

# Yannarie Salt Project Fauna Survey

## Fauna and Fauna Assemblage Survey



Dean's Creek

Scotti Creek

Hope Cree

Hope Point

Simpson Island

Burnside Island

Tent Island

September 2005

Prepared for  
**Straits Salt Pty Ltd**

Prepared by  
**Biota Environmental Sciences Pty Ltd**



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# 1.0 Introduction

## 1.1 Project Background and Assessment Context

Straits Salt Pty Ltd (Straits) is planning to develop a 10 million tonne per annum (Mtpa) solar salt field along the eastern margin of Exmouth Gulf, Western Australia (Figure 1.1). A Referral Document was prepared and submitted to the Western Australian Environmental Protection Authority (EPA) in accordance with Section 38 of the *Environmental Protection Act 1986* on 15<sup>th</sup> April 2004. The EPA determined that the level of assessment for the proposed Straits Salt Project would be set at Environmental Review and Management Programme (ERMP).

The project was also referred to the Department of the Environment and Heritage (DEH) in accordance with the requirements of the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)*. The DEH confirmed that the project would be treated as a controlled action on the basis of the 'threatened communities and migratory species' factor and that assessment under the *EPBC Act 1999* would be required. This assessment would, however, be conducted in accordance with the bilateral agreement between the Commonwealth and State Governments, whereby it would primarily follow the Western Australian environmental assessment process.

An Environmental Scoping Document was prepared by Straits (2005), setting out the relevant factors and scope of work required for the ERMP. This document was subsequently approved by the EPA and forms the basis for the forthcoming environmental assessment.

## 1.2 Summary Project Description

Straits proposes to undertake the construction and subsequent operation of all necessary facilities for a 10 Mtpa conventional solar salt field and the subsequent export of the salt product. A conceptual layout for the salt field, based on the most recent version of the working design for the project, is shown in Figure 1.2.

The facilities will consist of two intake pump stations delivering seawater into a series of concentration ponds. Seawater within the concentration ponds would then undergo natural evaporation resulting in an increase in salt concentration. The resultant brine (high salt concentration sea water) is then pumped into a series of smaller crystalliser ponds where, again via natural evaporation, the salt concentration in the brine reaches a point where solid salt (NaCl) crystals are formed. The salt crystals are allowed to build up to a depth of approximately 0.5 m in the crystalliser pond. The pond is then drained and a mechanical harvester removes the salt crystals, which are taken to a washing facility to produce export quality salt. This salt is stockpiled before being loaded onto barges. It will then be transhipped into the central Gulf and unloaded onto waiting bulk carrier ships.

The residual brine (known as bitterns), which contains remnant salts from the seawater, will be either retreated or discharged to the ocean. The current preferred bitterns disposal options is via the barge harbour to be constructed at the western point of Hope Point (see Figure 1.2).

## 1.3 Previous Fauna Surveys in the Locality

There has been limited terrestrial fauna survey work completed in the proposal area. CALM has previously conducted trapping on some of the islands within Exmouth Gulf (Start and McKenzie 1992), has seabird records from these islands and is currently undertaking surveys on Giralia Station to the immediate south of the Yannarie Salt project area (P. Kendrick, pers. comm. 2005).



Figure 1.1: Locality plan for the Yannarie Salt project.



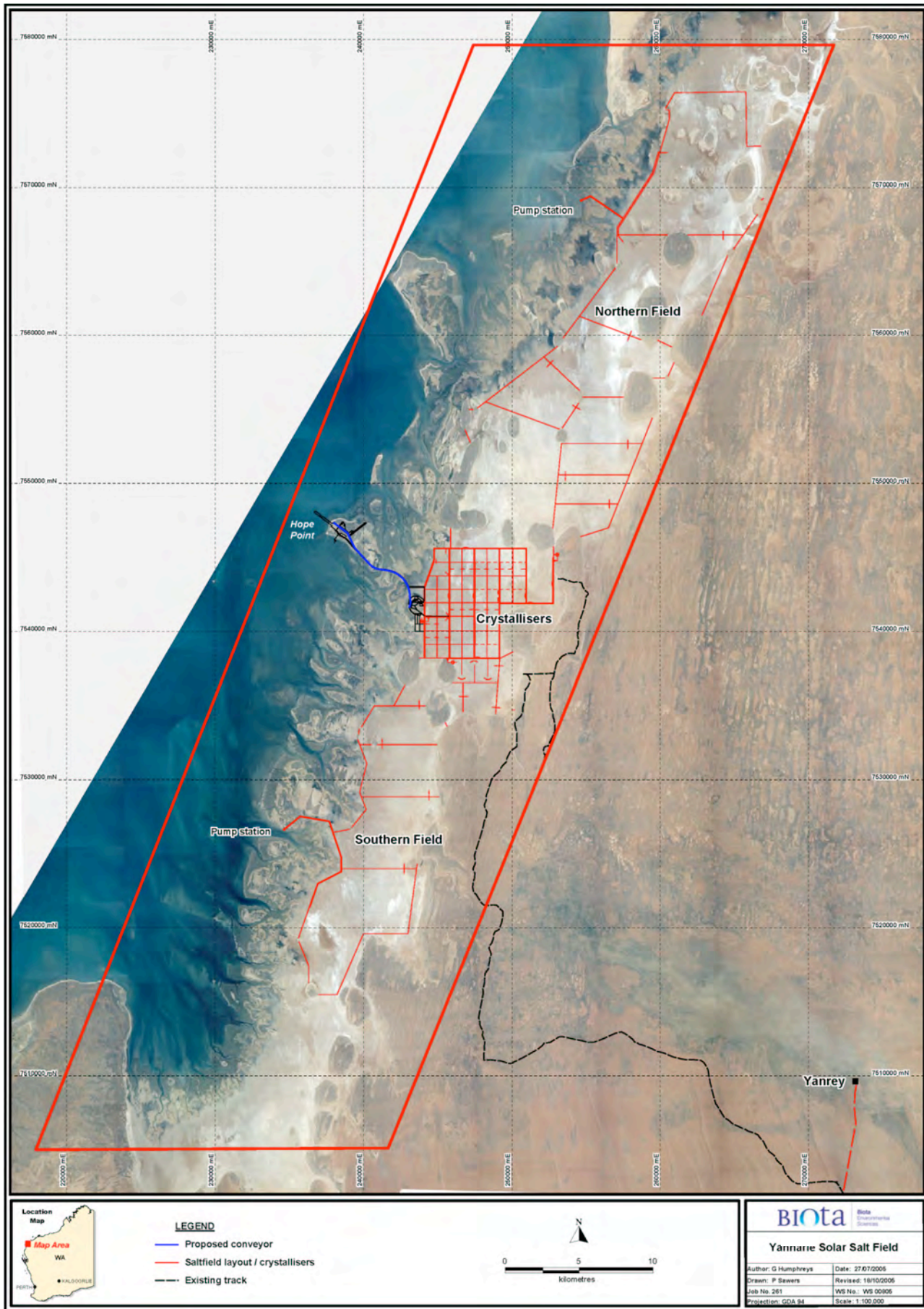


Figure 1.2: Conceptual layout for the ultimate 10 Mtpa Straits solar saltfield (red polygon outlines study area).

Prior to the current study, the only other systematic surveys completed in the locality comprise:

- terrestrial fauna survey collecting work completed along the Tubridgi gas pipeline corridor to the north of the current project area by the WA Museum (WA Museum 2005); and
- ongoing systematic sampling of terrestrial fauna on islands within the Onslow Salt solar saltfield to the north of the current project area (Biota 2002, 2005c).

The majority of the other terrestrial fauna information available is at a more regional scale of consideration (e.g. The Herpetofauna of the Exmouth and Onslow – Ashburton Regions (Storr and Hanlon 1980, Storr and Harold 1981)).

## 1.4 Study Area

The study area addressed by this report comprised the terrestrial fauna habitats occurring in the areas that may be affected by the proposed Yannarie Salt project (see Figure 1.2). This included habitats at the western margin of the hinterland and mainland remnants associated with the saltflats toward the eastern margin of Exmouth Gulf.

Specifically, the main areas surveyed included:

- the dunefields, swales and flats of the mainland remnants that occur as supratidal land on the saltflat area proposed to accommodate the saltfield (the 'Onslow Plain'; DC Blandford and Oceanica 2005); and
- equivalent habitats on the adjacent hinterland area (the northern extent of the 'Carnarvon Dunefield'; DC Blandford and Oceanica 2005), particularly along the nominal alignment for the proposed site access road.

Additionally, some opportunistic sampling was carried out in the mangrove habitats addressed in detail by Biota (2005a).

## 1.5 Scope and Objectives of this Study

This survey was designed and carried out to meet the requirements of EPA Guidance Statement No. 56 (Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia) (EPA 2004). It also meets the scope of work identified in the Straits Salt Project Environmental Scoping Document as approved by the EPA (Straits Salt 2005). This document has been prepared primarily to assist EPA in carrying out the formal environmental assessment of the proposed Yannarie Salt project and is considered suitable for this purpose.

Consistent with the intent of Guidance No. 56, the general objectives of this study were to:

1. identify particular significant fauna and faunal assemblages, to allow for their conservation and management through best practice in the development of the Yannarie Salt proposal;
2. develop and enhance Western Australia's knowledge base of fauna and faunal assemblages and biogeography at both the local and regional scale; and
3. collect survey data capable of underpinning long-term observation and of value in the measurement of future project compliance.

With the nature of the proposed development, and the habitats present, the survey focused on:

1. comparison of the fauna and fauna assemblages of the mainland remnants with similar habitats on the immediately adjacent hinterland; and
2. identification of the fauna species and fauna assemblages occurring on the mainland remnants that will be isolated within the salt field once seawater pumping commences. Given this, the systematic survey focussed on the ground component of the fauna (mammals, herpetofauna and terrestrial invertebrates), with avifauna data collected on the basis of systematic surveys for mangrove dependent and wader species, and other opportunistic records, only (see Section 2.4).

## 2.0 Survey Methodology

### 2.1 Survey Timing and Weather

The fauna survey was conducted over a 10-day period between the 15/08/2004 and the 24/08/2004. Weather during this period was fine to warm with maximum temperatures ranging from 26.3°C – 29.1°C, and minimum temperatures ranging from 12.6°C – 15.5°C (data from the Onslow recording station; Table 3.1). There was no rainfall during the survey period. The average maximum temperature for August 2004 (26.6°C) was slightly higher than that of the same month in previous years (26.5°C) (see Table 3.2). With the distance from Onslow (see Figure 1.1), conditions in the study area may have varied slightly from those summarised above.

Table 2.1: Daily Meteorological Observations for Onslow 15/08/04 – 24/08/04 (data provided by the Western Australian Bureau of Meteorology).

Date	Maximum Temperature (°C)	Minimum Temperature (°C)	Temperature at 9am (°C)	Temperature at 3pm (°C)	Rainfall 24 hrs to 9am
15/08/04	28.0	12.8	19.0	27.3	0
16/08/04	27.1	15.5	19.7	24.1	0
17/08/04	27.4	13.0	20.7	24.4	0
18/08/04	29.1	12.6	19.8	27.1	0
19/08/04	26.3	11.4	21.6	25.7	0
20/08/04	27.9	13.3	18.4	26.3	0
21/08/04	26.9	13.3	20.1	23.4	0
22/08/04	26.9	12.8	20.3	23.1	0
23/08/04	26.6	13.0	19.8	23.5	0
24/08/04	14.26.3	14.2	21.1	23.7	0

### 2.2 Survey Team

The vertebrate fauna sampling for this survey was conducted under “Licence To Take Fauna For Scientific Purposes” No. SF004657 issued to Mr Garth Humphreys. Ethics approval was granted under the Western Australian Museum (DCLM) Animal Ethics Committee, which covers Mr Roy Teale as a Research Associate with the WA Museum. The Fauna survey team comprised Mr Roy Teale, Mr Garth Humphreys, Dr Michael Craig, Mr Phil Runham, Mr Mike Greenham, Ms Zoë Hamilton, Mr Dan Kamien (all of Biota Environmental Sciences), and Mr Greg Harold (consultant).

Invertebrate identification was undertaken by Mr. Dan Kamien (Biota Environmental Sciences). Dr. Mark Harvey, Ms. Julianne Waldock and Ms. Shirley Slack-Smith (all of the WA Museum), provided assistance with more detailed invertebrate identification and contextual information. Also acknowledged are Brad Maryan and Norah Cooper (both of the WA Museum) who assisted with confirmation of herpetofauna and mammal identifications respectively.

### 2.3 Survey Methods and Sampling Effort

#### 2.3.1 Systematic Censusing

The central component of the systematic censusing consisted of 20 fauna trapping grids, each located within a defined habitat (see Figure 2.1; Table 2.3). The Yannarie Salt project study area was reviewed during a survey site selection process to assess the range of habitat types present and evaluate the accessibility of proposed trapping grids. Fauna survey sites were then selected during this exercise so that they sampled:

- a representative set of the fauna habitats types within the project area;
- any areas of perceived potential conservation significance; and
- across the geographic extent of the project area, with some sampling emphasis on known potential impact areas (particularly sites where materials may be sourced to construct and armour salt field bund walls).



Table 2.2: Climatological summary for Onslow (data provided by the Western Australian Bureau of Meteorology).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Mean Daily Maximum Temperature (°C)	35.8	35.6	35.4	33.2	28.8	25.4	24.8	26.5	29.1	31.6	33.8	35.2	
Mean Daily Minimum Temperature (°C)	23.6	24.2	23.2	20.3	16.2	13.1	11.5	12.4	14.1	16.5	19.1	21.6	
Mean Total Monthly Rainfall (mm)	26.7	51.4	47.8	19.8	47.2	45.2	18.1	9.1	1.3	0.7	1.4	5.4	274
Mean Maximum Air Temperature 2004 (°C)	35.9	34.7	35.5	33.8	28.8	27.9	25.2	26.4	28.2	35.7	34.0	37.8	
Mean Minimum Air Temperature 2004 (°C)	24.9	25.7	24.4	22.9	16.3	15.0	15.8	12.8	15.3	20.0	20.6	23.6	
Total Monthly Rainfall 2004 (mm)	7.8	3.6	81.8	0	2.2	0	11.6	0	0.3	0.0	0.8	0.4	108.5

Table 2.3: Trapping grid location and trap effort (GDA94 Zone 50).

Site	Location (AMG)	Datum	Trap Type	Date Opened	Date Closed	Nights Open	No. of traps	Total effort (trap nights)
SS01	254935mE 7542351mN	WGS84	Pit-fall trap	16/08/04	22/08/04	6	10	60
SS02	252683mE 7536670mN	WGS84	Pit-fall trap	16/08/04	22/08/04	6	10	60
SS03	252028mE 7532006mN	WGS84	Pit-fall trap	16/08/04	22/08/04	6	10	60
SS04	236336mE 7528433mN	WGS84	Pit-fall trap	16/08/08	22/08/04	6	10	60
SS05	245132mE 7525779mN	WGS84	Pit-fall trap	17/08/04	23/08/04	6	10	60
SS06	244724mE 7535438mN	WGS84	Pit-fall trap	17/08/04	23/08/04	6	10	60
SS07	245355mE 7534791mN	WGS84	Pit-fall trap	17/08/04	23/08/04	6	10	60
SS08	254135mE 7546405mN	WGS84	Pit-fall trap	16/08/04	23/08/04	7	10	70
SS09	253240mE 7543900mN	WGS84	Pit-fall trap	16/08/04	23/08/04	6	10	60
SS10	251456mE 7547019mN	WGS84	Pit-fall trap	17/08/04	23/08/04	6	10	60
SS11	247415mE 7548077mN	WGS84	Pit-fall trap	17/08/04	23/08/04	6	10	60
SS12	245137mE 7547610mN	WGS84	Pit-fall trap	17/08/04	23/08/04	6	10	60
SS13	243709mE 7541775mN	WGS84	Pit-fall trap	17/08/04	23/08/04	6	10	60
SS14	240095mE 7545195mN	WGS84	Pit-fall trap	16/08/04	22/08/04	6	10	60
SS15	238783mE 7547019mN	WGS84	Pit-fall trap	16/08/04	22/08/04	6	10	60
SS16	243171mE 7537341mN	WGS84	Pit-fall trap	16/08/04	22/08/04	6	10	60
SS17	245440mE 7537925mN	WGS84	Pit-fall trap	16/08/04	22/08/04	6	10	60
SS18	259487mE 7555705mN	WGS84	Pit-fall trap	17/08/04	22/08/04	5	10	50
SS19	239490mE 7546795mN	WGS84	Pit-fall trap	17/08/04	22/08/04	5	10	50
SS20	246705mE 7550733mN	WGS84	Pit-fall trap	17/08/04	23/08/04	6	10	60
SSGH01	236243mE 7525554N	WGS84	Raking Site	18/08/04	18/08/04	N/A	N/A	N/A
SSGH02	238912mE 7547256mN	WGS84	Raking Site	17/08/04	17/08/04	N/A	N/A	N/A
Total pit nights:								1,190

