

CHAPTER 1

THE ARCHAEOLOGY OF DESERTS:
AUSTRALIA IN CONTEXT

On and on, stepping it out
Across the wide country,
Across the plain.
On and on, stepping it out
Across the wide country
In the heat of the day.

‘Travel Song’ by Wajurrpirdi, original in *Ngarluma* (von Brandenstein and Thomas 1974: 44)

Of the six inhabited continents, Australia is by far the driest, with large internal areas of desert that make up nearly 70 per cent of the landmass. This immense region of dunefields, ephemeral rivers, saltlakes and desert uplands forms one of the largest desert biomes in the world (United Nations Environment Programme [UNEP] 2006), comparable in size to Arabia or Central Asia; only the Sahara is larger (Figures 1.1 and 1.2). In this book, I have set out to review what we know of the archaeology of Australia’s deserts. At one level, this is a record of prehistoric settlement and adaptation in one of the world’s major desert regions. On another level, it is also a history of some distinctive Aboriginal societies. Unlike the deserts of Africa, Asia and the Americas, the precontact history of Australia’s deserts is exclusively a history of the autonomous development of hunter-gatherer communities descended from the original late Pleistocene settlers of the continent.

POSITIONING THIS RESEARCH

Archaeological research in these drylands has global as well as regional dimensions, and it is worth setting these out at the outset. The first point to make is that the peopling of Australia’s deserts represents one end of an arc of dispersal involving the diaspora of early modern humans from Africa (Balme et al. 2009). Exploration and colonisation of deserts and drylands appears to have been part and parcel of this movement. McBrearty and Brooks (2000)

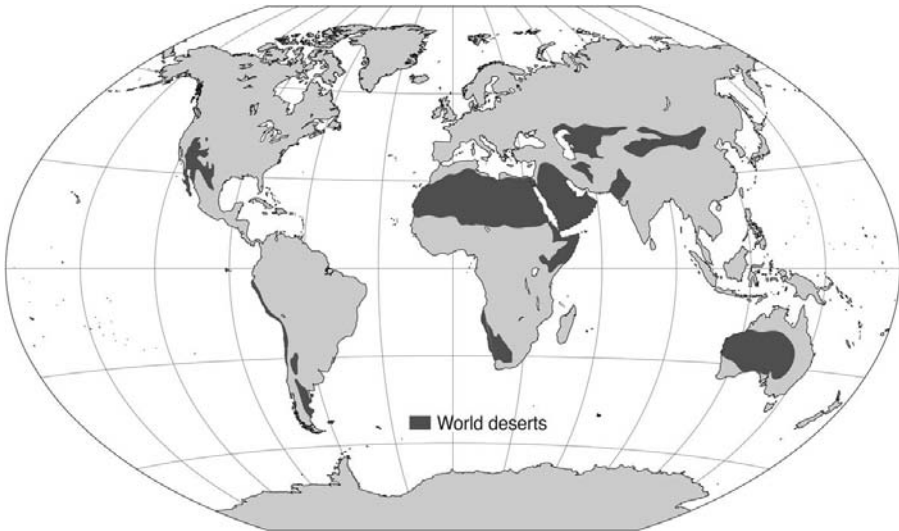


Figure 1.1. The modern distribution of deserts. Based on *Global Deserts Outlook* (UNEP 2006). Australia's deserts form one of the world's major desert regions, as well as the largest desert biome in the Southern Hemisphere.

