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EGERTON

FAUNA SURVEY

**TECHNICAL REPORT:
SUPPLEMENT TO
CONSULTATIVE ENVIRONMENTAL REVIEW**

ALAN TINGAY & ASSOCIATES

FEBRUARY 1994

REPORT NO: 93/74

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1. INTRODUCTION

1.1 Purpose and Scope of the Study

This report outlines the results of a vertebrate fauna survey of a property known as 'Egerton' which is situated in the Shire of Swan.

The aims of the present study were to:

- determine the vertebrate fauna present on the property,
- determine the distribution of the vertebrate fauna across the major habitat types present on the property,
- determine if there are any rare or otherwise unusual species that may require special conservation measures, and
- determine the regional significance of the vertebrate fauna found on the property.

This report describes the methods used in assessing the fauna present on the property; documents the results obtained from the field assessment; compares the fauna present with that in the region; and provides recommendations for vegetation/habitat retention in order to protect significant fauna habitat on the property.

1.2 Location and Background of Egerton

Egerton is located approximately 20km north-east of the City of Perth, north of Gnangara Road and to the west of West Swan Road in the locality of Ellenbrook, Shire of Swan (Figure 1). The property covers 495.3ha and until recently, it was zoned Rural under the Metropolitan Region Scheme (MRS) and the Shire of Swan Town Planning Scheme (TPS) No. 9 District Zoning Scheme. However, after an application by the owners of the adjacent Ellenbrook property, and environmental approval from the Minister for the Environment following advice from the Environmental Protection Authority (EPA), the zoning of both Ellenbrook and Egerton was changed to 'Urban Deferred' (Figure 2).

The next step in the planning process involves rezoning of Ellenbrook and Egerton to Urban under the MRS and to Residential Development (or similar) under the Shire of Swan TPS.

The intention to apply for a lifting of the urban deferment at Egerton was referred to the EPA and the EPA decided to formally assess the proposal so that the environmental implications of the specific urban structure plan could be established. The EPA requested the owners of the property, Multiplex Constructions Pty Ltd, to prepare a Consultative Environmental Review (CER) to provide a basis for that assessment. The present fauna survey was commissioned by Multiplex Constructions Pty Ltd as a supplement to the CER.

2. METHODS

2.1 Introduction

The survey program was designed to sample all major fauna habitats on the property and included a systematic trapping programme of ground dwelling species, bird surveys, active searching and opportunistic observations.

The principal habitats surveyed were:

- *Eucalyptus* Woodland*¹
- *Banksia* Low Woodland*²
- *Melaleuca* Low Woodlands to Low Closed Forests*³
- *Pericalymma ellipticum* Heath
- *Juncus pallidus* Sedgeland

Specific survey sites are described below, followed by a description of survey methods.

2.2 Sampling Areas

Four survey sites were established which contained 5 representative major habitat types. Areas degraded by clearing or grazing were not systematically sampled, although opportunistic surveying of this habitat type was carried out. The survey locations are shown in Figure 3. A summary description of the vegetation at each survey site is presented below and in Table 1.

2.2.1 Location A

Location A was situated adjacent to the western boundary of the property at approximately its mid point. The vegetation of this area is predominantly pine tree (*Pinus pinaster*) plantations with an admixture of *Eucalyptus calophylla*, *E. marginata*, and *E. tottiana*. This Woodland changes to *Pericalymma ellipticum* Heath in an interdunal swale of lower elevation. The Heath stands in shallow water in wet winter months.

2.2.2 Location B

Location B was situated on the western section of the property, close to the northern boundary. At moderate elevations the vegetation consists of *Banksia attenuata*/*B. menziesii* Low Woodland and *Adenanthos cygnorum* Shrubland. A transition zone of *Eucalyptus marginata* Woodland with Bracken (*Pteridium esculentum*) understorey grades to *Melaleuca preissiana*/*Eucalyptus rudis* Low Closed Forest with a sedge

*¹ *Eucalyptus* Woodlands are generally *E. calophylla* but may also contain *E. tottiana*, *E. rudis*, and *E. marginata* Woodlands.

*² *Banksia* Woodlands were made up of either one or more of the following species: *B. attenuata*, *B. menziesii*, *B. grandis*, *B. illicifolia*, *B. littoralis*.

*³ *Melaleuca* Low Woodlands to Low Closed Forests are made up of *Melaleuca preissiana* Low Woodlands and *Melaleuca raphiophylla* Low Closed Forests.

TABLE 1

EGERTON FAUNA SURVEY
DESCRIPTION OF VEGETATION AT EACH SURVEY SITE

Survey Site	Trap Number and Type																																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30					
	PVC	PVC	Buc	PVC	PVC	ME	LE	TC	ME	LE	TC	ME	LE	TC	ME	LE	TC	ME	LE	TC	ME	LE	TC	ME	LE	TC	ME	LE	TC	ME					
A	Ec/P WL, Sc-O, S-M					Pe, CH, S					P, LW, Sc-O, M					Pe, CH, S					P/Ec, LW, Sc, S					P, LOW, Sc, S					Pe/Mp, CH, D, S-M				
B	Ec/Er/Bi/Mp/Br, LW, D, M-T										Ba/A, LOW, Sc, S-T					Cl, S-M					Mp/Br/EC, LOF, D, M-T					Cl, S-M					Bi/E/X/Br, LOF, D, M-T				
C	Bi/X, LOW, Sc, S					Mp, LCF, W, Sc, S										A/Ba/EC, LOF, O, M-T										Ep, Sh, O, S-M									
D	Jp, OS, Bi/Ac, LW, S-M															Mp/Jp/Bi, LCF, D, M-T										Mp, LOF, O, M-T									

LEGEND:

TRAP TYPE

Buc - Pitfall, 20L bucket
LE - Large Eliot
ME - Medium Eliot
PVC - Pitfall, Pipe
TC - Tomahawk cage trap

VEGETATION COMPLEX

Ac - Acacia saligna
A - Adenanthos cygnorum
B - Banksia attenuata
Bi - Banksia illicifolia/littoralis
Br - Bracken
Cl - Clearing with fallen trees
CH - Closed Heath
Ec - Eucalyptus calophylla
Er - Eucalyptus rudis
Ep - Eremaea pauciflora
Jp - Juncus pallidus
LCF - Low Closed Forest
LOF - Low Open Forest
LOW - Low Open Woodland
LW - Low Woodland
Mp - Melaleuca preissiana
OS - Open Sedgeland
Pe - Pericalymma ellipticum
P - Pinus pinaster
Sh - Shrubland
W - Wetland
WL - Woodland
X - Xanthorrhoea preissii

UNDERSTOREY

Sc - Scattered
O - Open
D - Dense

LEAF LITTER

S - Sparse
M - Medium
T - Thick

understorey at lower elevations. Part of this survey location was adjacent to a *Pericalymma ellipticum* Heath.

2.2.3 Location C

Location C was situated on the mid-northern boundary of the property. The vegetation consists of *Banksia attenuata*/*B. menziesii* Low Woodland with areas of *Eucalyptus calophylla*/*Banksia attenuata* Woodland and at the lowest elevation a *Melaleuca preissiana*/*Eucalyptus rudis* Closed Forest and *Melaleuca raphiophylla*/*Eucalyptus rudis* Low Closed Forest (Wetland) with sparse understorey. *Banksia littoralis*/*B. grandis* Low Woodland was also present adjacent to the wetland area. This wetland contained water at the time of survey.

2.2.4 Location D

Location D was situated on the fringes of a linear wetland in the centre of the property. The vegetation consists of a *Juncus pallidus* sedgeland adjacent to a *Melaleuca preissiana* Low Woodland and *Melaleuca raphiophylla* Low Closed Forest with an understorey of Bracken and sedges of varying densities. Slightly upland of this are *Acacia* and *Eucalyptus* species which appear to have been planted. Further uphill are *Pinus pinaster* plantations. The *Juncus pallidus* Sedgeland and part of the *Melaleuca raphiophylla* Low Closed Forest appear to have been grazed and a small levee has been built through a section of the wetland.

Intensive and systematic surveys to detect fauna present were conducted throughout the localities described above.

2.3 Survey Methods

Trapping for amphibians, reptiles and small mammals was carried out in each major habitat unit.

The four sampling localities were systematically surveyed in spring between 12 and 17 October, 1993. At each site, 30 traps were laid as follows:

• Pit trap (PVC pipe)	4
• Pit trap (bucket)	1
• Cage trap (Tomahawk)	6
• Medium Elliott	10
• Large Elliott	9

	30 traps at 4 trapping sites

TOTAL	120 traps

In all, the pit traps were operational for 6 days, while the other traps were used for 5.

Pitfall, cage and Elliott traps were used to maximise the probability of catching a wide range of species. The configuration of the traplines is illustrated in Figure 4 and trap

dimensions are described in Appendix A. Each survey site had 3 traplines, each containing 10 traps. There was approximately 50m between each trapline.

Pit traps were dug into the ground so that the opening of the trap was flush with the ground surface and were placed 10m apart with a 30cm high fenceline between each trap. The shade cloth fenceline was designed to intercept passing animals and direct them to the pits to facilitate a higher catch rate. The shade cloth fence was supported using metal stakes. Two sizes of pitfall traps were used:

- 160mm diameter PVC stormwater piping cut into 600mm lengths with flywire mesh floors, and
- 20L Rheem plastic buckets with small drainage holes in the bottom.

Pitfall traps were securely covered when not in use to prevent the accidental capture of fauna.

The cage and Elliott traps were placed approximately 15m apart.

All traps were marked for identification with surveyors flagging tape.

Elliott and Tomahawk cage traps were baited with a ball of peanut paste, rolled oats and honey late in the afternoon and checked soon after dawn, when the bait was removed and the traps were left shut during the day. Pitfall traps were left open all day and were checked just after dawn and when the cage traps were baited in the evening.

Weather conditions during the survey varied from fine and warm, cool and cloudy with fog to cool and rainy.

2.4 Bird Survey

The four survey sites were surveyed for birds in conjunction with the trapping regime (12 to 17 October, 1993) and also on 19 October, 1993. Equal time was spent at each site, although opportunistic observations in other areas were recorded, along with habitat information. An experienced biologist conducted all surveys. The observer walked slowly through the site. Species heard and/or seen were recorded on data record sheets. Binoculars were used to facilitate identification and birds were 'called up' at regular intervals.

The main vegetation types surveyed for birds included:

- *Pinus pinaster* with admixture of *Eucalyptus* Woodland,
- *Pericalymma ellipticum* Heath,
- *Banksia attenuata*/*Banksia menziesii* Low Woodland/*Adenanthos cygnorum* Shrubland,
- *Eucalyptus calophylla*/*Banksia attenuata* Woodland,
- *Melaleuca raphiophylla*/*Eucalyptus rudis* Low Closed Forest, and
- *Melaleuca preissiana*/*Eucalyptus rudis* Low Closed Forest.

Opportunistic surveys were carried out in pasture areas and around the Ornamental Lake and Old Mill Dam.

2.5 Active Searching

Adjacent to each trapping site an area of approximately 50m x 50m (0.25ha) was actively searched for reptiles and frogs. Systematic searching under rocks, bark on dead trees, fallen logs and leaf litter was carried out. Approximately 1 hour active searching by two people was carried out at each site.

2.6 Opportunistic Observations

Throughout the fauna survey, opportunistic sightings and/or calls of birds, mammals, reptiles and frogs were recorded.

Scats, burrows and diggings were also noted as evidence for the presence of some species.

2.7 Analysis

Multidimensional Ordination Analysis

Multidimensional ordination analysis makes it possible to demonstrate the similarity between fauna communities in different habitats or regions. Ordination analyses were performed to compare the suite of animals present at various sites in the Perth Area with the fauna present at Egerton. This provides a basis for determining regional significance.

The regional species data set was carried out using the computer analysis technique of ordination with Detrended Correspondence Analysis (DCA). DCA ordination arranges similar groups of species in clusters. The results of these analyses are presented graphically in scatter diagrams. The program was run on an Apple Macintosh Microcomputer SE30 using the CANOCO software package.

3. RESULTS

The species of fauna found during the survey, and their distribution is summarised in Appendix B and C and is discussed below.

A total of 60 vertebrate species were recorded including:

- Frogs 6 species
- Reptiles 9 species
- Birds 38 species
- Mammals 3 native, 4 introduced.

3.1 Frogs

3.1.1 Species Present

Six species of frog were found during the present study all of which were associated with wetland areas or vegetation that fringed wetlands.

Crinia georgiana is a small frog (24 to 46mm snout-vent length) that breeds in spring and often lays eggs in shallow seep water or even roadside gutters. The species is found between Gingin in the north, inland to Dumbleyung and east to Cape Le Grand (Tyler et al, 1984). These were the most commonly captured frogs at Egerton. They were found in *Pericalymma ellipticum* Heath, *Juncus pallidus* Sedgeland as well as *Eucalyptus calophylla/Pinus pinaster* Woodland and *Banksia attenuata/B. menziesii* Low Woodlands associated with wetland areas.

