



DEPARTMENT OF
FISHERIES AND WILDLIFE
WESTERN AUSTRALIA

REPORT NO 30

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The Wildlife of the Proposed Karroun Hill Nature Reserve, Western Australia

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BY

W. K. YOUNGSON
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PERTH
WESTERN AUSTRALIA

1977

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Department of Fisheries and Wildlife

108 Adelaide Terrace

PERTH

R E P O R T

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THE WILDLIFE OF THE PROPOSED KARROUN HILL NATURE RESERVE, WESTERN AUSTRALIA.

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ABSTRACT

Plants and vertebrate animals were recorded from a proposed 300 000 ha nature reserve centred on Karroun Hill in the goldfields of Western Australia (30°03'S; 118°02'E).

Plant communities are described in terms of their structurally important species and related to local physiography.

Fifteen native mammal species, sixty-four bird species, twenty-four reptile species and one amphibian were recorded. Annotated lists are presented. The wildlife reflects the transitional nature of the Coolgardie Botanical District. Both Eremean and South Western Province species were recorded.

I INTRODUCTION

In its report to the Environmental Protection Authority (Anon. 1974) the Conservation Through Reserves Committee (C.T.R.C.) recommended that approximately 300 000 ha of vacant Crown Land 30 km north-east of Beacon and close to the eastern edge of Lake Moore, Western Australia, be declared an "A" Class reserve for the conservation of flora and fauna. The following reasons were given:

- a) It is on the boundary between the South Western and Eremean Botanical Provinces. This interzone is noted for its diversity of vegetation types and degree of endemism (Burbidge 1960; Marchant 1973).
- b) The area, particularly the mallee country, contains a number of birds, which are rare to the region. These include the Major Mitchell Cockatoo (*Cacatua leadbeateri*), Red-tailed Black Cockatoo (*Calyptorhynchus banksi*), Mallee-Fowl (*Leipoa ocellata*) and Gilbert Whistler (*Pachycephala gilberti*).
- c) The area is representative of both the Southern Murchison and the Northern Wheatbelt. Neither area contains existing large reserves.

Staff from the Department of Fisheries and Wildlife were involved in a biological survey of the area when the C.T.R.C. report was written.

This paper is based on data collected during four field trips to the proposal: 13-17 September 1973; 22 January - 4 February 1975; 16-22 June 1976; 16-17 February 1977.

Throughout the report several geographical terms are used. These require definition. "Botanical Provinces" and "Botanical Districts" (see Fig. 1) are those of Gardner and Bennetts (1956). The "Wheatbelt" includes the Avon Botanical District, most of the Irwin District, the northern portions of the Stirling and Eyre Districts, and intrudes into southern parts of the Coolgardie District.

II CLIMATE AND GEOMORPHOLOGY

Climatic survey data relevant to the proposal have been published by the Bureau of Meteorology (Anon 1964). A summary is presented here.

The proposal lies on the north-eastern fringe of the wheatbelt of Western Australia and has a distinctly seasonal climate with hot dry summers and cool wet winters. Two rainfall stations, Goodingow and North Beacon, operate 75 km to the north and 22 km to the south of the area respectively (see Table 1). The yearly average for Goodingow taken over a 45 year period is 265 mm with just over half this amount (139 mm) falling between the months of May and August inclusive. The North Beacon rainfall readings span 15 years with a yearly average of 294 mm. Over half this amount falls between May and August inclusive. Localised summer thunderstorms are comparatively frequent and are brought about by depressions migrating southwards from the tropics. When they reach the high temperatures and unstable air over the sub-tropics, heavy falls occur in some areas while neighbouring localities have little or no rain.

Average summer day temperatures are 32°C to 35°C in the region but extremes of 43°C to 46°C have been recorded. Average winter minima are 4°C - 5°C with temperatures as low as -4°C recorded in some years.

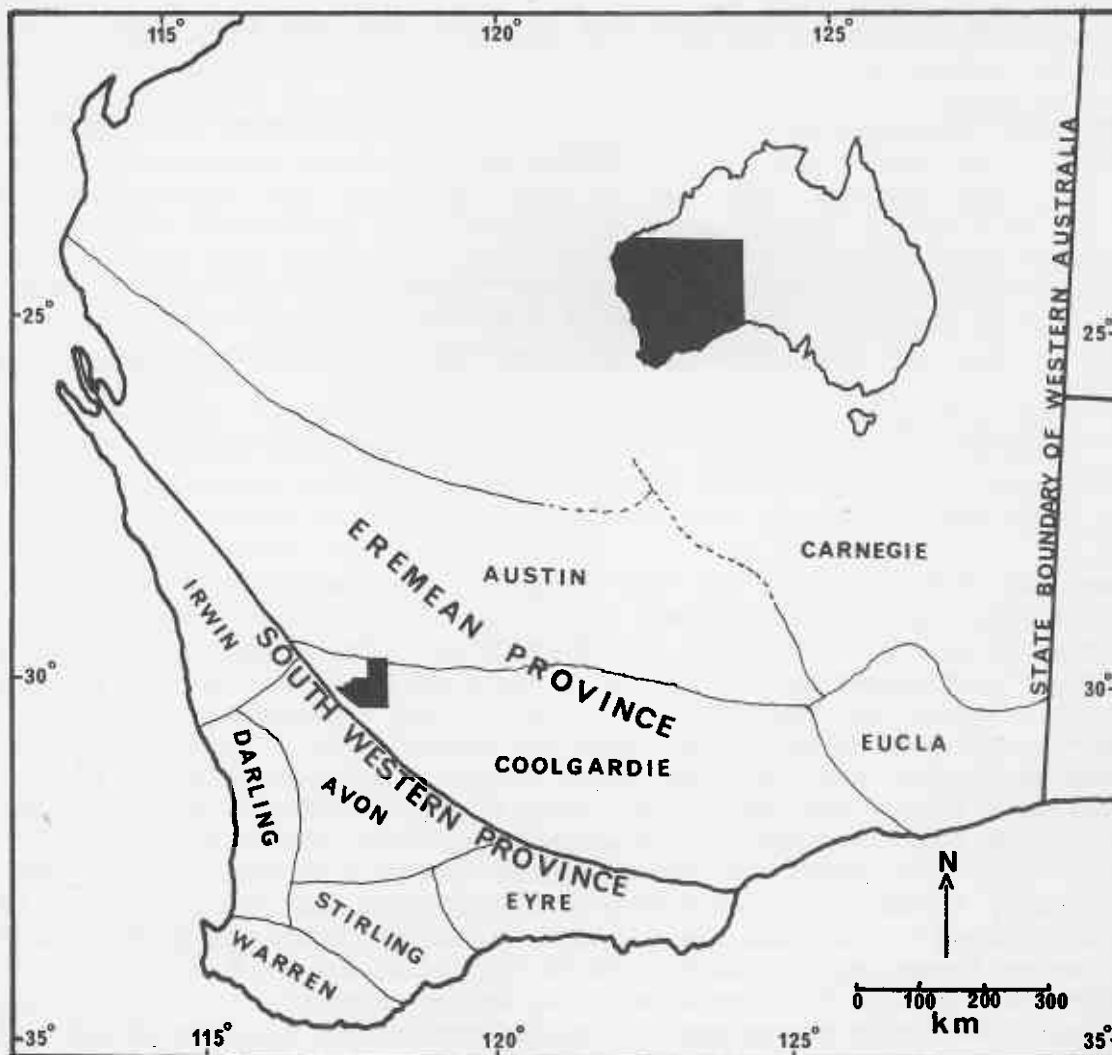


FIGURE 1. Location of the proposed Nature Reserve at Karroun Hill, Western Australia. The boundaries of the relevant Botanical Provinces and Botanical Districts as defined by Gardner and Bennetts (1956) are shown.

