A BIOLOGICAL SURVEY

of

CAPE LE GRAND NATIONAL PARK

by

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&

JOHN DELL

Records of the Western Australian Museum,
Supplement No. 1, 1975

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Manuscript received 21 September 1973

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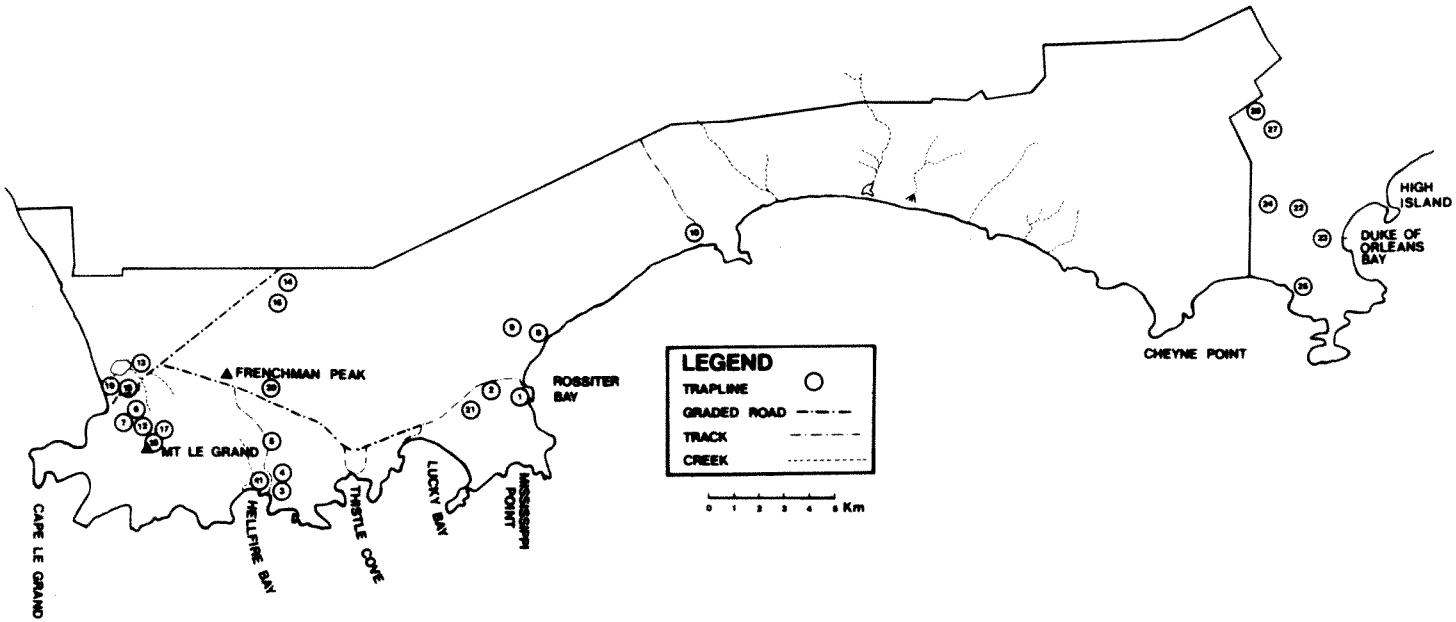

Map of Cape Le Grand National Park showing boundaries, roads, traplines and physiographic features mentioned in text.

INTRODUCTION

During 15 April — 2 May and 5 — 23 December 1972, the survey unit of the Western Australian Museum carried out a biological survey of the Cape Le Grand National Park under the auspices of the Western Australian National Parks Board. This survey was intended primarily to discover the species of vertebrates on the Park, evaluate their status, and to make recommendations for their management.

Cape Le Grand National Park is important because it is one of three National Parks (the others being Fitzgerald River National Park and Cape Arid National Park) representing the southern littoral sand heath formation. This formation is one of the twelve major vegetational groupings described for Western Australia by Gardner (1944) and extends from Albany to Israelite Bay.

Apart from occasional bird sightings (see Dell — this report), most of our knowledge of the fauna of Cape Le Grand National Park and its immediate surrounds, prior to these surveys, is from reports written by National Parks Ranger, N. Walmsley, to the Managing Secretary of that Board. In the first of these reports (dated 10 October 1966), Walmsley recorded that he had seen 'brown kangaroos, grey kangaroos, brumbies, native cats, possums, a few rabbits, emus, black ducks, and swans' on the Park, and had been told that Tammar Wallabies also occurred there. In November of that year he reported that a Mr Dunn, who lives just off the eastern end of the Park, had also seen Tammars, as well as pigmy mice, marsupial mice, wild turkey, Cape Barren Geese, White Egrets, bitterns and ducks. During 1969 Walmsley visited the area on three occasions. In January he reported seeing only several ducks and brumbies, but observed large numbers of emus and kangaroos. He also noted that the area burnt by fire during the summer of 1967-1968 had recovered, and that there were more flowers there than previously; in September he noted the absence of Bustards, Cape Barren Geese and brumbies; in December he reported that 'the flora has made a spectacular recovery after the fire of the summer of 1967-1968'. In September 1971 he again reported an absence of Bustards, Cape Barren Geese and brumbies. However, he noted on that occasion that small birds, emus, and kangaroos were plentiful and suggested that the tameness of kangaroos indicated that there had been no recent shooting in the area.

The only other animals known to occur (or to have occurred) on the Park are known from specimens located in the Western Australian Museum. They are the Brush-tailed Rock Wallaby *(Petrogale penicillata)*, the House Mouse *(Mus musculus)*, and several species of reptiles and frogs.

The flora of the Park was surveyed in 1971 and 1972 by A.S. Weston, Western Australian Herbarium.

This report consists of three principal papers that deal separately with the mammals, birds, and reptiles, frogs and freshwater fish, found on the Park. Each paper lists the species present and provides notes on them. The recommendations concerning the management of the fauna of the Park are not included in this report.

DESCRIPTION OF THE PARK

General

Cape Le Grand was gazetted as an 'A' class Reserve on 21 May 1948 under the Land Act of 1933 for a National Park. At that time the area of the Park was *ca* 16,000 ha, but it was not vested in any controlling authority. On 18 February 1966 it was vested in the National Parks Board of Western Australia and on 26 June 1970 was enlarged to *ca* 22,000 ha by the addition of Esperance locations 661, 692, 1388, 1939, 1941, 1942 and Neridup location 394. The Park is encompassed by the latitude and longitude range of 33°49' — 34°02' and 122°4' — 122°34' respectively. It has a maximum dimension of 45 km and includes about 36 km of coastline.

Physiography

The National Park and much of the coast and coastal plain of this region are dominated by massive rock outcrops of pre-Cambrian granite and gneiss. These outcrops rise above low undulating country covered with coastal scrub-heath and occasional thickets of low eucalypt trees in the protected curves of some of the bays. Many freshwater pools (some of which become swamps during the drier summer months) are scattered across the Park. These pools and swamps are frequently surrounded by a narrow belt of eucalypt and paperbark trees.

Several of the more prominent features of the Park such as Mt Le Grand, Frenchman Peak and the cave at the western end of the reserve near the site of an old homestead, are described by Clarke and Tarlton Phillips (1953). Frenchman Peak, which is 286 m high, has a large conspicuous hole through its summit. During the Miocene period the sea level was at least 300 m above the present sea level and it is suggested by the above authors that this hole may have resulted from wave action.

The coastline of the National Park consists of alternating rocky headlands and wide sandy beaches. These beaches and the unconsolidated sandhills behind them are frequently unstable; there have been several cases described of sand drifts advancing steadily inland in this region (Clarke and Tarlton Phillips 1953).

Soils

The soil of the Esperance plain on which Cape Le Grand is situated, has been described by Teakle and Southern (1936) as having a typical soil profile of grey siliceous sand with a yellow-red and grey gravelly sandy-clay loam subsoil. These authors also note that this soil is low in plant nutrients which generally renders it unsuitable for crop production in the absence of fertilisers.

Climate

Cape Le Grand National Park, along with the rest of the south coast of Western Australia, has a temperate coastal climate with wet winters and dry summers. The Park lies within a rainfall belt which extends west from Israelite Bay to Stokes Bay, and receives an annual average of 560 mm. However, Cape Le Grand itself receives considerably more rain than this because it is a

headland. A rain gauge at the base of Mt Le Grand has recorded an annual average of 735 mm for the past 5 years.

There are no great seasonal extremes in the region of the Park: the south coast of Western Australia has a very reliable rainfall by Western Australian standards (Leeper 1960). Further, the mean maximum temperatures for the hottest and coldest months (January and July, respectively) at Esperance, which is the nearest meteorological station, differ by only 8.0° C: the comparable difference for mean minimum temperatures is 8.1° C.

METHODS OF SURVEY

Soil

Soil samples were taken from the A1 horizons in the vicinity of the traplines. The soil colours were later identified from Munsell soil colour charts (Munsell Colour Co. Inc., Baltimore, Maryland 21218 U.S.A. 1954 exhibition), and their texture from Northcote (1971).

Flora

Prior to beginning work we examined the vegetation map of the Park and selected the parts that were to receive more attention during the survey. Attempts were made to collect vertebrates in all the prominent plant associations, and traplines were set for mammals in all these associations.

Plant specimens were collected only to enable a description of the vegetation surrounding the traplines. These species were identified by the Western Australian Herbarium.

Fauna

Mammals were trapped using Elliott, breakback, cage, and pit traps. The small mammal traplines were located in a manner that has become standard for this Survey Unit, i.e. 20 traps set in a line consisting of Elliotts alternating with breakbacks at a spacing of 10 m. In addition to the standard trapline, at each trapping location pit and cage traps were set at a distance that would not influence the trapping success of the standard trapline.

It was anticipated that the eastern end of the Park would be trapped in December 1972. However, a fire burned out much of this area several weeks prior to the December survey and for this reason traplines were placed in vegetation not damaged by the fire off the eastern boundary of the Park. These extralimital locations are shown on the accompanying map. In addition to trapping, animals were collected by searching in hollow logs, blackboys *(Xanthorrhoea sp)*, burrows, ground litter, bulldozer spoil on the road verges; searching beneath logs, rocks etc.; spotlighting at night from the vehicle; and shooting with 0.22 dust shot.

Freshwater fish were collected by adding Rotenone (a chemical trade-named Chem-Fish-Coll) to the pools and running streams. This substance affects the gills of fish and brings them to the surface: it is temporary in its effect, and after the fish have been collected potassium permanganate is placed into the water to nullify its effect.

The bird data were recorded by John Dell. Information includes habitat preferences, brief behavioural notes and occasional observations on food plants. As far as was possible all major vegetation types were investigated. Identifications were made with 10 x 50 Carl Zeiss binoculars. However, sometimes identifications were made on the characteristics of bird-song. A few species which were doubtfully identified on sightings were confirmed by collecting specimens. Included in the annotated list of birds recorded from the Park are a few species noted close to the northern boundary. It is likely that some of these species also occur on the Park.

MAMMALS

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Little is known of the local distribution, abundance and general biology of mammals on the southern littoral sand heath of Western Australia. In the last five years, however, there have been three surveys at localities in this region, viz. Two People Bay, Fitzgerald River and Israelite Bay. None of these were as intensive as the present study and none has yet been published.

Fourteen mammal species have been recorded from Cape Le Grand National Park. They comprise six marsupials, two native rodents, two marine mammals, one native eutherian, and four introduced species. They are: the Western Grey Kangaroo *(Macropus fuliginosus)*, Tammar Wallaby *(Macropus eugenii)*, Brush-tailed Rock Wallaby *(Petrogale penicillata)*, Short-nosed Bandicoot *(Isoodon obesulus)*, Pigmy Possum *(Cercartetus concinnus)*, Southern Bush Rat *(Rattus fuscipes fuscipes)*, Ashy-grey Mouse *(Pseudomys albocinereus)*, Honey Possum *(Tarsipes spencerae)*, Australian Sea-lion *(Neophoca cinerea)*, Dolphin *(Delphinus sp.)*, House Mouse *(Mus musculus)*, Rabbit *(Oryctolagus cuniculus)*, Horse *(Equus caballus)* and the Fox *(Vulpes vulpes)*.

All mammals collected have been accessed into the Western Australian Museum mammal collection. Those collected in April are registered as M 9121 — M 9247, and M 9363 — M 9473, and those from December as M 9685 — M 9841.

The results of the mammal trapping in the National Park are set out in Appendix 1 (Page 41). They indicate the trapping effort over the area and show the number of each type of trap set. A total of 4460 trapnights were established (a trapnight is one trap set over a 24 hour interval). A description of the vegetation of all areas trapped appears in Appendix 11 (Page 42).The mammals on the Park are discussed separately below:

Western Grey Kangaroo *(Macropus fuliginosus)*

The Western Grey Kangaroo occurs in south-west Western Australia, and southern South Australia (including Kangaroo Is.), and extends into western Victoria and south-western New South Wales, where it overlaps with the Eastern Grey Kangaroo, *Macropus giganteus* (Kirsh and Poole, 1972). During the April survey apparently fully grown *M. fuliginosus* were sighted in groups of two, three and four throughout the Park. They showed no obvious

preference for any particular habitat, and an adult male and adult female were even sighted on Mt Le Grand. In April these groups appeared to be sedentary because they were regularly sighted in the same area during the survey. Eleven groups were consistently counted on the 15 km stretch of road between Rossiter Bay and the western end of the Park during nightly spotlight runs. In December their numbers and distribution appeared to be similar to those noted in April, although on this later trip most groups had a juvenile member. A large *M. fuliginosus* with a pouch young was struck by a vehicle near Mt Le Grand on 31 April 1972. The approximate birth-date of the young animal was obtained by subtracting the gestation period of 30 days (Frith and Calaby, 1970) from its age, which was roughly estimated from the growth-age data for the Eastern Grey Kangaroo (Kirkpatrick, 1964). This indicated that this young was born at the beginning of summer, which would suggest that the juveniles sighted in the December 'groupings' were probably about one year old.

Tammar Wallaby *(Macropus eugenii)*

Until a few years ago it was believed that this wallaby had almost vanished from the mainland and survived only on the North and South Wallabi Is., in the Abrolhos group, Garden Is., the Archipelago of the Recherche, and the islands at the eastern end of the Great Australian Bight, including Kangaroo Is. Recently, however, it has been observed at a number of mainland localities in Western Australia, including the Tuttanning Reserve, Tarin Rock Reserve, Boyagin Reserve and near Ongerup. It was mentioned in the introduction of this report that this species was seen on the Park as recently as 1966. No Tammars or their sign were recorded on these surveys. The lack of its preferred habitat on the Park, i.e. moderately tall dense scrub, would suggest that this species, like *P. penicillata*, no longer occurs there.

Brush-tailed Rock Wallaby *(Petrogale penicillata)*

The only specimen known from the Park was collected at Lucky Bay on 20 May 1906 by J.T. Tunney. This specimen was deposited in the W.A.M. Collection (Reg. No. 8614). It is extremely doubtful if *Petrogale* still exist on the Park because none were sighted during either survey and no sign of them was found. Several other populations of *Petrogale* in south-west Western Australia have become extinct in modern times, e.g. at Wongan Hills, Beverley, York, and Waddouring Rock.