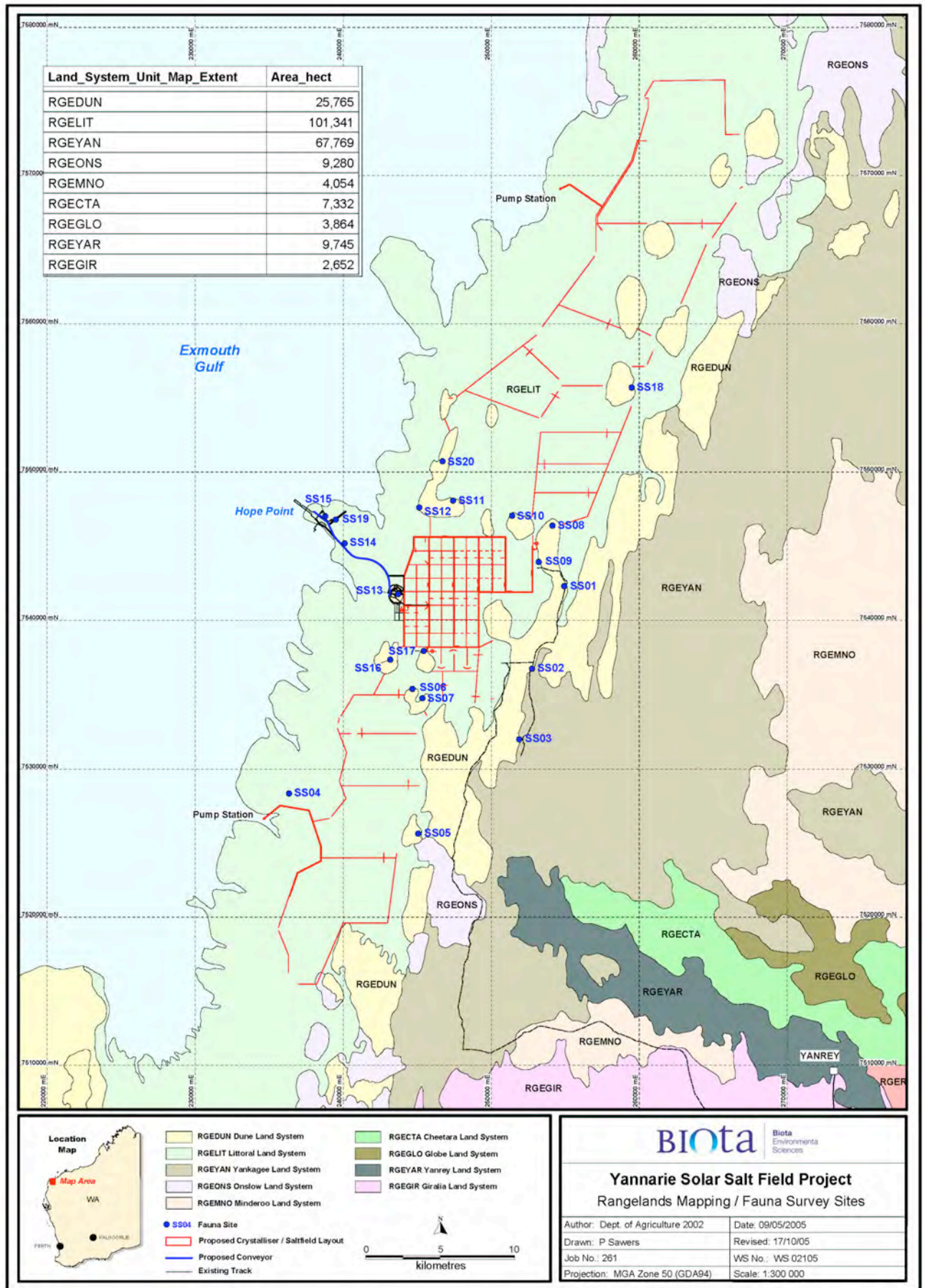


Figure 2.1: Location of fauna survey sites for the Yannarie Salt project (background data source: Payne et al. 1988).

All 20 of the trapping grids consisted of a row of 10 pitfall traps spaced along a line approximately 100 m in length. The pits (alternating 20 litre buckets and 40 cm long PVC tubes), were spaced at approximately 10 m intervals, and connected with a single length of 30 cm flywire fencing.

### 2.3.2 Avifauna Sampling

Sampling of terrestrial avifauna was based on records of terrestrial bird species recorded during systematic transects to target mangrove and migratory wader bird species (see Biota 2005a; Section 1.5). Other opportunistic avifauna records were also collected during the ground fauna systematic sampling work.

### 2.3.3 Invertebrate Sampling

Targeted invertebrate groups were sampled through opportunistic and systematic collections during the survey. Prior to field work, WAM staff were consulted to confirm invertebrate groups of interest and to identify any specific curation methods (e.g. the preservation of Wolf spiders for DNA analyses).

Invertebrate groups targeted during the survey included:

- Araneae (Spiders, in particular Trapdoor and Wolf Spiders);
- Pseudoscorpionida (Pseudoscorpions);
- Scorpionida (Scorpions);
- Diplopoda (Millipedes); and
- Pulmonata (Land Snails).

Trapdoor and Wolf Spiders were preserved in 70% ethanol, with one or two legs removed and placed in 100% ethanol for future molecular studies.

Samples of land snails were collected as both live and dead specimens. Live specimens were collected by excavating beneath *Triodia* hummocks, and only intact dead specimens were collected. Live specimens were submitted to Assoc. Prof. Mike Johnson (University of WA School of animal biology) for future genetic analysis and to the WA Museum. Dead shells were submitted to the WA Museum and added to the Biota reference collection.

Hand foraging was undertaken for pseudoscorpions, including peeling bark and lifting rocks. The latter technique was also used to search for scorpions, with additional specimens collected from vertebrate pit traps. Millipedes were searched for while raking leaf litter and other debris. Representative samples of other invertebrates from pit traps were collected, placed in 70% ethanol and lodged with the WA Museum.

### 2.3.4 Non-systematic Sampling

A range of non-systematic fauna survey activities was undertaken by the survey team to supplement the trapping and investigate additional habitats identified during the course of the survey. These included:

- habitat specific searches for evidence of Schedule and Priority listed fauna species;
- searching (including raking and head-torching) of microhabitats for reptile, frog and small mammal species;
- opportunistic sightings and records;
- identification of animal remains; and
- recording and identification of secondary signs (where possible) including tracks, scats and diggings.

### 2.3.5 Taxonomy and Nomenclature

The taxonomy and nomenclature used in this report are based on Aplin and Smith (2001) for reptiles and frogs, Johnstone (2001) for birds and How et al. (2001) for mammals. Invertebrate taxonomy follows other authorities as cited.



## 2.4 Survey Limitations

Several limitations on this study should be recognised by the reader of this report:

- Sampling was targeted across the area affected by the nominal salt field design current at the time of the field survey.
- Systematic fauna sampling, the primary component of the study, was completed on the basis of trapping grid installation in habitats considered to be representative of the range of units apparent in the area. Not all areas within the study were therefore ground-truthed or equally sampled for fauna.
- The fauna sampling of the study area reported in this document comprised a single survey phase, and it is possible that additional fauna species would be recorded if the sites were revisited at other times of the year, particularly after a major rainfall event.
- Terrestrial invertebrate sampling was targeted at specific groups only, and was largely opportunistic or secondary to the main systematic sampling effort.
- This document is primarily a survey report and provides an account of survey team, methodology, the fauna recorded from the site and their habitats, and their perceived conservation significance. No assessment of potential impacts or recommendations for environmental management are provided here, as these will be addressed in the forthcoming ERMP.



## 3.0 Project Area Regional Context and Fauna Habitats

### 3.1 Bioregion

The Yannarie Salt project area falls into the Carnarvon bioregion as defined in the most recent update of the Interim Bioregionalisation of Australia (IBRA) (Thackway and Cresswell 1995, Environmental Australia 2000).

The Carnarvon bioregion is described as:

*“Quaternary alluvial, aeolian and marine sediments overlying Cretaceous strata. A mosaic of saline alluvial plains with samphire and saltbush low shrublands, Bowgada low woodland on sandy ridges and plains, Snakewood scrubs on clay flats, and tree to shrub steppe over hummock grasslands on and between red sand dune fields. Limestone strata with Acacia stuartii / bivenosa shrublands outcrop in the north, where extensive tidal flats in sheltered embayments support mangal. Arid.”*

CALM (2002), places the project area in the CAR1 (Cape Range) biological subregion with the Carnarvon bioregion. The CAR1 subregion is 2,547,911 ha in size and is described as:

*“Cape Range and Giralia dunefields form the northern part of Carnarvon Basin. Rugged tertiary limestone ranges and extensive areas of red aeolian dunefield, Quaternary coastal beach dunes and mud flats. Acacia shrublands over Triodia on limestone (Acacia stuartii or A. bivenosa) and red dunefields, Triodia hummock grasslands with sparse Eucalyptus trees and shrubs on the Cape Range. Extensive hummock grasslands (Triodia) on the Cape Range and eastern dune-fields. Tidal mudflats of sheltered embayments of Exmouth Gulf support extensive mangroves. Beach dunes with Spinifex communities. An extensive mosaic of saline alluvial plains with samphire and saltbush low shrublands along the eastern hinterland of Exmouth Gulf. Islands of the Muiron, Barrow, Lowendal and Montebello groups are limestone-based. Climate is arid, semi-desert to sub-tropical climate, with variable summer and winter rainfall. Cyclonic activity can be significant, and cyclonic systems may affect the coast and hinterland annually.”*

Note that the parts of this description relating to ‘Rugged tertiary limestone ranges...’ relate to the Cape Range Peninsula rather than the eastern portion of the subregion which contains the current study area.

### 3.2 Land Systems

Land System (Rangelands) mapping covering the project area has been prepared by Agriculture Western Australia (Payne et al. 1988). These are broad units that each consist of a series of “land units” that occur on characteristic physiographic types within the Land System.

The portion of the project area that is proposed to accommodate the salt field is dominated by three land systems: Dune, Littoral and Yankagee (see Figure 2.1). Some small areas of the Onslow land system also occur and the easternmost portions of the planned access road pass through areas of the Minderoo, Yanrey and Giralia land systems in the south (Figure 2.1). The dominant land systems in the project area are typical of the coastal portion of the locality (Payne et al. 1988).

Table 3.1: Land Systems (rangelands) present in the Yannarie Salt project area (source: Payne et al. 1988).

Land System	Description	Extent in Project Area (ha)
RGEDUN – Dune	Dunefields near the coast; soft spinifex pastures in excellent condition; no erosion.	25,765
RGELIT – Littoral	Tidal mudflats; mangroves and samphire; little pastoral value.	101,341
RGEMNO – Minderoo	Alluvial plains covered with sand in parts; tussock grasses and spinifex pastures in fair to good condition; minor erosion.	4,054
RGEONS – Onslow	Undulating sand plain between clay plains; soft spinifex and tussock grass pastures in good condition; no erosion.	9,280
RGECTA – Cheetara	Gilgai plains; tussock grasses in fair condition; no erosion.	7,332
REGGLO – Globe	Active floodplains with snakewood; degraded chenopod and tussock grass pastures in very poor to fair condition; moderate erosion.	3,864
REGYAR – Yanrey	Gilgai floodplains; coolibah woodland with weeping grass and other tussock grasses in fair condition; no erosion.	9,745
RGEYAN - Yankagee	Sandy plains with dunes and numerous claypans; soft spinifex and stony chenopod pastures in fair to excellent condition; minor erosion.	67,769
RGEGIR - Giralia	Longitudinal dunes and broad sandy plains supporting hard and soft spinifex grasslands.	2,652

### 3.3 Beard's Vegetation Mapping Units

Beard (1975) mapped the vegetation of the 'Pilbara' at a scale of 1:1,000,000. The extent of this map sheet also covered the northern Carnarvon Basin Region and, within this, the Carnarvon Botanical District as defined by Beard. The Yannarie Salt project area is located in this Botanical District and more specifically falls within the Yannarie Coastal Plain as delineated by Beard (1975).

Three topographic / soils units were recognised from the Yannarie Coastal Plain:

1. Pediplains and hills on siltstones and other marine rocks. Chief soils are hard alkaline red soils.
2. Extensive plains with some occasional rocky hills in the inland parts, claypans in the coastal parts, and considerable sandy stretches with parallel sand dune formations. Chief soils of the dunes are red sands and the soils of the plains are acid, neutral and alkaline red earths, with non-cracking clays in the claypans.
3. Salt flats, tidal swamps and coastal sand dunes on the seaward fringe. The chief soils are saline loams with shelly sands and small areas of calcareous and/or siliceous sands on coastal dunes. Saline clays or muds on slopes and flats submerged at high tide occur in the mangrove zone.

Due to the inaccessibility of the coastline of the Yannarie Coastal Plain during the Beard (1975) vegetation survey, the area was not visited and the vegetation community types identified at this time were interpreted from aerial photography.

Beard's (1975) survey identified three main vegetation types in the study area based on aerial photo interpretation only:

1. Mangrove vegetation on the coastline and covering the intertidal zone with *Avicennia marina* as the principal species with some *Rhizophora stylosa*

2. Behind the intertidal zone is a belt of bare hypersaline mud, which sometimes floods with spring tides. This zone is quite devoid of any vegetation, but some samphire communities occur locally (*Halosarcia* species).
3. Behind the saline tidal mud flats area is a zone mapped as shrub steppe on sandhills with numerous small claypans. The shrub steppe is typically dominated by *Triodia* species (*T. epactia/pungens*) with *Acacia bivenosa*, *A. synchronicia*, *A. tetragonophylla* and *A. xiphophylla* the most common shrub species present.

### 3.4 Site-specific Soils and Vegetation Descriptions

Each survey site was broadly classified by landform type and position in the landscape. The sites were then described in more detail in terms of soils (by DC Blandford and Associates 2005) and vegetation (Biota 2005b). Table 3.2 below provides this information for each site, with representative photographs of the range of habitat types present in the study area following in Plate 3.1 to Plate 3.6. Table 3.2 provides a summary of survey sites grouped by broad landform habitat units, highlighting those situated on the hinterland from those on the mainland remnants.

Table 3.2: Landform, soils and vegetation habitat descriptions at each of the fauna survey sites.

Site	Landform	Soils	Vegetation
SS01	Longitudinal dune	Uniform red sand profile; earthy Sand. Fabric is single-grained with increasing fabric development with depth.	Scattered tall shrubs of <i>Acacia murrayana</i> over open shrubland of <i>Pityrodia loxocarpa</i> over low open shrubland of <i>Tephrosia rosea</i> var. <i>clementii</i> over very open hummock grassland of <i>Triodia epactia</i>
SS02	Clay flat	Uniform textured profile, neutral, strongly saline, light sandy clay loam. Salt crusting on surface and with sub-rounded pebbles at 0.8 m depth of alluvial origin	<i>Halosarcia auriculata</i> low open heath over <i>Halosarcia indica</i> and <i>Halosarcia halocnemoides</i> subsp. <i>halocnemoides</i> scattered low shrubs
SS03	Dune Swale	Red duplex soil with surface sand overlying a slightly alkaline, saline, fine sandy clay loam	<i>Stemodia</i> sp. Onslow low open shrubland over mid-dense hummock grassland of <i>Triodia epactia</i>
SS04	Longitudinal dune	As for site SS01	<i>Hakea stenophylla</i> subsp. <i>stenophylla</i> open shrubland over <i>Scaevola sericophylla</i> low open shrubland over <i>Triodia epactia</i> mid-dense hummock grassland
SS05	Interdune flat	As for Site SS03	<i>Scaevola spinescens</i> low open shrubland over <i>Triodia epactia</i> mid-dense hummock grassland
SS06	Dune swale	Red fine grained sand, weak dry crust on soil surface	<i>Acacia synchronicia</i> open shrubland over <i>Scaevola spinescens</i> and <i>Acacia stellaticeps</i> low open shrubland over <i>Triodia schinzii</i> and <i>Triodia lanigera</i> hummock grassland
SS07	Longitudinal dune	As for site SS01	<i>Hakea stenophylla</i> subsp. <i>stenophylla</i> open shrubland over <i>Pityrodia loxocarpa</i> low open shrubland over <i>Triodia epactia</i> and <i>Triodia schinzii</i> mid-dense hummock grassland
SS08	Mobile sandsheet	Consolidated red loam palaeosol, with encroaching mobile, fine red sands	Low open tussock grassland of <i>Cenchrus ciliaris</i> with emergent <i>Acacia</i> shrubs

Table 3.2: Landform, soils and vegetation habitat descriptions at each of the fauna survey sites.

Site	Landform	Soils	Vegetation
SS09	Eroded coastal dune	Alkaline, non-saline sand to loamy sand, becoming stratified and more saline with depth. The basal unit of the dune was the most saline with calcrete nodules.	<i>Acacia sclerosperma</i> and <i>Acacia synchronicia</i> open shrubland over <i>Acacia stellaticeps</i> scattered low shrubs over * <i>Cenchrus ciliaris</i> tussock grassland
SS10	Longitudinal dune	As for site SS01	<i>Corymbia zygophylla</i> scattered low trees over <i>Grevillea stenobotrya</i> scattered tall shrubs over <i>Triodia epactia</i> closed hummock grassland
SS11	Longitudinal dune	As for site SS01	Tall open shrubland of <i>Grevillea stenobotrya</i> over mid-dense hummock grassland of <i>Triodia schinzii</i>
SS12	Interdune flat	Red sandy clay	<i>Acacia bivenosa</i> open shrubland over <i>Scaevola spinescens</i> low open shrubland over <i>Triodia epactia</i> and <i>Triodia lanigera</i> mid-dense hummock grassland
SS13	Dune swale	Clay loam over shallow calcarenite nodules to consolidated lenses	<i>Acacia bivenosa</i> scattered shrubs over <i>Scaevola spinescens</i> low open shrubland over <i>Triodia epactia</i> closed hummock grassland
SS14	Interdune flat	Red sandy clay	<i>Acacia bivenosa</i> scattered shrubs over <i>Scaevola spinescens</i> low open shrubland over <i>Triodia epactia</i> closed hummock grassland
SS15	Longitudinal dune	As for site SS01	<i>Pityrodia loxocarpa</i> and <i>Scaevola cunninghamii</i> low open shrubland over <i>Triodia epactia</i> closed hummock grassland
SS16	Dune swale	Red duplex soil, grading to fine sandy clay loam	<i>Eucalyptus victrix</i> low woodland over <i>Triodia epactia</i> open hummock grassland
SS17	Longitudinal dune	As for site SS01	<i>Pityrodia loxocarpa</i> and <i>Scaevola sericophylla</i> open shrubland over <i>Triodia epactia</i> and <i>T. schinzii</i> mid-dense hummock grassland
SS18	Dune ridge on clay pan	Consolidated, red fine to medium grained sandy	<i>Atriplex paludosa</i> subsp. <i>moquiniana</i> and <i>Rhagodia eremaea</i> scattered low shrubs over <i>Triodia epactia</i> mid-dense hummock grassland and * <i>Cenchrus ciliaris</i> open tussock to tussock grassland
SS19	Clay flat	As for Site SS02	<i>Halosarcia indica</i> low open heath with <i>Muellerolimon salicorniaceum</i> and <i>Halosarcia halocnemoides</i> subsp. <i>tenuis</i> as low open shrubland
SS20	Longitudinal dune	As for site SS01	<i>Acacia stellaticeps</i> , <i>Pityrodia loxocarpa</i> and <i>Scaevola sericophylla</i> low open shrubland over <i>Triodia schinzii</i> mid-dense hummock grassland



Table 3.3: Summary of survey sites by broad habitat units present in the project area (\* sites situated on the hinterland).