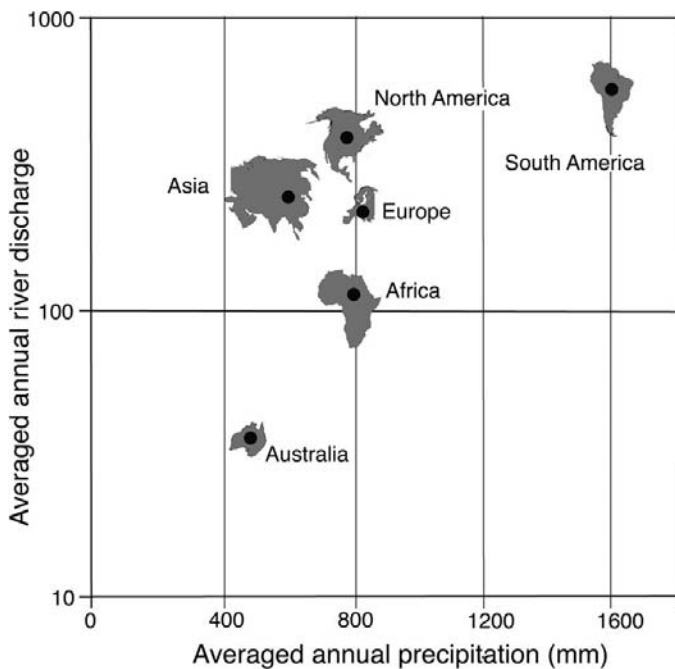


Figure 1.2. Australia is the driest of the six inhabited continents. Just how dry can be seen from the figures for rainfall and river discharge for each continent. Annual precipitation is averaged over the continental area. River discharge is the average annual discharge converted to equivalent rainfall (mm). Australia's deserts represent the extreme end of a largely dry continent but do not include hyper-arid areas comparable to the Sahara, Namib or Atacama deserts. (Source: Australian Bureau of Meteorology 2008: 45)

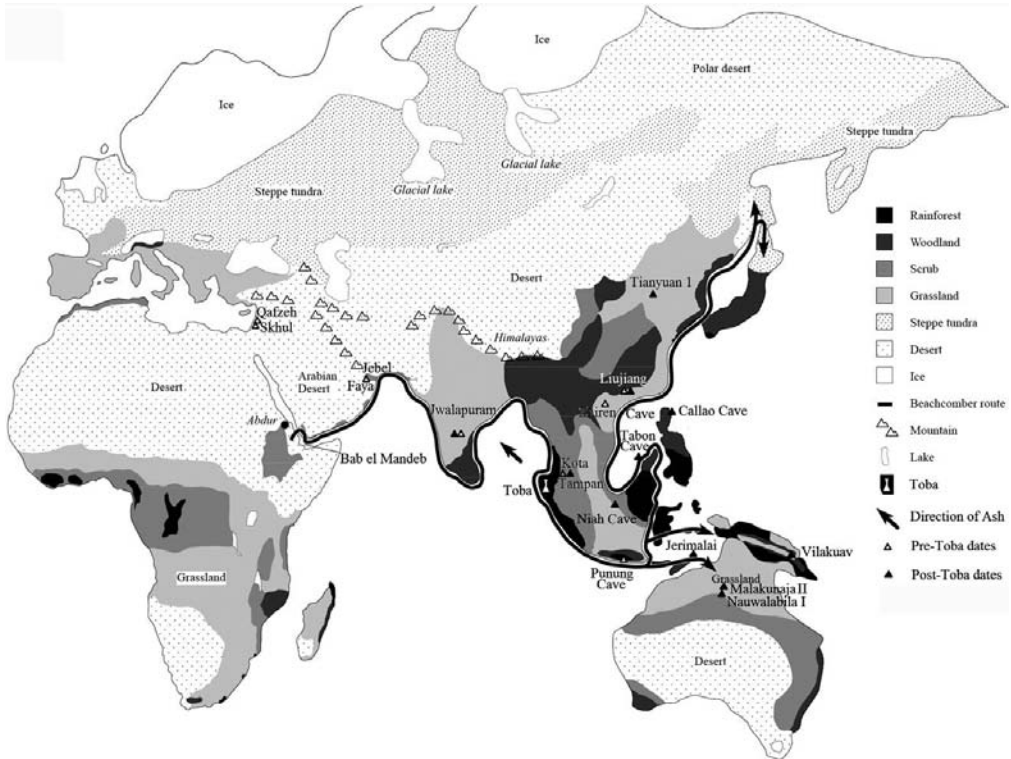


Figure 1.3. The southern route for spread of modern humans out of Africa and into the Australasian region, showing the relationship to world deserts. Map courtesy of S. Oppenheimer (2012: fig. 3).

