management practices applied by Martu, particularly on accompanied foraging trips. The most conspicuous practice was burning which is analysed in terms of why, who, where and when Martu burnt country. A case example of species specific practices is then detailed. The second section considers three philosophical concepts that underpinned traditionally-orientated management: the notion of biological-human spirits, the perpetuation of spirit and holding country amongst kin. The third section focuses on other socio-ecological changes in which Martu contextualised resource degradation. It sharpens attention on the national park through inquiry into Martu perceptions of the park. The concluding section identifies the relevance of Martu management practices and concepts for park and ecosystem management.

8.2 Resource and land management practices by Martu

8.2.1 Variety and occurrence of applied resource management

During the 1990 study, observations of the practices interpreted to ‘manage’ land and its resources were recorded. The locations where some of these practices occurred were marked on Figure 7.6 and 7.8 as ‘non-foraging events’. Table 8.1 collates the number of occasions when Martu women from all settlements applied these land or resource management measures on accompanied trips.

Unexpectedly, women on the majority (70%) of accompanied trips lit burns. This was the most common management-type action applied by Martu women. On 12 occasions (30% of trips), water sources were inspected. The deliberate fragmentation and dispersal of plant resource parts was observed on three of 40 trips. Of 40 accompanied trips exclusively by women, only two site rituals were conducted. The most common management measures observed amongst women were burning followed by inspection of water sources.

Table 8.1 Number and occurrence of different land or resource management events or actions done by women on accompanied trips from Parngurr, Punmu and Kunawarritji in 1990

Type of management activity	Parnngurr	Punmu	Kunawarritj i	Total
Total nos. of trips	27	11	2	40
Burning	22	6	0	28
Inspection of water sources & cultural sites	7	5	0	12
Cleaning water sources	1	3	0	4
Jukurrpa site ritual[217]	1	0	1	2
Plant propagule fragmentation or dispersal	1	0	2	3

This data set does not include accompanied–mixed gender trips or unaccompanied trips; When one action occurred several times on one trip (e.g. several burns ignited), the action was still recorded as one.

Unrecorded in Table 8.1 was the subtle but vital process of 'monitoring' that enabled other land uses (Ch. 4.3). As women travelled, observations of the occurrence of animal and plant species and their condition or phenological state (respectively) were noted aloud and discussed. This involved both seasonal and spatial monitoring of species in relation to area and land type (Ch. 7). Concurrently, group members observed evidence of the travels and activities of people who had been in an area earlier. They commented, for example, about where vehicle tracks turned off, whose footprints were seen or who had had a dinner camp at the location now marked by tin cans under tree shade. This information influenced very immediate decisions and longer term ones. For instance, on an August trip from Parnngurr to the Wanal creek area to collect *wamurla*, it was noted that the Williams' family vehicle had turned off to one patch so we continued on to another known patch. [218] Monitoring with its resource and human components was critical to regular foragers knowing the abundance and condition of local resources and then planning actions to procure and enhance more resources.

On accompanied trips with men, burns were also ignited but no water place and/or site rituals were conducted. However, on unaccompanied trips, particularly those by men, site visits and monitoring were said to be undertaken. The deliberate actions of Martu men checking on both the activities of miners and the condition of nearby sites (Ch. 4.4) was an important aspect of management. These measures were followed by reports of the site conditions to other Martu and, if trespass or damage to the site had occurred, reports to WDLC (R. Lawrence, Land Officer, pers. comm. 1988).[219] Presumably,

[217] *Jukurrpa* ~ dream, story, dreamtime, dreaming, origin period of landscape customs and laws, creative period that continues in the present

[218] *wamurla* ~ *Solanum diversiflorum*, Bush tomato

[219] WDLC ~ Western Desert Land Council

within larger *ngurlu* areas[220] (Ch. 7.2.7) men also visited and conducted site rituals. Burning occurred on many unaccompanied trips by mixed gender and all male groups.

8.2.2 Burning and bushfires: purposes and practices

Methodologically, in this study, a greater amount of information about burning resulted from observation of burning practice rather than semi-structured interviews and discussions. Questions to an older Martu person such as “When do you burn?” commonly resulted in broad responses such as “anytime”. Compared to Martu descriptions of seasonal or spatial concepts, burning concepts were difficult for Martu to explain and best interpreted by the researcher through observation of burning practices and discussion of past burn areas. Over the course of the study, burning was seen to be so common it was equally informative to identify and understand why, when and where Martu did not burn. During the field work, no aerial or satellite imagery was available to the researcher (Ch. 3.10); this severely constrained the classification and mapping of burn patterns.

The study found burning to be a regular feature of contemporary hunting, gathering and other activities on Martu lands. Bushfire and hearth (campfire) ignition were each highly significant yet normal parts of the daily life of Martu. Burns were common on foraging trips (Tab. 8.1). Recently burnt areas (*nyurnma*) and later seral stages of bush fires had a major influence upon foraging routes (Ch. 7.3.3) and many resource species were collected from early seral stages.

In pre-European times, fire was a critical tool. Its contemporary importance continued to be evident, beginning with the diligence and care with which Martu men demonstrated fire-making by sawing techniques. [221] For many desert groups, fire and its counterpart, rain, were key elements of *Jukurrpa* myths, sites, songlines and rituals (Kimber 1983; Nash 1990). Dedicated fire dreamings held by Martu were not mentioned by Martu nor in Tonkinson (1991); however, fire was integral to certain myths and rituals. A specialist Martu vocabulary described fire (*waru*), fire-making tools, ignition techniques, size classes of fires, parts of a fire, ash and coal types, and burn succession stages.[222] The emphasis in this section is upon non-hearth fires.

In 1990, matches were the principal tools used to ignite bushfires. Senior and middle-aged Martu men demonstrated traditional fire-making techniques for the benefits of younger Martu, visitors and researchers; however, matches were preferred for initial

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[220] *Ngurlu* ~ sacred areas; fear; sacred object, sacred ceremony; taboo (Ch. 7.2)

[221] The fire log was the softwood *Karwinkarra* (*Gyrostemon ramulosus*) with a split wedged open, the saw a hardwood *Mijarrpa* (*Corymbia chippendalei*), the wedge chaff was *Ral-ral* (*Eragrostis tenellula*) and the tinder a dry grass.

[222] For example, *jangi* ~ firestick, matches; *taaru* ~ big fire; *puyu* ~ smoke; *mulya kutju* ~ peak of fire; for firewood (*waru*), ash (*jurnpa*) and coal (*pinyiri*) types were distinguished by the source species; burn regeneration stages were noted in Chapter 7. Marsh (1991) and Valiquette (1993) include fire-related terms. Nash (1990) documented an example of the comprehensive terms associated with fire use by Warlpiri people.

bush fire ignition.[223] Once a fire was lit, Martu commonly used a flaming stick (*jangi*) to transfer fire from one point to another whilst walking to create a fire line. Vehicles greatly extended the spatial extent one person could ignite fires. It was common for specific older Martu passengers to strike and throw matches into spinifex hummocks whilst the vehicle was moving and under appropriate weather conditions.

Reasons why Martu burnt country and people who did the burning

The major reasons observed or stated by Martu as to why they burnt land were associated with hunting, signalling and the 'cleaning up' or clearing of country. The greater accessibility of recently burnt areas and the greater biological productivity of early seral stages were reported earlier (Ch. 7.2.6). The overall importance of burning was emphasised by Mitchell Panaka, a Martu man in his early 30s and an expert hunter:

> proper way to say it is *nyurnma* or *nyaru*, this is burnt ground. [It is] most important for looking after country (Mitchell Biljabu 1/4/90)

The 'clean up' of country was a key motivation for burning when Martu returned to their lands in the early 1980s. Over a period of 20 years and longer when Martu had been in Pilbara settlements (Tab. 2.5) and burn ignition came only from lighteing strikes then vegetation was likely to have been relatively more uniform and spinifex cover dense. A long term associate of Martu remembered people around Punmu in 1981–83:

> going beserk, burning, burning. They loaded the car up with matches and lit them. Burnt it, burnt the whole country right out. They'd say "This is the saddest country. We've let it go for too long" They burnt out the whole area south to Rudall. Large stretches of it were burning. (Brian Kelly 11/90)

Mitchell Biljabu recollected:

> when Martu came back to Panaka there were no *Nyalka*, just one or two finishing trees, everywhere there was just *Punti*, *Paru*, *Kukulyuru Pinnyuru* and old *Nyalka*. [Then] Martu burnt here, and all over the *Nyalka* trees grew again, new *Pinnyuru* come up (Mitchell Biljabu 1/4/90 in FW 90/3:60)[224]

The notion of 'cleaning up' was analogous to 'sweeping' mature or senescent spinifex from the ground by burning it. Martu made comments such as "*warta* (plants) too much the same" or "too many rubbish plants". The former indicative of people's appreciation of species diversity and the latter demonstrated the low cultural value attributed to plants with no economic purpose. Burning of this kind was a deliberate and intentional management strategy to rectify resource scarcity.

This study investigated the purpose and relative significance of different reasons to burn. Women on accompanied foraging trips, when asked, identified the primary

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[223] Matches were often in short supply (like many store resources). Commonly, hearth fires were relit by use of buried embers or a neighbour's fire. All households maintained at least one hearth fire.

[224] Panaka Panaka ~ springs near Punmu; *Nyalka* ~ *Acacia amplicep s*, an important species providing abundant shade and edible seeds; *Punti* ~ dense scrub, *Senna helmsii* (used only for spear tips), *Paru* ~ spinifex generic; *Kukulyuru* ~ chenopod spp; *Pinnyuru* ~ *A. translucens*

purpose of burns through observation or statement. This information was then collated and is presented in Figure 8.1.

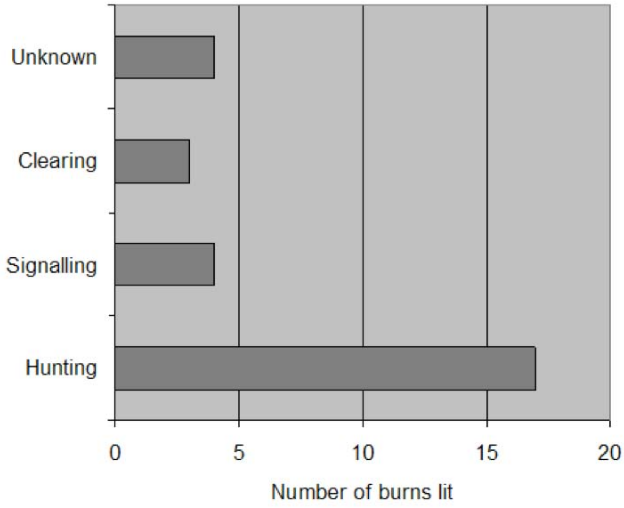

Figure 8.1 Purposes and number of burns lit by women on accompanied trips from all settlements in 1990

n = 28 burns; Accompanied foraging trips from Parnngurr (n=33) in March and August–September 1990 and accompanied trips from Punmu (n= 14) in March and September 1990; A fire lit by multiple ignition points (e.g. a fire line) was recorded to be a single fire.

It was found that the majority of burns lit by women were principally to hunt (Fig. 8.1). Burns were used as an immediate and practical tool to hunt. They were most commonly applied to clear ground to expose the holes of reptiles and to flush and drive Cats. An expert woman hunter recalled burning on a hunting trip in the context of a full account of the trip, extracted here:

> We were still following the cat. The wind would blow the track, but we could see it in some places. We followed it east. The fire [we had lit] burnt east then it finished. We were making a new burn. (Nyamaru Karimarra August 1990, translated full account in App. 8)

One burn had been ignited to flush a cat upwind whose fresh tracks had been located. When this fire had died out they lit a second burn to flush then drive the animal to cover where it was killed. On 60% of accompanied trips, women lit fires to hunt Sand goanna, Perentie, Yellow-spotted monitor, Centralian blue-tongue, Great desert skink, Cat and Rabbit. It is likely that the high frequency of women's hunting (Ch. 6) correlated with a high frequency of burns. It appeared that men used burns as a hunting tool less frequently than women did. One explicit use of fire to drive a Euro was recorded on an accompanied trip (Photo 7.1). Hunting trips where men walked rather than drove all the time were more likely to involve burning as a tool.

Signal fires were less frequently ignited (Fig. 8.1). These fires marked the location and direction of a foraging party in relation to Martu at a settlement or other location. On two occasions, signal fires aided vehicle pick up of a walking group (see Ch. 5.7.1). Martu also burnt as they approached significant cultural sites as a means of announcing their arrival to the *Jukurrpa* characters of that site.

Clearing burns occurred on only three of 28 accompanied trips (Fig. 8.1). By 1990, extensive burning to clear country had slowed as fuel loads had been reduced. 'Clean-up' burns occurred mainly on longer distance trips from the settlements to areas that had not been visited or burnt in the previous decade or earlier or where small long unburnt patches were encountered on foraging trips. Men ignited more clearing burns than women did because they tended to travel longer distances thus, in 1990, encountered less recently burnt country.

Martu also saw burns as multifunctional. Later benefits were associated with the promotion of specific plant resource species and the attraction of game animals to regenerating areas of vegetation following burns. This multi-functionality is apparent in observations from Mack Milangka, a man in his 60s, who had walked 1000s of kilomteres reliant on bush foods as a *pujiman* when in his early 20s:

> Big fire sometimes good. Break up fire, look to see what will stop it. Little bit *walpa* it can't go much. Big wind, lots of *Janparra* it will go a long way. *Maruntu* stays there, easy to track, kill after a fire. *Waru* then *kalyu* come back later, plenty *Kirtirr, Wamurla, Jinyjiwirrilyi, Pura, Ngurjana, Lunkunpa*. Must have a *waru* to have rain and *wilyki*. (M. Gardener 88/2:22).[225]

Compared to this interpretation of contemporary Martu practice, desert literature has placed greater emphasis on burning for delayed returns rather than immediate hunting returns (see Kimber 1983, Latz 1995).

Above, Mack Gardener emphasized the link between rain and fire in promoting regeneration. This researcher once observed bush fire smoke that seeded clouds to produce rain. [226] This observation further affirmed the interrelationship between fire and rain that was often stated by Martu. That is, in their view, fire could create rain in turn these factors promote plant growth and resource productivity.

Martu had an appreciation of fire as a source of security rather than a threatening force (unless associated with sorcery).[227] This was most vividly illustrated in an exceptional event involving Martu and Pilbara Aboriginal women:

> Fifteen vehicles full of women drove in single file east from Punmu to a remote site where three days of Law ceremonies were to be conducted.[228] At dusk, the 11th vehicle caught fire

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[225] *pujiman* ~ bushman; *walpa* ~ wind; *Janparra* ~ spinifex; *Maruntu* ~ *Varanus panoptes*, Yellow-spotted monitor; *kalyu* ~ rain; *Kirtirr* ~ *Yakirra australiensis* (edible seed); *Wamurla* ~ *Solanum diversiflorum,* Bush tomato*; Jinyjiwirrilyi* ~ *S. centrale,* Desert raisin*, Pura* ~ *S. chippendalei,* Bush tomato, *Ngurjana* ~ *Eragrostis eriopoda,* Native woollybutt (edible seed*), Lunkunpa*, *Acacia dictyophleba* (edible seed); *waru* ~ fire; *wilyki* ~ edible seeds

[226] This occurred on a windless, humid, hot day in November. A hot but not extensive burn created a large, dense upward smoke plume. It was likely the fuel was a resinous species judging by the blackness of the smoke. Over the course of an afternoon, clouds formed over the crest of the smoke plume; these grew into cumulus and expanded to fill the sky. A heavy rainfall fell that night. To me, this was clear evidence of smoke seeding rain clouds.

[227] Fire was sometimes associated with sorcery. It could be a tool used for malicious means by a sorcerer or, alternately, unexpected burns were explained as the act of sorcerers.

from spinifex jammed below the differential. A quick-thinking driver assisted her four elderly passengers to a safe distance. Attempts to extinguish the fire failed and all moved back. The passengers worried about their bankbooks, medicines etc that were now burning. Four jerry cans of petrol exploded and the Nissan was engulfed in flames in the darkness. Everyone was jittery and anxious. Suddenly, next to us a spinifex hummock burst into flames having been deliberately lit by a Punmu woman. As I jumped back in fright, Martu stepped forward to the reassurance of this fire. Whilst warming themselves by the hummock fire, there was laughter as the women relaxed and retold of the escape from the burning vehicle … As we departed, a small bushfire continued to burn from where we had watched the now smouldering vehicle.

Fire also influenced emotions. The above simultaneous contrast between a very threatening fire and a fire that provided security was extreme to non-Aboriginal eyes but seemed to be unnoticed by Martu. They were comfortable with fires they lit and controlled.

During the study, foragers were the most active group who burnt, particularly women in their 30s and older. The large number of burns recorded on accompanied trips (Fig. 8.1) was unexpected because desert literature in the 1990s and earlier, reported on burning practices by Aboriginal men (e.g. Kimber 1983) and, by exclusion, implied that women rarely burnt country. On several occasions, younger women also lit fires.

Traditionally, children lit small fires in ways that copied older people. During the study, young Martu children had and used matches. Children of three or four would light single spinifex tussocks. In 1990, two four year old boys had accidentally burnt two camps at Parnngurr. Children contributed to the frequent burning in close proximity (<500 m) of the settlements. Adults, who also burnt there to reduce snake risk, accepted this. Further research is required to identify the application and knowledge of younger people about burning. It was a highly skilled activity reliant on interpretation of fuel loads, wind, temperature and local geography particularly breaks and sites. These skills were acquired through observation, experience and encoded in stories.

Only one reprimand for burning country was recorded, on that occasion:

Judy Karimarra [a senior woman] had ignited a spinifex burn less than 30 m^2 to clear for *Mulyamiji*. Two women in their twenties continued to walk southwards searching for Sand goanna. *En route* they lit a fire line that burnt for about three hours before extinguishing. When Judy met them at the vehicle, the young women were strongly reprimanded. Judy said their burn could have attracted *mamu*. There was no obvious fire risk to us or any infrastructure because of wind direction (FW diary 25/3/90) [229]

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[228] Large gatherings of women to conduct ceremonies through dance, songs, ritualised exchanges and other interactions at locations distant from desert settlements were uncommon in Western Australia. However, on lands in the NT and SA where land council support and resources are used these events occurred annually. Small-scale preparations occur over weeks and months around the larger events.

[229] *Mulyamiji* ~ *Egernia kintorei*, Great desert skink; *mamu* ~ evil spirit, wild, savage spirits

It was unusual for Martu to scold each other. This incident probably related to Punmu people's nervousness following the February road deaths rather than a concern about the ecological effects of landscape burning.

Where and when burns were ignited

This dissertation argues that the spatial patterning of Aboriginal burning needs to be understood through the spatial patterns of foraging (Fig. 7.6). In 1990 at the landscape scale, burning appeared to be most intensive within the 50 km settlement radii and ignition points were predominantly along tracks and in proximity to dinner camp locations.

In the early 1980s, the spatial extent of burns had been relatively large (as described by Brian Kelly above) and some perhaps five to ten kilometres long. In 1990, most fires lit by Martu women were smaller and burnt less than 500 m from their ignition point; these were mainly Cat hunting fires. Burns lit to hunt reptiles were often less than 100 m^2. Women's hunting burns were markedly smaller than burns lit by men to clear country or hunt game. Unlike men who travelled a lot in vehicles, women foragers walked. For their own safety, they had to minimise risks of changes in fire direction and intensity. Smaller burns were safer and adequate for the game they sought. Of the 28 burns observed on accompanied trips by women, none jeopardised a foraging party or their vehicle/s.

By 1990, it appeared that burn sizes within settlement radii had become smaller due to breaks created by the larger patches burnt from 1981 to 1990. Over time, it was likely the patterning would continue to refine from large, coarse-scale fires to a finer-scaled pattern if Martu continued their intensive land and resource use. However, the evolution of this patterning was conditional on no major constraints or controls being imposed upon Martu. There was also an ecological risk of Martu 'overburning' local plant and animal populations due to short fire intervals for areas close to the settlements (<10 km) and along primary travel routes. [230]

In 1990, there were still vast areas of Martu lands that had been unburnt since people retracted from their lands in the first half of the 20th century or that had been burnt by lightning strikes. Such areas were more than 50 km from the settlements and more than about 10 km from primary and secondary tracks. These areas were vulnerable to extensive wildfires including burns lit by Martu on occasions when they explored and travelled longer distances. During the study months, no bushfires were seen to burn for longer than two days (based on horizon smoke observations). This suggested that there were few if any wildfires within about 100 km of the settlements.

[230] 'Over-burning' refers to negative ecological consequences of burn regimes with, for example, burn intervals too short to allow obligate seeders to set seed, burns so frequent that epicormic growth is depleted or bark scarring of perennial species (even 'fire tolerant' ones) that penetrate to timber on subsequent burns. Such consequences are apparent for flora but may have direct and indirect fauna effects too.

Kimber's (1983) paper remains a seminal paper on desert Aboriginal burning practice (e.g. Allan & Southgate 2002). Kimber had observed from the Western Desert and central Australia in the 1970s, that fires were primarily lit to clear country. Moderate-sized burns (10–20 km^2) were common and large fires (100–1000 km^2) rarer. On Martu lands in 1990, the burn sizes were considerably smaller. Burns by women foragers appeared to be less than 5 km^2 and usually less than 1 km^2. Since the early 1980s, it seemed that burn sizes near the settlements were reducing in size probably due to the reinstatement of burn breaks from previous burns and less burning to 'clean-up' country.[231]

At finer spatial scales, burns traversed all landform types with sufficient fuel loads. Ignition points were more common on spinifex sandplains as more roads traversed this land type and foraging areas targeted them (Ch. 7.2). In the late 1980s, Pilbara ecologists questioned whether Aboriginal people had protected Mulga (*Acacia aneura*) communities from bush fires (Tony Start, CALM ecologist, 1989 pers. comm.). During the study, there was no evidence that Martu either burnt protective breaks or avoided burning *Wanari* or *Wintamarra*.[232] Isolated stands occurred south and west of Parnngurr; Mulga was even less common at Punmu. Some stands had been fully burnt so only mulga stags remained, the fringes of others had been burnt whilst others remained unscathed. The most valued resource in these stands was firewood (Ch. 5.7.7).[233] When asked about whether Martu burnt near Mulga, Louie Warren, archaeologist and Punmu coordinator for two years, replied:

> It depends if there is something [in the Mulga] that Martu want. When at Paji last November they said "too much rubbish, too much grass, shrubs". They burnt the whole lot. All the creek line which was Mulga and other plants went up. (L. Warren 26/1/90, FW diary)

The only Mulga stand recorded to be explicitly protected was within the *nyurlu* area just east of Parnngurr. [234]

In the 'proper way', Martu burns were lit to avoid stands of certain resource species. Mitchell Biljapu and Roly Williams independently spoke of the need for burns to be kept away from *wama* (nectar) plants especially *Jalpinypa*, *Yumpalpa* and *Kuparra*.[235] It was understood that burns evaporated the highly prized nectar and these plants were damaged by fire; Latz (1995) identifies them as of low to moderate fire tolerance. It was not observed whether Martu adhered to this protocol. Other ecologically and resource significant communities were the riparian habitats along Karlamilyi. At the time of

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[231] Bird et al. (2005) described recent fine and medium-grained (some > 20 km^2) burn mosaics near Parnngurr.

[232] *Wanari* ~ *Acacia aneura*, Mulga; *Wintamarra*~ *A. paraneura*, Weeping Mulga

[233] Other resource species occurred in these communities including varanids, *Yawalyurru* (*Canthium attenuatum*, Native currant) but unlike near Jigalong and also in central Australia, Great Sandy Desert Mulga patches did not harbour the highly prized Honey ants (*Camponotus* spp).

[234] *ngurlu* ~ sacred areas, fear; sacred object, sacred ceremony; taboo

[235] *Jalpinypa ~ Grevillea eriostachya*; *Yumpalpa ~ Hakea suberea*; *Kuparra ~ Aluta (Thryptomene) mainsonneuvii*

study, it appeared that few burns had penetrated the *Eucalyptus camaldulensis* and *Melaleuca leucadendra* riparian woodlands. This was despite a secondary vehicle track, from which burns could have been ignited, dissecting the woodland as it paralleled the river. It was not ascertained if riparian habitats were deliberately protected.

Finally, in terms of spatial aspects, previous burns created burn breaks. Dune crests, creeks and hills also provided low fuel areas that sometimes stopped fires (dependent on weather conditions). Importantly, tracks also acted as burn breaks. Whilst there were no statements by Martu that they explicitly used these breaks to contain fires, it was likely that experienced people factored tracks and other breaks into their ignition patterns. If a fire kept burning people did not seem concerned as larger burns were considered far better than too few burns.

Burn characteristics such as time of burn were, it is argued here, strongly influenced by the purpose of a burn and, in the case of hunting burns, the species that was pursued. As expert hunter Mitchell Biljapu said:

> Some fires are best for *Parnajarrpa* and *Maruntu*. You burn them in *wantajarra*. Burn to [show] their holes. If you want *Kipara*, *Marlu* make a fire beginning of *yalijarra* before the rains. [They] come when the *yukuri*, *Jinyjiwirrilyi* growing. If you want *wamurla* make a fire before *yalijarra*, *wamurla* doesn't grow much when you burn in *wantajarra* (M. Biljabu 1/4/90 in FW 90/3:60,84)[236]

In this conversation, Mitchell identified the immediate consequences of burning and responses anticipated three or four months later. Whilst individuals might glibly say "burn 'em anytime", Mitchell was more specific as he identified the season. The large number of burn purposes spread burn ignition across the seasons, however, there was a likely correlation with more burning in periods when there was more hunting.

Martu foragers avoided burning when weather conditions were unsuitable. On several occasions individuals spoke about burning then decided against it because the wind was too strong. People were particularly cautious in the hot, windy periods before summer. Of course, there were seasonal periods when vegetation moisture levels were too high and it was impossible to burn. As Naaju recollected in a story about her past:

> it was the start of *kulyuwa*, that is why I saw no smoke (Naaju 1992:9).[237]

On Martu lands, there were lapses in burning in periods when settlement populations dwindled such as when people were away on Law business. Otherwise, there was often the smoke of one or two burns on the horizon (Photo 7.1).

An important feature of burning that was uniquely identified through this study was the 'ownership' of resources within a burn patch by the person who ignited the burn. This important protocol was highly pertinent to the concept of 'resource management'.

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[236] *Parnajarrpa* ~ Sand goanna; *Maruntu* ~ Yellow-spotted monitor; *wantajarra* ~ cool season; *Kipara* ~ Bustard; *Marlu* ~ Red kangaroo; *yalijarra* ~ hot season; *yukuri*, ~ green, green country; *Jinyjiwirrilyi* ~ Desert raisin;. *Wamurla* ~ Bush tomato, *Solanum diversiflorum*

[237] *kulyuwa* ~ cool season rains (these would have extinguished fires and/or fuel loads were too green to carry fire.

During the study, this protocol continued to be recognised, at least by middle-aged and older Martu but could not always be respected. Insight into the protocol came in 1990 when translating Topsy Milangka's life history. Describing an event before European contact in the 1950s, she said:

> We saw a big mob of *Pura* there but it was for somebody else—their area. But we went there anyway, it was too tempting. It was too much, there were *Pura* everywhere. We stayed around there and we ate it (Topsy in Yirapartu et al. 1992:9).[238]

Topsy's group were at Pimurlu which I knew to be an area for which her father was a custodian. This suggested that even within their own estates individuals recognised someone else as the 'owner' of those *Pura*. Later, when I asked the translator, Patricia Purungu, what Topsy meant, she explained:

> The person who burnt a *nyurnma*, that is properly theirs. But if you're hungry and the food is going to waste (then) you have it. (Patricia Purungu, 90-3 FW diary) [239]

She meant that the food resources regenerating in a recent seral community were 'owned' by the individual who lit the fire, and, in principle, others did not have the right to exploit the resources (at least without asking).

Subsequently, I had a deeper understanding of the observations Martu women voiced as they travelled through country. It was common to hear someone recounting who had lit that burn, who was with them and what species they had collected in that area. Whilst I had recognised these observations to be resource monitoring, I saw that they were more, that is, assertions to others about personal rights of access to the resources of those burnt patches. Notwithstanding this, Martu 'resource owners' recognised that the needs of hungry people overrode individual rights. Practicality prevailed over protocols.

To extend this logic (and Myer's 1982 analysis), it may have been in the interests of Martu individuals to burn where they could, thereby expanding the area where they had both principal rights of harvest and the right to grant other harvesters access thus expanding the 'owners' reciprocal networks. The latter is why it did not actually matter if other harvesters gathered the resources because later the 'owner' could remind them of it and, potentially, be reciprocated. Here was a practice that indicated a purposeful connection between resource management (burning) to promote resource production and resource management to enhance one's socio-economic opportunities.

8.2.3 Sites and rites: water places and managing them

In an ethnoecological reconstruction of traditional life in the Great Sandy Desert, the management of water resources would warrant as much attention as burning. *Waru* and *kalyu* were counterparts.[240] In modern times, Martu's physical reliance on surface waters for drinking was supplanted by reliance upon subterranean waters pumped through bores at the settlements. In 1990, natural water sources were managed by Martu

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[238] *Pura ~ Solanum Chippendale,* Bush tomato

[239] *nyurnma* ~ recently burnt ground or area where charcoal is visible and regrowth small

[240] *waru* ~ fire, firewood, heat; *kalyu* ~water, rain, springs, rockholes or rain pools

less frequently than burns were ignited (Tab. 8.1). Consequently, here relatively less is written on waters in this study of contemporary life.

None-the-less, natural water sources and associated sites continued to have spiritual, emotional and historic importance for Martu in 1990. The many types of watersources, the density of named places and their significance as *yinta* was described (Ch. 7.2). [241] During the study, management was directed to these places through remembering and relocating them, visits, appropriate rituals and cleaning.[242]

During the study, water sources were inspected on 12 of 40 accompanied trips by women; on four of those occasions they were cleared and on two occasions specific rituals were conducted (Tab. 8.1). On unaccompanied trips, waterplaces and other cultural sites were said to be visited by groups of Martu; however, it was inappropriate for me to ask about site-specific activities. On long distance trips, such as those resourced by researchers, visits to and the management of sites were the central focus for older Martu. Only one of these long distance trips occurred during the 1990 study; others were observed in 1986–88 research (Ch. 3.1).[243] Longer distance trips (>10 km from secondary tracks) were generally reliant on external support and back up vehicles.

In the early 1980s, when Martu groups began returning to settle on their lands, the management of select surface waters was immediate. A middle-aged woman remembered:

> When Martu first go to Panaka Panaka they clean out Rawly Rawly. Straight away cloud been going around in the morning, big storm and all the lightening, rained nearly every day (Daisy Purungu 18/9/90, FW diary 90/5-133)

Rawly Rawly was one of at least six springs within 500 metres of the present day Punmu settlement. In the eyes of Martu, the weather phenomena were testimony of their action and affirmation of the powerful interplay between Martu and country. Cleaning the springs was an act of responsibility and, at the time, a necessity as the returnees relied on this drinking water.

Throughout the 1980s and longer, older Martu remembered these waterplaces and sought to relocate them. In 1988, some were mapped (Ch. 7.2.3) but there were hundreds of places mentioned and their exact spatial locations were difficult to access in remote rugged terrain and find in a changed landscape. These *yinta* had multiple values.[244] Historic, spiritual, territorial and personal factors motivated the searchers.

An attempt to find one of these places occurred in late November 1990:

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[241] *yinta* ~ water source in home country; birthplace; Jukurrpa sites, historical camping sites; places that were at the heartland of country held by individuals and their kin, sacred totemic place.

[242] The ‘relocation’ of water sources involved finding the exact location of places remembered from past experience and *Jukurrpa* stories; many of these places were known from more than 20 years ago.

[243] In 2006, water places continue to be a major objective of Martu on trips now termed ‘return to country’ visits (S. Davenport, Coordinator, Kanyirninpa Jukurrpa, pers. comm. March 2007).

[244] *yinta* ~ water source in home country; birthplace; Jukurrpa sites; historical camping sites; places that were at the heartland of country held by individuals and their kin.

> From Kunawarritji, Nyangapa Karimarra wanted to find a soak near Mallowa (Well 32, Canning Stock Route). Nyangapa, Jeffery James, Marjorey, Patricia and I went in the University Toyota on an overnight trip to search for it. Nyangapa remembered playing in white soils of the site as a young girl (she is now in her 60s). It was a *Luurnpa* site; white soils being his faeces. JJ and a man called Friday had searched for it about 7 years ago. As we drove they knew its approximate location, Nyangapa recollected the local terrain included dunes north and east, a gravely rise south. A large isolated *Marntila* had marked the site. We zigzagged and searched about 10 km^2, after three hours without success they concluded the tree had died and red sands had been overblown the soak. JJ said we needed a helicopter to locate it. (27/10/09 FW diary 90(6):125)[245]

Had we found the above site, it was likely that on subsequent trips other custodians would have returned to clear the site and do appropriate rituals.

Senior Martu often lamented the poor condition of past surface waters now infilled by erosion and neglect over 30 years and longer. Sites and their surrounds had become *tikil* (dry). Cleaning these potential waters was laborious work. For sandplain soaks, river soaks and springs, digging involved the removal of soil overburden, sometimes more than half a tonne of it. Sticks and, at worst, dead animals were removed. Shovels, billies, cups or available containers were used to dig. The depth was dependent on the watertable. Deep waters required steps to accommodate the digger. It was common for someone to dig to or below soil surface level. Sometimes the sides were shored up with a 12 gallon drum or logs.

When water was located, there was a lot of excitement and commendation amongst those present. Muddy water was scooped out until it flowed clear. A critical aspect of cleaning was to taste the *kalyu* (water). Discerning assessments of its sweetness and other flavours were articulated and people discussed the similarity of taste to other sites.[246] Those present had a symbolic taste of the water. They believed it had a living quality that strengthened individuals and connected them to that place (Jim Marsh, linguist pers. comm. 13/9/90). All water sites cleaned during the study were left open. Martu said these were needed to bring *kuka* (game animals) to the area.

At certain cultural sites that had been located, other rituals were conducted. Introductions of the Martu visitors to the totemic character were common. These explained the good intention of the visitors and assuaged the totemic character. Associated activities included burning, circumambulation of the site, sweeping the ground with shrub branches, and re-arranging stones or other elements.

At *japiya* sites, Martu women were particularly orderly in their process. [247] There were exhortations to the character of that site to be generous and bestow success upon the

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[245] *Luurnpa* ~ Red-backed Kingsfisher, a significant *Jukurrpa* traveller; *Marntila* ~ *Acacia pruinocarpa*, Black Gidgee.

[246] Yu (1999) reported that Nyangumarta people's discernment of water taste and discussion of the similarity of taste between different water sites had enabled them to understand the connectedness between wetlands and their subsurface hydrological flows.

[247] *japiya* ~ increase sites; "the spirit-homes of many different plants and animals" (Tonkinson 1992:117)

hunting party. To illustrate one of two occasions on the accompanied trips, when we stopped by a distinctive stone feature high on a ridge:

> The senior Warnman woman, Topsy Milangka called aloud to the *Jukurrpa* character in her guttural voice. She introduced herself as of this country and one of his people. She introduced her skin, her daughter and others in the party (including me another Milangka). "We are going hunting, we want plenty of meat. We want Euros, Cats, Bustards, Sand goannas. We want them to be fat and plenty of them". Whilst she commanded this generosity, Junju and Rita were prompting her with things to say but made no attempt to speak up themselves. Even Muuki, an authoritative Warnman man, remained quiet. (translated by her daughter Nyapi Karimarra 3/9/90 FW diary 90/5:67)

As we returned past this site, the vehicle did not pause but Topsy shouted an acknowledgement of the bounty we had secured.[248] On both visits to different *japiya* the custodians summoned a variety of species rather than a single species that is, neither site appeared to be species specific. And on both occasions, women led the summoning of the spirits, contrary to a statement about *japiya* that the:

> [spirits] awaited the summons of the human guardians [who were] male-estate group elders (Tonkinson 1991:117)

Many cultural sites were believed to be places of great power. Whilst senior women and men demonstrated assertiveness or even bravado, most people behaved deferentially by lowering their head, being quiet etc. During the study, it was of considerable concern to Martu that *kartiya* including miners and tourists had, and potentially were, visiting these places. There were multiple aspects to these concerns. One was that the sites themselves, and thus the totemic characters, may somehow be damaged. Another was that the unwitting visitors may be harmed by the power of the site, its outraged occupants or custodians. Like many Aboriginal groups, senior Martu expressed compassion for the welfare of all people. A third concern was that visitors had transgressed Martu cultural conventions and not requested permission for access. These concerns underpinned the active inspection and monitoring of sites during the study by Martu. This was a relatively frequent activity on accompanied trips (Tab. 8.1) and more so on unaccompanied trips by men. [249]

Despite the profound and multiple values of these cultural sites, the practical care of them appeared to be substantially less than in pre-European times. Probably because their economic value had been replaced, also, there were many constraints such as access and digging was hard work. Only a tiny proportion of the hundreds of

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[248] The group had collected one Cat, five Sand goannas and a Ridge-tailed monitor. When I somewhat naively asked Nyapi if they ever left any of this game as an offering to the character she responded "No, he is a number one hunter!"

[249] These concerns were seen most acutely in 1986 when senior Martu including Sambo Samson and his wife Nayiji returned to Mr Samson's custodial places Jilukuru and Pinpi springs after a more than 25 year absence (and with archaeologist Peter Veth and field workers including myself). These are major Dreaming sites in the region (Tonkinson 1991). Uninitiated people were not supposed to be within hundreds of metres of the sites. Yet Mr Samson found evidence of campers by the springs. Later a four wheel-drive magazine portrayed women swimming in the springs. These transgressions and risks caused grave concern amongst Martu. Similar concerns were raised by A<u>n</u>angu in relation to climbing Ulu<u>r</u>u (CLC 1998).

waterplaces on Martu lands were, and could be, maintained. The most overt evidence for a change in their care was in the use of local rockholes, springs and pools for washing bodies and clothes. Wetlands close to the settlements had soap, shampoo, washing powder, cartons, plastic bottles and other discarded materials in them. Parnngurr rockhole showed signs of algal blooms due to synthetic nutrients. Historically, Martu had been very particular about keeping drinking waters clean and camping at a distance from them so as not to disturb game.[250]

Older Martu regularly spoke of the need to revive the maintenance of scattered surface waters or replace them with a network of windmills and tanks.[251] They wanted new surface waters to increase the numbers of game animals and provide water for Martu to safely extend their travel range. Based on these experiences with Martu, I surmise that Australian desert ecologists have generally underestimated the significance of surface waters in providing waters to many macropods, birds, dingoes and other species, including soaks relatively inconspicuous to outsiders.[252]

8.2.4 Ceremony and ritual to 'manage' water places and plants

On two accompanied trips during 1990, Martu conducted particular rituals associated with rock holes and sacred sites (Tab. 8.1). Additionally, in the contexts of both initiation and women's ceremonies there were songs, dances and body paintings associated with plant and animal species that inhabited Martu ecosystems. These have been referred to by Tonkinson (1991) and were observed in the three day women's ceremony east of Punmu. In Martu life, these were generally secret occasions that few 'outsiders' were privy to (Tonkinson 2007). Their content was scantily translated by Martu for, or understood by, this researcher. Details associated with them were restricted information. Thus, this section is brief.

From a Euro-Australian perspective, why should these ceremonies be regarded as an ecological management measure? In my view, they related to ecosystem management because dance, painting and song were media for managing knowledge associated with certain species. Through these media, information about species behaviour, their distribution, other ecological characteristics and ecological connections between species were encoded. The characters that were these species inhabited *Jukurrpa* stories; rituals provided a focus upon them and maintained the vitality of species. Information about species, water places and landscapes was transmitted through these media. Later decisions about practical 'management' actions directed to species were partially

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[250] This apparent contrast between efforts to extract and clean some water sources whilst rockholes and other water sources were polluted may be explained by a lack of awareness of pollution causes and effects and also less care by younger generations for scarce surface waters when bore water was abundant in the settlements.

[251] Brian Kelly (mechanic) tried to convince Martu service agencies of this need. About 1989, he negotiated with the Australian Army who installed bores on Aboriginal lands to drill several in more remote areas but none were capped. Independently, Cane and Stanley (1985) proposed a network of roads and windmills to support hunting, burning and more extensive Aboriginal land use on homelands in central Australia.

[252] Independently, this been suggested by Robinson et al. (2003)

derived from the information gained through ritual and ceremony. Within desert cultures, ceremony and ritual were analogous to the conferences and workshops attended by Euro-Australian natural resource managers; they were forums for information exchange about species, ecosystems and landscapes.

8.2.5 Practical methods to 'manage' specific plants and animals

In pre-European times, Martu had an extremely diverse food resource inventory with greater than 150 animals and 120 plant species (Tab. 5.6). Species specific management was likely to be directed to those species of high value, in short supply (Hunn & Williams 1986), and/or with biological traits amenable to management. In traditional times, the most 'managed' species were dingoes which were integrated into Martu lives to the point of semi-domestication. Older Martu spoke of how they fed and watered dingoes and in return dingoes aided hunting, regurgitated small game, kept surface waters open, provided warmth, alerted Martu to suspicious characters and provided edible pups.

During the study, evidence for the direct management of resource species was substantial. The strongest evidence related to two *Solanum* species. Specific harvest and management practices were also recorded for other plant species including *Cyperus bulbosus, Vigna lanceolata, Grevillea eriostachya, Canthium latifolium.* The main evidence recorded for 'management' practices associated with animals was through burning and taboo restrictions (Ch. 6.4.4). For Emu, Bustards and Galahs it was said that in the 'proper ways' Martu hunters should not kill the parents of eggs, chicks or fledglings; however the juveniles could be taken (Benjamin Edwards Purungu June 1987). During the study it was not heard whether this protocol continues to be respected.

There was no evidence for other measures associated with proportion of population off-take or the protection of life history stages. There was evidence to the contrary. For example, on at least two occasions in early 1990, substantial proportions if not all of the Bustard flocks were shot. The gravid females Thorny Devil and Sand goanna were actively sought.[253] No specific controls on hunting Euro were recorded.

Table 8.2 summarises Martu practices that were identified through this study as contributing to the 'management' of plant and animal species. This table is structured by descending spatial scales that were complementary to the scales intercepted by foragers (Ch. 7.3).

It is hypothesised that these practices significantly modified the regional-scale distributions, productivity and possibly genetic composition of species that were significant food resources to Martu and other desert people.

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[253] Biological opinion on which age classes should be accorded protective management varies. For instance, within the conventional management of fisheries there are size limits that protect juvenile stocks. However, it has been argued that protection should be accorded to reproductively mature, larger-sized classes which are fecund and can thus reproduce populations (Johannes 1998).