Habitat Unit	Survey Sites
Longitudinal dunes with mixed low shrublands over <i>Triodia</i> hummock grasslands	SS01*, SS04, SS07, SS10, SS11, SS15, SS17, SS20
Open shrublands over <i>Triodia</i> hummock grasslands on duplex soils in dune swales	SS03*, SS06, SS13, SS16
Low, open <i>Acacia</i> shrublands over dense <i>Triodia</i> hummock grasslands on duplex soils on interdune flats	SS05*, SS12, SS14
Open samphire shrublands on saline clay pans	SS02*, SS19
Margin of unconsolidated sand sheet	SS08*
Dune ridge on margin of clay pan	SS18
Eroded coastal dune	SS09*



Plate 3.1: Open samphire shrublands on saline clay flats (Site SS002).

Plate 3.2: Scattered *Eucalyptus victrix* over *Triodia epactia* hummock grasslands in dune swales (Site SS16).Plate 3.3: *Acacia sclerosperma* over *Acacia stellaticeps* over *Triodia epactia* and Buffel \**Cenchrus ciliaris* on eroded coastal dunes (Site SS119).Plate 3.4: Mixed shrubs over *Triodia epactia* and *T. schinzii* on longitudinal dunes (Site SS01)



Plate 3.5: Sparse Mixed shrub and *Acacia* species over *Triodia epactia* hummock grassland on interdune flats. (Hope Point; Site SS14).

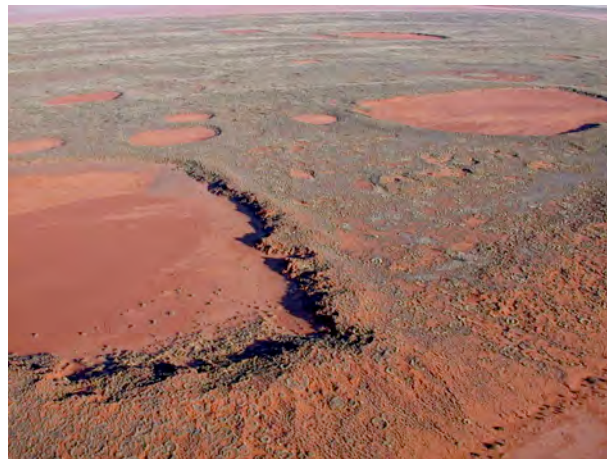


Plate 3.6: Dune ridge margin of claypan, low shrubland over *Triodia epactia* / *\*Cenchrus ciliaris* hummock grassland (Site SS18).



## 4.0 Vertebrate Fauna

### 4.1 Overview

The surveys of the Yannarie Salt project area recorded a total of 138 vertebrate taxa (including 57 bird species discussed in Biota (2005a)). Table 4.1 provides a summary of the number of species recorded from each major vertebrate group during the survey. Each of the major groups is discussed in greater detail in Section 4.2 to 4.4, with accounts of the individual species given in the relevant annotated lists.

Table 4.1: Number of vertebrate fauna species recorded during the Yannarie Salt survey.

Fauna Group	Total
Terrestrial Avifauna	33
Migratory Waders / Littoral Avifauna *	48
Mangrove Avifauna *	9
Native Mammals	7
Introduced Mammals	5
Reptiles	34
Amphibians	2
Total:	138

\* terrestrial avifauna only considered in detail in this report; mangrove dependent birds and migratory waders are documented in a separate study (Biota 2005a).

## 4.2 Birds

### 4.2.1 The Assemblage

Thirty-three species of terrestrial avifauna were recorded from the project area. Records for a further 57 waders and mangrove dependent species are addressed separately as part of Biota (2005a). The 33 terrestrial species recorded represented twenty families, with a more detailed account of the habitats and other observations for each species provided by family in the following annotated list (Section 4.2.2).

### 4.2.2 Annotated List

#### CASUARIIDAE (Emus)

Emu - *Dromaius novaehollandiae*

Recorded from tracks and scats on several of the mainland remnants closer to the hinterland.

#### ACCIPITRIDAE (Eagles and Kites)

Black-shouldered Kite - *Elanus caeruleus axillaris*

Recorded from Simpson Island in August and January and from Tent Point in August. Seen hovering over coastal dunes and adjacent *Triodia* grassland.

Whistling Kite - *Haliastur sphenurus*

Only a single record of one bird seen over the margin of the mangroves to the East of Tent Island during the January wader survey (Biota 2005a).

Wedge-tailed Eagle - *Aquila audax*

Recorded from Central Tent Island and West Hope Point in August. Recorded over coastal dunes and adjacent *Triodia* grassland.

Spotted Harrier - *Circus assimilis*

Single record of one bird over North-west Tent Island in January.

## FALCONIDAE (Falcons)

Nankeen Kestrel - *Falco cenchroides cenchroides*

Records of single birds hover over coastal dunes and adjacent *Triodia* grassland on Burnside Island and North-west Tent Island in August.

## OTIDIDAE (Rails)

Australian Bustard - *Ardeotis australis*

Single record of two birds in *Triodia* grassland on Simpson Island in August.

## TURNICIDAE (Button-quails)

Little Button-quail - *Turnix velox*

Single record of a bird flushed from dense hummock grassland on Hope Point.

## PSITTACIDAE (Parrots)

Galah - *Cacatua roseicapilla assimilis*

Only record is a flock of four flying over North-west Tent Island in August.

Little Corella - *Cacatua sanguinea westralensis*

Several records from Central Tent Island, Simpson Island, North-east Hope Point and Dean Creek in August. Recorded from mangroves (*Avicennia marina* (n=10)), coastal dune vegetation and coastal rocks. Seen in flocks of up to 14.

## CUCULIDAE (Cuckoos)

Horsfield's Bronze-Cuckoo - *Chrysococcyx basalis*

Single record of a bird heard calling adjacent to mangroves on South-east Hope Point in August.

## HALCYONIDAE (Kingfishers)

Sacred Kingfisher - *Todiramphus sanctus sanctus*

Widespread with records from South-east Tent Island, Simpson Island, North-east Hope Point and West Hope Point in August and Burnside, Simpson, Wagtail and North Hope Point in January. An additional record from Tent Point in March. Typically seen singly. Mostly recorded from *Avicennia marina* (n=7) and *Rhizophora stylosa* (n=1).

## MEROPIDAE (Bee-eaters)

Rainbow Bee-eater - *Merops ornatus*

Only recorded in January 2005 when seen on Burnside and Simpson Islands.

## MALURIDAE (Wrens)

White-winged Fairy-wren - *Malurus leucopterus leucopterus*

Widespread and common. Recorded from North-east, North and North-west and Central Tent Island, North-east Tent Point, Tent Point and North and West Hope Point in August. Recorded from North-west Tent Island, Wagtail Island and North Hope Point in January and from Central Tent Island, Tent Point and Wagtail Island in March. Typically records from coastal *Spinifex* and adjacent *Triodia* in groups of up to six.

## MELIPHAGIDAE (Honeyeaters)

Singing Honeyeater - *Lichenostomus virescens*

Widespread and common. Recorded from South-east Tent Island, North-east and South-west Tent Point, Simpson Island, North-east, North, West and South-east Hope Point and Dean and Scotti Creeks in August. Also recorded from North-west Tent Island and Dean Creek in January. Mostly recorded from mangroves (*Avicennia marina* (n=19), *Rhizophora stylosa* (n=2) and *Ceriops tagal* (n=3)) with some records from coastal dunes and adjacent *Triodia* grasslands with emergent shrubs. Typically seen singly or in pairs.

Brown Honeyeater - *Lichmera indistincta indistincta*

Widespread and common. Recorded from North-west, Central, South and South-east Tent Island, South-west Tent Point, Simpson Island and North-east Hope Point in August and from North-west Tent Island, Simpson Island and Wagtail Island in January. Recorded mainly from mangroves (*Avicennia marina* (n=23), *Rhizophora stylosa* (n=14) and *Aegicercus corniculatum* (n=2)) and typically seen singly.

Crimson Chat - *Epthianura tricolor*

A flock of four was seen in North-west Tent Island in January with records of singles from Simpson Island in January and March.

## DICRURIDAE (Flycatchers and Fantails)

Willie Wagtail - *Rhipidura leucophrys leucophrys*

Two records of single birds. One on Wagtail Island in August and the other on Tent Point in March.

## CAMPEPHAGIDAE (Cuckoo-shrikes)

Black-faced Cuckoo-shrike - *Coracina novaehollandiae*

Two records of a pair seen in *Triodia* grassland on Burnside Island in August and a single bird from Central Tent Island in March.

White-winged Triller - *Lalage tricolor*

Recorded from north-west Tent Island, Burnside Island and Simpson Island in August and from Burnside Island in March. Recorded from mangroves (*Avicennia marina* (n=2)), coastal dunes and *Triodia* grasslands. Seen singly or in pairs.

## ARTAMIDAE (Woodswallows)

White-breasted Woodswallow - *Artamus leucorhynchus leucopygialis*

Widespread and common. Recorded from Central Tent Island, Burnside Island, Simpson Island, North Hope Point and Dean Creek in August with a further record on Simpson Island in March. Recorded primarily from mangroves (*Avicennia marina* (n=14)) or from dead mangroves along the coastline. Recorded in groups of up to eight.

## CRACTICIDAE (Butcherbirds)

Pied Butcherbird - *Cracticus nigrogularis*

Several records of what was probably the same bird in mangroves (*Avicennia marina* (n=1)) on West Hope Point in August.

## CORVIDAE (Crows and Ravens)

Little Crow - *Corvus bennettii*

Two records of a pair from North-west Tent Island and three birds on South-west Tent Point in August.

Torresian Crow - *Corvus orru ceciliae*

Two records of a single bird over North-east Hope Point and a pair on West Hope Point in August.

## HIRUNDINIDAE (Swallows and Martins)

White-backed Swallow - *Cheramoeca leucosternus*

Only record is one bird flying over *Triodia* grassland on North-west Tent Island in August.

Welcome Swallow - *Hirundo neoxena*

Widespread and very common. Recorded from Central Tent Island to North Hope Point in August, from North-west Tent Island to North Hope Point in January and from Central Tent Island to Simpson Island in March. Recorded along the coastline in all coastal habitats in groups of up to six.

Tree Martin - *Hirundo (Cecropis) nigricans nigricans*

Recorded from Central Tent Island, South-west Tent Point, North Hope Point and Dean Creek in August, from Burnside Island and North Hope Point in January and from Tent Point in March. Records over all coastal habitats in groups of up to eight.

Fairy Martin - *Hirundo (Cecropis) ariel*

Recorded over Dean and Scott Creeks in August and over Simpson Island in January. Seen in mixed flocks with Tree Martins.

## SYLVIIDAE (Warblers and Songlarks)

Spinifexbird - *Eremiornis carteri*

Only record is a single bird heard calling on north Hope Point in August.

Brown Songlark - *Cincloramphus cruralis*

Only record is a single male seen displaying in *Triodia* grassland on North-west Hope Point in August.

Singing Bushlark - *Mirafra javanica horsfieldii*

The only record is a single bird seen on North Hope Point in March.

## PASSERIDAE (Finches)

Zebra Finch - *Poephila guttata castanotis*

Only record is a group of four birds seen in North-east Hope Point in August.

## MOTACILLIDAE (Pipits)

Australian Pipit - *Anthus australis australis*

Widespread and common. Recorded from North, North-west and Central Tent Island, North-east and South-west Tent Point, Simpson Island and North and West Hope Point in August. Further records from Simpson and Wagtail Island in January and North-west Tent Island and Burnside Island in March. Recorded mostly from coastal dune vegetation and adjacent *Triodia* grasslands. Seen singly or in pairs.

#### 4.2.3 Regional Endemism and Restricted Taxa

None of the terrestrial bird species recorded represent endemic or regionally restricted taxa.

#### 4.2.4 Avifauna Taxa of Conservation Significance

No Schedule listed avifauna species were recorded from the Yannarie Salt project area. A single Priority fauna species, the Australian Bustard, was recorded from mainland remnants on the saltflats. The Rainbow Bee-eater, which is listed as a migratory species under the EPBC Act 1999 and the Japan-Australia Migratory Bird Agreement (JAMBA), was also recorded.

Australian Bustard *Ardeotis australis* (Priority 4)

This species has declined significantly in southern Australia but still remains common in northern Australia. This Australian Bustard is typically locally nomadic and seem particularly attracted to recently burnt areas (see Section 6.3). Two birds were seen in *Triodia* grassland on Simpson Island in August 2004 and the species probably occurs widely in similar habitats throughout the study area. Given its habitat preferences, it will be negligibly affected by the proposed development.

Rainbow Bee-eater *Merops ornatus* (JAMBA)

This species breeds in Australia and migrated to northern Australia and Indonesia (with one record from Japan) in the austral winter. It typically feeds on flying insects which it captures in short flights from prominent perches. It was recorded at a few sites in January 2005 and is probably quite common in the study area wherever there is suitable habitat. Given its habitat preferences, it will be negligibly affected by the proposed development.

## 4.3 Mammals

### 4.3.1 The Assemblage

A total of seven native and five introduced mammals were recorded from the study area during this survey (Table 4.2). The groups recorded include one echidna, three carnivorous marsupials, one kangaroo, three rodents, sheep, cattle, feral cat and fox. Sheep and cattle were widespread on the hinterland on Yanrey Station and will not be discussed further.

### 4.3.2 Annotated List

Table 4.2 contains the mammal records from each fauna habitat type. The species are discussed individually in the following annotated list (voucher numbers for specimens lodged with the WA Museum are given where relevant).

#### TACHYGLOSSIDAE

Short-beaked echidna – *Tachyglossus aculeatus*

This species was recorded from a range of habitats from scats only at sites SS01, SS05, and SS18.

#### DASYURIDAE

Little Red Kaluta – *Dasykaluta rosamondae*

Recorded on four occasions from SS06 (n=2), SS13 (n=1), and SS14 (n=1) (M56570). All sites supported dense *Triodia* hummock grassland, consistent with the documented habitat preferences of this species.

Stripe-faced Dunnart – *Sminthopsis macroura*

Just two individuals recorded from the coastal dune margin of the hinterland at site SS09 (M56577, M56575).

Lesser Hairy-footed Dunnart – *Sminthopsis youngsonii*

Recorded from a total of 17 individuals from almost every habitat sampled during the study (sites SS03 (n=4) (M56551, M56557, m56574), SS05 (n=4) (M56558, M56559), SS06 (n=1), SS12 (n=1) (M56561), SS13 (n=1) (M56576), SS17 (n=3), SS18 (n=1) (M56573), and SS20 (n=2)).

#### MACROPODIDAE

Euro – *Macropus robustus*

This species was recorded on six occasions, all from sightings, from site SS11 (n=1), SS15 (n=1), SS19 (n=2) and two from an opportunistic location within the project area.

#### MURIDAE

House Mouse – *Mus musculus*

Recorded on eight occasions from both the hinterland and the mainland remnants, including sites SS05 (n=1), SS12 (n=1) (M56558), SS14 (n=2), SS15 (n=2) (M56560), and SS19 (n=2) (M56571).

Spinifex-hopping Mouse – *Notomys alexis*

A single individual was pit-trapped from the eroded coastal dune on the hinterland margin at site SS09 (M56569).

Sandy Inland Mouse – *Pseudomys hermannsburgensis*

This was the most widespread and commonly recorded ground mammal species with 103 records (Table 4.2). This species was recorded from three-quarters of the survey sites (Table 4.2), with 13 specimens vouchered with the WA Museum to assist in resolving taxonomic issues with this species (see Section 4.3.5; M56552, M56549, M56564; M56565, M56578, M56572; M56567, M56555, M56554, M56553, M56556, M56550 and M56563).

## FELIDAE

Cat - *Felis catus*

Tracks of this introduced species were recorded from a mainland dune swale at site SS03. It is likely however, that cat activity is widespread in the project area.

## CANIDAE

Fox – *Vulpes vulpes*

Scats of this introduced species were recorded from one of the main land remnants at site SS04. Diggings and tracks were also recorded from the hinterland margin at SS08. McKenzie and Burbidge (1998) note more widespread activity of this feral predator in the project area.