Heleioporus eyrei (Moaning Frog) lays eggs in a burrow and does not require open water for reproduction. These frogs are commonly found in coastal and near coastal areas in the south-west of Western Australia. They are relatively common at Egerton and were found in *Melaleuca preissiana* Low Woodland and *Banksia attenuata/B. menziesii* Low Woodland.

Heleioporus inornatus are medium sized frogs (44 to 73mm snout-vent length) which are usually found on the Darling Ranges and scarp from Chidlow south to Walpole and Mt Barker. *H. inornatus* lay their eggs in burrows, which are generally confined to sandy, acid peat bogs. Only one frog of this species was captured in *Melaleuca preissiana* Low Woodland.

Limnodynastes dorsalis (Banjo or Pobblebonk Frog) is usually found amongst vegetation around permanent water during the wet winter months. During summer it inhabits a burrow to protect itself against dry, hot conditions. This species requires static or flowing open water to reproduce. Only one individual of this species was captured in *Eucalyptus calophylla/Pinus pinaster* Woodland adjacent to a wetland.

Ranidella glauerti are highly variable small frogs (20 to 24mm snout vent length) which occur from Moore River to Pallinup River and south to the Stirling Ranges. The species breeds following rain in swamps and streams and generally inhabits areas of permanent moisture at the edge of marshes. Although frequently heard in *Pericalymma ellipticum*

Heath, *Melaleuca preissiana* Low Woodland and *Juncus pallidus* Sedgeland, this species was seldom captured.

Ranidella insignifera are small long-limbed frogs which occur on the coastal plain between Gingin and Busselton, usually in temporary wetlands. They breed in winter by laying single eggs in pools of water. This species did not appear to be common at the time of the survey.

3.1.2 Comparison with other Metropolitan Localities

The frog community recorded at Egerton was compared by ordination to that of other localities in the Perth Metropolitan Region for which recent survey data is available. The surveys used for this analysis were as follows:

- Jandakot - Davidge (1979).
- Wireless Hill Park - Smith (1984),
- Lesmurdie - Dell & How (1989),
- Reserve 3692 Victoria Park - Turpin (1990, 1991),
- Yanchep - Alan Tingay & Associates (1991),
- Bold Park - How & Dell (1990),
- Whiteman Park - Arnold et. al. (1991),
- Yanchep National Park - Burbidge & Rolfe (1991), Shannon (1991), and other unpublished CALM records,
- Ellenbrook - Watkins & Bamford (1993),
- City of Canning - Maryan (1993)
- Perth International Airport - Alan Tingay & Associates (1994).

Heleioporus inornatus was removed from the analysis due to uncertainty of its status at Egerton.

The results of the ordination are illustrated in Figure 6. This Figure indicates that the frog community at Egerton is most similar to the City of Canning and Ellenbrook, with communities at Wireless Hill Park, Perth Airport and Whiteman Park also being very similar.

The second group of similar communities comprises Bold Park, Jandakot, Yanchep and Reserve 3692 Victoria Park.

Yanchep National Park shares similarities with the communities of both the groups mentioned above.

Finally, the figure indicates that the frog community recorded at Lesmurdie is distinctly different from all of the other communities. This is because the survey at Lesmurdie recorded only one frog species (*Ranidella pseudinsignifera*) and this species was not recorded at any of the other locations surveyed.

3.2 Reptiles

3.2.1 Species Present

The nine species of reptiles found on the property belong to the following families:

- Geckos 1 species
- Dragon Lizards 1 species
- Skinks 6 species
- Snakes 1 species.

Diplodactylus spinigerus is a semi-arboreal gecko which occurs between Gingin and Perth on the edge of the Darling Scarp with separate populations on the semi-arid south-east coast from Fitzgerald Inlet east to Toolinna Cove and north to Dalwallinu. They live in shrubs and low trees on all soil types (Storr et al, 1990). The single individual captured was found in *Banksia littoralis/B. grandis* Low Woodland.

Pogona minor is a small to medium bearded dragon which occurs in the southern Pilbara, east to the Little Sandy Desert, south to Pinjarra and east to South Australia (Storr et al, 1983). This lizard appeared to be relatively common at Egerton and was found in *Eucalyptus calophylla/Pinus pinaster* Woodland as well as *Melaleuca* Woodland.

Cryptoblepharus plagiocephalus is a small skink which is widespread throughout Western Australia, except for the extreme south between Dunsborough and the Nullarbor Plain (Storr et al, 1981). This species was observed sunning itself on the trunks of *Banksia* species.

Egernia napoleonis is a medium sized skink which occurs from Jurien Bay south and east to the Darling and Stirling Ranges and the Great Australian Bight. This species appeared to be relatively common in *Melaleuca raphiophylla* Low Closed Forest.

Hemiergis peronii quadrilineata is a small skink which occurs on the west coast, coastal plain and islands from Jurien Bay south to Busselton. At Egerton an individual was found under a fallen tree trunk in *Banksia attenuata* Low Woodland.

Lerista elegans is a small skink found along the west coast of Western Australia from Barrow Island to Perth. It was one of the most commonly captured lizards at Egerton and was found in *Eucalyptus calophylla/Pinus pinaster* Woodland.

Lerista praepedita occurs on west-coastal dunes and near coastal sandplains from Yardie Creek south to Mandurah. This lizard did not appear to be common and was only found in *Banksia attenuata/B. menziesii* Woodland.

Menetia greyii is a small skink distributed over the greater part of Western Australia between Derby and Lake Argyle south to Nannup and Albany. *Menetia greyii* was found in *Eucalyptus calophylla/Pinus pinaster* Woodland and *Banksia attenuata/Banksia menziesii* Low Woodland.

Notechis scutatus (Tiger Snake) is a highly venomous species which grows up to 1.2m in length. It inhabits the subhumid and humid zones of Western Australia (mainly adjacent to

streams and wetlands on coastal plains) from Jurien Bay south and east to Point Malcolm (Storr et al, 1986). A single individual of *Notechis scutatus* (Tiger Snake) was observed in an area of *Melaleuca raphiophylla* Low Closed Forest adjacent to a wetland.

A low number of individuals was found of the various reptiles species. Periods of cool weather during the survey may partially account for the low number of species trapped.

The skinks *Menetia greyii* and *Lerista elegans* were the most commonly captured reptiles.

3.2.2 Comparison with Other Metropolitan Localities

The lizard community recorded at Egerton was compared by ordination to that of other localities in the Perth Metropolitan Region for which recent survey data is available. The surveys used for this analysis were as follows:

- Jandakot - Davidge (1979),
- Garden Island - Robinson et al (1987),
- Lesmurdie - Dell & How (1989),
- Bold Park - How & Dell (1990),
- Whiteman Park - Arnold et. al. (1991),
- Yanchep National Park - Burbidge & Rolfe (1991), Shannon (1991), and other unpublished CALM records,
- Ellenbrook - Watkins & Bamford (1993),
- John Forest National Park - How & Dell (in press),
- Rottnest Island - Kitchener & How (1982); How & Dell (in press),
- Kings Park - J. Dell (pers. comm),
- Woodvale Reserve - How & Dell (in press),
- Melaleuca Park - How & Dell (in press), and
- Perth International Airport - Alan Tingay & Associates (1994).

The results of the ordination are illustrated in Figure 6. This figure indicates that the reptile fauna of locations on the Swan Coastal Plain is distinct from those on the Darling Scarp. On the Plain, two clusters of localities are apparent. One of these includes Egerton and Garden Island, Woodvale, Kings Park, Bold Park and Yanchep. Rottnest Island also shares similarities with this group.

These locations, excluding Rottnest Island, have the following species in common:

- *Cryptoblepharus plagiocephalus*
- *Hemiergus quadrilineata*
- *Lerista praepedita*.

In addition, the following species occur at four of the five locations:

- *Phyllodactylus marmoratus*
- *Pogona minor*
- *Lerista elegans*
- *Menetia greyii*
- *Tiliqua occipitalis*

- *Tiliqua rugosa*.

The second group of locations on the Swan Coastal Plain comprises Ellenbrook, Melaleuca Park, Jandakot, and Whiteman Park. Perth Airport also shares some similarities with this core group. The four localities in this core group share the following species in common:

- *Lialis burtonis*
- *Pletholax gracilis*
- *Pogona minor*
- *Tympanocryptis adelaidensis*
- *Cryptoblepharus plagiocephalus*
- *Ctenotus lesueurii*
- *Lerista elegans*
- *Menetia greyii*
- *Morethia lineoocellata*
- *Tiliqua rugosa*
- *Rhinoplocephalus gouldii*
- *Vermicella calanotus*.

The degree of overlap between the two core groups of localities on the Swan Coastal Plain can be seen by comparison of the above species lists. In essence, the two groups are separated due to apparent differences in the distribution of relatively few species. For example, *Hemiergis quadrilineata* occurs in all of the localities in the first core group but in only one of the second, namely Ellenbrook. The actual scatter of localities in the ordination diagram reflects the degree of similarity between localities in one group with those in the other. In the case cited, Ellenbrook is shown as more similar to the other core group than localities such as Whiteman Park.

3.3 Birds

3.3.1 Species Present

Thirty-eight species of birds were recorded on the property including 1 introduced species. The distribution of bird species according to habitat is shown in Appendix C. The number of species that have been recorded to date in each of the vegetation/habitat types is as follows:

• Farmland	20
• <i>Banksia</i> Woodland	12
• Ornamental Lake	9
• <i>Pinus pinaster</i> plantation with some native vegetation	9
• <i>Melaleuca</i> Low Woodland to Low Closed Forest	6
• Mill Pond	5
• <i>Pericalymma ellipticum</i> Heath	4

Features of the bird fauna (in Family order) were:

- Emus (*Dromaiidae*) were recorded in pasture at the mid and northern section of the property. One sighting was of a family unit of an adult and two chicks.
- A variety of waterbirds were observed on an ornamental pond in the mid-section of the property.
- Sacred Ibis (*Plataleidae*) were observed in areas of pasture.
- Two species of birds of prey (*Accipitridae*) were observed; the Wedge-tailed Eagle and the Black-shouldered Kite. They were not common and were seen flying over Woodland and Heath areas.
- The introduced Laughing Turtle-Dove (*Columbidae*) was common on the farmland.
- Parrots (*Cacatuidae* and *Platycercidae*) such as Ring-necked Parrots (28's) and Pink and Grey Galahs were common in *Banksia* Woodland and Farmland. A single Little Corella was recorded at the Mill Pond.
- The Australian Reed-Warbler (*Sylviidae*) was observed in *Typha orientalis* fringing the Mill Pond.
- Honeyeaters (*Meliphagidae*) were the most common species present at Egerton and included Red and Little Wattle Birds, Western Spinebills, White-cheeked Honeyeaters and Brown Honeyeaters. Brown Honeyeaters, in particular, were the most commonly seen birds on the property and were present in every habitat except *Melaleuca* Low Woodland to Low Closed Forest.

In general, the bird fauna at Egerton was typical for the region. The waterbird species which were present on ornamental lakes and ponds may otherwise not have been found on the property. The natural wetlands mostly consist of Heath and *Melaleuca* Low Woodland to Low Closed Forests with little open water suitable for many waterbird species.

3.3.2 Comparison With Other Metropolitan Localities

The bird community recorded at Egerton was compared by ordination to that of other localities in the Perth Metropolitan Region for which recent survey data is available. The surveys used for this analysis were as follows:

- Wireless Hill Park - Smith (1984),
- Reserve 3692 Victoria Park - Turpin (1990, 1991),
- Eglinton - Ninox (1990),
- Yanchep - Alan Tingay & Associates (1991),
- Bold Park - How & Dell (1990),
- Whiteman Park - Arnold et. al. (1991),
- Yanchep National Park - Burbidge & Rolfe (1991), Shannon (1991), and results of bird banding studies and other unpublished CALM records,
- Breton Bay - Ninox (1991),

3.4.2 Comparison With Other Metropolitan Localities

The mammal community recorded at Egerton was not compared to other communities of localities in the Perth Metropolitan Region using ordination analysis because of relatively small data sets for native mammals. However, it is possible to make some comparisons between localities on the available information.

Other localities recently surveyed for native mammals include:

- Lesmurdie - Dell & How (1989)
- Bold Park - How & Dell (1990)
- Eglinton - Ninox (1990)
- Whiteman Park - Arnold et al (1991)
- Yanchep National Park - Burbidge & Rolfe (1991)
- Yanchep - Alan Tingay & Associates (1991)
- Breton Bay - Ninox (1991)
- Wilbinga - Ninox (1991)
- Ellenbrook - Watkins & Bamford (1993)
- Perth International Airport - Alan Tingay & Associates (1994).