suggest that Aterian hunter-gatherers settled in the North African deserts from 110 ka down to 60 ka, as one prong of the dispersal of behaviourally and anatomically modern humans (see also Garcea 2004; Barton et al. 2009). The spread of modern humans along the southern margins of Eurasia 80–60 ka brought people to the northern approaches of a prehistoric continent made up of the modern landmasses of Australia, New Guinea and Tasmania (Figure 1.3). The settlement of this continent, around 50 ka, involved two remarkable events: first, the crossings of the Timor Sea and the straits east of the Moluccas to establish separate landfalls on the Australian landmass; and second, the move south from the northern savannas into the deserts and drylands that form the greater part of the continent and represent one of its most distinctive biomes (Byrne et al. 2008). Some 40 years ago, Golson (1971) assembled botanical evidence showing that early colonists from Southeast Asia would have found a range of familiar plant food species in the swamps and woodlands of northern Australia. However, any move inland into the deserts and drylands involved significant adjustments to a new biota. There are questions about how rapidly this move occurred and whether there was a significant time lag between entering the continent and moving into the interior.

Another theme is the history of the drylands themselves. Australia's deserts have not always taken their modern form: aridity has intensified or relaxed, the deserts have expanded and contracted along their margins and the rivers and lakes of what is now the 'dead heart' have been periodically reactivated. The Quaternary environmental history of these regions is part of a global story of climate change across the last glacial–interglacial cycle. These climatic shifts inevitably affected the ecological baseline for hunter–gatherer groups in the region. One question is whether the interior of Australia was initially settled when the lakes and rivers that ring the heart of the continent were more active than they are today. Another is whether intense aridity during the last glacial maximum led to abandonment of large parts of the continental interior and fragmented the social and economic world of inland groups. The quantum growth in understanding of the Quaternary history of arid Australia – fuelled in part by the availability of new dating techniques such as optically stimulated luminescence (OSL), uranium series (U/Th) and acid–base oxidation radiocarbon dating (ABOX ^{14}C) – now allows a fresh assessment of the environmental basis for prehistoric settlement in this region to be made.

Any archaeology of Australia's deserts is necessarily also a cultural history. Archaeologists working in Central Australia operate in the shadow of the classic ethnographies by Spencer and Gillen. *The Native Tribes of Central Australia* (1899) and *The Northern Tribes of Central Australia* (1904) were founding works of social anthropology and provided prehistorians in Europe with ethnographic analogues for Middle or Upper Palaeolithic societies in Western Europe (Reinach 1903; Sollas 1911; Lubbock 1912). For instance, Sollas famously dubbed the Australians 'the Mousterians of the Antipodes' (1911: 170). Although few social anthropologists after Spencer or Sollas accepted the argument that Aboriginal society preserved elementary or primordial social traits, contemporary foraging groups have often been used as economic analogues for early hunter–gatherer societies on the basis, as Testart puts it, that they preserve 'the most archaic way of life known to humanity' (1988: 1). Archaeological research now complicates this picture by showing that these desert societies have their own histories, and that late Pleistocene societies were not cast in the ethnographic mould. When did life in the desert change to something resembling the ethnographic pattern? One of the concerns of this book is to reconstruct how these societies were assembled over time.

AUSTRALIA'S DESERTS

There are large bands of deserts and drylands along the tropics in both northern and southern hemispheres (Middleton and Thomas 1997). Australia's deserts form the major block of arid lands in the southern hemisphere; taken as a whole, they constitute a classic mid–latitude desert. The region's aridity is a