Table 8.2 Traditionally-derived practices that contributed to plant and animal resource management by Martu at different spatial scales

Landscape scale
• periodic fallow areas when groups were elsewhere
• fallow areas due to presence of *mamu* or *nyurlu*; most dynamic, few fixed (analogy to closed zones)[254]
• burning that promoted landscape patchiness
• multiple species management
• resource species switching or rotation (due to diverse resource base)
Population and habitat scale
• burning that promoted habitat diversity
• highly localised tilling and soil disturbance that promoted disturbance–response species
Patch and place scale
• burning that promoted fire-response resource species (e.g. Solanums)
• avoidance burning of specific resource patches or individual plants (e.g. Flame grevillea, Quandong)
• custodial rights of fire-igniters to burnt patches
Species
• protective break burning around store-places and important sites
• totemic species restrictions (*jarrin*, mourning, different human life stages)
• selective harvesting of productive plant parts or ripe fruit (e.g. Pencil yam, Bush tomato spp)
• plant species harvesting methods including pounding not poking, partial harvest (e.g. Bush onion, *C. latifolium*)
• plant resource species seed and propagule broadcast and regional dispersal (e.g Bush tomato spp)
• hunting avoidance of birds when with juveniles (e.g. Emu, Bustard, Galah)
• storage (for weeks to months) (e.g. *S. chippendalei, Acacia* spp)

Pura and Wamurla as a case example of species specific management

Traditionally, Solanums were a staple Martu food (Veth & Walsh 1988; Tonkinson 1991). This study found the importance of *Pura* and *Wamurla* continued in contemporary times with them dominating the plant inventory by weight (Ch. 5.6.3). The fruit were relatively large (~ 4 cm diameter), moist and sweet thus highly prized. Botanically, they were known as clonal subshrubs whose growth and fruiting was strongly encouraged by fire or soil disturbance (Latz 1995a). They senesced then 'died' after 3–5 years thus appearing to be short-lived perennials.[255]

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[254] *mamu* ~ evil spirit, wild, savage spirits; *ngurlu* ~ sacred areas, fear; sacred object, sacred ceremony; taboo

[255] *Pura* ~ *Solanum chippendalei* ; *Wamurla* ~ *S. diversiflorum*; both Bush tomato. Whilst different species, both exhibit similar characteristics, uses and management methods thus they are discussed as somewhat synonymous. They were not found to be sympatric on Martu lands. People said that *Pura* was found to the north so around Punmu and Kunawarritji and *Wamurla* to the south around Parnngurr.

At least eight direct management methods for Solanums including *S. chippendalei* and *S. diversiflorum* were identified during the study (Tab. 8.2). Three methods enhanced production: selective harvest, burning of *Solanum* sites and deliberate seed dispersal. Five methods extended food reliability: tenured access, staggered fruit collection, fruit stores, drying and storage. Fruit stores may also have inadvertently contributed to enhanced production.[256] There were also ritual sites dedicated to both species.

Older expert Martu harvesters knew of the location of *Pura* and *Wamurla* even where there was no above-ground vegetative evidence for the species. These locations were ‘observed’ on three accompanied trips. Custodians recognised the potential of areas to yield productive patches following burning. On one occasion with Waka Taylor, a middle-aged Warnman custodian and reliable informant I recorded:

> When we stopped near Pilyakumaran, Waka pointed to an area of sandplain north of the range. He said there had been a *Wamurlakurru* there in *pujiman* days but now only *Pukarlyi* was visible, nothing else. To my eyes, there was a mature spinifex grassland almost monospecific. Waka said the area needed to be burnt and the *Wamurla* would grow in that place. On the following visit to Pilyakumaran, Waka said there was not enough wind to burn well, he would come back later, adding that if it rained there would then be another good *Wamurla* patch near Parnngurr. (8/10/90, FW diary 90/7-68) [257]

Culturally, this illustrated a perception from Martu traditions that their actions contributed to the release of dormant potential within their lands. They knew where these potentials lay and needed to appropriately ‘look after’ the place to release them.[258] Biologically, this suggested that root stocks of the clonal Solanum species could persist for extremely long periods, decades at least, until the combination of burns and rainfall stimulated root growth then above-ground vegetative growth and fruiting.[259] Furthermore, this case indicates a much tighter relation between burns and specific species responses than has been recognised in the literature. It also clearly demonstrated the benefit of longitudinal experience in local areas.

From productive patches of *Pura* and *Wamurla*, expert harvesters selectively collected fruit that were known to be sweeter than others. Fruit were also picked at full ripeness.

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[256] Martu described leaving various fruit and seed species in storage. *Pura* and *Wamurla* could be stored for several days as whole fruit buried deep in sand under tree shade. As dried fruits they were stored in trees. The former stores may sometimes have been abandoned or spoiled thus they could have been source patches of seed that regenerated.

[257] *wamurlakurru* ~ Bush tomato patch; *Pukarlyi* ~ *Triodia schinzii,* Feathertop spinifex

[258] This interpretation was aided by Dr Neville White a medical anthropologist and my former supervisor. His film ‘Spear in the stone’ illustrates similar concepts of dormancy then release by cultural action. Linguist, Ken Hale, in Green (2001:41) spoke of Warlpiri and Arandic perceptions of “a unity of the actual and the potential … the potential is the tree from which the boomerang comes, and they often speak about the tree itself as a boomerang.” My interpretation of Martu views on the release of the actual plant and fruit from its potential within appropriate habitats concurs with this perception of potential/actual but is also logically extended the concept (i.e. from plant product to source plant to plant’s habitat). This is sophisticated concept may be applicable in analysis of traditionally-orientated peoples views on ‘feral’ animals.

[259] Whilst above-ground plant parts senesced, it is now known to science that below-ground parts persisted possibly for many years (M. Ryder pers. comm. 2008). As this study indicates this was long known to older Martu.

For *Pura* one mark of sweetness was a spiral coil on the pericarp eaten by a caterpillar.[260] Whilst this preferential harvesting was observed, it was not ascertained if sweeter fruit came from geographically close or distant plants (thus the same or different clones). Within a species, if sweetness was a genetic characteristic rather than environmentally determined then it was possible that selective harvesting then dispersal reinforced this genetic character. Both selective harvest and asynchronous ripening prevented harvesters from stripping a patch of all fruit. Even with repeated visits to a patch there were still unpicked fruit remaining.

Bitter seeds in *Pura* and *Wamurla* need to be removed before eating and/or storage. Techniques for cleaning then making dried paste balls and skewers to transport and store them were observed in this study (also Latz 1995). When large quantities were processed, Martu women saved, piled then scattered the seeds. For example:

> At Kunawarritji, Nayju and Nyangapa had cleaned about 10 kg of *Pura* for three hours. When finished late in the afternoon, Ngangapa took the seeds on a cloth to the southern side of the settlement and broadcast them over a 20 m^2 area. She said *Pura* would grow there and indicated to the east where I could see *Pura* seedlings from seed scattered before Christmas. (23/10/90 FW diary 90/6:108)

Broadcasting seeds by the settlements was a very deliberate strategy by Martu to cultivate the plants close to residences. All settlements had *Solanum* populations close by, at Punmu and Kunawarritji amongst the buildings.

Martu seniors asserted they had always scattered *Pura, Wamurla, Jawirli, Munyurnpa* and other species with inedible, discarded seeds.[261] They recognised old *pujiman* camp sites, in part, by the presence of the latter two long-lived plants. In their eyes, it was their role to disperse productive plants.[262] Botanically, this adds evidence that Martu, like other desert groups, played a significant role in plant species distributions. This was also suggested by Kimber (1984) and has been noted in tropical environments (Hnatiuk & Kenneally 1981). However, human manipulation and manuport appears to have had little recognition in botanical interpretations of Australian species distributions or ecology.

During the study, there was strong evidence for a variety of resource management measures historically applied by Martu (Tab. 8.2) with some continuity of practice in 1990. Whilst middle-aged and senior Martu knew these measures and sometimes applied them, the evidence for their consistent or widespread application was

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[260] *Jukurrpa* myths about *Pura* refer to their sweetness and this spiral mark (Naaju 23/10/90). *Wamurla* ripeness was recognised by splits in the pericarp called *kumurlpa,* this word is synonymous with chest and arm ceremonial scars.

[261] *Pura ~ S. chippendalei, Wamurla ~ S. diveriflorum; Jawirli ~ Santalum acuminatum,* Quandong*; Munyurnpa ~ S. lanceolatum,* Bush plum

[262] Interestingly, two Pilbara Aboriginal man was responsible for the broadcast of Buffel grass seed along sections of Rudall River and Well 22 on the Canning Stock Route in the 1930s or 40s (Wilson 1989:26-27). Several middle-aged Martu women also attributed the presence of the edible Wild watermelon along the river to their dispersal of the fruit (Chapter 5.x). Both species are considered by ecologists to be introduced weeds.

fragmentary. This is a topic that requires more research. In particular, if management was pertinent to high value but scarcer species, were the practices still applied by each generation of Martu and if so how? In particular, were methods applied by Martu to manage populations of Echidna, Perentie, Bustard, Emu or Red kangaroo? Chapter 5.8 identifies them as species that may be vulnerable to over-hunting. Further field and literature research particularly amongst the main hunters (especially men) is required to identify such measures.

8.2.6 Tenure negotiations at local to regional scales

During the study, evidence for the recognition of local tenure by Martu over biological resources was apparent only in relation to *nyurnma*.[263] Myers (1982; 1986) had identified the Pintupi protocol of ‘always ask on the country of another’ as a form of natural resource management that allowed custodians to gauge the intensity of resource use in an area and respond accordingly. On trips with Martu in 1990, this principle did not appear to overtly influence Martu foragers in daily decisions about where to travel.

On daily trips, there were sometimes deliberations about spatial objectives (Ch. 7.3) and certain individuals seemed to lead in certain directions. However, no strong negotiations between potential foragers were recorded for trips within 50 km or so of the settlements. There may have been a tendency for certain families to forage in certain directions to which their family had stronger custodial affiliations but this was not apparent to the researcher.

Martu adults did frequently point out the direction of ‘their country’ (and countries plural) and explained their avenues of affiliation to them. Often these were more than a day’s return drive from a settlement. For the rarer longer distance trips, negotiations or more subtle expressions of intent were apparent. These ‘discussions’ often seemed protracted and to involve or loosely ‘alert’ several groups of people. As long distance trips were generally for primary purposes other than foraging, presumably the discussions were more over appropriateness and authority to access wider land areas and, implicitly, resources within them.[264]

In comparison to Myers (1982) on Pintupi lands, Tonkinson (1991) described for Martu a looser, more flexible traditional tenure system that gave bands access to many places without the need to ask. He suggested this was impractical due to the wide dispersal of Martu populations. Both groups would have monitored the presence of people in areas (and thus resource use) through deciphering the smoke from burns. Tonkinson’s interpretation leaves the question of traditional resource management through tenure on Martu lands only partly answered and in need of further investigation.

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[263] *nyurnma* ~ recently burnt ground or area where charcoal is visible and plant regrowth small.

[264] One exception was rare trips made by Martu men primarily to obtain *Kurlarta* (Spear tree, *Acacia jensenii*). Stands of suitable trees occurred more than one day’s return drive from each settlement. A trip to one such stand near Mirrpurn on the floodout of Karlamilyi took several days organisation by Punmu men and involved considerable discussion on the party members (Louie Warren pers. comm.)

Tonkinson (1989) described the complex affiliations that allowed Manyjilyjarra and distant groups access into the Karlamilyi area during the era of immigration to Jigalong (Tab. 2.5). It seems likely that in 1990, amongst the outstation residents, the affiliations and rights to resources of most 'regular' residents and foragers had been established. Importantly, one interpretation arising from Tonkinson's (1989) paper is that the Karlamilyi river area inclusive of the relevant quarter of the settlement's radii (Fig. 7.7 and 7.8) must have been subjected to use by greater numbers of people than in pre-settlement times (Tab. 2.11 compared with Tab. 2.6); albeit the per capita resource use would have been considerably lower.

During the study, Aboriginal 'visitors' to Parnngurr and Punmu were cautious and tentative in travelling and foraging. They followed local resident foragers. For example, some women from Wiluna accompanied one trip near Parnngurr. They stayed close to the main forager group and appeared to be very nervous. Conversely, at bush meetings in the Pilbara and Kalgoorlie, Martu men made no attempt to collect firewood until they had been advised by the custodians of the land to do so and from where they should obtain it (I. Warchivker pers. comm. 1993) Off their lands, Martu respected protocols of requesting and waiting until offered; in return, this was expected of visitors.

From a broad Martu socio-political perspective, their strongest area of attention to tenure issues and associated aspects of 'land management' was attempts to secure land title within the Australian legal system at a regional scale. In conventional Western land management, tenure negotiations are rarely considered a form of management because it is the assumed basis of an individual or agency's right to manage. Yet in 1990 and earlier it was evidently a dominant concern for all Martu and a major preoccupation of Martu spokespeople.

Put bluntly to state government representatives by WDPAC chairman:

> Before we talk about management plan we want Aboriginal land tenure first (Teddy Biljabu, 7/8/90).

And with more elaboration:

> My land makes me talk. Old people have they been managing or what? I feel that my grandfather never gave me land to give to whitefellas. Today it's their law. … In my area we have a big problem. We can manage land without these whitefellas. Where is the receipt? We're living there this is blackfellas' land. Martu run it not this government fellow (Anon WDPAC executive member 7/8/90 FW diary 90/2-50)

The time, effort and resources Martu allocated to demonstration and advocacy of their right to own, use and 'manage' their lands was enormous. For example, in August 1990 twenty people drove about 400 kilometres for a 3 day meeting, in October about 150 Parnngurr and Punmu residents spent 2 days at Well 61, in four months of 1990 there were at least 5 meetings of the WDPAC land committee and executive in Hedland about 720 km drive north-west. The legal and procedural attempts by Martu and WDPAC to secure land tenure were protracted and demanding (Cotton 1989; Lawrence 1989). For Martu politicians and leaders, 'management' type efforts at this regional scale appeared to eclipse efforts at finer spatial scales. It is interpreted that in their Martu, the regional tenure was necessary to legitimise local tenure management measures.

8.3 Western Desert Aboriginal philosophical concepts about plants, animals and people

This section presents and interprets philosophical concepts that Martu and other Western Desert people, held in respect to plants and animals. Earlier, concepts such as *Jukurrpa* and *yinta* were introduced (Ch. 2.2.4 and Ch.7.2.3 respectively).[265] Traditionally derived philosophies permeated the daily life of Martu on country, most strongly in traditionally-orientated individuals. They bound many elements into a whole system. These concepts have implications for cross-cultural land management and its effectiveness. They mediated the way in which Martu engaged with their land, plants, animals, other Australians and government institutions.

Philosophical traditions of Western Desert people were deeply embedded in Jukurrpa Law. In 1990 Martu were extremely circumspect in revealing their Jukurrpa to uninitiated people; they were widely recognised to be very conservative in this regard.[266] Philosophy was also contained within the language of the place and people. Further, as in any culture, it was the domain of some individuals more than others. Fragments were mentioned to me but as a young researcher but with no fluency in Martu language they had little coherence. It would have been inappropriate for a young female outsider to actively investigate concepts linked to Jukurrpa. Thus, it is necessary to interpret these concepts from the few 'public' aspects offered by Martu during the research and secondary sources. Perhaps the richest documentation of the spiritual beliefs of any Australian desert group that was intimately situated amongst the species and processes of the natural world was researched by Kukatja speaker and natural historian Father Peile and his Kukatja compatriots at Balgo (Peile 1997; Peile n.d.).[267] There have been few syntheses of these concepts in relation to resource or protected area management on Aboriginal lands in central Australia.[268]

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[265] *Jukurrpa* ~ dream, story, dreamtime, dreaming, origin period of landscape, customs, laws; *yinta* ~ watersource in home country; birthplace; past camping place, named place, sacred totemic place; *japiya* ~ increase sites; "the spirit-homes of many different plants and animals" (Tonkinson 1992:117)

[266] A reminder that in 1990 Martu elders continued to prohibit the representation of Jukurrpa through art and other media; they frowned upon the burgeoning Papunya Tula art movement of Pintupi/Luritja people that represented Jukurrpa. This prohibition relaxed just prior to 2005 when the first public Martu art exhibition was held.

[267] Kukatja were northern neighbours to Martu. In 1987, I corresponded with Father Peile in Balgo. He provided four unpublished manuscripts including a part of the book 'Body and soul' published posthumously in 1997. Even with insights from these works, it was difficult to engage with Martu on these topics mainly because I had little fluency in their language. Peile also published several papers on specific aspects e.g. ethno-herpetology (the bibliography lists some of them).

[268] An important recent exception is James (2005) which is discussed in the conclusion but did not inform the writing of these sections.

8.3.1 *Kurrurnpa* ~ the spirit of plants, animals and people

In Peile's manuscript 'Botanical terms and concepts of a desert tribe' a central concept was the Gugadja notion of:

> *kurrunpa; pilyurrpa* ~ soul, spirit, life essence; life-principle (with reference to plants, animals and people) (Peile n.d.:5).

This life-principle did not have nutritive or generative powers in maintaining plant growth, it just was. Gugadja made a hazy distinction between that which was spiritual and that which was concrete and material. Several qualities embodied in *kurrunpa* were documented; two were:

> Weight—e.g. a heavy length of wood is heavy to carry on account of the weight of a tree's life spirit.
>
> Status—e.g. the life-principle of 'rubbish' plants are held in low esteem (*purta*) [bad]. These plants do not provide shade, nor are they used by man or animals for food, medicaments, fabrication of instruments or weapons etc. (Peile n.d.:6).

These qualities interpret plants in ways unrecognised in Western botanical science but perhaps akin to wildlife–human relations expressed through deep ecology and fields that pursue better integrated human–environment systems.

Both the resilience and vulnerability of *kurrunpa* were evident in a synthesis that:

> The Kukatja seem to regard the growth of every plant as a fight and struggle against the heat of the sun. Water and wind are responsible for plant growth … the heat of the sun is hostile to plant growth, as it dries leaves, stems and branchlets. Dry leaves, dead leaves and dry bark are also caused by the heat of the sun. Another cause of dryness is excess water. If the life-principle and the physical substance of a plant become dry, it will become sick and eventually die. (Peile n.d.:13).

Herein, was an important insight—dryness of spirit was believed to cause death. It was unhealthy for the life essence. But it was not dryness attributable simply to a lack of water or too much heat for 'dryness' came from too much water too. The opposite of dryness was not dampness but rather it was cold. It was believed that a healthy life-essence was cold. The above quote also illustrated Gugadja identification of the roles of water, wind and sun in shaping the spirit thus the growth and death of plants. Wind was understood to emanate from the on-going Dreamtime, to enter and flow through the plant to make it alive. It also entered human bodies to become breath to invigorate those bodies.[269] Again, biological parallels were not so neat.

The spirit that animated plants was also believed to animate people. The interconnection or transformation between plants, humans and the landscape was mediated through *Jukurrpa.* As evocatively portrayed:

> In the Dreamtime, [trees] dreamed [they would like] to have breasts. Dreamtime women mythic beings with breasts came along. Trees were [then] with 'breasts' [knots] the same way [the women were], trees truly became women. [This happened to] a whole lot of trees. The rough-leaved bloodwoods [were also] with 'breasts' [knots] (Peile n.d.:10).

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[269] Perhaps this is another reason for Western Desert people's preference to sleep and live outside rather than inside windless, sunless houses.

Peile identified the cross-application of more than thirty human anatomical and plant anatomical terms. He also translated feelings, biological processes and life stages that were common to plants and people. For example:

> *tjiliwa* ~ muscle; nerve, root; plant fibre
> *mimi* ~ sick, painful, "sick", not healthy
> *ngala* ~ eat, absorb [through mouth or roots]
> *tjurnitjarra* ~ pregnant, swollen [ref. a germinating seed] (Peile n.d.:2-3).

In his book 'Body and soul' manifestations of the spirit's activity was further explored in relation to human health (Peile 1997:95):[270] Again, the notion of 'dry' was used to convey a state of health. A Gugadja person might say:

> "The soul breathes. [When it] becomes dry, a person dies" or "A child sniffs petrol. As a result of sniffing petrol, the spirit [inside the body] becomes dry, it becomes dry. (Peile 1997:96).

In Peile's interpretation, the latter clause partially helped to explain the cause and consequence of substance abuse by some Gugadja people.[271] It would be possible to extend some of the many details of human health back to Gugadja understanding of plants (and animals).

The concept of *kurrurnpa* was also core to the Martu human domain of spiritual health and wellbeing (said Jim Marsh, linguist, pers. comm. 30/9/90), and defined:

> *Kurrurnpa* [as] expression of feelings, spirit, similar to the idea of 'heart' in English (Marsh 1992:141-142).

However, its application to plants and other sentient beings was not recorded by Marsh (1992). This is likely to be a limit of linguistic experience rather than a different cultural perspective.

Seemingly in contrast, Tonkinson wrote:

> The Mardu have no one word for power or life essence, yet it is evident from their conceptions of the Dreaming that all creative beings are limitless reservoirs of power … (Tonkinson 1991:79).

He did not identify the explicit existence of *kurrurnpa* or its core characteristics in either plants or people. Also, whereas Tonkinson identified 'limitless power', Peile had documented factors that weakened this power. This may reflect different researcher interests and interpretations. The point is Martu philosophy about themselves and the land contained important beliefs about the forces that animated or withered life of all kinds.

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[270] The book is orientated toward medical service staff to aid their understanding of Guguada concepts.

[271] Petrol sniffing has been (and is) in epidemic proportions in remote Aboriginal settlements. Peile (1997:96) analysed social and psychological reasons that contributed to extreme substance abuse.

8.3.2 *Jarrinypa* ~ plant–animal–spirit–children and the perpetuation of spirit

An essential philosophical extension of the notion of life-essence or spirit was its perpetuation. Tonkinson described how:

> [in the Dreaming] all creative beings … deposited spirit reservoirs of plant and animal species at certain sites [*japiya*] along their routes. The Dreaming beings [also] left behind similar homes for *jijigarrgaly* (spirit-children) in various locations (Tonkinson 1991:79).

It was believed by Martu that as women passed by these places the spirit child entered the would-be mother thus she got pregnant. Occasionally men would 'catch' or 'see' the child. These *jarrinypa* had not just been 'children' they had also been plants, animals and objects. [272] To identify the conception totem of a child in utero or born, people recollected or sought exceptional happenings during the pregnancy or unusual features of the newborn. Often *jarrinypa* were 'seen' when women were hunting or gathering an abundant or exceptional resource.[273]

During the study, middle-aged and older Martu women volunteered information about how they identified the *jarriny* of adults and children. They spoke of how they continued to seek and name *jarrinypa* of newborns. For example, one girl in her twenties had a dark mark (birthmark) on her breast that looked like a *Yalapara* claw thus *Yalapara* was her *jarrinypa*. One women's *jarrinypa* was *Jinyjiwirrilyi* because her mother had gathered plenty near Balgo Hill.[274] Women's discussions of *jarrinypa* interwove conception place, its direction and features. The processes concurred with those described by Tonkinson (1991).

Those who held the *jarrinypa* of a species had a particular interest in that species. This was apparent in the detail offered by someone about their *jarrinypa* and the times they deliberately pointed out the species. Also, in recollecting the name of a species Martu women often first cited an individual's name as a precursor or mnemonic to the species name. Whilst plant species were said to be eaten by the holder of that 'spirit-plant-child', it remained ambiguous whether people hunted or ate animal *jarrinypa*. Responses included "you eat it and it'll make you stronger", "when you're a kid you can eat it", and "never killed it". It cannot be presumed that a totemic species was restricted. Occasionally literature has reported that a totemic species must be consumed (e.g. on Ngaanyatjarra lands (Pearson 1995)). Whilst Tonkinson (1991:81) wrote that Martu did not feel a special bond with *jarrinypa*, this study heard women intensely discuss individual person-species connections.

There was some adaptation of *jarrinypa* to modern contexts. For example, Patricia Purungu (a fluent Manyjilyjarra and English speaker in her 30s) recollected:

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[272] *jarrinypa* ~ spirit-child, conception totem (plant or animal); synonymous with *jijigarrgaly*.

[273] James (2005) notes that the term 'resource' compounds from re-source i.e. the replenishment of a source of life thus it is an apt term for the link between a food species and procreation.

[274] *Yalapara* ~ Perentie, *Varanus giganteus*; *Jinyjiwirrilyi* ~ Desert raisin, *Solanum centrale.* The 'bush names' of Martu individuals were often *jarrinypa*. These names were in daily use amongst younger and older Martu. It is unknown if they continued amongst children.

> I was working at Jigalong store. A mob of young girls working there too. One day a *Lungkurta* walked in. We'd never seen one there. "Oh, must be something, must be looking for something". Not long after, one of the girls came in [patted her stomach, she was pregnant]. Sure enough, that *Lungkurta* was her baby's *jarrinypa*. (24/10/90 FW diary 90/7:91).[275]

In this case, rather than the mother hunt or be hunted by the *Lungkurta* on country, they 'met' in the shop of a large settlement. All *jarrinypa* recorded were plant or animal resources. There appeared to be little incorporation of modern items.[276] In 1990, a group of four middle aged and older women readily listed the *jarriny* of fifteen individuals (people in their twenties and older).[277] But notably, the *jarrinypa* of some children, including a five year old foster child present were not known. When asked about this Patricia replied "we didn't know those children when they were born". It appeared the allocation or discussion of *jarrinypa* was waning for children. It was likely that young mothers who foraged less than older generations (Ch. 6.2) would have few encounters with potential *jarrinypa*.

If this was the case, how then did Martu individuals and kin perceive the state of spirit or life-essence of those children? There had been connections between the source places (lands) of that life-essence, the species that conveyed the life-essence from Jukurrpa to person and the animation of that person from that spirit. If these connections were weakened what happened to species and human individuals? These philosophical questions await future discussion between Martu and researchers.

8.3.3 *Kanyini* ~ holding country amongst kin

Another key philosophical concept related to people and country was explored amongst traditionally-orientated Pintupi by Myers (1986).[278] *Kanyini* translated as 'holding' or 'having' and was said to be synonymous with the concept of *yartayarntarninpa* (looking after) (Myers 1986:145). Marsh (1992:98) translated the root *kanyini* to 'keeping'.[279] The object of the verb related to both kin and land, it was applied in reference to relations amongst kin and/or in relations between individuals and their custodial lands and sites.

During field research, Martu periodically used the word *kanyini*, it was apparently critical in socio-political discussions about country, and an idiom with complex

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[275] *Lungkurta* ~ Centralian bluetongue lizard

[276] I was told that one man's *jarrinypa* was a 'sheet of iron' (such as used by Martu to build shelters) because he'd almost been hit by a windblown sheet when a baby, this was not confirmed.

[277] All listed were plants or animals. Of biological interest, three of the 15 people had *jarrinypa* of animals extinct or uncommon in the region.

[278] Pintupi were eastern neighbours to Martu. Myers was writing of 'traditional' beliefs at very early settlement. This concept was not written about by Peile and only mentioned by Tonkinson (1989), but may have been known to both.

[279] *kanyini* ~ is keeping, keeps (Marsh 1992:98). Hansen and Hansen (1992:22) expanded *kanyin̲u* ~ kept; had; cared for; copulated with; looked after; to sight a rifle; had as a spouse. There were several synonyms in Western Desert dialects including *kanyirninpa, kanyin̲u*. This chapter refers to Marsh's (1992) spelling of it.

associations. Martu emphasised the concept when talking about non-indigenous people traversing and 'disturbing' their lands. This was evident in a statement by a Manyjilyjarra man and Punmu 'boss':

> We used to live back at Karlamilyi and we looked after it well, without digging it up. Other [Martu] went to our country, without digging it up, we looked after it well leaving it in its original ... long ago the old people used to sit with respect for their country. ... [the country] which belongs to Aborigines has been there in good condition [before the miners]. We used to look after it well, it was untouched [as far as mining was concerned]. ... The old men used to give us the dreamtime stories of the country so that we could look after it well (Ditch Purungu).[280]

The notion of 'looking after' is resonant through this statement recorded during a period of grave concern amongst Martu about mineral exploration activity in the region. But it was also common in statements about Martu history and culture in contexts not directly responsive to mining, such as:

> We want to live on this country and look after it so later the next generations can take over. (Nyaparu (Ned) Gibbs 1987).

Rarely was the concept heard discussed in everyday foraging contexts during the study.

Myers (1987:145) introduced the concept to explain how the claims and rights of Pintupi individuals to country were justified and negotiated amongst Pintupi. He proposed that those individuals who 'hold' country had a special status in relation to that country over and above other kinds of claims from other individuals. His discussion was explicitly about the roles of initiated men in 'holding' country; he said that little was known about how Pintupi women 'hold' country (Myers 1987:146).

The assertion of *kanyirninpa*was cultivated, demonstrated and perpetuated through an active relationship between 'the holder' and 'that which was held'. [281] *Kanyirninpa* referred to relationships to place, relationships to ceremony and design or relationships between skin and kin. In the case of place, a demonstration of the 'holding' of that place was, for example, collection of significant resources in that place.

Pintupi spoke of the 'heavy' responsibilities *kanyirninpa* carried with it. At times, a 'holder' did physically have to carry heavy, serious ritual objects of that place. The concept of 'holding' invoked rights and responsibilities to the place person or object (Myers 1987:146). Importantly, an individual rarely 'held' a place on his or her own; individuals sought to share the responsibilities with appropriate kin and skin (section) class (*walymarri*).[282] [283] This was facilitated by the sharing of knowledge (*ninti*) of places through the iterative introduction to sites, Jukurrpa and rituals of the place. An

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[280] Recorded and translated by Lesley and Ken Hansen of Summer Institute of Linguistics circa 1990.

[281] *kanyirninpa*~ keeping, holding, having, holding country amongst kin

[282] *walymarri*, *walyjamarri* ~ a persons own relations / his or her own people / people from the same *yinta* (waterhole)

[283] Members of the skin-based ritual patrimoieties had reciprocal relations as *kirda* / *kurtungurlu* (~ owner / worker). This social classification is common to Warlpiri and northern desert groups but was apparently not amongst Martu (Tonkinson pers.comm.).

individual could not hold a place unless other ‘holders’ accepted their claim and taught them too. Socio-political processes of organisation and negotiation were integral to the notion of ‘holding’ country. It was not an ‘activity’ solely done by one or two individuals.

Myers (1987) embedded the concept of *kanyini* in discussions of Pintupi land and resource ownership (explicitly at early settlement and, by extension, to pre-contact situations.) Very pertinent to natural resource management was that:

> ‘ownership’ and the Pintupi ideology of custodianship are related to territorial organisation and to the regulation of resources. … rights to country provided a basis for localisation of people in [particular] areas … this pattern ensures that people return to marginal areas, [thus groups collectively] exploit the entire region, and this makes for increased efficiency in a regional system potentially supporting a larger population (Myers 1987:155). [284]

It was likely this spatio-temporal population dynamic was critical to the collection of resources that were highly variable in space and over time.

For Western Desert people, a corollary of ‘holding country’ was ‘to be held by’ that country. There was an ‘expectation’ of reciprocity in the role, that is, having nurtured lands people expected in return to ‘be nurtured by’ those lands and their elements—to be fed, housed and healed by them. This expectation/obligation of return itself related to an ontological construct simplified as exchange (*ngaparrpa*) the idiom expanding to a sophisticated concept.[285]

In synthesis, amongst Martu, complex philosophical concepts associated with life-essence or spirit (*kurrurnpa*), the perpetuation of that spirit through species in the landscape, the emergence of spirit-children (*jarrinypa*), ‘owning’, holding (*kanyirninpa*), knowing and teaching (*ninti-*) about country, sharing country with kin (*waljamarra*) and more were tightly integrated concepts, at least in traditionally-orientated contexts or idealised scenarios. But through this chapter section and earlier there have been indications of profound shifts and changes in the application of these concepts in the contemporary settings of post-colonial lands. How did Martu articulate or observe major changes, particularly in relation to land management?

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[284] This insight remains relevant to desert Australia today. If local attachments to ‘marginal’ places within a region can be maintained it disperses populations to exploit a wider region thus accommodating more people.

[285] *ngaparrpa* ~ in turn, to return; and related to *ngaparrtji* (see Hansen and Hansen 1992:81)

8.4 Significant socio-ecological and institutional changes relevant to land management

By 1990, 70–170 Martu adults had returned to their lands. They brought with them traditionally-derived languages, philosophies, skills and knowledge as well as the adaptations and adoptions of 20 years and more contact with *kartiya* and broader Australian society.[286] For younger people life was a blend of 'traditional' and Western ways in which they knew the lands of their parents mainly through oral rather than experiential learning.

When older Martu went back to country, they expected to return to lands as they remembered them but there had been changes on multiple fronts. Initially, in the late 70s to at least 1990, Martu encountered and sought to rectify environmental changes to water places, country long un-burnt and species that were less abundant. They also encountered signs of the few *kartiya* who had ventured onto those lands to make roads and explore for minerals (Tab. 2.5). In 1984, Martu 'bosses' learnt that a national park had been gazetted on lands for which they believed themselves to be custodians. Contrary to their understanding and initial professional advice, the 'park' was neither vacant crown nor claimable (Lawrence 1989). In the view of Martu leaders:

> After the whitefeller took the land off the people he put a lot of laws in there—pastoral leases, national parks and mining leases. They should have asked Martu people. (Billy Milangka 1988:11)

As we saw above, 'asking' was not merely a mark of respect desired by Martu it was the basis of recognition and negotiation. To not ask was in contravention of established Martu protocols and struck against the heart of concepts like *kanyirninpa*. Subsequently, Martu spokespeople initiated and maintained:

> a long struggle to regain social and spatial security within the region, treating Karlamilyi (Rudall River) as the epicentre of this movement (R. Lawrence 1989:2).

This section looks at other major socio-ecological changes identified by Martu and then at their responses to the national park.

8.4.1 Martu observations of other socio-ecological changes and resource depletion

During the study, Martu adults made numerous observations on socio-ecological changes to their lands over the twenty years and longer that they had been physically absent. These changes were interpreted within their conceptual framework of tight links between *Jukurrpa*–people–country and its resources. The changes related to the passing of the 'old people', declines in species, dryness of places and country, and animals and plants that had come with *kartiya* and gone with *kartiya*.

This summary of changes expressed by Martu is brief. Many of those changes reported from Martu had been common to Aboriginal groups in central Australia. Their diverse attitudes and perceptions have been well collated and interpreted by B. Rose (1995).

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[286] *kartiya* ~ white person, whitefella, non-Aboriginal person

This study found, that in Martu eyes, ecological changes were most commonly attributed to the absence of the ‘old people’ and their practices. Plant and animal resources had been responsive to and reliant upon those people. Patricia Purungu, a vibrant woman in her thirties, reflected when we were at Kataru:

> When Martu looking after country, *Jarwili*, *Munyurnpa* they all [growing]. Jurntu Jurntu—a *yinta*, *Jawirli* there. Nobody there to eat them when giving fruit. Nobody there and they finish up. Kinyu—no water (now), nobody there. (Patricia Purungu FW diary 1987:5) [287]

Those Quandongs and Bush Plums remembered by Patricia needed, in her interpretation, people to eat them, to ‘look after’ them to be sustained and productive. Similarly, waters became dry through no one drinking them, infilling and neglect.

The drying of country was another common observation of Martu. In light of philosophical understanding about the Western Desert concept of *kurrurnpa* perhaps when Martu spoke of dry, it was also an allusion to dryness of spirit within plants and people that contributed to poor health and death.[288] To extend this interpretation, it is possible that Martu, like other Aboriginal groups, attributed their own generally poor state of health to the poor condition of their custodial lands and places (also Scarlett et al. 1982).

Martu also related dryness to rainfall. As a woman in her 40s described it:

> Long time ago, say my grandfather’s time, they used to have plenty of rain. Rain every day, might be every week rain, they have this country fresh, they have a lot of bushtucker. ... ‘cause long time they had a lot of rain, we had a lot of old people, they passed away now, not so much rain (Nyapi Karimarra 12/8/90, FW diary 90/2-63).

But this view was inconsistent amongst Martu as they sometimes spoke of recent rainfall events as evidence of their power and good actions.[289] According to Tonkinson, younger Martu men had revived (pers. comm. 1990) rainmaking ceremonies but there were periods when they were ‘locked up’ due to funerals or inappropriate behaviour.[290]

Ecological changes more familiar to desert scientists were associated with the demise of species populations and the effects of introduced species. Like many indigenous groups or ‘ecosystem people’ intimately reliant upon natural resources, Martu saw these changes long before general scientific recognition or acceptance. Martu were an informant group for a classic study based on Aboriginal knowledge of the biology, distribution and reductions of small to medium sized mammals (Burbidge et al. 1988). As reported in that paper, older people lamented the absence of these animals which

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[287] *Jarwili ~ Santalum acuminatum*, Quandong edible fruit; *Munyurnpa ~ S. lanceolatum*, Bush plum; *yinta* ~ water source in home country; birthplace;

[288] *kurrunpa* ~ soul, spirit, life essence; life-principle (with reference to plants, animals and people)

[289] See quote in Section 8.2 on cleaning water places. Also of note, in August 1988, in a period usually the driest in the year, three days of continuous rain coincided with a three day meeting on Martu land attended by the WA State Premier. Senior Martu interpreted the rain as affirmation of their presence and strength on country.

[290] This revival was aided by ethnographic research recordings of ceremonial songs.

animated their *Jukurrpa*, were incorporated into skin classifications and integral to the people—land connections. A haunting event occurred several years earlier:

> In the near distance, less than 5 km east, we could see the escarpment of Durba Hills. The Martu name for our destination was only whispered. As we approached it [Kilujuru], Mr Samson expansively swept his arm, taking in the wide spinifex sandplain between dissected dunes, a stand of Coolibah and the hills. He said this was good *Mala* country. He recalled his parents burning to drive and capture the *Mala*. As he scanned the ground, he noted they were absent now. The nostalgia was palpable. Whilst we continued toward the site, Mr Samson, his wife and others sang of the *Mala* and other Beings. It was almost half a lifetime since he had been to his country here. (FW diary May 1986).

Throughout the study, there was frequent mention of these absent species and people puzzled over their fates with many suggested explanations for their decline.[291] In terms of plants and animals recognised by scientists to be introduced species, Martu had contrary views on their origin. For instance:

> Rabbit, Cat, Bustard, Hare Wallaby, Foxes, they all here in Dreamtime. Camels, Cattle, Donkeys, they come with whitefellas (Nyapi Karimurra 12/8/90, FW diary 90/2-63 original: 43).

Cats were not seen to be introduced or 'strangers' and were well integrated into the Martu customary economy (Ch. 5.7.4). By contrast to Cats, older Martu vividly recounted their first sightings of Camels. Whilst people recognised some species as recent arrivals, they generally accepted them. However, Camels evoked particular concern amongst active foragers:

> Too many Camels. [People] used to be safe, always water, now they drink all the water. *Kirti Kirti* saves water. Birds dying too. They [Camels] break all the *warta*, no good (Nyapi Karimurra 90/2-114).[292]

Here, Nyapi referred to the great volumes of surface waters drained by Camels and the damage to shrubs and trees with grave concern for Quandong. Women foot-foragers were also wary about potential dangers from solo or group Camels (see App. 8). Despite these concerns, Martu showed little interest in eradication or control of Camels. Proposals to shoot and discard them were rejected (Brian Kelly pers. comm. 23/9/90). Various Martu opinions were that everything had its place, it was wasteful or that the effort required was too great. These practicalities complemented positive attributes certain Martu saw in Camels. The animals were an occasional but very large food source in times of store shortages (Ch. 5.7.5), juvenile Camels were kept as pets at Parnngurr (e.g. those named 'Snow white' and 'Rambo'), Camel herds were a source of interest for Martu travellers and their Christian associations with the 'three wise men' were commonly discussed. There were no prevailing judgements on them as 'good' or 'bad' species within an ecosystem.

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[291] In 1990, older Martu spoke of 'the puppet show' time referring to when Burbidge et al. (1988) brought museum specimens of rare and extinct animals to aid enquiries about their ecology. This experience contributed to certain Martu explanations that the "whitefellas has those animals" and "whitefellas took them" (as with Martu children made wards of the state).

[292] *Kirti-kirti* ~ Euro; *warta* ~ tree, stick

During the study, Martu observations and opinions on other ‘introduced’ animals and plants (including Buffel grass) were recorded. Again there was some consistency with reports from B. Rose (1995), although, unlike in central Australia, there were no agency or local programs to control these introductions thus no Martu responses to control proposals informed by scientific knowledge. A common dilemma was that whilst Martu identified heavy impacts of ‘stranger’ plants and animals upon water and biotic resources they were either accepting of them and/or did not have the physical resources to actively counter these contemporary changes. Martu orientation was to ‘management’ measures familiar from their own cultural domain, and as shown above, they were unable to fulfil many of these responsibilities let alone those important to non-Aboriginal people.

It was in this wider context of extensive socio-ecological change that Martu placed a perceived scarcity of game animals and resource plants. Historically, bush food shortages that were short-term place-specific or longer-term had been commonplace. For example:

> We stopped there at Kirjin. We stayed there. Then we ran out of plant food. We were just living on meat. We stayed there until nothing was left. Then we went back (Jakaru Purungu in Yirapartu et al. 1992:19).

Critically, in *pujiman* times people moved on to another place where they anticipated adequate resources. This was a principal resource management strategy to which other Martu strategies were complementary and those of Euro-Australians unknown.

Frequent foragers only occasionally observed shortages of a particular species or of a general deficit of resources in a named area. The preferred strategies were to continually monitor potential harvesters and resources, avoid those known to have been used a lot recently and anticipate better resourced areas. A philosophical basis was also that resource use and ‘management’ practices perpetuated resources.

When I questioned occasional observations of shortages, Martu replies referred to the changes above and alternatives never were related to the possibility of less hunting. When three expert hunters were individually questioned they did agree that close to the settlements, game animals were less abundant due to hunting but each of them responded answered that if they hunted further away there would be “plenty there”. For example, Ditch Williams, an expert hunter who had returned to Punmu in 1982, said he was finding fewer Euro, Bustard and Kangaroo near Punmu. His solution was to build a new ‘hunting road’ from Punmu to Parnngurr. I asked where the road would go, his imagined route wound eastwards, south and west past Taarl and other *yinta*.[293] Again, the foraging strategy was to open ‘new’ country and go elsewhere.

[293] yinta ~ water source in home country; birthplace; *Jukurrpa* sites, historical camping sites; places that were at the heartland of country held by individuals and their kin, sacred totemic place.

8.4.2 A profound ethic of 'holding country and people' but not an explicit conservation ethic

Whilst keen Martu hunters certainly valued species, there were occasions during the study when game animals were injured and abandoned or killed and wasted. Martu rarely publicly reprimanded each other for anything and no criticism of occasions when resources were wasted was heard. On two accompanied trips, two Bustards were injured but not killed when shot. The injured birds escaped but the party abandoned them with no attempt to pursue them (this may be neglect or it may not have been practical to do so). On other occasions, dead Perentie and other reptiles deemed too skinny to eat were discarded.

It was difficult to explicitly ask Martu about 'conservation' because there were no direct translations and parallel concepts were confused e.g. with taboo restrictions of a completely different logical basis. Four non-Aboriginal staff were asked if they thought Martu conveyed a conservation ethic and uniform responses were: 'No, people took what bush foods they could, when they could and as much as they could'. Two examples were given of large numbers of species killed (Emu and Bustard). The pragmatic, Brian Kelly, who had been on Martu lands since the late 1970s asserted:

> There's no ethos of conservation and protection within their present thinking. … I'll give an example, at Kunawarritji—a tall Coolibah tree stood near the houses, to one side. Women would congregate under this tree to socialise and sit in its shade. It was a beautiful tree. The largest one at Kunawarritji, there was few of them in the wider area. One day an old couple took to the tree with a tomahawk. In three days they had reduced it to a pile of firewood. Nobody reacted, nobody did anything about it, they just let them do it (B. Kelly 23/9/90 FW diary 90/6-16).

