Chapter 6

MAMMALS OF THE SOUTH-WESTERN LITTLE SANDY DESERT

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ABSTRACT

The terrestrial mammal fauna of the south-western Little Sandy Desert was systematically surveyed during three visits to three focal areas in which five sites representing the array of landscape surfaces were trapped and searched. A fourth, less systematic, expedition added to data for one of the survey sites and sampled two additional areas. Twenty-eight extant native species and evidence of past occurrence by three locally or regionally extinct indigenous species as well as seven exotic species were recorded. This represents all but one of the indigenous species known to inhabit the whole biogeographical region. Nine CWR mammals that once occurred in the biogeographical region are presumed extinct. Spatially minor surfaces were disproportionately important but differed in their relevance to indigenous and exotic species. Sandstone uplands had the richest indigenous faunas and six species were restricted to that habitat. Loam and clay surfaces had the richest exotic faunas.

INTRODUCTION

A biological survey of the south-western Little Sandy Desert commenced with a reconnaissance trip in July 1995. The scope of the study was: *To conduct a comprehensive biological survey of the south-western Little Sandy Desert, Keartland Botanical District, to facilitate an evaluation of the nature conservation values of the region and make recommendations for reservation.*

Sampling infrastructure (including capped pit traps) were established in October 1995 and information on the mammal fauna of the study area was collected during four subsequent sampling trips (Table 6.1). This chapter reports the survey results for mammals in the form of an annotated species list. Information on preferred habitats is included where relevant.

METHODS

FIELD WORK

Terrestrial mammal sampling trips are detailed in Table 6.1.

Table 6.1 Itinerary of trips on which information about the terrestrial mammals of the south-western Little Sandy Desert was collected.

Trip	Duration	Principal Field workers
Sampling Trip 1 (Routine)	1996 – 4 to 22 June	A.N. Start, A. Chapman
Sampling Trip 2 (Routine)	1996 – 8 to 26 October	P. Kendrick
Sampling Trip 3 (Routine)	1997 – 11 to 28 August	A.N. Start, D. Knowles
Sampling Trip 4 (Landscope Expedition)	1999 – 11 to 22 September	A.N. Start

SAMPLING SITES

In each of three focal areas, Beyondie (B), Cooma Well (C) and Savory Creek (S), five sites were selected to represent as many of the characteristic landforms as possible. All sites were sampled systematically on each of the first three trips. Four of five Beyondie sites (B1, B3, B4, B5) and two sites at each of two additional focal areas, namely Yanneri Lake (Y) and Dreamtime Gully (D) (Figure 2.4), were sampled less systematically on a *Landscope* Expedition in September 1999. The surface types, coordinates and vegetation of all sites are described in Appendix 2.1 and summarised in Table 6.2. Additional data were recorded opportunistically throughout the project area.

SAMPLING METHODS

Terrestrial mammals - traps

At Beyondie, Cooma Well and Savory Creek, two trap lines were operated for five days on trips 1, 2 and 3. Each trap line consisted of:

- Six pits lined by 60 cm lengths of 15 cm diameter PVC pipe spaced at five metre intervals and interconnected by a continuous 30 cm high aluminium fly-wire drift fence;
- Two pits lined by 20 l PVC buckets, each placed between two five metre long drift fences, and
- 20 medium Elliott traps baited with a mixture of peanut paste and rolled oats.

All pit traps were left *in situ,* but capped, between trips. Drift fences were also left in place between trips.

Table 6.2 A summary of landforms and surfaces sampled for mammals during the botanical survey of the south-western Little Sandy Desert.

Landform	Summary description	Sample sites
Sandstones	Generally, hills with precipitous dry gullies and skeletal sandy soils. Low trees and shrubs over hummock grasses.	B5, C1, S5, D2
Lateritic uplands	Generally rolling uplands with incised dry gullies. Hummock grass and mulga along gullies.	C5, S3 (see B1 below)
Lunette dune	A gypsum (kopi) ridge, largely overlain by eolian red sand, bordering a dry saline playa. Low *Eucalyptus* woodland over shrubs and hummock grasses.	Y1
Red sand dunes	Generally steep, linear (sometimes complex) dunes. Sparse bloodwoods on the crests; patchy shrubs, forbs and hummock grasses amongst wind-excavated bare areas.	B3, C4, S4
Red sand plains	Generally extensive red sand plains supporting scattered (sometimes clumped) mallees and/or shrubs over hummock grass.	B2 (broad swale), C2, S2, D1
Calcareous loams	Generally, relatively flat, low sites on which loams or sandy loams overlay calcrete. Open mulga woodlands and, mostly annual, tussock grasses.	B1 (some lateritic gravel), B2, C3
Loamy clay	Fluvial deposit adjacent to Savory Creek and immediately upstream of a rock bar. Halophytes, low shrubs. Some patchy hummock grass on overlying eolian sand.	S1
Saline clay	Vegetated shore of a saline playa, in part overlain by eolian sand. Samphires, hummock and tussock grasses.	Y2

All pits at three Beyondie sites (B1, B4, B5) and half the pits at a fourth site (B3) were opened for two nights on the Landscope Expedition of September 1999. Elliott traps set each night on that trip were B1~20, B3~50, B4~25 and B5~25. At Yanneri Lake and Dreamtime Gully trap lines consisted of a variable number of Elliott traps and six or seven 20 l buckets spaced at five metre intervals and interconnected by 30 cm high nylon flywire drift fences. Total trap effort is summarised in Table 6.3.