Short-nosed Bandicoot *(Isoodon obesulus)*

I. obesulus is distributed throughout southern Australia including the Archipelago of the Recherche, but not the Nullarbor Plain. Their presence on the Park, however, is the most eastern live record for Western Australia. The ecology of this species has been studied by Heinsohn (1966) at Smithton, Tasmania, and by Sampson (1972) at Tuttanning, Western Australia. Specimens were trapped during the April and December surveys and this species is probably quite abundant on the Park. A subadult male was trapped in April from a small, dense patch of *Banksia occidentalis* about 1 km north-east of a *Eucalyptus cornuta* thicket at Rossiter Bay. The remaining three specimens were trapped in December from the eastern end of the Park. The habitat of *Isoodon* appears to be the denser thickets of closed scrub

which are characteristic of the vegetation proximate to the shoreline and surrounding the swampy depressions further inland (the fire which burnt the eastern end of the Park several weeks before the December survey destroyed extensive tracts of habitat suitable for *Isoodon*).

The four *Isoodon* collected appeared to be in good condition. The two females collected in December had pouch young — one with a litter of two and the other with a litter of three. These litters were aged from data in Heinsohn (1966) at 13 and 31 days and were therefore born at the onset of summer. These findings accord with the known breeding information for *I. obesulus*. Sampson noted that *Isoodon* give birth all the year round at Tuttanning (with each female having between 4-6 successive litters per year and an average litter size of 2.5). Heinsohn records that at Smithton, Tasmania, females give birth in all months of the year except for the period between March to June.

Pigmy Possum *(Cercartetus concinnus)*

A single male was captured 1 km east of Frenchman Peak. It was found inside a dead, erect, blackboy *(Xanthorrhoea preissii)* in a thicket of live blackboys around a small swamp.

According to Wakefield (1963) the stronghold of the Pigmy Possum in Western Australia is the more heavily wooded sclerophyll forest of the Jarrah *(Eucalyptus marginata)* belt. Furthermore, he states that the animal is either rare or absent in the coastal heaths between Albany and Israelite Bay. However, since little collecting has been done on the south coast, it is possible that *C. concinnus* is more abundant than supposed by Wakefield. This species has been collected on most surveys of the south coast, including Fitzgerald River, Cape Le Grand and Israelite Bay.

Southern Bush Rat *(Rattus fuscipes fuscipes)*

Before the studies by Horner and Taylor (1965) there was considerable confusion as to the taxonomic status of *Rattus assimilis*, *R. greyii*, and *R. lutreolus*, which occur in the high rainfall areas of eastern and south-eastern Australia, and *R. fuscipes*, which is found in the south-west of Western Australia. In 1965 Horner and Taylor reported that all four populations interbreed readily in captivity with no reduction in viability of either parental or hybrid generation and they considered the three forms are members of the single species *Rattus fuscipes*. Since then Warneke (1972) has stated that the differences between these rats, earlier given specific status, does warrant their being considered subspecies and this is confirmed by Taylor and Horner (1973). The ecology of *Rattus fuscipes assimilis* has been studied in rainforest at Mt Glorious, near Brisbane, by Wood (1971), and in Loch Valley in Victoria, by Warneke (1972). However, little is known of the general ecology of *R.f. greyii*, *R.f. fuscipes* or *R.f. coracius* (considered a sub-species of *fuscipes* by Taylor and Horner, 1973).

The present survey of mammals at Cape Le Grand National Park, while not designed as a rigorous ecological study, does provide some information on the ecology of *Rattus R.f. fuscipes*. The information, presented below, is based on observations of the *Rattus* trapped from the western end of the Park during April 1972 and December 1972.

Distribution and abundance on the Park

The same ten areas, representing the major vegetational associations on the Park, were trapped in both April and December using the standard small mammal trapline. It was obvious early in this trapping that some areas appeared to have a far higher number of *Rattus* than others. Not all *Rattus* trapped were removed from the populations because after five days we began to take only those caught in the killing (breakback) traps. Those caught in Elliott traps were released. Fig. 1 is a graph of the cumulative numbers of *Rattus* removed from each trapline in December and shows that few *Rattus* were taken in the *E. cornuta* woodland and *Banksia occidentalis* scrub after the eighth day — while the removal of those in the *Banksia speciosa* shrub and *Xyris* swamp continued unabated. The situation in the *E.* affin: *coronata* thicket was unusual in that catches were low earlier and only began to increase on about the eighth day. These results may suggest that the populations in the *E. cornuta* and *B. occidentalis* were small local populations that were being trapped out. Certainly both these habitats were small areas surrounded by low open heath which carries few *Rattus*. The *Xyris* swamp and *B. speciosa* apparently carry larger numbers. The trapping results in the *Eucalyptus* affin: *coronata* showed that increasing numbers were caught only after the seventh day. This late increase may result from *Rattus* moving into the area following the removal of large numbers of *Rattus* from the adjacent *Xyris* swamp.

Because of the changes in numbers of *Rattus* captured in some areas that occurred towards the end of the trapping periods, the total catch per unit effort of all the areas trapped was compared using the results of only the first five days of each trapping period. These results are presented in Table 1 which lists the area trapped and the number of *Rattus* captured per 100 trapnights. This table shows that the greatest catch per 100 trapnights (and presumably density) of *Rattus* is in the *E. cornuta* and *B. speciosa* associations and *Xyris* swamp. Smaller densities occurred in the *Banksia occidentalis*, *Eucalyptus* affin: *coronata* and *Melaleuca* swamp while the cave line and sand dune had very low densities. They were completely absent from the low open heath formation. Interestingly, the sequence of the catch per unit effort for each association in December remains almost the same as it was in April which suggests that no large-scale permanent movement of *Rattus* occurred in the period between these two surveys.

Condition

During the examination of the reproductive organs of the *Rattus* taken from Cape Le Grand in April and December (110 and 95 respectively) note was made of the amount of mesenteric fat in each specimen. The amount of fat as well as total body weight were used to judge their condition. To assist in interpreting condition of individuals they were grouped according to sex and reproductive status as non-parous females, parous females, juvenile males, or adult males.

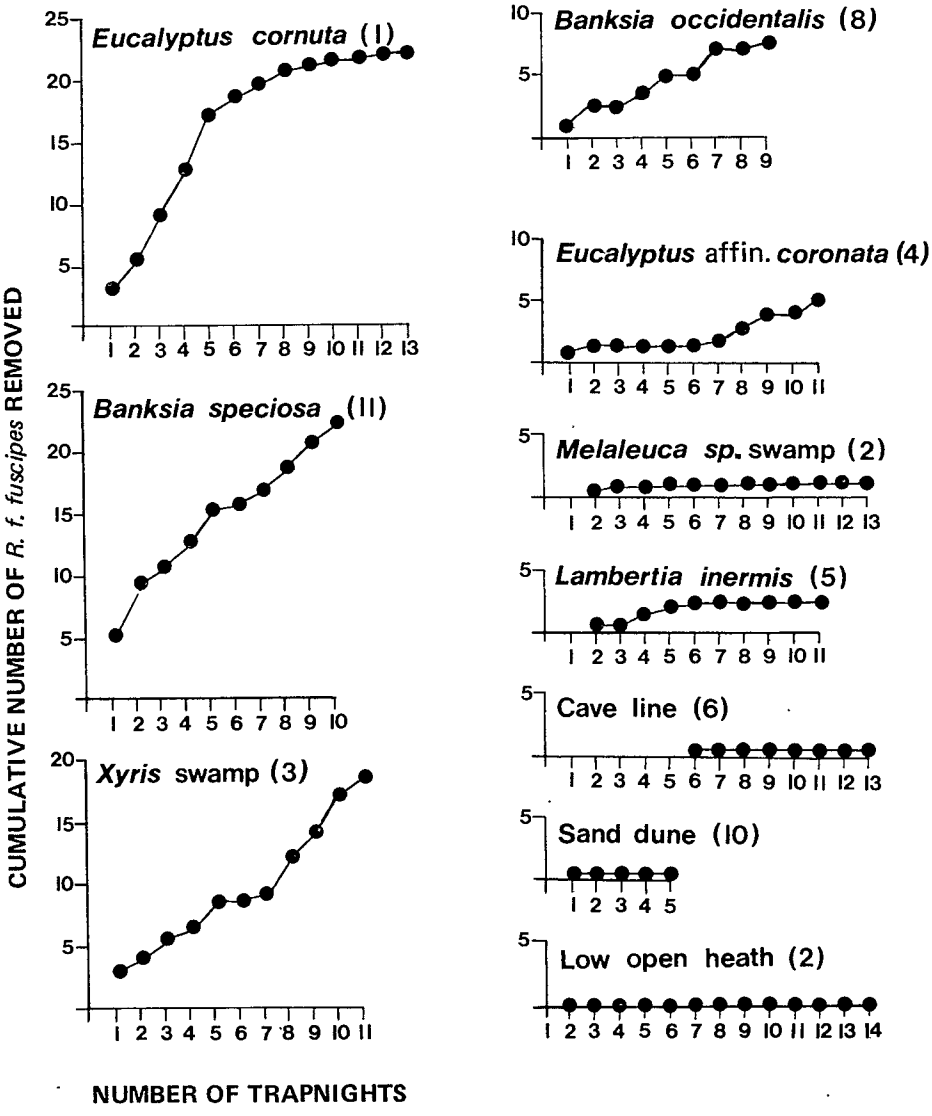

Fig. 1. Cumulative numbers of *Rattus f. fuscipes* removed from each trapline each day during trapping at Cape Le Grand in April 1973. The trapping period was from 5-13 days. Trapline numbers are in brackets.

Table 2 presents mean weight in each of the areas trapped according to the above sex and reproductive groupings and for both the April and December samples.

From Table 2 it appears that the mean weight of *Rattus* trapped in April varied between the different areas investigated. There is a tendency for all four reproductive and age groupings to be heavier in the *Banksia occidentalis*, *B. speciosa* scrubs, and *Eucalyptus cornuta* woodland (not necessarily in that order) than in the areas of *Eucalyptus* affin: *coronata* thicket, *Xyris* swamp, and *Lambertia inermis* scrub. It is thought that these weights actually indicate differences in the condition of *Rattus* between areas and do not merely reflect different age structures. This is supported by the observations on mesenteric fat which indicate a

TABLE 1

The number of *R. fuscipes* caught per 100 trapnights at each habitat type in April 1972 and December 1972.

Trapline No.	Habitat Type	Catch per 100 trapnights	
		April	December
1	*Eucalyptus cornuta* woodland	31.4	25.0
3	*Xyris* swamp	29.5	30.0
11	*Banksia speciosa* scrub	29.1	17.2
8	*Banksia occidentalis* scrub	14.6	15.0
4	*Eucalyptus* affin: *coronata* thicket	13.4	12.5
2	*Melaleuca sp* swamp	6.7	10.0
5	*Lambertia inermis* scrub	5.0	2.0
6, 12	Cave Line	3.3	0
10	Unconsolidated dune	1.0	—
2	Low heath assemblage	0	0

trend in non-parous females and juvenile males for those areas with 'heavier' *Rattus* to also have *Rattus* that have larger amounts of mesenteric fat. Only small numbers of parous females and adult males were caught and they generally had little or no fat. Further, there is no evidence that the size and age of *Rattus*, as indicated by the total body weight and incisor width measurements within these sex and reproductive groupings, differ noticeably between areas. It appears that with the exception of those from the *Xyris* swamp, *Rattus* are heaviest in those areas where their density is greatest. It is possible that the *Xyris* swamp is a marginal habitat and that the large numbers caught are attracted to the area by the potable water.

The considerable range in size in December of non-parous females and juvenile males, the low numbers of adult males collected, and the presence of many pregnant females, preclude a comparison of weights between localities. However, it is clear from the small amount of mesenteric fat in these *Rattus* that they were in poorer condition than those collected in April. For example, 96.8 per cent of those collected in December had no mesenteric fat or only a small amount, while only 56.0 per cent were in this category in April.

Reproduction

Reproduction in *R. f. assimilis* has been studied in the field and laboratory situation by Warneke (1972) and Taylor (1965) and in the field only by Wood (1971). These studies reveal a flexibility in the period of breeding in this species. In general, it appears that they give birth to young in spring and summer in Victoria but that breeding is more prolonged in the warmer regions. In Queensland they breed all the year round although their period of most intensive breeding is spring and summer. It would appear that climate has an important influence on the period of breeding of *R. fuscipes.*

In this study, reproductive groups were identified on criteria of Warneke (1972): parous females were distinguished by the presence of placental scars; reproductive activity of adult males was assessed by the length, colour and appearance of their testes. In addition, position of testes, and whether or not females were virgins were noted.

The reproductive condition of the populations of *Rattus* was markedly different on the two surveys. In April, of the 110 *Rattus* that were collected and dissected, 44 per cent were non-parous females, 16 per cent were parous females, 35 per cent were juvenile males, and 5 per cent were adult males. None of the parous females in April were lactating and none were visibly pregnant. In addition, the testes of the few adult males were inguinal in position, and were darkened and shrivelled — which suggested that spermatogenesis had ceased. It was thus apparent that by April all breeding had ceased. It was also inferred that many of the young of the previous breeding season had been trapped, most of them were large and many of the females had body measurements indicative of sexual maturity. This is shown in Fig 2, which is a graph of relative age (incisor width)[1] and breeding (parous, pregnant, and non-parous) condition of all the females trapped and removed in April and December. Although this histogram is based on visible pregnancies only, Warneke (1972) states that in large samples the error from not evaluating tube or free-uterine pregnancies is small. The histogram for April (Fig 2) suggests that few, if any, of the juveniles born last breeding season have bred, even though some of them may have been reproductively mature.

In December, of the 95 *Rattus* collected from the west end of the Park and dissected, 18 per cent were non-parous females, 37 per cent were parous females, 26 per cent were adult males, and 19 per cent were juvenile males. Some of the females captured in December were pregnant and some were lactating. In addition, all the adult males had large cream-coloured testes that were scrotal — a combination indicative of active spermatogenesis. Many juveniles of varying sizes were also trapped, including three virgin females. The presence of young of various sizes, and the reproductive condition of the adults, indicate

[1] Warneke (1972) regards incisor width as the most reliable indicator of age in *Rattus fuscipes assimilis.*

that they were well into their breeding period in December. Of adult females, 39 per cent were visibly pregnant on a macroscopic examination of uteri. The number of *in utero* embryos per pregnancy ranged between 2 and 7 with a mean of 4.8. This mean was slightly higher than the 4.5 that Warneke (1972) obtained for *in utero* litter size in *R. f. assimilis*. If the maximum number of embryos during a single pregnancy is seven, then a female with a greater number of placental scars could be assumed to

TABLE 2

Mean weight of *R. fuscipes* caught in each habitat type in April 1972 and at the same locality in December 1972*. Figures for Non-Parous Females, Parous Females, Juvenile Males and Adult Males are presented separately. Sample size is given within brackets.