Of the 10 localities listed above, 6 were reported to contain the Southern Brown Bandicoot (*Isoodon obesulus*) (Ellenbrook, Lesmurdie, Perth International Airport, Whiteman Park, Yanchep and Yanchep National Park). The distribution of Bandicoots has also been reported by CALM, who carried out a telephone survey in 1993, as widespread in areas of the Perth Metropolitan Region that still contain large areas of suitable vegetation. The status of the Southern Brown Bandicoot is reported to be common in some parts of its range (Australian Museum, 1991) and 'decreased in number' in metropolitan areas since European settlement (How & Dell, 1992).

Honey Possums have been reported to occur at Whiteman Park, Lesmurdie, Yanchep and Yanchep National Park. They have been reported to be common in limited areas (Australian Museum, 1991) and to have decreased in number in metropolitan areas since European settlement, due to loss of habitat (How & Dell, 1992).

Western Grey Kangaroos were recorded at 9 of the 10 sites recently surveyed (excluding the Perth International Airport). According to the Australian Museum (1991) the status of the Western Grey Kangaroo is 'abundant' although 'decreased in number' in the Perth Metropolitan area since European settlement (How & Dell, 1992).

3.5 Rare and Endangered Species

To date, one species, the Southern Brown Bandicoot, which has been classified as rare and endangered has been recorded at Egerton. This species is relatively abundant at Egerton and occurs in habitat types associated with dense vegetation and wetlands.

The Southern Brown Bandicoot or Quenda (*Isoodon obesulus*) is a ground dwelling marsupial about the size of a small cat. They have long tapering snouts, small round ears and relatively small eyes, short tails, and short legs. The fur appears glossy and brown but

is actually grey with brown tips heavily mixed with guard hairs which are tipped with black or golden tan. The guard hairs give the species its characteristic sleek appearance. The belly fur is white. A photograph is included at the end of this report (Plate 1).

The species has a relatively extensive distribution across southern Australia but it is most abundant in south-Western Australia, Victoria and Tasmania (Australian Museum, 1991). In Western Australia there is concern the species may be declining as a result of continuing habitat loss and predation pressures primarily due to the introduced European Fox (*Vulpes vulpes*). It is also possible that the destruction of habitat by fire may result in the extinction of the species in local areas. As a result of this concern, *Isoodon obesulus* has been gazetted as rare and endangered under the Western Australian Wildlife Conservation Act, 1950-1979.

The bandicoot is carnivorous and feeds primarily on ground dwelling lizards, insects, larvae and other invertebrates which are frequently dug out of the surface soils.

It builds nests in ground vegetation in which to rest during the day (Wood Jones, 1923) and appears generally to favour low dense vegetation as habitat. Heinsohn (1966) in a study of the species in Tasmania found that the population density ranged from 3 to 8 individuals per 40ha (100 acres). These generally lived in exclusive territories with each territory held by a male overlapping several territories held by females.

In Western Australia, recent studies (Broughton and Dickman, 1991) have shown that the size of the home range of bandicoots tended to be negatively correlated with food abundance. That is, that the more food was available the smaller the home range was. Further to this, home range systems of bandicoot populations are relatively flexible, with individuals exploiting resources in an opportunistic manner. In contrast to Heinsohn (1966) they found no indication that *I. obesulus* was territorial and speculated that territoriality may occur at low population densities if resources are defendable and intruder pressure low, but occupy overlapping ranges if population density is high.

In bandicoot surveys carried out by Alan Tingay & Associates (1992a, 1992b, 1993) densities of bandicoots appear to be dependent on the vegetation density. At Egerton, bandicoots were found in areas with dense vegetation with only one individual trapped in *Banksia* Woodland with medium to low density understorey. Estimates of home ranges for Southern Brown Bandicoots have ranged from 2.1 to 5.3ha for males and 1.5 to 4.6ha for females (Heinsohn, 1966). Bandicoots studies in WA tend to have home ranges on the smaller end of this scale, depending on the food resources and vegetation in their habitat (Broughton & Dickman, 1991).

Breeding takes place throughout most of the year with 3 to 5 young being born. The young develop inside a pouch which opens backwards between the females hind legs. Females can also breed well before they are fully grown. These features suggest that populations are capable of a high rate of reproduction.

In all, 9 individual bandicoots were captured at Egerton (details are given in Table 2). Of these, 2 animals were recaptured. Bandicoots were caught at each of the survey sites, but appeared to be restricted to areas surrounding wetlands where vegetation provided adequate cover and food resources. Typical habitat is shown in Plate 2.

- Wilbinga - Ninox (1991),
- Ellenbrook - Watkins & Bamford (1993), and
- Perth International Airport - Alan Tingay & Associates (1994).

The relative positions of these sites in the Perth area are illustrated in Figure 4.

The results of the ordination are illustrated in Figure 7. These diagrams show respectively:

- i) the primary ordinales for all species recorded, and
- ii) the ordinales for the bird communities excluding waterbird species.

In the analysis that involved all species, the bird community at Egerton appears relatively separate from other communities but with affinities with the communities recorded at Bold Park, Perth Airport and Whiteman Park. This affinity is shown by the positive scores on Axis 1 that these localities have in the ordination diagram. The common feature of these localities is that they include a number of records of waterbirds which tend to be absent from the other localities surveyed.

In the ordination excluding waterbirds, the bird community at Egerton is shown as having similarities with that recorded for Eglinton in the North-West Corridor of the Perth Metropolitan Region and also with the communities at Perth Airport, Wireless Park, Breton Bay, Wilbinga, and Reserve 3692 Victoria Park. The nature of this similarity between communities differs with each pair of localities.

3.4 Mammals

3.4.1 Species Present

Seven mammals were recorded on the property, including 4 introduced species, as follows:

- The Western Grey Kangaroo was the only native mammal which was common and widespread throughout the property.
- The Honey Possum is unusual in the Perth Metropolitan Area. One individual was found adjacent to a *Melaleuca preissiana* Low Forest and *Acacia saligna* Shrubland.
- The Southern Brown Bandicoot is classified as rare and endangered. It appears to be common on the Egerton property in areas associated with dense vegetation and wetlands.
- Of the introduced mammals, House Mice were most common in drier vegetation types and Black Rats were found in *Melaleuca* Low Closed Forest. A nest of foxes was observed and rabbits were commonly seen throughout the property.

The distribution of mammals recorded to date at Egerton is shown in Appendix B.

TABLE 2
Bandicoots Captured at Egerton

Trapline	Captures					Recaptures			
	Young Male	Adult Male	Female	Unidentified Sex	Total Captured Individuals	Young Male	Adult Male	Female	# Individuals Recaptured
A		1	2		3				
B		1	1		2		1		1
C		1		1	2				
D	2				2	1*			1
Total	2	3	3	1	Grand Total:9	1	1		2

* One animal captured 4 times in all

Two young male bandicoots were caught at survey area D, one of these was recaptured four times. Three adult males were caught; each at different survey sites (A, B, and C) which were widely separated spatially. Three female bandicoots were captured (Site A and B). The 2 females at Site A were sexually mature, although only one had young in her pouch. The female captured at Survey Area B was a juvenile and did not appear to be of reproductive age. A large bandicoot escaped before its sex could be identified.

3.6 Unusual Species

The Honey Possum (*Tarsipes rostratus*) is considered by some authorities to be scarce and unusual in the Perth Metropolitan Region on the basis of available survey data. According to the Australian Museum (1991) the Honey Possum is common in limited areas in South West Western Australia.

According to the Western Australian Museum (1978) surveys carried out on the south and west coast and in the wheatbelt indicated that the species is common in sandplain Heath, although it is considered uncommon on the North Swan Coastal Plain.

At Egerton the single Honey Possum was found adjacent to a linear wetland (Site D) in *Melaleuca preissiana* Low Woodland with *Acacia saligna* Shrubland.

Heleioporus inornatus is a frog usually found on the Darling Range and not on the coastal plain. Due to the proximity of Egerton to the Darling Scarp, it is possible that a population exists there.

3.7 Distribution of Species in Habitats

The fauna recorded in the 5 major habitat units sampled is listed in Appendix B and C and is summarised in Table 3.

TABLE 3

**NUMBER OF FAUNA SPECIES RECORDED IN
5 MAJOR HABITAT UNITS ON THE EGERTON PROPERTY**

Habitat	Number of Native Species Recorded					
	# Traps	Frogs	Reptiles	Birds	Native Mammals	Total
<i>Pericalymma ellipticum</i> Heath	18	3	0	4	2	9
<i>Eucalyptus/Pinus pinaster</i> Woodland	16	1	3	9	1	14
<i>Melaleuca</i> Low Woodland to Low Woodland Forest	35	4	3	6	3	16
<i>Banksia</i> Low Woodland	38	2	5	12	2	21
<i>Juncus pallidus</i> Sedgeland	10	2	0	-	2	4
Farmland	-	-	-	20	1	21
Ornamental Lake	-	-	-	9	-	9
Mill Pond	-	-	-	5	-	5

Due mainly to the high number of bird species recorded, *Banksia* Low Woodland had the highest number of native species of any of the habitats with 12 species of birds, and a total of 9 species of frogs, reptiles and mammals. Farmland had the highest number of species for habitats that were not trapped, and this was also due to the high number of bird species observed there (20).

Melaleuca Low Woodland to Low Closed Forest and their associated wetlands recorded the highest levels of frogs, reptiles and mammals (10 species) but fewer species of birds compared to other habitats.

The *Eucalyptus/Pinus pinaster* Woodland yielded 14 native species including 1 species of frog, 3 reptiles, 9 birds and 1 mammal.

Pericalymma ellipticum Heath had 9 species of native animals including 3 frogs, 4 birds and 2 mammals.

The *Juncus pallidus* Sedgeland has the lowest number of species recorded with 2 frogs and 2 mammals.

4. DISCUSSION

4.1 The Egerton Fauna

This survey of the Egerton property has revealed a fairly diverse vertebrate fauna which is typical for the region. Reptiles appeared to be the only family which was comparatively depauperate, and this may have been due to the cool weather experienced during the survey.

Mammals of particular interest include the Honey Possum (*Tarsipes rostratus*) which is unusual in the Perth Metropolitan region and the Southern Brown Bandicoot (*Isoodon obesulus*) which is classed as rare and endangered under the Western Australian Wildlife Conservation Act, 1950-1979.

Overall, some areas of the study site are of conservation significance because of:

- their proximity to Perth,
- unusual vegetation complexes such as the *Melaleuca* Low Woodland and Low Closed Forest, and
- the presence of the rare and endangered *Isoodon obesulus* (Southern Brown Bandicoot) and the unusual *Tarsipes rostratus* (Honey Possum).

In addition, the wetland areas and fringing vegetation provide an important habitat resource for other frog, lizard and mammal species.

Although many of the species recorded at Egerton are represented in other reserves and areas, the natural vegetation types and habitats present on the property are declining on the Swan Coastal Plain.

Habitat linkage and corridors for fauna are also important in ensuring the viability and survival of many fauna populations. A small isolated population is much more vulnerable to localised extinction compared to one which has links to other populations and habitats.

These factors suggest that the Structure Plan for the urban development of Egerton should endeavour to include natural vegetation within Open Space as far as possible. The preservation of the wetlands with *Melaleuca* Low Woodland to Low Closed Forest should have the highest priority in this respect as they provide habitat for a diverse range of fauna including the rare and endangered Southern Brown Bandicoot. The wetlands form a chain or corridor through the property with linkages to Ellen Brook. The northernmost of the wetlands is also in close proximity to sections of the adjacent Ellenbrook Estate which are to be set aside for conservation purposes.

In retaining key areas at Egerton such as wetlands and fringing vegetation a network of linked areas could be provided to complement other conservation areas in the district.

4.2 Comparison with Regional Fauna

A fauna survey was carried out by the Western Australian Museum in 1978 which covered the northern Swan Coastal Plain between the Swan River and Moore River to the north.

That report discussed the changes in fauna distribution since european settlement approximately 160 years ago. It concluded that european settlement, subsequent development and introduction of cats, foxes and rabbits has led to a decline in the abundance and distribution of native species, particularly reptiles and mammals.

Originally 33 native mammal species (with a possible 4 extra species) were reported on the northern Swan Coastal Plain while only 12 were believed to be extant in 1978. How & Dell (1992) have reported 18 species of native mammal to be present according to more recent surveys. Reptiles have shown a marked decline in Perth with very few species present after the clearance of native vegetation. Birds have shown a less marked decline with 9 of the original 223 species no longer present and 4 on the verge of local extinction (Storr et al, 1978).

Other, more recent, surveys that have been carried out in the vicinity of Egerton include Whiteman Park (Arnold et al, 1991) and Melaleuca Park (Watkins et al, 1993; How & Dell, In Press) and more specific surveys at Ellenbrook for birds, frogs and reptiles by the Royal Australasian Ornithological Society (RAOU, 1992) and the Western Australian Society of Herpetologist (1992).