TABLE 1.

AVERAGE MONTHLY AND YEARLY RAINFALL (IN MILLIMETERS)

NUMBER OF YEARS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL FOR YEAR
GOODINGNOW													
45	16	20	29	22	34	41	36	28	9	10	8	11	265
NORTH BEACON													
15	15	22	19	26	29	44	49	40	19	12	10	10	294

An aerial photo-mosaic of the proposal included runs of photographs taken in October 1962, April 1968 and October 1969. All showed evidence of recent bushfires. On 3 February 1975 a wildfire was observed in the vicinity of Mt Churchman. By the evening of the following day it had moved approximately 15 km south-west on a broad front and had burnt out a large proportion of the proposal west of the main track. It was stopped by firebreaks along the southern vermin proof fence. Many other recent and old burn patterns were recorded in the course of a flight over the proposal in November 1976. These patterns were especially common in the north-eastern and eastern parts of the proposal where the various shrubland formations are widespread and carry fires more readily than the open-woodlands characteristic of the more south-western portions. *Codonocarpus continifolius* was recorded in shrubland areas regenerating after fire.

The Karroun Hill area lies within the Western Shield, an area of mostly subdued relief, with an elevation of approximately 350 m although granite tors such as Mt Churchman (427 m) protrude above this level. The principal rocks are exposures of a granite and gneiss complex and mostly occur across the centre of the area. One small quartzite dyke was recorded just outside the south-eastern corner. The country appears to have been dissected by an active drainage system, although to-day the drainage lines are impeded or occluded and major valleys contain salt lakes which act as sumps and evaporative pans.

The Karroun Hill area is part of the catchment of Lake Moore and its outlying pans. Recent work by the Public Works Department of Western Australia has shown that Lake Moore

is the sump of an internal drainage basin (P.D.K. Collins, pers. comm.), unlike the Lake Grace-Chinokup System (McKenzie and Youngson, 1975) which functions as a river in exceptionally wet years.

Bettenay and Hingston (1961) and Beard (1972) have discussed the topography in the Merredin and Mt Jackson areas respectively. In principal the Karroun Hill area is similar. The gently undulating terrain, consisting of broad shallow valleys and extensive flat to gently sloping uplands, trends south-westward to Lake Moore. The uplands are extensive undissected remnants of an "old duricrusted plateau" surface and are covered with yellow sandy soils and laterite. In places around the eroding edge of the old plateau the lateritic duricrust is exposed as breakaways up to 3 m high. The old plateau surface has been stripped away over large areas leaving broad, shallow, gradually sloping valleys (the "new plateau"). Granites are exposed on the new plateau mostly as sheets and low outcrops.

As a general rule, red soils are confined to the shallow valley floors and immediate slopes. Yellow sands occur on depositional slopes higher in the landscape and laterite and yellow sandy soils are found on the divides, the old plateau surface.

III VEGETATION

The proposal is situated on the interface between the Eremean and South Western Botanical Provinces. A small portion of the north-eastern limit lies in the Austin Botanical District as defined by Gardner and Bennetts (1956); the remainder is located in their Coolgardie Botanical District. Beard (1970, p.3) describes the Coolgardie Botanical District as "mostly Eucalypt dominated which is a southern feature... Vegetation is determined by soil and consists of Eucalypt woodlands of various types, thickets and sand heaths". He describes the Austin District as "essentially the mulga country of Western Australia". The Avon Botanical District, adjacent to the proposal - but in the South Western Province, is described as "corresponding to the State's wheatbelt". Its original vegetation was "Eucalypt woodland of Salmon and York gum on red soils", with limited areas of sand and laterite carrying heath.

Beard (1972) has mapped the vegetation of *ca* 15 000 sq. km of land adjacent to the south-eastern corner of the Karroun Hill proposal. He distinguishes seven vegetation systems, six of which he regards as sub-divisions of the "Coolgardie district of the South-western Interzone of Burbidge (1960), while one belongs to the South-western Botanical Province".

In the following section, plant communities recognized in the Karroun Hill proposal are listed mainly in terms of physiography (Fig.2). Plant formation terminology follows Specht, Roe and Boughton (1974).

LIST OF PLANT COMMUNITIES

- 1a) Numerous salt lakes occur in the lower lying western end of the proposal. The gypseous and saline loams in the vicinity and on the edges of the lakes support a tall shrubland of *Melaleuca lateriflora* and *M. uncinata* to 5 m over *Eremophila* sp., *Olearia muelleri*, *Exocarpus aphyllus* and *Atriplex bunburyana* (0.5 - 2 m). Elements from surrounding formations such as *Eucalyptus salmonophloia* and *E. loxophleba* are sometimes present as emergents. Sparse decumbent patches of *Arthrocnemum* spp. also occur, increasing in density nearer and on the salt lakes.
- 1b) Around the south-eastern edge of the larger salt lakes is a lunette (3-4 m high) of friable grey-brown calcareous earth supporting a tall open-shrubland of *Casuarina obesa* (5-8 m) over sparse shrubs such as *Melaleuca eleutherostachya* and *Acacia* sp. to 2 m. *Enneapogon* sp. forms a diffuse ground cover. A mound of leaf litter approximately 0.5 m high surrounds the base of most of the Casuarinas.
- 2a) On the hard red soils of drainage lines leading to the salt lakes are tall open-woodlands consisting of *Eucalyptus salmonophloia* (15-20 m) sometimes with *Callitris columellaris* to 10 m. Sparse *Acacia acuminata* and *A. obtecta* to 2.5 m over scattered *Kochia triptera* and *Atriplex bunburyana* (0.5 m) form the understorey. Areas of bare ground, not covered by shallow leaf litter seasonally support numerous *Helichrysum lindleyi* Plate 3.
- 3a) Most of the southern half of the proposal consists of gradual slopes of red earth rising from the drainage lines. These support low open-woodlands to open-woodlands controlled by *Eucalyptus loxophleba* (10-15 m) and *Callitris columellaris* to 8 m with one or the other predominating. The understorey is of variable density and includes *Acacia acuminata*, *A. obtecta*, *A. prainii*, *A. sp. aff. linoelata*, *A. resinomarginea* and *A. graffiana* (2-3 m) over *Alyxia buxifolia* and *Hakea recurva* (1-2 m). Some or all of the above shrubs are present depending on the locality. Sparse *Helichrysum lindleyi* form a seasonal ground cover in clearings. Scattered granite outcrops are found in the higher areas of this formation. Plates 1, 2.
- 3b) In the north-eastern portion of the proposal the open-woodlands to low open-woodlands of *Eucalyptus loxophleba* and *Callitris columellaris* described in 3a) have a less diverse understorey composed of *Acacia aneura* (7 m) *Grevillea nematophylla* (7 m) over *Acacia tetragonophylla* (2 m) and, occasionally, *Brachychitin gregorii* (5 m).
- 3c) *Callitris columellaris* is found in varying numbers throughout most plant communities but on red earth 3a) it occasionally forms a low woodland 5-8 m high

over dense thickets of *Acacia acuminata*, *A. obtecta*, *A. prainii*, *A. sp. aff. lineolata* and *A. graffiana* to 2 m. Sparse *Santalum sp.* (3-4 m) over *Alyxia burifolia* and *Hakea recurva* (2-3 m) also occur. *Helichrysum lindleyi* is seasonally common on the bare ground.