Trapline No.	Habitat Type	Weight (g)	
a. Non-Parous Females		April	December
8	*Banksia occidentalis* scrub	73.6(9)	47.1(4)
1	*Eucalyptus cornuta* woodland	71.9(10)	48.4(3)
11	*Banksia speciosa* scrub	70.8(14)	19.2(1)
4	*Eucalyptus* affin: *coronata* thicket	70.0(2)	—
3	*Xyris* swamp	63.8(10)	32.1(4)
10	Unconsolidated dune	57.0(1)	—
5	*Lambertia inermis* scrub	57.0(2)	—
b. Parous Females			
1	*Eucalyptus cornuta* woodland	97.6(3)	89.3(3)
8	*Banksia occidentalis* scrub	89.0(3)	93.2(6)
11	*Banksia speciosa* scrub	88.0(5)	91.2(7)
3	*Xyris* swamp	84.0(5)	98.0(6)
4	*Eucalyptus* affin: *coronata* thicket	82.0(2)	—
c. Juvenile Males			
8	*Banksia occidentalis* scrub	80.5(6)	23.8(1)
11	*Banksia speciosa* scrub	79.6(12)	23.8(1)
1	*Eucalyptus cornuta* woodland	76.8(7)	58.1(5)
3	*Xyris* swamp	73.2(11)	32.7(7)
4	*Eucalyptus* affin: *coronata* thicket	71.0(2)	—
5	*Lambertia inermis* scrub	59.0(1)	—
d. Adult Males			
8	*Banksia occidentalis* scrub	112.0(1)	—
11	*Banksia speciosa* scrub	88.0(1)	96.2(6)
1	*Eucalyptus cornuta* woodland	85.0(1)	99.7(1)
4	*Eucalyptus* affin: *coronata*	76.0(2)	112.0(1)
10	Unconsolidated dune	79.1(1)	
3	*Xyris* swamp	—	96.2(6)

*Further *R. fuscipes* were trapped in December 1972 at locations not trapped in April 1972 — these are not included in this table.

have bred at least twice, and those with more than 14 — three times. The placental scars of adult females collected in December indicated that 64 per cent (21) had bred only once. The high proportion of females in December which had bred two or three times, compared with the figures for April, indicates that the breeding season was coming to an end at the time of the December survey and would probably finish with the birth of the young about the middle of January. Eleven of the 15 females that were pregnant in December were lactating at the time of their collection. It is possible that the other four pregnant females were also lactating, for Warneke found that it is difficult to compress milk from the teat of lactating *R.f. assimilis*. The observation that *R.f. fuscipes* became pregnant while still lactating indicates that fertilisation probably occurred at a post-partum oestrus and, as in *P.f. assimilis*, pregnancies occur in rapid succession.

Because there has been no survey of Cape Le Grand in winter there is no direct evidence indicating breeding activity of the species during that season. However, indirect evidence suggests that breeding, if it occurs in winter, is of low intensity. For example, if young were born in winter then it would be expected that some specimens would have been

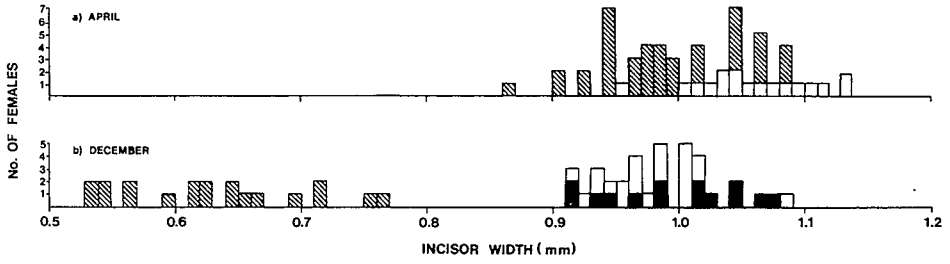

Fig. 2. Histogram of a measure of relative age (incisor width) for female *Rattus f. fuscipes*, versus their reproductive condition: non-parous (▨), parous (□), pregnant (■). These females were collected at Cape Le Grand National Park in (a) April 1972 and (b) December 1972.

collected in December with incisor-width measurements intermediate between those of the young and adult specimens collected at that time. This was not the case as is indicated by **Fig. 2b.** Secondly, if there was breeding in winter some females could be expected to have bred more than twice (on the basis of adult females caught in April) and none had. If it is assumed that *Rattus* on the Park have a gestation and weaning period similar to those Warneke records for *R. f. assimilis*, i.e. about 20 and 30 days respectively, it is possible to estimate the approximate onset of the birth season in this population. For example, the four females that had bred once and ceased lactating, had probably given birth about 50 days prior to early December (period of gestation plus period of weaning), while the four that had bred twice were all still lactating and weaning their young, and probably must have first bred less than 70 days before. It is reasonable to assume then, that breeding

commenced somewhere between 50 and 70 days prior to the December survey, i.e. about mid October to early November.

The major period of births of *R. f. fuscipes* on the Park (about mid-October to mid-January) is similar to that of the Victorian population of *R. f. assimilis* and supports the view that the southern races of *Rattus fuscipes* have discrete breeding seasons.

Ashy-grey mouse *(Pseudomys albocinereus)*

P. albocinereus is distributed throughout the sandplain country of the south-west of Western Australia, from Kalbarri in the north in an arc to Israelite Bay in the south. It would appear to be quite abundant in some areas. For example, Bannister (1969) found it in considerable numbers in Kalbarri National Park. According to A. Baynes (pers. comm.) populations can reach moderately high densities in the drier parts of its range. This mouse appears to be uncommon in Cape Le Grand National Park, as only a single subadult male was trapped. This specimen was caught in a *Lambertia inermis* thicket 1.5 km north of Hellfire Bay.

Honey Possum *(Tarsipes spencerae)*

Tarsipes is indigenous to the south-west of Western Australia and lives in the highly floriferous sandplain vegetation in an arc between Kalbarri in the north and the Duke of Orleans Bay in the south (Vose 1972).

At Cape Le Grand *Tarsipes* were caught in pit traps in both April and December. As these traps were only placed in soft soil, all habitats were not sampled. Little can be said about the trapping, except that in April they appeared to prefer Chittick *(Lambertia inermis)* to *Banksia* (see Table 3). The high catches in April compared to December seem to be influenced by factors other than extent of flowering, for both *Lambertia* and *Banksia* were flowering profusely in April and December.

The capture of a female Honey Possum with moderately large young in late April 1972 is of interest because little is known of their breeding. Ride (1970) does state that 'they normally carry two young in the breeding season, which is probably in June, July and August'. He further states that the young emerge some four months after birth and that at the time of their emergence they are nearly half the length of their mother. They are suckled for a further two weeks outside the pouch. An examination of the 26

TABLE 3

The number of *Tarsipes* caught in different habitat types at Cape Le Grand National Park in April 1972 and December 1972. The number of pit-trap nights is given.

Trapline No.	Habitat Type	April		December	
		Trapnights	Captures	Trapnights	Captures
1	*Banksia speciosa* scrub	55	3	48	0
8	*Banksia occidentalis* scrub	72	6	0	0
5	*Lambertia inermis* scrub	72	11	25	0
20	*Xanthorrhoea preissii* thicket	80	0	0	0
15	*Banksia speciosa* scrub	0	0	30	2

female *T. spenserae* in the W.A.M. collections revealed that 14 of them had young in the pouch and that the litter size ranged from 2 to 4 with a mode of 3. The smallest female with young had a head length (supraoccipital — tip of snout) of 23.7 mm. Date of collection was available for 17 females in the collection. Unfortunately, there are no adult females in the W.A.M. collection from the months of May, November, December or February. However, moderately large litters of a similar size have been collected in January, April and June, and smaller litters in September (M4230, M9467, M6989, M8035, M6611, M9482). Also, lactating females have been collected in September and October (M7839 and M8434). The collection of litters of similar size over a six-month period, and the observation that a lactating female was collected in September (a month when others were being born) indicates the breeding season in Western Australia is extensive. One female Honey Possum (M9467) collected on 28 April 1972 at Cape Le Grand was carrying three young that were about one quarter of the length of the adult and had eyes not yet opened; they were probably born about mid-March — early April. On 27 September 1972 a female was captured at North Tarin Rock reserve with 3 pouch young which had a mean head length of 1.8 mm; they were very small with legs and tail still fused, which indicated they were only a few days old (the smallest litter examined had head lengths of 1.5, 1.5, and 1.7 cm).

It would appear then, that the birth season extends at least from mid-autumn to mid-spring, and is much longer than previously supposed.

Little is known of the activity of *Tarsipes* in the field, although Vose (1972) observed that they had three main periods of activity in captivity: early pre-dawn to sunrise, late afternoon to early evening, and around midnight.

During these surveys Honey Possums were sighted on only one occasion: at 1700 hr on 25 April 1972 about 2 km north-east of the Rossiter Bay camp. John Dell records this sighting in his field notes as 'went to rebait trapline, shade temperature 17.5°C. Saw 2 *Tarsipes* sunning themselves on edge of track. One sitting on limb (flower stalk) of *Banksia speciosa* and ran down into undergrowth. Other on end leaves of *Acacia* about 0.7 m from ground, collected subadult female'.

Australian Sea-lion *(Neophoca cinerea)*

Neophoca cinerea is reasonably abundant on islands off the south coasts of Australia, particularly in the Archipelago of the Recherche. A breeding colony also persists on Carnac Island, near Fremantle, Western Australia. This species is distributed from Kangaroo Island, off South Australia, across the Great Australian Bight and along the west coast north to the Houtman Abrolhos (Wood Jones, 1923).

A juvenile seal which came ashore at Rossiter Bay on 23 April 1972 has been tentatively identified from a photograph as *Neophoca cinerea.* During December, numerous sightings of seals, probably this species, were made in Rossiter Bay.

Dolphin

Three Dolphins were sighted in Rossiter Bay on one occasion during December 1972. It is likely that they were Common Dolphins *(Delphinus delphis).*

House Mouse *(Mus musculus)*

The House Mouse is widely distributed in Western Australia. In recent years Newsome (1969, 1970, 1971) has studied *Mus* in the field in South Australia, and found that numbers increase in summer and fall in autumn. The period of breeding of *Mus* in south-west Western Australia appears to differ from that in South Australia. This is indicated by the unpublished results of trapping in five wheatbelt Reserves and at Sorrento near Perth. In some of these areas numbers of *Mus* are higher in late-autumn and winter and lower in spring and summer. It is probable that factors affecting the timing of breeding of *Mus* in Western Australia differ from those in the South Australian study, i.e. suitable soil moisture for burrowing, and food (in that order). Variation in numbers of *Mus* at the western end of Cape Le Grand National Park was similar to that in some other areas in Western Australia. In April, 127 were caught on 1893 trapnights[1], while in December only 8 were caught on 1650 trapnights[2].

Dissection and macroscopic examination of all specimens revealed no pregnant females, and 45 of the 47 females collected in April had straight 'thread' uteri suggestive of anoestrus. The single female collected in December had enlarged uteri. In December, males had larger testes and the tail of the epididymis was expanded.

The absence of pregnant females, and the capture of 12 juveniles, two of which weighed only 5 gm, in April, indicate that breeding had only recently ceased by the end of that month.

The results of the first five days trapping for *Mus* in April and December at Cape Le Grand are recorded in Table 4 for each trapline. This table is directly comparable to Table 1 which shows the number of *Rattus* caught in

TABLE 4

The number of *Mus* caught per 100 trapnights during both April and December in different habitat types. Results of the first five days' trapping only are included.

Trapline No.	Habitat Type	Number *Mus* caught per 100 trapnights	
		April	December
6, 12	Cave Trapline	24.0	0
11	*Banksia speciosa* scrub	17.2	0
1	*Eucalyptus cornuta* woodland	16.0	1.0
2	Low open heath formation	10.0	0
3	*Xyris* swamp	6.0	0
8	*Banksia occidentalis* scrub	5.0	0
5	*Lambertia inermis* scrub	4.0	0
10	Unconsolidated dunes	4.0	—
4	*Eucalyptus* affin: *coronata* thicket	0	0
2	*Melaleuca* sp. swamp	0	0

[1, 2] These were breakback, Elliott and pit traps only.

the same traplines. *Mus* has different habitat preferences to *Rattus* and seems to be less influenced by shrub cover. It appears that the density of *Mus* in any area is unaffected by the numbers of *Rattus*. For example, the same number (18) of both species were caught in the *Banksia speciosa* during the first five trapnights in April. Also, similar numbers were trapped in the *Eucalyptus cornuta* thicket at Rossiter Bay (16 *Mus* and 25 *Rattus*).

European Rabbit *(Oryctolagus cuniculus)*

It was mentioned in the introduction that a few rabbits had been seen on the Park in October 1966. None were seen in April 1972, and only three in December 1972. These three were beside a small warren near Mt Le Grand. There was little sign of rabbits in other areas of the Park, with the exception of the slopes leading down to Lucky Bay, where there were some very old droppings.

Horse *(Equus caballus)*

A few were seen in October 1966 and January 1969, but none in September 1969. No wild horses or their sign were seen on either of these surveys.

Fox *(Vulpes vulpes)*

Two foxes were noted on the Park during these surveys. In April 1972 an adult fox was seen at dusk on a track 600 m north of the Rossiter Bay campsite. In December a subadult male was caught in a cage trap set in Chittick *(Lambertia inermis)*. The stomach of this fox contained no animal remains.

DISCUSSION

The 1972 surveys of Cape Le Grand and other unpublished surveys of the southern littoral sand heath allow some general observations on the distribution and abundance of some small mammals of the region. For example, *Rattus fuscipes fuscipes* is abundant and widespread at Cape Le Grand and probably throughout the coastal heath. *Tarsipes spencerae* and *Isoodon obesulus* appear to be abundant in particular habitats. *Cercartetus concinnus* is probably widespread, but not common.

With the exception of *I. obesulus* none of the mammals recorded during the Cape Le Grand surveys are extensions of known range.

The absence of drier-country mammals from the Park such as *Notomys mitchellii*, and *Sminthopsis crassicaudata* was expected because of higher rainfall on this part of the coast compared with other nearby areas. The lack of any dasyurid marsupials on the Park was, however, surprising for the Common Dunnart *(Sminthopsis murina)* has been collected further along the coast at Israelite Bay. Also, the Park has habitat which is similar to that in which the Dibbler *(Antechinus apicalis)* was found (Morcombe 1967).

It is interesting that the two macropods, the Brush-tailed Rock Wallaby *(Petrogale penicillata)* and the Tammar *(Macropus eugenii)*, which are not found on the Park, are still found in the nearby Archipelago of the Recherche. Serventy (1953) records that in November 1950 *Petrogale* was

abundant on Mondrain Is., Combe Is., and Salisbury Is., while Tammar were fairly abundant on both Middle Is. and North Twin Peaks Is. In January 1973 M. Ellis (pers. comm.) again recorded both these species as common in the Archipelago.