### 4.3.3 Discussion

The survey of the Yannarie Salt project area recorded 12 mammal taxa (seven native and five introduced). This compares with:

- 16 ground mammal species (nine native and seven introduced) recorded in total by the WA Museum over four seasonal collecting periods (from 1998 to 2000), at the Griffin Gas Plant area near Tubridgi Point north of the study area (WA Museum 2005); and
- four phases of seasonal sampling over five years on similar mainland remnants at Onslow, which have yielded a total of 12 ground mammal species (eight native and four introduced) (Biota 2005c).

These comparison datasets from similar coastal habitats in the locality indicate that the mammal fauna of Yannarie Salt project area was well sampled for a single survey phase.

Removing overlaps, the combined mammal fauna documented for this section of coastal habitat from the three datasets (Biota 2005c, WA Museum 2005, this study; Appendix 5), totals 12 native species. The five native ground mammal species recorded from other surveys not recorded during the current study are:

- Northern Quoll - *Dasyurus hallucatus*;
- Red Kangaroo – *Macropus rufus*;
- Short-tailed Mouse - *Leggadina lakedownensis*;
- Ningai – *Ningai timealeyi*; and
- Planigale - *Planigale* sp. (see Appendix 5).

Of these, *Dasyurus hallucatus* and *Leggadina lakedownensis* are the only taxa of conservation significance which may occur and these are discussed further in Section 6.3. The Red Kangaroo, Ningai and Planigale are likely to occur in the habitats of the study area, and additional survey work would probably add these to the current tally.

### 4.3.4 Mammal Taxa of Conservation Significance

None of the mammal species recorded during the survey currently appear as Schedule or Priority fauna on the current *Wildlife Conservation (Specially Protected Fauna) Notice 2005* (see Section 6.0).

### 4.3.5 Unresolved Species Complexes

Two mammal taxa recorded during the survey are of currently unresolved taxonomic status and may harbour more species than currently recognised:

- *Sminthopsis macroura* is a widespread species across arid WA and, according to Norah Cooper (WA Museum, pers. comm. 2004), may be a species complex of at least two taxa and possibly three, although this work is unresolved.
- *Pseudomys hermannsburgensis* also appears to comprise a species complex, with two taxa potentially present in the Pilbara (Norah Cooper pers. comm.). Mr. M. Cowan (CALM Kalgoorlie, pers. comm. 2005), also suspects two taxa at several of his study sites in the Goldfields region of WA.

Table 4.2: Mammals recorded from the Yannarie Salt project study area (\* represents sites on the hinterland, remainder were situated on saltflat mainland remnants; Figure 2.1).

Species Name	Opp	SS01*	SS02*	SS03*	SS04	SS05*	SS06	SS07	SS08*	SS09*	SS10	SS11	SS12	SS13	SS14	SS15	SS16	SS17	SS18	SS19	SS20	Total
Tachyglossidae																						
<i>Tachyglossus aculeatus</i>		1				1													1			3
Dasyuridae																						
<i>Dasykaluta rosamondae</i>							2							1	1							4
<i>Sminthopsis macroura</i>										2												2
<i>Sminthopsis youngsoni</i>				4		4	1						1	1				3	1		2	17
Macropodidae																						
<i>Macropus robustus</i>	2											1				1				2		6
Muridae																						
<i>Mus musculus</i>						1							1		2	2				2		8
<i>Notomys alexis</i>										1												1
<i>Pseudomys hermannsburgensis</i>		3			1			2		1		2	2	18	19	32	4	2	1	12	4	103
Felidae																						
<i>Felis catus</i>				1																		1
Canidae																						
<i>Vulpes vulpes</i>					1				1													2



## 4.4 Herpetofauna

### 4.4.1 The Assemblage

Thirty-six herpetofauna species were recorded from the Yannarie Salt project area during the current survey. This total included two Myobatrachids (Australasian Ground Frogs), seven Gekkonids (geckos), two Pygpodids (legless lizards), four Agamids (dragon lizards), 13 Scincids (skinks), three Varanids (goannas), one Typhlopidae (blind snake) and four Elapids (front-fanged snakes).

### 4.4.2 Breeding Records

Breeding records were obtained for three species:

- *Nephrurus levis occidentalis*; a gravid female was trapped at SS18;
- *Heterontia binoei*; a small gravid female was trapped at SS12, another specimen (R157221) from SSGH02 had yolky follicles; and
- *Ctenophorus femoralis*; one specimen (R157186) trapped from SS08 had yolky follicles.

### 4.4.3 Annotated List

Table 4.3 at the end of this section lists the herpetofauna records from each survey site. The species recorded are discussed individually in the following annotated list (voucher numbers for specimens lodged with the WA Museum are given where relevant).

#### MYOBATRACHIDAE (Ground frogs)

##### Tawny Trilling Frog – *Neobatrachus fulvus*

Just three individuals from this species were recorded during the survey, all from pit-traps from sites SS01 (n=1), SS05 (n=1) (R157301), and SS10 (n=1) (R157298). Habitats ranged from linear red dunes to dune swales. An additional *Neobatrachus* individual which probably belongs to this species was pit-trapped from SS17 (R157227), and was vouchered with the WA Museum for confirmation of identification.

##### Desert Spadefoot – *Notaden nichollsi*

Eight individuals of this species were recorded from site SS01 (a linear sand dune; n=6), and SS08 (the margin of the mobile dunefield on Yanrey Point; n=2) (R157228). An additional individual was recorded from SS01, however it the specimen was desiccated and could only be confidently determine to genus. Based on known distributions (WA Museum 2005), it is likely that this specimen was also *N. nichollsi*.

#### GEKKONIDAE (Geckos)

##### Fat-tailed Gecko – *Diplodactylus conspicillatus*

Five individuals recorded, mostly from hummock grasslands on duplex soils in dune swales; sites SS03 (n=2) (R158295, R157276), SS06 (n=1) (R157275), SS11 (n=1), and SS12 (n=1) (R157302).

##### Pale-snouted Ground Gecko – *Diplodactylus stenodactylus*

Six individuals pit-trapped from SS01 (n=2) (R158284), SS02 (n=1) (R157273), SS03 (n=1), SS09 (n=1), and SS10 (n=1) (R157189).

##### *Gehyra pilbara*

Recorded from just four individuals; two hand-captured and two from pit-traps. This species was recorded only from SS03 (n=3) (R157285, R157287), and SS05 (n=1). Both sites were in dune swales containing termitaria, consistent with most other records from the locality (Biota 2005c).

##### Variegated Tree Dtella – *Gehyra variegata*

Recorded on eight occasions from SS10 (n=1), SS11 (n=1), SS12 (n=2) (R157241, R157235), SS16 (n=1) (R157325), and an opportunistic location within the project area (n=3). This included both linear dune and swale sites, with shrub overstorey or low trees present.



## 6.0 Conservation Significance

### 6.1 Approach to the Assessment

The fauna conservation value of the survey area is discussed in general terms in Section 6.2 and specifically for vertebrate and invertebrate fauna of conservation significance in Sections 5.3 and 5.5 respectively. Section 6.4 addresses known species complexes within the vertebrate fauna we recorded, and for which the conservation status is therefore unresolved. Section 6.2 describes the statutory framework under which species are assigned special protection.

### 6.2 Statutory Framework

Native fauna species, which are rare, threatened with extinction, or have high conservation value are specially protected by law under the *Western Australian Wildlife Conservation Act 1950-1979*. In addition, some species of fauna are covered under the 1991 ANZECC convention, while certain birds are listed under the Japan & Australia Migratory Bird Agreement (JAMBA) and the China & Australia Migratory Bird Agreement (CAMBA).

Classification of rare and endangered fauna under the *Wildlife Conservation (Specially Protected Fauna) Notice 2005* recognises four distinct schedules of taxa:

1. Schedule 1 taxa are fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection;
2. Schedule 2 taxa are fauna which are presumed to be extinct and are declared to be fauna in need of special protection;
3. Schedule 3 taxa are birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, which are declared to be fauna in need of special protection; and
4. Schedule 4 taxa are fauna that are in need of special protection, otherwise than for the reasons mentioned in paragraphs (1), (2) and (3).

In addition to the above classification, CALM also classifies other fauna species of potential conservation significance under four Priority codes:

**Priority One:** Taxa with few, poorly known populations on threatened lands.

Taxa which are known from a few specimens or sight records from one or a few localities on lands not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

**Priority Two:** Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands.

Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

**Priority Three:** Taxa with several, poorly known populations, some on conservation lands.

Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

*Bynoe's gecko – Heteronotia binoei*

This was the second-most commonly recorded herpetofauna species (after *Lerista bipes*), with 74 records (see Table 4.3). Typical of the species, it was also widespread in the study area, being recorded from 14 of the 20 survey sites and two opportunistic collections. Records were obtained from most habitat types, including linear sand dunes, dune swales, coastal flats and samphire flats (Table 4.3). As this taxon has been suspected of being a species complex (see Section 4.4.7), 17 specimens were vouchered with the WA Museum to contribute to ongoing taxonomic work (R157221, R157216, R157218, R157217, R157204, R158296, R157284, R157209, R157198, R157199, R157259, R157185, R157192, R157249, R157321, R157167, R157194).

*Nephrurus levis occidentalis*

Just three individuals recorded from sites SS01 (n=1) (R157305), and SS18 (n=2), both of which sampled dune ridge formations. Records include one gravid female from SS18 which was released.

*Strophurus strophurus*

Recorded only from two individuals pit-trapped from linear red sand dunes with *Triodia* hummock grassland cover at site SS11 (R157272, R157251).

## PYGOPODIDAE (Legless Lizards)

*Delma haroldi*

A total of just four individuals recorded from *Triodia* hummock grassland in a dune swale at SS13 (n=3) (R157315, R157266), and from a red sand dune at SS20 (R157311) (n=1).

Burton's Legless Lizard - *Lialis burtonis*

This species was recorded on nine occasions from five of the survey sites (SS03 (n=2), SS11 (n=2) (R157238, R157274), SS12 (n=1), SS17 (n=2) (R157229, R157255) and SS18 (n=1) (R157181)). Habitat types included linear dunes, dune swales, coastal flats and the margin of clay pans.

## AGAMIDAE (Dragon Lizards)

*Ctenophorus femoralis*

Recorded on 64 occasions, all from sites situated on dune formations (SS01 (n=47) (R157324, R157179, R157180, R158286, R158287, R158288, R158299, R158298, R158293, R157178, R157241, R157165, R157177, R157173), SS04 (n=2) and SS08 (n=15) (R157186, R157233, R157281, R157313)).

Central Netted Dragon - *Ctenophorus nuchalis*

This species was recorded on 16 occasions from most habitat types in the study area (see Table 4.3). Collection sites included SS01 (n=2) (R157292), SS02 (n=3) (R157269), SS03 (n=6) (R157254), SS04 (n=1), SS05 (n=1), SS09 (n=1), SS16 (n=1) (R157184), and SS17 (n=1).

Greater Military Dragon – *Ctenophorus rubens*

Only recorded on six occasion, mostly from red dune habitats, from sites SS01 (n=2) (R157253), SS03 (n=1) (R157271), SS17 (n=2) (R157206, R157261), and SS18 (n=1) (R157174).

Common Two-lined Dragon – *Diporiphora winneckeii*

Just two records, both pit-trapped from a linear, red sand dune at site SS10 (R157296, R157264).

## SCINCIDAE (Skinks)

*Ctenotus hanloni*

All seven records of this species were from *Triodia* hummock grasslands on duplex soils in dune swales. Sites included SS03 (n=1), SS12 (n=1) (R157248), SS13 (n=2) (R157239), and SS16 (n=3) (R157201, R157183).

*Ctenotus iapetus*

A total of 16 individuals recorded from most habitat types sampled in the study; sites SS01 (n=1), SS03 (n=1) (R157230), SS04 (n=4) (R157205, R157279, R157305), SS05 (n=1), SS07 (n=1),

SS10 (n=1), SS11 (n=4) (R157277), SS16 (n=1) (R157172), SS18 (n=1) (R157232), and one from an opportunistic location within the survey area (R157333).

*Leopard Skink - Ctenotus pantherinus ocellifer*

Recorded on 17 occasions, mostly from dune swales and coastal flat habitats. Sites included SS05 (n=1), SS06 (n=3) (R158285), SS08 (n=1), SS09 (n=1), SS16 (n=1) and SS18 (n=10) (R157188, R157222, R157169).

*Ctenotus rufescens*

Only three individuals recorded from SS01 (a linear red dune; n=1) (R157323), SS02 (sapphire clay flats; n=1) (R157314) and SS03 (duplex soils in a dune swale; n=1) (R157327).

*Ctenotus saxatilis*

A total of sixteen individuals recorded from nine of the 20 survey sites and all habitat types sampled. Sites included SSGH02 (n=1) (R157203), SS02 (n=1), SS04 (n=1) (R157280), SS05 (n=2) (R157202, R157207), SS12 (n=1) (R157236), SS14 (n=3), SS15 (n=3), SS16 (n=2) (R157182, R157331), SS20 (n=2).

*Narrow-banded Sand-swimmer - Eremiascincus fasciolatus*

Recorded from just three specimens from dune formations at sites SS01 (n=1) (R157283), and SS18 (n=2) (R157270).

*Glaphyromorphus isolepis*

Recorded on four occasions from SSGH02 (n=1) (R157220), SS14 (n=1) (R158292), and SS15 (n=2) (R157190, R157329).

*Lerista bipes*

This was the most commonly recorded herpetofauna species with 75 records from 12 of the 20 survey sites (see Table 4.3). Sixteen of the 75 specimens were vouchered with the WA Museum (R157211, R157219, R157213, R157213, R157176, R157258, R157234, R157268, R157267, R157237, R157193, R158297, R157256, R157260, R157226 and R157225).

*Lerista elegans*

This species was recorded on 15 occasions from SSGH02 (n=1), SS04 (n=2) (R157288), SS07 (n=2), SS11 (n=3) (R157278), SS15 (n=3), SS16 (n=1) (R157326), SS20 (n=1), and two from an opportunistic location within the project area.

*Lerista muelleri*

Seven individuals recorded from SS01 (n=1), SS03 (n=2) (R157246, R157231, R157316), SS05 (n=2) (R157252), SS08 (n=1) (R157294) and SS10 (n=1).

*Lerista onsloviana*

A total of 12 records for this regional endemic, most of which were from linear red sand dunes SS04 (n=1) (R157175), SS07 (n=1), SS10 (n=2) (R157289, R157265), SS15 (n=1) (R157189), SS16 (n=1) (R157191), SS17 (n=1), SS19A (n=1) (R157214), SS19B (n=2) (R157212), SS20 (n=1), and one from an opportunistic location within the project area (R157322).

*Common Dwark Skink - Menetia greyii*

Recorded on 67 occasions, from almost every site and habitat type sampled during the survey (18 of 20; Table 4.3). As there are outstanding taxonomic issues with this species (Section 4.4.7), 33 of the 67 specimens collected were vouchered with the WA Museum (R157210, R157215, R157163, R157293, R158283, R157317, R157318, R157291, R157257, R158290, R157244, R157242, R157243, R157320, R157200, R157250, R157307, R157319, R157208, R157171, R157262, R157197, R157195, R157196, R157164, R157170, R157168, R157300, R157312, R157263, R157308, R157286 and R157295).

*Notoscincus ornatus ornatus*

Recorded on three occasions from two sites, both of which were duplex soils in dune swales; sites SS13 (n=1) (R157304) and SS16 (n=2) (R15729, R157310).

## VARANIDAE (Goannas)

*Varanus brevicauda*

Recorded on just two occasions from dune swales at sites SS03 (n=1) and SS06 (n=1) (R158294).

*Varanus eremius*

A total of five individuals recorded, one each from SS01 (linear red dune; R158289), SS03 (*Triodia* hummock grassland in a dune swale), SS08 (the margin of the Yanrey Point mobile dunefield; R157282), and SS10 and SS11 (both linear red dunes).

Gould's Monitor - *Varanus gouldii*

A total of just four individuals recorded, one each from SS01 (R157328), SS14 (R157299), SS16, and an opportunistic hand-capture within the project area. This wide-ranging species would probably occur throughout the study area.

## TYPHLOPIDAE (Blind Snakes)

*Ramphotyphlops grypus*

Only three individuals recorded, one each from SS03 (R157291), SS11 (R157332), SS12 (R157297).

## ELAPIDAE (Front-fanged Snakes)

Yellow-faced Whipsnake - *Demansia psammophis cupreiceps*

A single individual was hand-captured opportunistically within the project area (R157330).

Mangrove Mud Snake - *Ephalophis greyae*

Three individuals were hand-captured from the margin of the mangrove zone (site GH01). Two more individuals were recorded during mangrove surveys carried out for the Yannarie Salt project (Biota 2005a).

Banded Mangrove Snake – *Hydrelaps darwiniensis*

A single individual sited on an intertidal mud bank during the mangrove surveys carried out for the Yannarie Salt project (Biota 2005a).

Ringed Brown Snake - *Pseudonaja modesta*

Two individuals recorded during the survey. One individual was hand caught at an opportunistic location within the project area (R157303), the other was a road kill at SS02 (R157306)



Plate 4.1: Banded Mangrove Snake  
*Hydrelaps darwiniensis*



Plate 4.2: Mangrove Mud Snake  
*Ephalophis greyae*

Table 4.3: Herpetofauna records from the Yannarie Salt study area (\* represents sites on the hinterland, remainder were situated on saltflat mainland remnants; Figure 2.1).