- 3d) Throughout 3a) there are occasional low-lying areas of red loams with clay subsoils. These support an open *Eucalyptus salubris* woodland 10-15 m high with sparse *Callitris columellaris* to 10 m over *Templetonia egena* (1 m). Ground cover consists of *Enneapogon sp.* and seasonal *Helichrysum lindleyi*.
- 4) At higher levels on the gradual slopes, red earths generally give way to yellow soils, and the vegetation forms a complex mosaic. Most of the granite outcrops appear to occur in these transitional areas between yellow and red soils but few were actually accessible by vehicle. One outcrop in the western end of the area was surrounded by an open-scrub of *Eremophila oldfeldii* (4 m) over *Eremophila clarkei* and *Dodonaea inequitifolia*. The yellow soils can be divided into three main types: yellow earths with some surface gravel, sandy yellow earths and yellow earthy sands.
- 4a) Areas of deep sandy yellow earths with some fine surface gravel support a low woodland of *Casuarina acutivalvis* (5-8 m) with emergent *Acacia resinomarginea* to 12 m and a few *Melaleuca uncinata* to 10 m. Patchy tussocks of *Ecdiocolea monostachya* form the ground cover. Plate 4.
- 4b) Sandy yellow earths support thickets of a tall shrubland of *Eucalyptus leptopoda*, *Acacia jutsonii*, *Melaleuca cordata* and *M. uncinata* (2-3 m) with shallow leaf litter covering the ground below.
- 4c) On higher depositional slopes in the north-eastern portion of the proposal, yellow earthy sands support (Plate 5) a tall open-shrubland composed of emergent *Eucalyptus leptopoda* (Mallee) and *Hakea coriacea* (6-7 m) over *Leptospermum sp. aff. fastigatum* (3-4 m), *Grevillea didymobotrya* (2 m) and *Leucopogon sp.* to 0.5 m. Ground cover consists of sparse *Triodia scariosa* interspersed with a sedge (Cyperaceae) both to 0.5 m. A low shrubland, with *Triodia scariosa* as a ground cover was recorded adjacent to the south-western limit of the area. In this instance, however, the upper storey consisted of *Casuarina corniculata* (2 m), *Petrophile incurvata* (1 m) and emergent *Eucalyptus leptopoda* (2-3 m). In the course of an aerial reconnaissance of the proposal the authors recognised two other patches of spinifex. The approximate positions are as follows: 29°59'S, 118°00'E; 30°10'S, 118°11'E. The extent of formations including spinifex in keeping with the transitional nature of the country from the South-western to the Eremean Botanical Province.

- 5a) The highest level in the landscape are lateritic gravels in a clay matrix which are situated on the top of the gradual rises. The vegetation of these divides is a low shrubland of *Casuarina corniculata* thickets (1-2.5 m) with *Hakea* sp. aff. *subsulcata* (3 m), *Melaleuca cordata* and *Phebalium tuberculosum* (1 m), and emergent *Acacia beauverdiana* to 5 m.
- 5b) Abrupt erosional scarps are sometimes present around the edges of the divides 5a). Two formations were recorded at the foot of these scarps. (i) A claypan with saline loams and a tall shrubland similar to 1a). (ii) A *Eucalyptus salubris* open-woodland referable to 3d) with a sparse ground cover of salt tolerant plants such as *Atriplex bunburyana* (Plate 6). Occasional emergent *Eucalyptus salmonophloia* and *E. loxophleba* are scattered through this association.

The physiography and vegetation communities (Table 2) recorded in the Karroun Hill area belong to the Karroun Hill System described in Beard (1972), although the trend towards salt pans and an almost complete removal of the duricrust in parts of the western portion of the area are relatable to Beard's (ibid) Moorine Rock System. He placed the Karroun System with the Coolgardie Botanical District and the Moorine Rock System with the Southwestern Province.

TABLE 2.

COMMUNITIES DESCRIBED BY BEARD (1972) IN THE JACKSON AREA AND RECORDED IN THE KARROUN HILL AREA

JACKSON AREA	KARROUN HILL AREA
<i>Acacia</i> - <i>Melaleuca</i> - <i>Casuarina</i> thickets	4(b), 4(c), 5(a)
<i>Acacia resinomarginea</i> thickets	4(a)
<i>Eucalyptus salmonophloia</i> and <i>E. salubris</i> sclerophyll woodlands	2(a), 3(d), 5(b) - ii
<i>Eucalyptus loxophleba</i> sclerophyll woodlands	3(a)
<i>Callitris columellaris</i> community	3(a), 3(b), 3(c)

A comparison of the floristic composition of the communities recorded in the Karroun Hill area with those described by Beard (1972) for the Karroun System in the Jackson area shows that there are definite floristic differences although most of the communities can be readily related as in Table 2, even allowing for the vagaries of different collectors.

The Karroun Hill area is valuable to conservation because it includes representatives of many of the plant communities typical of the Coolgardie District in the Jackson area. Preliminary results (Royce, unpublished) from the only large nature reserve in non-coastal parts of the Coolgardie District - the Lake Barker Nature Reserve situated approximately 200 km to the south-east - indicate substantial differences both in the vegetation systems present and in the species composition of certain plant communities common to both areas. For instance, in the Lake Barker Nature Reserve, sandplain communities corresponding to the shrublands 4(b), 4(c) and 5(a) are richer in mallee species and in Proteaceae species such as *Banksia* spp.; woodland formations corresponding to 2(a) and 5(b) - ii are also richer and include such species as *Eucalyptus oleosa* var. *glauca*, *E. gracilis* and *E. floetoniae*. On the other hand, *Callitris* woodlands comparable to 3(b) and 3(c) are not represented in the Lake Barker Reserve. Beard (1969) has also mapped country east of the Lake Barker reserve and his results correspond with these observations.

The presence of certain Austin District elements such as Mulga (*Acacia aneura*) and everlastings (*Helichrysum lindleyi*), and of sandplain shrublands controlled by *Acacia* spp. rather than the heathlands of mallee and Proteaceae species found further south, can be related to the area's location in the northern portion of the Coolgardie District.