BIRDS

JOHN DELL

INTRODUCTION

Little has been published on the birds of the Esperance Bay to Israelite Bay coast, although Serventy and Whittell (1967, p.26) draw attention to some Bassian species which have a discontinuous distribution on the south coast and emphasise the importance of the Cape Le Grand rainbelt first noted by Brooks (1895). Sedgwick and Sedgwick (1950) published the results of a survey of birds from Esperance along the coast to Mt Le Grand. In view of our present knowledge of birds that occur along the south coast, some species were unexpectedly absent from their list. V.N. Serventy (1951) listed birds seen at Israelite Bay, Point Malcolm and Duke of Orleans Bay in November 1950. Further information on the area was obtained by G.M. Storr (unpublished), who briefly surveyed the area from Esperance to Mt Le Grand in March 1958 and from Israelite Bay to Esperance in December 1959 and by D.L. Serventy who visited Esperance, Thistle Cove, Lucky Bay, Rossiter Bay and Duke of Orleans Bay in January 1944, Duke of Orleans Bay in July 1947 and Esperance and Duke of Orleans Bay in April 1948 and January 1958.

The Western Australian Museum collection contains a number of birds, chiefly waders, collected at Esperance in 1954 by W.H. Butler, and about 75 specimens collected by K.G. Buller in the Ravensthorpe-Kundip-Phillips River – Hamersley River and Mt Barren area in 1952.

The Recherche Archipelago, however, has aroused considerable interest from ornithologists. J.T. Tunney collected there in 1904 and 1906 for the Western Australian Museum Basset Hull reported his observations there as well as brief visits to Lucky and Mississippi Bay (= Rossiter Bay) in *The Emu* (1922). D.L. Serventy (1947) surveyed some of the islands in January 1944 and V.N. Serventy (1954) summarised his observations during 1950, as well as those of the previous authors. In addition there are observations in the State Archives (microfilm No 802A) by T.C. Andrews who spent some time on Middle Island in 1889.

Considerable information has now been obtained by the present author during lengthy surveys of the Cape Le Grand National Park from 15 April to 2 May 1972 and 5-23 December 1972. Further information was obtained

on birds of the Ravensthorpe to Hopetoun area in April 1973 by Dell and R.E. Johnstone (unpublished).

Presented here is an annotated list of the birds of the Cape Le Grand National Park including collations of previously published extralimital distributions.

ANNOTATED LIST

Emu *(Dromaius novaehollandiae)*

Sparse on Park and adjacent cleared country. Two in Park among dunes at east end of Rossiter Bay, 2 on Dunn Rock Road, 4 km north of Park in April 1972; 2 on Duke of Orleans Bay Road, 5 km north of Park in December 1972; occasional faeces seen throughout Park in April and December 1972. Adult with 7 unstriped young near Esperance on 4 January 1944, 18 half-grown birds 11 km east of Mt Merivale on 26 January 1958 (D.L. Serventy pers. comm.).

Little Penguin *(Eudyptula minor)*

Partial skeleton at Duke of Orleans Bay in January 1944 (D.L. Serventy, pers. comm.), dead bird at Esperance between December 1949 and March 1950 (Sedgwick and Sedgwick, 1950) and dead bird at Lucky Bay in April 1972.

Wandering Albatross *(Diomeda exulans)*

A dead bird near Esperance and another near Mt Le Grand were reported by Sedgwick and Sedgwick (1950).

Northern Giant Petrel *(Macronectes halli)*

A bird recovered at 64 km east of Esperance in 34° 01' S, 122° 06' E in June 1971 had been banded as a chick at Macquarie Island on 23 January 1971 (Purchase, 1973).

Short-tailed Shearwater *(Puffinus tenuirostris)*

Three dead birds on beach at Esperance on 23 April 1948 (Serventy, 1948).

Fleshy-footed Shearwater *(Puffinus carneipes)*

Several cruising in Esperance Bay, 1 at Lucky Bay and a skeleton at Duke of Orleans Bay in January 1944 (D.L. Serventy, pers. comm.); 2 derelict birds near Esperance and 1 at Cape Le Grand (Sedgwick and Sedgwick, 1950).

Great-winged Petrel *(Pterodroma macroptera)*

One collected at Israelite Bay in December 1954 and 1 dead on beach at Lucky Bay in December 1972.

? White-faced Storm-Petrel *(Pelagodroma marina)*

Eight freshly excavated nesting burrows under bushes in wind-deposited sand on an insular headland adjacent to High Island, Duke of Orleans Bay, in December 1972 were possibly attributable to this species. The headland was connected to the mainland by a tombolo covered with water to a depth of 0.5 m. The burrows, about 1 m long and about 70 mm in diameter, were large for White-faced Storm-Petrels and were closer to the size excavated by

Little Shearwater, *Puffinis assimilis.* The loose sand may have contributed to the size. The freshness of the burrows indicated recent excavation and would indicate the summer-breeding White-faced Storm-Petrel.

Little Grebe *(Podiceps novaehollandiae)*

One on freshwater pool between dunes, 100 m from beach at east end of Rossiter Bay in April 1972.

Hoary-headed Grebe *(Podiceps poliocephalus)*

Three on roadside pool on Cape Le Grand Road 10 km north of Park in April 1972. One at Shark Lake 13 km north of Esperance in March 1958 (G.M. Storr, pers. comm.). Several recorded near Esperance by Sedgwick and Sedgwick (1950).

Australian Pelican *(Pelecanus conspicillatus)*

Fourteen circling at 22 km east of Esperance in December 1959 (G.M. Storr, pers. comm.), 1 at freshwater lake 11 km east of Esperance in December 1972.

Australian Gannet *(Sula bassana)*

A bird recovered at 100 km east of Esperance at 33° 55' S, 122° 50' E on 17 April 1972 had been banded as a juvenile at Portland, Victoria on 23 December 1961 (Purchase, 1973).

Black Cormorant *(Phalacrocorax carbo)*

One at Lucky Bay on 16 January 1944 (D.L. Serventy pers. comm.), single birds and a pair on small islet 300 m from shore at Mississippi Point in December 1972. One near Esperance (Sedgwick and Sedgwick 1950).

Little Black Cormorant *(Phalacrocorax sulcirostris)*

One on freshwater pool among dunes at west end of Rossiter Bay in April 1972; single bird seen twice on islet 300 m from shore at Mississippi Point in December 1972. Recorded near Esperance by Sedgwick and Sedgwick (1950).

Black-faced Cormorant *(Phalacrocorax fuscescens)*

One at Duke of Orleans Bay on 26 January 1958 (D.L. Serventy, pers. comm.); 12 on islets 300 m from shore at Mississippi Point and 2 on rocks at Cheyne Point in December 1972. Recorded near Esperance by Sedgwick and Sedgwick (1950).

Little Pied Cormorant *(Phalacrocorax melanoleucos)*

One at Hellfire Bay and 2 at west end of Rossiter Bay in April 1972; 2 at west end of Rossiter Bay and occasional birds on most freshwater swamps between Esperance and Duke of Orleans Bay in December 1972. Recorded near Esperance by Sedgwick and Sedgwick (1950).

White-faced Heron *(Ardea novaehollandiae)*

Sparse on swamps on Park, frequent in paddocks and swamps outside Park. Status similar in April and December 1972.

White-necked Heron *(Ardea pacifica)*

Single birds on two small freshwater lakes on Condingup Road 47 km east of Esperance on 10 December 1972.

Reef Heron *(Egretta sacra)*

Recorded on reefs at Observatory Island (Sedgwick and Sedgwick, 1950).

Nankeen Night Heron *(Nycticorax caledonicus)*

One flushed from *Melaleuca* swamp near Frenchman Peak in December 1972.

Brown Bittern *(Botaurus poiciloptilus)*

One calling at Shark Lake 13 km north of Esperance on 8 December 1959 (G.M. Storr, pers. comm.). Likely to be present in any *Xyris-Baumea* swamps in the western part of the Park.

Black Swan *(Cygnus atratus)*

Several on freshwater lakes outside Park and approximately 175 on salt-lake 11 km east of Esperance in December 1972. Observed at Lake Wheatfield near Esperance (Sedgwick and Sedgwick 1950) and at Shark Lake near Esperance and Rossiter Bay in January 1944 (D.L. Serventy, pers. comm.).

Mountain Duck *(Tadorna tadornoides)*

A pair recorded twice at west end of Rossiter Bay in April 1972. Recorded over Esperance Bay and nearby lakes in 1944 by D.L. Serventy (pers. comm.) and by Sedgwick and Sedgwick (1950).

Black Duck *(Anas superciliosa)*

One feeding on shore at west end of Rossiter Bay and 6 on pool near Thistle Cove in April 1972; 170 on pools behind dunes at east end of Esperance Bay and occasional birds on swamps and pools throughout Park and adjacent country in December 1972. Recorded near Esperance by Sedgwick and Sedgwick (1950) and on pools in Park and at Esperance in January 1944, April 1948, and January 1958 by D.L. Serventy (pers. comm.).

Chestnut Teal *(Anas castanea)*

Two males in Duke of Orleans Bay on 20 December 1972. Several recorded near Esperance by Sedgwick and Sedgwick (1950).

Grey Teal *(Anas gibberifrons)*

Recorded near Esperance (Sedgwick and Sedgwick, 1950).

Blue-winged Shoveler *(Anas rhynchotis)*

One at freshwater lake 22 km east of Esperance on 15 December 1972.

White-eyed Duck *(Anthya australis)*

Twelve on small freshwater lake on Condingup Road 47 km east of Esperance on 10 December 1972.

Maned Goose *(Chenonetta jubata)*

Four at 10 km west of Lake Condingup in December 1959 (G.M. Storr, pers. comm.), 2 at freshwater lake 11 km east of Esperance in December 1972.

Musk Duck *(Biziura lobata)*

Occasional birds on pools during April and December 1972. Male calling and splashing on pool at Thistle Cove on 13 December 1972. Recorded near Esperance (Sedgwick and Sedgwick, 1950), and Duke of Orleans Bay in January 1944 (D.L. Serventy, pers. comm.).

Black-shouldered Kite *(Elanus caeruleus)*

Occasional birds sighted in April and December. A pair with a juvenile at Duke of Orleans Bay on 22 December 1972.

Wedge-tailed Eagle *(Aquila audax)*

A pair in vicinity of Frenchman Peak and Mt Le Grand in April and December 1972. Recorded at Esperance and Mt Le Grand (Sedgwick and Sedgwick, 1950).

White-breasted Sea-eagle *(Haliaeetus leucogaster)*

Sparse along coast in Park. Occasional birds recorded in April and December 1972, and by D.L. Serventy (pers. comm.) in January 1944 and July 1947.

Swamp Harrier *(Circus approximans)*

Frequent in vicinity of swamps on Park and adjacent country. Status similar in April and December 1972. Recorded near Esperance by Sedgwick and Sedgwick (1950).

Peregrine Falcon *(Falco peregrinus)*

A pair frequently recorded in vicinity of Mt Le Grand in December 1972. When the peaks were climbed the birds became disturbed, chattering and dive bombing.

Little Falcon *(Falco longipennis)*

One at Hellfire Bay in April 1972.

Brown Hawk *(Falco berigora)*

Occasionally on Park and adjacent country. Similar status in April and December 1972. Three catching flying ants *(Hymenoptera)* at east end of Rossiter Bay in April 1972. Recorded at Esperance and Duke of Orleans Bay in January 1944 (D.L. Serventy, pers. comm.) and at Esperance by Sedgwick and Sedgwick (1950).

Kestrel *(Falco cenchroides)*

Occasionally on Park and adjacent country. Roosting and perching in caverns on granite slopes. Single birds and pairs in April 1972. In December most sightings were adults with juveniles. Pair feeding young in nest on rock ledge near Mt Le Grand on 6 December 1972. A rock perch contained the remains of an *Amphibolurus minor* and a *Litoria cyclorhyncha.*

Brown Quail *(Coturnix ypsilophorus)*

Possible sighting at Esperance (Sedgwick and Sedgwick, 1950).

Painted Quail *(Turnix varia)*

A quail, not positively identified, was flushed from heath flats at the west end of Rossiter Bay in April 1972. A Painted Quail was flushed from heath on several occasions in December 1972, near Mt Le Grand, Lucky Bay and the west end of Rossiter Bay. One calling 'oom oom' in dunes among scattered *Banksia speciosa* on 15 December 1972. Serventy and Whittell (1967, p. 176) give the eastern limits of distribution as Wongan Hills, Broomehill and Dempster Inlet although Tunney mentions the species on Mondrain Island (V.N. Serventy, 1952 p. 6).

Spotless Crake *(Porzana tabuensis)*

A crake was heard in dense *Xyris* swamps at Hellfire Bay and in *Baumea* swamps at Thistle Cove in April 1972. A juvenile with reddish legs was seen in sedges on the edge of an interdune pool at the west end of Rossiter Bay in December 1972. Serventy and Whittell (1967, p. 181) give the eastern dis-

tribution as Bremer Bay. The probable sparsity of *Baumea-Xyris* swamps between Bremer Bay and Esperance (A.S. Weston pers. comm.) may indicate a break or intermittent distribution between Bremer Bay and Cape Le Grand. The Spotless Crake does not inhabit swamsp only, as is indicated by their sterile stony habitat without surface water on Eclipse Island (Serventy and Whittell: 1967, p. 181).

Swamphen *(Porphyrio porphyrio)*

Two on small, permanent lake west of Frenchman Peak on 11 March 1958 (G.M. Storr, pers. comm.).

Coot *(Fulica atra)*

A few recorded near Esperance by Sedgwick and Sedgwick (1950) and one at Lake Tarblong in January 1958 by D.L. Serventy (pers. comm.).

Australian Bustard *(Eupodotis australis)*

Two near Mt Merivale, 1 at 39 km west of Israelite Bay and one at 56 km west of Israelite Bay in December 1959 (G.M. Storr, pers. comm.).

Pied Oystercatcher *(Haematopus ostralegus)*

Recorded on most beaches in April and December 1972 and 5 on shallow freshwater pools near beach at east end of Rossiter Bay in April. Several recorded on beaches between Esperance and Cape Le Grand by Sedgwick and Sedgwick (1950).

Sooty Oystercatcher *(Haematopus fuliginosus)*

Recorded on wave-splashed rocks in April and December 1972. Several recorded between Esperance and Cape Le Grand by Sedgwick and Sedgwick (1950), and 4 at Duke of Orleans Bay and 1 at Rossiter Bay in January 1944 by D.L. Serventy (pers. comm.).

Banded Plover *(Zonifer tricolor)*

Calling at night at 7 km north of Esperance in March 1958 (G.M. Storr, pers. comm.). Recorded at Esperance by Sedgwick and Sedgwick (1950).

Grey Plover *(Pluvialis squatarola)*

A specimen collected at Esperance in December 1954 by W.H. Butler; 8 recorded at Israelite Bay (V.N. Serventy, 1951).