Besides traps set to catch terrestrial vertebrates, at each study site six pit traps (10 l bucket) to sample invertebrates was filled with preservative and left *in situ* between trips. Wire mesh grids prevented access by most mammals but, occasionally, very small individuals were caught.

Terrestrial mammals - Incidental records

All records of larger mammals (e.g. echidnas, macropods and most exotic species including dingos) are based on sightings of live animals, tracks, droppings, warrens or found remains.

Bats

Bats were sampled by using mist nets, harp traps, shooting and searching likely roost sites. In addition, Anabat II (Titley Electronics, Australia) or D940 (Pettersson Elektronik, Sweden) ultrasound detectors were used to obtain calls which were transformed (divided by 16 or 10 respectively) and recorded on TDK XG60 Metal IV cassette tapes through Sony Walkman Professional (WMD6C) tape recorders. McKenzie *et al.* (*in press*) have incorporated these results with other records in an analysis of the bats of the Little Sandy Desert. While bats were sought at all study areas, efforts were not always directed at study sites. Thus, records of bats from all study areas (but not individual study sites) are listed in the results section of this report. Information on foraging strategies is taken from McKenzie and Bullen (*in press*) and McKenzie *et al.* (*in press*).

Voucher specimen and nomenclature

Voucher specimens of most dasyurid, rodent and bat species were fixed in 5% formaldehyde solution and preserved in 70% ethyl alcohol. They have been deposited in the Western Australian Museum, Perth where Ms. Norah Cooper has confirmed field determinations. Liver samples were taken from representative dasyurid and rodent specimens and preserved in 70% ethyl alcohol for future genetic study. Scientific nomenclature is that used by McKenzie and Burbidge (2002).

Table 6.3 Trapping effort expressed as trap nights at each site sampled in the south-western Little Sandy Desert study area.

Trapping site	Sampling effort		
	Elliott traps	15 cm diameter PVC pipes	20 l Buckets
Beyondie			
B1	640	204	68
B2	600	180	60
B3	650	192	64
B4	650	204	68
B5	700	204	68
Cooma Well			
C1	600	180	60
C2	600	180	60
C3	600	180	60
C4	600	180	60
C5	600	180	60
Savory Creek			
S1	600	180	60
S2	600	180	60
S3	600	180	60
S4	600	180	60
S5	600	180	60
Yanneri Lake			
Y1	120	0	12
Y2	100	0	22
Dreamtime Gully			
D1	135	0	42
D2	225	0	0
TOTAL	**9820**	**2772**	**1004**

RESULTS

Twenty eight extant indigenous, one apparently locally and two presumed regionally extinct species were recorded in the project area. Extant indigenous species included a monotreme, eleven dasyurid and two macropodid marsupials, six rodents and eight bats. Exotic species included a rodent, two carnivores, three large herbivores and a rabbit. Table 6.4 summarises

the number of species recorded in each of the study areas. Details are presented in an annotated list (below) and Appendix 6.3.

Table 6.4 Summary of the extant mammal species recorded in the south-western Little Sandy Desert study area.

Mammals	Trapping Sites					
	Beyondie	Cooma Well	Savory Creek	Yanneri Lake	Dreamtime Gully	Elsewhere
Indigenous						
Echidna	1	1	1	1	1	1
Dasyurids	8	4	7	1	2	0
Macropods	2	2	2	0	1	2
Rodents	4	2	4	2	3	0
Bats	7	8	8	0	1	0
Total indigenous	**22**	**17**	**22**	**4**	**8**	**3**
Exotic						
Rodents	1	1	1	1	0	0
Carnivores	2	2	2	1	1	3
Herbivores	3	2	3	1	1	3
Rabbits	1	1		1		
Total exotics	**7**	**6**	**6**	**4**	**3**	**6**
TOTAL MAMMAL SPECIES	**29**	**23**	**28**	**8**	**11**	**9**

MONOTREMES

Tachyglossidae

Tachyglossus aculeatus (Short-beaked Echidna) B5, C1, S1, D2.

Records are based on droppings and at Dreamtime Gully, quills in a cave. Probably more widespread than these records indicate. Diggings probably made by Echidnas were seen at several locations, but not recorded without corroborating evidence.