IV MAMMALS

Survey techniques used were similar to those listed in Burbidge *et al.* 1976. Bats were obtained by means of a floodlighting technique (Youngson and McKenzie, 1977), mist nets and foraging.

All mammals collected have been lodged in the Western Australian Museum with accession numbers: M10589-10602, M12523-12626, M14704-14739, M15141-15157.

In the annotated species list data are presented in the following order:

- 1) Numbers of male and female specimens collected at each site.
- 2) Description of habitats in which the species was collected. These have been indexed into the descriptions of the plant formations (Vegetation, this report).
- 3) Breeding information. Expanded information not covered by Table 2 has been included under this heading.
- 4) Method of capture.
- 5) Notes on taxonomy, behaviour, ecology and distribution.

ANNOTATED SPECIES LIST

Megaleia rufa (Desmarest)

RED KANGAROO

Individuals and groups of two or three animals were flushed during the day or observed in the course of spotlighting runs. Nowhere common.

Recorded from most associations (1a), (2a), (3a), (3b), (3c), (3d), (4a), (4b), (4c), (5a), (5b-i), (5b-ii).

Sightings.

Macropus robustus Gould

EURO

Two adults and a juvenile at heel were often recorded on a breakaway in the western portion of the proposal. Two skulls were collected from this breakaway and one partial skeleton came from another to the north-east.

Breakaways with tall shrubland (5b-i), open-woodland (5b-ii).

Sightings. Pick-up specimens.

Sminthopsis murina (Waterhouse)

COMMON DUNNART

2 (1♂, 1♀). 3 (2♂, 1♀) adjacent to proposal.

Foot of breakaway fringed by a tall shrubland (5b-i). On the slopes of a quartzite ridge with *Casuarina acutivalvis* (to 3 m) *Calycopeplus* sp. (2 m) and *Ptilotus obovatus* (0.5 m) surrounded by a tall open-woodland (2a). An open-woodland (3d). A regenerating thicket (1 m high) of (4b) with tussocks of *Enneapogon* sp.

Trapped.

It is noteworthy that all specimens of *S. murina* were collected from areas subject to increased runoff such as breakaways and low-lying patches of *Eucalyptus salubris* woodland.

Myrmecobius fasciatus Waterhouse

NUMBAT

One femur was collected from a crevice in a breakaway and identified by A. Baynes of the Western Australian Museum.

Open-woodland (5b-ii).

Pick-up specimen.

It is doubtful whether a bone would last more than one hundred years in the conditions under which this one was found (A. Baynes, pers. comm.).

Leporillus sp.

STICK-NEST RAT

Consolidated remains of a stick-nest were found under a ledge in a breakaway.

Tall shrubland (5b-i).

Pick-up specimen.

Notomys mitchellii (Ogilby)

MITCHELL'S HOPPING MOUSE

22 (10 ♂, 12 ♀)

Low woodland (4a). Tall shrubland (4b), (5a). Tall open-shrubland (4c). Several specimens were collected in an area of (4b) which had been badly burnt. Sparse *Eucalyptus leptopoda* and *Melaleuca cordata* had regenerated to 0.5 m and were the only available cover on the bare ground. *Codonocarpus cotinifolius* to 3 m formed a very sparse upperstorey.

All specimens were collected in the higher levels of the landscape.

One female collected in September 1973 had four fetuses less than half term. One in the right uterine horn and three in the left. Another female (September 1973) had three fetuses, two in the right uterine horn and one in the left.

Trapped.

Pseudomys hermannsburgensis (Waite) SANDY INLAND MOUSE

2 ♀

Low woodland (4a). Low shrubland (5a).

Trapped.

Nyctophilus geoffroyi Leach

LESSER LONG-EARED BAT

3 ♀, 1 ♀ adjacent to proposal.

Tall open-woodland (2a) Low woodland (3c). Tall shrubland (5b-i).

Shot.

One female was collected from a group of at least five bats disturbed during the daytime in a stand of *Callitris columellaris* (January 1975).

Chalinolobus gouldii (Gray)

GOULD'S WATTLED BAT

48 (21 ♂, 27 ♀); 31 (23 ♂, 8 ♀) adjacent to proposal.

Tall shrubland (1a). Tall open-woodland (2a). Open to low open-woodlands (3a), (3d). Low woodland (3c). Tall shrubland (4b).

Shot, mist netted.

Chalinolobus morio (Gray)

CHOCOLATE BAT

5 ♀

Tall open-woodland (2a).

Shot.

Eptesicus pumilis (Gray)

LITTLE BAT

4 ♂

Tall open-woodland (2a). Tall shrubland (4b).

Shot.

[?]
Nycticeius greyi (Gould)

LITTLE BROAD-NOSED BAT

10 (6♂, 4♀).

Tall shrubland (1a). Tall open-woodland (2a). Low woodland (3c). Tall shrubland (4b).

Shot.

Tadarida australis Jones

WHITE STRIPED BAT

9 (4♂, 5♀); 6 (1♂, 5♀) adjacent to proposal.

Tall open-woodland (2a). Open-woodland (3a). Tall shrubland (4b).

One female collected in September 1973 had one foetus less than half term in the right uterine horn.

Trapped.

Tadarida planiceps (Peters)

LITTLE FLAT BAT

14 (7♂, 7♀); 1♀ adjacent to proposal.

Tall open-woodland (2a). Tall shrubland (4b).

Shot, mist netted.

Tachyglossus aculeatus (Shaw)

ECHIDNA

Fresh skeletal material was found in a rocky crevice. Characteristic diggings were recorded.

Tall open-woodland (2a). Open-woodland fringing a breakaway (5b-ii).

Pick up, scratchings.

Mus musculus Linnaeus

HOUSE MOUSE

8 (4♂, 4♀).

Tall shrubland (5b-i).

Oryctolagus cuniculus Linnaeus

EUROPEAN RABBIT

Tall open-woodland (2a). Open-woodland (5b-ii).

Tracks, scats, pick-up.

Uncommon on the proposal.

Felis catus Linnaeus

FERAL CAT

Tall open-woodland (2a). Open and low open-woodland (3a). Tall shrubland (4b).

Shot, trapped.

Often seen at night feeding on emu carcasses along the vermin proof fence (June 1976). All stomach contents examined contained carrion and plant remains.



Plate 1.—*Acacia* spp. and *Callitris columellaris*



Plate 2.—*Eucalyptus loxophleba* over *Helichrysum lindleyi*



Plate 3.— *Eucalyptus salmonophloia*



Plate 4.— *Casuarina acutivalvis*, *Acacia resinomarginea*, *Melaleuca uncinata*

(ii)



Plate 5.— *Eucalyptus leptopoda*, *Triodia scariosa*



Plate 6.— *Eucalyptus salubris*, *Atriplex bunburyana*

Figure 2. Physiography of the proposed reserve.