Beyond their obvious immediate and pressing need for firewood, Kelly's interpretation was the couple were publicly stating their neglect by younger people who should have provided them with firewood. This statement took priority over conserving a tree that appeared to have high local significance.

8.4.3 Martu views of the 'national park mob' and the park in 1990

This study recorded Martu opinions on the national park. This information was gathered from discussions with Martu and WDPAC staff. Wright (1989) concluded with statements by Martu elders conveying their opinion of the park; the research has drawn upon these too.[294] Additionally, Martu opinions expressed at public meetings on national parks, particularly the 'Millstream' meeting, were recorded. This was at a meeting of Pilbara and Western Desert Aboriginal and agency representatives organised by CALM at Millstream–Chichester National Park (reported in Tann 1991) which I attended in August 1990.

It was found, that from Martu perspectives in 1990, Rudall River National Park was at best an amorphous concept and at its worst a threatening one. Martu believed their lands

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[294] WDPAC ~ Western Desert Puntukurnuparna; CALM ~ Department of Conservation and Land Management, Western Australia.

had been wrongly appropriated by the 'national parks mob' associated with government and whitefellas. From Martu perspectives, this threatened their control, use and care of those lands. Generally, their interpretation of the national park was also tightly intertwined with mining and tourism. In 1990, no Martu expressed positive aspects associated with the national park. People saw no advantages to themselves individually or collectively, nor were they aware of potential benefits to the 'environment' or the wider public.

These sentiments may surprise or even annoy those Australians who have grown up with experiences and knowledge of national parks and their purposes. However, Martu views need to be understood in the cultural and socio-political context of 1990. To that time, most Martu had very limited or no knowledge of national parks, nature reserves or other protected areas other than Rudall River National Park and proposed nature reserves at Durba Hills and Lake Percival (Fig. 1.2; Ch. 2.2.10).[295] Similarly, the purposes of protected areas were foreign to people who had limited opportunity to appreciate the global and regional extent of urbanisation, land clearing, degradation and biodiversity loss that necessitated protected areas.

Miners and mining in the park and on Martu lands

This study heard that some Martu believed mining and a national park were one and the same. For example, when a group of Martu women were asked if they knew what a national park was for, an astute competent Warnman-English speaker and custodian of Karlamilyi pointedly replied:

> *Yuwa*, a place to mine in. (Nyapi Karimarra 14/8/90 FW diary)

Others nodded in assent and the conversation went on to identify different places where miners had recently been seen including within the area they knew to be the national park. There were many cases in transcripts where Martu individuals closely linked mining and the park (see Thieberger & Gallagher 1987; Thieberger 1989). Refutation of their view was difficult because, in their eyes and in reality, mining and the national park co-occurred on their lands.[296] Political meetings with Martu had often been attended by CALM and mining staff (the staff's different employers were invisible to most Martu); and there were no other protected areas known to them which might have indicated to the contrary.[297]

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[295] One exception was a two day 'study tour' in 1989 by four Martu leaders (Ditch Williams, Lucy Gibbs, Patricia Peterson and Brian Samson) to Uluṟu Kata Tjuta National Park on Aṉangu lands. Community Aid Abroad funded the tour and on invitation, I accompanied the group to arrange logistics. Unexpectedly, this experience intensified Martu concern about national parks as localities that attracted large numbers of tourists who also violated cultural protocols associated with sacred sites including Uluṟu itself.

[296] Rudall River National Park gazettal in 1977 allowed it to be open for mineral exploration, in 1987 three national parks in WA were declared open for mining (including Rudall River), in 1987 CALM accepted funds from CRAE for a RR national park management plan, in 1993 Kintyre mining lease was excised from the park (Chapter 2).

[297] I tried to explain Western purposes for national parks; it was a bewildering task because there were few yardsticks by which to make cross-cultural comparisons.

Only prominent Martu spokesmen recognised the distinction between CALM and mining companies. As in two examples:

> CALM have double standards. They don't let Aboriginal people do what they want, yet they support exploration and mining. Take your park away and leave us alone. It gives us too much trouble. You are making it hard for us to live on our land (Bobby Roberts in Tann 1991:36)

and:

> We believe your law is not strong enough. There is a lot of mining in the area. I told Chris (Haynes, Director of Nature Conservation) that his law is piss-weak. We have asked him how his law can be strengthened. You are not going to sell us out. There is no law to stop these miners, yet you can hold us out (Teddy Biljabu in Tann 1991).

As the current Chairman of WDPAC, Biljabu had the sharpest assertion on the subordination of CALM to mining interests.[298]

From 1984 to at least 1993, Martu maintained a forceful public position that mining was inconsistent with their responsibilities to their land and their families. Their views were founded on grave concerns about the effects of mining (especially uranium) on waters, sites, game animals, plants and people's health (see eloquent statement by Chairman Gibbs 1989, App. 9). Martu and Martu support groups had proactively demonstrated and argued against mining (WDPAC 1987; Warchivker 1991).[299]

A federal government senator stated that Rudall River represented a great dilemma with multiple and conflicting land use demands:

> The three act nightmare of a uranium mine on Aboriginal land in a national park (Jo Vallentine n.d. c. 1988)

The 'three act nightmare' later headlined newspaper articles, book chapters (Moody 1991) and continues to be quoted in wider public discussions associated with the region (e.g. ANAWA 2006).

The perceived allegiance between CALM and mining did not just confuse CALM's role in Martu interpretations, it masked the intents and purposes of CALM's policies associated with nature conservation (e.g. Muir 1982; CALM 1990). These policies did not seem to be known by Martu and in 1990, there were no on-ground, practical actions by CALM staff to demonstrate them to Martu.

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[298] WDPAC ~ Western Desert Puntukurnuparna Aboriginal Corporation previously Western Desert Land Council (WDLC)

[299] The above portrays a somewhat black and white view amongst Martu of mining. Publicly, this was true of the period as corroborated in Newman *et al.* (1993). However, Newman et al. (1995) provided evidence of more complex and obscure interrelations between Martu and mining companies. For instance, Martu utilised the water bores and tracks installed by mining companies. The report also gave a good synthesis of different experiences and perspectives associated with tourism. The next chapter documents a radical shift in Martu leader's attitudes toward mining.

Hunting in the park

The above stated constraints on Martu access to the park were partly hyperbole. Yet they were repeated in politicised contexts:

> We should be able to hunt where we like. Now there are problems because people have to find someone else's country to hunt on (anon Martu, cited in Tann 1991:12)

and:

> We cannot shoot or hunt in the park. That law wasn't passed by us. These people [CALM staff] are going to tell us where to go, what to eat (Teddy Biljabu in Tann 1991:24).

However, Mr Biljabu and the anonymous speaker were concerned Martu hunting and driving would have been excluded from the proposed Durba Hills and Lake Percival Nature reserves. The relevant legislation (Wildlife Conservation Act 1950) prohibited the taking of flora or fauna from nature reserves, thus, Martu concerns had a foundation.

In day to day life, there was no obvious evidence of constraints on Martu hunting due to the park. Chapter 7 demonstrated extensive spatial use of resources within it. However, individuals articulated a sense of being hemmed in on several fronts, for example:

> Oh! We're in the middle, where have we got to go? No where. Go that way? No, a mine. Go that way. No a park. ... (Patricia Peterson 25/10/90).

Whilst the limits were not overt or physical, they perhaps worked psychologically in terms of anxiety and frustration felt by the Martu individuals who were aware of their wider socio-political setting.

Tourists and tourism in the park and on Martu lands

Amongst those Martu who engaged with the cross-cultural political process, there was some awareness of the link between parks and tourists. It had been explained them that the green areas on topographic map sheets attracted tourists (R. Lawrence pers. comm. 1988). Separately, Martu observed increasing numbers of *kartiya* on their lands through the 1980s.[300],[301]

During the study, it was observed that Martu encounters with travellers varied. Groups of women foragers tended to avoid routes and places where tourists were likely to be. Occasional interactions between Martu men and tourists were congenial. On three occasions in the 1990 field months, Martu men drove to help tourists stranded by vehicle breakdowns. Alternately, Parnngurr people were very disturbed when a tourist convey drove through the settlement photographing them. Several unaccompanied trips in 1990 were to check on the location of *kartiya* in relation to cultural sites. Generally, Martu were accepting of visitors but did not want to be the unsolicited focus of their

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[300] *kartiya*~ white person

[301] On the 1988 study tour to Uluru - Kata Tjuta National Park, Martu in the group were aghast at the number of tourists in the park, Lucy Gibbs summed it as "too much *pinga*, too much nuisance" adopting a pejorative term for 'ants' to refer to large numbers of tourists.

attention and were particularly concerned about the welfare of cultural sites and those who ventured into them.

What did CALM and Martu want from each other?

At the Millstream meeting, those in attendance went on to draft recommendations that encouraged joint management arrangements, Aboriginal involvement in management plan development, park excisions for living areas, access for subsistence hunting and gathering and Aboriginal control of heritage information (Tann 1991). However, these recommendations fell far short of Martu and other people's demands for Aboriginal-held tenure title and equitable control. As fourteen amongst about 50 participants, Martu listened to the recommendations, publicly remained silent and went home. Their silence marked disapproval of the final outcomes.

To 1990, interactions between Martu, WDPAC and CALM were almost exclusively political, that is, they occurred amongst senior staff of the organisations and only in formal meeting contexts. CALM had no active or regular presence in the region thus Martu individuals could not develop relations with any CALM individuals. Yet interpersonal relations were critical to the development of cross-cultural processes and associated trust. To about 1988, any wildlife survey or other 'conventional' government park work was done independent of Martu and their representative organisation (e.g. Muir 1982; Burbidge & McKenzie 1983). From 1988 to at least 1990, there was a hiatus in applied, on-ground works in the park region.[302]

To 1990, CALM had no policy or legislation that explicitly supported the involvement of Aboriginal people in national parks and nature conservation (Barry Wilson, NPNCA Director, pers. comm. 19/10/90).[303] Drafts of potential guidelines were prepared for the State generally (NPNCA 1990) and Karlamilyi specifically (Johnston 1990), but there was little progress in ratification or implementation to 1994 or later.

Despite their apparent animosity or ambivalence toward CALM, Martu kept their options open. They and their representative agency, WDPAC, saw that CALM and they had interests in Karlamilyi and wider lands of the region even if there was ambiguity as to what those interests were and how they overlapped. As asserted:

> the Land Council has argued that because of CALM's scarce resources, Aboriginal people should be given a major role in managing the Park (R. Lawrence 1989:40)

Newman (1993) synthesised Martu, WDPAC and CALM proposals in relation to Rudall River National Park (App. 10). In the early 1990s, the core proposals from Martu representative organisations related to equitable park council membership, involvement in policy and planning, employment, training and on-ground management, and

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[302] There were two exceptions. One was the ethnozoological documentation of Aboriginal knowledge of rare and threatened species (Burbidge et al. 1988). Another was the one week visit of a CALM regional ecologist who assisted my PhD research project.

[303] The National Parks and Nature Conservation Authority (NPNCA) was the public body that held title to park lands that were then to be managed by CALM.

interpretation. The next chapter reviews if and how these proposals were enacted to 2007.

8.5 Chapter conclusions and their relevance to co-management

This chapter analysed the traditional beliefs of Martu related to land and resource management. It investigated the continued application of practices based upon these beliefs in and about 1990. The chapter concluded with a synthesis of Martu attitudes toward the national park and its conservation and land management agency.

Traditional Martu practices for the management of biological and water resources had the ultimate purpose of maintaining and perpetuating them for use and consumption. Martu mechanisms to sustain the productivity of their lands were embedded within an ontology with intimate and complex links between people–places–species–*Jukurrpa*. This chapter demonstrated ‘management’ actions that had been directed toward particular species (e.g. *Solanum* spp), toward local areas and sites within the landscape (e.g. water place cleaning and site rituals), at landscape scales (e.g. clean-up burning) and at wider regional scales (e.g. tenure advocacy). These were additional to well-recognised features such as high mobility, small multipurpose technologies and population aggregation and dispersal (Williams & Hunn 1986; White & Meehan 1993). In pre-colonial times, a complex system of ‘resource and land management’ actions had operated in concert.

A critical mechanism of land management amongst traditionally-oriented Aboriginal groups was also through seniority and social processes. The assertion that:

> before one can manage land effectively one must manage its personnel and this requires authority (Sutton & Rigsby 1986:158)

was applicable to Martu and other Western Desert people (Tonkinson 1991; Myers 1986). Investigation of these socio-political processes lies deep within the anthropological domain. It was not pursued in this study but is acknowledged as another important dimension of land and resource management.

The research in this dissertation found that knowledge persisted amongst middle-aged and older Martu of many of the practices that amalgamated into a land management system. However, in 1990 it was obvious that the conduct of some of these practices had waned. Difficulties in accessing land areas more remote from the settlements appeared to be one major constraint. Other practices had persisted, significantly, amongst regular foragers these were directed to the procurement of contemporary animal and plant resource species. And at the widest regional scale, Martu representatives directed considerable effort and resources at attempts to secure a legal tenure basis for Martu land use and management. Again, the difference between knowledge and practice is profound in terms of the impact of human activity upon local ecosystems.

Deliberate burn ignition was the most conspicuous and frequent management measure applied by Martu during the study. The Parnngurr population of 30–70 adults lit burns at least daily. Generally, they were relatively small in area especially those lit by women. It was found that the majority of burns were to hunt reptiles and Cats. These were the most common species collected by women foragers (Ch. 5.7). This has been subsequently reported for Western Desert settlements (Bird et al. 2005). Whilst Bird et al. (2005) noted exclusive ownership of new burns at least for a day, it was apparent from my study that recognised rights had persisted for at least to the time it took for Bush tomato species to reach peak fruit production (2–3 years post fire). Hunting as a principal motivation for burning by Martu in 1990 contrasts to the more general reasons of 'cleaning up country' reported for other Aboriginal groups (D. Rose et al. 2002; Kimber 1983).

In 1990, burn ignition on Martu foraging trips was concentrated within about 50 km of the settlements. For the early 2000s, Bird et al. (2005) noted it was concentrated within 100 km of Martu settlements. This spatial expansion of a burn mosaic was to be expected with the predicted expansion of road networks (Ch. 7.2). It is likely that due to a medium to fine-grained burn mosaic near Martu settlements that the risks of extensive wildfires were reduced. However, three factors—vast areas of infrequently visited Martu lands and changes in the purpose and people who burn—continue to contribute to wildfire risks. Notably, in the northern Great Sandy Desert in 2002–03, Aboriginal people identified a high proportion of fires that resulted from accidental spread and/or carelessness (Walsh et al. 2003) and younger people were pinpointed.

A co-management approach in Karlamilyi National Park needs to appreciate that burning is integral to customary harvest. Older Martu would have more expertise in applied burning than most scientists. [304] Support to older Martu to articulate, demonstrate and document their skills to younger Martu may be valuable. This study identified intensification of burning within settlement radii and along primary travel routes. External support for Martu to expand burn patterns to a wider spatial area would be ideal. Ironically, one mechanism for this lies within the pattern of tracks in the region; the upgrade or grading of new travel routes would reduce localised pressures. Practical co-management applications in relation to burning in tropical Australian environments have been synthesised (Hill et al. 1999; Dyer et al. 2001; KRFMP 2004; Anon 2005) and recently in central Australia (Gabrys & Vaarzon-Morel 2008). There have been major developments in bushfire research in the past two decades. The documentation of Aboriginal knowledge has been one area of progress; however, many challenges remain in the translation of this knowledge onto lands where traditionally-orientated systems are not dominant. Martu lands and this study remain unique because

[304] A long-term Manager of Finke National Park in central Australia observed that in the early 1900s and earlier, more than 100 Arrernte custodians would have ignited and managed burns in an area equivalent to the park. In the late 1990s and early 2000s, no Arrernte people burnt within the park and two part-time, inexperienced staff and the manager were responsible for maintenance of a burn program there, making the point that the numbers of people responsible for burn management were dramatically fewer than an ecosystem adapted to Aboriginal practices (Denis Matthews pers. comm. 2004).

of the closely demonstrated links between subsistence activities, applied burning and other management measures.

The study identified a nexus between burning and visits to cultural sites as previously reported (Nash 1990; Rose 1996). This was particularly for sites distant from settlements that had been unvisited for a long time. Signalling on approach and departure and burn rituals at the site was recorded. It is on trips such as these that wildfire risks are high due to accumulated fuel loads in landscapes with coarse-grained if any burn mosaics. Whilst Martu desired more frequent visits to remote sites these trips were observed to be rare. Importantly, those that occurred were partly resourced by non-Aboriginal people. Herein is another opportunity for co-management with Martu groups accompanied by agency staff and their vehicles. Also the cleaning of waters at these sites was desired by older Martu but occurred on a very low proportion of trips mainly due to the effort and tools required.

Resource specific practices applied by Martu for two Bush tomato species were detailed in this chapter and listed for other species. This clearly demonstrated the past intensity of management at least for high value species subject to short supply but with characteristics suited to manipulation. Detail of this kind is now mostly relevant to co-management for resource species that are in short supply. The chapter identified the need for similar research with vulnerable game species. A further important consideration of this preciseness of species management relates to existing or proposed commercial economic uses of Aboriginal bush food plants (DIA 2005; Whitehead et al. 2006). So-called ‘natural’ populations of key resource species have been influenced by, or were possibly the result of, many years of manipulation by Aboriginal people through pre-colonial eras. Thus, contemporary conservation risks for certain species may be compounded by under-harvest rather than over-harvest as presumed by some ecologists.[305] This may be a contentious statement but it demands further research attention.

The study found that Martu intensely monitored both the activities of personnel and the productivity of resource species. This was through acute observations and communication about both. For both animal and people movements, sand tracks were observed and interpreted by Martu individuals. Within scientific natural resource management systems, monitoring is an essential aspect of pastoralism, biodiversity and conservation and land rehabilitation. Skills in monitoring are a major area of potential overlap between Martu and the Western scientific interests within co-management.

Select philosophical concepts that interconnected the socio-ecological systems of traditional Western Desert peoples were explored in this study. Elements of *kurrurnpa*, *jarrinypa* and *kanyirninpa* were drawn from the research of Peile (n.d., 1997), Myers (1982, 1986) and Tonkinson (1991), because of their direct relevance to plants and

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[305] These risks are not just to the resource species in question but also to species reliant upon these resources. For example, *Jinyjiwirrilyi* is a major food source for *Kipara* (Chapter 5) i.e. Desert raisins for Bustards.

resource management.[306] Whilst an abundance of recent desert studies have concentrated upon *Jukurrpa* and land (e.g. Layton 1986; Glowczewski 1991; Rockman & Cataldi 1994; Graham 2003) few have had a species or ecological focus (exceptions being Newsome 1980; Kean 1991). The philosophical concepts described even greater depth and complexity of connection than often represented. Within them were protocols that, today, outsiders should consider and respect. Many of these concepts remain embedded within Western Desert dialects and best accessed through expert translators.

An elegantly woven presentation of these and related concepts was recently offered by James (2005) with a focus on Aṉangu–land kinship as expressed in the context of a tourism enterprise. In the early 2000s there has been a surprising congruence between projects on Western Desert lands that explore the *kanyirninpa* concept. Independent of each other, these projects have applied and/or described their interest in the concept. They have been undertaken on Pitjanjatjara, Yankunytatjara and Martu lands in the Western Desert. The projects related to a game animal management project (Wilson 2002), a tourism enterprise (James 2005), film (Randall 2006), and a history archive (Kanyirninpa Jukurrpa 2006). This convergence suggests a philosophical 'truth' and universality (at least across the Western Desert) in the *kanyirninpa* and related concepts. It has been suggested that the temporal convergence responds to a desperate need amongst Aboriginal philosophers to express higher ideals in an era of rapid cultural change and social dysfunction.

Key socio-ecological changes identified by Martu are identified in this chapter. It is speculated that some resonated with the above concepts and articulated with the 'drying' of country, *kurrurnpa* and the failing of people's 'spirit'. Other changes more familiar to scientists, such as the demise of mammal fauna and expansion 'introduced' species, are noted. Whilst Martu made many observations of these ecological changes, similar perceptions were well-analysed by B. Rose (1995) so were not expanded in this chapter.

In 1990, elements of the 'land ethic' amongst Martu were vivid, often expressed and practiced despite constraints and distractions. However, neither this ethic nor resource and land management was synonymous with 'nature conservation'. No evidence for an explicit conservation ethic amongst Martu was found, indeed there was some indication of the apparent waste and discard of biota that were contrary to conservation principles. Cautions about the romanticising of Aboriginal people were stated by long-term Yolngu associates White and Meehan (1993). Throughout this study, we have seen that Martu took what they needed and when they needed it. Certain individuals articulated a desire to 'manage' their land and its resources but, as with many societies, this desire was overridden by many constraints or the conflicting priorities of other Martu and other land users. In 1990, Martu had a complex of custodial tenures from which to 'manage' land but no legal tenure.

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[306] *kurrurnpa* ~ soul, spirit, life essence; life-principle (with reference to plants, animals and people), expression of feelings, 'heart'; *jarrinypa* ~ spirit-child, conception totem (plant or animal; *kanyirninpa*~ keeping, holding, having, holding country amongst kin

The final section in this chapter considered Martu perceptions and opinions of Rudall River National Park. These were contrary to conventional Western ideals of protected areas. However, Martu attitudes were well-founded in the specific case of RRNPk given the past and on-going mining activity across the park and Martu lands. Martu representatives, but not their constituents, recognised the subservience of national park ideals and laws to mineral development. This chapter concludes that, to the early 1990s, Martu had had no opportunity to appreciate the ideals of a national park because there was no tangible evidence of any congruence between their interests and CALM's. For a culture founded on experiential learning, there needed to be applied, on-ground works for Martu to make sense of the park and see it positively. In terms of co-management, a long process of relationship development, practical experience and information exchange was vital.

Aspects of fire-making and landscape burning

Photo 8.2 (top left) Under the guidance of Minyawu Miller, Benjamin Edwards uses a saw to make sparks that were tapped into kindling to make fire. Before matches, this was an essential and highly prized skill closely associated with Martu perceptions of fire in the hearth and landscape burning.

Photo 8.3 (top right) Women search a small burn they ignited to expose the burrows in a *Mulyamiji* (*Great desert skink*) warren near Punmu, 1990. The size and shape of burns was sometimes specific to a particular species that was sought.

Photo 8.4 (bottom left) and **Photo 8.5** (bottom right) Nyapi Robinson ignites and surveys a line of fires she lit south of Parnngurr in March 1990. These fires were to clear an area several kilometres square to aid regeneration of spinifex and an *Acacia dictyophleba* shrubland. It was not a species specific burn.

Examples of other land management-type activities done by Martu

Photo 8.6 (top left) View ESE to Durba Hills and Kilujuru with Coolibah in floodouts along Savory Creek, May 1986. This was the area Sambo Samson described as good Mala country. *Mala* (Rufous hare wallaby) was one of the species once common but now extinct on Martu lands. Expert Martu readily identified the habitats and places where particular species had been abundant.

Photo 8.7 (top right) Mayipi Robinson, Barbara Handley and Wirnta Williams excavating a soak near Karlkan Karlkan on Karlamilyi River, 1987. The opening and cleaning of soaks was a vital land management activity that Martu tried to continue but there were constraints upon people's opportunities to do so.

Photo 8.8 (bottom left) Tracks of *Winyjikirti* (Ridgetail monitor) go into the shade of a *Piwul* (*Melaleuca glomerata*). Like many desert hunters, experts Martu were highly skilled at track observation and identification. The monitoring of tracks, animal behaviour and plant phenology was a key aspect of foraging practice.

Photo 8.9 (bottom right) Martu women and Department of Conservation and Land Management ecologist, Peter Kendrick (right) on a trip in 1988. This was one of the first field trips amongst Martu people undertaken by CALM staff.

Stages in the harvesting and preparation of *Pura* (*Solanum chippendalei*) that exhibit some of the management-type practices associated with the species, October 1990.

Photo 8.10 (top left) Nganapa and Nayju return to a dinner camp with fruit harvested from a sandplain near Kunawarritji. The sand plain had been purposefully burnt to regenerate the *Pura* patch from the clonal species with a wide subterranean root system.

Photo 8.11 (top right) Nganapa uses a purpose made tool to split and clean seeds and inner pericarp of the *Pura* fruit. The seeds contain toxic alkaloids. At short-term camps, people would have left the seed *in situ*.

Photo 8.12 (bottom left) On the margins of Kunawarritji, Nayju disperses the *Pura* seed. Elsewhere on the fringes of the Kunawarritji were *Pura* plants grown from previously dispersed seed. They provided a local food source for people especially children.

Photo 8.13 (bottom right) A temporary store of *Pura* fruit in *Nyalyka* shrub (*Acacia ampliceps*). The cache was covered and stored here for a few days before seed removal.

Examples of threatened species and threatening processes on Martu lands

Photo 8.14 (top left) Patricia Fry and Dulcie Gibbs with fruiting bodies of the desert truffles (*Microclelandii bulundari*). This species and *Choiromyces aboriginus* had once been highly prized by Martu but were said to be less common in contemporary times. In scientific interpretations, it is possible these species have declined due to the decline of medium-sized marsupials that ate and dispersed the fungal spores.

Photo 8.15 (top right) *Mulyamiji* (Great desert skink) a species scientifically listed as ‘at risk’ but still found on Martu lands including close to Parnngurr, Punmu and Kunawarritji in 1990. The knowledge of Martu experts about this species is now contributing to ecological studies of it in the 2000s.

Photo 8.16 (bottom left) A *Jawirli* (Quandong) which was a highly valued species to Martu for its fruit, kernal, timber, shade and roots and with an important Jukurrpa. In 1988, Martu said this species had declined due to Camels browsing on it. In the 2000s, it has been listed as ‘at risk’ in the Northern Territory and is probably vulnerable in WA and SA.

Photo 8.17 (bottom right) Camels near Kurta Kurta claypans NNW of Parnngurr. This group was in a herd of 90 animals. Martu expressed mixed views on Camels that ranged from admiration to fear by women foraging on foot.

Photos 9.1 (a-c) A suite of photos showing the rapid changes on Martu lands including: (top) increasing numbers of tourists and visitors in convoy; (middle) the expansion of mining, as shown at Telfer about 100 km west of Punmu (photo by Carsten Bauer); and (bottom) young Martu adults doing a VET course in heavy machinery and mining operations at Punmu school (photo from http://www.rawaschool.com.au/Vet.htm).

9 Relevant changes and emergent issues on Martu lands 1990–2007

This chapter examines the relevance of Martu practices and knowledge *circa* 1990 to ecosystem and park management in the present day. It presents a brief analysis of major developments and issues and their influence upon co-management of Karlamilyi National Park and its wider ecosystems. This relates to the third major thesis question in terms of the implication of the thesis findings for ecosystem management. Ethical and methodological matters associated with cross-cultural research in remote-Aboriginal Australia are also raised in this chapter.

The chapter has three sections. The first updates the current land use mix on Martu–Park lands of subsistence and customary management then mining and tourism. The second section identifies steps by Department of Environment and Conservation (DEC) and Martu toward co-management of the National Park which remained unresolved in 2007.[307] It also identifies the concurrent ecological degradation processes. The third section presents three emerging issues. These are related to social dysfunction in remote settlements, misinterpretations at the cross-cultural interface and the challenges for those at this interface. Potential consequences of these issues for co-management are identified.

This chapter draws upon information derived from literature (including on-line and grey literature), secondary sources and two experiential case situations in which I was involved. The sources include personal communications with various staff involved in State and Martu negotiations. The two case studies presented are synthesised from lengthy notes I wrote following the experiences.

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[307] In 2006, the W.A. government Department of Conservation and Land Management (CALM) changed its name to Department of Environment and Conservation (DEC).

9.1 Uses of Martu–Park lands in early 2000s

9.1.1 Native title and Martu occupation

In 2002, there was a determination that recognised the existence of native title and specified Martu as native title holders in exclusive possession for 136,000 km^2 of land surrounding, but not including, Karlamilyi River National Park, pre-1994 mining tenements and other utilities (Fig. 9.1; FCA 2002). The Western Desert Lands Aboriginal Corporation (WDLAC) was the native title Prescribed Body Corporate (PBC). Martu and the PBC were, to early 2007, represented by Ngaanyatjarra Council. The recognition of native title rights legally gave Martu a stronger platform for negotiation with other land users.

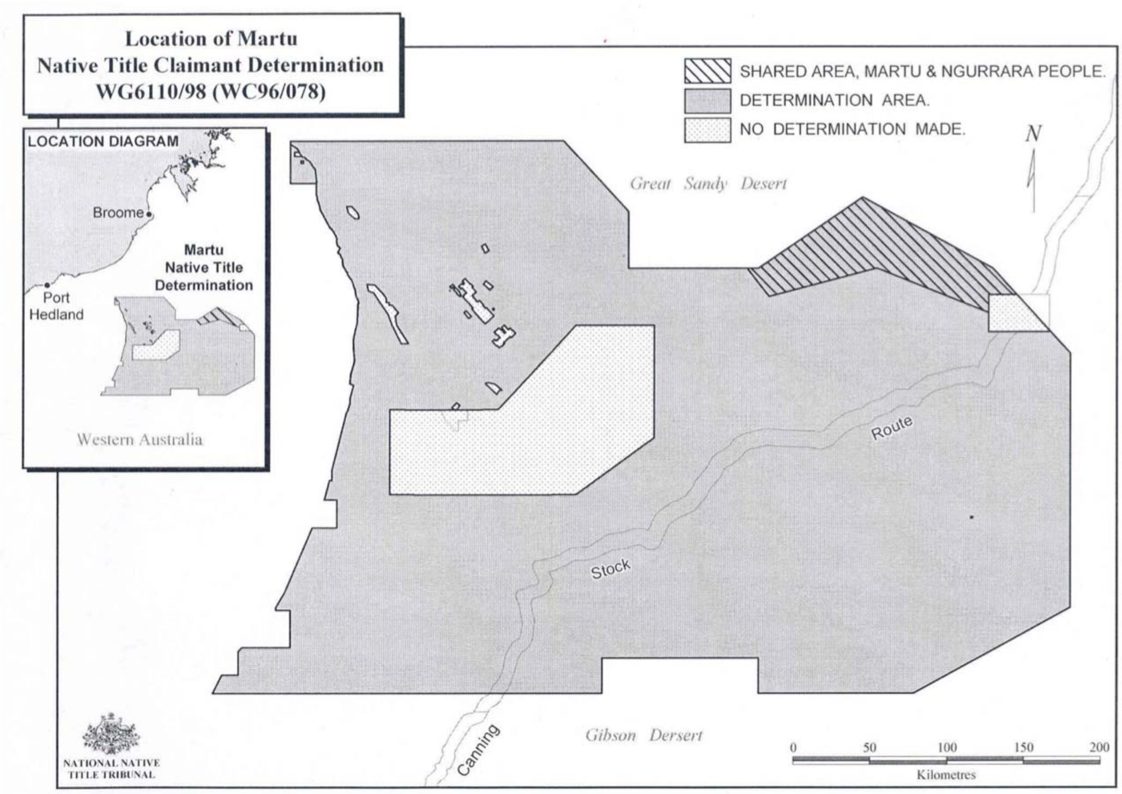

Figure 9.1 Martu Native Title determination area and exclusion of determination from Karlamilyi National Park and pre-1994 mining tenements (FCA 2002)

To 2007, Parnngurr and Punmu continued to be occupied settlements in the National Park and Kunawarritji was on Crown Land. Their total populations had increased to 300–400 Martu. The Aboriginal Independent Schools Association outlined profiles of settlement facilities in 2007. Active population mobility between the outstations continued and still extended to Jigalong (~ 350 Martu), Parnpajinya (a town reserve where Martu live on the fringes of Newman) and other Pilbara towns. Whilst there appeared to be an out-migration trend from the outstation settlements to these latter places, most Martu preferred to stay on homeland settlements rather than in towns (Tonkinson 2007:52).

Ironically, while there had been legal recognition of Martu title over a vast land area, concurrently, through the 90s to present, there has been increasing disengagement of younger Martu from the areas beyond settlement radii and major inter-settlement travel routes (Fig 10.5). This disengagement has multiple underpinnings including a decline in detailed knowledge of sites, *Jukurrpa* and food resources thus a fear of unknown dangerous places and a preference for settlement comforts such as showers and air-conditioning rather than arduous cross-country travel. Martu have been partially dependent upon non-Aboriginal people (including researchers) to provide the vehicle and other resources necessary to access the areas relatively remote from their settlements.

9.1.2 Customary and commercial harvest

Nonetheless, in the homeland settlements, Martu continued to hunt and gather on a regular basis. At Parnngurr,

> most people would like to hunt nearly every day, the majority forage 3–4 times a week (Bird et al. 2005:447).

A lesser estimate was that, whilst Martu would like to hunt more often, they went out at least twice a week on hunting trips with children rather than them doing formal schooling (T. Parkinson, Parnngurr schoolteacher, pers. comm. 12/3/07). It appears that elders continued to be active in customary practices 'on-country' in the early 2000s, albeit at a declining intensity compared to 1990. Hunting has been emphasised in several accounts of daily settlement life, for example in on-line reports from a school teacher about life in Punmu

> [Martu] people, still go hunting, often cook traditional meals with traditional utensils (made by the men of the community), and participate vigorously in ancient rituals. The methodology of "Living off the Land" remains the principle factor within the community. (Punmu school teacher 2007)

Whilst customary practices may be somewhat romanticised in the latter sentence, it demonstrates their persistence as is reported in settlements across the Western Desert (e.g. on Ngaanyatjara settlements McFarlane 2001; at Tjukurla unknown 2003; at Kiwirrkurra Ruby 2003). However, relative to the late 1980s, the nutritional reliance on foraging has declined for Martu due to more reliable store provision and an increased dependence on the cash/welfare/CDEP economy (Bird et al. 2005).

A small-scale commercial seed harvest and sale enterprise called '*Mankuni Wilykikaja* bush tucker and seed harvesting project' operated through WDPAC from 1994 to about 1999 (Kalotas 1999). This was subsidised through the Aboriginal Rural Resources Initiative (ARRI). A project evaluation identified the essential role of the project manager with one key role in liaison with potential buyers (Desmond & Rowland 2000). At one point, about 25 Martu women had seasonal casual work on the project and annual payments to harvesters were estimated to be $30,000 pa. The project wound down in the early 2000s due to the manager's departure.

The expansion of commercial art and craft production by Martu was a development of the early 2000s. Baskets have been one strand of this development and acrylic paintings another (Northern Exposure 2004). This production was supported by the local organisation Martumili Artists initiated about 2004. Basketry has been reliant upon natural grasses harvested from Martu lands (Davenport Acker 2006). The artworks convey bold representations of key *Jukurrpa* sites on Martu lands and/or bush resources (Bleige Bird 2006). The painting of such images has been a major contrast to the Martu unwritten 'policy' of the pre-2000s which prohibited public representations of cultural sites. Certain younger Martu vividly illustrated their connections to land through artwork about bush resources and family members (e.g. Tinker 2006). Artworks have been sold to provide small, irregular income to individual artists and the collective. The relevance of this development is two-fold: firstly, it provides new media by which Martu express relationships to their lands; secondly, it occupies and provides income to those who are also hunters, gatherers and managers of their lands.

Despite the persistence of customary incomes, the Martu hybrid subsistence–government economy appeared to continue a shift toward government (and multinational) income sources. The Martu economy:

> is more concerned with circulation, redistribution and consumption than production, [this] entails struggles [amongst Martu] to gain allocative power over invariably scarce resources (Tonkinson 2007:49).

The reliance upon externally-generated resources was perpetuated due to many challenges to Martu working within their own society for monetary gain (Tonkinson 2007). Martu engagement in conventional paid employment remained very low to the early 2000s.

9.1.3 Mining and exploration

The modern landscape occupied by Martu in the early 2000s is very different to that of the past, even the recent past of 1990. A paper on Martu burning regimes, concluded:

> today consists of permanent Martu communities, massive mining initiatives and increasing tourism. Not that Martu are absolutely opposed to these but efforts to retain a significant measure of control over their environment will continue. … This control is inextricably tied to burning (Bird et al. 2005:459).

Mining expanded as the dominating Western economic force on Martu lands and in Western Australia more widely through the 1990s. Punmu is less than 100 km from Telfer, Australia's largest gold and copper mine. Parnngurr (Cotton Creek) is about 75 km south-east from the Kintyre uranium deposit, the latter being near the boundary of the water catchment neighbouring Rudall River. Mt Cotton includes a uranium deposit but is protected as a registered sacred site. Active mineral tenements and intensive exploration activity occurs across lands occupied by Martu (see DIR 2007).

The north-west boundary of RRNPk was modified in 1993 to excise the Kintyre exploration tenement. It has been identified as the second largest uranium deposit in Western Australia and is operated by Rio Tinto (AUA n.d.). In the 1980–1990s, there was proactive opposition to mining amongst Martu, particularly uranium mining (Ch. 8.4.3, App. 9, WDPAC 1987; Clarke 1993; ANAWA 2006; Newman et al. 1993), even though Newman et al. (1993:127) recommended there be a study regarding the allocation of mining royalties through the State government. In the early 2000s, Martu representatives commenced negotiations with mining companies to potentially provide training and employment in the mining sectors, infrastructure and royalties. As reported:

> Rio Tinto is believed to have sought legal advice over whether it can develop the Kintyre uranium project in WA without the approval of the State Government. … Rio will also need the support of Kintyre's traditional owners, the Martu. They have expressed a desire to seek development but commercial terms are yet to be agreed (Zonneveldt 2007).

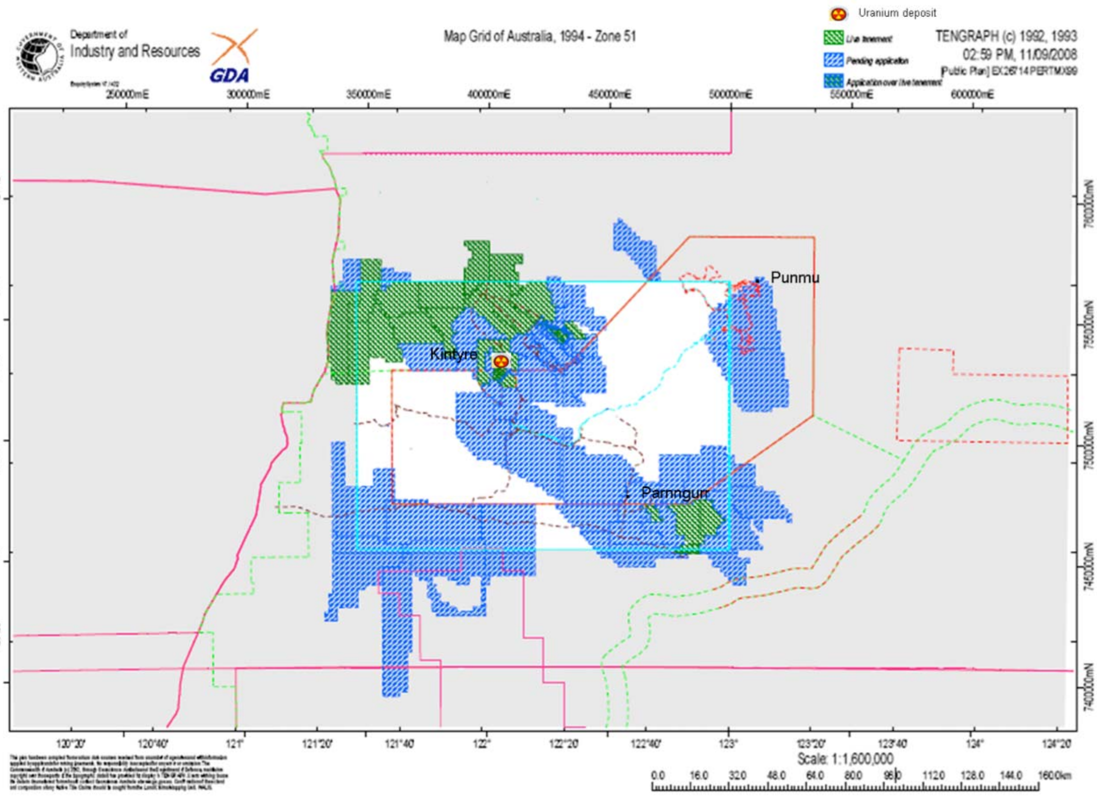

Figure 9.2 Location of mineral tenements on Rudall 1:250,000 Map Sheet in relation to Karlamilyi National Park, Kintyre and Martu settlements (Adapted from DIR 2006 and DIR 2008).

Figure does not show adjoining tenements on neighbouring map sheets. Locations of Parnngurr, Punmu and Kintyre are approximate.

Two Martu representatives argued they have been forced to the negotiating table due to poverty and the need for essential services (Wolf cited in Taylor 2006). Amongst Martu and their employees, views on these negotiations varied. Some felt that the representatives had been pragmatic and pursued the resources offered by mining companies; others said leaders had succumbed after decades of persistent pressure. Either way, the private sector has offered Martu better resources than state agencies including DEC. Compared to the early 1990s (Ch. 8.4.3), in 2007 Martu spokespeople were now more discriminating between the roles of mining company representatives and DEC.

Concurrent with mining company negotiations led by Martu representatives, other Martu continued to raise concerns about potential and observed damage to their lands that they associated with mining. An example is the purported salinisation and decline in water quality of downstream Karlamilyi River (Desmond Taylor, Warnman custodian and interpreter, pers. comm. 2/11/06). However, despite the recent historical opposition of most Martu and the current concern of at least a few Martu, their leaders have continued negotiations that may allow mining, conditional on potential benefits to Martu or, at least, Martu individuals.

Multinational mining companies command enormous resources and wield great politico-economic power in Australia, particularly in Western Australia. Increasingly, certain politicians, academics and Aboriginal commentators see mining as an economic development option for Aboriginal people on mineralised lands (Austin-Broos 2005; DIA 2005). The relations between Aboriginal peoples and mining companies have been reviewed by many (including Howitt 2001; Trigger 2003). Howitt (2001) overviewed cases of the chequered relations between mineral resource development and Aboriginal people in the 1980s and 1990s, especially changes in indigenous policy in the previously conservative trans-national Rio Tinto. In the 1990s, there appeared to be analogies between the case on Martu lands and the excision of Ranger uranium mine in the Alligator Rivers catchment from Kakadu National Park on Bininj lands in Arnhem Land.[308] For Kakadu, Lawrence (2000) detailed the findings of major social impact studies and numerous research reports. He identified how government and private developers had overridden opposition by traditional owners and Northern Land Council. Key differences between Bininj and Martu lands were that the latter had a relatively weaker legal tenure basis, less-resourced representative agencies and a lesser-known national park. In 2007, the Martu analogy to the Bininj position on Kakadu has lessened as Martu leaders sought gains from a powerful trans-national company.