Six species of frog were recorded at Egerton compared to 7 species at Melaleuca Park, 6 species at Whiteman Park and 9 species at Ellenbrook (Watkins et al, 1993 and Arnold et al, 1991). Fourteen species of frog are found on the northern Swan Coastal Plain.

Geckos and pygopods were not well presented in this survey compared to those present on the northern Swan Coastal Plain in general. Pygopods were not recorded at Egerton although 3 to 4 species have been recorded in the region. More intensive surveying during spring may have revealed legless lizard species.

Only 3 species of dragon lizards have been recorded on the northern Swan Coastal Plain. One of these was present at Egerton which appears to be typical for the area. Similarly with Varanids, 3 species are present on the Swan Coastal Plain and although none were observed at Egerton, two species are present at nearby Whiteman Park.

There are 25 species of skinks present on the northern Swan Coastal Plain with 6 of these present at Egerton. However, 12, 13 and 15 species of skinks have been recorded at Melaleuca Park, Whiteman Park and Ellenbrook respectively. Seasonal trapping is likely to reveal additional species at Egerton which are likely to be typical for the region.

Only one species of snake was recorded at Egerton compared to up to 9 species found in the region.

Thirty six bird species were present at Egerton compared to 57 recorded at Whiteman Park and Ellenbrook. This result may reflect a combination of effects including the areas of land surveyed, the types of habitat that are present, seasonal effects and relative survey effort.

Of the 18 native mammals still present on the Swan Coastal Plain (How & Dell, 1992), 3 were present at Egerton. The Western Grey Kangaroo was widespread and very common while the Southern Brown Bandicoot was common in certain areas. The Honey Possum was uncommon.

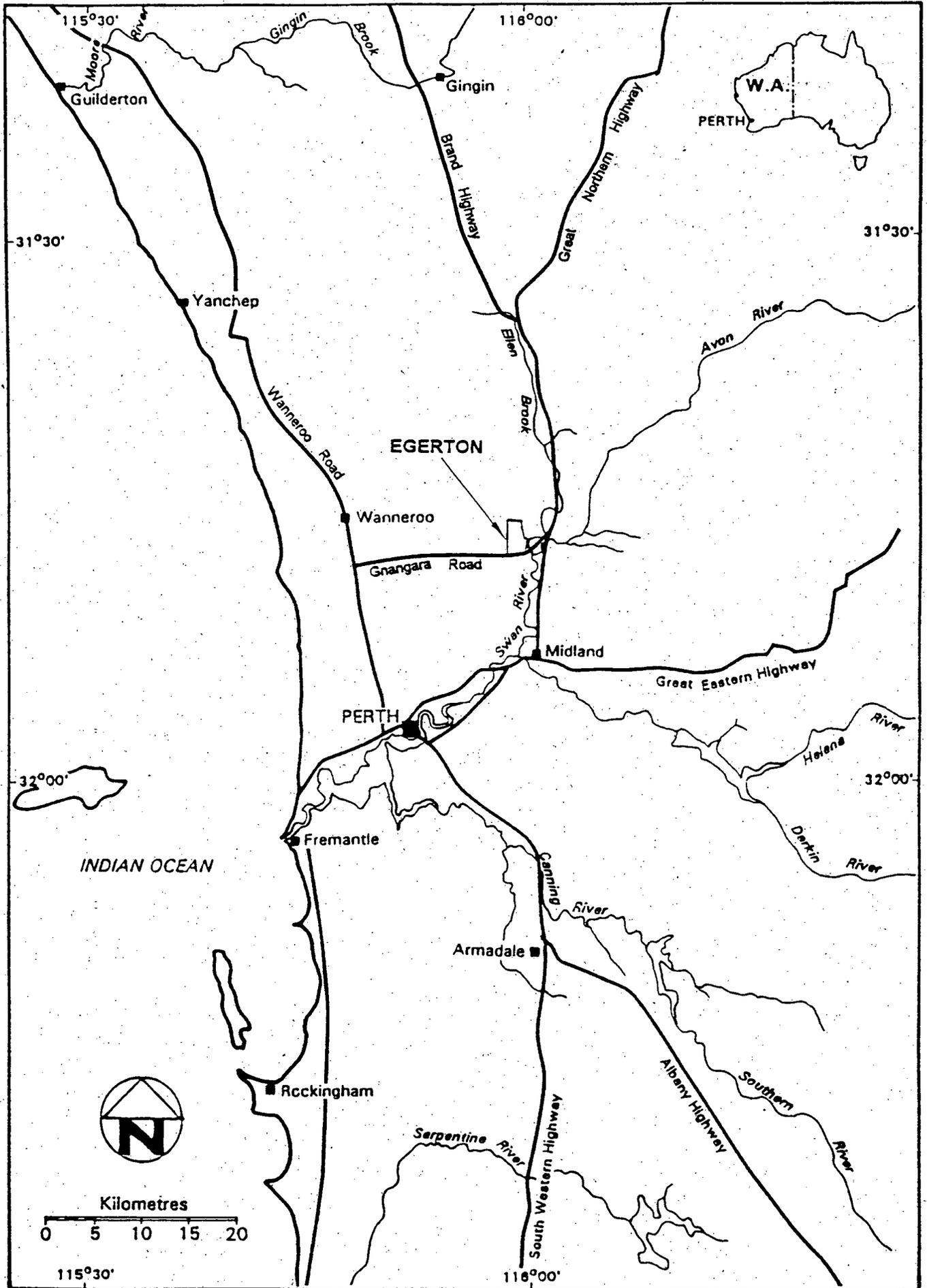
Generally, the species of vertebrate fauna at Egerton are typical for the region and reflect the varied habitats found there.

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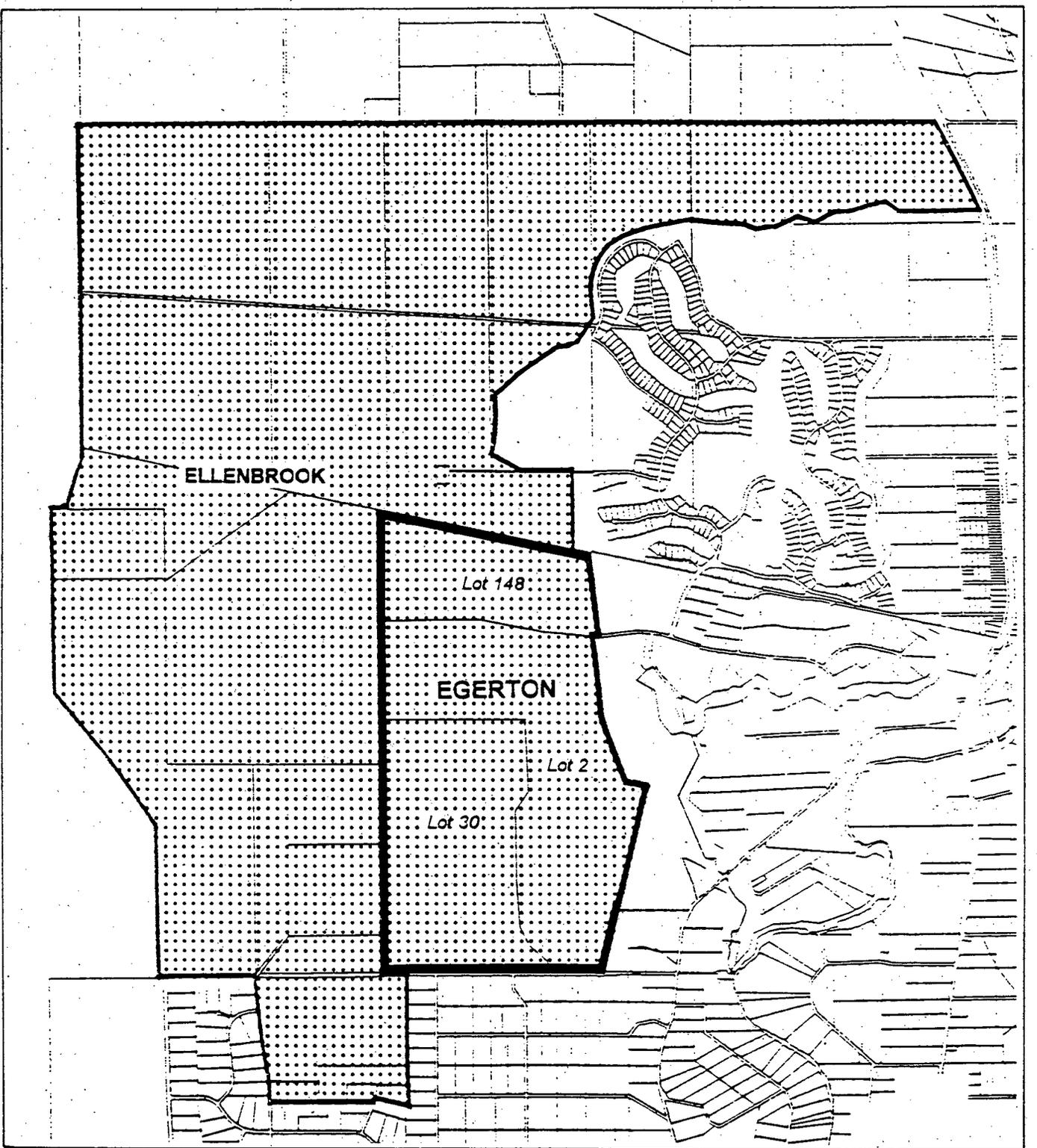
FIGURES



ALAN TINGAY & ASSOCIATES

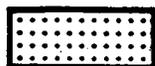
EGERTON REGIONAL LOCATION

FIGURE 1



SOURCE: FEILMAN PLANNING CONSULTANTS, 1993

LEGEND

-  Property Owned by Multiplex Constructions Pty Ltd
-  Land Zoned Urban Deferred

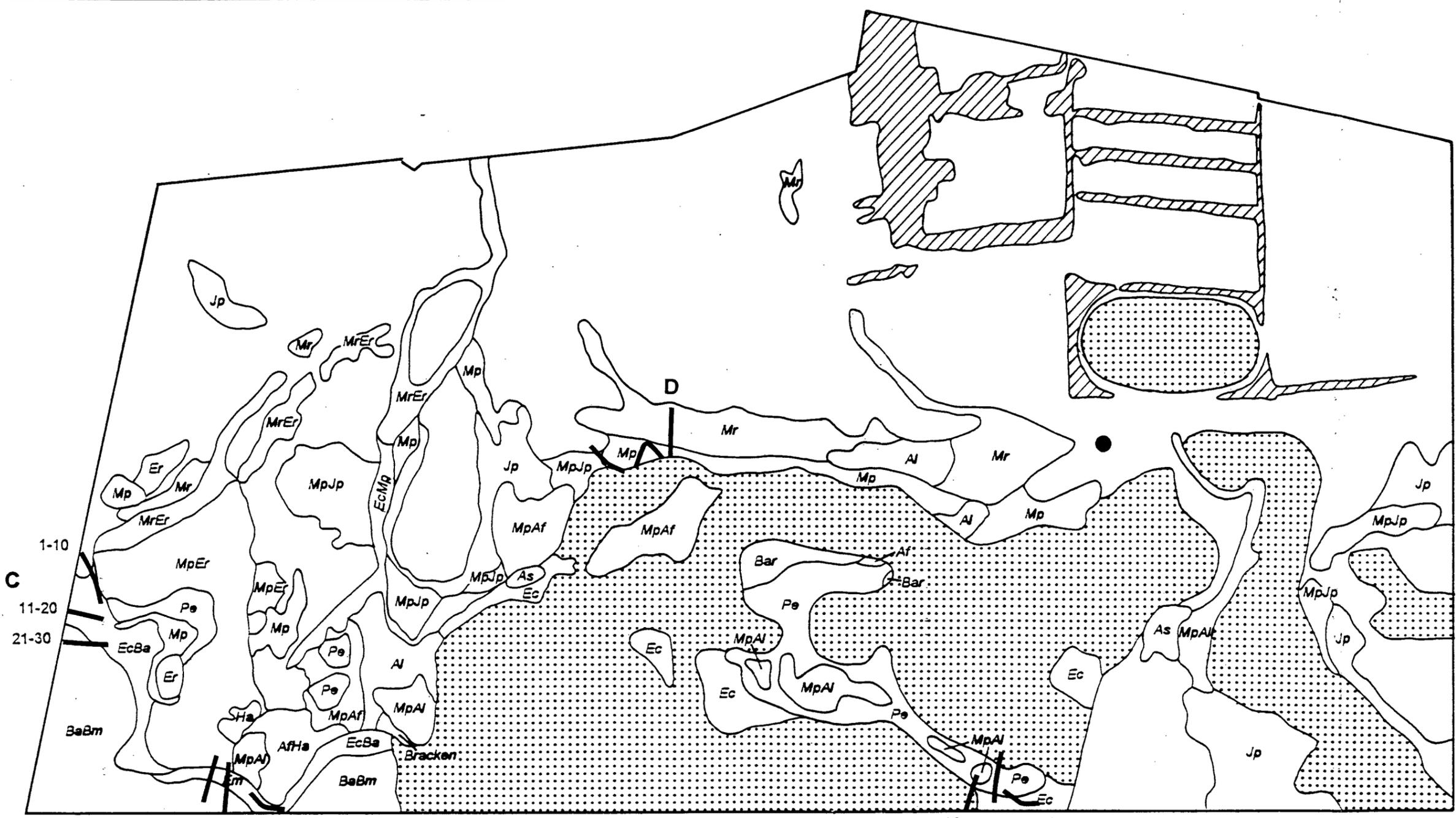


SCALE 1:40,000





Kilometres



LEGEND

- A Fauna Survey Sites
- 1 10 Traplines
- Ornamental Pond Site

- Pine Plantation
- Ornamental Plantings
- Pasture

LEGEND B

LEGEND A

Dry/Woodlands

BaBm - *Banksia attenuata*/*B. menziesii* Low Woodland

Transitional/Woodlands

- Ec - *Eucalyptus calophylla* Woodland
- EcBa - *Eucalyptus calophylla*/*Banksia attenuata* Woodland
- Em - *Eucalyptus marginata* Woodland