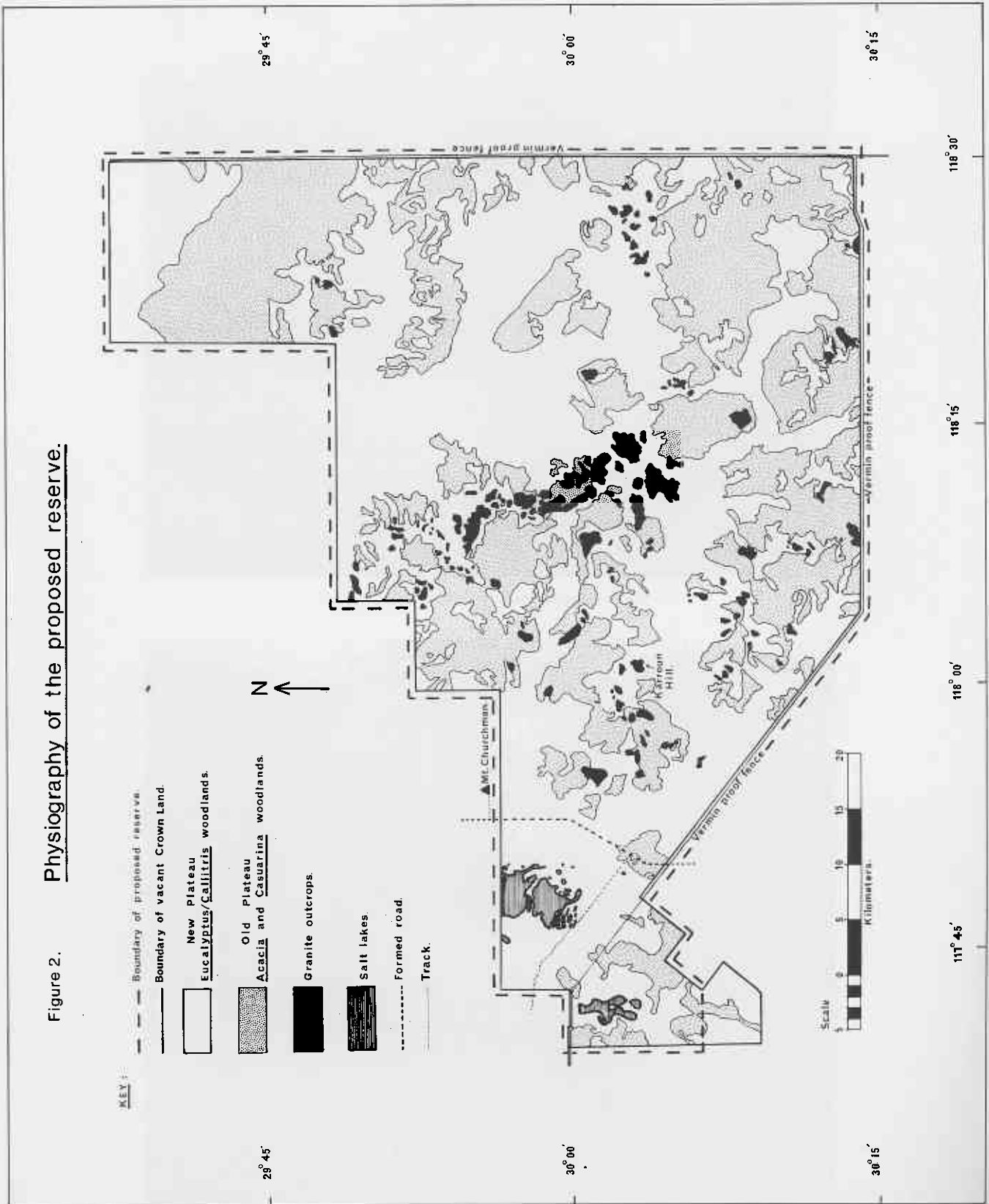


TABLE 3

BREEDING INFORMATION

Species	Date	Number of adult females collected†	Uterine distension only	Mammae & uteri enlarged	Females with foetuses	Enlarged mammae only
<i>Sminthopsis murina</i>	Jan 1975	1				
	June 1976	1		1		
<i>Notomys mitchelli</i>	Sept 1973	2			2*	
	Jan 1975	5		1		
	June 1976	5		3		
<i>Pseudomys hermannsburgensis</i>	Sept 1973	1	1			
	Jan 1975	1		1		
<i>Nyctophilus geoffroyi</i>	Jan 1975	2	1			
	Feb 1977	1		1		
<i>Chalinolobus gouldii</i>	Jan 1975	26	1	7		3
	June 1976	5	2	3		
	Feb 1977	3				
<i>Chalinolobus morio</i>	Jan 1975	5				1
<i>Nycticeius greyi</i>	Jan 1975	4		2		
<i>Tadarida australis</i>	Sept 1973	3	1	1	1*	
	Jan 1975	2		1		
	June 1976	1		1		
	Feb 1977	4		3		
<i>Tadarida planiceps</i>	Sept 1973	1		1		
	Jan 1975	6	1			

* See annotated species list.

† Excluding females whose reproductive systems were destroyed during collection.

Vulpes vulpes (Linnaeus)

EUROPEAN FOX

Tall open-woodland (2a). Open and low open-woodland (3a).
Tall woodland (4b).

Shot, scats, sightings during the day and at night.

All stomachs examined contained insect and plant remains.
Scats contained bone fragments and hair identified as
rabbit. Uncommon throughout the proposal.

Fifteen native mammals were recorded in the proposal including
thirteen extant species and two (*Leporillus* sp. and
Myrmecobius fasciatus) which presumably no longer occur
there. Four feral species were also recorded.

The mammal list includes both south-western and inland
species. *Sminthopsis murina* and *Notomys mitchelli* are
normally associated with the South Western Botanical Province;
Megaleia rufa and *Pseudomys hermannsburgensis* with the Ereman
Province. Such a mixture of mammal faunas is predictable in
the Coolgardie District considering its intermediate location
and the transitional nature of its vegetation. An examination
of relevant mammal records in the collection of the Western
Australian Museum supports this view. Other mammal species
known from the Coolgardie District, but not recorded during
this survey, include *Macropus fuliginosus*, *Cercatetus concinnus*
and *Sminthopsis crassicaudata*.

This collection has further defined the distributional limits
of *Pseudomys hermannsburgensis* and *Nycticeius greyi* by
providing first records of these species from the inland
periphery of the wheatbelt. Subsequently, we recorded
N. greyi at Wongan Hills (W.A.M. M15184) in the central
wheatbelt.

This is the first time that a substantial population of
Tadarida planiceps has been located in Western Australia.

The only other systematic mammal survey in the Coolgardie
District was undertaken on the Lake Barker Nature Reserve
(Western Australian Museum and Department of Fisheries and
Wildlife unpublished data; Butler, unpublished report) in
1969 and 1970. Results show that the Karroun Hill area and
the Lake Barker Nature Reserve have similar bat faunas;
tree-dwelling species such as *Tadarida australis* and
Chalinolobus gouldii are particularly common in both areas.
Ground-dwelling native mammals however, are poorly represented
in both the Karroun Hill area (6 species recorded) and the
Lake Barker Nature Reserve (4 species - *Megaleia rufa*,
Macropus fuliginosus, *M. robustus* and *Tachyglossus aculeatus*,
although evidence was also produced to suggest the presence
of *Sminthopsis crassicaudata*).