Australian environmental organisations have raised concerns about the serious socio-ecological risks of Kintyre’s development due to massive groundwater extraction, wet waste storage and transport of radioactive materials (e.g. ANAWA 2006). Concerns have been raised about contamination of land and ecological resources including widespread low-level radiation from uranium exploration (P. Kendrick, DEC, pers. comm. 27/4/07) and consequent effects upon wildlife and Martu. Unlike Kakadu there have been no independent social and ecological impact studies in respect to mining (including uranium) on Martu lands since the study by Newman et al. (1993). It remains to be seen whether the desired commercial and community-development gains from Martu negotiations with mining companies will be achieved, and in the longer-term, whether they will compensate for medium and long-term eco-cultural costs to Martu and their lands. It is likely that the socio-environmental consequences of the Western Australia mineral resources boom will be partially but never comprehensively documented.

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[308] Bininj is a Kunwinjku and Gundjeihmi word for people who have rights and interests in KNP (KBOM 2007)

9.1.4 Tourism and research

Tourism has been the other major land use that has expanded and populated Martu lands through the last two decades. The Canning Stock Route (CSR) has been increasingly popular amongst four-wheel drive enthusiasts, with several dedicated publications (e.g. Stanton 1992; HEMA 2007) and many web references (e.g. ExplorOz 2008). Tourist access routes to and from the CSR pass through or near Parnngurr, Punmu and Kunawarritji (Fig. 9.3). RRNPk has had steady increases in tourist numbers; it has been profiled in advertising for tourism in the east Pilbara, desert travellers and national parks visitors (e.g. DEC 2007). A recent agreement between Martu representative agencies and the Australian National Four Wheel Drive Council included a permit system and a code of conduct for respecting Aboriginal people, lands and sites (with >$20,000 fines for violation) for the CSR and land of exclusive native title possession (ANFWDC n.d.).

Research amongst Martu and on their lands by non-indigenous people from a variety of disciplines has persisted from the late 1980s to the present (Tab. 2.4). Anthropological research was most intense prior to the 2002 native title determination. Regular archaeological site survey trips were undertaken in the 1990s to the present, with recent foci on the Canning Stock Route, Durba Hills and Calvert Ranges (Veth 2005). Ethnohistorical research and documentation trips have been facilitated by Kanyirninpa Jukurrpa (2006). Research related to elements of Martu natural resource management has included investigations into Martu burning and hunting practice (Bird & Bleige Bird 2004; Bird et al. 2005) and threatened animal species surveys (O'Malley 2003; Nano & McGuire 2006). Some of this research has involved travels beyond settlements onto wider Martu lands; Martu conducted hunting, gathering, burning and other land uses during these research trips. Martu travels to places distant from settlements have been increasingly reliant upon the vehicles, motivation and resources provided by researchers. Here, I suggest that ‘research’ constitutes a particular hybrid land use that is directed by external agendas but draws upon traditionally-derived Martu knowledge and expertise.[309]

9.1.5 Competition between land users

The impact of these land use developments upon hunting by Martu, other traditionally-derived practices and co-management of the national park are manifold. Competition between various land uses conducted by Martu and the increasing number of non-Martu land users is likely to have intensified over the last decade due to overlaps in the natural resources and spatial areas required by different land users. Surface and subterranean waters are potentially the most contested resource in this desert region. Spatially, Martu generally avoided areas where tourists and mining personnel were active; this is likely to have excluded Martu foragers from productive bush food areas (Ch. 7.3.2), and, at times, constrained their burn ignitions. Martu concerns about site damage were high,

[309] In response to this suggestion, Peter Johnson (lawyer, Kanyirninpa Jukurrpa, pers. comm. 8/2/08) observed that Martu may earn at least $400k in 2008-2010 from research consultations.

particularly for places within the national park where the ANFWD (n.d.) agreements were inapplicable or disrespected.[310]

Furthermore, some of these land uses are competing for the same human resources. For example, consultations with Martu over settlement infrastructure and services, mining, national parks, art programs and other activities detracted from the time people have available to go hunting, gathering and conduct customary practices.[311] Conversely, it is possible that income derived from these activities was used to supplement and support customary activities. A conclusion that:

> even within a single community, different people face different (and not necessarily complementary) tradeoffs relative to their subsistence and burning purposes (Bird et al. 2005:460)

is also true when externally directed land uses are added to the mix of land uses. It is likely that the trade-offs and decisions made amongst Martu in relation to the diverse land uses, both those they control and externally-controlled ones, has caused internal conflict and tension. It is predicted that current Martu representatives will opt for land uses that provide the greatest potential income and benefits. These will possibly detract from the commitment and resources that Martu make available to their traditionally-derived management systems and national park co-management.

9.1.6 Change and the sustainability of remote settlements

Aboriginal societies in remote regions of Australia have undergone profound changes; on Martu lands, this has been "an extraordinarily intense trajectory of change" (Tonkinson 2007:41). In my lifetime, Martu people were still living a hunter-gather lifestyle on their lands. Now their children and grandchildren live in an extremely different material and socio-economic environment. R. Tonkinson (2007) reviewed forty years of change in Martu society and the government policy contexts in which these occurred. He asserted that recent federal government policies (of the Howard Liberal party era) accelerated Martu societal change by demanding a reduction in cultural difference by interventions that increasingly forced Aboriginal people out of homeland settlements and into greater economic engagement with mainstream Australia.[312] Relevant changes within Martu society identified by Tonkinson (2007) included: increasing numbers of vehicles and higher regional mobility which had the advantage of intensifying social relations but the disadvantages of higher accident rates, purchase and operating costs, and increased entanglement with legal systems due to fines and charges; altered social relations between men and women resulting in more teenage pregnancies, challenges in child raising and less protection from violence; a decline in school attendance and basic literacy and numeracy; and, increasing bondage

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[310] ANFWDC ~ Australian National Four Wheel Drive Council

[311] Whilst there were 300-400 Martu, often consultations came back to the same 30-40 people who thus have very regular consultation demands made of them.

[312] Tonkinson (2007) presented these perceptive and prescient interpretations before the federal government Intervention into Northern Territory Aboriginal communities when the actions of the Australian government became even more explicit and extreme than Tonkinson described.

of Martu to alcohol, cash and motor vehicles. Conversely, Tonkinson (2007) argued that Martu responded by a deliberate maintenance of their cultural differences and continuity of certain traditions thus maintaining some autonomy from white people; further, they did this despite the costs of on-going poverty and its consequences. Significant cultural continuities identified by Tonkinson (2007) included the importance attributed to family, kin and initiation ceremonies.

In a sobering paper, M. Tonkinson (in press) wrote of the profound and widespread emotional and material costs Martu are bearing with the catastrophically high frequency (~ fortnightly) of funerals. These were for premature and preventable deaths—people dying too young. She concluded that, despite the high costs of ritualised events, funerals were vitally important for providing family solidarity and cultural identity.

In Australia, a substantial literature debates the future sustainability of remote indigenous communities. Key themes identified by leading anthropologists and economists (Austin-Broos 2005) were expressed as contrasts between extremes. These themes included: economy versus culture, education versus jobs, out-migration versus local economy, poverty versus specific cultural dimensions (e.g. resource sharing), customary remoteness versus modern remoteness, and local versus national strategies. Academic discussion on indigenous issues occurs amidst weekly public media attention and debate.

In sum, the future sustainability of homeland settlements is, at best, uncertain and the mechanisms by which economic and social sustainability may be achieved are highly contentious. Amongst these mechanisms, there is growing attention to the opportunities that may lie in Aboriginal CNRM to provide income, employment, health benefits and improved ecosystem management in homeland regions. Paradoxically, in 2007, whilst the federal government promoted a $50 million indigenous land management package (DEWR 2007), the government concurrently intervened in remote settlements with punitive ‘state of emergency’ measures that, it has been argued, will undermine the socio-economic infrastructure of the remote settlements from where lands can be accessed and management applied (Altman & Hinkson 2007). Such paradoxes contribute much uncertainty.

9.2 More than 20 years toward co-management of Karlamilyi Park with no resolution to 2007

Non-Aboriginal representatives from as early as 1987 mooted collaboration between Martu and CALM (Wright 1989 424). The 1990 ‘Millstream recommendations’ (Ch. 8.4.3) arose from heated debates around the fundamental principle of the right of Aboriginal people to substantive involvement in the control and management of reserved areas (Woenne-Green et al. 1994). But the recommendations were softened and the status quo between Aboriginal people and government agencies (Martu and CALM) continued. Whilst the Commonwealth and states supported the recommendations in principle:

> Aboriginal rights and interests in protected areas remained subordinate to government and non-governmental economic and political interests seen to conflict with tourism, resource development, mining and the conservation of natural resources (Lawrence 1997:11).

This comment rings true to the present in the Karlamilyi region where mining and exploration appear to be the most powerful driver.

From 1990 to late-2007, there had been no resolution of negotiations between Martu representative agencies and State agencies in respect to co-management of Martu lands and Karlamilyi National Park. This lack of resolution was set within the wider context of Aboriginal–State joint management negotiations which remained unresolved. It had been found by the High Court that native title rights and interests in conservation reserves had been extinguished thus RRNPk was excluded from the otherwise successful Martu native title claim in 2002 (Figure 9.1; FCA 2002). Hence the claim:

> was a bittersweet victory … at the determination ceremony, Teddy Biljabu, eloquently expressed the outrage [of Martu] saying they had been 'given a body without its heart' (Davenport et al. 2005:184)

referring to the wider native title area with its heartland, Karlamilyi, the only primary river channel in the region, excluded from the determination.

In 2003, a major consultation paper for State-wide recognition of Indigenous ownership and joint management of conservation lands under other tenure arrangements was circulated (CALM 2003a). In 2004, three options were considered: (1) negotiation of inalienable freehold title; (2) a joint management arrangement; and/or (3) 99 year leaseback from Martu to CALM (M. O'Dell, lawyer, pers. comm. 16/3/04). Senior CALM staff explicitly endorsed joint management agreements but with no comment on the tenure options (ONT 2006). By contrast, submissions from mining agencies, including AMEC, strongly opposed CALM proposals to transfer crown land to Aboriginal corporate ownership (AMEC 2005; in ONT 2006).[313] Whilst CALM had made slow but significant progress in recognition of joint management arrangements, the finalisation of policy and legislation had been thwarted by many factors including the objections of other land users.

In early 2007, the WA Government Office of Native Title (ONT) was preparing a conditional offer to Martu to establish an 'Indigenous conservation title' which entailed Freehold tenure for the Park but was contingent upon a 99 year leaseback to the State. Legally, the land would be vested with WDLAC and an agreed joint management body to plan and undertake applied works. A similar arrangement had been offered to custodians of the Gibson Desert Nature Reserve; however, they and their representative agency, Ngaanyatjarra Council, had reportedly been very wary because of the necessity for leaseback and its duration and unacceptability of conditions on hunting, off-road driving and other matters. Under the proposed title, in the event of a conflict between traditional rights and conservation values, the WA State Minister for Conservation

[313] Association of Mining and Exploration Companies Inc.

would make a final decision. But as Aboriginal representatives would have majority participation in the joint management body, theoretically, disputes should not arise.[314]

It appeared that the Department of Premier and Cabinet (which housed the ONT) had undertaken roles previously fulfilled by CALM (now DEC) in the formulation of agreements for protected area management. Concurrently, the agencies who undertook negotiations on behalf of Martu had each metamorphosed. After Martu land tenure negotiations were transferred from WDPAC to the Ngaanyatjarra Council Native Title Unit (NTU) as the native title representative body, Ngaanyatjarra Council staff facilitated negotiations between WDLAC and CALM then DEC.[315] Whilst the wider Ngaanyatjarra Council had expertise in applied protected area management negotiations they had very limited staffing with no intent or capacity for on-ground land management support on Martu lands. In early 2007, the Ngaanyatjarra NTU morphed into the Central Desert Native Title Services, its ongoing role being to secure native title and provide legal advice. In 2007, it remained that there was no Martu agency with expertise or resources to support applied land management. However, Martu were apparently unperturbed because, as in 1990 (Ch. 8.4.3) their focus had remained on the issue of principle—Martu tenure over Karlamilyi Park.

The repeated failures or delays in reaching a co-management agreement caused frustration (at least) expressed on all sides. DEC ecologists recognised that agreement delays compromised their applied, practical management of lands. The biodiversity condition trend of the wider GSD bioregion was considered to be declining.[316] Major threatening processes were believed to be changed fire regimes, feral Camel damage and weed (Buffel grass) invasion (McKenzie et al. 2002:51). For more than a decade, only one DEC officer had annually visited the region (for 1–2 weeks) to do applied works and develop relations amongst Martu.

Euro-Australian management of Karlamilyi Park was very limited or absent, from when gazetted in 1977 to 1990 to at least 2002. In biodiversity terms, reserve management in the western GSD including RRNPk was ranked as poor because:

- there are no management plans;
- there are no on-site staff (even in parks with high tourist visitation and containing Aboriginal communities);
- there are no feral animal control programs;
- no prescribed burning takes place … (McKenzie et al. 2002:53)

Notably, McKenzie et al. (2002) did not refer to the ecological effects of mining in the region.

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[314] The Indigenous Conservation Bill was to be tabled in WA State Parliament in early 2008

[315] WDPAC = Western Desert Puntukurnuparna Aboriginal Corporation; WDLAC = Western Desert Lands Aboriginal Corporation.

[316] GSD = Great Sandy Desert

The link between biodiversity condition and remote Aboriginal settlements was recognised by CALM but not explicitly in positive or beneficial ways.

> Conservation priorities: Land acquisition and management issues are overshadowed by native title legislation and partnership arrangements with Aboriginal communities. A large off-reserve conservation effort is needed to preserve biodiversity. … Reducing the effects of inappropriate fire regimes is a priority. The biggest constraint on effective land management is the absence of data on the composition and status of most of the region's biota. [pp51] … limited financial resources, the low number of people available to implement strategies, recognition that native title will require cooperative work with desert Aboriginal communities, the need to increase awareness of conservation throughout the community are [also] major constraints (McKenzie et al. 2002:53).

In an unusually open reflection, one employee wrote:

> Recognition of Native title will require cooperative work with desert Aboriginal communities. In some cases, this will mean a big change in the way we do business with traditional owners The presence of a researcher influences the behaviour and expressed opinions of their 'subjects'. The more relaxed the subjects are the closer to reality are the observations and records. However, opportunities could be significant due to the close proximity of large communities (Parnngurr, Punmu, Kunawarritji, Kiwirrkurra, Bililuna) (Kendrick 2001a:341).

It could be interpreted that 'the big change' Kendrick referred to meant the need for CALM's recognition of Aboriginal interests, better processes of genuine engagement and perhaps the support of cooperative work with traditional owners. In the absence of these processes, the status quo has persisted for applied cooperative actions.

In 2006, specific DEC staff continued steps to catalyse relations with Martu, overcome the co-management impasse and get some collaborative actions happening in the Park. The following account synthesises these steps. This reports a recent experience wherein I was invited into matters of joint management on Martu lands.

In October 2006, I received an unexpected phone call from a past colleague and long-term CALM/DEC employee. It was to informally canvas my interest in involvement in the management of Karlamilyi NPk. The following notes summarise my record of the phone call; they indicate the on-ground situation and role of DEC.

> The DEC employee who rang had visited Martu people and their lands in most years since 1990. He reflected on how the first visit had been an important introduction to Martu people and provided the initial opportunity to be guided by and engage with Martu 'on country' rather than in the confines of a community meeting. While most of his subsequent visits were less than 10 days duration, they had occurred over a much longer period than any other DEC staff. He added that current DEC regional staff, including managers, would benefit from an overview of the research underpinning this dissertation.
>
> He explained there was still no permanent or regular DEC presence in the national park. DEC had employed a Park Ranger but he'd remained there less than two years. There had been little progress in practical on-ground park management over the past fifteen years. A Park Council was established in 2005, it had 17 Martu members and two DEC staff but was currently inactive.
>
> The proposed roles of the vacant park manager position were to 1) manage tourism and park infrastructure, 2) support Martu people in employee, trainee or other roles through the

MATEScheme or preferably through a program tailored to suit them.[317] 3) Contribute to political negotiations in respect to the Park, Martu, DEC and the State Government. [318]

My colleague’s personal expectations of the position were that it would involve practical, on ground collaborations with Martu: 1) so they would be comfortable with tourists through tourist management, 2) to work on burning, including aerial burns; 3) to do plant, animal and ecological surveys that possibly involved fauna relocations; 4) to undertake cultural site management including visitor and camel exclusion; and; 5) to support Martu on country visits.

In the Pilbara region, there were a small number of Aboriginal people employed in the MATES. This approach was to be adapted to Martu employment and training; recognising that Martu did not necessarily want to work full time as they had many cultural and other commitments. The budget available to support Karlamilyi Park management would be approximately $500,000 per annum. (Notes from phone call with Pilbara Regional Leader, Nature Conservation, pers. comm. 9/10/06).

This information highlights several points relevant to the application of the findings of this dissertation. Firstly, that the research subject was still highly topical. Secondly, it indicates a progressive approach by one individual within a relatively conservative government organisation but an approach that was neither universal nor well-entrenched. Thirdly, that the staffing and operational budget within DEC was very small. Finally, the fact that this enquiry was to me indicates that the numbers of experienced personnel suited to remote, practical cross-cultural, environmental work were very few.

9.3 Trauma, government expectations and the individuals in-between

Now the direction and tempo of this chapter will alter. The section recounts and analyses two experiences I had that occurred over consecutive days; one was a consequence of the other. The content of this section may be discordant; however, interpretation of the experiences conveys matters that are pressingly urgent today. These matters contribute to the failure or success of applied co-management and wider ecosystem management. The purposes of each subsection below are: firstly, to give an insight into the present day realities on remote desert settlements; secondly, to illustrate the gaping discrepancies between government-derived expectations and what is desirable or achievable in remote settlements; and thirdly, to pinpoint the stark tensions between cultural domains that are intensifying for individuals and researchers. These purposes relate to the application of this dissertation and the context within which it would be applied. There are major constraints on potential ‘implementation’ of the results of the thesis, yet suggestions arising from the dissertation offer ways to overcome these constraints.

[317] MATES = Mentored Aboriginal Trainee Employment Scheme (CALM 2003)

[318] my numbering and not in priority order

9.3.1 Trauma in remote settlements

Mary's Story: one case example

> Saturday, early December 2006: A nurse rang from Alice Springs Hospital. I was asked to go in to support a grieving ritual by a Martu mother [I will call her 'Mary']. Her 8 year old son had been killed. She had been evacuated from Kiwirrkurra to Alice Springs. The person/s responsible had not been identified. The mother had been injured and just emerged from a coma. This was a case more serious than 'usual' at the hospital and well beyond my professional or personal experience. Apparently I was the only nearby person known to the mother in Alice Springs. After seeking information from two colleagues, I went with trepidation. I did so for reasons of compassion, obligation and responsibility. I could have said no.
>
> There was tight police security on my arrival as the sole visitor. After her wailing, Mary released a flood of poignant, chaotic memories. She described a maelstrom of madness before the boy's death. There were fragments about the child's anticipation of Christmas, a husband's demands, the many times she'd been bashed, reluctant travel from Parnpajinya in Newman to Kiwirrkura [~1250km] for men's Law ceremonies, rum, ganja [marijuana], dozens of hungry children, intense heat [>44°C], a desperation to escape and return to her home. Aloud she yearned for her father and family and scattered odd recollections through her tumbled words such as when we had shared Bush turkey at a camp near Jigalong. The mother's wonder of, and love for, her son were palpable. He had been her *only* child.
>
> Later when the wailing and words had ebbed, I cut her hair as she'd requested.[319] Snippets of Mary's dark, poodle-soft hair fell to the floor as I cut it short. Whilst I cut, she gently stilled my hand, looked at me eye to eye then asked that people pray for her and explained why. I stopped then hand in hand, we sat close both stunned. Her agony was incomprehensible.[320]

At its surface, this is a deeply traumatic story about the death of a child, all too common an experience amongst Martu and other Aboriginal people in desert Australia. Beneath this writing was a deeper and more complex story of a mother's life and its tremendous costs. The subsequent grief, pay-back rituals and consequences are likely to reverberate for generations.

Crises in remote Aboriginal settlements, death, abuse, disability and illness have been widely reported. Eight Martu people died in an incident north of Punmu the month before the 1990 field research (Ch. 2.3.2). Five young and middle-aged Martu died in the last six months of 2006 (M. Tonkinson, anthropologist, pers.comm. 2/12/06). In December 2006, at a settlement of 300 people, a man hung himself and his rescuer had a heart attack; his wife with whom we worked remained dazed and shocked. In 2006–2007, the sexual abuse of Aboriginal children in central Australia received national

[319] A common grieving practice of women relatives close to the deceased; hair strings gifts are made from the hair (M. Tonkinson in press: 4).

[320] This is an abridged version of nine diary pages. My confusion, despair and questioning scratched into those pages is culled. Names and most details are withheld. The experience is recounted here after careful consideration on the ethics of writing of it. Newspaper reports on the precipitating incident were in the public domain (Rogers 2006a,b; Finnane 2006). In January 2007, 'Mary' was charged and extradited to a maximum security prison. A package I sent to her in jail with a letter, her family photos and a bag of *Jinyjiwirrilyi* (*Solanum centrale*) was returned.

legal, media and political attention. The list goes on. The week after Mary's case, it was referred to in the context of stabbings in desert Australia which were described as:

> staggering, an epidemic … the highest reported incidences of stab injuries in the world (Finnane 2006).

Terrible trauma has been rampant in remote desert settlements. Reports say that it is escalating rapidly and will perpetuate generation to generation (Anderson & Wild 2007).

The processes of indigenous violence and substance abuse have been documented (e.g. Sutton 2001; Anderson & Wild 2007) they signal a severe rupturing in the foundation of a moral order.[321] Their consequences have received attention too; the frequency of funerals being immortalised in the statement "too much sorry business" (Langton et al. 1991 cited in Sutton 2001), so common a term in remote Aboriginal Australia it has become trite. Grief and mourning has been the subject of recent ethnographic research in the social and health disciplines (e.g. by anthropologists, Myrna and Bob Tonkinson and Victoria Burbank). They note preliminary indications that injury and mortality are higher on Martu lands than in east Arnhem Land settlements (V. Burbank, pers. comm. 25/1/07).

The bewildering complexity of factors that shaped and maintained repeated patterns of violence in remote indigenous settlements was carefully synthesised by Sutton (1991). He wrote of continued traditions such as male dominance over females exacerbated by demoralising postcolonial effects embedded within a Western system of failed indigenous policies. Subsequently, Cowlishaw (2003) and Sutton (2005) tersely exchanged interpretations on the underlying causal factors and the emphasis of attribution to either indigenous or non-indigenous people. They were drawing from experiences in remote settlements (Sutton) and rural towns (Cowlishaw) where the relative influences of intrinsic and extrinsic factors (respectively) may have differed. The original paper is important reading for those who need to recognise the historical and contemporary context of remote settlements. In my view, it is essential reading for individuals tempted with singular, quick-fix, coercive solutions to 'the Aboriginal problem'.

Sustained trauma impacts on people's health and reduces their capacity to be active. The simple ability to get out of bed in the morning can be quashed (W. Baarda, long-term Yuendumu school teacher, pers. comm. 3/8/05). Recent epidemiological studies indicate there may be greater vulnerability to illness that accumulates from generation to generation (V. Burbank, pers. comm. 25/1/07). Local people's willingness to engage with 'outsiders', be they researchers or employers, may be debilitated by repeated

[321] This section was drafted before the release of the Anderson and Wild (2007) report into the protection of Aboriginal children from sexual abuse. Subsequently, media commentary on reported cases has been prolific with strong political reactions. Cases such as this purportedly precipitated the federal government's 'Intervention' in Northern Territory communities. Political responses have been analysed by contributors to Altman and Hinkson (2007).

crises. Trauma has a consequence for people's capacity to be involved in NRM and co-management.

Researchers in indigenous natural resource management and related disciplines occasionally cite statistics on morbidity, mortality, incarceration rates etc. Many of these researchers are motivated to support 'improvements' to the lives of Aboriginal people. Recently, the health benefits from indigenous people's involvement in CNRM-related work has been documented in multidisciplinary research in northern Australian (Burgess et al. 2005; Garnett & Sithole 2007). This research has shown that indigenous people who took part in customary and contemporary land management were significantly healthier than their less active counterparts (Garnett & Sithole 2007). Lower diabetes rates and lower cardiovascular disease risks were reported (also Burgess et al. 2005). In parallel, ecological measures of ecosystem health showed landscapes to be in better condition, although precursors of ecological decline were present (Tab. 10.1). A 10 year study comparing health in large settlements and small outstations of central Ausralia have also indicated better human health profiles in the latter and partially attributed them to hunting activity and bush food intake (Rowley et al. 2008). Similarly, some health indices were better for indigenous people in remote areas rather than towns (Scrimgeour 2007). These studies affirm what many Aboriginal people including Martu have repeatedly expressed (Ch. 6.4). Whilst Vanstone (2007) and Hughes (2007) have contested such findings, the body of evidence for positive links between Aboriginal health, the occupation of decentralised settlements and CNRM activities is substantial.

Paradoxically, Aboriginal people's capacity to take part in co-management may be constrained by trauma even though participation in co-management may enhance people's health and well-being through their activity 'on country'. It may be that certain older Martu people continue to maintain their hunting practice and engagement with 'country' partly as a means of coping with stresses. Younger Martu may want to earn income that supports their 'work on country'. Alternately, the high levels of illness and trauma suffered by Martu may constrain people's desire or capacity to engage with external agencies, and take part in co-management. For example, individuals may be unable to sustain regular, full-time paid employment within Karlamilyi National Park. Thus, agencies need to adapt to such realties, for example by offering repeated, short-term contracts. The pool of people who are to be engaged in Park and country related institutional work should be wide for practical reasons as well as custodial ones. This tragic reality of consistent trauma requires co-management programs to have respectful, flexible, non-conventional approaches.

It is pertinent that the concluding chapter of a substantial international text on co-management identified that:

> a crucial ingredient [for co-management] is the concrete ability of [local] people to become involved … powerful obstacles include being perennially sick, weak … depressed because of a succession of disasters. (Borrini-Feyerabend et al. 2004:428).

These authors then reminded readers of the substantial differences between resource-rich and resource-poor peoples. Death, illness and disability are discordant.

9.3.2 The gulf between 'outsider' government ideals and local Aboriginal realities

A gulf often exists between the expectations of 'outsiders' trying to bring benefit to Aboriginal people and the local realities into which those expectations are placed. Below is a second case experience which illustrates one attempt to bridge this gulf and the consequences.

The Workshop Story: another case example

> Two days after being with Mary in hospital, still shaken and disturbed by that confrontation with life and death in remote-desert settlements, I was now in a capital city at a workshop about a specific project with ten staff of various research and development (R&D) organisations. The project's stated goal and research aims were to bring benefit to Aboriginal people through the commercialisation of their natural resources. Aboriginal people, the project's major 'stakeholders', were absent with one exception. Whilst I engaged constructively with the meeting, privately, it felt that we fiddled whilst Rome burnt. There seemed to be a gaping disconnect between the ambitious R&D proposals and local realities which included the frequent death of young people. It was apparent to me that the scientists and managers at the workshop had little understanding of the social context in which our research was to operate and produce outcomes.
>
> As the workshop re-commenced, I asked to speak. I sketched the barest outline of my experience with Mary and the state of her life and family. I then suggested that we had to better recognise the wider social and cultural environment in which we worked. This context included constant grief that reduced local Aboriginal people's capacity to engage with outsiders including researchers. I tried to suggest that R&D staff needed to: be cautious in their approach; genuinely consult Aboriginal people in remote settlements; steady and slow the pace of their development proposals; set aims and outputs appropriate to local environments; and, recognise the demands upon individuals with whom we did research amidst the repeated trauma in their lives.
>
> After my comments, there was a brief pause, a sharp inhalation then I was abruptly told by an R&D manager that—we must remain "objective and dispassionate" in our research and that we were to "avoid the dysfunctional communities and pick the winners". Post-traumatic stress counselling was recommended for me.
>
> I sat back aghast then dismayed. My intention behind raising what happened at the hospital as an indication of conditions in Aboriginal settlements and how R&D could respond was misinterpreted. Two colleagues then tried to elaborate on the concerns I had raised but wider discussion on these matters was stalled. The meeting returned to its planned agenda. Later it was asked, why did I raise irrelevant matters?

The trauma experienced by individuals and communities is a reality that shapes social landscapes throughout remote Aboriginal Australia. There have been few individual 'winners' and fewer 'winning' communities (by whoever and whatever criteria defines winners). Apart from moral considerations of respect and empathy, it is essential that the people who fund and guide external R&D projects comprehend and respond constructively to this reality.

A Pandora's Box of detail and issues lie behind this 'Workshop story' (and 'Mary's story). Here, the lid is barely lifted in looking at the reasons why this workshop story is told. Three main players within these events can be identified—institutional managers, trans-cultural researchers and Aboriginal people. It is irrelevant that one player was the manager of an R&D organisation. They could have been staff in a government department or anywhere with limited direct contact with Aboriginal people yet writing policy or funding proposals intended to benefit them.[322]

It is significant that, at a workshop principally about Aboriginal people, the institutional managers saw Mary's story as irrelevant. By rejecting it, they were ignoring the wider realities in which the R&D was supposed to be applied. Thus, they failed to see the very significant limits on 'community engagement' and 'adoption' (terms critical to research reporting). Without appreciation of profound trauma in Aboriginal societies, the necessary adaptations to work in this context could not be made. Consequently, it is likely that 'adoption' of recommendations from research will be further curtailed.

The next issue is whether 'objective, dispassionate research' is possible or appropriate in this Australian cross-cultural context. Ethnographic research requires subjective engagement. Effective relations between researcher and subject require the expression of genuine interest, empathy, emotions and other traits. The presence of a researcher influences the behaviour and expressed opinions of their 'subjects'. The more relaxed the subjects are the closer to reality are the observations and records. Researchers in any discipline carry filters, personal interests and individual values that should be clear in their methodology. Rigorous research that is conducted independent of a presumed endpoint is essential but this is different to 'objective research'.

Many traditionally-oriented desert people are highly subjective in their outlook. They position themselves in relation to other people. They expect individuals to have and express opinions. Within their cultural domain, relationships continue to be of paramount importance (Tonkinson 2007). This is extended to the establishment of interpersonal relations with researchers; the cautious staged sharing of knowledge and opinion is partially mediated by the quality of these relationships. Such relationships are inconsistent with 'objective research'. The myth of 'objectivity' in Aboriginal NRM has been strongly critiqued for similar reasons (Howitt 2001:5`,117).

A belief in 'objective research' is indicative of a conventional empirical-analytical research approach. These are very different to participatory research in which the researcher genuinely seeks the ambitions and opinions of local people. Contrasts between 'external-expert driven research' and 'locally-driven research' have been reviewed (Pimbert 2004). Reflective researchers ask many deep questions such as the degree to which top-down research priorities need to be set compared to locally-generated ones. In international aid contexts it has been extensively argued that effective societal change is better achieved through 'participatory' or inclusive methods

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[322] This workshop experience was not an isolated one, colleagues and I have had similar experiences elsewhere. In literary writing, Dutton (2006) portrayed another mismatch within a workshop between government-required processes and those of a community-based indigenous organisation. One anthropologist wryly calls her efforts to bring reality checks to forums about Aboriginal people 'the wet blanket syndrome'.

whereby local people and institutions come into mutual agreements based on understanding, motivation and the capacity to act (Borrini-Feyerabend et al. 2004; Pimbert 2004).

Another issue from the workshop was the stated need to ‘pick the winners’ and ‘avoid dysfunctional communities’. This suggests a belief that there are ‘winning communities’ and particular criteria by which these can be identified. By contrast, in central Australia and Martu lands, various levels of ‘dysfunction’ are widespread; there appear to be few winners. Indicators such as in the ‘Overcoming indigenous disadvantage’ reports (e.g. DIA 2005) provided some socio-economic criteria to access communities but few of these assessments have been completed. The workshop issue also raised a question about avoiding dysfunctional places when these may be the very places where locally-focused research is required and from which potentially innovative responses could be identified. Presumably, the R&D manager was concerned that projects in ‘dysfunctional communities’ may not succeed which would not auger well for on-going funding to an R&D organisation. This signals the administrative and economic pressures that are on government, statutory and other agencies. These are to quantify outputs, commercialise, and operate within tight deadlines to secure government financial support. Similar pressures also operate on national parks and NRM programs.

Approaches driven by outsiders that are output-focussed have been a powerful force in cross-cultural natural resource management and co-management. For instance, it results in predetermined priorities set by scientists (e.g. weed and feral animal control, threatened species survey) above local Aboriginal priorities (e.g. IEK transmission to young Aboriginal people, game species management).[323] These priorities are tied to funding. Funding is linked to cycles that are very short (1–3 years) relative to the time frames needed for genuine local engagement and change (estimated at 10–20 years). Funding necessitates substantial quantitative progress reporting on applied projects thus high administrative literacy. It requires outsiders to write applications and management plans with varying degrees of ‘consultation’ with local people often without the particular interests of the authors being clear to the readers or remote Aboriginal people. These are examples of the differences between external expectations and local capacities that must either be bridged or remain as a gulf.

9.3.3 Individuals in-between cultures and trans-cultural stamina

I was invited into ‘Mary’s story’ and was a part of the ‘Workshop story’. Here I raise a third matter that arose from both experiences—the role of intermediaries in the cross-cultural space. In Mary’s case, professional and personal obligations influenced my decision to go to the hospital. Her father was a senior Martu man, he had introduced me to Martu lands, had generously shared substantial ethnobotanical expertise with me as a fledgling researcher, he had hunted and gathered literally the length and breadth of the Western Desert when a young initiate, was a ‘scout’ to several researchers and had

[323] Indigenous Ecological Knowledge

received an Order of Australia. There are photos and quotes from him in this dissertation. From a Martu kin perspective, I was the woman's 'father's sister'. She and I were the same age and had first camped together in 1988. These accumulated connections contributed to the obligations upon which I acted. Such experiences as in the hospital can be the painful cost of research amongst Aboriginal people.

At the workshop, I was participating as a project member, an experienced trans-cultural researcher and one expert in my ethnoecology discipline. I was attempting to constructively raise attention to a wider context pertinent to our project with a genuine desire to see better Aboriginal engagement and sustainable outcomes. I had expected managers with relatively limited cross-cultural experience (but experts in their professions) to respect and, better still, heed my suggestions. This was not the case.

Numerous employees of organisations working for Aboriginal people refer to the deep, persistent stresses caused by their work. Consequently, there are handbooks to avoiding 'burn-out' in remote settlements (CRANA 1997; CRANA 2000). Some find that it is the needs and demands of Aboriginal clients, patients or constituents that are overwhelming. Others find negotiations with non-indigenous agencies create agitation, frustration or hurt. By contrast, close relations with Aboriginal people on country energises and inspires some of these same people. As anthropologist, tour facilitator and English–Pitjantjatjara translator Diana James wrote:

> [we] are not impartial mediators but rather are those who have been deeply touched by the power within the opposition, wounded by it in fact, and who seek to move from that wounded knowledge towards a convergence of cultures that respects unity in diversity (James 2005:339).

Life in this 'wounded space' takes a high toll on individuals who frequently move between cultural domains. The interface between remote-area Aboriginal people and Western institutions is a very fraught one. My mental image is of being jammed between two tectonic plates (one large, one small) that buckle, shear and rarely mesh.

The consideration of personnel in this inter-cultural space is relevant to the practicalities of co-management at Karlamilyi or any remote indigenous protected area. Staff willing to work amidst remote Aboriginal people are increasingly scarce (Ch. 9.2; also D. Alexander, CLC Land Management manager pers. comm. 30/1/08). These staff need to be competent, multi-skilled, and have stamina, personal integrity and resilience. Co-worker support, housing and places of retreat are required to sustain long-term commitments to the people with whom they work. Conversely, government agents need to recognise their presumptions, spend time amidst local people and actively listen. They should consider the consequences of their organisation's policy and personal actions upon Aboriginal people and act on the changes they can make within their own institutional systems.

9.4 Chapter conclusion and relevance to co-management

In conclusion, this chapter presents secondary research, case experiences and some literature to review major issues emerging in Martu and other remote Aboriginal communities over the past 20 years. It finds that land uses by non-Martu people had increased with greater mining activity and more tourists. These land uses have intensified and covered a wider area than in the early 1990s. Martu hunting, burning and other customary activities have continued but with an apparent decline in the need for sustenance and thus frequency of customary harvest than reported during this 1990 research. The chapter suggests that, because of the intensification of land uses, there is greater competition for natural resources by different land user groups.

The chapter reports that after twenty years of proposals, steps toward co-management of the national park remain small and unresolved. It is likely these steps were undertaken mainly by Martu representatives and poorly understood by the Martu majority. DEC's commitment to Aboriginal involvement in nature conservation and management has increased over the past decade. However, there were no co-management agreements for Karlamilyi National Park to late-2007 due to the lack of tenure resolution. It appears this was partially attributable to the dominance of mining and other land user interests in the wider State agenda. None-the-less, senior staff in the DEC Regional Office sought a park manager committed to applied, practical work amongst Martu who would also progress a co-management process. Senior staff believed there was a need for personnel with a comprehensive understanding of the knowledge and practices of Martu. The content of this dissertation remains pertinent today both as recent historical background and as an explanation for contemporary Martu perceptions and practice.

In recent times, profound trauma is reported to have increased within Martu populations. Death, disability and illness have repercussions for co-management and other CNRM activities. They make it hard, at least, for Martu and agency staff to shape, and work toward, common objectives. The few individuals employed in the trans-cultural space move between radically different cultures and experience substantial pressures from different sides. Expectations of co-management outcomes would need to be realistic within this stressful social context and DEC would require highly flexible, supportive and adaptive strategies for the necessary engagement between themselves and Martu.

Notwithstanding these considerable challenges, cross-cultural collaboration amongst Martu, state agency personnel and their wider organisations is critical to the effectiveness of future natural and cultural resource management. Good collaboration provides vital opportunities to reduce personal and societal trauma. Most importantly, being on their country whilst travelling, hunting, gathering and applying their expertise is likely to provide senior Martu with respite and restoration from tensions and anxieties; in turn, they offer strong role models for younger generations.

'Mary's story' involved one Martu death among too many; the workshop demands for 'objective research … with winners' had precedents too. In my interpretation, the seminal paper by Sutton (2001:126) opened with a call for the dominant (European) society to reflect upon its culture's role in contributing to the problems. His paper closed with an assertion of the need for some indigenous people to 'rethink' classical cultural practices and their engagement with the wider political economy (p.156). From my perspective, it is the opening call that those of us who are outsiders and Euro-Australian, can respond to, in particular by proposing improvements within the institutions I work for with respect to desert Aboriginal people and their cultural systems. The responsibility for volunteering to respond to Sutton's concluding assertion lies with Aboriginal people and their cultural institutions. For each of us, our closest sphere of influence is that where we predominantly live and work. It is vital that future co-management plans and actions recognise this fraught and complex environment in which Martu and their employees live.




Tourists and mining personnel have increasingly become major users of Martu lands.

Photo 9.2 (top left) In the 2000s, tourist convoys of eleven and more vehicles are common along the Canning Stock Route with some visitors exploring nearby places such as here, a rocky outcrop above a shelter (photo from www.geo-tours).

Photo 9.3 (top right) Tourists at Jilakuru, Durba Springs, a place that once could only be visited by initiated Martu men (photo by Sue Davenport, 2008).

Photo 9.4 (bottom left) Tourists pumping fuel at Well 23. Tourism facilities such as fuel dumps, interpretive signs, shelters and ablutions have increased in number along the Canning Stock Route and linked tracks (photo from picasa web.google 2008).

Photo 9.5 (bottom right) Kintyre site near Camp Tracy identified as potential to be a world class uranium mine (AUA n.d.) (photo from www.anawa.org.au/wa/kintyre.html 2008).



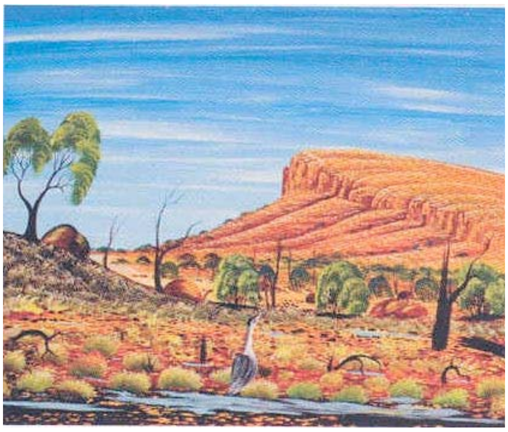

Various Martu activities in the 2000s

Photo 9.6 (top left) Dawn Oates and Jakayu Biljabu outside Dawn's home at Parrngurr in 2008 (photo by Sue Davenport).

Photo 9.7 (top right) Film makers record Jeffry James and Billy Patch who explain the difference between a Martu map and a whitefella map (photo by Sue Davenport, 2008). Researchers and media production crews now provide the resources required for Martu groups to access lands distant from settlements.

Photo 9.8 (bottom left) A cross by the road side marks the site of a vehicle accident where four people were killed; a marker of the excessively high mortaility rate amongst Martu.

Photo 9.9 (bottom right) Martu men erecting a sign commissioned by WDPAC, Dept of Indigenous Affairs and Dept of Planning and Infrastructure. It reads "You are leaving the Canning Stock Route. Please be aware that the land you are entering contains sites and areas of significance to the Martu people. Without prior permission, entry to the land is strictly prohibited." (photo by Sue Davenport 2008).



In the 2000s, artworks by Martu have become a major form of representation of their lands and an activity for employment and income.

Photo 9.10 Women from the Martumili arts centre and other regional centres painting the Canning Stock Route at Well 36 whilst on an expedition organised by FORM an independent arts and cultural organisation in Western Australia (photo from Reconciliation Australia 2007).

Photo 9.11 Painting of Karlkan Karlkan on Karlamilyi River by Muuki Taylor, *circa* 2004 (photo from Bleige Bird 2006) See Chapter 1.1 for a description of one event at Karlkan Karlkan.

Photo 9.12 *Jakulyukulyu* (the Pleiades) painted by Nyari Morgan *circa* 2004 (photo from Bleige Bird 2006).

Photo 9.13 A painting by Jason Tinker of a Bustard searching for *Jinyjiwirrilyi* (Desert raisin). Jason painted an exhibition of paintings whilst in Roebourne jail (photo from Davenport Acker 2006).

Photo 10.1 Mac Gardener is pensive at sunset west of Parnngurr in 1988. That evening he had a 'dream' and premonition that a close family member had passed away. On return to Jigalong the next day, he learnt of the death of an uncle. This photograph reflects a pensive uncertainty about the future of Martu people on their lands.

10 Conclusions and implications for Martu and Department of Environment and Conservation and ecosystem management on their lands

10.1 Chapter structure, core thesis and overall argument

This concluding chapter has four sections. Firstly, it reviews the core thesis and synthesises the major reasons why Martu knowledge and practices are critical to the management of Martu lands including Karlamilyi National Park and surrounding ecosystems. Secondly, the key findings about Martu land uses are presented and the ecological sustainability of their practices considered at different scales. Thirdly, the chapter collates major findings on the interaction between Martu and the Western Australian State government including the Department of Environment and Conservation (DEC). Fourthly, the roles of institutions and individuals within them are summarised.