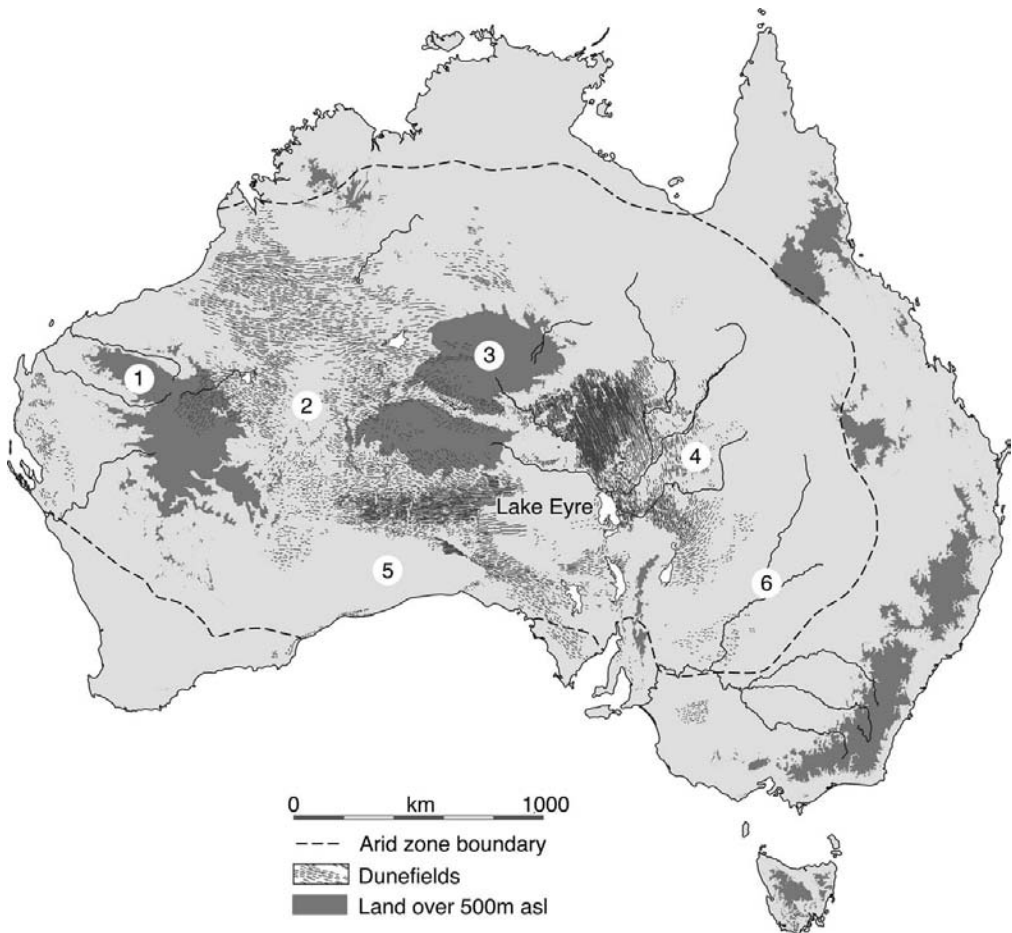


Figure 1.4. The Australian arid zone, showing major geographic features: (1) Pilbara; (2) Western Desert; (3) Central Australia; (4) Arid rivers region; (5) Nullarbor Plain; (6) Darling–Paroo river system. The boundary of the region follows Morton et al. (2011).

product of large-scale subsidence of dry, stable air along the tropics, enhanced by the size of the continent. The geographic boundaries for this block of Australian deserts and drylands are poorly defined – and it is well to remember that modern climate indices are likely to be a poor guide to the extent of these deserts in the past. I use the boundary adopted by Morton et al. (2011). Referring to the standard UNEP aridity index P/PET (a ratio of precipitation to potential evapotranspiration), Morton et al. take a P/PET value of less than 0.4 as the boundary of arid Australia (see also Stafford Smith and Cribb 2009) (Figure 1.4). This includes areas that, on climatic criteria, would be classified as arid and semi-arid (UNEP aridity index: semi-arid P/PET 0.20–<0.50; arid 0.05–<0.20), but aligns better with eco-regions where biota have clear adaptations to arid conditions (see Thackway and Cresswell 1995). The

coverage of this book mostly deals with an arid core, that is, the 3 million km² area that today would be formally classified as arid on UNEP criteria. However, the wider boundary used by Morton et al. suits my purposes because it also represents the maximum extent of the arid zone during the climatic conditions that prevailed during the late Pleistocene. Throughout this book, I use the terms 'desert' and 'arid zone' interchangeably to refer in general terms to the (shifting) arid core, and 'desert margins' to refer to the semi-arid or dry-subhumid fringes of the desert; and I refer to 'Australia's deserts' whenever I need to remind myself that the 'desert' is not a uniform region.