MARSUPIALS

Dasyuridae

Antechinomys laniger (Kultarr) B1.

One specimen, recovered from a long-term invertebrate pit trap.

Dasycercus cristicauda (Mulgara) C4.

One, captured on a swale vegetated with a mid-dense low shrubland and hummock grassland of *Aluta* and *Triodia*.

Dasykaluta rosamondae (Little Red Kaluta, Little Red Antechinus) S1, S3, S5.

Captured at three locations in the Savory Creek study area. The gravely and stony upland surfaces at S3 and S5 are similar to stony slopes on which it is commonly caught in the Pilbara Biogeographical

Region but, there, it is seldom taken from surfaces like that at S1 (A.N. Start, personal observations). However, there was a rocky ridge very close to S1 from where the animal may have come.

Dasyurus geoffroyi (Chuditch) D2.

A skull with some fur and dried tissue attached was recovered from a cave at Dreamtime Gully. This species was once widespread through the central and western deserts, where it may have been still present until the 1950s or 1960s (Burbidge *et al.* 1988). It is presumed regionally extinct (*Burbidge et al.* 1988, Maxwell *et al.* 1996).

Ningaui ridei (Wongai Ningaui) B1, B3, B4, C1, C2, D1.

Widespread and usually associated with hummock grass habitats.

Planigale maculata (Common Planigale) B5, S5.

See discussion under *Planigale* species 2.

Planigale species 2 B5.

Three planigales representing two taxa were collected on sandstone surfaces. Two have been attributed to *P. maculata* but taxonomic treatment of Western Australian arid zone planigales is unsatisfactory and subject to revision (Norah Cooper, Western Australian Museum, pers. comm.).

Pseudantechinus woolleyae (Wolley's Antechinus) C1, S5.

Uncommon. Only recorded on rugged sandstone surfaces.

Sminthopsis longicaudata (Long-tailed Dunnart) B5, S5.

Uncommon. Only recorded on rugged sandstone surfaces.

Sminthopsis macroura (Stripe-faced Dunnart) B1, B2, C2, S1.

Fairly common. Associated loamy soils.

Sminthopsis ooldea (Ooldea Dunnart) B2, B4, C3, C5, S3.

Fairly common. Except at B4, associated with mulga on lateritic and calcrete surfaces.

Sminthopsis youngsoni (Lesser Hairy-footed Dunnart) B1, B3, B4, C2, S3, S4, D1, Y1.

Common. Usually caught on sandy surfaces.

Macropodidae

Bettongia lesueur (Boodie) B1, B2, C3, various.

All records are based on the remains of former warrens (which are still clearly visible in limestone, calcrete and lateritic country of the Great and Little Sandy, Gibson and Tanami Deserts (*Burbidge et al.* 1988, Andrew Burbidge, CALM, pers. comm.)). Large warrens, now occupied by rabbits, at B1, B2 and C3 were characterised by extensive tunnelling under calcrete slabs and large piles of excavated soil, which sometimes formed peripheral moats. Elsewhere, warrens were most visible in gravely soils where they appeared as mounds several metres in diameter, usually crowned by forbs and annual grasses in contrast to the ubiquitous hummock grasses of the surrounding terrain.

This species was once widespread and abundant in the central deserts where it is now presumed extinct, although it persisted until about 1935 and perhaps as recently as about 1960 (Maxwell *et al.* 1996, Burbidge *et al.* 1988).

Macropus robustus (Euro) B5, C1, S5, D2.

Euros were frequently seen in rocky habitats where scrapes and droppings indicated that they used numerous overhangs and small caves for resting.

Macropus rufus (Red Kangaroo) B1, B2, B3, B4, C2, C4, S1, S4.

Droppings of large macropods were widespread throughout the study area and those on non-rocky surfaces were probably deposited by Red Kangaroos. Animals were seldom seen.

Petrogale sp. (Rock Wallaby) D2.

Faecal pellets of a Rock Wallaby (probably *P. lateralis*) were abundant in a cave at Dreamtime Gully.

EUTHERIANS

Muridae

* *Mus domesticus* (House Mouse) B1, B2, B3, B4, B5, C1, C2, C3, C5, S1, S3, S5, D1, D2, Y1, Y2.

Common. Usually ubiquitous in all habitats.

Leporillus apicalis (Djooyalpi, Lesser Stick-nest Rat) B5, C1, S1, D2.

The species is presumed extinct (Lee 1995). Our records are based on old stick nests containing 'amberat' placed in rocky breakaways and caves. They are attributed to *L. apicalis* because only that species is known to have occurred as far north as the Little Sandy Desert. (Robinson 1995a, 1995b).

Notomys alexis (Tarrkawarra, Spinifex Hopping-mouse) B3, B4, C2, C4, S2, S3, S4, S5, D1, Y1.