Species Name	Opp	SS01*	SS02*	SS03*	SS04	SS05*	SS06	SS07	SS08*	SS09*	SS10	SS11	SS12	SS13	SS14	SS15	SS16	SS17	SS18	SS19	SS19A	SS19B	SS20	Total	
<b>Myobatrachidae</b>																									
<i>Neobatrachus fulvus</i>		1				1					1														3
<i>Notaden nichollsi</i>		6							2																8
<b>Gekkonidae</b>																									
<i>Diplodactylus conspicillatus</i>				2			1					1	1												5
<i>Diplodactylus stenodactylus</i>		2	1	1						1	1														6
<i>Gehyra pilbara</i>				3		1																			4
<i>Gehyra variegata</i>	3										1	1	2				1								8
<i>Heteronotia binoei</i>	27	1		2	4	1	1	1			1		2		3	11		3	6	3		2	1		74
<i>Nephurus levis occidentalis</i>		1																	2						3
<i>Strophurus strophurus</i>												2													2
<b>Pygopodidae</b>																									
<i>Delma haroldi</i>														3										1	4
<i>Lialis burtonis</i>				2			1					2	1					2	1						9
<b>Agamidae</b>																									
<i>Ctenophorus femoralis</i>		47			2				15																64
<i>Ctenophorus nuchalis</i>		2	3	6	1	1				1							1	1							16
<i>Ctenophorus rubens</i>		2		1														2	1						6
<i>Diporiphora winneckeii</i>											2														2
<b>Scincidae</b>																									
<i>Ctenotus hanloni</i>				1									1	2			3								7
<i>Ctenotus iapetus</i>	1	1		1	4	1		1			1	4					1		1						16
<i>Ctenotus pantherinus ocellifer</i>						1	3		1	1							1		10						17
<i>Ctenotus rufescens</i>		1	1	1																					3
<i>Ctenotus saxatilis</i>			1		1	2							1		3	3	2							2	16
<i>Eremiascincus fasciolatus</i>		1																	2						3
<i>Glaphyromorphus isolepis</i>														1	2										4
<i>Lerista bipes</i>	14				12	2		4	2		4	8	5			7	9	4						1	75
<i>Lerista elegans</i>	2				2			2				3				3	1							1	15
<i>Lerista muelleri</i>		1		2		2			1		1														7
<i>Lerista onsloviana</i>	1				1			1			2					1	1	1				1	2	1	12
<i>Menetia greyii</i>			1	1	1		2	9	2		2	1	3	1	1	6	6	14	1	4				10	67

Table 4.3: Herpetofauna records from the Yannarie Salt study area (\* represents sites on the hinterland, remainder were situated on saltflat mainland remnants; Figure 2.1).

Species Name	Opp	SS01*	SS02*	SS03*	SS04	SS05*	SS06	SS07	SS08*	SS09*	SS10	SS11	SS12	SS13	SS14	SS15	SS16	SS17	SS18	SS19	SS19A	SS19B	SS20	Total	
<i>Notoscincus ornatus ornatus</i>														1			2							3	
Varanidae																									
<i>Varanus brevicauda</i>				1			1																		2
<i>Varanus eremius</i>		1		1					1		1	1													5
<i>Varanus gouldii</i>	1	1													1		1								4
Typhlopidae																									
<i>Ramphotyphlops grypus</i>				1								1	1												3
Elapidae																									
<i>Demansia psammophis cupreiceps</i>	1																								1
<i>Ephalophis greyae</i>	3																								3
<i>Hydrelaps darwiniensis</i>	1																								1
<i>Pseudonaja modesta</i>	1		1																						2



#### 4.4.4 Discussion

The survey of the Yannarie Salt project area recorded two species of amphibians and 34 reptile species. This total of 36 taxa compares with:

- 53 herpetofauna species (49 reptiles and four frogs) recorded by the WA Museum over four seasonal collecting periods (from 1998 to 2000), at the Griffin Gas Plant area near Tubridgi Point, north of the study area (WA Museum 2005); and
- four phases of seasonal sampling over five years on similar mainland remnants at Onslow, which have yielded a total of 43 herpetofauna species (all reptiles) (Biota 2005c).

Removing overlaps, the combined herpetofauna documented for this section of coastal habitat from the three datasets (Biota 2005c, WA Museum 2005, this study), totals 63 herpetofauna species (58 reptiles and five frogs; Appendix 5). Four of these are reptile species only recorded during the Yannarie Salt survey and not previously collected from the locality by the WA Museum (2005) or Biota (2005c). All of the 27 herpetofauna species recorded from other surveys but not recorded during the current study (Appendix 5), occur more widely in the Pilbara and Carnarvon bioregions (Storr et al. 1990; 1999, Wilson and Swan 2003).

#### 4.4.5 Herpetofauna Species of Conservation Significance

None of the reptile or frog species recorded during the survey currently appear as Schedule or Priority listed fauna on the current *Wildlife Conservation (Specially Protected Fauna) Notice 2005* (see Section 6.0).

#### 4.4.6 Regional Endemism and Restricted Taxa

Three of the herpetofauna taxa recorded during the study area are restricted in terms of distribution or habitat requirements:

- *Lerista onsloviana* (limited to the Onslow – Ashburton Plain);
- *Ephalophis grayae* (restricted to mangrove habitat along the Pilbara and Kimberley coast); and
- *Hydrelaps darwiniensis* (also restricted to the mangrove coast of the subtropical and tropical arid zone).

These species have all been previously recorded from the locality, either by Biota (2005c) or the WA Museum (2005).

#### 4.4.7 Unresolved Species Complexes

Four reptile taxa recorded during the survey are of currently unresolved taxonomic status and may harbour more species than currently recognised:

- *Diplodactylus stenodactylus* is recognised as a species complex with a number of new taxa recognised from, and possibly confined to, the Pilbara (Mr Laurie Smith, pers comm. 2004);
- representatives of three other previously recognised species complexes were recorded during the current survey, comprising *Heteronotia binoei* (Aplin and Smith 2001), *Lerista muelleri* (Aplin and Smith 2001), and *Menetia greyii* (Aplin and Smith 2001; Aplin et al submitted).





## 5.0 Invertebrate Fauna

### 5.1 Overview

The survey of the Yannarie project area collected 915 invertebrate specimens, representing 17 orders. The majority were not identified beyond family level and are not discussed here. Only those taxa:

- belonging to groups known to include short-range endemics (e.g. mygalomorph spiders, millipedes, land snails (Harvey 2002; Section 5.2)); or
- that were otherwise of conservation significance (eg. family Buprestidae); or
- for which specific expertise was readily available at the WA Museum (eg. pseudoscorpions, wolf spiders and other spider groups),

were identified to genus or species level.

### 5.2 Short Range Endemics

Many recent publications have highlighted taxonomic groups of invertebrates with naturally small distributions at the species level (less than 10, 000 km<sup>2</sup>) (Harvey 2002; freshwater snails, Ponder and Colgan 2002; land snails, Clark and Richardson 2002). These taxa are variously described as 'narrow range endemics' or 'short-range endemics' (see Harvey 2002), and are in part characterised by poor dispersal capabilities, confinement to disjunct habitats and low fecundity (Harvey 2002, Ponder and Colgan 2002). Given the potential importance of short-range endemism to the conservation of biodiversity, the assessment of such invertebrate taxa is becoming an important component of impact assessment (as recognised in EPA 2003). Examples of taxonomic groups that show high levels of short-range endemism in this respect include millipedes, mygalomorph spiders, and freshwater and terrestrial molluscs.

#### 5.2.1 Mygalomorph Spiders

A total of four mygalomorph spider individuals were collected during the survey, all of which belonged to the family Nemesiidae. These individuals were collected from SS08, SS11, SS12, and SS15.

### 5.3 Other Invertebrate taxa

#### 5.3.1 Spiders

The survey recorded several families of araneomorph spiders, none of which appear likely to harbour potential SREs. The survey 243 specimens of araneomorph spiders, which have been lodged with WA Museum to contribute to ongoing taxonomic work.

#### 5.3.2 Scorpionida

Two individuals were recorded, one from SS01, and one from SS08. These specimens have been submitted to the WA Museum and are currently awaiting confirmed identification.

#### 5.3.3 Other Taxa

Other invertebrate taxa collected during the survey included scolopendrid and scutigrid centipedes, blattodeads, coleopterans, dipterans, hemipterans, hymenopterans, lepidopterans, orthopterans, neuropterans, dermapterans, thysanurans and isopods. None of these groups are likely to contain short range endemics and the specimens have been lodged with the WA Museum.



## 6.0 Conservation Significance

### 6.1 Approach to the Assessment

The fauna conservation value of the survey area is discussed in general terms in Section 6.2 and specifically for vertebrate and invertebrate fauna of conservation significance in Sections 5.3 and 5.5 respectively. Section 6.4 addresses known species complexes within the vertebrate fauna we recorded, and for which the conservation status is therefore unresolved. Section 6.2 describes the statutory framework under which species are assigned special protection.

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Classification of rare and endangered fauna under the *Wildlife Conservation (Specially Protected Fauna) Notice 2005* recognises four distinct schedules of taxa:

1. Schedule 1 taxa are fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection;
2. Schedule 2 taxa are fauna which are presumed to be extinct and are declared to be fauna in need of special protection;
3. Schedule 3 taxa are birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, which are declared to be fauna in need of special protection; and
4. Schedule 4 taxa are fauna that are in need of special protection, otherwise than for the reasons mentioned in paragraphs (1), (2) and (3).

In addition to the above classification, CALM also classifies other fauna species of potential conservation significance under four Priority codes:

**Priority One:** Taxa with few, poorly known populations on threatened lands.

Taxa which are known from a few specimens or sight records from one or a few localities on lands not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

**Priority Two:** Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands.

Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

**Priority Three:** Taxa with several, poorly known populations, some on conservation lands.

Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Four: Taxa in need of monitoring.

Taxa which are considered to have been adequately surveyed or for which sufficient knowledge is available and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. Taxa which are declining significantly but are not yet threatened.

Priority Five: Taxa in need of monitoring

Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

## 6.3 Threatened Fauna Species that may occur in the Yannarie Salt Project Area

No Schedule or Priority fauna species were recorded during the survey of the Yannarie Salt project area (see Sections 4.2, 4.3 and 4.4).

Database searches and literature reviews indicated that eleven species of Schedule fauna and nine Priority listed species have either been recorded from, or are likely to occur, in the locality of the Yannarie Saltfield. Six species; the Bilby, the Pilbara Olive Python, the Leathery Turtle, the Hawksbill Turtle, the Leathery turtle, the Mulgara, and the Green Turtle, are also listed as Vulnerable under the *EPBC Act 1999*. Two species, the Night Parrot and the Loggerhead Turtle are listed as Endangered under the *EPBC Act 1999*. These threatened fauna species are listed in Table 6.1 and discussed individually below.

Table 6.1: Species of conservation significance recorded from or likely to occur within the Yannarie Saltfield survey area (\* marine fauna or migratory wader species not considered in detail in this study).

Species	State Level	Federal Level
Bilby <i>Macrotis lagotis</i>	Schedule 1	Vulnerable
Orange Leaf-nosed Bat <i>Rhinonictis aurantius</i>	Schedule 1	-
Night Parrot <i>Pezoporus occidentalis</i>	Schedule 1	Endangered
Pilbara Olive Python <i>Liasis olivaceus barroni</i>	Schedule 1	Vulnerable
* Loggerhead Turtle <i>Caretta caretta</i>	Schedule 1	Endangered
* Hawksbill Turtle <i>Eretmochelys imbricata</i>	Schedule 1	Vulnerable
* Leathery Turtle (Luth) <i>Dermochelys coriacea</i>	Schedule 1	Vulnerable
* Green Turtle <i>Chelonia mydas</i>	Schedule 1	Vulnerable
Mulgara <i>Dasyercus cristicauda</i>	Schedule 1	Vulnerable
* Dugong <i>Dugong dugon</i>	Schedule 4	Migratory
Peregrine Falcon <i>Falco peregrinus</i>	Schedule 4	-
<i>Lerista planiventralis maryani</i>	Priority 1	-
Little North-western Mastiff Bat <i>Mormopterus loriae coburgiana</i>	Priority 1	-
Lakeland Downs Mouse <i>Leggadina lakedownensis</i>	Priority 4	-
Western Pebble-mound Mouse <i>Pseudomys chapmani</i>	Priority 4	-
Grey Falcon <i>Falco hypoleucos</i>	Priority 4	-
* Eastern Curlew <i>Numenius madagascariensis</i>	Priority 4	Migratory
Star Finch (western) <i>Neochmia ruficauda subclarescens</i>	Priority 4	-
Australian Bustard <i>Ardeotis australis</i>	Priority 4	-
Bush Stonecurlew <i>Burhinus grallarius</i>	Priority 4	-

Six of these threatened species are marine fauna or migratory waders and these are documented in separate studies (Oceanica 2005 and Biota 2005a respectively), and will not be considered further here (these are marked with an asterisk in Table 6.1 above).

### 6.3.1 Schedule Fauna

Bilby *Macrotis lagotis* (Schedule 1; 'Endangered')

**Distribution:** The former range of the Bilby included most of the semi-arid areas of mainland Australia, however it is now confined to *Triodia* hummock grassland and *Acacia* scrub across parts of northern Australia.

**Ecology:** The Bilby *Macrotis lagotis* is a medium sized ground mammal, ranging in weight from 1.0-2.5 kg. The species is apparently strictly nocturnal and constructs a substantial burrow system, which may be up to 3 m in length (Flannery 1990). Similar to the Mulgara, the species has been documented as showing temporary home ranges and relatively rapid changes in distribution in response to variation in habitat resources (Johnson 1995). Whilst fox and cat predation and the effect of rabbits and stock are thought to be the principal factors in the decline of the Bilby, fire regimes have also been suggested as an important factor in maintaining habitat diversity for this species (Johnson 1995).

**Likelihood of occurrence:** The managers of Yanrey Station believe that there are historical records of this species on the pastoral lease. However, the CALM database only lists a single, uncertain record over 30 years old from the locality. It is therefore considered unlikely that this species still persists on the hinterland and it would not occur in the isolated habitat remnants within the area proposed to accommodate the salt field.

Orange Leaf-nosed Bat *Rhinonictoris aurantius* (Schedule 1)

**Distribution:** The Orange leaf-nosed bat is found in the Pilbara region of Western Australia, through the Kimberley and across the Tops End into north-western Queensland. This species is an Australian endemic. The Pilbara population is geographically the most isolated population of *R. aurantius*, being separated from the northern Australian populations by nearly 400 km of sandridge desert. It differs from the Northern population in terms of wing-shape indices and echolocation call frequency (N.L. McKenzie unpub.)

**Ecology:** This species is often found in monsoon rainforest, tall open forest, open savanna woodland, black soil grassland and spinifex-covered hills. They are more influenced by the availability of suitable roost caves than habitat types (Churchill, 1998). They are opportunistic in their diet, eating primarily moths and beetles throughout the year and flying termites during the wet season.

**Likelihood of occurrence:** This species would not occur in the study area and the only record on the CALM database was from inland habitats from 1925. It has specific roost requirements (Armstrong and Anstee 1998), and no caves in the appropriate geological formations occur in the project area.

Night Parrot *Pezoporus occidentalis* (Schedule 1, 'Endangered')

**Distribution:** Night Parrots have been reported from every state on the Australia mainland. Apparently suitable habitat occurs, or has occurred, across most of the inland, covering at least half of the continent. Records are sparsely distributed through this area. However, there does appear to be concentrations of records in western Queensland and the eastern Pilbara (Higgins et al. 1999).

**Ecology:** It is listed as endangered under the *EPBC Act 1999* and as Schedule 1 under the *Wildlife Conservation Notice 2005*. Night Parrots inhabits areas where there is dense, low vegetation, which provides them shelter during the day. Most records come from hummock grasslands with spinifex (porcupine grass, *Triodia*), from areas dominated by samphire or, particularly, where these two habitats are juxtaposed. It has been suggested that birds move into the grasslands when *Triodia* is seeding. They have also been reported in low chenopod shrublands with saltbush and bluebush and from areas of Mitchell grass *Astrelba* with scattered chenopods. Many records have come from waterholes, and almost all reports from areas of *Triodia* have noted the presence of nearby water. The species is secretive and almost all confirmed sightings of feeding or drinking birds have come after dark. Sightings during the day almost always have been of birds flushed from hiding places by herds of stock, dogs or fire. Birds typically sit very tight, flushing only if the disturbance is very close, actually affecting the clump of vegetation in which it is hiding. Early observers stressed the

dependence of the parrot upon dense spinifex or samphire for daytime roosting spots and for nesting.

The Night Parrot is presumably like other arid zone birds in being markedly nomadic. The extent of the movements and the possibility of some seasonality in any part of the range are unknown. Several possible reasons have been proposed for the decline of this species in recent years including habitat loss through clearing, changes burning practices, stock and rabbit grazing, reduced availability of water holes or surrounding suitable food plants and predation from feral animals (particularly cats and foxes). The relative importance of these factors is not known.

Likelihood of occurrence: Not recorded during the current survey. Just four records of this species dating back to 1967 were yielded by the CALM Rare Fauna database search for the locality (Appendix 4). Given the age of these records, and the evidence of fox and cat activity recorded during the study, the species is considered unlikely to occur in the project area.

Pilbara Olive Python *Liasis olivaceus baroni* (Schedule 1; Vulnerable)

Distribution: Regarded as a Pilbara endemic, this subspecies has a known distribution that coincides roughly with the Pilbara bioregion (Environment Australia).

Ecology: Shows a preference for rocky habitats near water, particularly rock pools. May shelter in deep rock crevices, with a diet that includes birds, reptiles and mammals as large as rock wallabies.

Likelihood of occurrence: Suitable habitat for this species does not occur within the project area and it is not likely to be present.

Mulgara *Dasyercus cristicauda* (Schedule 1, 'Vulnerable')

Distribution: The Mulgara is a medium sized (60-120 g) carnivorous marsupial occurring in suitable habitat across the arid zone of Western Australia.