Dampland/Heaths & Sedgelands

- Pe - *Pericalymma ellipticum* Closed Heath
- Al - *Agonis linearifolia* Open Heath over *Juncus pallidus* Sedgeland
- Af - *Astartea fascicularis* Closed Heath

AfHa - *Astartea fascicularis*/*Hypocalymma angustifolium* Closed Heath

Ha - *Hypocalymma angustifolium* Closed Heath

Dampland/ Forests, Woodlands & Heaths

- Er - *Eucalyptus rudis* Open Forest
- MpEr - *Melaleuca preissiana*/*Eucalyptus rudis* Closed Forest with *Banksia littoralis*
- Mp - *Melaleuca preissiana* Low Woodland
- MpJp - *Melaleuca preissiana* Low Woodland over *Juncus pallidus* Sedgeland
- MpAl - *Melaleuca preissiana* Low Open to Low Woodland over *Agonis linearifolia* Closed Heath
- MpPe - *Melaleuca preissiana* Low Open Woodland over *Pericalymma ellipticum* Closed Heath

MpAf - *Melaleuca preissiana* Low Open Woodland over *Astartea fascicularis* Closed Heath

As - *Acacia saligna* Low Woodland over *Agonis linearifolia* Open Heath

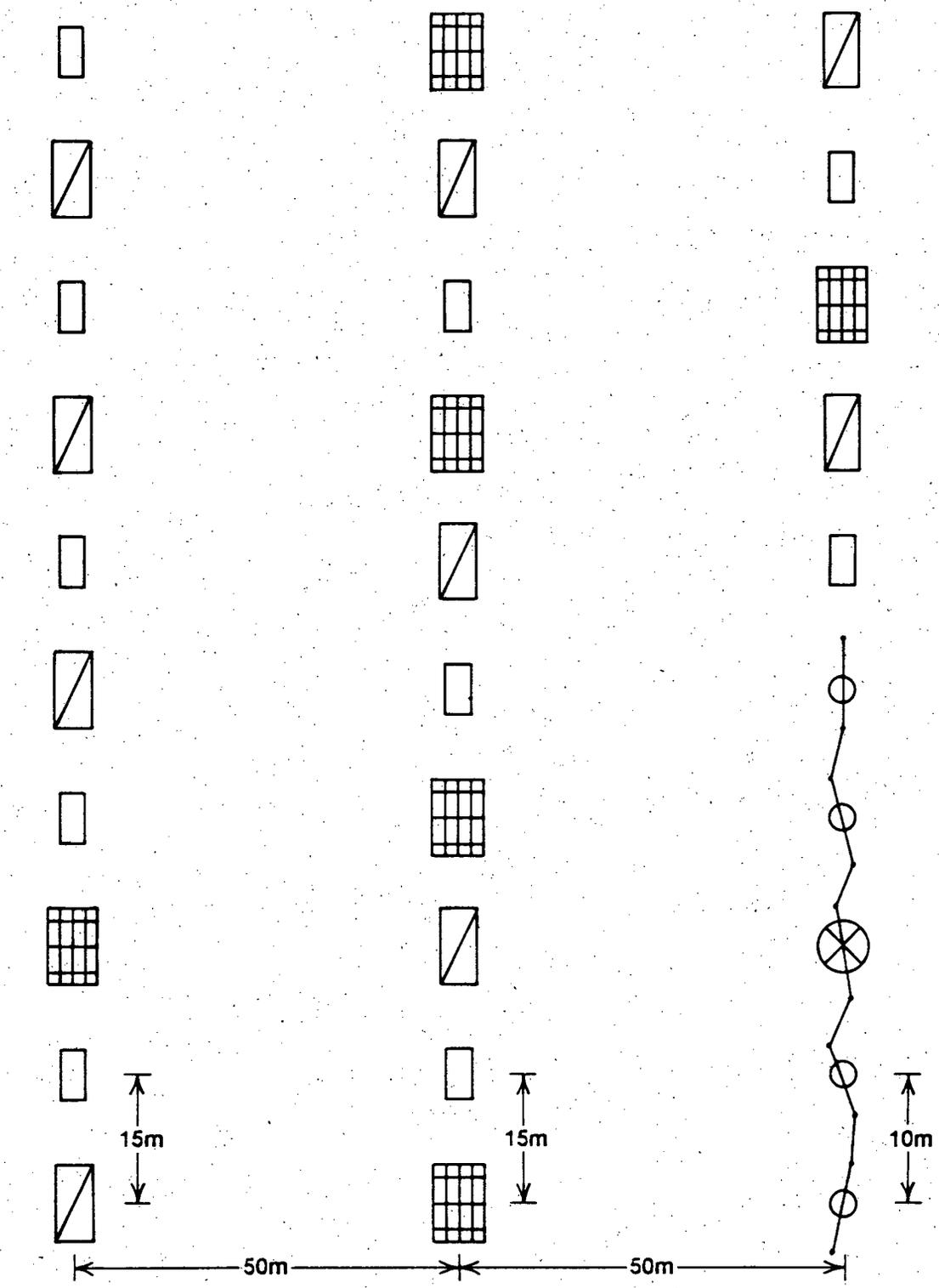
Jp - *Juncus pallidus* Sedgeland

Sumpland/ Forests, Woodlands & Sedgelands

- Mr - *Melaleuca raphiophylla* Low Closed Forest
- MrEr - *Melaleuca raphiophylla*/*Eucalyptus rudis* Low Closed Forest
- EcMp - *Eucalyptus calophylla* Woodland over *Melaleuca preissiana* Low Woodland
- Bar - *Baumea articulata* Closed Sedgeland

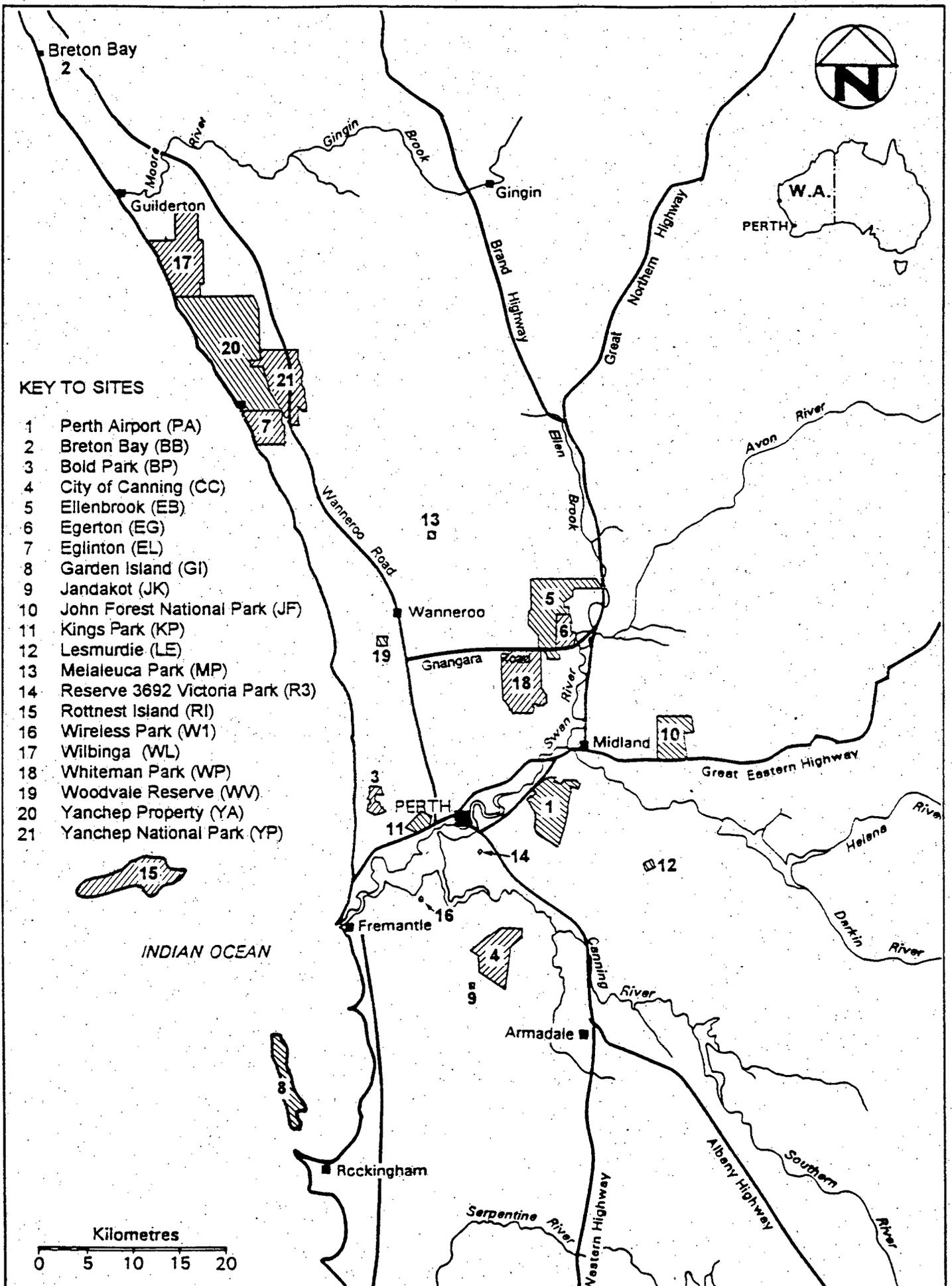
EGERTON VEGETATION TYPES & FAUNA SURVEY SITES