Large Sand-dotterel *(Charadrius leschenaultii)*

Single birds recorded near Esperance by Sedgwick and Sedgwick (1950).

Red-capped Dotterel *(Charadrius ruficapillus)*

Frequent in Park and adjacent beaches and salt lakes: recorded in April and December 1972; by Sedgwick and Sedgwick (1950); and in January 1944 by D.L. Serventy (pers. comm.).

Red-kneed Dotterel *(Charadrius cinctus)*

One on shallow freshwater clay flats near beach at east end of Rossiter Bay on 28 April 1972.

Black-fronted Dotterel *(Charadrius melanops)*

Recorded near Esperance by Sedgwick and Sedgwick (1950).

Hooded Dotterel *(Charadrius cucullatus)*

Sparse in Park at Mississippi (= Rossiter) Bay (Basset Hull, 1922). Frequent on salt lakes and beaches near Esperance (Sedgwick and Sedgwick, 1950);

numerous at Shark Lake in January 1944, and 15 on Pink Lake near Esperance in April 1948 (D.L. Serventy, pers. comm.).

Bar-tailed Godwit *(Limosa lapponica)*
One at Israelite Bay (V.N. Serventy, 1951).

Common Sandpiper *(Tringa hypoleucos)*
Single birds at Duke of Orleans Bay in January 1944 and 1958, and at Rossiter Bay in January 1944 (D.L. Serventy, pers. comm.). Occasional sightings among wave-splashed rocks in December 1972. Recorded at Esperance by Sedgwick and Sedgwick (1950).

Grey-tailed Tattler *(Tringa brevipes)*
A female was collected at the west end of Rossiter Bay on 13 December 1972, feeding in ridge of seaweed on beach. Call 'che-eet' or 'we-eet' while flying in an arc over water.

Greenshank *(Tringa nebularia)*
One at Shark Lake in January 1944 (D.L. Serventy, pers. comm.), several recorded near Esperance by Sedgwick and Sedgwick (1950).

Knot *(Calidris canutus)*
One collected at Esperance in December 1954 by W.H. Butler.

Red-necked Stint *(Erolia ruficollis)*
Recorded at Rossiter Bay and Duke of Orleans Bay in January 1944 (D.L. Serventy, pers. comm.); approximately 20 on beach at west end of Rossiter Bay in December 1972. Recorded along coast by Sedgwick and Sedgwick (1950).

Sharp-tailed Sandpiper *(Erolia acuminata)*
Flocks noted at Esperance by Sedgwick and Sedgwick (1950); 7 collected at Esperance in December 1954 by W.H. Butler.

Curlew Sandpiper *(Erolia ferruginea)*
One collected at Esperance in December 1954 by W.H. Butler.

Banded Stilt *(Cladorhynchus leucocephalus)*
Between 1000 and 2000, many in juvenile plumage, on salt-flats 10 km east of Esperance on 23 December 1972. Sedgwick and Sedgwick (1950) record flocks on beaches near Esperance.

Avocet *(Recurvirostra novaehollandiae)*
Two on beach at east end of Rossiter Bay in April 1972; about 40 on salt-flats 10 km east of Esperance in December 1972; hundreds at Shark Lake in January 1944 (D.L. Serventy, pers. comm.).

Silver Gull *(Larus novaehollandiae)*
Up to 6 birds on most bays in April and December 1972. 55 at Lucky Bay in April while a fishing boat was anchored during a gale. Recorded on every visit by D.L. Serventy (pers. comm.) and by Sedgwick and Sedgwick (1950).

Pacific Gull *(Larus pacificus)*
Up to 5 birds in all bays during April and December. 22 at Lucky Bay during gale in April. Adult-juvenile ratio was: April, 18:11; December, 28:1.

Recorded on every visit by D.L. Serventy (pers. comm.) and by Sedgwick and Sedgwick (1950).

Marsh Tern *(Chlidonias hybrida)*

Recorded near Esperance by Sedgwick and Sedgwick (1950).

Caspian Tern *(Hydroprogne caspia)*

One at Esperance, Thistle Cove and Lucky Bay in January 1944 (D.L. Serventy, pers. comm.); 1 fishing at Rossiter Bay in December 1972 occasional birds along Esperance Bay (Sedgwick and Sedgwick, 1950). Nest with 2 eggs at Israelite Bay, and nests with eggs or chicks on Douglas and Goose Islands, in November 1950 (V.N. Serventy, 1951); nests with chicks on Middle Island and small islet 1 km north-west of North Twin Peak Island on 9 Janaury 1973 (M. Ellis, pers. comm.).

Crested Tern *(Sterna bergii)*

A few at Esperance and Lucky Bay in January 1944; 2 at Duke of Orleans Bay in July 1947 (D.L. Serventy, pers. comm.); 2 at Lucky Bay and 5 at Rossiter Bay in April 1972, 1 near Mt Le Grand and 2 adults and a juvenile at Duke of Orleans Bay in December 1972. Occasional observations along Esperance Bay (Sedgwick and Sedgwick, 1950) and Israelite Bay (V.N. Serventy, 1951).

Fairy Tern *(Sterna nereis)*

An egg was collected among flotsam at east end of Esperance Bay on 10 December 1972. Recorded at Esperance (Sedgwick and Sedgwick, 1950) and Israelite Bay (V.N. Serventy, 1951).

Common Bronzewing *(Phaps chalcoptera)*

Recorded near Esperance and Rossiter Bay in January 1944 (D.L. Serventy, pers. comm.); single birds recorded in April and December 1972 in heath, under *Banksia speciosa - Lambertia inermis* association, and in dense dune heath of *Acacia saligna*, *Leucopogon* sp. and *Melaleuca thymoides* near Mt Le Grand and Rossiter Bay. Recorded in sand hills at Esperance by Sedgwick and Sedgwick (1950).

Brush Bronzewing *(Phaps elegans)*

Recorded in sand hills near Esperance (Sedgwick and Sedgwick, 1950).

Purple-crowned Lorikeet *(Glossopsitta porphyrocephala)*

Five in flowering *Eucalyptus cornuta* thicket at Rossiter Bay in April 1972, 3 flying south near Hellfire Bay in December 1972. Flocks recorded in flowering Eucalypts near Esperance (Sedgwick and Sedgwick, 1950).

White-tailed Black Cockatoo *(Calyptorhynchus baudinii)*

About 20 feeding in heath at Rossiter Bay in January 1944; flocks of 120, 110 and 30 near Esperance on 25 April 1948 (D.L. Serventy, pers. comm.); approximately 100 in mallee on Dunn Rock Road and 85 on Cape Le Grand Road 11 km north of Park boundary in April 1972. Recorded near Esperance by Sedgwick and Sedgwick (1950).

Port Lincoln Parrot *(Barnardius zonarius)*

Two recorded at Point Malcolm on 28 November 1950 (V.N. Serventy, 1951).

Red-capped Parrot *(Purpureicephalus spurius)*

Recorded at Esperance (Basset Hull, 1922); D.L. Serventy (pers. comm.) was informed by Esperance people in January 1958 that it was plentiful in Yate near the Dalyup River about 25 km west of Esperance.

Smoker Parrot *(Polytelis anthopeplus)*

Residents of Esperance informed D.L. Serventy (pers. comm.) that a few were present in January 1958.

Rock Parrot *(Neophema petrophila)*

One at Duke of Orleans Bay in January 1944 (D.L. Serventy, pers. comm.), 13 along dunes at Hellfire Bay, 10 on dunes at west end of Rossiter Bay feeding on flowers of *Adenanthos cuneata*, 14 on dunes at east end of Rossiter Bay, about 30 on island 4 km from shore in Rossiter Bay, about 100 in cattle paddock on Condingup Road in April 1972. Singly or in pairs along the coast in December 1972: at Esperance Bay, Lucky Bay, Rossiter Bay and Duke of Orleans Bay. Pair feeding on seeds of *Arctotheca nivea* growing on tombolo between Duke of Orleans Bay and Cheyne Point in December 1972. Recorded along Esperance Bay by Sedgwick and Sedgwick (1950).

Elegant Parrot *(Neophema elegans)*

Single bird in heath at Mt Le Grand in December 1972.

Fan-tailed Cuckoo *(Cacomantis pyrrhophanus)*

One at Duke of Orleans Bay in January 1944 (D.L. Serventy, pers. comm.). Calling in *Casuarina* thickets on granite outcrop at Lucky Bay and in *Eucalyptus cornuta* thicket in April 1972. In same localities and in heath on a rocky headland at Duke of Orleans Bay in December 1972.

Golden Bronze Cuckoo *(Chrysococcyx lucidus)*

One calling at Israelite Bay on 27 November 1950 (V.N. Serventy, 1951).

Tawny Frogmouth *(Podargus strigoides)*

Several noted throughout Park while spotlighting in April and December 1972. Roosting birds seen in daytime in *Melaleuca* swamps, *Eucalyptus* thickets, and in bushes among tumbled rocks on hillsides. Adult sitting on nest in *Eucalyptus gomphocephala* at Mt Le Grand in November 1971 (A.S. Weston, pers. comm.).

Spotted Nightjar *(Eurostopodus guttatus)*

One hawking at dusk over low heath near granite outcrop at Hellfire Bay and 3 over dune heath at west end of Rossiter Bay in April 1972.

Fork-tailed Swift *(Apus pacificus)*

One hawking over low heath at the west end of Rossiter Bay during stormy weather on 18 April 1972; about 50 flying north at the same locality on 17 December 1972.

Sacred Kingfisher *(Halcyon sancta)*

Recorded at Esperance (Sedgwick and Sedgwick, 1950).

Welcome Swallow *(Hirundo neoxena)*

Moderately common on Park along coast and around granite peaks, and in adjacent country.

Breeding — 7 December 1972: peak near Mt Le Grand, 8 empty nests, 1 with broken shells below, 2 with a dead chick below; another peak near Mt Le Grand, several empty nests, 2 dead chicks on ground.

15 December 1972: 2 nests on ledges of tumbled rocks on shore near Mississippi Point, 1 empty, 1 with young.

17 December 1972: several empty nests and 5 with young in cavern on top of Frenchman Peak.

Tree Martin *(Hirundo nigricans)*

Four moving south at Rossiter Bay on 12 December 1972; 7 over cleared country on Condingup Road 38 km east of Esperance on 10 December 1972. Recorded at Esperance in February (Sedgwick and Sedgwick, 1950).

Australian Pipit *(Anthus novaeseelandiae)*

Single birds recorded on roadside in low stony heath near Frenchman Peak in April 1972; frequent in cleared paddocks north of the Park in December 1972. Noted on beach near Esperance (Sedgwick and Sedgwick, 1950) and frequently in paddocks in January 1958 (D.L. Serventy, pers. comm.).

Black-faced Cuckoo-shrike *(Coracina novaehollandiae)*

Seasonal, sparse in December and frequent in April in Park and adjacent country. In April 1972, 3 recorded each day in the *Eucalyptus cornuta* thicket at the west end of Rossiter Bay, a single bird at Lucky Bay, and 6 groups of up to 5 birds flying north over cleared country north of the Park. Three observations of single birds in December 1972, at Hellfire Bay, Rossiter Bay and Duke of Orleans Bay. Recorded flocking in summer near Esperance by Sedgwick and Sedgwick (1950).

Little Grass-bird *(Megalurus gramineus)*

Recorded at Shark Lake north of Esperance in December 1959 (G.M. Storr, pers. comm.).

Reed Warbler *(Acrocephala stentoreus)*

Calling at Thistle Cove in January 1944 (D.L. Serventy, pers. comm.); in all large *Baumea* swamps between Esperance Bay and Duke of Orleans Bay in December 1972. Recorded at Shark Lake north of Esperance in December 1959 (G.M. Storr, pers. comm.).

Brown Songlark *(Cinclorhamphus cruralis)*

Recorded near Esperance and in farmland 50 km east in January 1958 (D.L. Serventy, pers. comm.).

Southern Emu-wren *(Stipiturus malachurus)*

Frequent in low heath, gully thickets and dense heath on dunes throughout Park in April and December 1972. Parties of up to 5 birds during April, pairs or adults with juveniles during December.

Splendid Wren *(Malurus splendens)*

Recorded near Esperance (Sedgwick and Sedgwick, 1950). This observation needs confirmation as this species has not been positively identified east of longitude 118° E on the south coast (Dell, unpublished).

Chestnut-tailed Thornbill *(Acanthiza uropygialis)*

Recorded near Esperance (Sedgwick and Sedgwick, 1950). This observation needs confirmation.

Yellow-tailed Thornbill *(Acanthiza chrysorrhoa)*

Small flock at Duke of Orleans Bay in January 1944 (D.L. Serventy, pers. comm.). Recorded near Esperance (Sedgwick and Sedgwick, 1950).

Broad-tailed Thornbill *(Acanthiza apicalis)*

One at Duke of Orleans Bay in January 1944 (D.L. Serventy, pers. comm.); pair in December 1972 in dense thickets of *Agonis linearifolia, Gahnia decomposita* and *Lepidosperma* sp. near Hellfire Bay. Frequent in sandhill areas near Esperance (Sedgwick and Sedgwick, 1950).

Spotted Scrub-wren *(Sericornis maculatus)*

Widespread throughout Park in April and December 1972 in *Banksia speciosa* and wherever dense vegetation was more than a metre high. Not recorded in *Lambertia inermis.* Recorded frequently along the coast by D.L. Serventy (pers. comm.) and along Esperance Bay by Sedgwick and Sedgwick (1950).

Field Wren *(Calamanthus fuliginosus)*

Juveniles seen near Shark Lake in January 1944 (D.L. Serventy, pers. comm.). Recorded in low heath throughout Park in April and December 1972. This species is apparently abundant in heath near Esperance (Sedgwick and Sedgwick, 1950).

White-fronted Chat *(Epthianura albifrons)*

Party at Duke of Orleans Bay in January 1944 (D.L. Serventy, pers. comm.); flocks of up to 20 in cleared country north of the Park in April and December 1972. Recorded near Esperance by Sedgwick and Sedgwick (1950).

Hooded Robin *(Petroica cucullata)*

Pair at Frenchman Peak and pair at Rossiter Bay in April 1972, in low open heath where *Nuytsia floribunda* and occasional *Lambertia inermis* provided perches; pair at Frenchman Peak in December 1972.

Willie Wagtail *(Rhipidura leucophrys)*

Sparse on Park and adjacent country in vicinity of water. Single birds at Esperance, Duke of Orleans and Rossiter Bays in January 1944 (D.L. Serventy, pers. comm); pair in April 1972 at Rossiter Bay; pairs near Mt Le Grand, Rossiter Bay, Lucky Bay and Duke of Orleans Bay in December 1972. Noted in vicinity of water at Esperance by Sedgwick and Sedgwick (1950).

Restless Flycatcher *(Seisura inquieta)*

Recorded near Esperance (Sedgwick and Sedgwick, 1950).