Diversity is an important theme here. 'Deserts', observed Isaiah Bowman, Director of the American Geographical Society, 'are no more alike than mountains or plains' (1924: 60). This is true in the Australian context, where patterns of rainfall, soil fertility and physical geography vary across the arid zone and frame a range of different opportunities for people. The zone of greatest aridity centres on Lake Eyre – a huge saltlake of 9,690 km² – where annual rainfall averages about 100 mm. Out from this, average annual rainfall increases from 250 mm in the south to 500 mm in the north. The greater part of the interior forms an arid core of 3 million km², where P/PET is less than 0.20 (meaning that rainfall makes up less than 20 per cent of the potential loss of moisture through evaporation). This is surrounded by a wide belt of semi-arid country, adding another 2–2.5 million km².

The named deserts tend to be major dunefields or stony ('gibber') plains, but the arid zone encompasses a wider range of regions. We can list the more important of these, moving from west to east across Figure 1.4:

1. The Pilbara in northwest Australia is a zone of uplands and ranges, between the Fortescue and Ashburton Rivers. Importantly, this region has both an inland and a coastal component and connects the desert interior with an arid west coast that extends from the Dampier region, to Northwest Cape, and on to Shark Bay in the south.
2. In the western half of the arid zone, three sandy deserts (Great Sandy Desert, Little Sandy Desert and Great Victoria Desert) are grouped with the Gibson Desert (an expanse of lateritic gravel plains) and collectively called the 'Western Desert' (Gould 1977: 8). These deserts are part of a continental swirl of dunefields that ring the heart of the continent (Hesse 2010). Most of the dunes here are linear sandridges less than 15 m high and are often stable and vegetated. More than 1.6 million km² of the Australian arid zone is covered by aeolian sand, either sandplain or dunefields. All of the sandy deserts also contain small range systems, with rockholes, gorges and run-on areas that provide focal points for human use of the region.
3. The Central Australian ranges form a large block of desert uplands in the heart of the continent – with the MacDonnell Ranges in the north

and the Mann–Musgrave Ranges south of Lake Amadeus – dubbed ‘the Red Centre’ by HH Finlayson (1936) for its crimson, deeply oxidised rock faces and red sands. Geographically, this is a plateau 500 m above sea level, broken by the central ranges, which strike east–west across the region in an almost unbroken belt more than 400 km long and up to 160 km wide, separated by narrow sandplains or alluvial valleys. The northern ridges of the MacDonnell Ranges are rugged uplands of crystalline and metamorphic rocks. Local relief commonly exceeds 300 m, and Mt Liebig (1,267 m), Mt Zeil (1,531 m) and Mt Sonder (1,380 m) are the highest points in Central Australia. The major river systems of Central Australia – such as the Finke River – have their headwaters in these ranges, and this is a starkly beautiful landscape with dark red gorges and gum-lined river channels of white sand and gravel. The Central Australian ranges also contain the greatest concentration of rare, relict and endemic plant species in the arid zone, underlining their importance as the major biogeographic refugium in the desert.

4. The eastern desert – the ‘arid rivers’ region – is a large ephemeral riverine system that includes the catchments of the Mulligan and Georgina Rivers, and the Diamantina–Warburton and Cooper Creek–Barcoo drainages (Robin, Dickman and Martin 2010). These arid rivers intermittently transfer large flows of slow-moving floodwaters from the desert margins towards Lake Eyre, which is the terminus for this vast internal drainage system (Kotwicki 1986). Unlike the sand-bed channels of Central Australia, this is a muddy, in places anastomosing, channel system. During the 2009–10 La Niña, shallow floodwaters reactivated a network of channels, swamps and floodplains, gradually inundating an area larger than Germany. In the lower part of the catchment, these intermittent flows create a sharp contrast between the transient richness of the floodplains and some of the most arid sandridge country in Australia, giving the eastern desert quite a different character to the Western Desert and Central Australia. Towards Lake Eyre, increasing aridity and desolation – as well as the prominence of apparently fossil lakes and palaeochannels – led JW Gregory to label this region ‘the dead heart of Australia’ (1906).
5. Among this set of deserts, the Nullarbor Plain on the southern margin of the continent has a unique character. This is a vast karst plain, forming a treeless chenopod steppe. Surface water is absent, although solution tubes form natural cisterns in places. From a human perspective, the most habitable part of the region is a narrow strip of arid woodland sandwiched between the open plain and sea cliffs up to 100 m high; it is along this southern margin that massive limestone caves and dolines preserve some of the deepest and best stratified archaeological sites in Australia.