Common. Captured at all sandy sites. Tracks were seen on sandy surfaces throughout the study area. Occasionally trapped on other surfaces in the Savory Creek study area.

Pseudomys chapmani (Ngadji, Western Pebble-mound Mouse) S5.

Mounds (mostly not active; see Start (2000) for a discussion of active and inactive pebble-mounds) were located on the lower slope of a sandstone hill adjacent to a shrub-lined creek. Animals were trapped higher up the same hill at the S5 study site. Information on pebble size-range from mounds at this site is given by Start (2000). Extensive searches were made for mounds on sandstone ranges at Cooma Well, Beyondie and Dreamtime Gully and on upland, gravely, laterite surfaces at Savory Creek and Cooma Well. None were found.

Pseudomys desertor (Wildjin, Desert Mouse) B3, B5, S2.

Usually rare. Sandy surfaces in the Savory Creek (sandplain) and Beyondie (swale) survey sites but also on sandstone at the latter. Only one was captured before 1999 (Savory Creek) but six were taken at Beyondie that year. Most were subadult. Their abundance at Beyondie in 1999 probably reflects seasonal conditions.

Pseudomys hermannsburgensis (Mingkiri, Sandy Inland Mouse) B1, B2, B3, B4, B5, C1, C2, C3, C4, C5, S1, S2, S3, S4, S5, D1, D2, Y1, Y2.

Very common and ubiquitous. Specimens showed considerable variation. On some individuals, the white underside was sharply divided from the brown dorsum on the cheeks and flanks but gradual on others. Some individuals had blackish pigmentation in the foot skin, where others had white or pale pink feet. Tail length also varied. Similar variation has been noted in the east Pilbara (A.N. Start, personal observation). One specimen resembles an entity known from the Pilbara that may represent a distinct taxon (Norah Cooper, Western Australian Museum, pers. comm.). This taxon warrants further study.

Zyzomys argurus (Djoorri, Common Rock-rat) B5, D2.

Recorded from sandstone habitats at Beyondie and Dreamtime Gully. Only one was captured before 1999 (at Beyondie) but ten were caught at Dreamtime Gully that year (including pregnant females and

subadults). Their abundance at Dreamtime Gully in 1999 may reflect temporal (seasonal conditions) rather than geographical factors.

Molossidae

Mormopterus beccarii (Beccari's Freetail Bat) Beyondie, Cooma Well, Savory Creek.

Apparently common and widespread, recorded foraging in relatively open airspace a little above or alongside canopies.

Tadarida australis (White-striped Freetail Bat) Cooma Well, Savory Creek.

Apparently uncommon, but possibly a migrant absent from the area at times. Foraging recorded in open air space high above tree canopies.

Emballonuridae

Saccolaimus flaviventris (Yellow-bellied Sheathtail Bat) Beyondie Cooma Well, Savory Creek.

Sometimes common, foraging in open air space high above tree canopies.

Taphozous georgianus (Common Sheathtail Bat) Cooma Well, Savory Creek.

Apparently uncommon. Foraging in open air space above tree canopies.

Vespertilionidae

Chalinolobus gouldii (Gould's Wattled Bat) Beyondie, Cooma Well, Savory Creek.

Widespread and common, foraging in open air just above or alongside canopies. One disturbed in daylight from a narrow, hollow bloodwood (*Corymbia* sp.) branch entered another similar one about 100 m distant

Nyctophilus geoffroyi (Lesser Long-eared Bat) Beyondie, Cooma Well, Savory Creek.

Widespread and common, particularly in mulga woodland where it foraged below the canopy within the stands. Roosting bats (usually alone, but up to four pregnant females) were located at Cooma Well and Beyondie in hollow, dead mulga stems, sometimes below disused nests of Chestnut-rumped Thornbills (*Acanthiza uropygialis*).

Scotorepens greyii (Little Broad-nosed Bat) Beyondie, Cooma Well, Savory Creek.

Widespread and common, foraging in open air just above or alongside canopies.

Vespadelus finlaysoni (Finlayson's Cave Bat) Beyondie, Cooma Well, Savory Creek, Dreamtime Gully.

Widespread and common near sandstone hills, foraging in cluttered airspace close against canopies or within mulga stands. Roosting colonies were located in caves at Savory Creek and Dreamtime Gully.

Canidae

* *Canis lupus dingo* (Dingo) Vicinity of B1, B3, B4, C1, C2, C3, C4, S1, S2, S3, S4, D1, Y1, Y2.

Dingoes but more commonly, their scats and tracks were seen throughout the study area. Set dingo traps were found near Beyondie and they are, no doubt, hunted for scalp money within and beyond the pastoral leases that fringe or extend into the project area. Apparent absence from some rocky and gravely sites may reflect poor track visibility on hard surfaces.