FIGURE 3



LEGEND

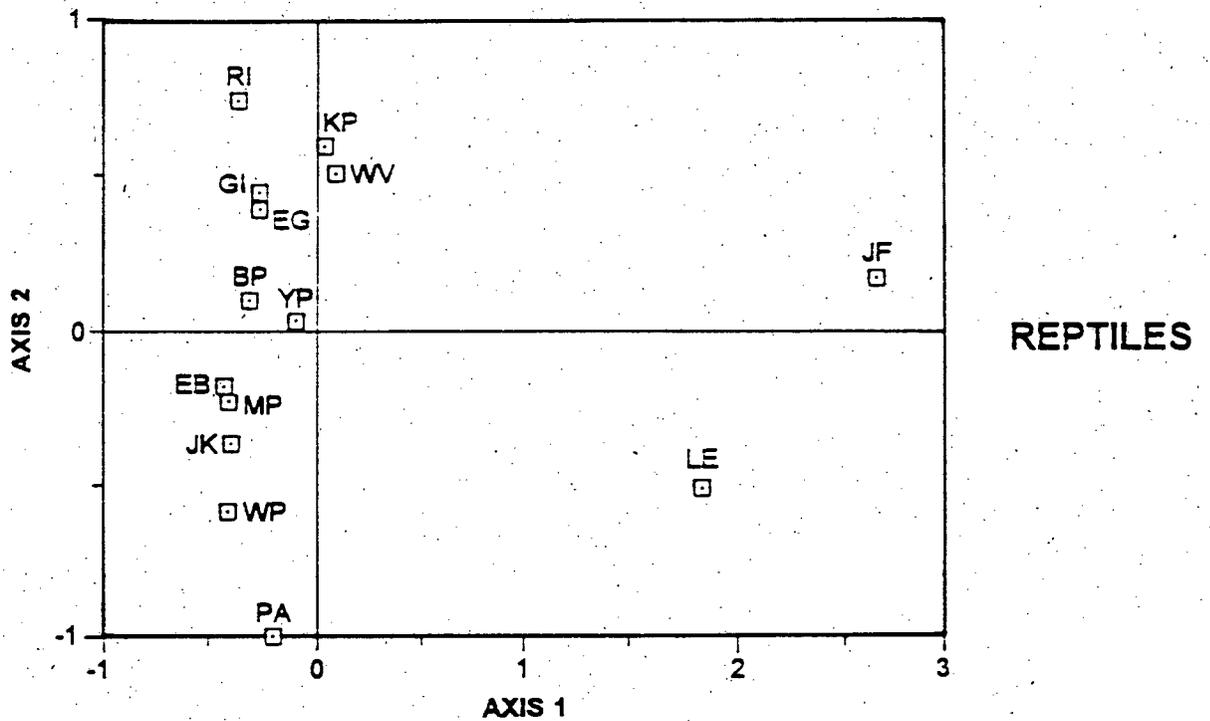
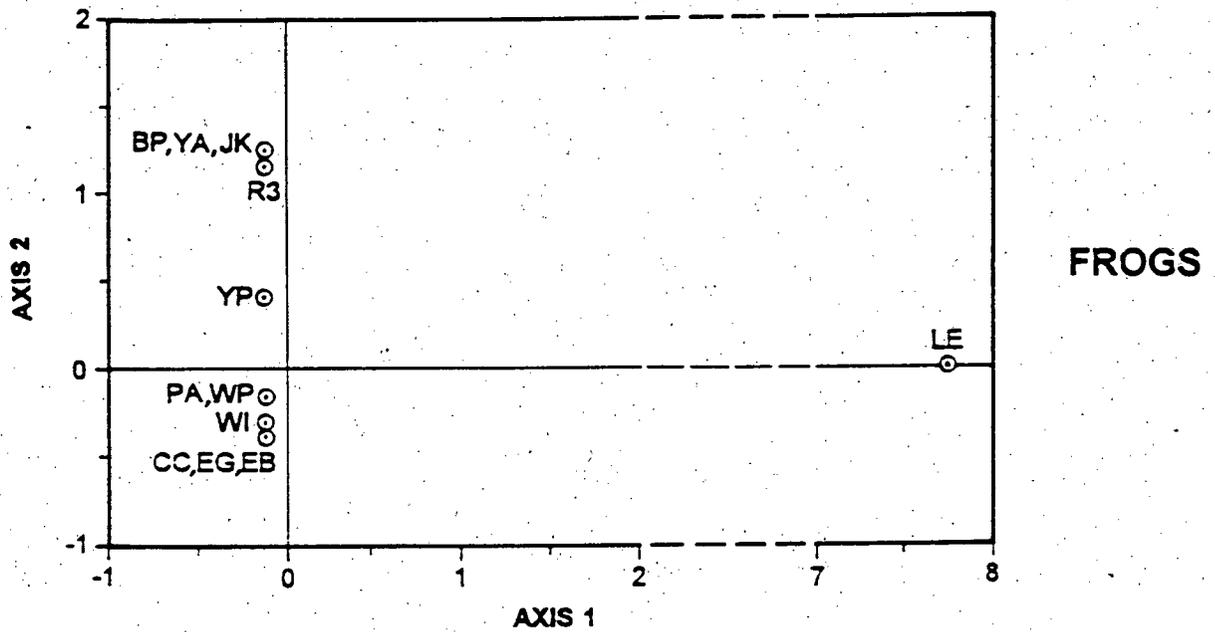
- | | | | |
|-------------------------------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------|------------------------|
|  | Medium Elliott Trap |  | PVC Pitfall Trap |
|  | Large Elliott Trap |  | Bucket Pitfall Trap |
|  | Tomahawk Cage Trap |  | Shadecloth Drift Fence |



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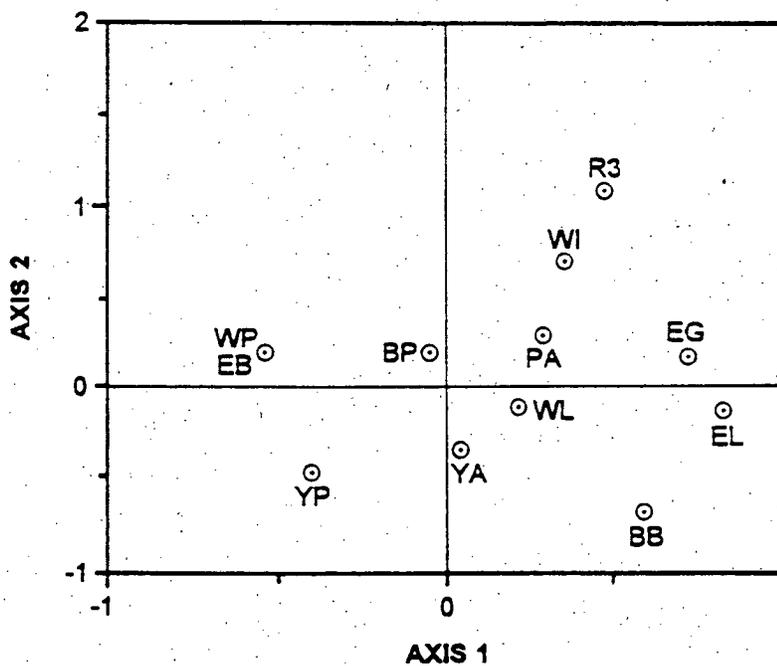
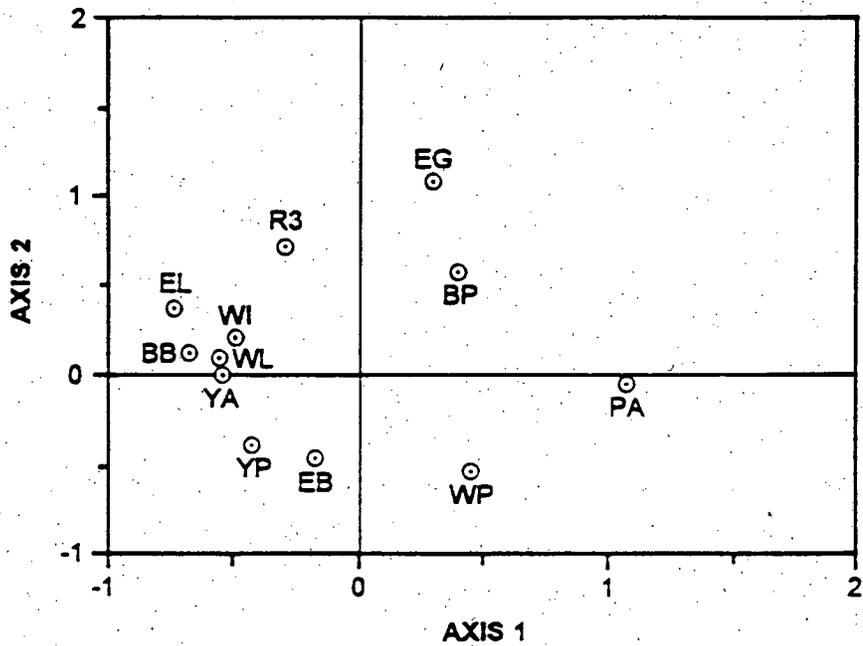
REGIONAL LOCATION OF FAUNA SURVEY SITES

FIGURE 5



KEY TO SITES

PA	Perth Airport	LE	Lesmurdie
BP	Bold Park	MP	Melaleuca Park
CC	City of Canning	RI	Rottnest Island
EB	Ellenbrook	WI	Wireless Park
EG	Egerton	WP	Whiteman Park
GI	Garden Island	WV	Woodvale Reserve
JK	Jandakot	YA	Yanchep Property
JF	John Forrest National Park	YP	Yanchep National Park
KP	Kings Park		



KEY TO SITES

PA Perth Airport
 BB Breton Bay
 BP Bold Park
 EB Ellenbrook
 EG Egerton
 EL Eglinton

R3 Reserve 3692, Victoria Park
 WI Wireless Park
 WL Wilbinga
 WP Whiteman Park
 YA Yanchep Property
 YP Yanchep National Park

PLATES



PLATE 1

**SOUTHERN BROWN
BANDICOOT**
(Isoodon obesulus)

Adult male caught at Egerton



PLATE 2

**BANDICOOT HABITAT AT
EGERTON**

Melaleuca Wetland with dense
understorey of *Xanthorrhoea preissii*
and *Juncus pallidus*

APPENDICES

APPENDIX A

**DIMENSIONS AND SPECIFICATIONS OF TRAPS USED
DURING THE EGERTON FAUNA SURVEY**

APPENDIX A

Dimensions and Specifications of Traps Used During the Egerton Fauna Survey (Diameter, Length, Depth and Width of traps where appropriate)

PVC Pitfall Trap:	D: 16cm	L: 60cm		
Rheem 20L Bucket Pitfall Trap:	D: 26cm	L: 40cm		
Medium Elliott Trap:	L: 32.5cm	H: 10cm	W: 9cm	
Large Elliott Trap:	L: 46cm	H: 15cm	W: 16cm	
Tomahawk Cage Trap:	L: 50cm	H: 19cm	W: 20cm	

APPENDIX B

FROGS, REPTILES AND MAMMALS OBSERVED AT EGERTON

Key for habitat types at survey sites.

1. *Pericalymma ellipticum* Heath
 2. *Eucalyptus/Pinus pinaster* Woodland
 3. *Melaleuca* Woodland
 4. *Banksia* Woodland
 5. *Juncus pallidus* Sedgeland with Bracken
- (o) Observed during survey.
(i) Introduced species.

HABITAT SURVEYED

	1	2	3	4	5
FROG SPECIES					
LEPTODACTYLIDAE					
<i>Crinea georgiana</i>	*	*		*	*
<i>Heleioporus eyrei</i>			*	*	
<i>Heleioporus sp (inornatus)?</i>			*		
<i>Limnodynastes dorsalis</i>	*				
<i>Ranidella glauerti</i>	*		*		*
<i>Ranidella insignifera</i>			*		
LIZARD SPECIES					
GEKKONIDAE					
<i>Diplodactylus spinigerus</i>				*	
AGAMIDAE					
<i>Pogona minor</i>		*	*		
SCINCIDAE					
<i>Cryptoblepharus plagiocephalus</i>				*	
<i>Hemiergis quadrilineata</i>				*	
<i>Egernia napoleonis</i>			*		
<i>Lerista praepedita</i>				*	
<i>Lerista elegans</i>		*			
<i>Menetia greyii</i>		*		*	
SNAKE SPECIES					
ELAPIDAE					
<i>Notechis scutatus</i>			*		
Tiger Snake					

MAMMAL SPECIES	1	2	3	4	5
MACROPODIDAE					
<i>Macropus fuliginosus (o)</i>	*	*	*	*	*
Western Grey Kangaroo					
TARSIPEDIDAE					
<i>Tarsipes rostratus</i>			*		
Honey Possum					
PERAMELIDAE					
<i>Isodon obesulus</i>	*		*	*	*
Southern Brown Bandicoot					
MURIDAE (i)					
<i>Mus musculus</i>	*			*	*
House Mouse					
<i>Rattus rattus</i>			*		
Black Rat					
CANIDAE (i) (o)					
<i>Vulpes vulpes</i>		*			
Fox					
LEPORIDAE (i) (o)					
<i>Oryctolagus cuniculus</i>		*		*	
Rabbit					

APPENDIX C

BIRD SPECIES RECORDED AT EGERTON

Key for bird habitat types at survey sites:

1. *Pericalymma ellipticum* Heath (Wetland)
 2. *Pinus pinaster* Plantation with some native vegetation
 3. *Melaleuca* Low Woodland to Low Closed Forest (Wetland)
 4. *Banksia* Woodland
 5. Farmland
 6. Ornamental Lake
 7. Mill Pond
- (o) Observed during survey
(i) Introduced species.