THE ECOLOGICAL BACKGROUND

Plant and animal communities in inland Australia have been 'shuffled and reassembled through filters of increasing aridity' throughout the Quaternary (Morton et al. 2011: 315) and have adapted to a landscape poor in basic nutrients such as nitrogen and phosphorus. However, on shorter ecological timescales, Stafford Smith and Cribb (2009) point out that deserts are characterised not just by scarcity but also by transient richness. Today, Australia's deserts are only moderately arid and mostly well vegetated, with large areas of spinifex (*Triodia*) hummock grassland and arid woodlands. But they experience extreme variation in rainfall and biological production. In some respects, the desert is an unstable extension of the savanna, shrublands and grasslands surrounding the region. Part of the reason for the unexpectedly high perennial biomass is that rain-bearing systems occasionally extend deep into the interior. Rainfall in Australian drylands is influenced by several weather systems, all of which attenuate towards the centre of the continent: the Australian summer monsoon in the north, tropical cyclones in the Pilbara and northwest, and the winter westerlies along the southern margins of the desert (Sturman and Tapper 2006). The monsoon is the most important of these – and the Quaternary record of the desert is largely a history of shifts in the reach of monsoon rainfall into the interior and changes in the strength of this circulation system (Figure 1.5). The net effect of these circulation patterns is infrequent and unpredictable large rainfall events separated by long dry spells that sometimes last for several years. Although variability in rainfall is a generic characteristic of most deserts, Van Etten (2009) showed that the summer rainfall zone of Australia's deserts (north of 27°S) has extreme interannual fluctuations in rainfall, greater than most other desert regions. For instance, Alice Springs, with a median annual rainfall of 259 mm, received only 54 mm of rain in 1985 but a staggering 903 mm in 1974. The region also experiences extremes in temperature: at 69.3°C, an area near Winton was the hottest area on Earth in 2003 (Mildrexler, Zhang and Running 2006).

In the hummock grasslands of Central Australia and the Western Desert, wildfire is an important circuit-breaker in these ecosystems. Fires follow the buildup of fuel loads in good years, recycling scarce nutrients and removing climax vegetation. However, in the arid rivers region east of Lake Eyre, wildfires are less frequent (Morton et al. 2011: fig. 4) and here, episodic flooding is probably at least as important in redistributing nutrients and triggering biological activity. In general terms, the spinifex ecosystems of the western half of the desert are rejuvenated by fire, and those in the eastern part of the desert are rejuvenated by water (in the form of extensive floods).

Despite the influence of erratic and intermittent rainfall on the ecology of these deserts, research has also shown that it is too simplistic to characterise