Felidae

* *Felis catus* (Cat) Vicinity of B1, B3, B4; C2, C4, C5, S1, S2, S4 D1 Y1, Y2.

Common. Occasionally cats but more commonly scats and tracks were seen on soft surfaces throughout the project area. Apparent absence from rocky and gravely sites probably reflects poor track visibility on hard surfaces.

Equidae

* *Equus asinus* (Donkey) Vicinity of B1 C1 S1, S2, S3, S4, S5, Ilgarari Creek.

Tracks indicated that donkeys were widespread but generally scarce except in the vicinity of Savory and Ilgarari Creeks, where dependable water probably sustained them.

Bovidae

* *Bos taurus* (European Cattle) Vicinity of B1, S1, S2.

Cattle were permanently present along Savory Creek and on adjacent sand plains. Elsewhere, they may be itinerant visitors from unfenced, adjacent pastoral leases when water is available. The Beyondie record was of old tracks although van Leeuwen (CALM, pers. comm.) reported a small herd foraging on Willie Soak in April 1997.

Camelidae

* *Camelus dromedarius* (Dromedary, One-humped Camel) Vicinity of B1, B2, B3, B4, B5, C1, C2, C3, C4, C5, S1, S2, S3, S4, S5, D1, Y1, Y2.

Camels or their tracks and scats were common throughout the study area except in uplands, particularly more-rugged sandstone hills. Carcasses indicated that they are hunted on occasions, probably for meat but also by sporting shooters and as part of feral animal control programs.

Leporidae

* *Oryctolagus cuniculus* (European Rabbit) B1, B2, C3, Y1, Y2

Rabbits were common on loamy soils overlying calcrete at Beyondie and Cooma Well, where they occupied large warrens that had originally been constructed by Burrowing Bettongs (see above). They were also common on clay pans and the fringes of playas and salt lakes but not recorded on Savory or Ilgarari Creeks.

DISCUSSION

There have been no previous surveys of the mammals of the study area. However, McKenzie and Youngson (1983), Burbidge *et al.* (1988) and McKenzie and Burbidge (n.d.) provide information on European records and Aboriginal knowledge of mammal distributions pertinent to the Little Sandy Desert Biogeographical Region.

Twenty-eight species of indigenous mammals still occur in the study area. At least two more mammals may occur in the study area. The Northern Marsupial Mole, *Notoryctes caurinus,* is widespread in Australia's more northern sandy deserts but seldom encountered because of its fossorial habits and the Bilby, *Macrotis lagotis* is still patchily distributed in adjacent biogeographical regions. Another species, the Black-footed Rock-wallaby survives elsewhere in

the Little Sandy Desert (e.g. Calvert Range) and was probably the rock-wallaby once present but apparently now extinct in the project area.

At least seven species that are now presumed regionally or totally extinct are known or likely to have occurred in the Little Sandy Desert. They are Chuditch (*Dasyurus geoffroyi*), Burrowing Bettong (*Bettongia lesueur*), Woylie (*Bettongia penicillata*), Spectacled Hare-wallaby (*Lagorchestes conspicillatus*), Rufous Hare-wallaby (*Lagorchestes hirsutus*), Golden Bandicoot (*Isoodon auratus*) and Pig-footed Bandicoot (*Chaeropus ecaudatus*). During the survey evidence was found which indicated that two of them, the Chuditch and Burrowing Bettong, occurred in the study area. The causes and patterns of decline in Australian mammals have been discussed by many authors (e.g. Burbidge and McKenzie 1989, McKenzie and Burbidge 2002, Morton 1990, Short and Smith 1994, Smith and Quinn 1996) and are beyond the scope of this report except to note consistency with the general pattern; that is CWR (critical weight range), non-volant mammals have experienced the greatest decline.

Thus, the indigenous mammal fauna of the biogeographical region probably comprised at least 38 species at European settlement. At least nine (24%) are presumed extinct at the regional scale but 29 (74%) and possibly 31 (79%) are still extant. Within the study area, at least 28 species persist (i.e. 90% of those possibly and 97% of those known to be extant within the Little Sandy Desert). In summary, the study area has experienced the same level of loss as the rest of the Little Sandy Desert, but it retains a rich and diverse indigenous mammal fauna, which includes all but one of the species known to be extant in the biogeographical region.

Seven exotic species are established in the study area and an eighth, the Red Fox has been recorded on Weelarrana Station (the pastoral lease that extends into the study area along Savory Creek) and Kumarina Station (in the catchment of Ilgarari Creek) (King and Smith 1985). Foxes, which followed rivers through the Pilbara (Start 2000), may have accessed the study area along these drainage lines. The impact of feral mammals on indigenous species in the study area is not known but foxes and cats may have had a significant impact.

Some species were widespread and abundant in all habitats (e.g. Sandy Inland Mice, House Mice and some of the tree roosting bats) however, most species were not ubiquitous to all habitats. Their distributions were influenced by a variety of physical and temporal environmental parameters.