Ecology: It is listed as vulnerable under the *EPBC Act 1999* (a referral has been lodged under this legislation), and as Schedule 1 under the *Wildlife Conservation Notice 2005*. This species apparently prefers mature spinifex associations on sandy substrates. Populations are thought to contract to core habitat areas during harsh years and have also been documented as undergoing rapid expansions in response to good conditions (Woolley 1992).

Likelihood of occurrence: Pastoralists at Yanrey Station believe they may have sighted this species on the station. However there was no evidence of Mulgara activity or suitable habitat within the project area (Roy Teale, pers obs.).

Peregrine Falcon *Falco peregrinus* (Schedule 4)

Distribution: The Peregrine Falcon has an almost cosmopolitan distribution. The only subspecies in Australia (*macropus*) is widespread throughout Australia and Tasmania (Marchant and Higgins 1993). The Australian population has been estimated at 3,000 to 5,000 pairs (Cade 1982).

Ecology: This species inhabits a wide range of habitats including forest, woodlands, wetlands and open country. The availability of prey is apparently more important than habitat in determining its distribution. Home ranges are probably defended year round and are variable in size, though not typically less than 480 ha (Marchant and Higgins 1993).

This species typically nests on cliffs (81% of nests Australia-wide) but also on stick nests (11%) and in tree hollows (8%). Breeding typically occurs from August to November (Johnstone and Storr 1998). Food is almost exclusively birds such as pigeons, parrots and passerines, which are captured in flight (Johnstone and Storr 1998). Mammals such as possums and rabbits have been recorded as rare prey items (Marchant and Higgins 1993).

Likelihood of occurrence: Not recorded during the current survey. The species is not expected to be resident in the Yannarie Salt project area as no potential roosting or nesting sites were observed. It may visit the area on an occasional and transitory basis.

### 6.3.2 Priority Fauna

#### *Lerista planiventralis maryani* (Priority 1)

**Distribution:** This subspecies is only known from three specimens in the Western Australian Museum collection. Its distribution has been described as the northwest coast between Onslow and Barradale (Wilson and Swan 2003).

**Ecology:** This species forages by day in exposed sandy areas, leaving many meandering tracks (Wilson and Swan 2003).

**Likelihood of occurrence:** This species was not recorded from the study area and was not recorded by repeat seasonal sampling in similar nearby habitats (Biota 2005c, WA Museum 2005). It may still be present in the study area given the sandy dune habitat types present.

#### Little North-western Mastiff Bat *Mormopterus loriae coburgiana* (Priority 1)

**Distribution:** This species' distribution encompasses the West Australian coastal areas from Derby to Exmouth Gulf. It is an Australian endemic (Churchill 1998)

**Ecology:** This species has been found roosting in small sports and crevices in dead upper branches of the mangrove *Avicennia marina*. Individuals emerge early in the evening in groups of up to 100 individuals above the mangrove canopy, before dispersing to forage alone or in pairs. They are restricted to mangrove forests and adjacent areas. *M. loriae* prey on insects above and beside the forest canopy. They give birth to single young, which are born in the wet season (summer) (Churchill 1998).

**Likelihood of occurrence:** This species has been recorded as far south as Cape Preston (Biota and Halpern Glick Maunsell 2000), and Start and McKenzie (1992) note its presence in mangrove habitats in eastern Exmouth Gulf. It is likely that this species occurs in the mangroves of the project area.

#### Lakeland Downs Mouse *Leggadina lakedownensis* (Priority 4)

**Distribution:** Since 1997, the number of records of this species has increased substantially such that it has now been recorded from over 20 locations (Armstrong et al. in prep). A recent taxonomic revision of *Leggadina* (Cooper et al. 2003) found that despite morphological variation, *L. lakedownensis* are genetically similar across their range and the variation is insufficient to warrant subspecific status for any regional populations. In Western Australia the distribution includes the Pilbara and Kimberley regions. The have recorded this species on cracking clay communities from Cape Preston in the west to the northern flanks of the Fortescue Marshes in the east.

**Ecology:** Regional records suggest that the primary mainland habitat comprises areas of cracking clay and adjacent habitats (although this species has also been recorded from hill tops; Dr Peter Kendrick, DCLM Karratha, pers. comm. 2003). At Cape Preston this species was recorded from *Acacia xiphophylla* open shrubland over a mosaic of *Triodia wiseana* and *Eragrostis xerophila* mixed hummock and tussock grassland (Biota and Halpern Glick Maunsell 2000). At Southern Plains (near Tom Price), numerous individuals were recorded from *Acacia xiphophylla* shrubland over *Triodia longiceps* and annual grasses (Biota 2002). Along the proposed Hope downs rail alignment it was recorded from *Astrebla pectinata* tussock grassland. During the FMG stage A survey (Biota 2004) this species was recorded from *Astrebla pectinata*, *Aristida latifolia* tussock grassland on the self-mulching clays within the Chichester Range.

**Likelihood of occurrence:** This species was not recorded during the current survey and core habitat (cracking clay communities) is absent from the project area. This species was, however, recently recorded from similar habitat at Onslow, which represented the southern most coastal record for this species (Biota 2005c). Whilst the habitat at Onslow was similar to that in the study area, the species was found in native grasslands, which were absent from the current study area. Based on the available data, this species is considered unlikely to occur in the study area.



Western Pebble-mound Mouse *Pseudomys chapmani* (Priority 4)

**Distribution:** This species is common to very common in suitable habitat within the Hamersley and Chichester sub-bioregions.

**Ecology:** Well known for its behaviour of constructing extensive mounds of small stones covering areas from 0.5 - 9 m<sup>2</sup> (Strahan 1995). This mound formation is most common on spurs and gentle scree slopes with suitable size class stones.

**Likelihood of occurrence:** Suitable habitat for this species did not occur in the project area and none of its conspicuous mounds were recorded. The species is not likely to occur in the study area.

Grey Falcon *Falco hypoleucos* (Priority 4)

**Distribution:** The Grey Falcon is endemic to Australia where it is widespread but rare throughout the arid zone. Its population has been estimated at 1,000 pairs with about 5,000 individuals present post-breeding (Marchant and Higgins 1993).

**Ecology:** This species inhabits a wide range of habitats in the arid zone but appears to be least rare in lightly wooded coastal and riverine plains (Johnstone and Storr 1998). In the Pilbara, the Grey Falcon has mostly been recorded from the coastal plain between the de Grey and Ashburton Rivers (Storr 1984). Little is known of the ecology of the species but it appears to feed primarily on birds, with mammals and insects forming variably important parts of the diet depending on season and location (Marchant and Higgins 1993). The species may be either resident or nomadic but its movements are poorly understood. It breeds in trees, typically in the abandoned nests of crows and butcherbirds (Marchant and Higgins 1993). Eggs have been recorded in July and August but its breeding season is not certain.

**Likelihood of occurrence:** Not recorded from the project area during the survey, but may occur along the more coastal portions of the open coolibah woodland associated with the Yannarie River.

Star Finch (western) *Neochmia ruficauda subclaescens* (Priority 4)

**Distribution:** This species is endemic to Australia where it is found from the Pilbara to south-eastern Australia. It remains most common in the tropics. Its population has not been estimated but the species is typically patchy and highly variable in abundance.

**Ecology:** This species is typically confined to reedbeds and adjacent vegetation communities along permanent waterways in the Pilbara. It is considered to be resident in most of its range but, as with all finches, the species can wander widely. Its ecology in the Pilbara is not well known but it has been observed feeding on the seed of sedges (*Cyperus* spp.) and Buffel Grass (*Cenchrus ciliaris*) (Dr. Mike Craig, pers. obs.). In other parts of its ranges it feeds mainly on seeds but insects are a common part of the diet during the breeding season. It typically nests in March and April, as seeds are maturing after summer cyclones, and its domed nest is usually built in reeds up to several metres from the ground. The clutch is between three and six and the young usually fledge after about 16 days. In captivity, Star Finches may produce as many as three broods per year. The main threat to the species is considered to be overgrazing by stock along waterways which destroys the riparian vegetation on which they depend (Garnett and Crowley 2000).

**Likelihood of occurrence:** Not recorded during the current assessment and unlikely to occur given the lack of permanent waterways and associated reed beds.

Australian Bustard *Ardeotis australis* (Priority 4)

**Distribution:** The Australian Bustard occurs over much of Western Australia, with the exception of the more heavily wooded southern portions of the state (Johnstone and Storr 1998). Its wider distribution includes eastern Australia and New Guinea.

**Ecology:** This species prefers open or lightly wooded grassland including *Triodia* sandplains (Johnstone and Storr 1998) and is considered scarce to common depending on season and habitat. It has an omnivorous diet and occurs in a relatively broad range of habitats but appears to have some preference for grasshoppers and is often attracted to recently burnt



areas (Marchant and Higgins 1993). This species breeds from March to September and the eggs are laid on bare, preferably stony, ground (Johnstone and Storr 1998).

Likelihood of occurrence: This species occurs in the project area. It was recorded on two occasions from Hope Point (see Section 4.2.4), and is likely to occur across the study area at low densities.

## 6.4 Other Vertebrate Taxa of Interest

Several other vertebrate fauna taxa recorded during the survey are of current taxonomic interest:

- the *Diplodactylus stenodactylus* species complex is currently under review with possibly six new species occurring in the Pilbara and Carnarvon bioregions (Mr. Paul Doughty, WA Museum, pers. comm. 2005);
- *Menetia greyii* is known to be a species complex with further taxonomic work pending; and
- the *Lerista muelleri* complex has been subject to revision by Mr Laurie Smith (WAM); the individuals collected from the study appear to be of the nominal 'clarus' form of this species complex, that has previously been collected from Onslow (Biota 2005c).

## 6.5 Fauna Habitats Conservation Significance and Overall Fauna Conservation Value

At the broad scales of rangeland units and Beard's vegetation mapping, the habitat types present in the study area occur relatively widely in the locality. This includes areas on Giralia Station to the south of the project area which has recently been acquired by CALM and is being managed for conservation purposes.

Locally, the fauna habitats comprise similar units which are repeated and effectively replicated, both on the mainland (the Carnarvon dunefield) and to varying extents on each of the isolated mainland remnants on the Onslow Plain salt flat (Payne et al. 1988). The linear sand dune formations, coastal flats and clay pans are typical landscape features in this locality and these are all represented on both the mainland and the saltflat mainland remnants. This similarity in habitats is reflected in the ground fauna assemblage with most species recorded from the study area being represented in other sites locally or in the wider region (see Section 4.3.3; Section 4.4.4; Appendix 5).

The mainland remnants are generally more intact from the perspective of fire history and weed invasion (see Biota 2005b). They are also somewhat isolated from the influences of pastoral grazing pressure and feral predators present on the hinterland. Although foxes and cats were both recorded from the saltflat mainland remnants, an opportunity exists to create small fauna reserves when the field is flooded and these remnants become isolated as true islands. The value of this, and the conservation value for fauna of each mainland remnant currently, is likely to be proportional to the size of the island and the array of habitat types represented.

No threatened fauna were recorded during this survey, and a review of databases and other nearby studies suggests that few listed species are likely to occur. The habitats of the project area still have conservation value as good examples of areas supporting a faunal assemblage representative of the locality and one that is poorly reserved and under threat from various processes including grazing pressure, fire and feral predators in the remainder of the sub region (CALM 2002).



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# Appendix 1

## CALM Regulation 17 Permit to Take Protected Fauna





**DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT**

Enquiries: 17 DICK PERRY AVE, KENSINGTON, WESTERN AUSTRALIA  
 Telephone: 08 9334 0333  
 Facsimile: 08 9334 0242

Correspondence: Locked Bag 30  
 Bentley Delivery Centre WA 5983

PAGE 1  
 NO. SF004657

RECEIPT NO.      AMOUNT  
 \$0.00

**WILDLIFE CONSERVATION ACT 1950  
 REGULATION 17**

**LICENCE TO TAKE FAUNA FOR SCIENTIFIC PURPOSES**

THE UNDERMENTIONED PERSON MAY TAKE FAUNA FOR RESEARCH OR OTHER SCIENTIFIC PURPOSES AND WHERE AUTHORISED, KEEP IT IN CAPTIVITY, SUBJECT TO THE FOLLOWING AND ATTACHED CONDITIONS, WHICH MAY BE ADDED TO, SUSPENDED OR OTHERWISE VARIED AS CONSIDERED FIT.

**EXECUTIVE DIRECTOR**

**CONDITIONS**

- 1 THE LICENSEE SHALL COMPLY WITH THE PROVISIONS OF THE WILDLIFE CONSERVATION ACT AND REGULATIONS AND ANY NOTICES IN FORCE UNDER THIS ACT AND REGULATIONS.
- 2 UNLESS SPECIFICALLY AUTHORISED IN THE CONDITIONS OF THIS LICENCE OR OTHERWISE IN WRITING BY THE EXECUTIVE DIRECTOR, SPECIES OF FAUNA DECLARED AS LIKELY TO BECOME EXTINCT, RARE OR OTHERWISE IN NEED OF SPECIAL PROTECTION SHALL NOT BE CAPTURED OR OTHERWISE TAKEN.
- 3 NO FAUNA SHALL BE TAKEN FROM ANY NATURE RESERVE, WILDLIFE SANCTUARY, NATIONAL PARK, MARINE PARK, TIMBER RESERVE OR STATE FOREST WITHOUT PRIOR WRITTEN APPROVAL OF THE EXECUTIVE DIRECTOR. NO FAUNA SHALL BE TAKEN FROM ANY OTHER PUBLIC LAND WITHOUT THE WRITTEN APPROVAL OF THE GOVERNMENT AUTHORITY MANAGING THAT LAND.
- 4 NO ENTRY OR COLLECTION OF FAUNA TO BE UNDERTAKEN ON ANY PRIVATE PROPERTY OR PASTORAL LEASE WITHOUT THE CONSENT IN WRITING OF THE OWNER OR OCCUPIER, OR FROM ANY ABORIGINAL RESERVE WITHOUT THE WRITTEN APPROVAL OF THE DEPARTMENT OF INDIGENOUS AFFAIRS.
- 5 NO FAUNA OR THEIR PROPERTY SHALL BE RELEASED IN ANY AREA WHERE IT DOES NOT NATURALLY OCCUR, NOR HANDED OVER TO ANY OTHER PERSON OR AUTHORITY UNLESS APPROVED BY THE EXECUTIVE DIRECTOR. NOR SHALL THE REMAINS OF SUCH FAUNA BE DISPOSED OF IN SUCH MANNER AS TO CONFUSE THE NATURAL OR PRESENT DAY DISTRIBUTION OF THE SPECIES.
- 6 THIS LICENCE AND THE WRITTEN PERMISSION REFERRED TO IN CONDITIONS 3 & 4 MUST BE CARRIED BY THE LICENSEE OR AUTHORISED AGENT AT ALL TIMES FOR THE PURPOSE OF PROVING THEIR AUTHORITY TO TAKE FAUNA WHEN QUESTIONED AS TO THEIR RIGHT TO DO SO BY A WILDLIFE OFFICER, ANY OTHER STATE OR LOCAL GOVERNMENT EMPLOYEE OR ANY MEMBER OF THE PUBLIC.
- 7 \*\*\*\*\*ANY INTERACTION INVOLVING GAZETTED THREATENED FAUNA THAT MAY BE HARMFUL AND/OR INVASIVE MAY REQUIRE APPROVAL FROM THE COMMONWEALTH GOVERNMENT DEPARTMENT OF ENVIRONMENTAL AUSTRALIA, PHONE 02 6274 1111. INTERACTION WITH SUCH SPECIES IS CONTROLLED BY THE COMMONWEALTH GOVERNMENT'S ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 & ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION REGULATIONS 2000 AS WELL AS CALM'S WILDLIFE CONSERVATION ACT & REGULATIONS \*\*\*\*\*
- 8 NO DIOPROSPECTING INVOLVING THE REMOVAL OF SAMPLE AQUATIC AND TERRESTRIAL ORGANISMS (BOTH FLORA AND FAUNA) FOR CHEMICAL EXTRACTION AND BIOACTIVITY SCREENING IS PERMITTED TO BE CONDUCTED WITHOUT SPECIFIC WRITTEN APPROVAL BY THE EXECUTIVE DIRECTOR OF C.A.L.M.
- 9 FURTHER CONDITIONS (NUMBERED 1 TO 10) ARE ATTACHED.

**PURPOSE**

**AUTHORISED PERSONS**

STRAITS SALT FIELD PROPOSAL (EASTERN EXMOUTH GULF) ENVIRONMENTAL IMPACT ASSESSMENT FAUNA SURVEY.

MR ROY TEALE, DR MIKE CRAIG, MR GREG HAROLD, MS ZOE HAMILTON.