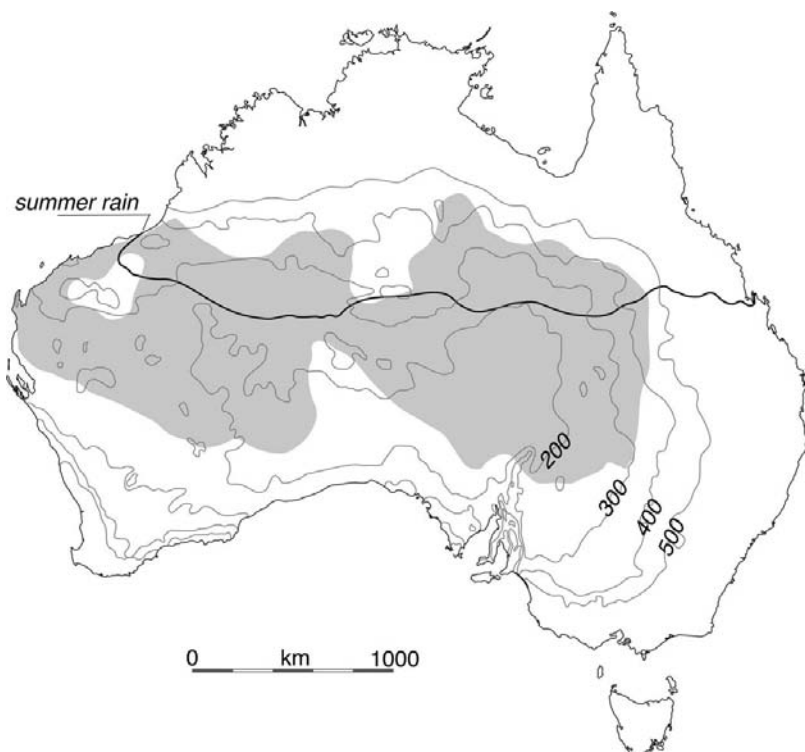


Figure 1.5. Influence of the Australian monsoon on Australia's deserts. Bold line shows the southern limit of the summer rainfall zone (where rainfall in October–March is >3:1 rainfall in April–September). Shaded area shows zone of highest variability in rainfall (1.25–2.0: calculated as 9th decile–1st decile/median). Isohyets show mean annual rainfall. Variability is greatest at the limits of the monsoon. (After Morton et al. 2011: fig. 3)

biotic activity in these deserts as entirely a pulse-and-reserve system, whereby pulses of plant growth are separated by long dormant periods. This is because the high standing biomass and low turnover of plant matter also provide the basis for food webs between booms. Because infertile soils promote longer leaf lifespans and tough unpalatable vegetation, the major herbivores in Australia's deserts are termites and ants consuming plant detritus and exudates. These invertebrate communities are comparatively stable and provide the basis for persistent guilds of consumers: reptiles, birds, insectivorous rodents and marsupials. These in turn provide an array of persistent resources for Aboriginal people, especially in the form of lizards and grubs. In the global context, the density and diversity of reptiles in these environments is unusual: Nosepeg Tjupurrula memorably described the abundance of varanid lizards in *Pintupi* country as making it like a 'poultry run' (Kimber 1988: 48).

THE DESERT'S PEOPLE

Historically, the Australian desert had some of the lowest population densities on record for human populations (as low as one person per 100–200 km²). At the time of European contact, somewhere between 60,000 and 100,000 people occupied Australia's deserts. Berndt (1959) estimated that the precontact population of the Western Desert was between 10,000 and 18,000 people. For Central Australia, a figure of between 10,000 and 12,000 people seems probable, given population estimates for various areas. The highest population densities were in the ranges and river corridors – ranging from about 1 person per 13 km² in the best parts of the Central Australian ranges (Strehlow 1965, 1970), through 1 person per 50 km² in other parts of the ranges (Yengoyan 1968; Layton 1986), to 1 person per 90–200 km² in the sandy deserts (Meggitt 1962; Long 1971; O'Connell, Latz and Barnett 1983).

Reviewing cultural divisions across the continent, Peterson (1976) found that although arid-zone groups were distinct from those in other areas, the desert was not a single-culture area. The Western Desert groups were the most socially inclusive and fluid societies, including people we know today as the *Martu*, *Ngaatjatjara* and *Pintupi* (Sutton 2003). Some culturally related groups, such as the *Pitjantjatjara* and *Yankunytjatjara*, also occupied range country in the Mann–Musgrave Ranges. There was otherwise a sharp cultural divide, with Arandic-speakers occupying the Central Australian ranges, including the *Arrernte*, *Alyawarr* and *Anmatyerre*. Generally, these societies were marked by richer cultural paraphernalia; denser, more deeply etched mythologies and longer ceremonial song cycles. To the east, groups such as the *Diyari* and *Yandruwantha* along Cooper Creek, and the *Wangkangurru* occupying the Simpson dunefield, were different again. Ranged along a demographic gradient, there were systemic changes in patterns of territoriality and land tenure, with territoriality apparently coupled to population density. Corporate descent groups had primary responsibility for land in Central Australia and probably also in the eastern part of the arid zone (Peterson 1986; Sutton 2003; Keen 2004) but were absent in the Western Desert. In the latter area, 'sociality is stretched to its uttermost and the emphasis is on inclusion': descent is reduced to 'a metaphor manifested in such phrases as, "my father's country" as an explanation or claim' (Peterson 1986: 151–2), although ritual property is still jealously held.

HUMAN ECOLOGY

Deserts are difficult environments for hunter-gatherers, not just because scarcity of water is a limiting factor but also because they are inherently patchy and highly variable on a range of spatial and time scales. Small parts of the landscape – springs, groundwater discharge zones, run-on areas and oases – are