Western Shrike-thrush *(Colluricincla harmonica rufiventris)*

Recorded near Esperance (Sedgwick and Sedgwick, 1950).

Crested Bellbird *(Oreoica gutturalis)*

Recorded at Israelite Bay (V.N. Serventy, 1951).

Spotted Pardalote *(Pardalotus punctatus).*

Three in mallee near Hellfire Bay and 5 in *Eucalyptus cornuta* at the west end of Rossiter Bay in April 1972; 4 in mallee near Mt Le Grand in December 1972.

Red-tipped Pardalote *(Pardalotus substriatus)*

Eight flying south near Hellfire Bay and 4 flying south at the west end of Rossiter Bay in December 1972, giving migratory calls.

Silvereye *(Zosterops lateralis)*

Foraging flocks in most areas of dense vegetation in April and December 1972. Nest with 2 eggs and 1 newly hatched young in dune thicket near Mt Le Grand on 10 December 1972. Considered by Sedgwick and Sedgwick (1950) to be the most abundant species at Esperance.

Brown Honeyeater *(Lichmera indistincta)*

Recorded at Esperance, Thistle Cove, Duke of Orleans and Lucky Bays in December 1944 and Thistle Cove in January 1958 (D.L. Serventy, pers. comm.). 2 in flowering *Eucalyptus cornuta*, 2 in flowering *Lambertia inermis* and a few flowering *Eucalyptus lehmanni* in April 1972. Frequent throughout Park in December 1972, feeding in flowering *Lambertia inermis*, in dense creek thickets and in mallee on rocky slopes. Recorded in flowering *Banksia* and *Eucalyptus* at Esperance by Sedgwick and Sedgwick (1950).

Singing Honeyeater *(Meliphaga virescens)*

Two in flowering *Eucalyptus cornuta*, 2 on island 4 km from shore at west end of Rossiter Bay, 4 in *Lambertia inermis -Eucalyptus tetragona* thickets in April 1972. Single birds in December 1972 at east end of Esperance Bay and Mississippi Point and a pair at Duke of Orleans Bay. Widespread at Esperance (Sedgwick and Sedgwick, 1950).

White-naped Honeyeater *(Melithreptus lunatus)*

Three in flowering *Eucalyptus cornuta* at west end of Rossiter Bay in April 1972; 2 adults feeding 2 juveniles in same thicket on 12 December 1972. The coastal distribution of this species is little known. Serventy and and Whittell (1967, p. 387) give the range 'along the coast to Stokes Inlet. Its distribution between here and the mouth of the Gairdner River may not be continuous, but it has been observed at Hopetoun and the Jerdacuttup Creek'. It is probable that the White-naped Honeyeater is associated with Eucalypts. The absence of *Eucalyptus cornuta* from much of the coast east of the Stirling Range may account for the Honeyeater's patchy distribution. The habitat of the White-naped Honeyeater at Hopetoun, Jerdacuttup Creek and Stokes Inlet in unknown. *Eucalyptus cornuta* has been collected at Needilup.

Western Spinebill *(Acanthorhynchus superciliosus)*

Frequent throughout Park and adjacent uncleared country in April and December 1972. Feeding on flowering *Lambertia inermis* in April and December. More plentiful in December, many with juvenile plumage. Recorded by D.L. Serventy (pers. comm.) at Thistle Cove, Duke of Orleans and Lucky Bays in January 1944 and near Esperance in January 1958. Only 2 noted near Esperance by Sedgwick and Sedgwick (1950).

Tawny-crowned Honeyeater *(Gliciphila melanops)*

Common throughout Park and adjacent country in April and December 1972, in low heath where *Lambertia inermis* and *Nuytsia floribunda* emergents provide observation and singing perches. Feeding on flowers of *Lambertia inermis* in April and December. The most frequent bird on Park in April, less abundant in December. Singing and defending territory in April. Breeding in December: clutch 2 on 6 December, clutch 2 on 14 December. Male collected with testes 5.2 x 4.1 and 4.3 x 5.1 mm on 11 December. Nest with 2 eggs in *Dryandra* at Lucky Bay on 16 January 1944 (D.L. Serventy, pers. comm.).

New Holland Honeyeater *(Phylidonyris novaehollandiae)*

During April 1972 common in *Banksia speciosa, Agonis linearifolia* and *Banksia occidentalis*; hundreds congregating in flowering *Eucalyptus cornuta* thicket at the west end of Rossiter Bay; less frequent in *Lambertia inermis.* Similarly abundant in December 1972, but more widespread, many feeding on flowers of *Lambertia inermis.* Two young flew from nest in *Banksia speciosa* near *Eucalyptus cornuta* at Rossiter Bay on 28 April. Another nest being built in *B. speciosa* nearby on 29 April. Numerous juvenile birds in December, many still being fed. Considered by D.L. Serventy (pers. comm.) to be commonest bird at Rossiter and Duke of Orleans Bays in January 1944. Numerous in thickets near Esperance (Sedgwick and Sedgwick, 1950).

Yellow-throated Miner *(Manorina flavigula)*

Flocks up to 30 in Park in vicinity of *Melaleuca* up to 8 m tall during April 1972. Flocks up to 15 moving among *Lambertia inermis* in December 1972. Breeding in tall timber in December: 3 young flew from nest in a 14 m *Eucalyptus gomophocephala* near Mt Le Grand on 6 December; pair with 3 juveniles among *Melaleuca* between Rossiter Bay and lucky Bay on 12 December; pair with young barely flying in *Melaleuca* near Frenchman Peak on 13 December. Flocks recorded by D.L. Serventy (pers. comm.) at Esperance, Rossiter and Duke of Orleans Bays in January 1944, at Esperance in April 1948 and between Esperance and Mt Merival in January 1958. Not mentioned by Sedgwick and Sedgwick (1950).

Red Wattle-bird *(Anthochaera carunculata)*

Recorded at 12 km west of Israelite Bay in December 1959 (G.M. Storr, pers. comm.) and at Esperance by Sedgwick and Sedgwick (1950).

Little Wattle-bird *(Anthochaera chrysoptera)*

Flocks up to 10 throughout Park during April 1972 in *Banksia speciosa, Lambertia inermis* and *Agonis linearifolia.* Similarly distributed in December 1972, but in pairs or smaller flocks. Recorded at Rossiter Bay and Thistle Cove in January 1944 and between Esperance and Mt Merivale in January 1958 (D.L. Serventy, pers. comm.) and near Esperance by Sedgwick and Sedgwick (1950).

Red-eared Firetail *(Zonaeginthus oculatus)*

In dense thickets at east end of Esperance Bay, Rossiter Bay and Duke of Orleans Bay in December 1972. Apparently more common in January 1944 when D.L. Serventy (pers. comm.) recorded it near most bays visited. Not recorded at Esperance by Sedgwick and Sedgwick (1950).

Masked Wood-swallow *(Artamus personatus)*

Two at Rossiter Bay in *Eucalyptus cornuta* on 12 December 1972. One at 101 km west of Israelite Bay on 8 December 1959 (G.M. Storr, pers. comm.).

Dusky Wood-swallow *(Artamus cinereus)*

Several at 20 km north of Duke of Orleans Bay in January 1958 (D.L. Serventy, pers. comm.); 8 in *Eucalyptus tetragona - Lambertia inermis* at east end of Rossiter Bay on 28 April 1972; 1 at 99 km west of Israelite Bay on 8 December 1959 (G.M. Storr, pers. comm.); 6 near Esperance (Sedgwick and Sedgwick, 1950).

Grey Butcher-bird *(Cracticus torquatus)*

Pairs in vicinity of *Eucalyptus gomphocephala* at Mt Le Grand and near tall *Melaleuca* throughout Park in April and December 1972. Frequent near Esperance (Sedgwick and Sedgwick, 1950).

Western Magpie *(Cracticus tibicen dorsalis)*

Sparse in Park and adjacent cleared country. Only found on Park along roads in vicinity of tall timber, e.g. *Eucalyptus gomphocephala* at Mt Le Grand. Pair feeding 2 young in nest 15 feet up in small Swamp Yate in paperback swamp 21 km east of Esperance on 9 December 1959 (G.M. Storr, pers. comm.). Noted by D.L. Serventy (pers. comm.) at Duke of Orleans Bay in January 1944. Small flocks noted near Esperance by Sedgwick and Sedgwick (1950).

Raven *(Corvus coronoides)*

Sparse in Park, frequent in adjacent cleared country in April and December 1972. On Park only in vicinity of rocky hills. Noted at Esperance by Sedgwick and Sedgwick (1950).

Little Crow *(Corvus bennetti)*

Seasonally frequent in cleared country outside Park. Flocks up to 50 birds in paddocks north of Park during December 1972.

DISCUSSION

Although birds of a Bassian origin are predominantly forest inhabiting, some are found in the mallee-sandplain, several range east along the southern coast, and some continue into South Australia. Cape Le Grand is basically the southern edge of the mallee-sandplain modified into a coastal heath, and is outside the distribution of many Bassian species. Its avifauna consists of an intermingling of species of Bassian and Eyrean origins, but — because of rainfall and possible humidifying effects of the sea — Bassian species dominate. Also, the huge exposed granite surfaces, particularly in the west end of the Park, provide considerable run-off and greatly increase the effective rainfall.

Serventy and Whittell (1967) mention that the Esperance - Cape Arid bulge may be an outlier of the South-West region. It now appears that this coastal bulge is merely part of the distribution of South-West Bassian birds and is not a significant outlier. Some birds, however, may have distributions modified by intermittent habitat. Only the Red-eared Firetail *(Zonaeginthus oculatus)* is likely to have a sizeable break in its distribution. Some of the supposed distribution gaps mentioned by Serventy and Whittell may be due

to insufficient observation and are likely to merely reflect the difficulty of human access to parts of the south coast.

Serventy and Whittell (1967) record 16 species which are known to range east to about the Esperance area. These are listed below with notes on their occurrence in the Park: White-tailed Black Cockatoo *(Calyptorhynchus baudini)*, to Mississippi Bay (= Rossiter Bay) — recorded on this survey along Dunn Rock Road, north of Rossiter Bay; Western Rosella *(Platycercus icterotis)*, recorded east to the Dundas District, but its coastal range not known — not seen on this survey; King Parrot *(Purpureicephalus spurius)*, east along the coast to Esperance — not recorded on this survey; Elegant Parrot *(Neophema elegans)*, east to near Esperance — recorded at Mt Le Grand in December 1972; Fan-tailed Cuckoo *(Cacomantis pyrrhophanus)*, east to Israelite Bay — sparse on Park in April and December 1972; Little Grass-bird *(Megalurus gramineus)*, east to Shark Lake, near Esperance Bay — not recorded on this survey; Splendid Wren *(Malurus splendens)*, east to Esperance — not recorded on this survey; Southern Emu-Wren *(Stipiturus malachurus)*, east to Israelite Bay — frequent on Park during 1972 surveys; Scarlet Robin *(Petroica multicolor)*, to the east of Esperance — not recorded on this survey; Golden Whistler *(Pachycephala pectoralis)*, east to Eucla including the Recherche Archipelago — not recorded on this survey; Silvereye *(Zosterops lateralis gouldi)*, east to Eucla — moderately common on Park during 1972 surveys; Spinebill *(Acanthorhynchus superciliosus)*, to Hopetoun, after a gap, reappearing at Esperance and continuing to Israelite Bay — frequent throughout the Park during the 1972 surveys; Tawny-crowned Honeyeater *(Gliciphila melanops)*, east to Israelite Bay — common throughout the Park during the 1972 surveys; New Holland Honeyeater *(Phylidonyris novaehollandiae)*, east to Israelite Bay — common throughout the Park during the 1972 surveys; Red-eared Firetail *(Zonaeginthus oculatus)*, recorded at Lucky Bay, Mississippi Bay (= Rossiter Bay) and Duke of Orleans Bay — recorded during the 1972 surveys at the east end of Esperance Bay, Rossiter Bay and Duke of Orleans Bay.

In addition the known range of four Bassian species was extended: Painted Quail *(Turnix varia)*, from Dempster Inlet to Rossiter Bay; Spotless Crake *(Porzana tabuensis)*, from Bremer Bay to Rossiter Bay; Spotted Pardalote *(Pardalotus punctatus)*, from the Stirling Range to Rossiter Bay; White-naped Honeyeater *(Melithreptus lunatus)*, from Stokes Inlet to Rossiter Bay.

The known ranges of the Masked Wood-Swallow *(Artamus personatus)* and Little Crow *(Corvus bennetti)* were extended southwards. These species appear to be summer nomads but may be frequently overlooked. The 'black clouds' of crows referred to by Andrews in 1889 on Middle Island were likely to have been Little Crows and not Ravens *(Corvus coronoides)* as suggested by V.N. Serventy (1954).

The absence of wrens *(Malurus)* from the Park is not altogether expected. The Splendid Wren *(M. splendens)*, has been recorded near Esperance (Sedgwick and Sedgwick, 1950) and the Blue-breasted Wren *(M. pulcherrimus)*, has been recorded at Norseman (Whitlock, 1922; Serventy and Whittell, 1967) and between Ravensthorpe and Hopetoun (Dell and Johnstone, 1973 unpublished).

REPTILES, AMPHIBIANS and FISHES

A. CHAPMAN and JOHN DELL

REPTILES

The April and December 1972 surveys of Cape Le Grand National Park recorded 30 species of reptiles. Here is an annotated list of them.

GECKOS *(Gekkonidae)*

Diplodactylus spinigerus

One male and 1 female collected at night from the foliage of coastal scrub at Duke of Orleans Bay in December. One from a *Banksia speciosa* leaf about 1.4 m above ground; the other from a dead twig about 0.3 m above ground.

Phyllodactylus marmoratus

Moderately common during both surveys. Usually under exfoliated granite, but one specimen collected under decaying driftwood on beach at Duke of Orleans Bay. A gravid female with 1 egg in left oviduct collected in December.

Phyllurus milii

One collected under exfoliated granite at Thistle Cove in April.

LEGLESS LIZARDS *(Pygopodidae)*

Pygopus lepidopodus

One collected in April, 3 in December, usually basking in sun under small shrubs. One was collected about 0.5 m off the ground in a tussock of sedge.

Delma australis

Four collected under litter and in abandoned ant-nests in April.

Aprasia striolata glauerti

One collected in December in white-grey sand under root clump in roadside spoil 3 km north of Frenchman Peak.

DRAGON LIZARDS *(Agamidae)*

Amphibolurus adelaidensis

One gravid female collected in December behind coastal sand dunes at the entrance to a burrow. It had 2 eggs in right oviduct and 1 in the left.

Amphibolurus minor

One female collected in April dead on roadside near closed scrub. One male collected in December in open scrub on sandy soil.

Amphibolurus ornatus

Common during April and December under exfoliated slabs on large granite outcrops. Two gravid females collected in December with eggs present in both oviducts (clutch size: 2 and 3). *A. ornatus* of similar size collected in April and December show no gross morphological differences in either ovaries or testes. All April animals had some mesenteric fat, whereas some in December did not.