The core thesis evolved through the long course of this dissertation. During field work in 1990, the supposition was “that an understanding of the land use and management activities and ecological knowledge of Aboriginal people is necessary when planning sustainable and effective ecological programs on their lands” (Ch. 1.1). Later, the thesis narrowed to contend “that the knowledge and practices of Martu are of direct relevance to sustaining ecosystem processes and national park management on their custodial lands”. The thesis was analysed in terms of: the role of subsistence amongst other land use activities (Ch. 4); biological resources utilised and their cultural significances (Ch. 5); socio-economic aspects of foraging (Ch. 6); Martu spatio-temporal concepts and patterns (Ch. 7), and, interpretation of management-type concepts within the Martu domain and in their understandings of the government conservation agency (Ch. 8). Chapter 9 provided a brief update of major changes from 1990 to 2007. The research foci sharpened toward co-management in early 2007 when, despite decades of attempted negotiation, there was still little progress in on-ground park management by the state agency and the researcher received a direct invitation for a role in co-management (Ch. 9.2).

Nationally, roles for Aboriginal people in NRM have been increasingly recognised over the past two decades. There has been rapid evolution in government, statutory and non-government policy and resourcing to Aboriginal organisations. This has been manifested through, for example, the operation of community ranger groups (e.g. Storrs 2003; KLC & DIA 2006), expanded co-management of national parks (Smyth 2001), the IPA program (Szabo & Smyth 2003), strengthened institutional structures within land councils (e.g. NLC 2005; CLC 2007), indigenous land and sea management forums (e.g. CLC 2005), and policy and legislative recognition (Baker et al. 2001). These developments have many international parallels (Berkes et al. 2000; Borrini-Feyerabend et al. 2004).

In Australia, it has often been overlooked that certain Aboriginal groups and individuals, as in the case of Martu, continue to modify their ecological knowledge systems and maintain land use and management relatively independent of Western-based land management administrations. Indeed, relative autonomy in land management has been the preferred choice of some groups (White 2002), generally more ‘traditionally-orientated’ ones. Their continued land use and management practice has often fallen below the radar of reviews and recommendations (as with Davies et al. 1999) partly due to limited documentation. Furthermore, these traditionally-derived (customary or classical) practices and perceptions continue to underpin Aboriginal involvement in government and non-government-management processes. Whilst we know that institutionally-supported indigenous land management has expanded, we do not know how the more independent systems have fared in recent years. There is circumstantial evidence in central Australia that as the former have progressed the latter have fragmented.

The nature and pace of the above developments has been highly variable between different Aboriginal groups and the legal and political systems of each state or territory. The Western Australian government remains relatively conservative and dominated by mining and other land use interests; consequently, state-wide Aboriginal CNRM programs have been more limited than in some other Australian states (Gilligan 2006). For example, CALM was tentative in giving positive comment during an evaluation of the national IPA program (McKenzie et al. 2002:53) and in 2007 joint management agreements were yet to be finalised for Purnululu and Karajini National Parks where government and traditional owners have negotiated for more than two decades.

In synthesis, this dissertation has investigated the core thesis proposing that the knowledge and practices of Martu have a direct relevance to ecosystem processes and Karlamilyi National Park management, and found it to be true. It is argued that this ‘relevance’ is for two major reasons:

a) Martu people were, and remain, the major land user group in the region—‘major’ in terms of numbers of people inhabiting the area, accumulated knowledge and use of park land that long pre-dated its gazettal, spatial extent of their activities within and beyond the park, and, intensity of their applied, on-ground management. This relevance would be irrespective of the people’s racial background. It is comparable to certain farmers, pastoralists and others being recognised as land carers or stewards because of their long local associations, knowledge and practices in particular locales, and their ecological motivation and commitment. This is a strong point of direct relevance; it puts humanity before race. Other regional land users continue to be mining companies, tourists and researchers.

b) As Aboriginal people, certain Martu also had unique skills, perceptions, values and actions setting them apart from non-indigenous land users. These related to their hunting and gathering practice, richness and diversity of the biological resources they utilised, detailed wildlife knowledge, burning skill, species specific resource management, conceptualisation of a 'People–Country–*Jukurrpa'* inter-embedded system and more. These are relevant to park management in offering or raising matters of mutual interest and divergent opinion, respectively.

In this dissertation, two other key reasons for Martu–Park relevance were identified but received less attention than the above:

c) The state agency, DEC, which has legal title and a legislated management responsibility, has no on-ground presence on 'their' park.[324] They have little capacity to 'manage' one of the largest, most remote national parks in the world. They are based at least 700 km from the park with almost negligible staffing, limited operational resources and little local knowledge (McKenzie et al. 2002:53).

d) Social justice, humanitarian, community development and employment opportunities are required for Aboriginal groups such as Martu who live in situations that external people see as 'disadvantaged' and 'remote'. Eco-cultural resource management provides opportunities consistent with local knowledge and skills. In the 1980s, social justice reasons were identified as the sole rationale for Aboriginal involvement in the park (Muir 1982). However, this factor alone has been insufficient to achieve an endorsed Martu role in park management.

Another significant factor that affirms the core thesis was the 2002 determination that:

e) Martu are native title holders for 136,000 km^2 of land surrounding the park. Their negotiations and ILUAs with mining companies, tourism agencies and other land users potentially will influence the primary river channel and park ecosystems in the context of their surrounding ecosystems.[325]

Importantly, this dissertation goes beyond the core thesis about 'relevance' to conclude that Martu land use practice and knowledge are 'integral' to the effective management of Karlamilyi National Park and its wider ecosystems through co-management, aimed at the maintenance of biological and cultural diversity (or at least, the steadying of their decline).

The above thesis, supported by conclusions in this dissertation, remains pertinent today because of three overarching developments. Firstly, significant challenges remain in the transition from land management programs, policies and plans to implementation especially in Australian desert regions. Secondly, in Western Australia limited planning and practical progress has occurred in respect to co-management of parks and wildlife.

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[324] In 1990, NPNCA formally held title and CALM had management responsibility to act on that title. In 2004, the Conservation Commission of Western Australia held the title for management by CALM then DEC.

[325] ILUA = Indigenous land use agreements

The third reason is one of regional applicability as Martu are the only Aboriginal land user group near Karlamilyi National Park. Both Martu and the DEC have significant shortfalls in the knowledge, resources and capacity required to adequately maintain natural and cultural resources and eco-cultural integrity within the degrading environments of the park and wider ecosystems. It is argued that improved natural and cultural resource management requires the equitable participation of both parties to give synergy to their practice.

The dissertation has endeavoured to do multiple things. In terms of research methods, it has been a trans-disciplinary study between the biological sciences and anthropology; it observed the use of biological resources by Martu as well as documented their knowledge and opinions. Concomitantly, it has been concerned with past and present realities with an applied orientation rather than idealised scenarios. In terms of its subjects, Martu were the principal focus; however, because of the national park subject within the research questions, it has summarised priorities and actions by the government conservation agency. Attention to Martu has required an understanding of the influential socio-economic features of Martu settlements and organisations. More widely, both the Park and Martu have been strongly dominated by mining (thus multinational companies) as the major economic land use of the region. Figure 1.6 introduced these dualities.

10.2 Major findings about Martu land use and management practice

10.2.1 Martu as active, contemporary users and managers of their lands

The contemporary life of Martu people in and about 1990 was the major subject of this thesis. The dissertation opened with the demand of a powerful Martu spokeswoman that the proposed research is re-orientated to look at Martu as modern day people rather than historical artefacts (Ch. 1.3.1). She wanted hunting and gathering to be seen as a vital activity of the present rather than the past. In response, the research focused on contemporary subsistence, land use and management. The dissertation demonstrated that Martu continued to be active users and managers of their lands in 1990. Hunting and gathering practice, burning, site maintenance and many eco-cultural activities continued to be vigorously conducted in 1990. The knowledge and habits underpinning their practices drew upon long-standing traditions. Martu adapted, adopted and modified these practices to suit modern opportunities informed by their exposure and experience with wider Australia and the world. Customary land use activities reportedly continued to at least the present (Ch. 9.1.2)

10.2.2 Animals and plants were significant components of a holistic cultural system

The field work for this dissertation commenced with a view of animals and plants simply as biological resources that had various uses, principally as food. However, the quantitative and qualitative results showed that inherent in species were multiple values beyond the overt utilitarian ones (Ch. 5 & 8). Furthermore, hunting and gathering to collect those species was conducted for economic reasons but also for social, recreational, health, ritual and other reasons (Ch. 6). The resources and the activities to procure them were multi-functional. It was through the course of this research that I came to appreciate that plant and animal species were simultaneously natural and cultural resources to Martu of deep significance.

Sophisticated links were demonstrated in Chapter 8 between ‘plants/animals’, ‘spirit’, ‘children’, ‘reservoirs at sites’, ‘country’, *Jukurrpa* ‘travel routes’ and more. This placement in inverted commas is because the English terms do not convey the depth of Martu concepts which interlinked physical, emotional and intellectual states of being. These elements combined into a holistic cultural system. The ontological system comprised the Martu universe. Plants and animals were an integral part of that universe.

This interconnectedness is implicit in the simple ‘Country–People–Dreaming’ concept which opened this dissertation (Ch. 1.4). However, this concept was found to underestimate the depth and complexity of the system and its elements. It was not simply that animals/plants were ‘connected’ to people through country, they were even more than interwoven; animal and plant species and human individuals were embedded-together. The biological concept of symbiosis seems analogous. These inter-relations were necessary for the functioning of the whole system. The concept of *kanyirninpa* reflected this mutualism in its dual meanings of ‘to hold’ *Ngurra–Martu–Jukurrpa* and ‘being held by’ *Ngurra–Martu–Jukurrpa* (Ch. 8.3). In the traditionally-derived Martu ontology, hunting (or gathering) a species was integral to the ‘holding’ of that species—its ‘use’ and ‘care’ were inter-dependent (hence the title of this dissertation).

Figure 10.1 presents the domains and major elements of this system and partially synthesises some of the findings in this dissertation.[326] It portrays multiple direct connections between a resource species and elements within each domain. For example, one species can be a major *Jukurrpa* character (Ch. 2.2.4), have a kin name (Ch. 5.2), be a target for certain foragers (Ch. 6.2.4) and fires lit in order to hunt it (Ch. 8.2). In turn, each of the circular elements branches into more and more detail as seen in relevant sections of this dissertation. The complexity portrayed in Figure 10.1 is a significant advance on that originally conceptualised in Figure 1.4.

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[326] This Figure has multiple origins. Chapter 1.6 identified its genesis; its graphic conceptualisation evolved through the course of understanding perspectives of Martu and other traditionally-orientated desert groups. Its evolution was also informed by MK Turner’s poster (Figure 10.2). A prototype was developed from this in April 2008 by the Alice Springs-based *Merne Altyerr-ipenhe* (Food from the Creation time) Aboriginal reference group of whom M.K. Turner is a member (there are no Martu members). The group saw an immediate use for Figure 10.1 so they altered and incorporated it into documents they were preparing and into the DVD by Dobson, Walsh and Sati (2008). In the documents, the figure is credited to them as well as this dissertation.

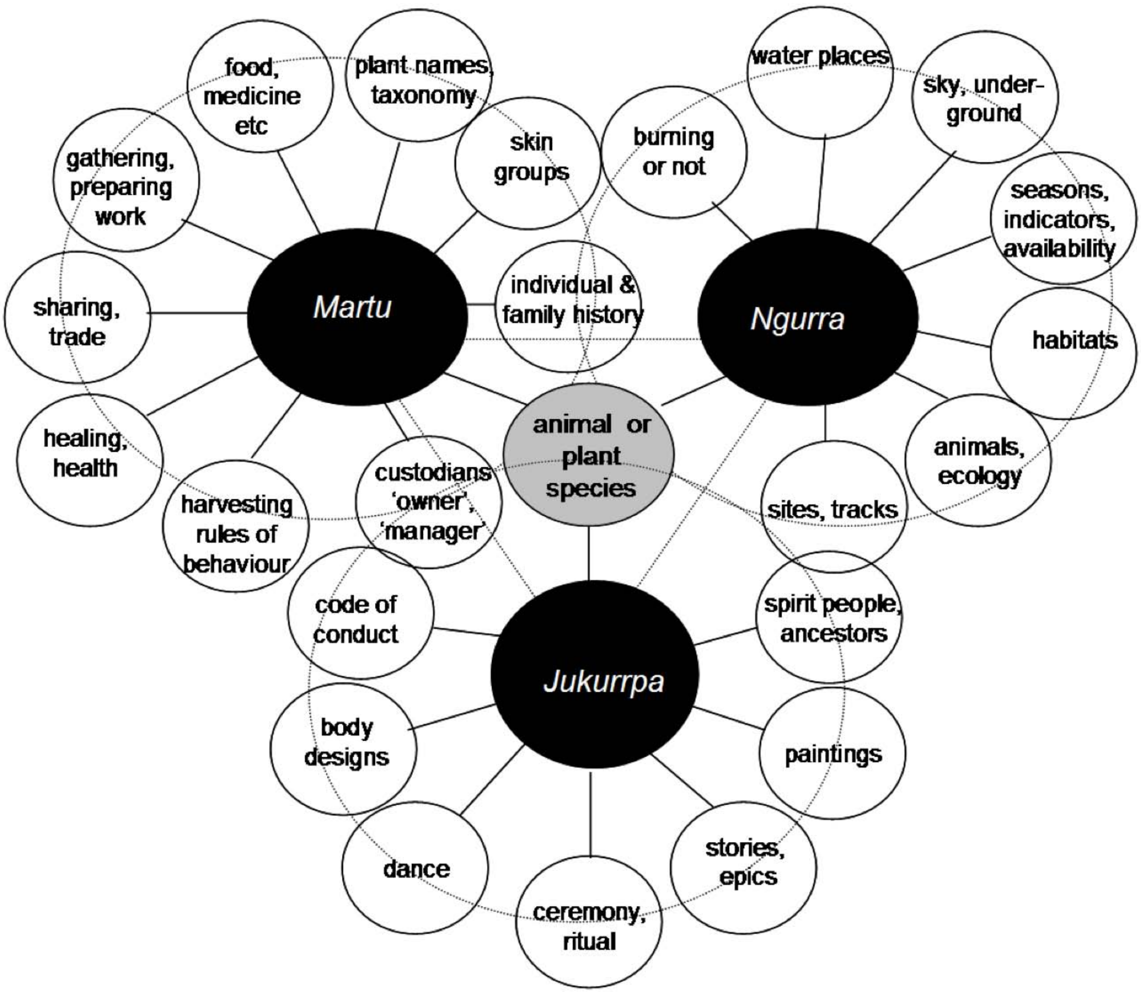

Figure 10.1 Representation of the major domains, elements and connections within a traditionally-derived desert Aboriginal world-view expanded beyond People–Country–Dreaming and centred on resource species as the economic heart of Cultural and Natural Resource Management (CNRM)

Figure 10.1 has also been informed by Turner's (2005) poster (Fig.10.2). Turner is a senior eastern Arrernte speaker and acclaimed cultural expert. The centrality of the land and its resources in her representation of Arrernte life is clear. These frameworks need to be viewed as dynamic in that the central elements can shift according to the context. This is similar to interpretations of desert Aboriginal art wherein the meaning of the painting is adjusted to spatial, social or temporal contexts (Sutton 1988).

A proposition in this conclusion is that the holistic eco-cultural system of Martu and other Western Desert people offers non-indigenous land users and managers an alternative view of eco-cultural landscapes and their functioning. This has also been proposed by Bird Rose (1996), James (2005), Turner (2005) and others. Martu views provide philosophical and possibly practical alternatives to non-indigenous people who question dominant perspectives on ecosystem management in Australia. However, there is a vast gulf between this view and the entrenched Western segregation between land–wildlife–people.

Figure 10.2 ‘Everything comes from the land’ poster (Turner 2005)

The conceptual frameworks of Figures 10.1 and 10.2 should also caution non-Aboriginal people about the potential unforeseen effects of their extraction, manipulation or domination of eco-cultural resources dear to Aboriginal people (also Langton 1998). That is, the effects may not play exclusively upon the species but also upon people whose identity and livelihoods have been embedded in certain species. There are very real risks that the people–species ontological connections will be severed and jeopardise the well-being of traditionally-orientated people. These risks may be exacerbated with the increased estrangement from custodial lands and also with intensified bioprospecting, wildlife harvesting and economic ‘development’ of Aboriginal bush food resources (DIA 2005; Whitehead et al. 2006). It is critical that species custodians are actively involved in decision-making about species with commercial value.[327]

Whilst Turner’s conceptual diagram is familiar in synthesising content also expressed in Aboriginal stories, texts and paintings, the enactment of it is bewilderingly elusive in modern Australia. Figures 10.1 and 10.2 add detail to the right-hand sphere of Figure 1.3. However, unlike Figure 1.3, they neither position Aboriginal concepts in relation to the concepts and systems of the dominant Euro-Australian society nor represent the modification of those concepts amongst modern-day Arrernte or Martu people. Turner (2005) was not naïve to these omissions but the poster portrayed the world as she remembered it and knows it. The poster shows Arrernte children ‘This is where you come from’, and they and outsiders ‘This is what you need to know’ (M.K. Turner pers.

[327] Notably, recent arguments for the co-management of Dugong species have expanded from a solely biological conservation imperative to a cultural conservation imperative for Torres Strait Islander peoples whose customary identity is principally linked to Dugong hunting (Marsh et al. 2004, Kwan et al. 2006).

comm. 14/5/06). But it does not tell any of us where the overlap between desert Aboriginal and non-Aboriginal world views does or could lie.

10.2.3 Economic use of resource species critical to Martu sustenance and engagement with land

Another key finding was the major role that hunting and gathering played in the contemporary economy of Martu. Of the meat available to Martu for consumption, in 1990 bush meat contributed a substantially higher proportion than store meat (Ch. 6.3). Customary harvest was seen to have provided commodities, trade items, social currency, work and other components of an economy. The need and desire for bush resources was a major impetus for Martu to collect and store relatively large quantities of species compared with store goods (Ch. 6.3), for keen individuals to forage at least two or three times weekly (Ch. 6.2.3), to extend their spatial and temporal land use pattern (Ch. 7) and to burn to collect and manage resources. In 1990, economic imperatives based on local natural resources underpinned Martu engagement with their lands. Whilst it is reported that Martu continue to hunt and gather in the early 2000s (Ch. 9.1.2), the quantitative intensity by various measures is not known. Similarly, there have been no substantive studies of customary harvest in central Australian desert communities since the mid 1980s. There remains a critical need for such studies to assess the customary economy and wildlife management options.

This dissertation agreed with the findings of Rose (1987), Altman (1987, unpubl.a), Devitt (1988) and Povinelli (1993) who all argued the critical importance of foraging to local Aboriginal economies in remote settlements in the 1980-90s. Jon Altman (1987) identified the combination of bush, store and government resources incorporated into the Guniwinggu economy. He later proposed the ‘hybrid economy’ concept which has subsequently been refined and argued for northern Australian Aboriginal lands (Altman 2001; J.C. Altman 2005). In relation to Martu in 1990, if the ‘hybrid’ is considered to be the blend of bush meat and store meat, it was the ‘traditional’ commodities that were dominant, and the ‘modern’ commodities that were secondary.[328] Some Martu supplemented a ‘traditional’ bush meat diet with Western goods; they were not simply supplementing a Western diet with bush foods (by contrast to Smith & Smith 1999). Alternately, it could be suggested that the bush/store divide was not a dichotomy perceived by Martu; rather they acted opportunistically through decisions based on identifying as wide a resource base as possible.

An important reflection arose from the section examining bush meats, store meats and the need for sustenance (Ch. 6.3). Did the wrong perspective drive this comparison? That is, had I presumed that store goods were highly valued and Martu needed to supplement them with bush foods rather than the reverse—that bush foods were better and simply complemented by store goods? The first perspective is predicated on a

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[328] Monetary income and capital items from government sources is identified in Ch. 2.2.12. Vehicles had a major influence on Martu hunting strategies (Ch. 4.7). The acquisition of vehicles and fuel and maintenance costs were mainly provisioned from government sources, directly or through CDEP and welfare payments.

deficit model, that is, deficiency or shortcoming in bush resources relative to Martu needs and the store; the second is predicated on a surplus model, that is, the abundance and bountifulness of bush resources. Was hunting driven by hardship or a rich part of normal life? Previously, I had not seen my own value judgements. There were probably similarly contrasting values amongst Martu individuals, particularly between generations, reflected in the different frequency with which individuals foraged (Ch. 6.2). Implicit value judgements such as these are common in cross-cultural research even amongst experienced ethnographers. Recognition of them is an important step toward shedding prejudices and improving cross-cultural understanding and exchanges.

Intersections between customary harvest and state/welfare economies have been the spine of Altman's research and policy proposals over the past two decades (e.g. Altman & Peterson 1988; Altman et al. 1996; Altman & Whitehead 2003; Altman unpubl. a). It is my interpretation that Altman's recent joint explorations of market-based economic development opportunities in bush resources has been an extension of his long recognition of the customary economic value of bush resources and demands for monetary economic opportunities for Aboriginal people (J. Altman 2005; Altman 2004). Notably, Altman and others in the past few years have expanded the hybrid economy concept to be inclusive of indigenous income and/or employment from the private sector but Altman continues to recognise customary harvest as a major component of local economies in remote and very remote regions. The findings of this dissertation concur with the high socio-economic values he has recognised in indigenous hunting, gathering and fishing.

The economy of Martu is of direct relevance to national park and natural resource management in several ways. Firstly, hunting and gathering was a major impetus for continued burning practice with its consequent influences upon biodiversity. Secondly, government agents including park managers need to recognise that the Martu economy was (and apparently still is) partially reliant upon natural resources; thus limits or exclusions upon hunting would potentially jeopardise the sustenance income of Martu foragers, a group already living below the poverty line. Thirdly, there may again be small-scale commercial economic opportunities in bush resources on Martu lands as harvested and sold in the mid-1990s (Kalotas 1995; Desmond & Rowland 2000) and as considered at state and national levels (e.g. Whitehead et al. 2006; DIA 2005). Overall, it is proposed that NRM programs on Martu lands be structured around the major resources of importance to Martu (Ch 5.7). Pastoral programs in state agencies are structured around the management of individuals stock, cattle herds, pasture management and farm management. Similarly, it is proposed that Martu programs be structured around their principle resource species and management tools. Figure 10.3 sketches the structure of an integrated multi-species resource use and management system applicable to Martu lands.

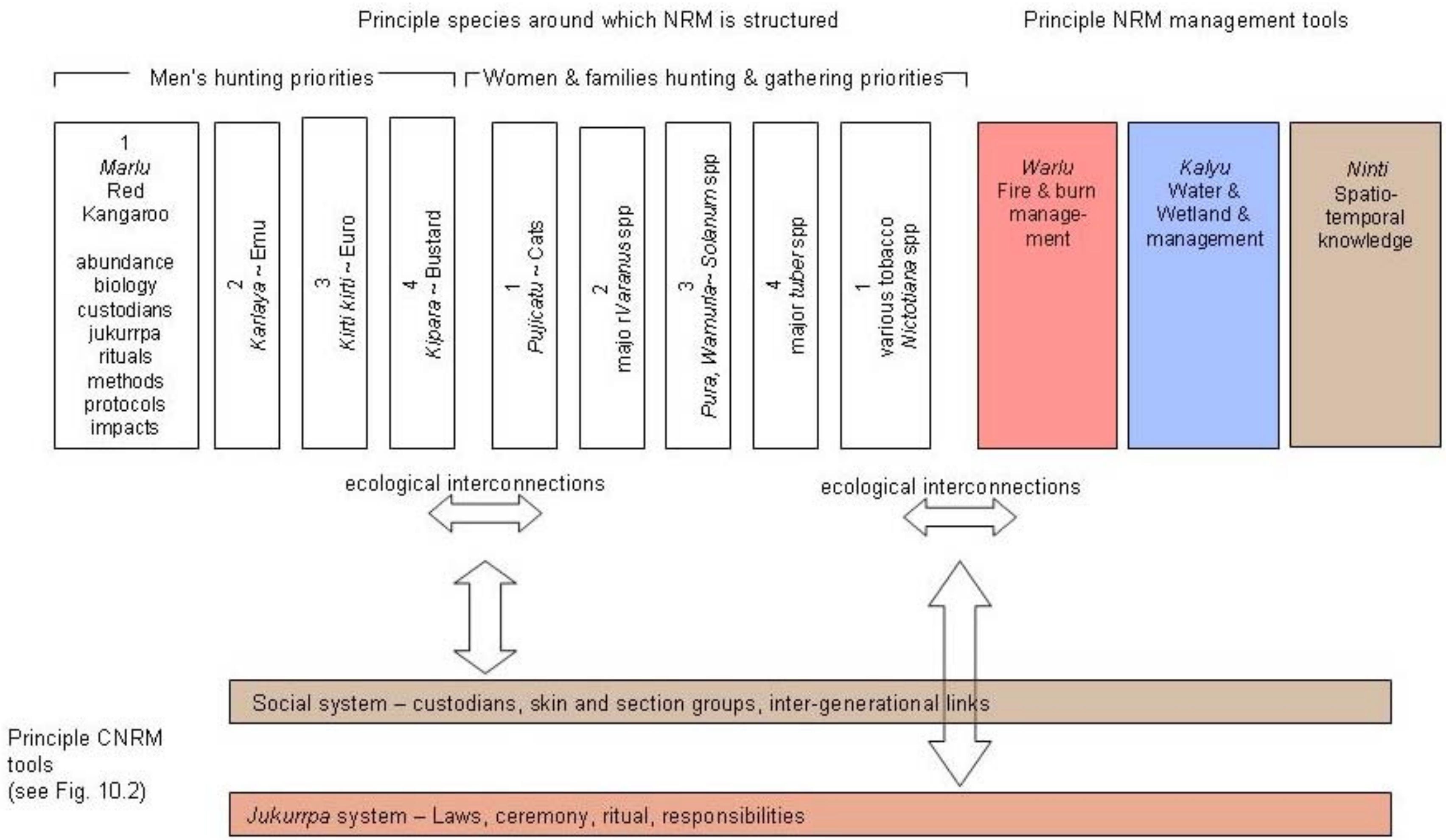

Figure 10.3 Integrated multi-species resource use and management system on Martu lands and recommended for future CNRM programs

There are two major implications from interpretation of Figure 10.3. Firstly, this conclusion proposes that a focus on species of high priority to Martu would enhance the likelihood of more refined Martu application of traditional management practices with positive flow-on effects for NRM (see Fig. 10.4). Furthermore, it is suggested that even conventional national NRM priority issues such as Camel management need to be negotiated with Martu in terms of the impacts of Camels (or other issues) upon species of highest importance to Martu. Secondly, it is argued that externally resourced NRM programs need to be expressed within frameworks compatible with Martu world-views, particularly when Martu are the principle players responsible for on-ground works (see Fig. 10.12). The Martu environmental view has been dominated by their high priority resource species.

10.2.4 Resource users who had been 'managers' in their traditional system—but what about now?

An issue debated in academic interpretations of indigenous land 'management' has been whether practices deliberately or inadvertently contributed to conservation or management (Ch. 1.7). A finding of this study was that within a traditional Martu system a host of practices was applied to maintain or perpetuate resource production (Ch. 8.2). Whilst Martu did not set out to deliberately conserve single species independent of people or the wider system, the collective of activities around searching, tracking, burning, harvesting protcols, killing and eating species contributed to the maintenance of resource species. The overall system was deliberate but not necessarily isolated practices within it. In a traditionally-orientated view, Martu appeared to be like Yanyuwa (Bradley 2001) in managing their lands through negotiation. Food and other resources were the currency of negotiation between Martu and the sentient beings within their landscape. In a traditionally-derived Martu view, use and 'management' seemed to be synonymous and the cross-cultural translation of these concepts did not have clear equivalence.

The affront and challenge to Martu in the mid-late 20th century was that a distant government agent with no personal connection to sites on their lands was legally the 'owner' and the 'manager' of those lands (also Lowe & Pike 1997). These appeared to compromise, and possibly undermine, the ontological basis of Martu practices. Thus whilst hunting and gathering practice continued it did so from a philosophical basis that was different to that of pre-colonial times yet not accepting of the mainstream Western system wherein management was by remote agents. This difference may have been more intense for younger than older people. The nature of a middle domain between dominant cultural constructs, which has been termed a 'no-man's land' (M. Holmes, anthropologist, 7/06), remains poorly understood by outsiders and possibly by local people themselves. Deliberate, systematic 'management' of a landscape or 'negotiation' with a landscape would now appear to be very difficult within a traditionally-derived framework. For any party—Martu, Euro-Australian or other—it would be very difficult to 'manage' lands without a legal or moral basis.

10.2.5 Contemporary hunting, gathering, burning and other practices may have promoted ecological integrity—at certain intensities and scales

This dissertation questioned the ecological sustainability of Martu practice circa 1990. It began by considering sustainability at the species level (Table 1.4, Ch. 5.8). Despite methodological limitations, as the research progressed it emerged that certain Martu practices appeared to contribute positively to ecosystem processes and to the possible reduction of specific threatening processes. Section 8.2 identified a suite of traditionally-derived Martu resource and land management practices that may have influenced individual species populations and biodiversity in pre-colonial times; these were presented at descending spatial scales (Table 8.2). Martu continued some of these practices during the study. For future research, it is hypothesised that Martu CNRM and species use slowed biodiversity decline on lands accessible from modern settlements, in particular, through burning regimes and frequent Cat hunting. The persistence of these practices (Ch. 8.2.1) and methodological issues (Ch. 3.8 and 5.8.1) tempered strong assertions about the negative impacts of species hunting. It is proposed that assessments of ecological sustainability must consider the complexity of interactions across multiple species, activities and scales.

This conclusion proposes the need for further examination of human influences upon Australian arid-zone ecology. Chapter 2 outlined key propositions about the functioning of arid Australia (Stafford Smith & Morton 1990) which incorporated abiotic and biotic relationships but not the roles of humans within the landscapes.[329] Long histories of human occupation at different spatial and temporal population densities across the present arid zone are now well-recognised (Veth et al. 2005). Certain flora and possibly fauna species may have co-evolved with indigenous burning and management practices and thus may be resilient to, or even reliant upon, harvest activities. Chapter 8 analysed ethnographic evidence and identified Martu practices that probably had a significant influence upon flora and fauna. Fire-ignition, water-point manipulation (and possibly rain-making) and species manuport and dispersal were some of the most significant practices. Burrows et al. (2006) provided strong scientific evidence for the direct influence of fire ignition by Pintupi upon regional burn patterns. The demise of small to medium sized mammals in the early 1900s is partly attributed to the desert depopulation and cessation of Aboriginal burning regimes (Burbidge et al. 1988; McKenzie et al. 2002:53). To reverse this logic, Aboriginal populations and practices may have deliberately or inadvertently shaped those mammal populations. Botanical and zoological evidence for the influence of other human practices is scant, but only because it has rarely been researched rather than because it has been disproved. The recognition that Aboriginal CNRM influenced the integrity of Australian biota in precontact times

[329] Stafford Smith and Morton (1990) has subsequently been revisited to incorporate human-ecological interactions and other developments in Australian ecology (paper in preparation in 2008).

provides a very different starting point for analysis of contemporary Aboriginal species use and management practice, and of Australian ‘natural’ desert ecosystems.[330]

Australian ecological studies of customary wildlife harvest have generally been species specific and have also isolated harvest impacts from wider ecosystem management by indigenous groups (e.g. Bomford & Caughley 1996). Furthermore, studies tended to consider harvest impacts on single species rather than upon suites of harvested species. Chapter 5 quantified harvest parameters (species frequency of collection, numbers of individuals collected, weights collected) for the 34 animal species hunted during the study. One finding was that, amongst desert groups, a highly diverse potential resource base and frequent prey switching were essential strategies for foraging in a highly variable environment. It is concluded that, in desert regions, harvest impacts must be considered across the array of contemporary game resources rather than on individual species.

Chapter 5.8.3 suggested that Echidna, Perentie and Yellow-spotted monitor could have been vulnerable to over-harvest within the 50 km settlement radii over a 10–20 year period from 1990. The harvest effects on nomadic resource species (Emu, Bustard, Red kangaroo) may have been only moderate on Martu lands due to the short periods they occurred within foraging access. However, for these species, the cumulative effects of Aboriginal hunting from settlements neighbouring Martu lands were unknown (Fig.10.4). Recent conclusions that indigenous hunting of the Dugong, an iconic species central to Torres Strait Islander culture, is unsustainable (Marsh et al. 2004) may reinforce calls for assessments of species sustainability and co-management support.

Yibarabuk et al. (2001) provided an alternative to the species-focussed approach when they surveyed and analysed parameters of ecological integrity on Aboriginal lands near an outstation in central Arnhem Land. The major land use in their study area was outstation occupation and a subsistence economy, as on Martu lands in 1990.[331] They concluded that the ecological integrity of their study region was relatively high compared to areas within Kakadu National Park and wider Arnhem Land. They attributed this integrity to continuous Yolngu occupation and the maintenance of traditional fire management practice. Table 10.1 uses the parameters identified by Yibarabuk et al. (2001) and synthesises qualitative data from this dissertation to compare ecological integrity within Martu settlement radii and the wider Great and Little Sandy Desert bioregions.

[330] The findings of Gerritson (2008) may contribute to a reassessment of Australian pre-colonial ecosystems. His historical research presents evidence for a typology of early agricultural practices applied by different Aboriginal groups in different bioregions. In the future, ecologists may see Australian environments differently if they were viewed as human-manipulated systems rather than natural ecosystems in the late Holocene to European contact era.

[331] The Arnhem Land outstation population was approximately 25 persons but it was only 70 km south of Maningrida with approximately 1300 people. The combined population of Parnngurr, Punmu and Kunawarritji *circa* 1990 was 70–170 adults (Ch. 2.3.2).

Table 10.1 Indicators of ecological integrity on Martu lands at ecosystem scale

Indicators of ecological integrity (from Yibarabuk et al. 2001)	Status on Martu lands relative to lands > 100 km from settlements	Confidence level: 3=high, 1=low	Data sources
Biological diversity	Floristic diversity probably high associated with early burn regeneration and medium-grained burn pattern. Fauna diversity high albeit > 30% original mammal fauna regionally extinct in early–mid 1900s during period of Aboriginal emigration	2	Chapter 5; Walsh 1987; Bird et al. 2005
Presence of rare and range-restricted native fauna	Rare fauna persistence was high. Persistence within 100 km of settlements of vulnerable species Greater Bilby, Mulgara, Great Desert Skink; endangered Northern Marsupial Mole; protected Woma python despite declines in wider desert bioregions. No plant species listed as endangered or vulnerable. Persistence of species-at-risk Bustard.	3	Chapter 5; Nano and McGuire 2006
Threatened communities	No declared threatened communities but Karlamilyi primary river channel pools and riparian ecosystems and saline lake ecosystems at high risk from Camels and Buffel grass. Persistence of long-lived, fire sensitive vegetation types (e.g. *Aluta (Thryptomene) maisonneuvei*) due to wildfire protection from medium-scale burns; persistence of obligate seeders (*Hakea, Grevillea*) requiring long fire interval.	1	Chapter 5; unpublished observations; May and McKenzie 2003
Harvested species	Production of harvested species at least moderate. Continued harvest of >34 fauna and >35 flora species. Possible localised declines in Perentie, Yellow-spotted monitor, Echidna due to over-harvest	2	Chapter 5; Bird et al. 2005
Threatening processes	Reduced wildfire risks as ameliorated by Martu medium–fine scale burn regime; hunting of Cat ameliorated localised predator pressure;	2	Chapters 5, 7, 8; Bird et al. 2005
Exotic plants	Unknown but Buffel grass dispersal along riparian ecosystems and elements, tracks and around settlements.	1	Chapter 8; unpublished observations; May and McKenzie 2003
Exotic animals	Presence of increasing Camel populations especially on river and wetlands. Diversity low with absence of Donkeys, Horses, Cattle found elsewhere in bioregions. Foxes little affected by Martu; possibly strong limits on Cat populations by Martu hunting; hunting effects on Rabbits unknown; mixed Dingo/Dog breeding from Martu camp dogs may reduce biodiversity.	3	Chapter 5; unpublished observations; May and McKenzie 2003

The purposes of this table are both conceptual and for synthesis. The former purpose is to raise the recognition that, at certain intensities, Martu subsistence, burning and other resource management activities may have increased biodiversity (following people's 20 year and longer absence from their lands) or, at least, slowed biodiversity decline. Conceptually, this approach demonstrates that a wide suite of parameters needs to be considered beyond species specific harvest impacts. This attention to ecological integrity also flags the need for Australian ecologists to recognise and be cautious about their presumptions as to the vulnerability of wildlife to over-harvesting within a wider subsistence-managed ecosystem.

In synthesis, it was possible that lands within an accessible radius of Martu settlements had a higher ecological integrity for some general indicators and particular species than lands distant from the settlements. It was possible that the re-establishment in the 1980s – early 1990s of a coarse to medium-grained burn regime and the intensive hunting of feral Cats favoured certain native species thus slowing biodiversity decline. Preliminary evidence for comparatively higher ecological integrity persisted to the early 2000s with the continued location of rare and restricted fauna within the region (O'Malley 2003; Nano & McGuire 2006, Paltridge, ethnozoologist, pers. comm. 16/11/07). Martu continued resource collection and the application of fire to create a medium to fine-scale burn regime (Bird et al. 2005).[332] Conversely, whilst certain species were available for harvest, others were reported to have declined within settlement radii possibly due to over-hunting and/or wider threatening processes.

These conclusions should temper published ecological opinion on the patterns of declining trends in biodiversity values across the GSD bioregion (McKenzie et al. 2002). These authors did not identify the possibility that biodiversity could be higher closer to settlements due to Aboriginal activities. Similarly, beneficial NRM actions by Aboriginal custodians were totally unrecognised in biodiversity audit assessments of management responses (McKenzie et al. 2002; NLWRA 2003). Yet there is preliminary evidence for both positive and negative impacts upon biodiversity from Martu practices. In future research, the relative integrity of Aboriginal homelands warrants testing through ecological and ethnographic research and comparison with depopulated, unmanaged lands remote from Western Desert settlements.

Theoretically, the ecological sustainability of hunting and wider manipulation of resources by desert Aboriginal people needs to be viewed at different organisational scales ranging from localised species populations to wider ecosystem processes. These scales are neither temporal nor spatial as multiple species and processes are involved. Simplistically, they can be conceptualised as in Figure 10.4. Examples of management-type activities that influence sustainability at each of these scales are drawn from Table 8.2. These practices have consequences for humans and the wider ecology.

[332] Natural historians and zoologists who lived in or worked near remote settlements at Kintore and Nyirrpi in the eastern Great Sandy Desert (Peter Thorley, archaeologist pers. comm. 1994) had made similar observations. Rachel Paltridge (pers. comm. 2006) is investigating these through ethnozoological surveys.

	Examples of management-type practices	**Human consequences**	**Ecological consequences**
Species (single species)	selective harvest of life stages species consumption taboos species broadcast and dispersal	Sustainability of single species utilisation	Species population resilience
Populations (multi-species)	predation on feral cats diverse resource inventory target prey switching	Sustainability of hunting and gathering	Persistence of diverse flora and fauna species (particularly resource species)
Ecosystem	water place maintenance spatio-temporal mosaic burning shifting fallow areas	Sustainability of People-Resources-Land-*Jukurrpa* system	Ecosystem function and ecological integrity supported

Figure 10.4 Concept diagram of interactions between scales of ecological organisation, management practices and human and ecological consequences

Figure 10.4 presents an important advance upon the single species approach to sustainability that opened this dissertation. A major finding was that a suite of practices apparently ameliorated negative effects upon single and multi-species. In concert, these traditional practices have influenced ecosystem functioning over 5000 years and longer.

However, positive indicators of ecological integrity on Martu lands cannot be assumed to persist through time and space. Over time, growing resident Martu populations will impose intensified hunting and land use pressures in localised areas. The demise of skills and motivations to hunt and burn, including reduced Cat hunting and fire ignition patterns that are for reasons other than species specific hunting, could result in diminution of the practices that maintained biodiversity and ecological integrity. Declines in the economic value of bush resources but the persistence of foraging for other reasons could also have negative ecological impacts. Martu population out-migration could also withdraw CNRM beneficial to certain species and ecosystems. Spatially, risks of over-burning close to Martu settlements and along primary roads have been noted (Ch. 7 and 8). This may cause declines in biodiversity. Thus there are trade-offs. Over space, the ecological benefits of Martu CNRM are likely to accrue across particular radii from the settlements (25–150 km), declining closer in due to intensive resource use, and declining furher out due to limited resource use and management.

In future research, longitudinal species-specific assessment of the ecological sustainability of Martu hunting could be conducted. Data from Appendix 4 could be compared with the post-2000 data sets recorded by Bird, Bleige-Bird and colleagues and synthesised in their papers (e.g. Bird et al. 2005; Bird & Bleige Bird 2004). Comparative measures of Martu hunting returns between 1990 and the early 2000s may provide a contemporary assessment of the sustainability of land use and management practices.

The sustainability of hunting by Kuninjku people from outstations in north Arnhem Land over a 24 year interval was compared (Altman unpubl. a; Altman unpubl. b; Griffiths 2003; Altman 2003). Altman (2003) concluded that Kuninjku hunting was sustainable. His evidence was based on persistence of similar hunting practices, similar social mixes of older and younger hunters, similar or larger weights of animals hunted and a similar number of species hunted. Although, as in this Martu study, Altman could not relate hunting patterns to game species population patterns due to limited species demographic data nor did he report on changes to rates of species harvest. He noted that increases in Buffalo hunting and possible decreases in reptiles due to Cane toad predation may have altered hunting patterns. Altman (2003) stated it was “clear harvesting was within ecologically sustainable limits”. However, he did not identify methodological constraints on his study thus some caution is needed in accepting this conclusion.

Modern ecological perturbations beyond the realm of traditional Martu expertise may compound declines in ecological integrity on Martu lands. It is very difficult to disaggregate these perturbations from Martu impacts. Camel, wildfire and weed impacts may have had more importance than Martu hunting. The numbers of Camels hunted by Martu was extremely small relative to Camel population growth rates (Ch. 5.8). Martu perceptions of species scientifically designated as ‘weed’ and ‘feral’ species may, in the short-term, constrain management control of introduced species. In the longer-term, it is the availability of cost-effective management measures and resources within DEC that will determine the effectiveness of weed and feral control but it is likely this effectiveness will be enhanced if there is engagement with Martu after priorities important to them are addressed.

In summary, there were ethnographic, historical and botanical indications that Martu lands comprised an ecosystem that prehistorically and historically required manipulation to maintain biological diversity. Multiple actions and knowledge maintained resource species diversity. However, historical information suggests that ecological integrity declined with the retraction of Martu and other Western Desert groups from their lands prior to the 1960s. Declining trends may have been slowed on Martu lands due to the lateness of desert emigration and then Martu re-immigration during the 1980s homelands movement. The partial reinstatement of burning, hunting, water place cleaning and other customary practices may have slowed but not stopped widespread ecological decline. Threatening processes resultant from Camels, other feral animals, weeds and wildfire contributed to an overall declining trend. Species favoured by Martu practices such as burning and the reduction of Feral cat populations may have ameliorated these wider effects but they were unlikely to be halted or reversed at a regional scale.