The urgent need for biological survey work in the Coolgardie
Botanical District is reflected by the lack of data on the
species richness and ecology of its mammal fauna.

V BIRDS

In the annotated species list data are presented in the following order.

- 1) Relative abundance.
- 2) A brief description of habitats in which the species was recorded. These have been indexed into the descriptions of the plant formations. (Vegetation, this report).
- 3) Date recorded.

ANNOTATED SPECIES LIST

EMU (*Dromaius novaehollandiae*)

Large scattered parties observed travelling south along the vermin fence in June 1976. One newly hatched chick (15 cm high) seen in same month. Recorded on all visits.

BLACK-SHOULDERED KITE (*Elanus notatus*)

One seen. Tall open-woodland (2a) near cleared country January 1975.

WHISTLING KITE (*Haliastur sphenurus*)

Observed twice. September 1973, June 1974.

COLLARED SPARROWHAWK (*Accipiter cirrocephalus*)

Two seen. Tall open-woodland (1b). September 1973, January 1975.

WEDGE-TAILED EAGLE (*Aquila audax*)

Common in all areas but seen more often in June 1976 feeding on emu carcasses along the vermin proof fence. Recorded on all visits.

LITTLE FALCON (*Falco longipennis*)

Uncommon. Seen over tall open and low open-woodlands (2a, 3a). June 1976.

NANKEEN KESTREL (*Falco cenchroides*)

Common in the vicinity of salt lakes (1a) but uncommon elsewhere (4a, 4b, 4c). Recorded on all visits.

BROWN FALCON (*Falco berigora*)

Moderately common; seen in all areas. Recorded on all visits.

LITTLE QUAIL (*Turnix velox*)

One party of about eight seen in low shrubland (5a) where two were collected in mammal traps. January 1975.

BLACK-TAILED NATIVE HEN (*Tribonyx ventralis*)

One seen on a track through tall open-woodland (2a) near cleared country. September 1973.

BANDED PLOVER (*Vanellus tricolor*)

One small party seen on farmland adjacent to the proposal. January 1975.

AUSTRALIAN DOTTEREL (*Peltohyas australis*)

One group of about twenty birds seen on farmland adjacent to the proposal. February 1977.

COMMON BRONZEWING (*Phaps chalcoptera*)

Locally common in most woodlands (2a, 3a, 3b, 3c, 3d), especially near water. Recorded on all visits.

CRESTED PIGEON (*Ocyphaps lophotes*)

Uncommon. Individual birds observed in open-woodlands (2a, 3a). September 1973, January 1975, February 1977.

RED-TAILED BLACK COCKATOO (*Calyptorhynchus banksi*)

One small flock seen in tall open-woodland (2a). September 1973.

MAJOR MITCHELL COCKATOO (*Cacatua leadbeateri*)

Small flocks of up to eight birds seen on three occasions in different localities; possibly the same group. Tall open-woodlands (2a). January 1975, June 1976.

GALAH (*Cacatua roseicapilla*)

Common. Small groups and scattered individuals seen near farming country and in tall open-woodland (2a). Recorded on all visits.

REGENT PARROT (*Polytelis anthopeplus*)

One seen. September 1973.

PORT LINCOLN PARROT (*Barnardius zonarius*)

Common single birds and small parties seen in most areas - usually in woodlands (2a, 3a, 3b, 3c, 3d). Recorded on all visits.

MULGA PARROT (*Psephotus varius*)

One pair seen near a rock-hole in low open-woodland (3a). June 1976.

BOOBOOK OWL (*Ninox novaeseelandiae*)

One seen. Others heard calling after dark. Open-woodlands (2a, 3a). September 1973, January 1975.

TAWNY FROGMOUTH (*Podargus strigoides*)

Common. Up to three individuals flushed during the day and many seen in the course of spotlighting runs after dark. Mainly in woodland formations and on fence posts along the vermin proof fence. Recorded on all visits.

OWLET-NIGHTJAR (*Aegotheles cristatus*)

Two seen during spotlighting runs. One flushed from its roost in tall open-woodland (2a) during the day.

SPOTTED NIGHTJAR (*Eurostopodus guttatus*)

One bird recorded hawking around a quartzite outcrop in a low open-woodland (5b-ii).

RED-BACKED KINGFISHER (*Halcyon pyrrhopygia*)

One seen. A nest with three partially fledged young was found in red loam clinging to the roots of a fallen Salmon gum (2a). February 1975.

RAINBOW BIRD (*Merops ornatus*)

One flock recorded in February 1975. Single bird seen in February 1977.

WHITE-BACKED SWALLOW (*Cheramoecca leucosternum*)

One flock of twelve recorded. June 1976.

AUSTRALIAN PIPIT (*Anthus novaeseelandiae*)

Seasonally common. One seen in January 1975. Many recorded on and adjacent to the proposal; mainly on tracks through a wide range of formations. February 1977.

GROUND CUCKOO-SHRIKE (*Pteropodocys maxima*)

Two parties seen near a quartzite outcrop (5b-ii). June 1976.

BLACK-FACED CUCKOO-SHRIKE (*Coracina novaehollandiae*)

Moderately common. Small parties, pairs or individual birds seen in most formations. Recorded on all visits.

SOUTHERN SCRUB-ROBIN (*Drymodes brunneopygia*)

Sightings were uncommon. Several found in mammal traps set in shrublands. (4b, 5a). January 1975.

WHITE-BROWED BABBLER (*Pomatostomus superciliosus*)

A few small parties seen (3a, 3c) in September 1973.

SPLENDID BLUE WREN (*Malurus splendens*)

Only two groups seen on the fringe of a tall open-woodland (2a). January 1975.

WEEBILL (*Smicornis brevirostris*)

Common in all areas particularly in woodlands (2a, 3a, 3b, 3c, 3d). Recorded on all visits.

BROAD-TAILED THORNBILL (*Acanthiza apicalis*)

Moderately common in areas of shrubland (4b, 5a). September 1973, January 1975, June 1976.

CHESTNUT-TAILED THORNBILL (*Acanthiza uropygialis*)

Two parties seen. Old nest found in a stump in tall open-shrubland (4c). June 1976.

YELLOW-RUMPED THORNBILL (*Acanthiza chrysorrhoa*)

Uncommon. Several birds seen and an old nest found in tall open-woodland (2a). September 1973, June 1976.

REDTHROAT (*Pyrrholaemus brunneus*)

Recorded in low shrubland (5a). January 1975, June 1976.

WHITEFACE (*Aphelocephala leucopsis*)

One recorded in January 1975.

BROWN FLYCATCHER (*Microeca leucophaea*)

One seen in low woodland (3c). June 1976.

HOODED ROBIN (*Petroica cucullata*)

Uncommon. Seen in isolated patches of low shrubland (5a). June 1976.

RED-CAPPED ROBIN (*Petroica goodenovii*)

Moderately common. Seen in all formations, generally in pairs. September 1973, June 1976, February 1977.