SKINK LIZARDS *(Scincidae)*

Ctenotus labillardieri

Moderately common under exfoliated slabs of granite. Eleven collected in April, 9 in December. Two size groups of each sex collected in each season. Males with snout-vent length greater than 65 mm and females with snout-vent length greater than 63 mm were breeding in December. Clutch 2 or 4 eggs, approximate terminal size in oviduct was 9 x 8 mm. Probably takes 2 years to reach sexual maturity.

Ctenotus gemmula

One collected in December on white sand with sparse litter under open heath to 0.5 m on side of sandridge about 10 m from interdune sedge swamp, 3 km west of Rossiter Bay. It was a gravid female with snout-vent length 56 mm and had 1 egg in each oviduct, the larger 15 x 8 mm. *C. gemmula* is evidently smaller than *C. labillardieri* at sexual maturity and lays fewer, but larger eggs.

Ctenotus catenifer

Three non-breeding specimens with snout-vent length 38-42 mm were collected in December in the same habitat as *C. gemmula.*

Egernia multiscutata bos.

An adult was dug from a burrow in sand-dunes at the east end of Rossiter Bay in April.

Egernia kingii

A male collected on insular headland adjacent to High Is., Duke of Orleans Bay, in December had large testes, 14 x 6 mm and 8 x 7 mm. The stomach was crammed with seeds of a *Leucopogon.*

Egernia nitida

Common on granite outcrops from peaks to the ocean splash-zone. Breeding in December. One or 2 eggs in each oviduct.

Leiolopisma trilineatum

Common in thickets and edges of rushy swamps. Breeding in December. Six eggs collected in old ant stick-nest in December had embryos nearly ready to hatch. A gravid female with 2 eggs in left oviduct and 1 in right was collected in December.

Lerista microtis

A mummified specimen was collected in April 1972 from the top of consolidated sand-dunes at east end of Rossiter Bay.

Lerista distinguenda

Two specimens were collected in December. A gravid female with snout-vent length 36 mm and a single egg 8 x 5 mm was dug out of white-grey sand under heath 2 km east of Frenchman Peak. Another was collected on interdune under sedge at Rossiter Bay.

Hemiergis peronii

Frequent throughout Park under fallen blackboys, roadside spoil and dense litter; occasionally under exfoliated granite embedded in soil at base of

granite outcrops. Breeding in December, 3 females each with 2 eggs in oviducts.

Menetia greyii

Two juveniles collected in low sparse vegetation on edges of granite outcrops.

Morethia obscura

Common throughout Park. Males with snout-vent longer than 44 mm and females with snout-vent longer than 40 mm were breeding in December. Oviduct eggs ranged in length from 2 mm to 9.5 mm. Clutch: 2 or 3.

Tiliqua occipitalis

Sparse on Park. A gravid female with 4 eggs in right oviduct and 3 in left was collected near Mt Le Grand in December.

Tiliqua rugosa

Sparse on Park. One adult collected near Mt Le Grand in December.

GOANNAS *(Varanidae)*

Varanus gouldii

Not seen in April. Six seen, including 1 male collected in December.

BLIND SNAKES *(Typhlopidae)*

Typhlina australis

One juvenile collected from inside a dead standing blackboy growing in dry swamp near Mt Le Grand in December.

PYTHONS *(Boidae)*

Python spilotus

An adult collected on Mt Le Grand in April. Another seen nearby at the old homestead site in December.

FRONT-FANGED SNAKES *(Elapidae)*

Brachyaspis curta

Three females collected in April and 1 male in December, all from a small area at Rossiter Bay, 2 in the *Eucalyptus cornuta* thicket and 2 on the adjacent granite headland, 1 of which was observed to be active at night. An adult House Mouse (*Mus musculus*) was in the stomach of a large female 50 cm long. All other Bardicks were less than 35 cm long.

Demansia affinis

None seen on the Park during either survey. An adult male was collected dead from the road near Duke of Orleans Bay in April. Another seen in approximately the same place in December.

Denisonia coronata

The most abundant and widespread snake on the Park. Eleven collected in April and 4 in December. Found in sedge beneath the *Eucalyptus cornuta* at Rossiter Bay and in sedges at Duke of Orleans Bay. Several specimens collected under loose granite and 1 dug from roots of a shrub on sand dunes. A gravid female with 2 eggs in the left oviduct and 1 in the right was

collected in December. The largest Crowned Snake collected (total length 55 cm) had an adult *Leiolopisma trilineatum* in its stomach.

Notechis scutatus

The most abundant and widespread of the large snakes on the Park during April and December. Seen more frequently in December than April in dense scrub and on roads. Snakes in both months had large amounts of mesenteric fat.

DISCUSSION

This list increases considerably the number of reptiles recorded from the coastal belt between Esperance and Cape Arid, which, prior to these surveys, was only 11 species. Several of the species recorded from Cape Le Grand National Park are the most easterly known records in Western Australia. These are as follows: *Aprasia striolata glauerti, Leiolopisma trilineatum, Ctenotus catenifer,* and *Egernia kingii.* It is likely that the range of some of these species will be further extended by future collecting east of the National Park. *Denisonia coronata, Notechis scutatus, Diplodactylus spinigerus,* and *Ctenotus gemmula* have all been recorded as far east as Israelite Bay.

The only other area on the south coast for which a published list is available is from the adjacent Recherche Archipelago from which Glauert (1954) records 17 species of reptiles. The snake, *Acanthophis antarcticus* is the only reptile from Glauert's list not recorded from the National Park.

Thirteen of the 30 species were breeding in December; it is possible that others were breeding but were missed because of the difficulty in discerning breeding condition in males or recently fertilized females. Skinks in particular are summer breeders with 7 of 8 genera breeding in December.

AMPHIBIANS

All 6 species listed here for the Park were collected in both April and December.

GROUND FROGS *(Leptodactylidae)*

Crinia georgiana

Common in vicinity of swamps and creeks throughout Park. All those collected during December were juveniles.

Crinia sp.

Frogs of the *insignifera* species-group were common, and some were collected from the margins of swamps.

Heleioporus eyrei

Common in and around swamps. Numerous juveniles collected in December. Adults calling in April.

Limnodynastes dorsalis

Common in vicinity of swamps and under slabs of granite.

TREE FROGS *(Hylidae)*

Litoria adelaidensis

Common on open ground in vicinity of swamps and creeks, in water in a small dam, and in *Melaleuca* trees in swamps.

Litoria cyclorhyncha

Most widespread of all the large frogs in the Park. Found in trees, in a small dam, in roadside ditches at night, and under granite slabs during the day. Present under exfoliated granite near summit of Frenchman Peak.

DISCUSSION

Litoria adelaidensis has been recorded east to Israelite Bay (Main 1965) and its abundance in Cape Le Grand National Park is not unexpected. The Cape Le Grand record of *Crinia georgiana* is the easternmost known. The unidentified *Crinia*, particularly those from the temporary swamps at Duke of Orleans Bay, were in habitat similar to that described for *Crinia subinsignifera* by Main (1965). *Heleioporus eyrei* has previously been recorded east to Esperance (Main 1965).

The other species of frogs are within their previous known range.

FISHES

GALAXIDAE

Native Trout, Minnow *(Galaxias attenuatus)*

This was the only freshwater fish collected in the Park in April. It was collected from two fairly fast flowing freshwater streams, less than 20 cm deep with sandy bottoms, (see Plate 7) flowing under the road just north of Mt Le Grand and another crossing Dunn Rock Road.

The Native Trout is quite common in coastal streams in south-east Australia, and the Murray River system. It has only recently been recorded from the south-west of Western Australia. This fish spawns in the sea, the young returning to freshwater when about 2.5 cm to 3.0 cm long. Scott, (1962).

ATHERINIDAE

Hardyhead *(Atherinosoma sp.)*

GOBIIDAE

Goby *(Ellogobius olorum)*

The above 2 species were collected in December from a semi-stagnant lagoon with brackish water at Rossiter Bay approximately 2 km north-east of the *Eucalyptus cornuta* thicket. This lagoon was fed from a small creek, which was temporarily barred from the sea by a sand bar. Scott describes the habitat of *Ellogobius olorum* as streams near the sea in Western Australia, South Australia, and Victoria.

ACKNOWLEDGEMENTS

We are grateful to the National Parks Board of Western Australia for financial assistance and encouragement to undertake these surveys. In addition they allowed us access to departmental correspondence concerning the Park. We would like to thank N.T. Allen and G. Harold for assistance in the field during the December 1972 and April 1972 surveys respectively. We are particularly indebted to G.M. Storr, and A. Baynes, Western Australian Museum, for discussion and criticism of the manuscript. Dr Storr also allowed us access to his field notes. A.S. Weston, Western Australian Herbarium, was particularly helpful during the preparation for these surveys by allowing us access to unpublished data. We are also grateful to the Curator and Staff of the Western Australian Herbarium for identification of plant specimens. G.M. Storr identified the reptiles and frogs collected in April. B. Hutchins, Western Australian Museum identified the freshwater fishes.

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APPENDIX I

Trapping effort at Cape Le Grand National Park for areas trapped in (a) April and (b) December and (c) December extralimital. The type of trap — break-back (BB), Elliott (E), Pit (P), and Cage (C) and the number of trap-nights set at each trapline.

Trapline No.	Habitat Type	No. of Trapnights				
a. April		BB	E	P	C	total
1	*Eucalyptus cornuta* woodland	104	104	65	39	312
2	Low Open Heath	99	110	0	22	231
3	*Xyris* swamp	99	110	0	22	231
4	*Eucalyptus* affin: *coronata* thicket	55	44	0	22	121
5	*Lambertia inermis* scrub	120	120	72	24	336
6	Cave Line	48	24	0	12	84
7	*Nuytsia floribunda* scrub	26	52	26	13	117
8	*Banksia occidentalis* scrub	36	36	36	0	108
9	*Banksia speciosa* scrub	36	36	36	0	108
10	Unconsolidated dunes	40	40	0	0	80
11	*Banksia speciosa* scrub	154	110	55	33	352
b. December						
1	*Eucalyptus cornuta* woodland	60	104	44	0	208
2	Low Open Heath	60	60	0	0	120
3	*Xyris* swamp	50	50	0	8	108
4	*Eucalyptus* affin: *coronata* thicket	16	16	0	0	32
5	*Lambertia inermis* scrub	50	50	30	0	130
6	Cave Line	0	0	0	0	0
7	*Nuytsia floribunda* scrub	25	25	0	10	60
8	*Banksia occidentalis* scrub	33	33	50	0	116
9	*Banksia speciosa* scrub	60	60	0	0	120
10	Unconsolidated dunes	0	0	0	0	0
11	*Banksia speciosa* scrub	52	52	0	0	104
12	Cave Line	25	25	0	0	50
13	*Xyris* swamp	50	50	0	0	100
14	*Lambertia inermis* scrub	25	25	30	15	95
15	*Banksia speciosa* scrub	25	25	30	0	80
16	Low Open Heath	25	25	0	0	50
17	Creek bed	25	25	0	10	60
18	*Banksia occidentalis* scrub	15	15	0	6	36
19	Low Closed Heath	15	15	0	0	30
20	*Xanthorrhoea preissii* scrub	50	50	0	0	100
21	Inter-swamp dune	50	50	0	0	100
c. December	(Traplines beyond eastern boundary)					
22	*Anarthria scabra* heath	50	50	0	0	100
23	*Banksia speciosa* scrub	50	50	0	0	100
24	*Gahnia trifida* heath	25	25	0	0	50
25	*Dryandra armata* scrub	40	40	0	0	80
26	*Petrophile fastigiata* scrub	40	40	0	0	80
27	*Casuarina humilis* heath	15	15	0	0	30
						4,201

APPENDIX II

Description of the habitat type at each trapline

Trapline 1: *Eucalyptus cornuta* association.

Located at the south-western tip of Rossiter Bay in closed low woodland dominated by *Eucalyptus cornuta.* There was a small beach to the east, and a steep slope inland with dense *Banksia speciosa.* Two medium height shrubs, *Acacia saligna* and *Leucopogon* sp. formed a low scattered layer within the woodland, but became dense at the edge. Ground cover sparse, apart from a dense growth of sedge and grasses near the beach. Leaf litter was dense and continuous. Soil was dark olive-grey loamy sand.

Trapline 2: Low open heath formation **(Plate 1)**

Located about 1.5 km from Rossiter Bay on the coast side of the road to Lucky Bay in a low open heath with occasional *Eucalyptus* sp. and *Nuytsia floribunda* emergents. This heath was rich floristically, and contained many elements of heath seen elsewhere on the Park. The most common shrubs were *Daviesia* sp. *Grevillea* sp. *Petrophile teretifolia* and *Verticordia minutiflora.* Ground cover was sparse, and there was no litter. Soil was grey loamy sand. At the southern end of this trapline is an extensive swamp covered with a rush *Baumea* sp. with occasional moderately high *Melaleuca* trees around the edges.

Trapline 3: *Xyris* sp. swamp **(Plate 2)**

Located about 0.5 km east of Hellfire Bay and separated from the Bay by a ridge of consolidated sand dunes. Traps were set around edge of swamp which was covered with a low, thin-stemmed reed, *(Xyris* sp.) and occasional low *Agonis linearifolia.* A steady flow of water from a soak at the northern end covered the swamp to about 5 cm in April. *Eucalyptus lehmanni* formed a low thicket around most of the swamp, although the eastern bank was covered with large clumps of sedge, *Gahnia decomposita.* The shrub layer beneath *E. lehmanni* is mainly *Agonis* sp. *Banksia* sp. and a stunted mallee, *Eucalyptus globifera.* Slopes leading into the swamp were covered with a low open heath including *Jacksonia spicosa, Dryandra sessilis, Acacia browniana, Adenanthos sericea, Melaleuca globifera* and *Agonis obtusissima.* There was no ground cover, and very sparse leaf litter. Soil at edge of swamp was fine-grained light-grey loamy sand.

Trapline 4: *Eucalyptus* affin: *coronata* **(Plate 2** — right mid-ground).

Located about 0.5 km east of Hellfire Bay and about 500 m north of trapline 3 in moderate height closed scrub dominated by moderate height mallee *Eucalyptus* affin. *coronata.* Lower layer of shrubs about 2 m high consisted primarily of *Melaleuca globifera, Agonis linearifolia* and *Hakea suaveolens.* Ground cover of dense sedges; *Lepidospermum* sp. and *Gahnia decomposita.* The southern end of this trapline had occasional *Boronia denticulata* shrubs. Soil was coarse-grained, brown to dark-brown, loamy sand.