10.2.6 Wide spatial scale of land uses by Martu and probably their neighbours

Martu exhibited a strong and profound orientation to space and place (Ch. 7). The study identified that in 1990, 50 km radii around settlements and a 10 km corridor along primary and secondary tracks were the areas of most intensive resource use. Mobility within these radii and along travel routes was high (Ch. 4 and 7). Targeted and opportunistic species collections were frequent. Bushfires were also repeatedly ignited within these areas and some burnt beyond them. It is concluded that a landscape scale perspective on Aboriginal settlement and movement patterns is required in future research and management, particularly when addressing management options for nomadic resource species and extensive fires in the Western Desert.

This spatial scale needs to include the three Martu homeland settlements and surrounding settlements with interconnecting routes. When the radii and corridors are mapped for these areas, the spatial coverage of land uses by Western Desert people is seen at a regional scale (Fig 10.5). This wide scale is vital to understanding landscape scale ecological processes (e.g. burn regimes) and hunting impacts upon resource species exhibiting nomadic or exploiter spatial movement strategies

10.2.7 Continuity and Change: Elements of a CNRM system that influenced ecological integrity

Cultural ‘continuity and change’ has been a persistent theme in Australian Aboriginal anthropology. R. Tonkinson (2007:41) reviewed forty years of change amongst Martu yet concluded that major cultural patterns persisted. In this dissertation, it has been very challenging to write of a point in time seventeen years ago whilst being well-aware of the rapidity of this change (Chapter 9). Tonkinson (2007) wrote of the perseverance of ceremonial and ritual practices, continuity in sharing and kin obligations, the expanding mobility of Martu in recent times and more; however, each apparent continuity was tempered by his recognition of the attenuation, costs or risks of the practices.

Hunting, gathering and burning were practices conducted within a wide, holistic, complex cultural system. In pre-historic times, the totality of this system contributed to the relative sustainability of resource use on Martu lands. Elements of continuity within this system have been identified throughout this dissertation. Table 10.2 collates those more influential ones. They have been structured according to the bio-cultural domains recognised in conventional sustainability studies (economic, social and ecological) and refined in livelihood and intensive Aboriginal cultural studies to include ontological, technological, spiritual and personal realms. The persistence of many of these elements may have contributed to relative ecological integrity on Martu lands in the 1990s. Conversely, certain elements have changed thus destabilised this integrity (Table 10.3).

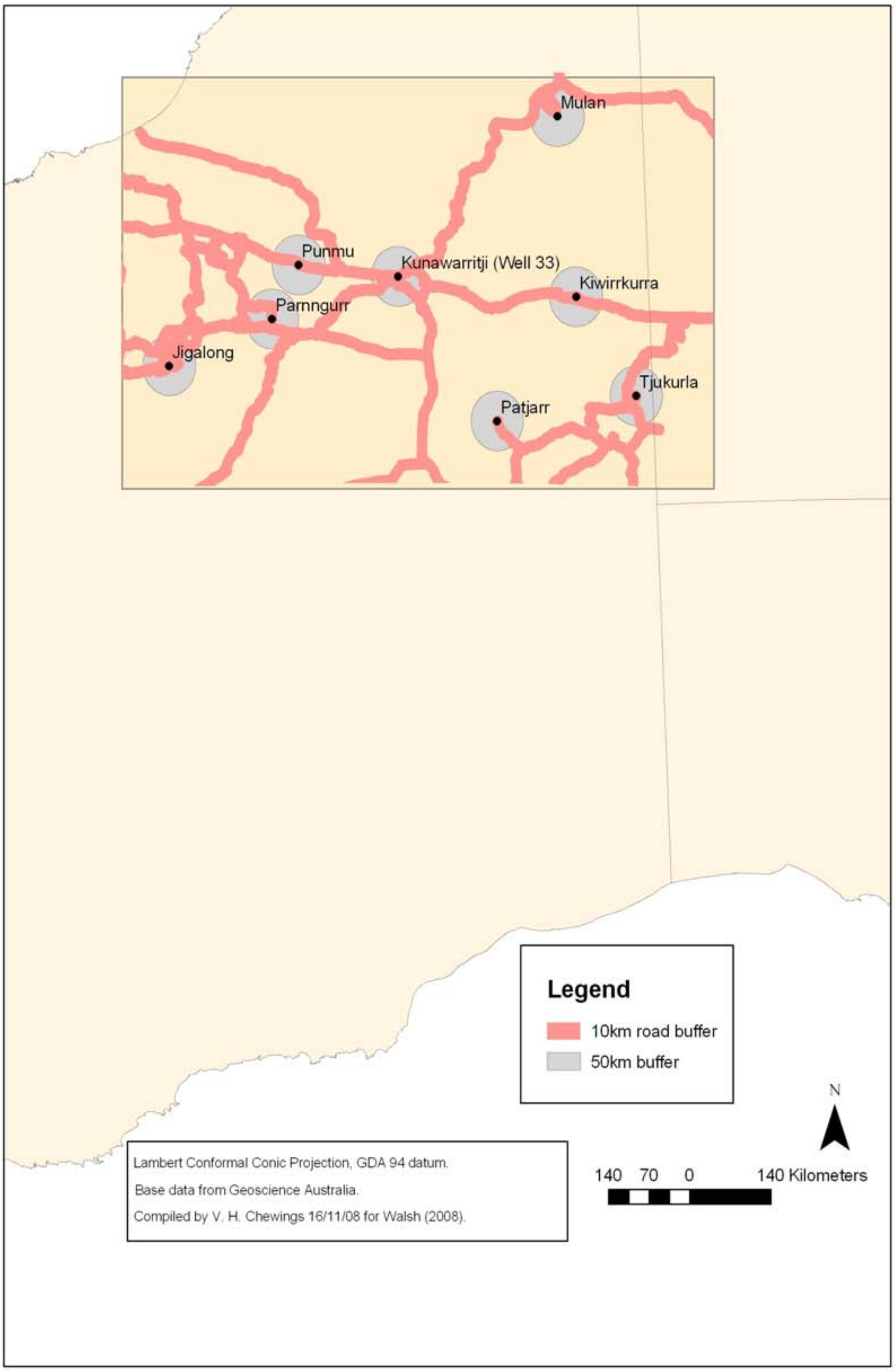

Figure 10.5 Radii and primary inter-settlement travel route corridors between Martu and neighbouring Western Desert settlements within which resource use, fire ignitions and other land use and management activities were concentrated.

Table 10.2 Traditionally-derived cultural elements contributing to socio-ecological sustainability on Martu lands in pre-settlement times and continuing to at least 1990

Ontological / philosophical constructs

- persistence of Martu *wangka* & dialects in which differentiated knowledge of species & ecosystems was embedded
- custodianship of regional lands & affiliation to discrete areas & sites
- world view with *Ngurra–Martu–Jukurrpa* ontology
- *kanyirninpa*, reciprocity, & other
- intergenerational knowledge transmission through experience & observation
- extremely high adaptability & flexibility to familiar, local conditions

Spiritual

- increase sites & ritual performance
- song, story & religious artefacts

Socio-political mechanisms

- high mobility within & across estates
- generally dispersed populations with short-lived gatherings (~ dispersed resource use pressure)
- kin connections to *yinta* & surrounds, mediated resource rights, access & negotiation
- flexible but negotiated tenure constrained others from un-controlled or unknown access
- forager, IEK & manager specialisations & roles (stewards & wise people)
- strong authority from elders contributing to internal social cohesion
- individual rights & responsibilities known & enforced

Economic

- species rich & diverse inventory so when one species reduced could switch to another
- majority of economic resources secured from local area (some traded in) so in interests of people to 'manage' short supply resources
- adequate food to meet nutritional /physical needs

Ecological / geographic

- intensely named landscape so reference points for collection & 'management'
- ecosystem productivity enhanced through burning, rainfall, & keeping surface waters open
- specific species productivity enhanced through above & also dispersal, disturbance promoting regeneration & habitat modification
- reliance on natural resources through primary or limited secondary production
- resource species classification, knowledge acquisition & monitoring

Technological

- burning as a major tool
- limited multipurpose tool suite based on timber & lithic materials
- walking to secure resources

Personal

- warm, humane, compassionate, resilient & humorous individuals (Tonkinson 2007:56)
- healthy, vital, active people

Table 10.3 Modern elements destabilising socio-ecological sustainability of Martu resource use and land management

Ontological

- no legal ownership of Park lands to 2007 so reduced incentive to 'manage' them
- decline in Martu *wangka* dialects including ecological language; replacement with Aboriginal English with less specialisation
- truncated ceremonial stages (Tonkinson 2007)
- decline in local increase rites for species (Peterson 2000)
- anxiety over cultural site damage by outsiders
- significant interruptions to intergenerational knowledge transmission
- unknown changes in ontological & philosophical concepts

Socio-political

- large settled populations so far fewer people dispersed to burn, manipulate, know & 'hold' lands
- looser definition of estate areas & decline in mediated resource rights in settlement radii
- new land users & outsiders who do not know or respect cultural protocols
- largely uncontrolled access by explorers, miners, tourists
- weakened authority of elders; socio-political 'leaders' now English-speakers, middle aged, limited experience 'on-country'
- demands of institutional 'representation' (including time, conflict over resources, personal vs 'community' interest) detract from time for customary practices
- responsibilities to family, sites & culture weakened
- urban migration so less knowledge & manipulation of lands

Economic

- welfare dependency and reliance upon government sources
- bush resources complement to other income diminishing (hybrid economy)
- dollar expenses for transport and travel were high
- extremely limited conventional monetary & employment options
- pursuit of private sector income especially mining royalties
- narrowing of natural resource inventory
- localised declines of high value resource species
- inadequate food quality to meet energy / physical needs

Ethno-ecological / geographic

- decline in known, named places & decline in knowledge of those places & surrounding lands (fear of less known lands)
- ecosystem production associated with surface waters had major decline
- ecosystem productivity declined through feral animals, weeds, wildfire
- loss of most small–medium sized mammal resources
- spatial land use intensification within settlement radii & eastern Karlamilyi region
- limited knowledge of national & global degradation of natural resources

Technological

- subterranean water, buildings, electricity etc. infrastructure needs maintenance, also increases dependency on whitefellas
- vehicle tracks that contribute to erosion, weed dispersal
- non-degradable material goods ('rubbish')

Personal

- extremely high substance abuse (R. Tonkinson 2007)
- high mortality & morbidity (R. Tonkinson 2007; M. Tonkinson in press)
- anxious, traumatised, exhausted, demoralized individuals (M. Tonkinson in press)

By contrast to the elements of continuity (Table 10.2), there have been significant changes in practice and knowledge on Martu lands that impact upon ecological sustainability of subsistence and other land use practices (Table 10.3). The combination of these elements influenced ecological integrity in positive and negative ways. Overall, whether there is balance between these elements is unknown. It may be that in 1990, the positive elements slowed but could not reverse declining trends in biodiversity. These human–ecosystem interactions were complex ones with multiple domains that need to be considered in planning for sustainable resource and land use.

The notion of 'cultural integrity' is pertinent to this study because of apparently tight links between cultural practice and ecological integrity. However, unlike ecological integrity, there are no well-established parameters of 'cultural integrity' that relate to 'people and country' and its condition. Several studies have proposed parameters relevant to different groups or regions. For example, Walsh (2000) suggested preliminary socio-economic indicators for sustainable use of Aboriginal lands in central Australia.[333] Smyth and Beeron (2001) developed cultural indicators for the management of the WTWHA using a pressure–condition–response framework. These studies endeavoured to have cultural values (related to those in Table 10.1) recognised within more conventional ecological reporting.[334]

Internationally, linguists, ethnobiologists and others have investigated the interrelated threats faced by linguistic/cultural diversity and biodiversity (Maffi 1996). They recognise that locales of high linguistic and biological diversity often overlapped. The attrition of languages correlates with the fragmentation of indigenous ecological knowledge. Assessments of the state of Australia's 250 indigenous languages show a rapid decline with predictions of their extinction by 2050 (McConvell & Thieberger 2001). In parallel, the acuity of ecological knowledge and practice can be extrapolated to have diminished nationally (McConvell & Thieberger 2001). In 1990 and 2007, Martu *wangka* remained the first language of a majority of Martu on the outstations; however, there has been greater amalgamation between dialects and increasing use of Aboriginal English with the likelihood of a downward language trend from 'strong' to 'threatened' status (McConvell & Thieberger 2001). Martu children continue to be active hunters (Bird & Bleige Bird 2004), thus elements of traditional ecological knowledge and practice persist in younger generations in the 2000s. These intergenerational continuities in the language underpinning ecological knowledge, foraging, burning and associated practice may contribute to the persistence of ecological integrity (Maffi 2001).

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[333] This was based on a large body of data of land use and management issues identified by 200 Aboriginal people from ten areas in workshops with nine non-indigenous facilitators over 1996–1999.

[334] Similarly, ecological and social aspects of Aboriginal culture have been overlooked in national reporting on 'Aboriginal disadvantage' which concentrate upon health, education, housing and other parameters (e.g. DIA 2005). Garnett and Sithole (2007:29) have argued that indicators associated with 'active participation by indigenous people in CNRM' need to be included amongst the national indicators.

Throughout this dissertation, there is a strong argument for an integral role of Martu knowledge and practice within national park management, on the one hand. Ideally, there are opportunities for all parties involved and most importantly for motivated, capable Martu experts and younger people. On the other hand, there is a strong caution because relevant skills, knowledge and capacity documented at one point in time will diminish in a context of rapid eco-cultural change. Individual, person to person and intergenerational changes in knowledge and skills appeared to be high (Ch. 6). A risk inherent in potential applications of this research is that the knowledge, skills and practice of Martu individuals have diminished over time. Thus, both Martu and national park staff could be misled in their understanding of what is possible to achieve. However, a yardstick that tempers judgements of longitudinal decline in ecological knowledge is the comparison, not of younger Martu people with older Martu people, but of Martu cohorts with their wider Australian peers. Martu who live in homeland settlements, travel and hunt 'on country' will generally know more about their local lands than people from urban and other Australian environments.

10.3 Implications of the thesis findings for National Park and wider ecosystem management

10.3.1 Approaches to 'integration' through simplistic or complex paths with different consequences

Whilst the subject of this dissertation was the land use practices and knowledge of Martu, its object was the national park and ecosystem management. It has been argued that Martu knowledge and practice were ***integral*** to the maintenance of ecosystem processes, biodiversity and park co-management. Here it is concluded that Martu–DEC relations will govern co-management and its effectiveness. The engagement (and prevailing disengagement) between Martu and CALM in relation to RRNPk was analysed in Chapters 8 and 9. There is a substantial challenge in ***how*** to bring two systems of concept and practice together. Real co-management is impossible without an equitable framework that unites these systems. The emergent thesis of co-management would be disproved were it not possible to see how co-management could work.

Chapter 1.3 introduced the importance of recognising that Aboriginal and non-Aboriginal world-views contrast. Figure 1.5 portrayed a simple concept of relations between Martu and the then CALM that were orientated to co-management as envisaged early in this research. Within this conceptual framework, the dissertation gave greatest emphasis to contemporary Martu views and assessed their potential relevance to co-management. Figure 1.5 is adapted in Figure 10.6 to better illustrate the long evolution of a system of Martu knowledge and practice (Ch. 2.2.3), the rapidity of change in Martu lives, and the economic and political context in relation to other land users and other state and federal government policies and legislation. The two overlapping spheres indicative of Aboriginal and non-Aboriginal domains are a common representation of co-management and an ideal from which this dissertation began. During the study and to the early 2000s, these were conceptualised as separate spheres of Martu CNRM and DEC NRM priorities with overlap increasing from minimal to slight.

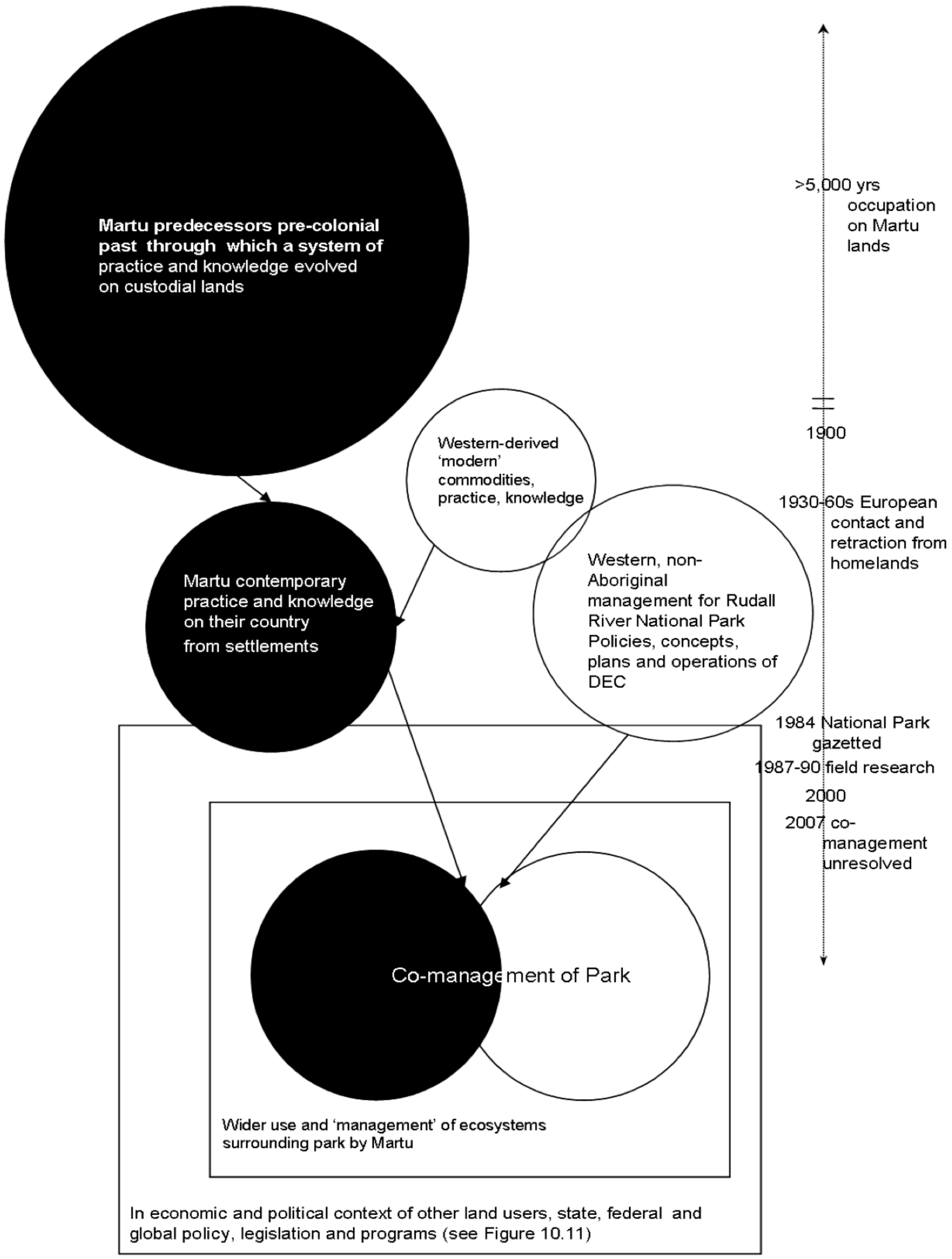


Figure 10.6 Conceptual framework within which the Martu domain was historically dominant then incorporated Western elements and then, ideally, meets the Western NRM domain to achieve co-management with the Department of Environment and Conservation

Figure 10.6 is developed in Figure 10.7 in an adaptation from James (2005). She proposed a concept of ‘idea-seeds’ that are translocated or moved from one racial domain to another to be adopted within that domain. As a ‘seed’, these ideas then ‘grow’ and ideally, contribute to greater trans-cultural understanding. This dissertation adapts and extends the ‘idea seeds’ concept by considering the number and growth of these ‘ideas’. Further, they are presented in relation to racial spheres that overlap as needed in co-management, whereas James (2005) portrayed them in disconnected spheres.

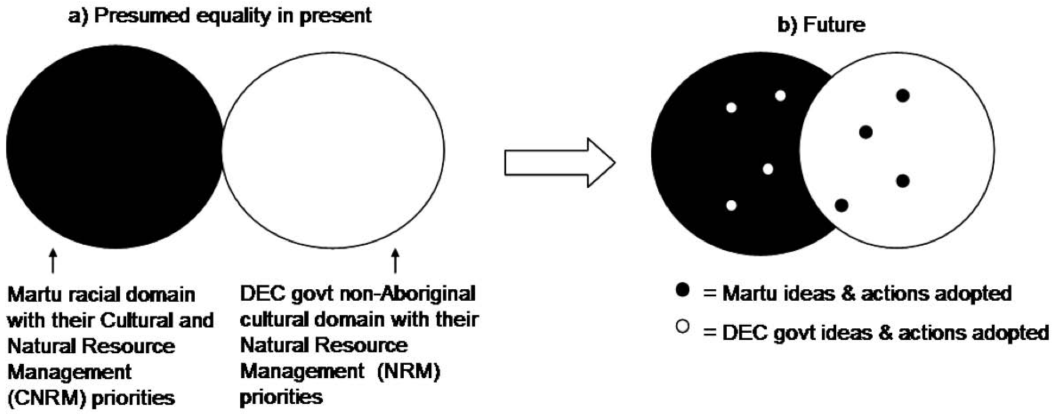


Figure 10.7 Conceptual diagram of exchanges between Martu and DEC (Scenario a adapted from James 2005)

Hill (2003:176) offered an alternative concept of dual toolboxes for land management to jointly engage indigenous and non-indigenous people, specifically for fire management. This has attracted the attention of DEC researchers (Burrows et al. 2006). The two toolboxes lie within the Aboriginal and Western domains respectively. Hill later adapted this as a bridge metaphor which has conceptual merit as it recognises the parallel existence of two systems of knowledge, language, law and operations or practice. It identifies the need to ‘bridge’ the overlapping space through the negotiated agreements required in a co-management situation.

Figures 10.7 and 10.8 differ in that the former emphasises the constructs of institutions and the latter emphasises the constructs of individuals and the processes of exchange. However, there are significant shortcomings in concepts symbolised as equal circles (Fig 10.7) or equal pillars (Fig 10.8). Firstly, there are no clear processes to facilitate exchange between the spheres. Secondly, they imply the power relations between Martu and DEC (or indigenous people and government organisations) are equal. In terms of power relations, there has been a strong inequality between the power held by Aboriginal people and Western institutions. A minority–majority population difference, the dominance of dollars and financial resources in the government sector, the centralisation of Western law and decision-making and the relative paucity of documentation of Aboriginal ecological systems contribute to, and reinforce, the imbalance.

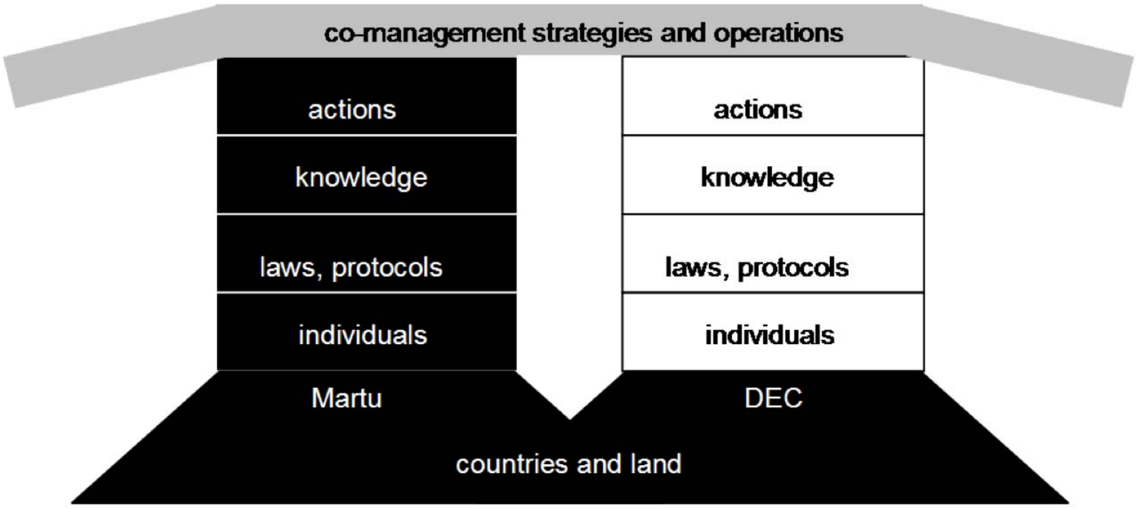


Figure 10.8 Conceptual diagram of major components of indigenous and non-indigenous systems to be bridged (Adapted from Hill 2003)

Figure 10.9 contrasts the outcomes of exchanges in three scenarios—a 'simple' approach to co-management and then two complex approaches to co-management—that recognise power differences and the synergies that are, ideally, possible when a more equitable approach is pursued.

The 'simple' approach portrayed in Figure 10.9(a) assimilates elements of Martu knowledge into dominant Euro-Australian priorities for NRM. This acknowledges that senior Martu have certain elements of valuable ecological knowledge that can be fitted into mainstream goals. It seeks to extract this knowledge and selectively interpret it within dominant state and federal government frameworks. The knowledge sought is that fortuitously congruent with Western conservation objectives (e.g. recognising that mosaic burning promotes species diversity). The principal NRM priorities (i.e. feral animal and weed management, fire control and threatened species survey) remain dominant and Martu are expected to accept and adopt these priorities. Martu may be offered jobs but predominantly in tasks consistent with those of conventional parks and Western NRM.

Martu field research and wider Australian literature (Woenne-Green et al. 1994; Smyth 2001; Muller 2003) indicate that the 'simple' scenario is most widespread in Western Australia state and federal governments. The simple model requires critique. There are indications that joint-management in federal parks has significant flaws. These indications include poorer ecological integrity in national parks compared to adjoining Aboriginal lands (Yibarbuk et al. 2001), intense conflicts within national parks over resource use (Palmer 2004) and extreme social dysfunction at Mutijulu inside Uluṟu-Kata Tjuta NPk. These conditions cannot be attributed to land management constructs alone, but these may have some bearing. In some cases, it appears that equitable co-management has been notional rather than actual.

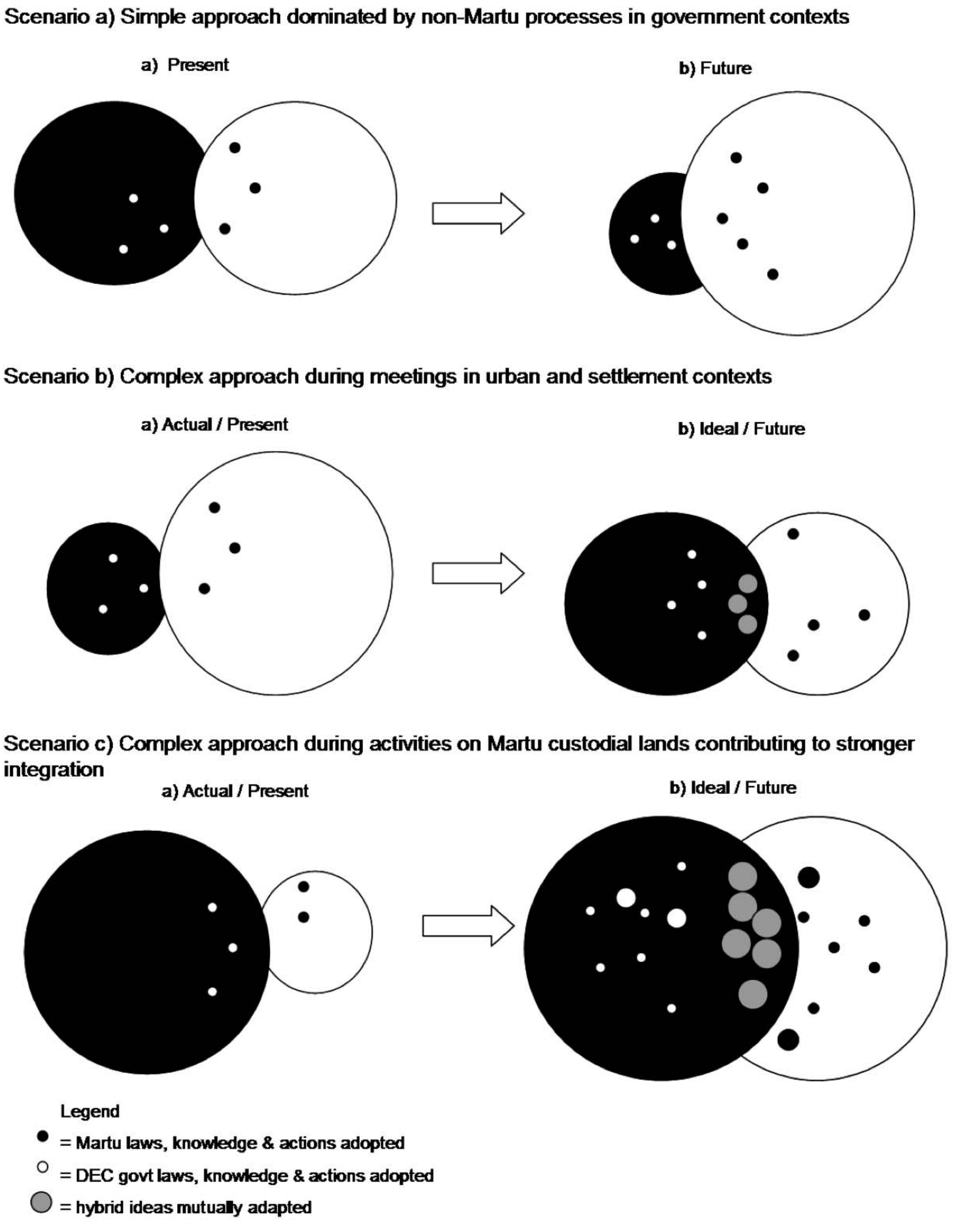


Figure 10.9 Conceptual diagrams of consequences of exchanges between Martu and DEC under three scenarios

Scenarios vary in following the parameters: Power relations in two spatial contexts (sphere size); Degree of collaboration (sphere overlap); Nos of 'ideas' translocated (nos of dots in spheres); Strength of 'ideas' translocated to become actions (size of dots)

In a national review, Smyth (2001:75) identified joint management as a trade-off between the rights and interests of traditional owners and government conservation agencies. In a Kakadu NPk case study, Muller (2003:75) characterised joint management as an uneasy compromise between sometimes coinciding but often conflicting agendas. She argued it assimilated Aboriginal interests into a predetermined government framework and set the relationship between co-managers as a political one.

A current study is investigating the different values and priorities of stakeholders in the north Tanami IPA (Walker in prep.). Preliminary findings indicate a diversity of management expectations and tensions amongst traditional owners, rangers, land council support staff and funding agencies.

To date, none of the organisations associated with Karlamilyi NPk–Martu lands have accepted co-management because the trade-offs they identified have been too great and the distracting forces too strong (Ch. 9). Few compromises have been made thus there has been little progress. In late 2007, it remained unclear whether co-management was mutually achievable or even desirable to Martu, DEC or the state government. In the long-term, it is unlikely that the simplistic, inequitable, intermittent and short-term approach to co-management will be effective.

This dissertation has identified the complexity of Martu land and resource use systems. It has shown the integration between ontological, social, economic and other domains (Fig. 10.1). These have shaped a sophisticated inter-relation between people and ecosystems through both use and manipulation of resources. Within the Park, this complexity is greater because of multiple and often divergent ambitions amongst Martu compared with CALM. In light of this dissertation, it is necessary to reject a simplistic path to co-management because these are not simple systems. In any case, elsewhere in Australia ‘simple’ approaches do not seem to have been effective by ecological and social criteria.

Figure 10.9 proposes alternative ways to conceptualise the trans-cultural exchanges necessary to achieve more equitable co-management. Figure 10.9 (b) and (c) symbolise a major distinction in the power relations when Martu are in urban and settlement contexts or on their custodial lands. Martu (and other remote desert groups) have been observed to be dominant in the latter context and withdrawn in the former context (Ch. 10.4). Conversely, non-Aboriginal people are generally more dominant in urban contexts and uncertain in remote contexts. Figure 10.9 symbolises three parameters: the greater number of ideas exchanged when activities are ‘on country’ compared to urban contexts, the greater growth and strengthening of ideas in the hybrid space when there is more equitable exchange and the greater overlap achieved in co-management. This dissertation predicts that more equitable co-management will be achieved through greater emphasis in collaboration when ‘on country’.

The ‘complex’ path to co-management respects the different ontology, values, goals and strategies that exist between Martu and DEC. It requires an equitable compromise that allows each party to modify its conceptions. It does not presume exclusive legitimacy of either cultural system. It seeks to widen the area of overlap between Aboriginal CNRM and Euro-Australian NRM. This requires equitable, mutual processes of change; thus, it demands slower, steadier, long-term processes that facilitate inclusiveness of local Aboriginal people, and it demands significant evolution within government systems toward Aboriginal engagement on Aboriginal terms. It proposes the need for government to balance its power relative to local people which will require a reduction in the absolute power a government has in specific situations. True co-management requires a theoretical and practical hybrid space wherein ideas can combine and grow stronger to become actions. A strengthening of ideas within internal racial domains contributes to a strengthening of those in the collaborative space.

In shifting from theory to practice to achieve complex genuine co-management, participating parties need to determine co-management actions. The actions and initiatives of Martu would be indicative of their priorities and objectives. If this approach is accepted, outsiders need to observe and ask Martu groups what they want from co-management (if they want it at all). A critical early step would be to genuinely and effectively collaborate amongst Martu to find out what they now view as practical priorities. With insight, CALM ecologists wrote:

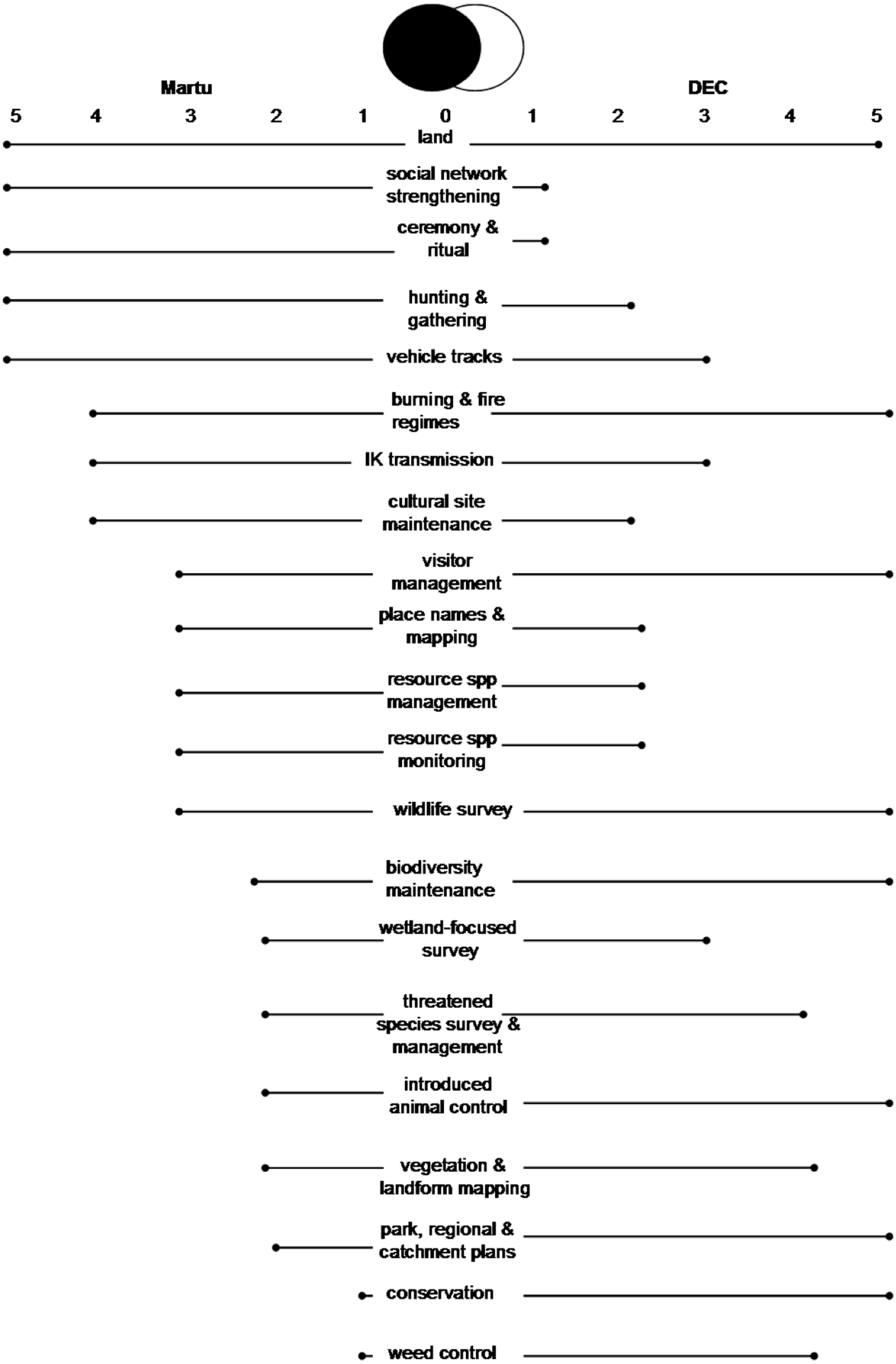
> Acknowledgement of differing land management objectives is critical to improved NRM in the region. (McKenzie et al. 2002:53).

This dissertation has identified topics of congruence and divergence between Martu and the state government conservation department in respect to Martu–Karlamilyi Park lands. Disagreements over park tenure had been the subject of strongest difference voiced by Martu and their representative agencies (Ch. 8.4.3 and 9.2). Hunting has also repeatedly emerged as an issue of difference between Martu and state agencies (including in 2007). The predominant attention to these subjects by state and Martu representatives has seen little progress in agreements or practical applications at the cost of greater ecological and cultural fragmentation and dysfunction. The ethical position would be to identify and build on points of congruence whilst also recognising points of difference for future negotiation. Effective cross-cultural collaboration is more likely to occur through commonalities rather than differences.

10.3.2 Similarities and differences between Martu and Department of Environment and Conservation priorities for CNRM

This dissertation proposes that the processes to achieve change over time must recognise the detail of common and different land management priorities and then focus applied management on those areas of commonality. Figure 10.10 identifies the major priorities of Martu and DEC in relation to resource and land management. It suggests a notional rating that identifies the relative importance of that particular subject to each party based on the findings of this dissertation. The subjects of greatest commonality are the ones where the combined rating is close to zero or neutral. These are proposed as the topics for action in the initial applied steps toward co-management.

This diagram is for heuristic and information summary purposes. It provides a means to conceptualise similarity and difference in Martu and DEC priorities. This is intended as a starting point for more informed negotiation among the parties, rather than a final or static analysis. This dissertation advocates that, due to the long failure to resolve co-management and the higher potential for conflict over topics of difference, it would be more constructive to pay attention to topics of greater mutual interest in steps toward co-management. Thus, attention to the subjects of difference should be deferred.



Martu
DEC
5
4
3
2
1
0
1
2
3
4
5
land
social network strengthening
ceremony & ritual
hunting & gathering
vehicle tracks
burning & fire regimes
IK transmission
cultural site maintenance
visitor management
place names & mapping
resource spp management
resource spp monitoring
wildlife survey
biodiversity maintenance
wetland-focused survey
threatened species survey & management
introduced animal control
vegetation & landform mapping
park, regional & catchment plans
conservation
weed control

Figure 10.10 (facing page) Comparison of Martu and Department of Environment and Conservation priorities for cultural and/or natural resource management knowledge (or research) and practices (or operations) (5 = high importance, 1 = low importance). Source material is from Martu as reported in Chapters 4–8 and CALM sources (Chapter 9 and McKenzie et al. 2002; Burrows et al. 2006) To compile this figure, subjects of common interest to each party were listed starting with those of importance to Martu. Those of no common interest were not included e.g. administrative reporting on park management outputs for DEC or settlement shop supplies for Martu, even though these had an indirect influence on park use and management. Tenure and governance were excluded because of their intractability. In an Excel table, each identified subject was allocated a rank relative to other subjects of importance to Martu and DEC. The distribution of ranks across all subjects for each party was near even i.e. four of highest rank for DEC, three of lowest rank. The ranks were notional ones that were synthesized from within each group; they did not reflect the intra-group diversity of opinion on each subject. Whilst the subjects were of mutual interest they were not necessarily of the same view within each group e.g. hunting was of some mutual interest but for very different reasons.

In totality, between Martu and DEC the topics of congruence are few. Figure 10.9 indicates that topics of greatest mutual interest were vehicle access and track management, burning, visitor management, place names and mapping, monitoring, resource management, and Indigenous Knowledge transmission. These were also topics where applied, practical actions could be undertaken jointly. Examples of the topics of extreme difference between Martu and DEC priorities included social networking, ceremony and ritual, management plan preparation and weed control. For example, from a Martu perspective, whilst *Jukurrpa* Law and ritual provide a central basis 'to hold country' they articulate no role for external 'land managers', including government, in this domain.

Plant and animal resources were a major subject of mutual interest to Martu and national park managers. However, interpretations of 'resources' were radically different for each party. Chapter 5 demonstrated how certain species were utilised by Martu, the research focus being upon food resources. Other values imbued within species as kin, *Jukurrpa* characters and more were identified (Fig.10.1). The consumption of species was central to Martu views of their perpetuation (Fig. 10.3). By extreme contrast, conventional Western Australian park management held the view that biota is to be protected, conserved and preserved. The dominant scientific position has been that species are publicly owned 'biological resources' with roles within an ecosystem and that local human use is inconsistent with preservation.

For resources to be managed they need to be culturally defined (Hunn & Williams 1986). Amongst Martu, bush food, tobacco, medicinal and firewood species were those of greatest significance. Commonly, these were the more abundant species as economies of scale influenced harvest effort. By contrast, ecologists have conventionally placed greatest emphasis upon rare, threatened and endangered species; consequently, greater survey and management effort is directed to rare rather than common species (McKenzie et al. 2002).

Whilst rare species had been of interest to some Martu, they were not the species of greatest resource value. Martu and state management cultures had very different definitions of resources within the GSD region and the national park, thus potentially different management regimes. A major conclusion of this dissertation is that resource co-management on Martu lands needs to be orientated to the species of importance to Martu that are locally vulnerable. This concurs with the proposed directions of the Kuka Kanyini project in South Australia which aims to increase the numbers of wildlife species preferred by Anangu–Pitjantjatjara people (Wilson 2002; Wilson et al. 2004).

Another subject of overlapping interest between Martu and DEC was indigenous ecological knowledge. Amongst Martu foragers, the comparison and contrast of observations of species biology was a subject of great intellectual interest. They were students of their lands; knowledge and learning were accorded high regard. In 1990, Martu parents, grandparents and leaders articulated strong desires for younger Martu generations to learn of their lands and its elements. Certain Martu also put substantial effort into 'teaching up' outsiders including researchers. In parallel, amongst individual DEC staff there has been recognition of the value of IEK to science. In particular, the knowledge of Martu and other Western Desert people has expanded scientific knowledge of rare and threatened species and burning regimes (e.g. Burbidge et al. 1988; Pearson & Ngaanyatjarra Council 1997; Pearson et al. 2001; Burrows et al. 2006). This congruence of interest is another important area to build upon in co-management. However, the intended audiences have been very different, with Martu being orientated to younger Martu generations and interested outsiders; whilst scientists communicated principally to other scientists and Western land managers. Lamentably, as scientific recognition of Martu ecological knowledge grew, there were signs that its appreciation by younger Martu had dwindled. In future steps toward co-management, it will be crucial that equivalent or greater effort be directed to intergenerational knowledge transmission amongst Martu.