## Appendix 2

### Results from WA Museum Database Search



Reptiles collected between -21.75, 113.83  
and -22.83, 114.98

Agamidae

*Ctenophorus clayi*  
*Ctenophorus femoralis*  
*Ctenophorus isolepis gularis*  
*Ctenophorus isolepis isolepis*  
*Ctenophorus nuchalis*  
*Ctenophorus reticulatus*  
*Ctenophorus rubens*  
*Diporiphora winneckeii*  
*Lophognathus gilberti gilberti*  
*Lophognathus longirostris*  
*Moloch horridus*  
*Pogona minor minor*  
*Rankinia parviceps parviceps*

Boidae

*Antaresia perthensis*  
*Antaresia stimsoni stimsoni*  
*Aspidites melanocephalus*

Cheloniidae

*Chelonia mydas*  
*Eretmochelys imbricata bissa*

Elapidae

*Acanthophis wellsi*  
*Acanthophis wellsi/pyrrhus*  
*Aipysurus apraefrontalis*  
*Aipysurus duboisii*  
*Aipysurus eydouxii*  
*Aipysurus laevis*  
*Brachyuropsis approximans*  
*Demansia calodera*  
*Demansia psammophis cupreiceps*  
*Disteira major*  
*Disteira stokesii*  
*Ephalophis greyae*  
*Furina ornata*  
*Hydrophis elegans*  
*Hydrophis ocellatus*  
*Hydrophis ornatus*  
*Neelaps bimaculatus*  
*Pseudechis australis*  
*Pseudonaja modesta*  
*Pseudonaja nuchalis*  
*Simoselaps anomalus*  
*Simoselaps bertholdi*  
*Simoselaps littoralis*  
*Suta fasciata*

Gekkonidae

*Crenadactylus ocellatus*  
*Crenadactylus ocellatus horni*  
*Diplodactylus conspicillatus*  
*Diplodactylus klugei*  
*Diplodactylus mitchelli*

*Diplodactylus ornatus*  
*Diplodactylus pulcher*  
*Diplodactylus squarrosus*  
*Diplodactylus stenodactylus*  
*Gehyra pilbara*  
*Gehyra punctata*  
*Gehyra sp*  
*Gehyra variegata*  
*Heteronotia binoei*  
*Nephrurus levis*  
*Nephrurus levis occidentalis*  
*Rhynchoedura ornata*  
*Strophurus ciliaris aberrans*  
*Strophurus elderi*  
*Strophurus jeanae*  
*Strophurus rankini*  
*Strophurus strophurus*

Pygopodidae

*Aprasia fusca*  
*Aprasia sp*  
*Delma australis*  
*Delma nasuta*  
*Delma pax*  
*Delma sp\_1*  
*Delma tinctoria*  
*Lialis burtonis*  
*Pygopus nigriceps*

Scincidae

*Carlia munda*  
*Cryptoblepharus carnabyi*  
*Cryptoblepharus plagiocephalus*  
*Cryptoblepharus sp*  
*Ctenotus duricola*  
*Ctenotus grandis titan*  
*Ctenotus hanloni*  
*Ctenotus helenae*  
*Ctenotus iapetus*  
*Ctenotus maryani*  
*Ctenotus pantherinus ocellifer*  
*Ctenotus rufescens*  
*Ctenotus saxatilis*  
*Ctenotus schomburgkii*  
*Ctenotus serventyi*  
*Cyclodomorphus melanops melanops*  
*Cyclodomorphus sp*  
*Eremiascincus fasciolatus*  
*Eremiascincus richardsonii*  
*Glaphyromorphus isolepis*  
*Lerista allochira*  
*Lerista bipes*  
*Lerista elegans*  
*Lerista lineopunctulata*  
*Lerista macropisthopus fusciceps*  
*Lerista Muellieri*  
*Lerista onsloviana*  
*Lerista petersoni*  
*Lerista planiventralis*

<i>Lerista planiventralis maryani</i>	<i>Sminthopsis macroura</i>
<i>Lerista planiventralis planiventralis</i>	<i>Sminthopsis youngsoni</i>
<i>Lerista praepedita</i>	
<i>Lerista uniduo</i>	Delphinidae
<i>Menetia greyii</i>	<i>Pseudorca crassidens</i>
<i>Menetia surda</i>	
<i>Morethia lineoocellata</i>	Dugongidae
<i>Morethia ruficauda exquisite</i>	<i>Dugong dugon</i>
<i>Notoscincus ornatus ornatus</i>	
<i>Tiliqua multifasciata</i>	Emballonuridae
<i>Tiliqua rugosa rugosa</i>	<i>Taphozous georgianus</i>
Typhlopidae	Macropodidae
<i>Ramphotyphlops ammodytes</i>	<i>Macropus robustus erubescens</i>
<i>Ramphotyphlops grypus</i>	<i>Macropus rufus</i>
<i>Ramphotyphlops hamatus</i>	<i>Macropus sp</i>
<i>Ramphotyphlops sp</i>	<i>Petrogale lateralis lateralis</i>
<i>Ramphotyphlops splendidus</i>	
Varanidae	Molossidae
<i>Varanus acanthurus</i>	<i>Chaerephon jobensis</i>
<i>Varanus brevicauda</i>	<i>Mormopterus beccarii</i>
<i>Varanus eremius</i>	<i>Tadarida australis</i>
<i>Varanus giganteus</i>	
<i>Varanus gouldii</i>	Muridae
<i>Varanus panoptes rubidus</i>	<i>Mus musculus</i>
<i>Varanus tristis</i>	<i>Notomys alexis</i>
<i>Varanus tristis tristis</i>	<i>Pseudomys delicatulus</i>
	<i>Pseudomys hermannsburgensis</i>
	<i>Rattus rattus</i>
	<i>Rattus tunneyi</i>
Amphibia collected between -21.75, 113.83 and -22.83, 114.98	Phocidae
	<i>Mirounga leonina</i>
Hylidae	Pteropodidae
<i>Cyclorana maini</i>	<i>Pteropus scapulatus</i>
<i>Litoria rubella</i>	
Myobatrachidae	Vespertilionidae
<i>Neobatrachus fulvus</i>	<i>Chalinolobus gouldii</i>
<i>Neobatrachus sp</i>	<i>Nyctophilus geoffroyi</i>
<i>Neobatrachus sutor</i>	<i>Scotorepens greyii</i>
<i>Notaden nichollsi</i>	<i>Vespadelus finlaysoni</i>
<i>Pseudophryne douglasi</i>	
Mammals collected between -21.75, 113.83 and -22.83, 114.98	Birds collected between -21.75, 113.83 and -22.83, 114.98
Balaenidae	Acanthizidae
<i>Eubalaena australis</i>	<i>Calamanthus campestris</i>
	<i>Calamanthus campestris campestris</i>
	<i>Gerygone tenebrosa</i>
Canidae	Accipitridae
<i>Vulpes vulpes</i>	<i>Accipiter fasciatus fasciatus</i>
	<i>Haliaeetus leucogaster</i>
Dasyuridae	Aegothelidae
<i>Dasykaluta rosamondae</i>	<i>Aegotheles cristatus cristatus</i>
<i>Ningaii sp</i>	
<i>Ningaii timealeyi</i>	
<i>Planigale sp</i>	
<i>Pseudantechinus roryi</i>	

Ardeidae	<i>Stipiturus ruficeps</i>
<i>Ardea sacra sacra</i>	<i>Stipiturus ruficeps ruficeps</i>
<i>Butorides striatus stagnatilis</i>	
Artamidae	Meliphagidae
<i>Artamus cinereus</i>	<i>Acanthagenys rufogularis</i>
<i>Artamus cinereus melanops</i>	<i>Lichenostomus keartlandi</i>
<i>Artamus leucorynchus leucopygialis</i>	<i>Lichenostomus penicillatus</i>
<i>Artamus minor</i>	<i>Lichenostomus virescens</i>
<i>Artamus personatus</i>	<i>Lichmera indistincta indistincta</i>
Campephagidae	Meropidae
<i>Coracina novaehollandiae</i>	<i>Merops ornatus</i>
<i>novae hollandiae</i>	
<i>Coracina novaehollandiae subpallida</i>	Motacillidae
	<i>Anthus australis australis</i>
Charadriidae	Pachycephalidae
<i>Charadrius mongolus mongolus</i>	<i>Colluricincla harmonica kolichisi</i>
<i>Charadrius ruficapillus</i>	<i>Colluricincla harmonica rufiventris</i>
	<i>Oreoica gutturalis</i>
Columbidae	<i>Pachycephala lanioides</i>
<i>Geopelia cuneata</i>	<i>Pachycephala melanura melanura</i>
<i>Geophaps plumifera</i>	
<i>Geophaps plumifera ferruginea</i>	Petroicidae
<i>Ocyphaps lophotes</i>	<i>Eopsaltria pulverulenta</i>
	<i>Petroica cucullate</i>
Corvidae	Podargidae
<i>Corvus bennetti</i>	<i>Podargus strigoides brachypterus</i>
Cracticidae	Pomatostomidae
<i>Cracticus nigrogularis</i>	<i>Pomatostomus temporalis rubeculus</i>
<i>Cracticus tibicen longirostris</i>	
<i>Cracticus torquatus</i>	Procellariidae
	<i>Pterodroma mollis</i>
Cuculidae	<i>Puffinus assimilis assimilis</i>
<i>Chrysococcyx basalis</i>	
Dicaeidae	Psittacidae
<i>Dicaeum hirundinaceum hirundinaceum</i>	<i>Cacatua sanguinea westralensis</i>
	<i>Nymphicus hollandicus</i>
Dicruridae	<i>Platycercus varius</i>
<i>Rhipidura fuliginosa preissi</i>	<i>Platycercus zonarius zonarius</i>
<i>Rhipidura leucophrys leucophrys</i>	
<i>Rhipidura phasiana</i>	Ptilonorhynchidae
	<i>Ptilonorhynchus maculatus guttatus</i>
Haematopodidae	Rallidae
<i>Haematopus longirostris</i>	<i>Gallirallus philippensis mellori</i>
Halcyonidae	Scolopacidae
<i>Dacelo leachii leachii</i>	<i>Limosa lapponica menzbieri</i>
<i>Todiramphus chloris pilbara</i>	
<i>Todiramphus sanctus sanctus</i>	Sylviidae
	<i>Cincloramphus cruralis</i>
Laridae	<i>Eremiornis carteri</i>
<i>Larus novaehollandiae novaehollandiae</i>	Zosteropidae
<i>Sterna bengalensis</i>	<i>Zosterops luteus</i>
<i>Sterna bergii</i>	<i>Zosterops luteus balstoni</i>
Maluridae	
<i>Malurus leucopterus leuconotus</i>	



## Appendix 3

### Results from CALM Rare Fauna Database Search





Your Ref:  
Our Ref:  
Enquiries: 2001F001096V08  
Phone: Christine Freegard  
Fax: (08) 9334 0579  
Email: (08) 9334 0278  
christinef@calm.wa.gov.au



Mr Lee Mould  
Biota Environmental Sciences Pty Ltd  
2/186 Scarborough Beach Rd  
MT HAWTHORN WA 6016

Dear Mr Mould

#### REQUEST FOR THREATENED FAUNA INFORMATION

I refer to your request of 26 May for information on threatened fauna east of Exmouth Gulf, South of Tubridgi Point and North of Giralia Bay.

A search was undertaken for this area of the Department's Threatened Fauna database, which includes species which are declared as '*Rare or likely to become extinct* (Schedule 1)', '*Birds protected under an international agreement* (Schedule 3)', and '*Other specially protected fauna* (Schedule 4)'. Attached are print outs from these databases where records were found.

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the sixth point that refers to the requirement to undertake field investigations for the accurate determination of threatened fauna occurrence at a site. The information supplied should be regarded as an indication only of the threatened fauna that may be present.

An invoice for \$150.00 (plus GST), being the set charge for the supply of this information, will be forwarded.

It would be appreciated if any populations of threatened fauna encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss threatened fauna management, please contact my Senior Zoologist, Dr Peter Mawson on 08 93340421.

Yours sincerely

A handwritten signature in blue ink that reads "freegard".

.....  
for Keiran McNamara  
EXECUTIVE DIRECTOR

3 June, 2004

WILDLIFE BRANCH: 17 Dick Perry Avenue, Technology Park, Kensington, Western Australia 6151  
Phone: (08) 9334 0455 Fax: (08) 9334 0278 Website: [www.naturebase.net](http://www.naturebase.net)  
Postal Address: Locked Bag 104, Bentley Delivery Centre, Bentley, Western Australia 6983

## Threatened and Priority Fauna Database

Page 1 of 2

21.3766°S 114.19°E / 22.948°S 116.116°E E of Exmouth Gulf, S of Tubridgi Pt &amp; N of Giralia Bay

\* *Date* *Certainty* *Seen* *Location Name* *Method***Schedule 1 - Fauna that is rare or is likely to become extinct*****Macrotis lagotis*** **Bilby** *1 records*

This species shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.

1972 3

***Rhinonicteris aurantius*** **Orange Leaf-nosed Bat** *1 records*

This species of bat occurs in a few scattered locations in the Pilbara, as well as the Kimberley. It roosts in caves and is sensitive to human disturbance.

1925 1 Red Hill

***Pezoporus occidentalis*** **Night Parrot** *4 records*This nocturnal species is known to inhabit treeless or sparsely wooded spinifex (*Triodia* spp) near water.1967 2 Duck Creek  
1967 2 Yarraloola  
1967 2 5 Giralia  
1967 2 5 Yanrey***Morelia olivacea barroni*** **Pilbara Olive Python** *1 records*

This python occurs in a wide range of habitats but especially in rocky hills and ranges and near water.

1

***Caretta caretta*** **Loggerhead Turtle** *3 records*

This species of marine turtle has been recorded at numerous locations along the WA coast.

1987 1 8  
1988 1 1 Muiron Islands Nature Reserve  
1994 1 250 Muiron Islands Nature Reserve***Dermochelys coriacea*** **Leathery Turtle (Luth)** *1 records*

This species of marine turtle has been recorded at numerous locations along the WA coast.

1991 1 1

**Schedule 4 - Other specially protected fauna*****Falco peregrinus*** **Peregrine Falcon** *0 records*

This species is uncommon and prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land. It may occur in the area in question.

**Priority One*****Lerista planiventralis maryani*** ***Lerista planiventralis maryani*** *1 records*

1990 1 1 Caught or trapped

**Priority Two**

Thursday, 3 June 2004

Department of Conservation and Land Management



## Threatened and Priority Fauna Database

Page 2 of 2

21.3766°S 114.19°E / 22.948°S 116.116°E E of Exmouth Gulf, S of Tubridgi Pt &amp; N of Giralia Bay

* Date	Certainty	Seen	Location Name	Method
0 records				

## Priority Three

0 records

## Priority Four

***Leggadina lakedownensis*** **Lakeland Downs Mouse (Kerakenga)** 3 records

This secretive species is known to occur in the Pilbara and the Kimberley. Its populations rise and fall dramatically, probably in response to climatic fluctuations and availability of seeds.

1996	1	435	Thevenard Island Nature Reserve	Caught or trapped
1996	1	65	Serrurier Island Nature Reserve	Released
2000	1	32	Serrurier Island Nature Reserve	Caught or trapped

***Pseudomys chapmani*** **Western Pebble-mound Mouse (Ngadji)** 3 records

This species is well-known for the characteristic pebble-mounds which it constructs over underground burrow systems. These mounds are most common on spurs and lower slopes of rocky hills.

1994	1		Mardie Stn	
1994	1		Parry Range	
1996	2	0	Cane River	

***Falco hypoleucos*** **Grey Falcon** 1 records

A nomadic species inhabiting lightly timbered riverine plains.

1995	1	3		Day sighting
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***Numenius madagascariensis*** **Eastern Curlew** 1 records

This species is a migratory visitor and has been observed on reef flats and sandy beaches along the West Australian coast and in coastal estuaries.

1966	1	6	Onslow	Day sighting
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***Neochima ruficauda subclaescens*** **Star Finch (western)** 1 records

A nomadic species inhabiting grasslands and eucalypt woodlands near water.

2002	1	5	Yarraloola	Caught or trapped
------	---	---	------------	-------------------

\* Information relating to any records provided for listed species:-

Date: date of recorded observation

Certainty (of correct species identification): 1=Very certain; 2=Moderately certain; and 3=Not sure.

Seen: Number of individuals observed.