Trapline 5: *Lambertia inermis* association **(Plate 3).**

Located approximately halfway between Frenchman Peak and Hellfire

PLATES

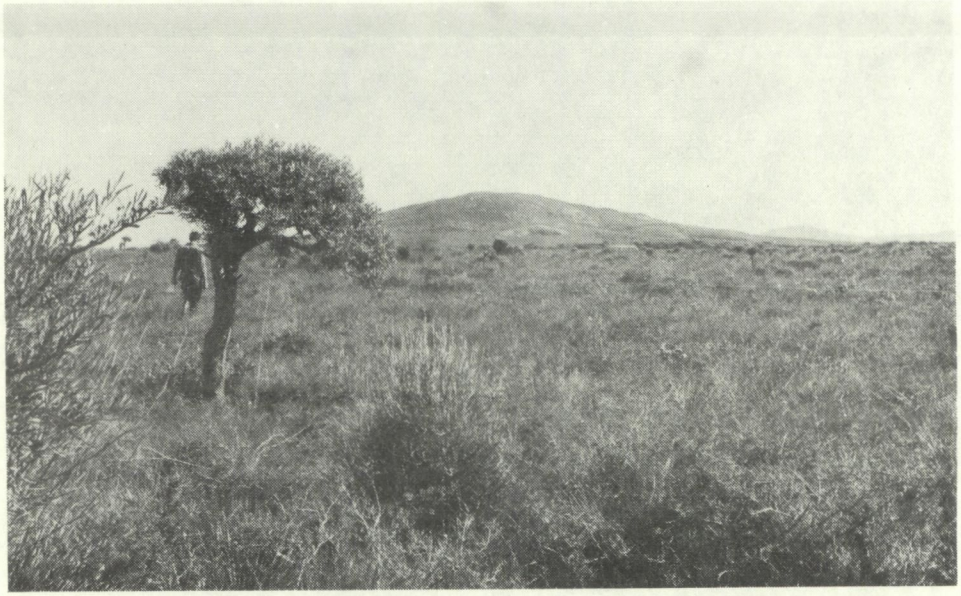

Plate 1 Low open heath. Trapline 2.

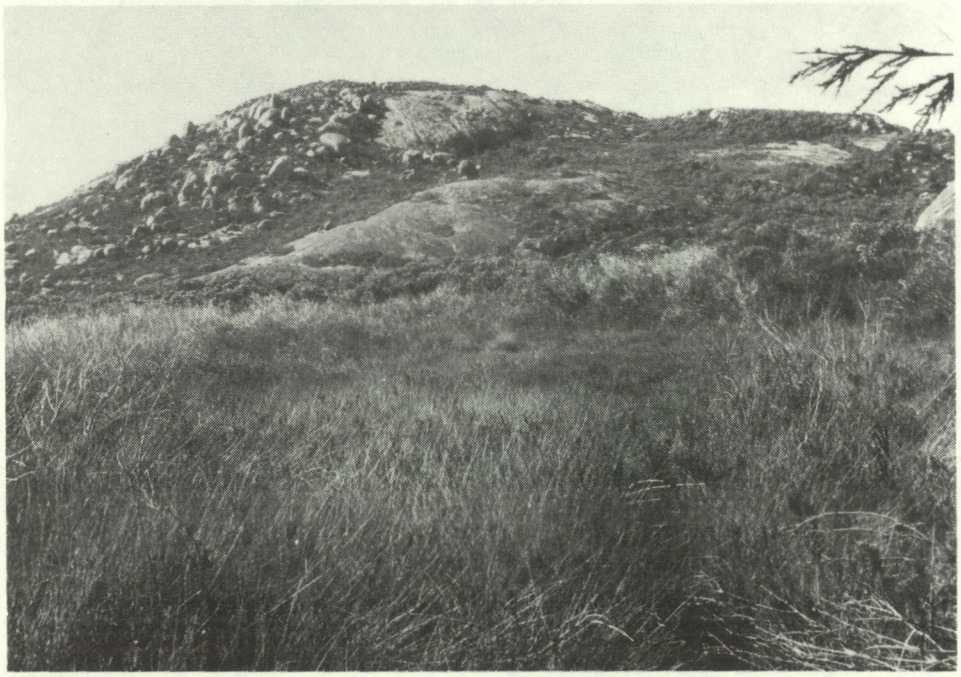

Plate 2 *Xyris* swamp, trapline 3 in foreground. *Eucalyptus* affin: *coronata* thicket, trapline 4 in right mid-ground.

Plate 3 Open scrub *(Lambertia inermis* association*)*. Trapline 5.

Plate 4 Unconsolidated dunes. Trapline 10.

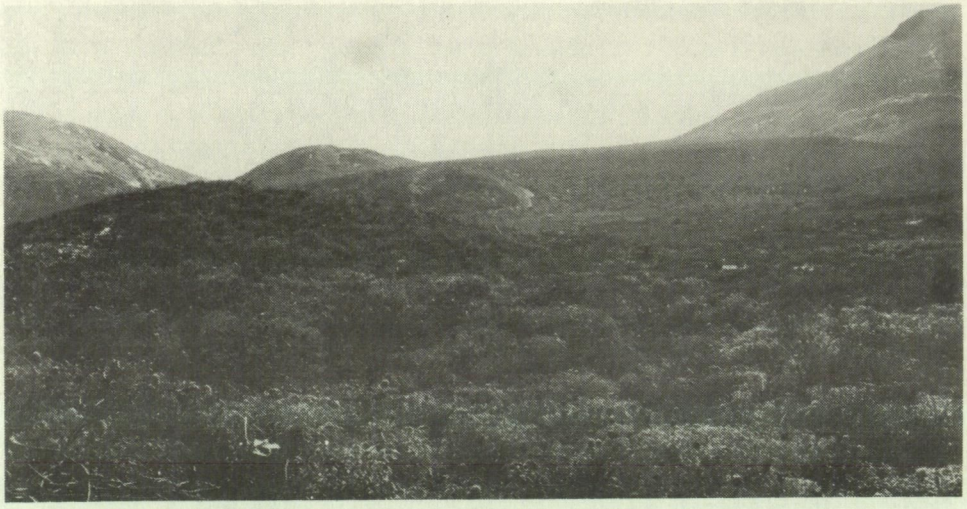

Plate 5 Closed scrub *(Banksia speciosa* association*)*. Trapline 11.

Plate 6 Closed scrub *(Xanthorrhoea preissii* association). Trapline 20.

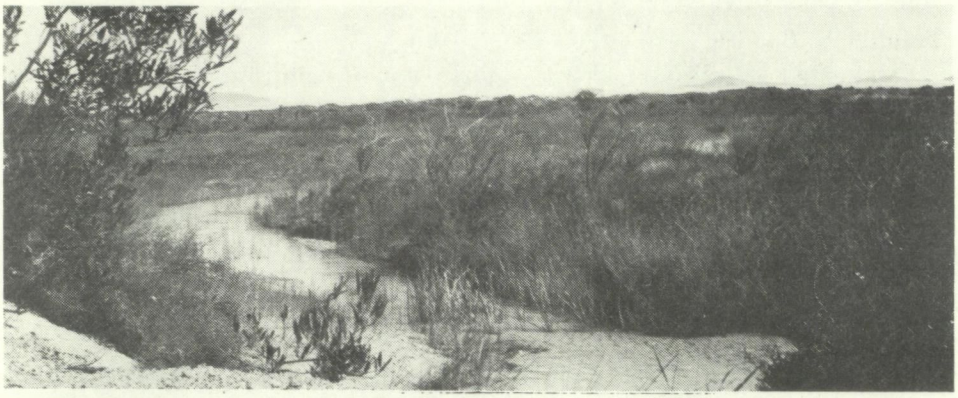

Plate 7 Typical freshwater creek near Mt Le Grand.

Plate 8 Earth mound built up around entrances to *Rattus fuscipes* burrow system exposed by fire. Commencement of run is in foreground.

Bay, on either side of the road connecting these two points in vegetation dominated by Chittick, *(Lambertia inermis)*, a moderate height shrub with an understorey of low shrubs, mainly *Daviesia* sp. *Banksia pulchella*, an unidentified dwarf *Melaleuca* and *Adenanthos cuneata*. Leaf litter was sparse. Soil was light-grey, fine, sandy loam.

Traplines 6 and 12:

Located along the bottom of a steep, sloping, granite rock face near Mt Le Grand, with closed scrub adjacent to the slope. Some traps set in a large cavern in the granite slope. Soil was light-grey sandy loam.

Trapline 7: *Nuytsia floribunda* association.

Located near trapline 6 in open scrub outside the cavern in vegetation dominated by Christmas trees *(Nuytsia floribunda)* with a shrub assemblage of moderate height *Lambertia inermis* and *Banksia speciosa*. Soil was coarse-grained, light-grey, sandy loam.

Trapline 8: *Banksia occidentalis* association.

Located approximately 3 km north-east of campsite at Rossiter Bay in closed scrub dominated by *Banksia occidentalis* with sub dominant *Melaleuca cuticularis* in dense thickets occupying depressions in the heath. Leaf litter was sparse and soil was dark greyish-brown loamy sand.

Trapline 9: *Banksia speciosa* association.

Located near trapline 8 across a series of small semi-consolidated sand dunes. Heath similar to trapline 8 but with *Banksia speciosa*. Ground cover sparse and almost no litter. Soil was dark greyish brown loamy sand.

Trapline 10: Unconsolidated dunes **(Plate 4).**

Located behind the beach at far east end of Rossiter Bay. The dunes were sparsely covered by low bushes including *Verticordia minutiflora*, *Darwinia* sp. *Melaleuca globifera* and the tussock grass *Scirpus nodosus*. Soil was white sand.

Trapline 11: *Banksia speciosa* association **(Plate 5)**

Located inland from the beach at Hellfire Bay in vegetation dominated by medium height *Banksia speciosa* and low mallee emergents *(Eucalyptus cornuta)* with low shrubs including *Daviesia* sp. *Petrophile teretifolia*. Ground cover was mainly *Lyginia tenax*. Litter sparse. Soil was light grey sand. [The following descriptions apply to small local communities trapped only in December.]

Trapline 13: *Xyris* swamp.

Located 4 km north of Mt Le Grand. This swamp was similar to trapline 3; it differed in that it was surrounded by low-lying swampy country and not by consolidated sand-dunes.

Trapline 14: *Lambertia inermis* association.

Located 6 km north-east of Frenchman Peak in a tall, dense growth of *Lambertia inermis* which grew at the base of a small granite outcrop. Run-off from the granite resulted in a dense, almost impenetrable shrub understory of *Xanthorrhoea preissii* and *Banksia speciosa*.

Trapline 15: *Banksia speciosa* association.

Located 5 km north-east of Frenchman Peak in vegetation similar floristically to trapline 11. It differed in that it was on more loamy soil, and the *Banksia speciosa* was stunted and seldom exceeded 1 m in height.

Trapline 16: Low open-closed heath.

Located 1 km east of Mt Le Grand in a low open and closed assemblage up to 60 cm in height. It was on one of the heavily laterised slopes to the east of Mt Le Grand.

Trapline 17: A creek bed.

Located 1 km north-east of Mt Le Grand along a small watercourse which was filled with running water; the banks were heavily vegetated with *Agonis linearifolia* and *Melaleuca* sp.

Trapline 18: *Banksia occidentalis* thicket.

Located 2 km north of Mt Le Grand in a dense thicket along a roadside verge. The Banksias were 6 m high, presumably on account of the additional soil moisture resulting from run-off from the road.

Trapline 19: Low closed heath on dune.

Located 2 km north of Mt Le Grand in a community of low shrubs *Acacia cochlearis*, and *Pimelea ferruginea*, both to 20 cm, as co-dominants. The occasional decumbent bush *Spyridium globulosum* to about 1 m high was present. Another low shrub *Olearia axillaris* was present, but sparse.

Trapline 20: *Xanthorrhoea preissii* association **(Plate 6)**

Located 1 km east of Frenchman Peak. This trapline commenced at the edge of a swamp and encompassed two soil and vegetation types: a narrow belt of *Eucalyptus occidentalis* and *Agonis linearifolia* around the swamp margin on black loam and fine sandy soils; and an extensive medium height closed scrub formation consisting of *Xanthorrhoea preissii*, *Adenanthos cuneata*, *Acacia browniana* and occasional *Nuytsia floribunda* on dark-grey, fine sandy loam. There was very little ground cover associated with this formation.

Trapline 21: Inter-swamp dune system.

Located 2 km from Rossiter Bay on the coast side of the road to Lucky Bay in a line of low sandhills, forming a ridge between two dry swamp beds. This ridge was covered with moderate height *B. speciosa* on the crest, with occasional *Nuytsia floribunda* and *Lambertia inermis* on each side of the crest. A low shrub layer along the crest and on either side consisted of *Adenanthos cuneata*, *Casuarina humilis*, *Isopogon trilobus*, *Beaufortia micrantha*. Ground cover and leaf litter were absent except under *B. speciosa* shrubs.

[The following descriptions apply to the traplines off the eastern boundary of the Park in December 1972.]

Trapline 22: *Anarthria scabra* association.

Located about 4 km west of High Island in a low open heath with the dominant sedge, *Anarthria scabra*. A tussock grass *Gahnia trifida* and

Melaleuca pulchella formed a scattered assemblage within the sedge.

Trapline 23: *Banksia speciosa* association.

Located about 3 km south-west of High Island in a dense closed scrub formation of *B. speciosa* which was similar to trapline 11, but had ground cover of *Anarthria scabra.*

Trapline 24: *Gahnia trifida* association.

Located about 6 km west of High Island in a dry swamp bed, with a pure association of *Gahnia trifida* as a low open heath.

Trapline 25: *Dryandra armata* association.

Located about 5 km south-west of High Island in a closed scrub formation interspersed with large granite boulders. *Dryandra armata* dominated the scrub, with *Beaufortia micrantha* and *Casuarina humilis* also present.

Trapline 26: *Callitris preissii* association.

Located about 7 km north-west of High Island in a closed scrub formation on top of a low hill with intermittently exposed granite at the summit. The formation was dominated by *Callitris preissii* ssp *verrucosa,* with *Calothamnus quadrifidus* and *Hakea suaveolens* both co-dominant.

Trapline 27: *Casuarina humilis* association.

Located about 6 km north-west of High Island in a complex, low, open heath formation with *Casuarina humilis, Adenanthos cuneata, Petrophile fastigiata* and *Hakea suaveolens.* The occasional *Nuytsia floribunda* and *Xanthorrhoea preissii* were emergent over the heath.

INSTRUCTIONS TO AUTHORS

Manuscripts

Manuscripts must be submitted in duplicate, typewritten, double spaced with wide margins. Positions of text figures and tables must be indicated. Authors may include an abstract for publication as part of a paper. The Committee may require an author to submit an abstract if no abstract is submitted and it considers that an abstract would be useful.

Illustrations

Papers may be illustrated by black and white line drawings or black and white photographs. One set of illustrations will be required. Photographs should be printed on white glossy paper, showing a full range of tones and good contrast. Top and bottom should be clearly indicated. Line drawings should be no more than four times the maximum size for publication, which is 19 cm x 12·5 cm, including caption. Authors should indicate their preferred degree of reduction. Numbering and lettering should be done lightly in blue pencil. Composite illustrations are to be submitted separately, with a sketch of authors' requirements. Final illustrations will be produced by the Western Australian Museum's display artists.

Footnotes

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