Bushfires and burning was another topic of strong mutual interest between Martu and DEC. Nationally this is recognised as a concern common to many indigenous and non-indigenous land user groups (e.g. Cary et al. 2003). The purposes of burning intended by Martu and DEC had some overlap. This study found that Martu women foragers burnt principally as a tool to hunt, consistent with later findings of Bird et al. (2002). Burns also perpetuated a suite of corollary benefits. Martu less commonly expressed the rationale 'to clean up country' than reported from northern Australia (e.g. Bird Rose et al. 2002). The proprietorial, foraging, economic and other values had immediate, short-term and long term returns to certain individuals and groups. Bird et al. (2005) also identified some of the costs to Martu hunters who desired other resources, and the tensions between different burning and land management objectives amongst Martu. DEC's purposes for burning were nature conservation through the maintenance of landscape and habitat diversity, habitat protection for rare biota and the reduction of extensive hot wildfires (Burrows et al. 2006). Human life, asset and property protection have also been standard objectives of all state agencies through bushfire prevention and suppression. The reality on Martu–Park lands has been a dominance of Martu burning purposes (especially species specific hunting, signalling) and lightning strike ignition with little applied fire management by DEC. During the study, there were preliminary indications that Martu practices had re-applied a medium-grain mosaic during the homelands movement of the 1980s and a medium to fine mosaic to at least 2005; however, anthropogenic ignitions have also contributed to extensive wildfires at locations distant from settlements (Bird et al. 2005).

Herein, an often unspoken dilemma exists for ecologists and conventional national park managers. Wildlife utilisation and hunting were major drivers of the Martu burn regime. The very practices criticised or prohibited by certain Euro-Australian ecologists and NRM management planners have been fundamental to the burning and wider land management regimes of Martu. These practices and consequent mosaics appeared to have contributed to relative ecological integrity on lands in proximity to Martu settlements. Furthermore, the expansion of the track network by Martu has also dispersed the spatial patterns of ignition and subsequent burns.

These dilemmas have been repeated for the maintenance of indigenous ecological knowledge. Hunting, gathering and vehicle travel were the principal activities through which this knowledge was refined and transmitted. Knowledge of species, their behaviour, habitats, phenology and more was reliant upon resource monitoring and foraging practice. Individuals refined knowledge and contributed it to the collective pool of Martu knowledge. The acuity of Martu ecological knowledge reflected their contemporary and active role as hunter-gatherers. Not surprisingly, on Martu lands, where the persistence of a hunting practice has been relatively strong, key Martu hunters have been found to be holders of some of the most detailed ecological knowledge in the Western Desert (Ada Nano, zoologist, pers. comm. 20/6/06).

Western Australian government agents have repeatedly threatened to exclude hunting and off-road use by indigenous land users from protected areas. This was one secondary point of disagreement in 2007 ‘Indigenous Conservation Title’ negotiations (Ch. 9.2). This exclusion potentially undermines the very practices that appear to have contributed to ecological and cultural integrity within the Karlamilyi Park and wider Martu region. Across jointly managed parks in Australia, hunting is also a common subject of difference but one with potential solutions. For example, the ideal in Kakadu NPk is to allow for local customary harvest that is jointly monitored and, where necessary, customary or Park regulations are applied with traditional owner consultation (KBOM 2007).

The 2007 proposed ‘Indigenous *Conservation* Title’ Bill (my emphasis) by the Western Australian government Office of Native Title risks perpetuating a mismatch between desert Aboriginal and state government ideals.[335] Martu have never claimed a ‘conservation’ ethic, neither a species specific nor biodiversity one. They had a pragmatic interest in ‘mix up’ country from which their diversity of resources could be

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[335] In February 2008, the ‘Indigenous Conservation Bill’ was to be tabled in Parliament despite little consultation amongst Martu on its content this included freehold title for the Park, a 99 year lease and protection of conservation values as well as traditional rights (Peter Johnson, pers. comm. 8/2/08). Conflicts between the latter two were to be resolved by the Minister for Conservation. Potentially, this would put greater emphasis on conservation interests over traditionally-derived Martu interests.

sourced but this was not a commitment to ‘biodiversity’ itself. They had a strong interest in sustained resource ‘utilisation’ but not ‘conservation’ per se. The likelihood of their informed and knowing agreement to the Conservation Bill seems remote. Should agreement be reached, the risks are that external agencies set ‘conservation’ outcomes and outputs that are inconsistent with what Martu could deliver. It is unlikely that co-management progress would be made with the drafting of agreements predominantly based on the regulations and policies of the dominant non-indigenous agency.

Terminological and conceptual changes to the proposed Bill such as ‘Collaborative co-cultural diversity agreement’ or even the commonly used ‘Protected area agreement’ would reflect objectives that are more mutually achievable. A closer convergence of natural and cultural resource management would parallel biological and cultural diversity maintenance. Nationally and internationally, this is identified as the common ground (Smyth & Beeron 2001; Maffi 1996; James 2005; White 2002). The IUCN protected area models that accommodated local people and their practices were recognised by the Western Australian government in a paper on Indigenous ownership and joint management (CALM 2003a). Category VI ‘Managed resource protection area’ is more applicable to lands surrounding Martu settlements than Category II National Parks. Indigenous Protected Areas (IPA) has been established in relation to this category but to mid 2007, there had been no substantive discussion about IPAs on Martu lands or within Karlamilyi National Park.

In the wider western and central deserts there are six declared IPAs and several developing ones (Fig 10.11). In policy statements, these provide opportunities for stronger recognition of Aboriginal practices inclusive of multiple land uses (including hunting) rather than an exclusive ‘conservation’ emphasis. However, the processes by which federal government priorities are resolved with local indigenous priorities are under continual development. For the Northern Tanami IPA, these are being investigated in an important study undertaken by Walker (in prep.). Preliminary results indicate that there are strong tensions within and between local, regional representative and federal agencies.

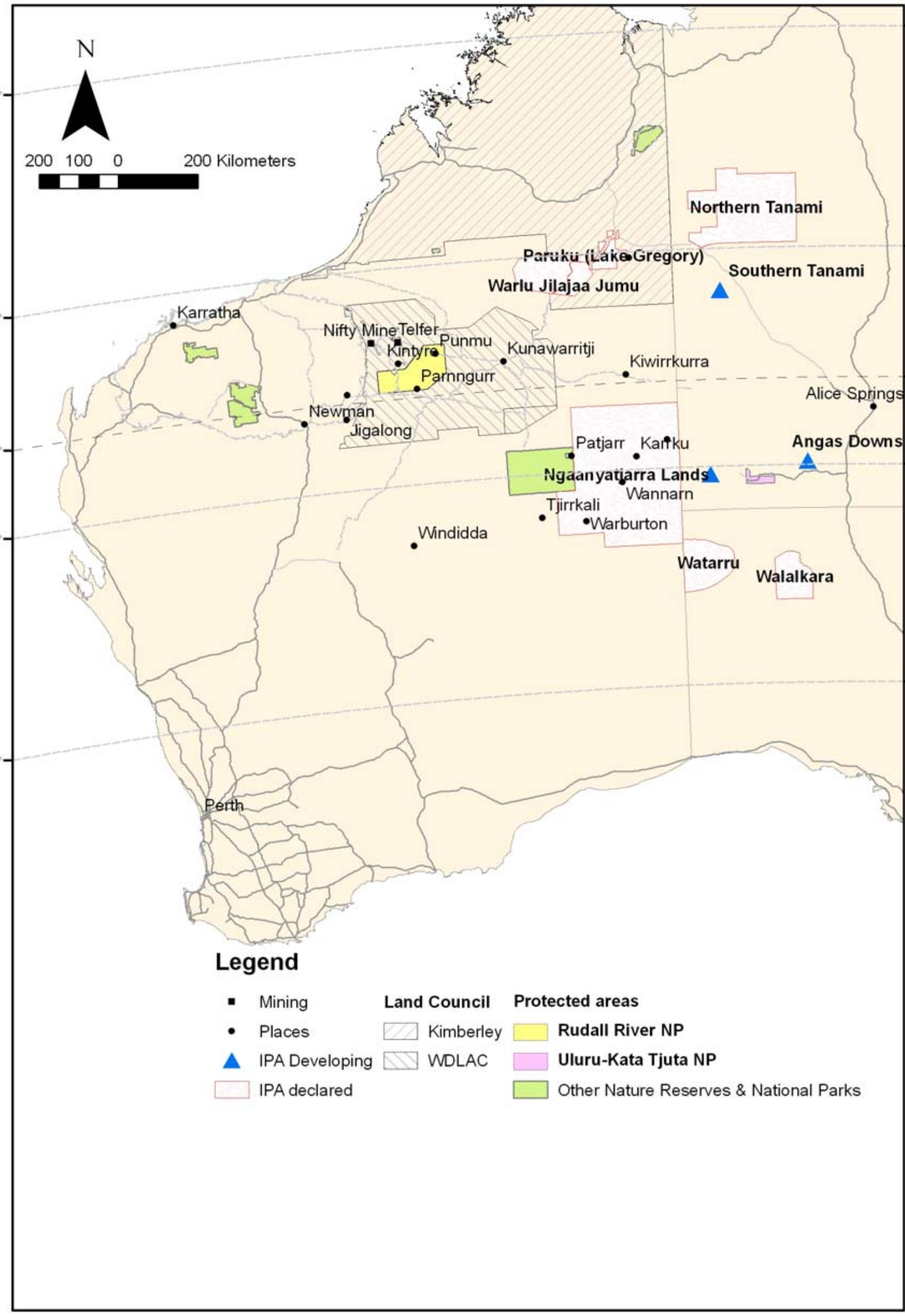

Figure 10.11 Indigenous Protected Areas on remote Aboriginal lands in the central and western deserts

10.4 Beyond the core thesis: the institutionalisation of Aboriginal land management and the roles of individuals

At the outset of the field research, my presumption was that if Martu knowledge and practice were found to be directly relevant to park management then the state agency and Martu would 'somehow' change to collaborate with each other. In hindsight, this presumption was flawed. This dissertation and earlier writings (including Wright 1989; Walsh 1992b) demonstrated the relevance of Martu knowledge and practice and have been widely cited (e.g. Altman & Allen 1992; Bomford & Caughley 1996; Davies et al. 1999). Furthermore, tenure, governance and planning mechanisms to achieve joint management for Rudall–Karlamilyi National Park have been proposed (Johnston 1990; Newman et al. 1993). Yet after more than 20 years, there is no systematic applied co-management in Karlamilyi National Park.

A paper on networks between Aboriginal people and conservation-related agencies (Walsh 1995) illustrated the many players and interactions required to achieve on-ground land management. This illustration was a significant step beyond the simple schema with which this thesis commenced (Fig.1.5). In 2007 in relation to Martu lands, the numbers of players, their institutions and their interactions was far greater than represented in the 1995 diagram or Figure 10.5. Furthermore, these players and connections have been extremely dynamic, some short-lived and some enduring.[336] Certain connections have been obscure or hidden due to secrecy, commercial–in–confidence and other factors; at times, they may have pulled in different directions.

Figure 10.11 illustrates some of the groups and agencies with a direct and indirect interest in Martu lands identified from literature and discussion with DEC and Kanyirinpa Jukurrpa staff in 2007. The importance of these actors in relation to this dissertation is that the achievement of co-management agreements and then applied management are, and will be, reliant upon recognition of ontological differences, yet synchronicity in action, between at least the key players.

Figure 10.12 identifies the many players that operated in 2007 in relation to Martu lands but not necessarily in relation to each other. If future research analyses the roles and interactions amongst these players, it is hypothesised they would be found to be extremely dynamic.

Chapters 8, 9 and Walsh (1995) analysed elements that constrained constructive relations between Martu and CALM, mainly from a Martu perspective. In particular, I identified a lack of common understanding over the purpose of a park, the belief amongst Martu that they were ably managing land, objection to legal tenure over the land being held by a state agency, a wariness about exclusion of Martu practice from the

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[336] Network analysis is an emerging field of socio-political research related to NRM particularly looking at the transfer of information and resources (Yiheyis paper). Methods and quantitative analytical techniques have been developed. A dedicated study would be required to more formally research this topic on Martu lands.

Park and a lack of interpersonal and organisational trust. Critically, CALM/DEC failed, or was unable, to offer Martu roles and/or resources valued by them.

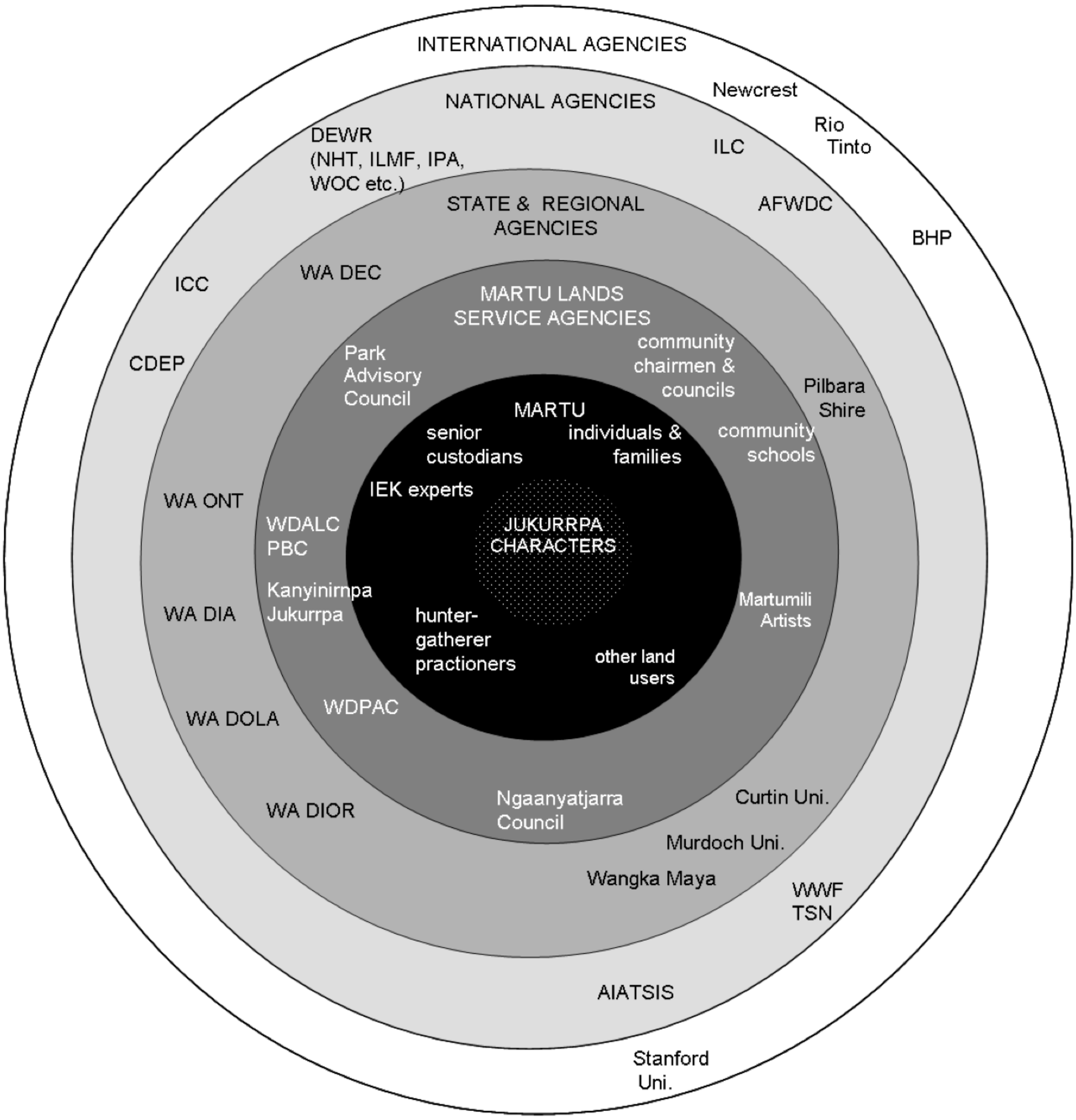

Figure 10.12 Key players influential upon the co-management of Karlamilyi National Park and adjacent Martu lands.

Powerful political, legal and cross-cultural forces exacerbate an almost intractable situation on Martu–Park–mining tenement lands. These forces are multifarious, complex, divergent and asynchronous. They centre on contestations over park tenure and the lure and influence of mining companies. It could be interpreted that Martu lands overlaid by the park are more important to Martu than Karlamilyi Park is to DEC thus Martu can afford to 'go slow' on negotiations that compromise their desired tenure acquisition. Alternately, Martu leaders in the early to mid 2000s pursued more financially lucrative avenues than those accessible through government NRM programs (e.g. Taylor 2006). There are many other factors inhibiting transitions from 'relevance' to recognition to co-engagement then operational co-management.

10.4.1 Increasingly institutionalised Aboriginal land management brings benefits and risks

Davies et al. (1999:84) reviewed ingredients for effective Aboriginal community-wildlife management projects in Australia. They identified factors common to sustainable, successful projects including co-management of parks. The list is instructive in relation to Martu–Park lands; if the 'project' was equivalent to 'steps toward co-management' only 3 of 18 factors identified by Davies et al. would be well met, with more than seven factors having no points of achievement on Martu lands in 2007. The latter factors included: no regional indigenous land management organisation, no strong stable government agency networks and no external landcare-type funds. Davies et al. (1999:100) concluded that the securing of long-term support from governments and indigenous organisations was one ingredient crucial to successful indigenous community wildlife management. Significantly, whilst Davies et al (1999) identified 'subsistence wildlife use' as an activity (relatively independent of institutions), it was overwhelmed by documentation from agency-driven projects both top-down and collaborative. Thus, traditionally-derived activities remained 'under the radar' of their analysis.

Authorised regional institutions such as land councils or corporate bodies have been key to facilitating the delivery of state and federal funds and priorities to remote area Aboriginal groups. They can be viewed as a third pillar underpinning the bridge between indigenous and western constructs (Fig.10.6). In relation to Martu lands, it is this third reinforcing pillar that has been absent or, at best, shaky with highly dynamic changes to representative structures and personnel within them. In certain parks, Boards of Management fulfil the bridging role, for example at Uluru, critically supported by the Office of Joint Management and later the Central Land Council joint management and Mutijulu liaison officers (Australian Government 2007; UKTBOM & PA 2000). On IPAs and jointly managed parks, regional Aboriginal land management organisations such as the NLC Caring for Country Unit and CLC Land Management section provided facilitation, planning, advice, motivation, administrative, financial transfer and other support to traditional owners. On other land tenures it was KLC Land + Sea Management (KLC n.d.), Ngaanyatjarra Land Management Unit and subregional organisations such as Dhimmuru (2006) that supported IPAs, ranger programs and other land management programs on represented lands. Within these organisations, particular outstanding individuals have played critical, sometimes irreplaceable, roles, in facilitating cross-cultural negotiations.

On one hand, government support to Aboriginal NRM may be commendable. On the other, it could be argued that it risks the increased displacement of traditionally-derived CNRM when the simplistic approach prevails (Fig.10.8). External engagement or support potentially comes to remote-area Aboriginal people with high costs.

Intermediaries between governments and very-remote area Aboriginal people have been required as cross-cultural mediators. These costs have included: the external imposition of land management priorities (typically fire, weed and feral animal control) that override local priorities; a heavy reliance upon highly literate and numerate outsiders both to administer grants, contracts and other income sources, and to compile written plans and strategies; and, the structuring and responsibilities of committees or corporations necessary to receive and manage funds but often incompatible with traditionally-derived authority structures. More (usually non-indigenous) administrators and coordinators reduce funding to Aboriginal land managers and applied works.[337] Government administrative demands have come at high financial costs that reduce to 'trickle down' to on-ground workers. This has been a common problem in remote areas, whilst not restricted to Aboriginal contexts it is certainly exacerbated within them.

In desert Australia, to what extent are institutional land management projects and programs reliant upon literate and numerate outsiders? Has their role been underestimated? How do the interests and skills of those cross-cultural 'mediators' shape local 'Aboriginal' projects? How can they best support the relative independence and uptake or revival of responsibility by local people? What happens when individual outsiders move elsewhere? These questions are most pertinent in regions where the critical mass of personnel and resources are extremely small and the presence or absence of a single person often makes or breaks success. A key problem on Martu lands is that the number of support staff and their trans-cultural Martu counterparts is extremely small and dispersed; there may not be sufficient critical mass.[338] Politically, these can be difficult questions to explore because the findings could challenge ideals of self-determination and external perceptions of exclusively 'indigenous' practice, thus opening the door to the charge that challenges are racially motivated. Conversely, without honesty of analysis, 'indigenous' programs may fail because the role of essential external people goes unrecognised.

If greater institutional support were forthcoming, would it offer better opportunities for Martu and CNRM? Alternately, would it unwittingly force greater dependency on non-indigenous personnel and institutions? Again, I think it depends whether a simple assimilative or complex collaborative approach is taken (Fig.10.8). Tonkinson (2007:42) asserted that Martu deliberately worked to maintain their autonomy through minimal and selective engagement with the dominant society and its government policies. He argued that Martu have accepted, or resigned themselves to, the social disadvantage and costs borne, their relative independence and autonomy being more highly valued. The challenge Martu presumably consider is whether a decline in

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[337] For example, the Tanami IPA feasibility assessment allocation was c. $100,000 with about 60% allocation to coordinator salary, 30% allocation to vehicle and operations and the remaining 10% providing CDEP top-up to Lajamanu rangers. Additionally, CLC resourced the feasibility study and subsequent declaration. CLC Land Management had 15–20 full-time non-indigenous staff across a region with 17,000 constituents.

[338] In mid 2007, about four non-Martu people had roles in current co-management negotiations and they all have other full-time commitments.

traditionally-derived practice is worth the trade-off in opportunities that may lie in more *whitefella* external support for these practices.

10.4.2 Bureaucracies need to transform to accommodate desert Aboriginal ontology and practice

An important lesson from this research and subsequent experiences is that Western economic, administrative and bureaucratic systems have had, and continue to have, powerful impacts upon the lives of Aboriginal people. There is a strong need for greater recognition and understanding of the influence of institutional structures and power relations (Ch. 10.3) upon cross-cultural CNRM.

In my view, these systems must make significant changes to reconcile with and engage Aboriginal diversity. The extent of abandonment, loss, adaptation, adoption and compromise amongst Aboriginal people, appropriately termed ‘deep colonising’ (D. Rose 1999 in 2001), has already been enormous and costly. Outsiders frequently describe ‘the Aboriginal problem’, as in the 2007 labelling by the Federal government of a ‘state of emergency’ in indigenous communities. I believe the capacity to change systems lies closest to one-self. Outsiders need to constructively reflect on ourselves as individuals then upon our institutions (Ch. 9.3.2). We must actively listen to the variety of Aboriginal people and groups then yield and adjust dominant systems. We also need to inspire, motivate and offer hope. There are important research questions such as: Where do the mismatches between the administration of Aboriginal CNRM and Euro-Australian NRM lie? How can government processes change to better accommodate traditionally-derived ontology and practices? There is a need to analyse the procedures of these bureaucracies rather than solely Martu or the Aboriginal ‘other’.

In international development contexts, there has been an expansion of attention from community participation to institutional change. This has been through local-level planning and action processes involving rural farmers and small land-holders (Pretty et al. 1995) to research into the ‘transformation of bureaucracies’ in government and international non-government agencies so they become more people-centred (Pimbert et al. 2000). A five year review revealed many challenges to the capacity within agencies to change but it did offer examples of improved policies and practice including a decentralisation of governance to regional levels (Pimbert 2004).

In concluding the book on first contact between a Martu group and white people, Davenport et al. (2005) headlined how ‘everything changed, nothing changed’ from 1964 to 2005. They called for a future where Euro-Australians recognise and discard their presumptions of sovereignty which deny Martu realities. They argued for an engagement within Martu language, conceptual frameworks and decision-making to secure a better future for Martu from the many directions by which that future could unfold. Effective change also requires profound changes within Euro-Australian perceptions and institutions.

10.4.3 In co-management, practical activities 'on country' must come before policy and planning

This dissertation proposes that it will be practical actions 'on country' that demonstrate the meaning of government national park policy and operations to Martu, and it has identified why and where these should be focussed. To date, applied operations by the state agency have been very limited. Thus, there has been little practical demonstration of the process and purpose of national park management and potential benefits to Martu or their country.

Another major lesson from my field research amongst Martu I only came to understand years later after many meetings with Aboriginal people in towns and settlements. The majority of this dissertation is about practice and action rather than knowledge and concepts. In the course of travelling, finding bush resources or explaining the lay of their land Martu people were active, articulate, capable and confident. This demeanour contrasted to a general quietness and withdrawal at meetings in settlements and urban contexts when generally only one or two Martu 'spokespeople' voiced opinions. This extreme contrast in character between people when on their country and when in Western-style meetings appears to be common across central Australia.

In 1990, the assurance Martu expressed when on country reflected the environment they had grown up in, where they knew and, in turn, were known by beings in the lands. The geographic realm in which younger Martu are confident will be that near settlements, roads and dinner camps visited and known to them. Facilitation of decision-making and planning processes associated with CNRM should be on or close to the familiar, custodial lands of various Martu groups. Martu change when they are on their country, thus engagement on their lands is a prerequisite to getting effective input to co-management. This is why there is greater emphasis in Figure 10.8c on exchanges occurring on Martu custodial lands.

The critical step toward applied co-management is to engage amongst Martu groups whilst active with practical tasks on custodial lands of the relevant groups. These activities should be those that constitute applied management from both Martu and DEC perspectives (Fig.10.9). Generally, Martu are practical, hands-on people rather than people who think in hypothetical or conjectural ways. It is in the course of such activities that translated questions should be discussed—What are you doing on your custodial/park lands? How do you want your future to be? Would you collaborate with DEC on managing those lands? DEC is interested in doing this work (showing or explaining what it is), what do you think of that? By being active, the relative passivity that is common at 'meetings' and 'workshops' is reduced. Iterative questions require a careful, considered, long-term and practical approach.

Practical actions must take priority over policy and plan development. This is directly contrary to current conventional approaches requiring policy and plans before actions, for example in IPA feasibility assessments and declaration. The most vital thing is to have resourced, capable Martu and support staff on the ground for regular periods over five years and longer. Cultural and natural resource management outcomes do not occur just by writing or talking, they require action.

If both parties want to persist with a co-management option, workable strategies that bridge the gap between Martu and DEC are necessary. Practical actions to find out what Martu want to do should occur through collaboration in multi-purpose country visits. These should combine cultural site mapping and management, vehicle track mapping, hunting and burning, and survey of key bush resource (food, medicine and other utility) species.[339] Facilitating intra- and inter-cultural transmission of Martu knowledge and practice through actions, observation and recording is vital to these activities.

10.4.4 Participatory planning and action offers an effective approach under certain conditions

Participatory approaches to natural resource management have been widely applied, particularly in international development contexts. The training of facilitators is both specialised and reliant upon localised innovation (Pretty et al. 1995). In the 1990s, adaptations of participatory planning and action frameworks were effective in actively engaging Aboriginal groups in enterprise planning and park management planning (Walsh & Mitchell 2002). This ‘effectiveness’ was manifested in strong local participation, plan outputs that reflected local content and priorities, and on-going works self-motivated by local people beyond the planning phase. However, participatory approaches require more time and personnel resources than is commonly available; their application appears to have been limited in recent years, although interest in the approach remains high.[340] Recently, there have been several critiques of participatory approaches (Christens & Speer 2006) particularly criticising the co-opting and misrepresentation of ‘participation’ by inflexible institutions. The recognition of a typology of participation ranging from coercive to locally-controlled governance is important. It is my view, that the participatory approaches effective in central Australia, under certain conditions, would also be readily adapted to Martu lands. One lesson after publication of the book on cross-cultural approaches to decision-making (Walsh and Mitchell 2002) was the importance of people from funding institutions and agencies also being participants to locally-based planning processes. This would be critical to them more clearly understanding the priorities of local people, recognising the need for adaptation and change in their systems and all parties being more directly responsible and accountable to each other.

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[339] In early 2007 when rewriting much of this dissertation, I drafted an A3 table of fie pages that specified ‘Applications of the Martu system in co-management’. This provided detailed actions arising from the content of each chapter of the dissertation. It has not been included in this dissertation but is available on request.

[340] In 2005, this book won the Planning Institute of Australia national award for excellence in scholarship, research and publication. I regularly receive enquiries from individuals seeking instruction or training in the approach. After more than a decade since a disparate scatter of practioners applied community-based planning approaches across central Australia, it would be timely to conduct a review and evaluation of participatory planning.

10.4.5 People are central and essential to land management

In the early writing of this dissertation, a thesis orientated to co-management seemed sensible and reasonable. After writing these last two chapters and with fifteen years experience in cross-cultural NRM, I am clearer on the risks and possibilities of attaining that goal. The core thesis was supported; however, to date the process of its application to co-management has been and is highly elusive. The necessary synchronicity of factors has failed to coincide.

At the outset of this research, I recognised people influenced ecosystem management. At the conclusion, I believe that they are central and must be the start and endpoints of both Aboriginal CNRM and Euro-Australian NRM. The actions of people shape the future of plants, animals and ecological processes. In particular, it is Martu people who must be supported through their family and kinship systems to resume the governance and care of their lands.

It is with greater depth of appreciation that I now appreciate the truth of Schaller's (1980) statement presented in Chapter 1.3 about the social and cultural basis to ecological problems. I concur with Langton's (1998:74) conclusion that:

> Sustainable ecological management is principally a problem of human decision-making.

Like other scientists, I advocate a people-centred approach to ecosystem and natural resource management.[341] Over the past two decades, within Australian NRM, links between people and land are now accepted. However, there are many constraints on coordination between custodians, landholders and scientists to implementation.

One flawed presumption is that Aboriginal people (and public servants) are homogeneous groups. Amongst Martu, there are hunters, politicians, entrepreneurs, opportunists, carers, teachers, and a diversity of individuals with different and sometimes conflicting interests. In DEC, there are individuals who genuinely want to work amongst Martu but overriding presumptions, unsupportive views amongst their superiors, protracted policy processes or scarce operational resources limit them. In my experience, particular personalities are more capable of 'getting things to happen' than policies. Practical change lies within the power of particular individuals. As Borrini-Feyerbend et al. (2004:428) concluded:

> the most important ingredients to get co-management moving are humane qualities rather than intellectual or technical proficiencies: a positive attitude, goodwill, curiosity, care, honesty, appreciation, respect …determination and courage.

[341] Demonstrated in the book "Planning for country: cross-cultural approaches to decision-making on Aboriginal lands' (Walsh and Mitchell 2002)

10.5 Personal epilogue: pessimism and optimism for future inter-cultural relations in land care

Like the patchwork patterning of burns and plant communities that characterised the study region, this conclusion has offered a mosaic of findings, inferences and proposed directions on multiple complex topics. It finishes with some personal reflections. After 22 years of practical and research experience in cross-cultural land management in Australia, I oscillate between despair and hope.

My pessimism is due to: the death of too many Aboriginal people too young; the vulnerability of real people to reactive, punitive government politic; the oft-repeated misinterpretations and mismatches at the cultural interface; the fragmentation of a rich socio-ecological knowledge system; the demise of unique eco-cultural practices; the expanding dominance of mining, economic rationalism, bureaucracies and globalisation; and the intensifying degradation of natural ecosystems. There is a trajectory of Martu and other traditional owners being urbanised and isolated from their custodial lands. The challenge is to slow and steady the rate of change to support people's dignity and well-being and concurrently, stem the degradation of arid lands. Unoccupied lands will become barren, quiet, dangerous, feral lands. The dangers of pessimism are exhaustion, apathy and inaction.

Optimism comes from: the commitment and integrity of certain colleagues (Aboriginal and non-Aboriginal); the resilience and generosity of many Aboriginal people with whom we collaborate; innovations linking land-based knowledge to modern technology; the energy of outstanding younger people who speak and act across languages and cultures; a commitment to local people and a provincial life; and the pleasure gained from being 'on country' to observe, collect, and share bush food plants, animals and other eco-cultural resources.

Cross-cultural research amongst Aboriginal people on their lands has enriched my life in irrevocable ways. It has contributed to my profession as an ethnoecologist and facilitator. I continually see 'country' in eco-cultural terms. I look for its resources and landmarks. I better understand what 'connection to country' means having buried my child in the red earths of the central deserts. My heart feels the meaning of 'a sentient landscape' through an *Ilweke* (Cypress Pine) where that child's spirit-tree continues to grow.[342] I place a stronger value on 'community', social connections and cooperation. I live amongst people who hold, care for and know my story. The signs of people who use their country bring the land to life. In the bush, footprints, abandoned car bodies, scattered tin cans, old cooking hearths all hold a story. It is local people's knowledge, skills and actions that keep the integrity of our ecosystems strong.

Hope and optimism are essential ingredients that we can offer each other. Hope comes from confidence in the knowledge, skills and capacity of individuals. Hope lies in the

[342] *Ilweke* (Arrernte) ~ *Callitris glaucophylla*

glimmer people have of their own strength, integrity and value. Outsiders should not be the ones to impose their vision or idealised, simple solutions to complex problems. Martu lands and the wider Western Desert is not a region with clear answers. Aboriginal custodians of land must have options to shape their visions for the future at individual, family and collective levels through governance and participation. They may choose to work with outsiders they know and trust. Outsiders need to listen, watch and reflect on how they change to accommodate Aboriginal ways.

Over two decades, I have scaled my personal hopes down to small, practical achievements. As a researcher, I want to leave documents offering an honest insight to rich, diverse desert cultures. These may provide a written legacy for the children of people figured here and future generations of Aboriginal and non-Aboriginal people. I was heartened that this research made a significant contribution to a successful determination of Martu native title.[343] For the future, this research argues for a re-examination of Martu and Euro-Australian relations in ways that sustain desert ecosystems. Positive, productive relations between collaborators are essential. It is vital that government agencies and administrations transform policies and procedures to better accommodate the practice and perception of ecosystem-based Aboriginal people.

It is likely that it will be applied practical, hands-on work on Martu lands within their domain that will bring significant beneficial changes to their lives and lands. Travelling, mapping, sharing knowledge, collecting bush resources, burning, fencing, cleaning soaks, and visiting far-flung places all contribute to good relations amongst local people and outsiders. These relationships reinforce well-being. Younger people may want support and employment under the guidance of older interested Aboriginal people, at best their senior, learned grandparents. Outsiders may have roles in providing resources, interest that validates local knowledge and empowering local people.

My constant hope is that Australian bureaucrats, politicians and the public appreciate all people who endeavour to know, work on, and hold country strong. Despite the challenges, I maintain my commitment to the active, productive support of cultural and ecological diversity within Australia’s peopled desert lands.

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[343] In 2008, after a long period in central Australia, I was invited through Kanyirinpa Jukurrpa (of Western Desert Lands Aboriginal Corporation) to take part in an External Reference group to guide the development of a Natural and Cultural Heritage Management plan on Martu lands.

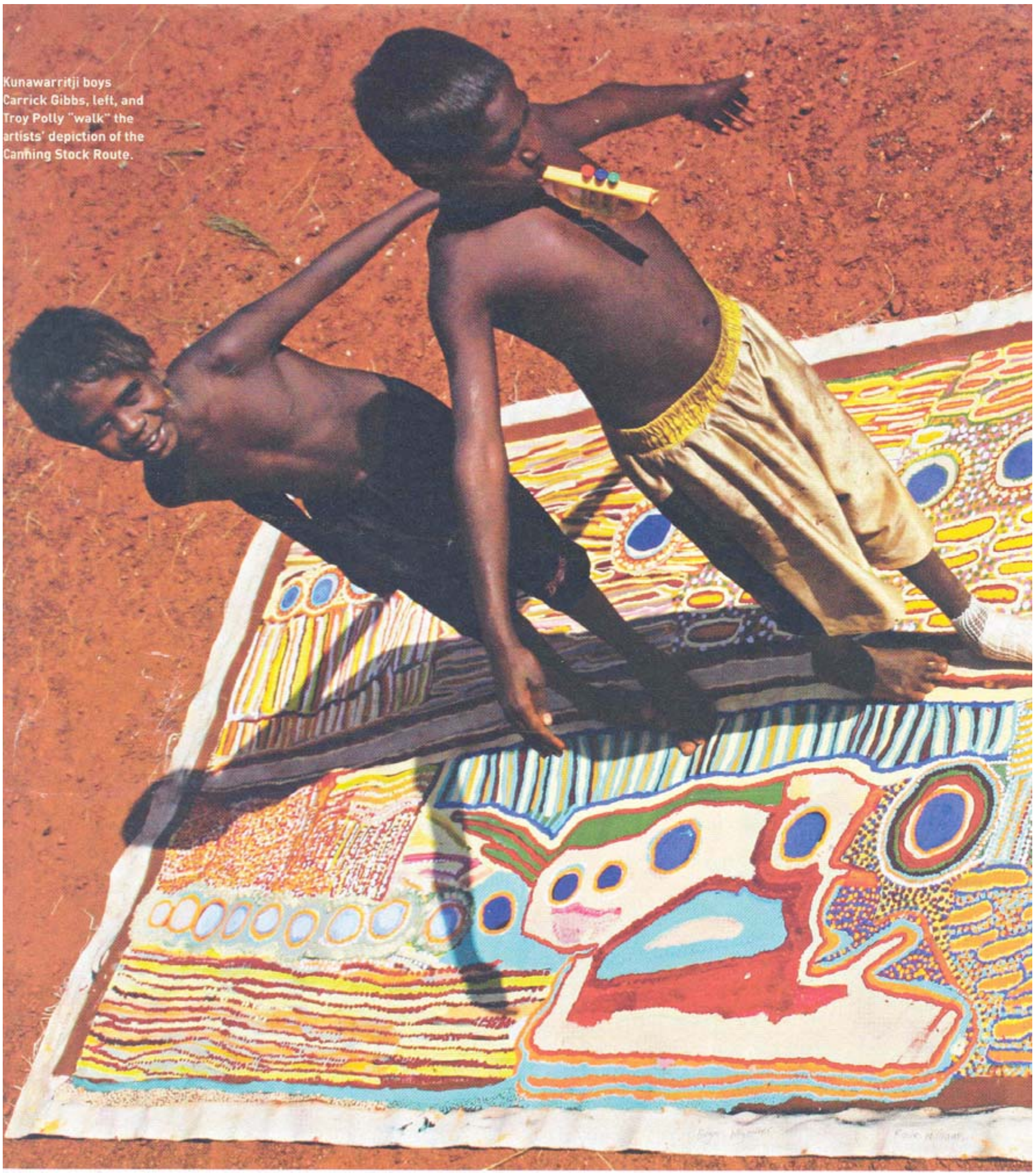

Photo 11.1 Carrick Gibbs and Troy Polly of Kunawarritji walk across a canvas of places painted by elders at Kunawarritji. In the 2000s, Martu children increasingly see country through paintings and less through on-site experience than their predecessors. The photo was by young Martu woman, Morika Biljabu (Laurie 2008). Morika is developing a new range of skills in multi-media production.

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Zonneveldt, M. 2007, 'Rio seeks Kintyre uranium ruling', *Herald Sun*, June 03, 2007 06:35pm.

12 APPENDICES

12.1 Previous publications and materials produced by the candidate from the field research

Multiple copies of all documents have been sent to relevant Martu individuals or the contracting organisations and lodged with Martu representative agencies (WDPAC and WA Aboriginal Legal Service). In 2006–07, the audio-visual materials were deposited with *Kanyirninpa Jukurrpa* historical archive who subsequently deposited these materials in the National Sound and Film Archive. These included colour scans from photographic transparencies and prints, audio tapes and VHS footage.

12.1.1 Refereed papers and chapters

Walsh, F. 1995, ‘Interactions between land management agencies & Australian Aboriginal people: rationale, problems & some lessons’, in Nature conservation 4: The role of networks, eds D. Saunders, J. Craig & E. Mattiske, Surrey Beatty & Sons, Sydney, Australia, pp. 88-106.

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Walsh, F. J. 1988, The influence of the spatial and temporal distribution of plant food resources on the Martujarra. Australian Archaeology, 25, 88-101.

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12.1.2 Community resource documents

Yirapartu, Naaju, Jakaru, Marralaltu 1992, Compiled by F. Walsh Stories of *pujiman* (bushman) days by four Martu women. University of Western Australia, 34 pp

Walsh, F. 1992, How to gather bush foods that grow in Martu country, 27 pp

Veth, P. & Walsh, F. 1986, Old camping places & plant use in Martujarra lands. The University of Western Australia.

12.1.3 Reports

Walsh, F. 1992a, Ethnobiological evidence to support objections by Western Desert Punntukurnuparna Aboriginal Corporation to proposed mining leases in the vicinity of Parnngurr (Mt Cotton).

Walsh, F. 1994, Ethnoecological evidence of Martu connection to land. Report to the Western Australian Aboriginal Legal Service and the Western Desert Puntukurnuparna Aboriginal Corporation.

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Bell, D. T. & Walsh, F. J. 1991, Traditional Aboriginal food resources of the desert: their domestication potential, Final report to the Rural Credits Development Fund, The University of Western Australia.

12.1.4 M.Sc. (Prelim.) Thesis

Walsh, F. 1987, Patterns of plant resource use by Martujarra Aborigines. Department of Botany. Perth, The University of Western Australia.

12.2 Notes on Martu *wangka* alphabet

Chapter 2.2.1 describes Martu dialects of the study region and Section 3.4.5 describes methods of interpretation and transcription in the cross-language context of the study. Throughout the dissertation, Martu wangka words and terms are embedded in the body text, these are translated in the footnotes. These translations have been sourced from Marsh (1992), with some expansion from (Hansen & Hansen 1992) and (Valiquette 1993). Species identifications were made during or after the field work.

The orthography used in this dissertation is that specified in Marsh 1992. Notably, this was distinct from the 'old' orthography used by Tonkinson and retained in Tonkinson (Tonkinson 1991).

Marsh (1992: 10) wrote:

> Martu wangka has 23 different sounds with important differences between them. The sounds of Martu wangka are written like this:
>
> a aa i ii j k l ly m n ng ny p r rl rn rr rt t u uu w y

Like most dictionaries, Marsh (1992) then gave a pronunciation guide to Martu wangka.

In this dissertation, Peter Johnson checked and corrected Martu *wangka* for consistent use of the orthography.

12.3 Example of primary data level from foraging trip field records typed into standard template

Appendix 3 most directly relevant to Chapter 3.8

Interested readers can obtain the full original data on application to the author.

RECORDS OF FORAGING AND OTHER EXCURSIONS FROM PARNNGURR

LANDSCAPE—TRIPS FROM THE COMMUNITY

EXCURSION NUMBER 22-0

DATE Tuesday 14/8/90

MOTIVATION Nancy Chapman visited at 8am to see what I was doing for the day. She said Rita and her were going for lunki. At 9am, earlier than expected, a group of women came over when Gil and I were packing. Navy & Daphne decided to stay in camp.

PURPOSE Specifically to get lunki from an area previously visited by Rita, Nancy and others. On a past trip there Rita killed a cat. She said there were several older burns made last winter and a new patch burnt about one month ago.