BIRD SPECIES	1	2	3	4	5	6	7
DROMAIDAE							
<i>Dromaius novaehollandiae</i>					*		
Emu							
PODICIPEDIDAE							
<i>Tachybaptus novaehollandiae</i>						*	
Australasian Grebe							
PHALACROCORACIDAE							
<i>Phalacrocorax melanoleucos</i>						*	
Little Pied Cormorant							
PLATALEIDAE							
<i>Threskiornis aethiopica</i>					*		
Sacred Ibis							
ANATIDAE							
<i>Tadorna tadornoides</i>						*	
Australian Shelduck							
<i>Anas superciliosa</i>						*	
Pacific Black Duck							
PANDIONIDAE							
<i>Aquila audax</i>		*					
Wedge-tailed Eagle							
ACCIPITRIDAE							
<i>Elanus notatus</i>	*						
Black-shouldered Kite							
RALLIDAE							
<i>Fulica atra</i>						*	
Eurasian Coot							
<i>Porphyrio porphyrio</i>						*	
Swamp Hen							
COLUMBIDAE							
<i>Streptopelia senegalensis</i>					*		
Laughing Turtle-Dove (i)							

BIRD SPECIES	1	2	3	4	5	6	7
CACATUIDAE							
<i>Cacatua roseicapilla</i> Pink & Grey Galah					*		
<i>Cacatua pastinator</i> Little Corella							*
POLYTELITIDAE							
<i>Platycercus zonarius</i> Ring-necked Parrot (28)			*	*	*		
CUCULIDAE							
<i>Cuculus pyrrhophamus</i> Fan-tailed Cuckoo				*	*		
<i>Chrysococcyx lucidus</i> Shining (Golden) Bronze Cuckoo			*		*		
ALCEDINIDAE							
<i>Dacelo novaeguineae</i> Laughing Kookaburra			*		*		*
<i>Halycon sancta</i> Sacred Kingfisher		*			*		
CORACIIDAE							
<i>Merops ornatus</i> Rainbow Bee-eater					*		
CAMPEPHAGIDAE							
<i>Coracina novaehollandiae</i> Black-faced Cuckoo Shrike		*					*
PACHYCEPHALIDAE							
<i>Pachycephala rufiventris</i> Rufous Whistler	*		*	*	*	*	
<i>Colluricincla harmonica</i> Grey Shrike Thrush					*		
MONARCHIDAE							
<i>Rhipidura fuliginosa</i> Grey fantail				*	*	*	

BIRD SPECIES	1	2	3	4	5	6	7
<i>Rhipidura leucophrys</i> Willy Wagtail		*			*		
SYLVIIDAE							
<i>Acrocephalus australis</i> Australian Reed-warbler							
MALURIDAE							
<i>Malurus splendens</i> Splendid Wren		*		*			
ACANTHIZIDAE							
<i>Gerygone fusca</i> Western Warbler		*		*	*		
<i>Acanthiza apicalis</i> Inland Thornbill			*				
MELIPHAGIDAE							
<i>Anthochaera carunculata</i> Red Wattle Bird						*	
<i>Anthochaera chrysoptera</i> Little Wattle Bird				*			
<i>Acanthorhynchus superciliosus</i> Western Spinebill		*					
<i>Phylidonyris nigra</i> White-cheeked Honeyeater				*			
<i>Lichmera indistincta</i> Brown Honeyeater	*	*		*	*		
ZOSTEROPIDAE							
<i>Zosterops lateralis</i> Silvereye	*	*	*		*		
GRALLINIDAE							
<i>Grallina cyanoleuca</i> Magpie-lark				*	*		

BIRD SPECIES	1	2	3	4	5	6	7
CRACTICIDAE							
<i>Cracticus torquatus</i> Grey Butcher Bird				*			*
<i>Gymnorhina tibicen</i> Magpie					*		
CORVIDAE							
<i>Corvus coronoides</i> Australian Raven				*	*		*

APPENDIX D

REGIONAL DISTRIBUTION OF FROGS, REPTILES, BIRDS AND MAMMALS IN THE PERTH AREA

KEY:

- BP Bold Park (How & Dell, 1990)
PA Perth Airport (WA Museum, J. Dell pers.comm.; Robson & Chester, 1989)
WP Whiteman Park (CSIRO, 1991)
KP Kings Park (J. Dell pers.comm.)
YP Yanchep National Park (Burbidge & Rolfe, 1991; Shannon, 1991; Bird Banding CALM unpublished)
MP Melaleuca Park (In: How & Dell (In Press))
GI Garden Island (Robinson, Maryan & Browne-Cooper, 1987)
RI Rottnest Island (Kitchener, D.J., & How, R.A., 1982; How & Dell (In Press))
LE Lesmurdie (Dell & How, 1989)
JK Jandakot (Davidge, 1979)
WV Woodvale Reserve (How & Dell (In Press))
JF John Forest National Park (How & Dell (In Press))
EB Ellenbrook (Watkins & Bamford, 1993; RAOU, 1992; WASH, 1992)
EG Egerton (Alan Tingay & Associates, 1994)
CC City of Canning (Maryan, B.C., 1993)
W1 Wireless Park (Smith, 1984)
R3 Reserve 3692 Victoria Park (Turpin, 1990, 1991)
YA Yanchep Property (Alan Tingay & Associates, 1991)
EL Eglinton (Ninox, 1990)
BB Breton Bay (Ninox, 1991)
WL Wilbinga (Ninox, 1991)

These sites are illustrated in Figure 5.

Appendix D

FROGS	BP	PA	WP	KP	YP	MP	GI	RI	LE	JK	WV	JF	EB	EG	CC	WI	R3	YA	EL	BB	WL
Leptodactylidae (Ground Frogs)																					
<i>Crinia georgiana</i>			1										1	1	1						
<i>Heleioporus eyrei</i>	1	1	1		1					1			1	1	1	1		1			
<i>Limnodynastes dorsalis</i>	1	1	1		1					1			1	1	1	1	1	1			
<i>Myobatrachus gouldii</i>	1	1	1		1					1			1		1			1			
<i>Pseudophryne guentheri</i>		1	1										1		1						
<i>Ranidella glauerti</i>		1											1	1	1	1					
<i>Ranidella insignifera</i>		1	1										1	1	1	1					
<i>Ranidella pseudinsignifera</i>									1												
Hylidae (Tree Frogs)																					
<i>Litoria adelaidensis</i>		1	1		1								1		1	1					
<i>Litoria moorei</i>		1	1		1								1		1	1					
TORTOISES																					
Chelidae (Side-neck Tortoises)																					
<i>Chelodina oblonga</i>		1	1										1	1	1						
LIZARDS																					
Gekkonidae (Geckoes)																					
<i>Crenadactylus ocellatus</i>					1				1			1			1			1			
<i>Diplodactylus alboguttatus</i>	1		1															1			
<i>Diplodactylus granariensis</i>													1								
<i>Diplodactylus polyopthalmus</i>				1	1						1	1									
<i>Diplodactylus spinigerus</i>	1				1	1	1	1				1	1	1					1		
<i>Gehyra variegata</i>									1			1									
<i>Phyllodactylus marmoratus</i>	1		1	1	1		1	1	1		1	1			1			1	1		1
<i>Underwoodisaurus milii</i>				1	1							1									1

Appendix D

	BP	PA	WP	KP	YP	MP	GI	RI	LE	JK	WV	JF	EB	EG	CC	WI	R3	YA	EL	BB	WL
Pygopodidae (Legless Lizards)																					
<i>Aclys concinna</i>					1																
<i>Aprasia pulchella</i>												1			1						
<i>Aprasia repens</i>	1		1	1	1			1	1		1	1	1		1			1			1
<i>Delma fraseri</i>		1			1	1				1			1		1			1			
<i>Delma grayii</i>		1			1										1			1			
<i>Lialis burtonis</i>	1	1	1	1	1	1	1	1	1	1		1	1		1	1	1	1			
<i>Pletholax gracilis</i>	1	1	1		1	1				1			1		1		1	1			
<i>Pygopus lepidopodus</i>			1		1	1				1					1						1
Agamidae (Dragons)																					
<i>Pogona minor</i>	1	1	1	1	1	1			1	1	1	1	1	1	1		1	1	1	1	1
<i>Tympanocryptis adelaidensis</i>	1		1		1	1				1			1		1		1	1		1	1
Varanidae (Monitors or Goannas)																					
<i>Varanus gouldii</i>	1	1	1		1								1		1						
<i>Varanus rosenbergi</i>	1		1																		
<i>Varanus tristis</i>		1							1												
Scincidae (Skinks)																					
<i>Bassiana trilineata</i>		1	1		1		1						1		1	1					
<i>Cryptoblepharus plagiocephalus</i>	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1			1
<i>Ctenotus delli</i>												1									
<i>Ctenotus fallens</i>	1	1	1	1	1	1		1	1		1		1		1		1	1	1	1	
<i>Ctenotus gemmula</i>			1			1							1								
<i>Ctenotus impar</i>		1	1												1						
<i>Ctenotus labillardieri</i>												1									
<i>Ctenotus lesueurii</i>	1	1	1	1	1	1				1			1		1	1	1	1			
<i>Cyclodomorphus branchialis</i>	1			1	1																
<i>Egernia kingii</i>								1	1										1		
<i>Egernia luctuosa</i>																			1		1
<i>Egernia napoleonis</i>			1		1	1		1					1	1	1	1					
<i>Hemiergis initialis</i>									1			1									

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	BP	PA	WP	KP	YP	MP	GI	RI	LE	JK	WV	JF	EB	EG	CC	WI	R3	YA	EL	BB	WL
<i>Hemiergis quadrilineata</i>	1	1		1	1		1	1			1		1	1	1	1	1	1	1	1	1
<i>Lerista christinae</i>								1					1								
<i>Lerista distinguenda</i>									1			1									
<i>Lerista elegans</i>	1	1	1	1	1	1		1	1	1		1	1	1			1	1		1	1
<i>Lerista lineata</i>							1	1	1						1						
<i>Lerista lineopunctulata</i>	1			1	1			1												1	1
<i>Lerista praepedita</i>	1			1	1	1	1	1			1		1	1				1	1	1	1
<i>Menetia greyii</i>	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1			1
<i>Morethia lineocellata</i>	1		1	1	1	1	1	1		1			1					1		1	
<i>Morethia obscura</i>	1		1	1	1	1	1				1	1	1		1	1		1			1
<i>Tiliqua occipitalis</i>			1			1							1		1			1	1	1	
<i>Tiliqua rugosa</i>	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1
SNAKES																					
Typhlopidae (Blind Snakes)																					
<i>Ramphotyphlops australis</i>	1	1	1	1	1				1	1	1	1	1		1						1
<i>Ramphotyphlops waitii</i>															1						
Boidae (Pythons)																					
<i>Morelia spilotas</i>							1				1										
Elapidae (Front-fanged Snakes)																					
<i>Demansia psammophis</i>				1						1											
<i>Demansia reticulata</i>										1											
<i>Notechis coronatus</i>		1													1						
<i>Notechis curtus</i>																					1
<i>Notechis scutatus</i>			1		1	1	1						1	1	1	1	1				
<i>Pseudonaja affinis</i>	1	1	1	1	1	1		1	1		1	1	1		1	1		1			
<i>Rhinoplocephalus gouldii</i>		1	1		1	1			1	1		1	1		1						1
<i>Vermicella bertholdi</i>	1			1		1							1							1	1
<i>Vermicella bimaculata</i>	1	1		1		1				1					1				1		
<i>Vermicella calonotus</i>	1		1		1	1				1			1								

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	BP	PA	WP	KP	YP	MP	GI	RI	LE	JK	WV	JF	EB	EG	CC	WI	R3	YA	EL	BB	WL	
Vermicella fasciolata	1		1																			
Vermicella semifasciata	1										1		1								1	
MAMMALS																						
Tachyglossidae (Echidnas)																						
Tachyglossus aculeatus/Echidna		1	1		1																	
Dasyuridae																						
Dasyurus geoffroii/Chuditch																			1			
Antechinus flavipes/ Yellow Footed Antechinus									1													
Peramelidae (Bandicoots)																						
Isoodon obesulus/Southern Brown Bandicoot		1	1		1				1				1	1					1			
Phalangeridae (Possums)																						
Trichosurus vulpecula/Brush-tailed Possum	1								1													
Tarsipedidae (Honey Possums)																						
Tarsipes rostratus/Honey Possum			1		1				1					1					1			
Macropodidae (Kangaroos and Wallabies)																						
Macropus fuliginosus/Western Grey Kangaroo			1		1				1				1	1					1	1	1	1
Macropus irma/Western Brush Wallaby			1		1				1				1						1			
Mollosidae (Mastiff Bats)																						
Tadarida australis/White-striped Bat					1																	
Mormopterus planiceps					1																	
Vespertilionidae (Vesper Bats)																						
Chalinolobus gouldii/Gould's Wattled Bat					1																	
Eptesicus regulus																			1			

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	BP	PA	WP	KP	YP	MP	GI	RI	LE	JK	WV	JF	EB	EG	CC	WI	R3	YA	EL	BB	WL
Nyctophilus geoffroyi/Lesser Long-eared Bat					1																
Nyctophilus major/Greater Long-eared Bat					1																
Muridae (Rats and Mice)																					
Hydromys chrysogaster/Water rat					1																
Mus musculus/House Mouse (I)	1	1	1		1				1	1				1			1	1	1		
Pseudomys albocinereus/Ash-grey Mouse			1																		
Rattus fuscipes/Southern Bush-Rat					1					1								1			
Rattus rattus/Black Rat (1)	1	1	1		1				1					1				1			
Leporidae (Rabbits and Hares)																					
Oryctolagus cuniculus/Rabbit (I)	1		1		1				1				1	1				1	1	1	1
Canidae (Foxes and Dogs)																					
Vulpes vulpes/European Red Fox (Foxes)	1	1	1		1								1	1				1	1	1	1
Canis familiaris/Dog					1																
Felidae (Cats)																					
Felis catus/Feral Cat (I)	1				1													1			
Capra hircus/Feral Goat																					1
BIRDS																					
Emu/Dromaius novaehollandiae					1								1	1				1		1	1
Hoary-headed Grebe/Podiceps poliocephalus			1																		
Australasian Grebe/Tachybaptus novaehollandiae		1	1											1							
Australian Pelican/Pelecanus conspicillatus	1	1	1																		
Darter/Anhinga melanogaster		1																			
Great Cormorant/Phalacrocorax carbo	1	1																			
Little Black Cormorant/Phalacrocorax sulcirostris	1	1												1							
Little Pied Cormorant/Phalacrocorax melanoleucos		1	1										1								
Pacific Heron/Ardea pacifica	1	1	1																		
White-faced Heron/ Ardea novaehollandiae		1	1																		