GREY FANTAIL (*Rhipidura fuliginosa*)

Moderately common. Observed in most woodland formations. A winter visitor from the south of the State. September 1973, June 1976.

WILLY WAGTAIL (*Rhipidura leucophrys*)

Moderately common in most formations. Recorded on all visits.

RUFIOUS WHISTLER (*Pachycephala rufiventris*)

Moderately common in low and tall open-woodlands (2a, 3a, 3c).

WESTERN SHRIKE-THRUSH (*Colluricincla rufiventris*)

Common. Observed in most low woodlands and shrublands. January 1975, June 1976.

CRESTED BELL-BIRD (*Oreoica gutturalis*)

Moderately common. Recorded in most formations. Seen feeding around emu carcasses in June 1976.

BLACK-CAPPED SITELLA (*Neositta pileata*)

Uncommon. Parties observed feeding in tall open-woodland (2a) in January 1975.

RUFOUS TREE-CREEPER (*Climacteris rufa*)

Common. Pairs seen and heard in tall open-woodland (2a). September 1973, June 1976, February 1977.

STRIATED PARDELOTE (*Pardalotus substriatus*)

Moderately common. Seen and heard in areas of tall and low open-woodland (2a, 3d). January 1975, June 1976.

WESTERN SILVEREYE (*Zosterops gouldi*)

Uncommon. Occasionally seen in tall open-woodland (2a). September 1973, January 1975.

SINGING HONEYEATER (*Meliphaga virescens*)

Moderately common. Usually seen in areas of low and tall open-shrubland (4b, 5a). Recorded on all visits.

WHITE-FRONTED HONEYEATER (*Phylidonyris albifrons*)

Moderately common. Recorded in most formations. June 1976.

YELLOW-PLUMED HONEYEATER (*Meliphaga ornata*)

Common in tall open-woodland. June 1976.

YELLOW-THROATED MINER (*Manorina flavigula*)

Common. Parties of up to twenty birds observed in tall and low open-woodlands (2a, 3a). January 1975, June 1976, February 1977.

RED WATTLE-BIRD (*Anthochaera carunculata*)

Moderately common in tall and low open-woodlands (2a, 3a). September 1973, January 1975, June 1976.

SPINY-CHEEKED HONEYEATER (*Anthochaera rufogularis*)

Common. Observed in woodland formations (3a, 3c). One observed in *Calothamnus* on granite slopes of Mt Churchman. January 1975, June 1976.

ZEBRA FINCH (*Poephila guttata*)

One small flock at pools on granite slopes of Mt Churchman. January 1975.

MAGPIE LARK (*Grallina cyanoleuca*)

Uncommon. Several pairs and individuals seen near salt lakes (1a) and in woodland formations (2a, 3a). Recorded on all visits.

GREY CURRAWONG (*Strepera versicolor*)

Uncommon. Seen in tall open-woodland (2a).
January 1975, June 1976, February 1977.

PIED BUTCHER-BIRD (*Cracticus nigrogularis*)

Common. Seen in most formations especially along the
vermin proof fence eating fly larvae on emu carcasses.
September 1973, June 1976.

GREY BUTCHER-BIRD (*Cracticus torquatus*)

Moderately common near emu carcasses along the vermin
proof fence and observed in most formations. Recorded
on all visits.

WESTERN MAGPIE (*Gymnorhina dorsalis*)

Moderately common in the vicinity of cleared land and in
woodlands (2a, 3a, 3d). Recorded on all visits.

CROW/RAVEN (*Corvus* sp.)

Very common in all formations. Flocks concentrated
along vermin proof fence feeding on emu carcasses.
Probably Little Crows (*Corvus bennetti*) and Ravens
(*Corvus coronoides*).

Sixty-four species of bird were recorded in the Karroun
Hill area. There are no waterfowl in the list because the
salt lakes were dry at the time they were visited.

A bird census has been undertaken on a nature reserve of
comparable size, also in the Coolgardie Botanical District -
the Lake Barker Nature Reserve. The 103 species of birds
recorded there (Butler, unpublished) included 10 species
of waterfowl which probably also occur in the Karroun Hill
area on a seasonal basis. One important difference between
the two lists is the apparent absence of certain sandplain
heath-dwelling birds such as the Spotted Scrub-Wren (*Sericornis
maculatus*) and the Shy Ground-Wren (*Hyalacola cauta*) from
the Karroun Hill Area. This is probably related to a
corresponding absence of sandplain heaths which are an
important feature of the Lake Barker Nature Reserve.
Similarly, the richer complement of Mallee and other
Eucalyptus species on the Lake Barker Nature Reserve may be
responsible for the greater number of honeyeater species.

Four birds recorded on the proposal are worth special comment.
The Southern Scrub-Robin is outside the distribution given by
Serventy and Whittell (1976) who state that it is found
"north to a line joining Peron Peninsula, Perenjori, Wubin,
Dowerin, Southern Cross, Boorabin and Lake Dundas". Dense
Acacia thickets structurally similar to Wheatbelt communities
probably account for its presence in the proposal. The

Whiteface is close to the southern limit of its range; it is not known from any wheatbelt reserves (J. Dell pers. comm.). The Rufous Tree-Creeper was common in the Salmon Gum woodlands of the proposal although it is now regarded as scarce in the Wheatbelt. It is suggested by Dell and Johnstone (1976) that the apparent decrease in numbers of certain birds in the Wheatbelt is probably directly related to land clearing. Major Mitchell Cockatoos are sparsely distributed throughout their range and records from the southern part of their distribution are scarce.

Two good seasons prior to June 1976 resulted in an unusual number of Emus migrating south along the vermin proof fence. An attempt to drive to the northern boundary of the proposal in this month was thwarted by approximately six hundred Emus which gradually congregated in front of the vehicle during the first twenty kilometer stretch of track. Small parties were recorded moving along the fence throughout the night.

VI AMPHIBIANS AND REPTILES

All specimens have been lodged in the Western Australian Museum. In the species list below, data are presented in the following order:

1. Habitat codings (indexed to Environment).
2. Comments.

ANNOTATED SPECIES LIST

LEPTODACTYLIDAE

Neobatrachus sp.

4b.

Several tadpoles were collected from a pool below a gate grid in the vermin proof fence.

GEKKONIDAE

Gehyra variegata

1a, 2a, 3a.

Collected after dark on tree trunks and on the ground.

Heteronotia binoei

1a, 3a.

Collected on the ground and under rocks on the edge of a salt lake.

Diplodactylus vittatus

3a.

Collected on the ground.

Diplodactylus maini

1a, 3a.

Collected on the ground.

Diplodactylus spinigerus

2a.

Found about 2 m from the ground on a dead *Acacia*.

Diplodactylus pulcher

3a.

Collected on the ground.

Oedura reticulata

3a.

Found about 4 m from the ground on branches of *Eucalyptus loxophleba*.

Rhynchoedura ornata

3a.

Collected on the ground.

PYGOPODIDAE

Lialis burtonis

No data.

SCINCIDAE

Ctenotus mimetes

4a.

Collected from tussocks of *Ecdeicola monostachya*. Found in stomach contents of a Brown Falcon (*Falco berigora*).