TRAVEL MODE—Walked

NUMBER AND NAMES OF INDIVIDUALS

Rita Simpson—digging stick, 1 L water, tomahawk, dog

Ida Taylor—digging stick, tomahawk, scarf, bag

Nyamaru Bidu—digging stick, tomahawk, dog

Jagiyu Biljapa—digging stick, tomahawk, bag, dog

Pukiyu (Jagiyi's sister)—digging stick, tomahawk

Gil & Fiona

PROVISIONS AND EQUIPMENT see above

DESTINATION Sandplain patch with small dune in hill hollow north of Parrngurr

ROUTE AND TRAVEL TIMES

9.28am 00 km depart Parnngurr

Route went north from Parnngurr following a track until that went east where we left the track, branched off & continued north onto sandplain patch. Returned in a more direct line to the road then followed that back to Parnngurr.

10.11am 2 km track crosses creek

10.38am 3.4 km group diverges from track toward stony quartz rise (steady walking pace over this distance @2.9 km/hr)

11.46am 4 km arrive at foraging site 22-2

1.06pm 5.8 km leave foraging site 22-2

2.05pm 8.2 km stop at creek crossing of track for rest and food preparation (steady walking pace @ 2.4 km/h)

2.45pm leave creek

3.25pm pause for 5 mins for event 22-3

3.34pm 9.6 km arrive back at Parnngurr

TOTAL TIME AWAY 9.28am—3.3 pm = 6 hrs 6 mins

NB There was an AAPA community meeting in the afternoon so women curtailed their excursion to be back for the meeting

DESTINATION RADIUS DIRECT FROM THE COMMUNITY = ??? km

MAXIMUM RADIUS DIRECT FROM THE COMMUNITY

Furtherest distance on point of walk = ??? km

TOTAL DISTANCE COVERED WHEN WALKING = 9.6 km (pedometer reading)

WEATHER 24C/12C am:med. Wind, pm: med.wind

BURNING EVENTS yes

Nancy burnt Plechtrachne patch to clear area around V. gouldii hole

Nancy burnt another area, no comment on purpose

PLANT COMMUNITY—SEARCHING FOR PLANTS AND ANIMALS

EVENT NOS 22-1

LOCATION No known name. Aeolian sandplain approx. 4 km north Parnngurr. Dune on northern side of sandplain. N,E & S surrounded by low hills w open plain

Land unit—Aeolian sandplain in undulating hilly terrain with scattered dissected hills

MOTIVATION & PURPOSE as above

NUMBER & NAMES OF INDIVIDUALS

Group 22-1a) Rita & Fiona

Group 22-1b) Nancy & Gil

Group 22-1c) Jagiyu and Puki

Group 22-1d) Ida, Junju & Nyamaru

These groups were separate when we were on the sandplain patch otherwise everyone traveled as a group

PROVISIONS & EQUIPMENT as above

TIME SEARCHING—IN, OUT & TOTAL IN DIFFERENT PLANT COMMUNITIES

Group 22-1a) only

11.46am arrive on burnt patch on sandplain near dune

11.50–11.56am Got 2 lunki (one large, one small) moved onto another bush

11.58–12.01pm Got 2 lunki (one large, one small) moved onto another bush

12.03–12.08pm Got I chrysalid (edible), nothing more, moved to another bush

12.10–12.19pm Rita got 3 lunki, Fiona got 1

12.26–12.37 tried 2 plants, nothing

12.44 Everyone still in sight over an area less than 1 km2. All searching for lunki north & south of dune

1.00pm finish searching to weigh lunki & V. gouldii from event 22-1

1.00–1.05pm weighing time

On-site time—1 h 14 min (excluding weigh time)

Walking times—40 min

Search specific + collection time = 34 mins (for 5 lunki investigations)

Rest times—none

APPROXIMATE DISTANCES COVERED Group 22-1a) 1.8 km at collection site

VOLUMES OF MATERIAL COLLECTED IN PATCH

Collector	Animal	Wgt	Nos	Av.Wgt/Lunki	Rate (g/hr)
Rita	lunki	45	7	6.4	36
Nancy	lunki	100	12	8.3	81
Junju	lunki	75	11	6.8	60.8
Jagiyu	lunki	165	29	5.7	134
Pukiyu	lunki	20	7	2.9	16
Nyamaru	lunki	90	17	5.3	73
Ida	lunki	40	4	10.0	32.4
Totals		535	85	6.3	62

Rate calculated on collection over 74 mins

All lunki from Acacia dictyophleba, however, 2 species apparent: 1 species with wide head piece with spots, another species thin with distinct segments

OBSERVATIONS ON OTHER RESOURCES

Solanum diversiflorum fruit damaged by frost

Recent cat track (no attempt to follow it)

Camel track

Eragrostis eriopoda plants dehisced seeds

Acacia dictyophleba flowering widespread

PROCESSING—PREPARING THE MATERIALS FOR USE

INDIVIDUALS DOING PREPARATION

TECHNIQUES USED —lunki in ashes, varanids in ashes then earth oven

PREPARATION TIME—both species lunki cooked for 10mins; varanids in earth oven for 20mins

PREPARED ITEM WGTS—n/a

DISTRIBUTION TO COMMUNITY MEMBERS

Everyone cooks their own lunki, they are then shared around even though everyone has some. No observation of how many eaten on site & how many were taken back to Parnngurr.

2 varanids were divided amongst women present. Remaining 4 taken back to Parnngurr.

ADDITIONAL FORAGING OBSERVATIONS

Nancy collected fresh leaves of Grevillea stenobotrya for tobacco ashes

22-6 Rita & Nancy sucked flowers of Hakea suberea for nectar

22-7Ida & Nancy dug 2 handfuls of Cyperus bulbosus in 10 mins when we stopped in creek to rest, cook & eat

22-8 Rita gathered armful of Portulaca oleracea near Parnngurr as a seed demonstration for Fiona

Varanids were collected

Event	Collector	Animal	Gender	Wgt (g)
22-2	Junju	*V. gouldii*	?	125
22-3	Rita	*V. gouldii*	F	345
22-4	Jagiyu	*V. gouldii*	?	150
22-5	Ida	*V. gouldii*	F	220
	Ida	*V. gouldii*	M	165
	Ida	*V. acanthurus*	M	165

DIARY PAGE REFERENCES 1990/2:83-87; 1990/7:10-12

Plant community north of Parnngurr through which track traverses on low hilly rises

Low Acacia shrubland over sparse herbs—A. aneura (pilu form), Cassia helmsii, Hakea suberea, A. inaequilatera over sparse annual herbs and grasses

Sandplain with low Acacia shrubland over hummock grassland—Acacia ancistrocarpa, A. dictyophleba over Triodia pungens

12.4 Subset of data fields from accompanied trips with returns from all foraging groups combined

Appendix 4 is most directly relevant to Chapter 5.

(facing, follows: 3 fold out A3 pages)

12.5 Subset of data fields from unaccompanied foraging trips

Appendix 5 is most directly relevant to Chapter 5.

event nos		date	settlement	purpose	destinatn/directn	travel mode	Martu nos and gender	time away (mins)	spp collected	nos individuals of sp	total sp weight (g)
old	new										
1	1	5/3/86	Parnngurr	hunting	N to old bore	walk	3M				
2	2	5/3/86	Parnngurr	hunting	SSW	walk	2W	510	*F. catus*	1	3300
2	2	5/3/86	Parnngurr	hunting	SSW	walk	2W	510	*V. giganteus*	1	2925
2	2	5/3/86	Parnngurr	hunting	SSW	walk	2W	510	*V. panoptes*	1	1183
2	2	5/3/86	Parnngurr	hunting	SSW	walk	2W	510	*V. acanthurus*	4	600
2	2	5/3/86	Parnngurr	hunting	SSW	walk	2W	510	*V. gouldii*	1	387
2b	2b	5/3/86	Parnngurr	collect water	bore in creek	army truck	men				
3	3	5/3/86	Parnngurr	school excur'n	Kunti Kunti	3 vehicles	32A 36C	275	*A. australis*	1	3600
3	3	5/3/86	Parnngurr	school excur'n	Kunti Kunti	3 vehicles	32A 36C	275	*C. bulbosus*		
4	4	6/3/86	Parnngurr	firewood	N	army truck	4 young M		*A. aneura*		~1/4 ton
5	5	6/3/86	Parnngurr	foraging	N & E on calcrete	walk	2W	120	*0*		
6	6	7/3/86	Parnngurr	foraging	S	Jigalong Toyota	5M		*M. robustus*	1	21250
6	6	7/3/86	Parnngurr	foraging	S	Jigalong Toyota	5M		*V. acanthurus*		
7	7	7/3/86	Parnngurr	multiple	Nankurr plains	army truck	mixed	270			
8	8	8/3/86	Parnngurr	multiple	Kunti Kunti	Parnngurr Toyota	Williams family	470	*A. australis*	2	8000
8	8	8/3/86	Parnngurr	multiple	Kunti Kunti	Parnngurr Toyota	Williams family	470	*S. isabella*	1	500
9	9	9/3/86	Parnngurr	foraging	-	walk	3W	540	*Varanus spp*	-	~ 3000
10	10	9/3/86	Parnngurr	collect 'other'	N 1st road/creek crossing	Parnngurr Toyota	mixed	75	*M. glomerata*	trayload	
11	11	9/3/86	Parnngurr	collect 'other'	N along creek	walk	2W	225	*V. panoptes*	1	1183
11	11	9/3/86	Parnngurr	collect 'other'	N along creek	walk	2W	225	*E. coolibah*		
12	12	10/3/86	Parnngurr	foraging	E	walk	1M	230	no big spp		
12	12	10/3/86	Parnngurr	foraging	E	walk	1M	230	small spp		
13	13	10/3/86	Parnngurr	foraging	N 1st road/creek crossing	Parnngurr Toyota	Williams family	60	*A. australis*	1	4000
14	14	11/3/86	Parnngurr	foraging	N 2nd road/creek crossing	Jigalong Toyota	mixed		*A. australis*	2	8000
15	15	11/3/86	Parnngurr	foraging	E	walk	5W	210	*V. acanthurus*	4	600
15	15	11/3/86	Parnngurr	foraging	E	walk	5W	210	*V. gouldii*	3	1160

event nos		date	settlement	purpose	destinatn/directn	travel mode	Martu nos and gender	time away (mins)	spp collected	nos individuals of sp	total sp weight (g)
old	new										
15	15	11/3/86	Parnngurr	foraging	E	walk	5W	210	*?other*		
16	16	11/3/86	Parnngurr	management	Lalapakujarra	Jigalong Toyota	6M	360	*A. australis*	2	8000
16	16	11/3/86	Parnngurr	management	Lalapakujarra	Jigalong Toyota	6M	360	*V. acanthurus*	1	150
17	17	12/3/86	Parnngurr	multiple	S	army truck	A, young C				
18	18	12/3/86	Parnngurr	management	SE Winakarujunu, N Harbutt R.	Parnngurr Toyota	5M	240	*A. australis*	2	12000
18	18	12/3/86	Parnngurr	management	SE Winakarujunu, N Harbutt	Parnngurr Toyota	5M	240	*V. panoptes*	1	1183
19	19	12/3/86	Parnngurr	school	Parnngurr rockhole	school Toyotas		all day			
20	20	14/3/86	Parnngurr	foraging	Nankurr rockhole	Parnngurr Toyota	young M		*M. robustus*	1	21250
20	20	14/3/86	Parnngurr	foraging	Nankurr rockhole	Parnngurr Toyota	young M		*V. giganteus*	1	2925
21	21	15/3/86	Parnngurr	foraging	-	Parnngurr Toyota	M		*0*		
22	22	16/3/86	Parnngurr	camping	Karlkan Karlkan	6WD Mazda	Williams family		*A. australis*	5	20000
23	23	17/3/86	Parnngurr	foraging	Karlkan Karlkan	6WD Mazda	Williams family		*A. australis*	11	44000
24	24	17/3/86	Parnngurr	multiple	Yantakuji	visitor's Toyota	M	530	*0*	0	0
25	25	17/3/86	Parnngurr	school	Karlkan Karlkan, Christmas Pool	school Toyota	mixed	480	*V. giganteus*	1	2925
26	26	17/3/86	Parnngurr	multiple	Yantakuji	army truck	mixed	530	-		
27	27	17/3/86	Parnngurr	multiple	Karlkan Karlkan	Parnngurr Toyota	mixed	470			
28	28	18/3/86	Parnngurr	foraging	E Wanal creek	Jigalong Toyota	Bijukas family		*V. gouldii*	3	387
28	28	18/3/86	Parnngurr	foraging	E Wanal creek	Jigalong Toyota	Bijukas family		*A. ramsayii*	2	~5000
29	29	18/3/86	Parnngurr	foraging	E Wanal creek	Yellow Landrover	Robinson family				
30	30	19/3/86	Parnngurr	unknown	Yulpu	Parnngurr Toyota	mixed		*Lunki (E. coolibah)*	1 cupful	
31	31	19/3/86	Parnngurr	unknown	Yulpu	6WD Mazda	Williams family		*A. australis*	1	4000
32	32	20/3/86	Parnngurr	firewood	-	Parnngurr Toyota	3M		*A. aneura*	3 trayloads	
1*	33	11/8/86	Parnngurr	foraging	N sandplain	walk	3W	375	*V. gouldii*	5	1935
1*	33	11/8/86	Parnngurr	foraging	N sandplain	walk	3W	375	*V. acanthurus*	1	150
1*	33	11/8/86	Parnngurr	foraging	N sandplain	walk	3W	375	*Lunki (A. dictyophleba)*	2 handfuls	~135
2*	34	11/8/86	Parnngurr	foraging	Karlkan Karlkan	drove	young M		*C. dromedarius*	1 young	550000
3*	35	15/8/86	Parnngurr	school	Kuta Kuta	2 school Toyotas	mixed		*Lunki (E. coolibah)*	plenty	
3*	35	15/8/86	Parnngurr	school	Kuta Kuta	2 school Toyotas	mixed		*A. dictyophleba*		
3*	35	15/8/86	Parnngurr	school	Kuta Kuta	2 school Toyotas	mixed		*C. bulbosus*		
4*	36	18/8/86	Parnngurr	foraging	N Nyukuwarta	drove	M		*M. robustus*	1	21250
5*	37	19/8/86	Parnngurr	firewood	N	WDPAC Toyota	1 M		*A. aneura*	roof rackful	

event nos old	event nos new	date	settlement	purpose	destinatn/directn	travel mode	Martu nos and gender	time away (mins)	spp collected	nos individuals of sp	total sp weight (g)
6*	38	20/8/86	Parnngurr	firewood	N	Roly's Toyota	M		*A. aneura*	trayful	
7*	39	21/8/86	Parnngurr	collect 'other'	N along creek to burn	walk	2W	90	*E. coolibah*		
8*	40	21/8/86	Parnngurr	management, camping	Wikirri	WDPAC Toyota	mixed	o/night			
9*	41	23/8/90	Parnngurr	foraging	Parnngurr rockhole	walk	4M		*F. catus*	1	3300
10*	42	23/8/90	Parnngurr	school	Kaalpa	2 school Toyotas	mixed	525	*S. lanceolatum*		
10*	42	23/8/90	Parnngurr	school	Kaalpa	2 school Toyotas	mixed	525	*G. aff. eriostachya*		
11*	43	24/8/90	Parnngurr	foraging	N along watercourse	walk	2M				
12*	44	26/8/90	Parnngurr	foraging	E to White Range	walk	3M				
13*	45	26/8/90	Parnngurr	firewood	-	tip truck	1M		*? spp*	trayful	
14*	46	27/8/90	Parnngurr	multiple	~1km N on track	walk	8C				
15*	47	29/8/90	Parnngurr	foraging	SW near Parnngurr rockhole	walk	3M	525	*0*		
16*	48	29/8/90	Parnngurr	foraging	SE beyond White Range	Parnngurr trayback	M		*C. dromedarius*	1	550000
17*	49	30/8/90	Parnngurr	foraging	Winakarutjunu	Robinson's trayback	M	510	*M. robustus*	2	42500
18*	50	30/8/90	Parnngurr	foraging	N sandplain	Parnngurr trayback	mixed	257	*V. gouldii*	9	3483
19*	51	31/8/90	Parnngurr	firewood	N	Robinson's trayback	mixed	30	*A. aneura*		
20*	52	31/8/90	Parnngurr	firewood	E Wanal creek	Robinson's trayback	3M 6W 5C	370	*F. catus*	2	6600
20*	52	31/8/90	Parnngurr	firewood	E Wanal creek	Robinson's trayback	3M 6W 5C	370	*V. giganteus*	1	2925
20*	52	31/8/90	Parnngurr	firewood	E Wanal creek	Robinson's trayback	3M 6W 5C	370	*V. gouldii*	1	387
20*	52	31/8/90	Parnngurr	firewood	E Wanal creek	Robinson's trayback	3M 6W 5C	370	*V. acanthurus*	1	150
20*	52	31/8/90	Parnngurr	firewood	E Wanal creek	Robinson's trayback	3M 6W 5C	370	*T. multifasciata*	1	205
20*	52	31/8/90	Parnngurr	firewood	E Wanal creek	Robinson's trayback	3M 6W 5C	370	*S. diversiflorum*		
21*	53	31/8/90	Parnngurr	foraging	-	Parnngurr trayback	William's family	360			
22*	54	1/9/86	Parnngurr	foraging	N end White Range	school Toyota	5M	410	*0*		
23*	55	1/9/86	Parnngurr	meet loading truck	Wintamurra bore	school Toyota	1M 1F	180	*0*		
24*	56	4/9/86	Parnngurr	firewood	N	Parnngurr trayback	1M		*A. aneura*		
25*	57	4/9/86	Parnngurr	foraging	Karlkan Karlkan	Parnngurr trayback	mixed		*C. familiaris dingo*	6	6000
1	58	20/3/86	Punmu	foraging	north	walk	2W		*F. catus*	1	
2	59	24/3/86	Punmu	foraging	PE Pirrkilyi rocks	Ditch toyota	men		*Camel*	1	
3	60	25/3/86	Punmu	foraging	south along lake	Burts trayback	mixed family		*0*		
4	61	26/3/86	Punmu	foraging	south-east	Ditch toyota	men		*0*		
5	62	27/3/86	Punmu	foraging	south-east	Ditch toyota	men		*A.australis*	1	

event nos		date	settlement	purpose	destinatn/directn	travel mode	Martu nos and gender	time away (mins)	spp collected	nos individuals of sp	total sp weight (g)
old	new										
5	62	27/3/86	Punmu	foraging	south-east	Ditch toyota	men		*V. gouldii*	1	
6	63	29/3/86	Punmu	foraging	north-west	Mitchells toyta	men		*A.australis*	1	
6	63	29/3/86	Punmu	foraging	north-west	Mitchells toyta	men		*V. gouldii*	3	
7	64	30/3/86	Punmu	foraging	south	Burts trayback	mixed		*0*		
8	65	30/3/86	Punmu	foraging	Yilyara	walk	2 W		*C. bulbosus*		
9	66	31/3/86	Punmu	foraging	Yilyara	walk			*C. bulbosus*		
1	67	14/9/86	Punmu	foraging	NW on Telfer road	Ditch toyota, Burt trayback	,	495	*F. catus*	2	
1	67	14/9/86	Punmu	foraging	NW on Telfer road	Ditch toyota, Burt trayback		495	*T. multifasciata*	1	
1	67	14/9/86	Punmu	foraging	NW on Telfer road	Ditch toyota, Burt trayback		495	*M. horridus*	1	
2	68	15/9/86	Punmu	foraging	Nyakulajikujarra	Ditchs toyota drop off		510	*M. robustus*	1	
3	69	15/9/86	Punmu	firewood	east to airstrip	Ditch tyota			*A. aneura*		
4	70	15/9/86	Punmu	foraging	east	Burts trayback Hillux		240	*C. familiaris dingo*	1	
5	71	16/9/86	Punmu	foraging	south east	Burts trayback Hillux		180	*F. catus*	2	
5	71	16/9/86	Punmu	foraging	south east	Burts trayback Hillux		180	*T. multifasciata*	1	
5	71	16/9/86	Punmu	foraging	south east	Burts trayback Hillux		180	*V. gouldii*	2	
6	72	17/9/86	Punmu	foraging	south east	Burts trayback Hillux					
7	73	17/9/86	Punmu	foraging	north on old Telfer road	Burts trayback Hillux		120	*0*		
8	74	19/9/86	Punmu	foraging	north sandplain	Burts trayback Hillux		210	*V. gouldii*	2	
9	75	19/9/86	Punmu	foraging	north sandplain	walk		300	*F. catus*	1	
9	76	19/9/86	Punmu	foraging	north sandplain	walk		300	*V. gouldii*	2	
1	77	16/10/86	Kunawarriji	foraging		Roly's trayback Toyota		90	*F. catus*	1	
2	78	19/10/86	Kunawarriji	foraging		Roly's trayback Toyota		495	*0*		
3	79	19/10/86	Kunawarriji	foraging		walk		75	*0*		
4	80	20/10/86	Kunawarriji	foraging		Roly's trayback Toyota		520	*F. catus*	1	
5	81	21/10/86	Kunawarriji	foraging		Roly's trayback Toyota		490	*F. catus*	1	
5	81	21/10/86	Kunawarriji	foraging		Roly's trayback Toyota		490	*V. gouldii*	2	
5	81	21/10/86	Kunawarriji	foraging		Roly's trayback Toyota		490	*lunki*	4	
6	82	23/10/86	Kunawarriji	land mgmt		Roly's trayback Toyota		475	*A. australis*	1	
6	82	23/10/86	Kunawarriji	foraging		Roly's trayback Toyota		475	*S. chippendalei*	2 billys	
7	83	28/10/86	Kunawarriji	foraging		Kunaw truck			*S. chippendalei*	1 flour tin	12 kg

12.6 Mean weights of animal species collected by Martu as recorded from field data or literature.

Appendix 6 is most directly relevant to Chapter 5.

Species sorted from heaviest to lightest weights.

	Gender of animal	Nos individuals weighed	Wgt range (g)	Mean TBW (g)
One-humped camel [a]	combined	-	-	550,000
Red Kangaroo [a]	combined		-	46,250
Emu [e]	combined		-	38,000
Euro [a]	combined	-	-	21,125
Echidna [a]			-	4,500
Australian bustard [e]	male	2	4500–5000	4,750
	female	2	2700–3600	3,150
	combined	4	2700–5000	4,000
Cat (feral) [b]	male	8	3300–4675	4,282
	female	8	2640–3575	3,087
	combined	16	2640–4675	3,630
Perentie	male	2	2700–4500	3,600
	female	2	2000–2500	2,250
	combined	4	2000–4500	2,925
Woma python [f]	combined	-	-	2,490
Dingo c (8 week old pup)	combined	-	-	1,700
Rabbit a	combined	-	-	1,580
Marantu	young male	2	325–475	4,000
	male	1	2750	2,750
	combined	3	325–2750	1,183
Sand goanna	male	75	70–900	446
	female	46	180–540	301
	combined	121	70–900	387
Galah [d]	combined	-	-	330
Centralian blue tongue	combined	13	-	205
Great desert skink	male	1	250	220
	female	1	190	
	juvenile	2	30	
Varanus tristis [g]	combined	-	-	184
Ridge-tailed monitor	male	8	80–200	154
	female	8	90–250	205
	combined	16	80–250	150
Thorny devil	combined	5	35–70	49
Budgerigar [d]	combined	-	-	30
Bush coconut (on *Eucalyptus chippendalei* tree)[h]	-	25	-	8
Moth larvae (in *Codonocarpus cotinifolius* shrub roots)	-	31	-	7
Moth larvae (in *Eucalyptus victrix* trunk)	-	174	5–10	6
Moth larvae (in *Acacia melleodora* roots)	-	84	3–10	5

[a] (Strahan 1983)

[b] All weights are for entire animals i.e. before they are gutted or plucked etc. With the exception of Feral Cats which were weighed after gutting but to which 10% was added to account for the gut and make the figures comparable to other species. Also, as a size class for juveniles was difficult to define they have been included (except GD Skink)

[c] G. Fitzgerald, personal communication 1991, veterinarian, based on equivalent breed

[d] (Higgins 1999)

[f] L. Smith, W.A. Museum personal communication 1991, mean of two specimens

[g] L. Smith, W.A. Museum personal communication 1991, mean of 46 specimens

[h] Weight includes entire gall i.e. plant material, amniotic fluid and wasp larvae. Only wasp, fluid, wasp larvae and portion of inner gall flesh are edible.

12.7 Store deliveries to Parnngurr in March and October 1990

Appendix 7 is most directly relevant to Chapter 6.3

	Type	March 1994		October 1994	
		Nos units	Weight (g)	Nos units	Weight (g)
Meat and Meat products	Hamper Beef with cereal	124 cans	340	48 cans	340
	Kraft braised steak and onions	60 cans	440	24 cans	440
	Heinz chicken dinner	25 cans	225	–	
	Hogget chops	20 trays	500	6 trays	500
	chicken pieces	6 trays	1000	36 trays	1000
	Tuna	–		48 cans	200
	Tuna and onion	–		24 cans	200
	Steak and Kidney pies	–		36 cans	250
Other products	Heinz salt reduced spaghetti	36 cans	440	72 cans	440
	Hot Pot casserole base	8 pkts	80	–	
	Continental minestrone soup	16 pkts	40	–	
	Continental chicken soup	16 pkts	40	–	
	Uncle Toby's instant oats	24 tins	750	24 tins	750
	Bran Bix cereal	20 pkts	375	–	
	Wheatbix cereal	–		24 pkts	375
	Sunshine instant milk	44 tins	300	44 tins	300
	Sunshine instant milk	5 tins	1000	–	
	Baking powder	36 tins	200	36 tins	200
	Dingo white flour	20 drums	18 kg	15 drums	18 kg
	Sugar	45 bags	2000	18 bags	2000
	Arnotts milk arrowroot biscuits	18 pkts	250	–	
	Arnotts coffee biscuits	14 pkts	250	–	
	Arnotts assorted biscuits	–		30 pkts	250
	Dairy custard	12 cartons	500		
	Bushell tea leaves	70 pkts	250	48 pkts	250
	Goulborn apricot halves	10 tins	425	–	
	Berri cordial	6 bottles	2 L	12 bottles	2 L
	Passiona soft drink	40 cans		–	
	Sliced white bread	24 loaves		36 loaves	
	Calrose white rice	24 pkts	500	24 pkts	500
	Eggs medium	20 cartons	dozen	–	
	Kraft processed cheese	–		24 pkts	250
	Jam	–		12	250
Vegetables and fruit	pumpkins	4		5	
	onions	1 bag	10 kg	2 bags	10 kg
	potatoes	1	15 kg	–	
	lettuce	–		1 carton	
	celery	–		1 carton	
	tomatoes	–		1 carton	
	apples	–		1 carton	
	oranges	–		2 carton	

12.8 Nyamarru's account of a hunting trip to Wanal creek near Parnngurr in 1990

Appendix 8 is most directly relevant to Chapter 7.

Nyamarru Robinson (Bidu) Karimarra recounted a foraging trip to the Wanal creek (syn. Karrukujarrakarru) area east of Parnngurr. It synthesised aspects of Martu foraging discussed thesis chapters. The species tracked, shifting from one target species to another, caution about Camels, species killed (Chapter 5); sighting and care of other foragers, observation of game (later recounted to male hunters), older and younger people in the party (Chapter 6). The account demonstrated spatio-temporal aspects of hunting—the landforms and burn areas that were traversed by game and hunters and particular features of the time or season when they foraged (Chapter 7). It vividly describes the use of burns as a hunting aid (Chapter 8).

> Ngutuma and Kamu we got out. I said to Daphne "Look after the kids while Ngutuma and I go". Then I took the kids and gave them to Daphne to look after. I was eating nectar and Ngutuma went on ahead. After I left the kids I went on and the Dogs smelt a Cat. It was lying down I stood on it and hit it and killed it. Then I called out to Ngutuma "Come here, we'll go this way" Ngutuma said "Oh, I am looking for the Camels, she has taken the young ones with her". We went. On the dune, we saw three Turkey tracks. Then we went east in the recent burn patch. We were following the young Camel tracks. I was going on the west side of the burn and I was calling out to her. Ngutuma went to the east side. When I got to Ngutuma I said "We'll go this way there are two people over there". Then I saw a Cat track going west. I followed the Cat track. I saw where the Cat made a toilet, I dug it up and it was dry. I went up the dune and looked for Ngutuma she was still going west.
>
> I saw another Cat track; it had killed a small dragon lizard. I followed it east. The wind was blowing the track away. I sang out to Ngutuma to come back. We were both looking around for the track. I followed it right down to a small creek. I said to Ngutuma "Oh! The two Camels are ahead they might kick you. They've got their babies with them, they may chase you". Then we made a fire and we were walking on either side. We were still following the Cat. The wind would blow the track, but we could see it in some places. We followed it east. The fire burnt east then it finished. We were making a new burn. Then Ngutuma went and had some nectar. They I went and saw it (the Cat) lying down beside a tree. Then I followed it until I could see the eyes looking at me from the spinifex. I lifted my crowbar and hit it on the head. After I killed it, I got it and went south back towards Ngutuma. When I got there she was still eating nectar. I said "Come on we're going back, there is too much wind".
>
> Then we walked west; we went on the stony ridges. We walked along them we looked ahead and saw a Martu running across. I said to Ngutuma "look at that Martu, what is she running for?" so we turned around and went back to her. Then Munipa said "Cat, Cat went along".
>
> We followed that one east on and on and on through the new burn. Then it saw us, it bent down and slinked crawled away. Then it went into the spinifex and the Dog flushed it out.

The Dog chased it until it went inside a spinifex. Ngutuma was looking around for a Sand goanna. We left her. The Dog bit the Cat to the ground; we hit it, got it and went north. We stopped at the thicket and took the guts out. Then we got up and went. We got one more Sand goanna. Then we went and got another Ridge-tailed goanna. Then we went back to the water container and had a drink of water and had some meat. We had some meat; we sat down then said “Oh we’ve got to go and look for the old lady” No more.

Recorded in August 1990, translated from Manjilyjarra by Patricia Fry and transcribed by Fiona Walsh

12.9 Nyaparu (Billy) Milangka Gibbs' statement about Martu, Karlamilyi, the park and mining in 1987

Appendix 9 is most directly relevant to Chapter 8.

Nyaparu Gibbs was a leading Martu elder and spokesman. Extract from 'Martu statements on the ownership of Karlamilyi' (Thieberger 1989):245–246. Translated from Manjilyjarra to English.[1]

> The proper name for Rudall River is Karlamilyi. They call it Kintyre mine but we have had the name since the dreamtime, it is Yantikuji. In the summer there are meetings at that place, they have ceremonies and initiation business there. That was our land and now it is a National Park. We still know it belongs to the Aborigines. We are not lying. We know Karlamilyi, you can't change it to another name.
>
> If they take the sand away, they are going to block the river. The water should not be disturbed. Water has been there for a long time and will stay there even in the hottest times. The miners went there and called it all the wrong names. They are going to dig up uranium, a dangerous thing. If it gets into our drinking water supply we'll be sick and dead. It's too dangerous. Water might run down the river, our kids swim in that water. It could kill trees, fruit and animals. We do not want bad poisoned water. That creek is called Yantikuji. It runs to the west. We have known about the rivers, creeks and waterholes since the dreaming. We are not making this up for the first time. The Two Men [= Wati Kujarra] named the places in the dreamtime. The whitefellas came and didn't know the names. Our old people knew the names and passed them on to us.
>
> That Yantikuji uranium is a bad thing. When the wind blows to the east, dust will blow to Parnngurr (Cotten Creek). The water will travel underground and will kill us. It will be bad water. Kangaroos will die. Trees will be cut down. We can see the dangers, we're frightened of the dust. Some of the Warnman people from Punmu are still owners for the Yantikuji area. Aboriginal people are not happy for the mine to start. We are talking for the Mijijamaya people too, we haven't had a proper meeting to talk about the area, we're too far apart.
>
> The people that own this country will stay there forever. They will tell the names to their children and the children will follow them. The Two Men named Yantikuji and Karlamilyi hill. To the east they named Pungkulyi and on to the Stock Route.
>
> Today they say we are lying to the white people but we are telling the truth.

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[1] This statement by Nyaparu Gibbs was included to illustrate a Martu view on connectedness to their lands (Chapter 8.3) and perceived links between the park and mining (Chapter 8.4). By coincidence, the day I re-typed it the Prime Minister of Australia announced a change in the uranium policy and identified Kintyre as the next deposit to be opened. In response the WA Premier, restated his party's opposition to uranium mining.

12.10 Martu and CALM proposals for Rudall River National Park in 1993

This Appendix most directly relevant to Chapter 8

Extract from ‘Social Impact Study of Western Desert Rudall River Region’ (Newman et al. 1993):146–147).

> The Martu people were not consulted when the RRNP was gazetted in 1977. They feel strongly that the lands is theirs, and hence they want a say in the management of the park. They have asked to be part of a consultative advisory committee, which has been set up by the Department of CALM, in its preparation of a draft management plan. They also wish to see a park council established, similar to the one suggested for Purnululu. The Purnululu Park Council has equal representation from CALM and the Purnululu Aboriginal Council, and it provides a forum for the development of policy in relation to Aboriginal interests in the park.
>
> The Martu people want for their Karlamilyi Park (Rudall River) at least all the benefits that Purnululu Park has obtained for its inhabitants. These include:
>
> [format below to be dot point]
>
> the involvement of interested parties in the planning process, including Aboriginal people with traditional affiliation to the area, the Tourism Commission and local government;
>
> the development of a means of meaningful ongoing management input of Aboriginal people with traditional affiliation with land in the park;
>
> that employment opportunities be provided for Aboriginals in the management and interpretation of the Park;
>
> that proposals be developed for Aboriginals with traditional affiliation to reside in the Park
>
> that an Aboriginal National Park Ranger Training Programme be established.
>
> The Martu people have also suggested that their living areas and sphere of influence is focussed more in the eastern side of the park. Thus, in any proposed park development, the western section should be where vehicular access is granted and tourism nodes loCated. The Martu indiCate this is where residents from Telfer already visit and they have suggested that the Broadhurst Range and Yandacoogee Creek areas could be major attractions in the future … They have specifically indicated Desert Queen Baths as being a possible visitor node with its spectacular landscape and permanent pools.
>
> **Department of CALM proposals**
>
> The Department of CALM in its submission to the study has suggested some possible outcomes for the management of Rudall River National Park in relation to the interaction between the Martu people and tourism. They include:
>
> - The inclusion of a Martu person as a member of the planning team of its draft management plan of Rudall River National Park.

- The possible establishment of a Park Council. This would depend on the response to the Park Council concept currently proposed for Purnululu (Bungle Bungle) National Park. As part of the formation of the Council, consideration would also be given to having Aboriginal women on the council as requested by the women's group at the [Millstream] conference.
- The training and employment of Martu people as national park rangers in a similar scheme to that of Hamersley Range National Park.
- The appointment of a liaison officer to provide information on Aboriginal matters so the park can be properly managed.
- Publication of brochures on key aspects of Martu culture to help promote understanding, tolerance and acceptance of Martu culture by visitors. One of these publications could be a "Code of Conduct" for tourists.
- Signposting and other means to provide privacy for Martu residential areas and protection of their sacred and other significant sites.
- All of these proposals are strongly supported by the Social Impact Study.

12.11 Applications of Martu knowledge and practices to contemporary co-management of Karlamilyi National Park

This table should be read as columns rather than rows

Chapter 5 Animal and plant resources

Trends of continuity and change from pre-contact to ~ 1990 study period	**Applications of Martu system into co-management of Karlamilyi National Park in early 2000s**
Martu ethnotaxonomy continues to describe species and food groups; some incorporation of Aboriginal English words for species by younger Martu	Explore Martu taxonomy where inconsistent with Linnaean to identify possible improvements in scientific taxonomy
Continued utilisation of large number of species. cf other desert Aboriginal groups and especially other Park users	Accept that species inventory of plant and animal utilised by Martu is rich and diverse
Narrowing of species resource inventory but still a high number	Recognise that animal species used for subsistence are of high significance to Martu. Structure ecosystem management programs and projects around major Martu resource species (including feral animal and fire programs)
Apparent shift in subsistence significance from plant to animal foods (by spp nos, weight, frequency)	Recognise that certain Martu have a practical knowledge of a moderate proportion of the region's vertebrate and reptile fauna due to continued hunting practice
Major subsistence change occurred with loss of small–medium sized mammals from ecosystems and diet. Large number of varanid reptile species hunted to replace or expand into diet niche due to mammal loss	Recognise that knowledge and practice (e.g. burning) applied to small–medium size mammals has declined with species decline
Feral Cats and Camels hunted to replace or expand into diet niche due to mammal loss	Hunting of Feral Cats possible conservation advantage due to reduced Cat predation on certain species including threatened spp.\
Targeting of high value spp resulted in localised pressure on Euro, Sand goanna.	Survey and practical management of species potentially vulnerable to over-hunting (esp. Perentie, Echidna, Bustard). Further assessment of risk over time to Euro, Sand goanna needed.
Bustard intensively hunted when present; formally classified as 'vulnerable'	Recognise hunting not a clear, direct conservation risk as has direct and indirect benefits
Echidna, Perentie especially vulnerable; unknown vulnerability for highly mobile spp	Firewood harvest may have more impact than hunting by biomass weight converted
Possible ecological trade-offs between hunting and maintenance of ecological knowledge and reduction of Feral Cat populations	Recognise that IEK is mediated through the use of species and associated harvest and management practices.
	Surveys of rare and threatened species secondary to contemporary resource species

Chapter 6 Socio-economic features of foraging

Trends of continuity and change from pre-contact to ~ 1990 study period	**Applications of Martu system into co-management of Karlamilyi National Park in early 2000s**
Strong individual differences between people's engagement in foraging and the practice of it	Recognise that Martu were not a homogenous entity and seek a variety of opinion and engagement on land use and management matters
Senior Martu individuals maintan authority in 'cultural' contexts but younger English speakers in meetings and negotiations in non-Aboriginal contexts	Engage with Martu individuals who demonstrate active effort and strong interest in applied land and resource management
Skin and alternate generation social structures still intact but less rigid	Collaboration with and support to senior authority structures
Preferred gender segregation in land use activities	Seek out and collaborate with Martu 'experts' in particular topics e.g. species specific IEK
Some families enact stronger land and resource use than other families	Recognise and provide suitable staff to facilitate collaboration with specialist groups e.g. older women, younger men
Expansion in foraging motivation from sustenance need to recreation and demonstration of cultural continuity	Recognise that when hunting and gathering is driven by sustenance needs it is essential to people's nutrition and diet (don't jeopardise it)
	Recognise that when hunting and gathering is also shaped by cultural needs it may be necessary for people's well-being
	Research and identify how changed motivations may have detrimental affect upon burning and other resource management practice

Chapter 7 Spatial and temporal concepts and patterns

Trends of continuity and change from pre-contact to ~ 1990 study period	**Applications of Martu system into co-management of Karlamilyi National Park in early 2000s**
Continued language reference to place names, habitat types and other spatial descriptors but contraction of verbal use to accessible areas	Recognise extensive spatial land use by Martu determines areas where spp collected and 'management' applied
High density of places named by Martu; some documented, many undocumented	Apply appropriate and correct Martu place names within the park to provide a referential base for land areas with few formally mapped names (to improve spatial data base for planning and management)
Spatial extent of foraging continued on custodial lands irrespective of park boundary	Apply appropriate and correct Martu landform and habitat names in mapping associated with landform, vegetation etc.
Patchy use of land and resources within a 50 km radii of settlements; concentrated walking use within 10 km of settlements	Spatial mapping of track and road network conducted by Martu with GPS, GIS support
Shift from walking tracks to vehicle tracks; detailed knowledge of both by active foragers	Support spatially extensive land use and foraging to disperse negative spp population impacts and positive benefits
Use concentrated at dinner camp points along secondary and tertiary tracks	Encourage Martu access to land tracts with infrequent access

Primary travel routes subject to frequent use of resources by opportunistic collections Large tracts of land were infrequently visited and used at low intensity, if at all. These areas were remote from settlements, primary and secondary tracks. Dinner camps continued to target areas with wetlands and high landform diversity Spatial pattern of dinner camp and foraging areas highly dynamic due to exploration of ‘fresh’ areas, green areas and/or early seral burns Exclusion areas due to ngurlu or mamu excluded foraging by women, children and mixed groups from weeks to months; these were not fixed and shifted over longer time periods Total hunting and gathering exclusion known only from one site complex on wider Martu lands (Killajurru in Durba Hills) More than 75% of foraging trips to destinations inside park boundaries Seasonal concepts more detailed than previously recognised Seasonal patterning of resources predictable but variable under influence of climate especially rainfall Sequences of species availability known for nectars and certain food groups or taxa Seasonal patterning of availability and procurement highly variable within a year	Careful collaboration between Martu and park staff on placement of new tracks Expect resistance to proposed closure of certain existing tracks Encounter points between Martu and tourists likely to be on primary tracks, primary river channel and other significant wetlands Ascertain whether Martu and visitors want to encounter each other; perhaps exclude uninvited visitors from settlement radii Consider Martu exclusion area concept as partial analogy for explaining hunting exclusion zones (but wary of confusion over meaning) Collaborate to ascertain if sacred sites from which visitors should be excluded or interpretive signs provided Park boundary unrecognised by Martu (as Yinta are unrecognised by outsiders) Apply main Martu seasonal concepts in park descriptions and yearly planning Use adaptive management to be responsive to seasonal variations in fuel loads, resource species, species of interest

Chapter 8 Resource and land managers

Trends of continuity and change from pre-contact to ~ 1990 study period	**Applications of Martu system into co-management of Karlamilyi National Park in early 2000s**
Re-establishment and refinement of burning through hunting and other purposes resulting in a mosaic that would get finer-grained in settlement radii	Support to expand burn pattern to a wider spatial area and to reduce intensification within settlement radii and along primary travel routes
Relative lack of burns in distant areas of Martu lands and high wildlife risks with intermittent ignitions	Reduction of high wildfire risks by selection of remote cultural and natural sites of Martu significance for protective burning possibly by helicopter
Continued but reduced visits to wetland sites for ritual and/or cleaning to expose waters	Support to people to undertake visits to remote sites of significance especially wetlands to monitor, clean and ‘manage’ those sites
Soaps, detergent and other chemicals in rockholes close to settlements	Investigation into faunal species management methods
Species specific management and manipulation continued for contemporary	Recognition and revival of appropriate species specific management measures

plant resource species but rarely made explicit by Martu	Visitors and outsiders should respect the ‘always ask’ protocol of land and resource access
Kanyininypa concept of ‘holding’ country continued to be expressed in relation to land ownership and site protection nor evidence of its application in relation to biological resources (it may be hidden diminished or absent)	Research into ‘kanyininpa’ and related concepts to identify similarity and difference to analogous Western concepts and generational change in these concepts
	Promotion and revival of those concepts as appropriate
Possible demise in negotiation amongst Martu over access to estates and associated resources for those estates within settlement radii	Further research into Martu recognition of ecological change, degradation and species declines
Continued recognition of resource rights of burn igniter but sometimes overridden too	Significant time and resource investment into explanations about national parks—their purposes, ecological values, public values, costs and benefits to Martu
‘National park’ an entirely new concept to Martu and understanding of it at odds with Western national park ideals	Consider—what does the park have to offer Martu?