Water

There was no evidence that the distribution of indigenous species was influenced by the need to access fresh water. However, donkeys and cattle were. Donkeys were abundant on Ilgarari and Savory Creeks. Along the latter, they used all habitats including sandstone hills. However, cattle did not venture far from Savory Creek (they were not recorded on Ilgarari Creek) or use upland areas. Nevertheless, the ability of both species to venture further from dependable water in good seasons was evidenced by old tracks at Beyondie.

Vegetation and roosting habitat

Although highly mobile, the distribution of bats in the landscape may be restricted by specific roost requirements and the distance they can travel from roosts to forage. For example, Common Sheathtail Bats and Finlayson's Cave Bats require caves or large rock crevices and cannot utilise areas of sandy desert far from ranges supporting such habitats. Similarly, mulga provides both suitable roost sites and foraging habitat for the Lesser Long-eared Bat. However,

tree roosting bats that forage in open air above tree canopies such as Yellow-bellied Sheathtail Bats are able to use the entire study area.

Land surfaces

Land surfaces are critical to the distribution and diversity of the non-volant mammal fauna in the study area. Differences in surface types are related to landscape position. Thus, sandy surfaces occur in mid-altitudes throughout the project area but they are punctuated by isolated lateritic uplands and occasional sandstone ranges as well as by low-lying loams and clays associated with calcretes, playas and paleodrainage lines. The occurrence of species on primary land-surface types is substantially different to the contribution of those surfaces to the landscape (Table 4).

Table 6.5 The number of non-volant, extant mammals recorded on each of four major land surfaces. Values in parenthesis in brackets show the number of species recorded only on that land surface. (Single records of species on surfaces other than those on which they are common are treated as vagrant and were omitted.)

Non-volant extant mammals	Land surface types			
	Sandstone ranges	Lateritic uplands	Sandy surfaces	Loam - clay surfaces
Indigenous species (N=20)	11 (6)	5 (0)	8 (1)	8 (1)
Exotic species (N=7)	3 (0)	5 (0)	5 (0)	7 (2)
Total	**14 (6)**	**10 (0)**	**13 (1)**	**15 (3)**

Amongst indigenous species, only eight were recorded on sandy surfaces and only one of them, the Mulgara, was not recorded on other surfaces. Sandstone ranges with eleven species, six of which were restricted to them, were particularly important and loam or clay surfaces were as rich as sandy surfaces. The reason for the importance of the ranges may be found in the considerable structural complexity of the terrain and vegetation compared to the other surfaces. The relatively low diversity on lateritic uplands may be attributed to their position as run-off sites in combination with their structural simplicity.

Use of these surfaces by exotic species is quite different. All seven exotics used loam and clay surfaces and all except rabbits and cattle used sandy surfaces (although cattle occasionally ventured into sandy areas close to Savory Creek) and lateritic uplands. Lack of cat records in sandstone ranges is probably misleading; they are cryptic, usually nocturnal and the habitat is not conducive to preserving tracks. Thus, it appears that only rabbits, cattle and (usually) camels avoided the ranges.

Fire

Mammal populations in Australia's deserts are known to be affected by fire, which has been mooted as one of the most important factors affecting CWR mammal populations (e.g. Burbidge and McKenzie 1989) although the effects on populations of different species are poorly understood. Little is known of fire regimes in the study area but it is reasonable to assume that, since Aboriginal people departed, fire frequency has changed and burn areas have increased. There may also be fewer cool fires than there used to be, but that is speculative.

Certainly, most of the project area is fire prone and there was widespread evidence of fires throughout. Fires are probably most frequent and extensive in vegetation dominated by

hummock-grass communities, particularly extensive sand plains. In most other habitats some areas escape all but the most severe fires. Thus, in dune fields bare sand can protect patches and even prevent fires crossing into adjacent swales. In sandstone ranges, bare rock inhibits fire, particularly at the Cooma Well site. In low-lying areas and in mulga woodlands, halophytes made poor fuels and annual grasses and ephemeral forbs limit exposure during periods of high fire-risk. Mulga patches were generally long-unburnt.

Despite the existence of these refugia, fire is of considerable concern. Species such as Desert Mice, which are most common in hummock grasslands, are thought to require mature vegetation (Kerle 1995) and to be uncommon except in good seasons. Thus, frequent extensive fires could lead to a series of local extinctions and, without opportunity for recolonisation, regional extinction.

Climate

Two rodents that were rare throughout the study, demonstrated the capacity of arid-zone rodents to increase in good seasons. Only one Desert Mouse was captured, in the Savory Creek study area, prior to the *Landscope* expedition of 1999 when six, including five subadults were caught on sandy (four at B3) and sandstone (two at B5) surfaces at Beyondie. Similarly, before 1999, only one Common Rock-rat was caught (at B5) but nine, including reproductive females and subadults were caught in a 225 Elliott trap-nights limited trapping session at Dreamtime Gully. Interestingly none were taken at Beyondie on that trip, despite the abundance of Desert Mice.