Ctenotus uber

2a, 5b-1.

Collected from leaf litter and under rocks at the foot of a breakaway.

Ctenotus schomburgkii

2a, 3c.

Found in leaf litter.

Morethia butleri

Found in the stomach contents of a Brown Falcon (*Falco berigora*).

Cryptoblepharus plagiocephalus

2a.

Collected on trees and fallen branches.

Tiliqua rugosa

2a.

Recorded 4 km south of the proposal.

AGAMIDAE

Amphibolurus minor

1a, 3a, 3c, 4b.

Collected in areas of denser vegetation.

Amphibolurus ornatus

Collected on granite outcrops in the proposal and on the slopes of Mt Churchman.

Amphibolurus scutulatus

1a, 2a, 3a, 3c, 4b.

This was the most common lizard in the formations where it was recorded.

Amphibolurus reticulatus

2a.

Dug from burrows below shrubs.

Amphibolurus cristatus

2a, 3a, 3d, 5b-1.

Usually collected on areas of bare ground in *Eucalyptus* woodlands.

VARANIDAE

Varanus gouldii

3a.

Seen occasionally. Burrows were fairly common.

Varanus tristis

5b-1.

Trapped on a breakaway.

TYPHLOPIDAE

Typhlina bituberculata

4b.

Found drowned in a pool below a gate grid in the vermin proof fence.

ELAPIDAE

Pseudechis australis

1a.

This was the only snake recorded.

Twenty-four species of reptile and one amphibian were recorded on the proposal. The area is especially rich in geckoes and agamids but seems poor in skinks, snakes and amphibians. Further work would no doubt enhance the number of species.

The list is made up of species from both the South Western and Ereman Botanical Provinces. Examination of a reptile species list from the Lake Barker Nature Reserve (Butler, unpublished) gives a similar picture and further highlights the transitional nature of the country. *Amphibolurus cristatus*, for example, tends towards areas of higher rainfall and is replaced by *A. scutulatus* in the more arid regions of the State. Both, however, occur in the Karroun Hill proposal; occasionally in the same formations. This is one of the few localities where their distributions overlap (Pianka 1971).

The record of *Ctenotus uber* is of particular interest as it represents a south-western extension of range. It is probably at the limit of its distribution as no records are known from the northern Wheatbelt despite extensive survey work in the area.

Diplodactylus spinigeris and *Oedura reticulata* are at the north-eastern limits of their range.

VII DISCUSSION

The wildlife of the Karroun Hill area includes elements of both the South Western and the Ereman Province and reflects the transitional nature of the Coolgardie Botanical District in which the proposal is situated.

Although the Conservation Through Reserves Committee (Anon. 1974) assigned the Karroun Hill area (then called the Lake Moore Area) to their Murchison System (the western portion of the Austin Botanical District), our work suggests that the area is more appropriate to their Goldfields System (the non-coastal portion of the Coolgardie Botanical District - see Fig. 1).

Eleven Goldfield reserves or reserve proposals were discussed by C.T.R.C. and endorsed by the Western Australian State Cabinet (Anon. 1975). Five of these are relevant to the Karroun Hill proposal and are discussed below.

1. Mt Jackson - Mt Manning Range Area (ca. 300 000 ha). Beard (1972) mapped the vegetation of the southern half of this area. Although the Karroun Hill proposal is assigned to Beard's Karroun and Moorine Rock Systems (see Vegetation, this report), the Mt Jackson - Mt Manning proposal is sufficiently distinct to be assigned to different vegetation systems (the Die Hardy, Jackson and Bungalbin Systems). The distinction is based on landscape trends and on the structure and floristics of plant communities.
2. Walyahmoning Rock Area (ca. 20 000 ha). Assigned by Beard (1972) to his Moorine Rock System. The area includes a much greater proportion of breakaways and granite exposures than the Karroun Hill area.
3. Yellowdine Area (ca. 49 999 ha). Anon (1974) describes various rock and salt lake vegetations not recorded in the Karroun Hill proposal.
4. Boorabbin Area (ca. 30 000 ha). Predominantly sand-heath vegetation which is structurally and floristically different from sandplain formations recorded in the Karroun Hill proposal. Banksia and Myrtle species are important rather than *Acacia* spp.
5. Lake Barker Nature Reserve (208 000 ha). Many differences are discussed throughout the report.

The Karroun Hill proposal is a comparably large and diverse block of land which substantially contributes to the coverage of the existing and recommended reserve system in the Coolgardie District. However, it should be stressed that there is an urgent need for a regional biological survey of the Austin and Coolgardie Districts so that an integrated and fully represented reserve system can be delineated. These districts are under considerable pastoral pressure and comparatively few large areas of vacant land still exist.

In delineating the boundaries proposed for the reserve (Figure 2), several points were considered:

- 1) There are no other substantial reserves in the vicinity; there are advantages in setting aside large diverse nature reserves (discussed by McKenzie *et al.* (1973), p.16; McKenzie (1974), p.3).
- 2) Different topographical and vegetational features are widely spread across the proposal:-
 - (a) Mulga occurs in the north-eastern corner.
 - (b) Old plateau landscape and its associated plant communities predominate throughout the eastern end.

- (c) Outcrops of granite, exposed by erosion of the old plateau surface, mostly occur across the centre of the proposal.
 - (d) New plateau landscape, with its associated Eucalypt woodlands, are important in central and western portions.
 - (e) Salt pans with their distinctive vegetation, representing the lowest level in the landscape, are poorly represented and restricted to the western end.
- 3) An application has been received for alienation of part of the vacant land south of the Vermin Proof Fence. The boundary recommendation in this area is based on three points:
- (a) The need to include all available areas of salt pan in the proposal.
 - (b) The need to include as much Salmon Gum woodland as possible - this formation has been extensively cleared in the wheatbelt.
 - (c) The extent to which vegetation occurring in this south-western portion is duplicated elsewhere in the proposal.

RECOMMENDATIONS

1. That the vacant Crown Land delineated in Figure 2 be set aside as an A-Class reserve for the Conservation of Flora and Fauna and vested in the Western Australian Wildlife Authority.
2. That the reserve be named : "Karroun Hill Nature Reserve".

VIII ACKNOWLEDGEMENTS

The authors express their appreciation for assistance in the field by T.M. Hall, E. Ride, J. Henry, A. Baynes and P.J. Fuller. Mr Fuller's bird notes were especially valuable.

Plant specimens were identified by the Western Australian Herbarium and Dr J.S. Beard kindly permitted us to examine a draft vegetation map relevant to the proposed reserve. Reptiles and amphibians and certain mammals were determined by the Western Australian Museum, Dr G.M. Storr and Mr J. Dell being kind enough to make helpful comments on the reptile and bird records.

Dr A.A. Burbidge examined the draft.

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APPENDUM

On 20 September 1977, while the manuscript of this report was in press, two further records were obtained from the proposed reserve:-

CRIMSON CHAT (*Ephthianura tricolor*).

One seen in tall shrubland (4b) with *Casuarina acutivalvis* as in 4a).

Morethia butleri

3(a)
Granite outcrop.