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	BP	PA	WP	KP	YP	MP	GI	RI	LE	JK	WV	JF	EB	EG	CC	WI	R3	YA	EL	BB	WL
Cattle Egret/Egretta ibis (i)	1	1																			
Great Egret/Egretta alba		1																			
Glossy Ibis/Plegadis falcinellus(i)			1																		
Sacred Ibis/Threskiornis aethiopicus (i)	1	1	1											1							
Straw-necked Ibis/Threskiornis spinicollis(i)		1	1																		
Yellow-billed Spoonbill/Platalea flavipes(i)		1	1																		
Black Swan/Cygnus atratus	1	1	1																		
Australian Shelduck/Tadorna tadornoides	1	1	1		1									1				1			
Pacific Black Duck/Anas superciliosa	1	1	1											1							
Grey Teal/Anas gibberifrons	1	1	1																		
Chesnut Teal/Anas castanea	1																				
Australasian (Blue-winged) Shoveler/Anas rhynchotis		1	1																		
Pink-eared Duck/Malacorhynchus membranaceus	1																				
Hardhead/Aythya australis			1																		
Maned (Wood) Duck/Chenonetta jubata	1	1	1																		
Blue-billed Duck/Oxyura australis	1																				
Musk Duck/Biziura lobata	1	1																			
Black-shouldered Kite/Elanus notatus	1	1	1		1								1	1			1	1			1
Square-tailed Kite/Lophoictinia isura					1																1
Whistling Kite/Haliastur sphenurus					1																
Brown Goshawk/Accipiter fasciatus	1	1	1		1								1				1				1
Collared Sparrowhawk/Accipiter cirrhocephalus	1	1	1		1								1				1				
Wedge-tailed Eagle/Aquila audax		1	1		1								1				1		1	1	1
Little Eagle/Hieraaetus morphnoides	1	1	1		1								1				1		1	1	1
Marsh Harrier/Circus approximans		1			1																1
Peregrine Falcon/Falco peregrinus	1		1										1				1				
Australian Hobby/Falco longipennis			1		1								1				1				
Brown Falcon/Falco berigora		1	1		1								1							1	1
Australian Kestrel/Falco cenchroides	1	1	1		1								1			1		1	1	1	1
Painted Button-quail/Turnix varia	1		1										1						1		
Little Button Quail/Turnix velox					1																
Spotless Crane/Porzana tabuensis													1								
Dusky Moorhen/Gallinula tenebrosa		1																			
Eurasian Coot/Fulica atra	1	1	1											1							

Appendix D

	BP	PA	WP	KP	YP	MP	GI	RI	LE	JK	WV	JF	EB	EG	CC	WI	R3	YA	EL	BB	WL
Swamp Hen/ <i>Porphyrio porphyrio</i>		1												1							
Australian Bustard/ <i>Otis australis</i>																		1			
Silver Gull/ <i>Larus novaehollandiae</i>																			1		
Masked lapwing/ <i>Vanellus miles</i>	1		1																1		1
Banded Plover/ <i>Vanellus tricolor</i> (i)			1		1																
Black-fronted Plover/ <i>Charadrius melanops</i>	1	1	1																		
BlackWinged Stilt/ <i>Himantopus himantopus</i>	1	1																			
Banded Stilt/ <i>Cladorhynchus leucocephalus</i>			1																		
Domestic Pigeon/ <i>Columba livia</i> (i)					1														1		
Spotted Turtle-Dove/ <i>Streptopelia chinensis</i> (i)	1				1														1		
Laughing Turtle-Dove/ <i>Streptopelia senegalensis</i> (i)	1	1	1		1								1	1				1	1	1	1
Common Bronzewing/ <i>Phaps chalcoptera</i>			1	1									1								1
Crested Pigeon/ <i>Ocyphaps lophotes</i> (i)			1	1																	
Baudin's Black-Cockatoo/ <i>Calyptorhynchus latirostris</i>				1									1			1					
Carnaby's Black-Cockatoo/ <i>Calyptorhynchus carnabyi</i>	1	1			1								1					1	1		1
Pink & Grey Galah/ <i>Cacatua roseicapilla</i> (i)	1	1	1		1								1	1				1		1	1
Little Corella/ <i>Cacatua pastinator</i> (i)	1				1									1							1
Sulpher-crested Cockatoo/ <i>Cacatua galerita</i>	1																				
Rainbow Lorikeet/ <i>Trichoglossus haemotodus</i> (i)	1																	1			
Purple-crowned Lorikeet/ <i>Glossopsitta porphyrocephala</i>					1																
Red-capped Parrot/ <i>Platycercus spurius</i>	1	1	1		1								1			1					
Western Rosella/ <i>Platycercus icterotis</i>	1		1										1								
Ringnecked Parrot '28'/ <i>Barnardius zonarius</i>	1	1	1		1								1	1		1	1	1	1	1	1
Elegant Parrot/ <i>Neophema elegans</i>	1	1	1		1								1					1			
Pallid Cuckoo/ <i>Cuculus pallidus</i>	1	1	1		1								1					1			1
Fan-tailed Cuckoo/ <i>Cuculus pyrrhophanus</i>		1	1		1								1	1		1		1			1
Horsfield's Bronze-Cuckoo/ <i>Chrysococcyx basalis</i>	1		1		1								1					1		1	1
Shining Bronze-Cuckoo/ <i>Chrysococcyx lucidus</i>	1	1	1		1								1	1				1		1	1
Southern Boobook Owl/ <i>Ninox novaeseelandiae</i>	1		1		1								1			1					1
Barn Owl/ <i>Tyto laba</i>	1												1								
Tawny Frogmouth/ <i>Podargus strigoides</i>	1		1		1								1					1			
Australian Owlet-nightjar/ <i>Aegotheles cristatus</i>					1								1								
Fork-tailed Swift/ <i>Apus pacificus</i>			1		1								1								

Appendix D

	BP	PA	WP	KP	YP	MP	GI	RI	LE	JK	WV	JF	EB	EG	CC	WI	R3	YA	EL	BB	WL
Laughing Kookaburra/Dacelo novaeguineae (l)	1	1	1		1								1	1		1		1	1		1
Sacred Kingfisher/Halcyon sancta	1	1	1		1								1			1		1			
Rainbow Bee-eater/Merops ornatus	1	1	1		1								1	1		1	1	1	1		1
White-backed Swallow/Cheramoeca leucosterna	1				1													1	1	1	1
Welcome Swallow/Hirundo noexena	1	1	1		1								1			1	1	1	1	1	1
Tree Martin/Cecropis nigricans	1	1	1		1								1			1		1			
Fairy Martin/ Hirundo ariel		1																			
Richard's Pipit/Anthus novaeseelandiae	1	1	1		1								1					1	1	1	1
Black-faced Cuckoo-shrike/Coracina novaehollandiae	1	1	1		1								1	1		1	1	1		1	1
White-winged Triller/Lalage sueuerii		1	1		1								1								
Scarlet Robin/Petroica multicolor			1		1								1					1			1
Red-capped Robin/Petroica goodenovii		1	1		1								1								
Hooded Robin/Melandryas cucullata			1										1					1			
White Breasted Robin/Eopsaltria georgiana																					1
Golden Whistler/Pachycephala pectoralis			1		1								1								
Rufous Whistler/Pachycephala rufiventris	1	1	1		1								1	1		1	1	1	1	1	1
Grey Shrike-thrush/Colluricincla harmonica	1	1	1		1								1	1				1		1	1
Crested Bellbird/Oreoica gutturalis			1										1								
Grey Fantail/Rhipidura fuliginosa	1	1	1		1								1	1		1		1	1	1	1
Willie Wagtail/Rhipidura leucophrys	1	1	1		1								1	1			1	1	1	1	1
Clamorous Reed-warbler/Acrocephalus stentoreus	1	1												1							
Little Grassbird/Megalurus gramineus	1																				
Rufous Songlark/Cincloramphus mathewsi																				1	
Brown Songlark/Cincloramphus cruralis																					1
Splendid Fairy-wren/Malurus splendens	1	1	1		1								1	1				1	1	1	1
Variegated Fairy-wren/Malurus lamberti					1														1	1	
White-winged Fairy-wren/Malurus leucopterus	1		1		1								1					1	1	1	1
Southern Emu-wren/Stipiturus malachurus	1				1																
White-browed Scrubwren/Sericornis frontalis					1													1	1	1	
Weebill/Smicrornis brevirostris	1		1		1								1					1			1
Western Gerygone/Gerygone fusca	1	1	1		1								1	1		1		1	1	1	1
Broad-tailed (Inland) Thornbill/Acanthiza apicalis	1	1	1		1								1	1		1		1	1	1	1
Western Thornbill/Acanthiza inornata			1		1								1					1			1

Appendix D

	BP	PA	WP	KP	YP	MP	GI	RI	LE	JK	WV	JF	EB	EG	CC	WI	R3	YA	EL	BB	WL
Yellow-rumped Thornbill/ <i>Acanthiza chrysorrhoa</i>	1	1	1		1								1			1		1	1		1
Varied Sittella/ <i>Daphoenositta chrysoptera</i>	1	1	1		1								1								
Rufous Treecreeper/ <i>Climacteris rufa</i>					1																
Red Wattlebird/ <i>Anthochaera carunculata</i>	1	1	1		1								1	1			1	1	1	1	1
Little Wattlebird/ <i>Anthochaera chrysoptera</i>	1	1	1		1								1	1				1	1	1	
Yellow-throated Miner/ <i>Manorina flavigula</i>			1		1								1							1	1
Singing Honeyeater/ <i>Lichenostomus virescens</i>	1	1	1		1								1			1	1	1	1	1	1
Yellow-plumed Honeyeater/ <i>Lichenostomus ornatus</i>																		1			
Brown-headed Honeyeater/ <i>Melithriptus brevirostris</i>			1										1								
White-naped Honeyeater/ <i>Melithriptus lunatus</i>	1				1													1			
Brown Honeyeater/ <i>Lichmera indistincta</i>	1	1	1		1								1	1		1	1	1	1	1	1
New Holland Honeyeater/ <i>Phylidonyris novaehollandiae</i>	1	1	1		1								1					1	1		1
White-cheeked Honeyeater/ <i>Phylidonyris nigra</i>	1	1	1		1								1	1				1	1	1	
Tawny-crowned Honeyeater/ <i>Phylodonyris melanops</i>	1	1	1		1								1					1	1	1	1
Western Spinebill/ <i>Acanthorhynchus superciliosus</i>	1	1	1		1								1	1				1	1	1	1
Crimson Chat/ <i>Epthianura tricolor</i>					1																
White-fronted Chat/ <i>Epthianura albifrons</i>		1	1		1																
Mistletoebird/ <i>Dicaeum hirundinaceum</i>	1	1			1								1								
Spotted Pardalote/ <i>Pardalotus punctatus</i>	1	1	1		1								1					1		1	
Striated Pardalote/ <i>Pardalotus striatus</i>	1	1	1		1								1			1	1	1			1
Silvereye/ <i>Zosterops lateralis</i>	1	1	1		1								1	1		1	1	1	1	1	1
Red-eared Firetail/ <i>Stagonopleura oculata</i>			1										1								
Australian Magpie-lark/ <i>Grallina cyanoleuca</i>	1	1	1		1								1	1		1		1		1	1
Masked Woodswallow/ <i>Artamus personatus</i>			1										1								
Black-faced Woodswallow/ <i>Artamus cinereus</i>		1	1		1								1					1		1	
Dusky Woodswallow/ <i>Artamus cyanopterus</i>		1	1		1																
Grey Butcherbird/ <i>Cracticus torquatus</i>	1	1	1		1								1	1				1	1	1	1
Pied Butcherbird/ <i>Cracticus nigrogularis</i>																1					1
Australian Magpie/ <i>Gymnorhina tibicen</i>	1	1	1		1								1	1		1	1	1	1	1	1
Grey Currawong/ <i>Strepera versicolor</i>																					
Australian Raven/ <i>Corvus coronoides</i>	1	1	1		1								1	1		1	1	1	1	1	1