Given the capacity of small desert mammals to persist at low (often undetected) numbers but respond to resource abundance flowing from good seasons (e.g. Dickman 1999) and our poor knowledge of population trends brought about by post-fire vegetation succession, it is difficult from our data to determine the long-term conservation status of species. However some such as the Mulgara are apparently rare. Others occur as isolated populations in specialised habitats, and not all seemingly suitable sites support populations of them. They may also be rare and subject to regional decline as a consequence of localised extinctions. Again, dasyurids inhabiting sandstone habitats provide examples, including Long-tailed Dunnarts, Wolley's Antechinus and two planigales.

Whilst rodents like the Common Rock-rat may fluctuate in numbers, the Ngadji appears to be genuinely rare in the study area. Unlike rodents that make simple burrows and may be almost undetected by trapping in poor seasons, pebble-mounds persist for many decades after the animals have disappeared (Start *et al.* 2000) and are easily found by experienced observers. Despite extensive searches in five areas of potentially suitable habitat, mounds and mice were only located at S5 where there were few mounds and many of those were disused. Nevertheless, Ngadji are known from other sites in the Little Sandy Desert (Start 2000).

Conclusions

- The wave of CWR mammal extinctions that has affected Australia's deserts has caused extinctions in the study area comparable to the rest of the Little Sandy Desert Biogeographical Region.
- There is still a rich and diverse mammal fauna within the study area. It includes all but one of the mammals known to be extant in the Little Sandy Desert.
- Minor habitats support a disproportionate component of the mammal fauna and sandstone ranges are outstanding in this regard.

- Some species are rare and potentially susceptible to local extinction. Those events could translate into significant regional declines.
- Seven species of feral mammals occur within the region including feral cats. Foxes may have occurred in the study area in the past, and are possibly still present albeit in low numbers.
- The use of major surface types by feral mammals differs significantly from that of extant indigenous species and only (two) feral species are restricted by the availability of free surface water.
- Loamy or clay soils low in the landscape are used by all exotic species while (probably) only four use sandstone habitats.

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* * * * *

APPENDIX 6.1

Presence/absence matrix showing the recorded occurrence of all mammal species by trapping site.

Where species were recorded at survey sites, but not at any of the trapping grids within that site, they are listed under *X (where * is the letter representing to the survey sites). The survey sites were Beyondie (B), Cooma Well (C), Savory Creek (S) Dreamtime Gully (D) and Yanneri Lake (Y). Because bats were sampled widely within Study areas, records are all attributed to *X, and not particular trapping grid. Note that there was very limited effort at Yanneri Lake and Dreamtime Gully compared with other sites.

Names proceeded by an asterisk (*) are exotic species and those preceded by a hash (#) are presumed extinct in the study area or regionally.

Mammal species	Trapping grids																							Total
	B1	B2	B3	B4	B5	BX	C1	C2	C3	C4	C5	CX	S1	S2	S3	S4	S5	SX	D1	D2	DX	Y1	Y2	YX	
Monotremes																									
Tachyglossus aculeatus					*		*						*							*					4
Dasyurids																									
Antechinomys laniger	*																								1
Dasycercus cristicauda										*															1
Dasykaluta rosamondae													*		*		*								3
# *Dasyurus geoffroyi*																				*					1
Ningaui ridei	*		*	*			*	*											*						6
Planigale maculata					*												*								2
Planigale sp					*																				1
Pseudantechinus woolleyae						*										*									2
Sminthopsis longicaudata				*												*									2
Sminthopsis macroura	*	*						*					*												4
Sminthopsis ooldea		*		*					*		*				*										5
Sminthopsis youngsoni	*		*	*				*							*	*			*			*			8
Macropods																									
# *Bettongia lesueur*	*	*							*									*							4
Macropus robustus					*		*										*			*					4
Macropus rufus	*	*	*	*				*		*			*			*					*			*	9
# *Petrogale (?) lateralis*																				*					1
Rodents																									
* *Mus domesticus*	*	*	*	*	*		*	*	*		*		*		*		*		*	*		*	*		16
Leporillus apicalis					*		*											*		*					4
Notomys alexis			*	*				*		*				*	*	*	*		*			*			10
Pseudomys chapmani																	*								1
Pseudomys desertor			*		*									*											3
Pseudomys hermannsburgensis	*	*	*	*	*		*	*	*	*	*		*	*	*	*	*		*	*		*	*		19
Zyzomys argurus					*															*					2
Bats																									
Mormopterus beccarii						*						*						*							3
Tadarida australis												*						*							2
Saccolaimus flaviventris						*						*						*							3
Taphozous georgianus												*						*							2
Chalinolobus gouldii						*						*						*							3
Nyctophilus geoffroyi						*						*						*							3
Scotorepens greyii						*						*						*							3
Vespadelus finlaysoni						*						*						*		*					4
Dogs																									
* *Canis lupus dingo*	*		*	*			*	*	*	*			*	*	*	*			*			*	*		14
Cats																									
* *Felis catus*	*		*	*				*		*	*		*	*		*			*			*	*		12
Horses																									
* *Equus asinus*	*						*						*	*	*	*	*								7
Cattle																									
* *Bos taurus*	*												*	*											3
Camels																									
* *Camelus dromedarius*	*	*	*	*	*		*	*	*	*	*		*	*	*	*	*		*			*	*		18
Rabbits																									
* *Oryctolagus cuniculus*	*	*							*													*	*		5

Biological survey of the south-western Little Sandy Desert

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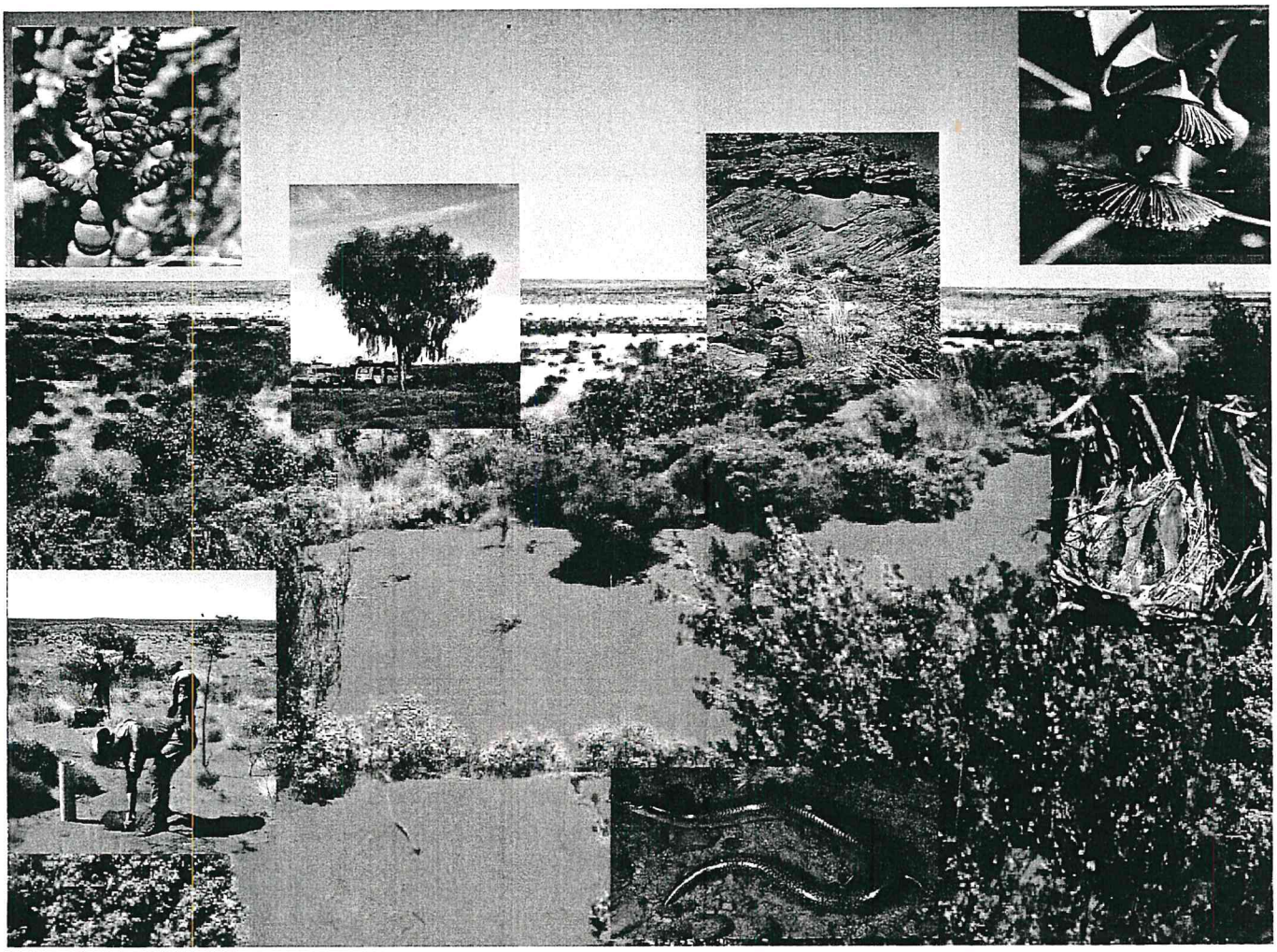

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