Location Name: Name of reserve or nearest locality where observation was made

Method: Method or type of observation

Thursday, 3 June 2004

Department of Conservation and Land Management







## Appendix 4

### Specimens Lodged with the WA Museum



Date	Site	Species Name	Sex	Method	Museum Number
18/08/2004	SSGH01	<i>Ephalophis grayae</i>		Hand Captured	R
17/08/2004	SS15	<i>Heteronotia binoei</i>		Hand Captured	R
17/08/2004	SS19B	<i>Lerista onsloviana</i>		Hand Captured	R
19/08/2004	SS16	<i>Ctenotus hanloni</i>		Pitfall Trap - Bucket	R
18/08/2004	SSGH01	<i>Ephalophis grayae</i>		Hand Captured	R
17/08/2004	SS03	<i>Menetia greyii</i>		Pitfall Trap - Bucket	R157163
17/08/2004	SS17	<i>Menetia greyii</i>		Hand Captured	R157164
17/08/2004	SS01	<i>Ctenophorus femoralis</i>		Pitfall Trap - PVC	R157165
17/08/2004	SS01	<i>Ctenophorus femoralis</i>		Pitfall Trap - Bucket	R157166
17/08/2004	SS18	<i>Heteronotia binoei</i>		Pitfall Trap - Bucket	R157167
17/08/2004	SS17	<i>Menetia greyii</i>		Pitfall Trap - PVC	R157168
17/08/2004	SS18	<i>Ctenotus pantherinus ocellifer</i>		Pitfall Trap - Bucket	R157169
17/08/2004	SS17	<i>Menetia greyii</i>		Pitfall Trap - Bucket	R157170
17/08/2004	SS16	<i>Menetia greyii</i>		Pitfall Trap - Bucket	R157171
17/08/2004	SS16	<i>Ctenotus iapetus</i>		Pitfall Trap - Bucket	R157172
17/08/2004	SS01	<i>Ctenophorus femoralis</i>		Pitfall Trap - Bucket	R157173
17/08/2004	SS18	<i>Ctenophorus rubens</i>		Pitfall Trap - Bucket	R157174
17/08/2004	SS04	<i>Lerista onsloviana</i>		Pitfall Trap - Bucket	R157175
17/08/2004	SS04	<i>Lerista bipes</i>		Pitfall Trap - Bucket	R157176
17/08/2004	SS01	<i>Ctenophorus femoralis</i>		Pitfall Trap - Bucket	R157177
17/08/2004	SS01	<i>Ctenophorus femoralis</i>		Pitfall Trap - Bucket	R157178
17/08/2004	SS01	<i>Ctenophorus femoralis</i>		Pitfall Trap - Bucket	R157179
17/08/2004	SS01	<i>Ctenophorus femoralis</i>		Pitfall Trap - Bucket	R157180
17/08/2004	SS18	<i>Lialis burtonis</i>		Pitfall Trap - PVC	R157181
17/08/2004	SS16	<i>Ctenotus saxatilis</i>		Pitfall Trap - Bucket	R157182
17/08/2004	SS16	<i>Ctenotus hanloni</i>		Pitfall Trap - Bucket	R157183
17/08/2004	SS16	<i>Ctenophorus nuchalis</i>		Observation	R157184
18/08/2004	SS14	<i>Heteronotia binoei</i>	Female	Pitfall Trap - Bucket	R157185
18/08/2004	SS08	<i>Ctenophorus femoralis</i>		Pitfall Trap - Bucket	R157186
18/08/2004	SS18	<i>Ctenotus pantherinus ocellifer</i>		Pitfall Trap - PVC	R157188
17/08/2004	SS15	<i>Lerista onsloviana</i>		Hand Captured	R157189
18/08/2004	SS10	<i>Diplodactylus stenodactylus</i>		Pitfall Trap - Bucket	R157189
17/08/2004	SS15	<i>Glaphyromorphus isolepis</i>		Hand Captured	R157190
18/08/2004	SS16	<i>Lerista onsloviana</i>		Pitfall Trap - PVC	R157191
17/08/2004	SS15	<i>Heteronotia binoei</i>		Hand Captured	R157192
17/08/2004	SS15	<i>Lerista bipes</i>		Hand Captured	R157193
18/08/2004	SS18	<i>Heteronotia binoei</i>		Pitfall Trap - PVC	R157194
18/08/2004	SS17	<i>Menetia greyii</i>		Pitfall Trap - PVC	R157195
18/08/2004	SS17	<i>Menetia greyii</i>		Pitfall Trap - PVC	R157196
18/08/2004	SS17	<i>Menetia greyii</i>		Pitfall Trap - PVC	R157197
18/08/2004	SS04	<i>Heteronotia binoei</i>		Pitfall Trap - PVC	R157198
18/08/2004	SS04	<i>Heteronotia binoei</i>		Pitfall Trap - PVC	R157199
18/08/2004	SS10	<i>Menetia greyii</i>		Hand Captured	R157200
18/08/2004	SS16	<i>Ctenotus hanloni</i>		Pitfall Trap - Bucket	R157201
18/08/2004	SS05	<i>Ctenotus saxatilis</i>		Pitfall Trap - PVC	R157202
17/08/2004	SSGH02	<i>Ctenotus saxatilis</i>	Female	Hand Captured	R157203
17/08/2004	SSGH02	<i>Heteronotia binoei</i>	Female	Hand Captured	R157204
18/08/2004	SS04	<i>Ctenotus iapetus</i>		Pitfall Trap - PVC	R157205
18/08/2004	SS17	<i>Ctenophorus rubens</i>		Pitfall Trap - Bucket	R157206
18/08/2004	SS05	<i>Ctenotus saxatilis</i>		Pitfall Trap - Bucket	R157207

17/08/2004	SS14	<i>Menetia greyii</i>		Hand Captured	R157208
18/08/2004	SS04	<i>Heteronotia binoei</i>		Pitfall Trap - Bucket	R157209
17/08/2004	SSGH02	<i>Menetia greyii</i>	Male	Hand Captured	R157210
17/08/2004	SSGH02	<i>Lerista bipes</i>		Hand Captured	R157211
17/08/2004	SS19B	<i>Lerista onsloviana</i>		Hand Captured	R157212
17/08/2004	SSGH02	<i>Lerista bipes</i>		Hand Captured	R157213
17/08/2004	SS19A	<i>Lerista onsloviana</i>		Hand Captured	R157214
17/08/2004	SSGH02	<i>Menetia greyii</i>		Hand Captured	R157215
17/08/2004	SSGH02	<i>Heteronotia binoei</i>		Hand Captured	R157216
17/08/2004	SSGH02	<i>Heteronotia binoei</i>	Male	Hand Captured	R157217
17/08/2004	SSGH02	<i>Heteronotia binoei</i>	Male	Hand Captured	R157218
17/08/2004	SSGH02	<i>Lerista bipes</i>		Hand Captured	R157219
17/08/2004	SSGH02	<i>Glaphyromorphus isolepis</i>		Hand Captured	R157220
17/08/2004	SSGH02	<i>Heteronotia binoei</i>	Female	Hand Captured	R157221
18/08/2004	SS18	<i>Ctenotus pantherinus ocellifer</i>		Pitfall Trap - Bucket	R157222
18/08/2004	SS17	<i>Lerista bipes</i>		Pitfall Trap - Bucket	R157225
18/08/2004	SS17	<i>Lerista bipes</i>		Pitfall Trap - Bucket	R157226
17/08/2004	SS17	<i>Neobatrachus</i>		Pitfall Trap - Bucket	R157227
18/08/2004	SS08	<i>Notaden nichollsi</i>		Pitfall Trap - PVC	R157228
18/08/2004	SS17	<i>Lialis burtonis</i>		Pitfall Trap - PVC	R157229
19/08/2004	SS03	<i>Ctenotus iapetus</i>		Pitfall Trap - Bucket	R157230
19/08/2004	SS03	<i>Lerista clarus</i>		Pitfall Trap - Bucket	R157231
19/08/2004	SS18	<i>Ctenotus iapetus</i>	Female	Pitfall Trap - Bucket	R157232
19/08/2004	SS08	<i>Ctenophorus femoralis</i>	Female	Pitfall Trap - PVC	R157233
19/08/2004	SS12	<i>Lerista bipes</i>		Pitfall Trap - Bucket	R157234
19/08/2004	SS12	<i>Gehyra variegata</i>		Pitfall Trap - Bucket	R157235
19/08/2004	SS12	<i>Ctenotus saxatilis</i>		Pitfall Trap - PVC	R157236
19/08/2004	SS11	<i>Lerista bipes</i>		Pitfall Trap - PVC	R157237
19/08/2004	SS11	<i>Lialis burtonis</i>		Pitfall Trap - PVC	R157238
19/08/2004	SS13	<i>Ctenotus hanloni</i>		Pitfall Trap - Bucket	R157239
19/08/2004	SS08	<i>Ctenophorus femoralis</i>	Male	Pitfall Trap - PVC	R157240
19/08/2004	SS08	<i>Ctenophorus femoralis</i>	Male	Pitfall Trap - PVC	R157241
19/08/2004	SS07	<i>Menetia greyii</i>		Pitfall Trap - Bucket	R157242
19/08/2004	SS07	<i>Menetia greyii</i>	Female	Pitfall Trap - Bucket	R157243
19/08/2004	SS07	<i>Menetia greyii</i>	Female	Pitfall Trap - Bucket	R157244
19/08/2004	SS03	<i>Lerista clarus</i>		Pitfall Trap - Bucket	R157246
19/08/2004	SS12	<i>Gehyra variegata</i>	Female	Pitfall Trap - PVC	R157247
19/08/2004	SS12	<i>Ctenotus hanloni</i>		Pitfall Trap - Bucket	R157248
19/08/2004	SS17	<i>Heteronotia binoei</i>	Unknown	Pitfall Trap - Bucket	R157249
19/08/2004	SS11	<i>Menetia greyii</i>	Male	Pitfall Trap - Bucket	R157250
19/08/2004	SS11	<i>Strophurus strophurus</i>	Male	Pitfall Trap - Bucket	R157251
19/08/2004	SS05	<i>Lerista clarus</i>	Male	Pitfall Trap - PVC	R157252
19/08/2004	SS01	<i>Ctenophorus rubens</i>		Pitfall Trap - PVC	R157253
19/08/2004	SS03	<i>Ctenophorus nuchalis</i>		Pitfall Trap - Bucket	R157254
19/08/2004	SS17	<i>Lialis burtonis</i>	Unknown	Pitfall Trap - PVC	R157255
19/08/2004	SS16	<i>Lerista bipes</i>		Hand Captured	R157256
19/08/2004	SS07	<i>Menetia greyii</i>	Male	Pitfall Trap - Bucket	R157257
19/08/2004	SS04	<i>Lerista bipes</i>		Pitfall Trap - Bucket	R157258
19/08/2004	SS07	<i>Heteronotia binoei</i>	Male	Pitfall Trap - Bucket	R157259
19/08/2004	SS16	<i>Lerista bipes</i>		Pitfall Trap - Bucket	R157260
19/08/2004	SS17	<i>Ctenophorus rubens</i>	Unknown	Pitfall Trap - PVC	R157261
19/08/2004	SS16	<i>Menetia greyii</i>		Pitfall Trap - Bucket	R157262
19/08/2004	SS19	<i>Menetia greyii</i>		Pitfall Trap - Bucket	R157263

18/08/2004	SS10	<i>Diporiphora winneckeii</i>		Pitfall Trap - Bucket	R157264
19/08/2004	SS10	<i>Lerista onsloviana</i>		Pitfall Trap - PVC	R157265
18/08/2004	SS13	<i>Delma haroldi</i>		Pitfall Trap - PVC	R157266
19/08/2004	SS10	<i>Lerista bipes</i>		Pitfall Trap - PVC	R157267
19/08/2004	SS10	<i>Lerista bipes</i>		Pitfall Trap - Bucket	R157268
20/08/2004	SS02	<i>Ctenophorus nuchalis</i>	Unknown	Pitfall Trap - Bucket	R157269
18/08/2004	SS18	<i>Eremiascincus fasciolatus</i>		Pitfall Trap - PVC	R157270
20/08/2004	SS03	<i>Ctenophorus rubens</i>	Unknown	Pitfall Trap - Bucket	R157271
20/08/2004	SS11	<i>Strophurus strophurus</i>	Male	Pitfall Trap - Bucket	R157272
19/08/2004	SS02	<i>Diplodactylus stenodactylus</i>	Male	Pitfall Trap - Bucket	R157273
20/08/2004	SS11	<i>Lialis burtonis</i>		Pitfall Trap - PVC	R157274
20/08/2004	SS06	<i>Diplodactylus conspicillatus</i>		Pitfall Trap - Bucket	R157275
20/08/2004	SS03	<i>Diplodactylus conspicillatus</i>	Unknown	Pitfall Trap - Bucket	R157276
20/08/2004	SS11	<i>Ctenotus iapetus</i>	Female	Pitfall Trap - PVC	R157277
19/08/2004	SS11	<i>Lerista elegans</i>		Pitfall Trap - Bucket	R157278
19/08/2004	SS04	<i>Ctenotus iapetus</i>	Male	Pitfall Trap - Bucket	R157279
19/08/2004	SS04	<i>Ctenotus saxatilis</i>	Female	Pitfall Trap - Bucket	R157280
19/08/2004	SS08	<i>Ctenophorus femoralis</i>	Male	Pitfall Trap - Bucket	R157281
20/08/2004	SS08	<i>Varanus eremius</i>		Pitfall Trap - Bucket	R157282
20/08/2004	SS01	<i>Eremiascincus fasciolatus</i>	Unknown	Pitfall Trap - Bucket	R157283
19/08/2004	SS04	<i>Heteronotia binoei</i>	Female	Pitfall Trap - PVC	R157284
20/08/2004	SS03	<i>Gehyra pilbara</i>	Unknown	Hand Captured	R157285
19/08/2004	SS19	<i>Menetia greyii</i>	Male	Pitfall Trap - PVC	R157286
20/08/2004	SS03	<i>Gehyra pilbara</i>	Unknown	Hand Captured	R157287
18/08/2004	SS04	<i>Lerista elegans</i>		Pitfall Trap - Bucket	R157288
20/08/2004	SS10	<i>Lerista onsloviana</i>	Male	Pitfall Trap - Bucket	R157289
20/08/2004	SS16	<i>Notoscincus ornatus ornatus</i>		Hand Captured	R157290
18/08/2004	SS03	<i>Ramphotyphlops grypus</i>		Pitfall Trap - Bucket	R157291
19/08/2004	SS01	<i>Ctenophorus nuchalis</i>		Pitfall Trap - PVC	R157292
19/08/2004	SS06	<i>Menetia greyii</i>		Pitfall Trap - PVC	R157293
19/08/2004	SS08	<i>Lerista muelleri</i>	Male	Pitfall Trap - PVC	R157294
19/08/2004	SS20	<i>Menetia greyii</i>		Pitfall Trap - Bucket	R157295
18/08/2004	SS10	<i>Diporiphora winneckeii</i>		Pitfall Trap - PVC	R157296
18/08/2004	SS12	<i>Ramphotyphlops grypus</i>		Pitfall Trap - Bucket	R157297
20/08/2004	SS10	<i>Neobatrachus fulvus</i>		Pitfall Trap - PVC	R157298
19/08/2004	SS14	<i>Varanus gouldii</i>		Pitfall Trap - PVC	R157299
18/08/2004	SS17	<i>Menetia greyii</i>		Pitfall Trap - Bucket	R157300
20/08/2004	SS05	<i>Neobatrachus fulvus</i>	Unknown	Pitfall Trap - Bucket	R157301
20/08/2004	SS12	<i>Diplodactylus conspicillatus</i>	Unknown	Pitfall Trap - Bucket	R157302
21/08/2004	Opportunistic	<i>Pseudonaja modesta</i>	Unknown	Hand Captured	R157303
21/08/2004	SS13	<i>Notoscincus ornatus ornatus</i>	Unknown	Pitfall Trap - Bucket	R157304
21/08/2004	SS04	<i>Ctenotus iapetus</i>	Unknown	Pitfall Trap - PVC	R157305
21/08/2004	SS01	<i>Nephruus levis occidentalis</i>	Unknown	Pitfall Trap - PVC	R157305
21/08/2004	SS02	<i>Pseudonaja modesta</i>	Unknown	Carcass	R157306
21/08/2004	SS12	<i>Menetia greyii</i>	Unknown	Pitfall Trap - Bucket	R157307
21/08/2004	SS19	<i>Menetia greyii</i>	Unknown	Pitfall Trap - Bucket	R157308
21/08/2004	SS16	<i>Notoscincus ornatus ornatus</i>	Unknown	Pitfall Trap - PVC	R157310
21/08/2004	SS20	<i>Delma haroldi</i>	Unknown	Pitfall Trap - PVC	R157311
20/08/2004	SS18	<i>Menetia greyii</i>	Unknown	Pitfall Trap - PVC	R157312
20/08/2004	SS08	<i>Ctenophorus femoralis</i>		Pitfall Trap - PVC	R157313
21/08/2004	SS02	<i>Ctenotus rufescens</i>	Unknown	Pitfall Trap - Bucket	R157314
21/08/2004	SS13	<i>Delma haroldi</i>	Unknown	Pitfall Trap - Bucket	R157315
21/08/2004	SS03	<i>Lerista clarus</i>	Unknown	Pitfall Trap - PVC	R157316

21/08/2004	SS07	<i>Menetia greyii</i>	Unknown	Pitfall Trap - PVC	R157317
21/08/2004	SS07	<i>Menetia greyii</i>	Unknown	Pitfall Trap - PVC	R157318
21/08/2004	SS12	<i>Menetia greyii</i>	Unknown	Pitfall Trap - Bucket	R157319
21/08/2004	SS08	<i>Menetia greyii</i>	Unknown	Pitfall Trap - Bucket	R157320
20/08/2004	SS18	<i>Heteronotia binoei</i>		Pitfall Trap - Bucket	R157321
22/08/2004	Opportunistic	<i>Lerista onsloviana</i>	Unknown	Hand Captured	R157322
22/08/2004	SS01	<i>Ctenotus rufescens</i>	Unknown	Pitfall Trap - PVC	R157323
19/08/2004	SS01	<i>Ctenophorus femoralis</i>		Pitfall Trap - PVC	R157324
19/08/2004	SS16	<i>Gehyra variegata</i>		Pitfall Trap - PVC	R157325
19/08/2004	SS16	<i>Lerista elegans</i>		Pitfall Trap - PVC	R157326
20/08/2004	SS03	<i>Ctenotus rufescens</i>	Male	Pitfall Trap - PVC	R157327
20/08/2004	SS01	<i>Varanus gouldii</i>	Unknown	Pitfall Trap - Bucket	R157328
17/08/2004	SS15	<i>Glaphyromorphus isolepis</i>		Pitfall Trap - Bucket	R157329
22/08/2004	Opportunistic	<i>Demansia psammophis cupreiceps</i>	Unknown	Hand Captured	R157330
22/08/2004	SS16	<i>Ctenotus saxatilis</i>	Unknown	Pitfall Trap - PVC	R157331
22/08/2004	SS11	<i>Ramphotyphlops grypus</i>	Unknown	Pitfall Trap - PVC	R157332
22/08/2004	Opportunistic	<i>Ctenotus iapetus</i>	Unknown		R157333
18/08/2004	SS06	<i>Menetia greyii</i>		Pitfall Trap - Bucket	R158283
18/08/2004	SS01	<i>Diplodactylus stenodactylus</i>		Pitfall Trap - Bucket	R158284
18/08/2004	SS06	<i>Ctenotus pantherinus ocellifer</i>		Pitfall Trap - Bucket	R158285
18/08/2004	SS01	<i>Ctenophorus femoralis</i>	Male	Pitfall Trap - PVC	R158286
18/08/2004	SS01	<i>Ctenophorus femoralis</i>	Female	Pitfall Trap - PVC	R158287
18/08/2004	SS01	<i>Ctenophorus femoralis</i>	Male	Pitfall Trap - PVC	R158288
18/08/2004	SS01	<i>Varanus eremius</i>		Pitfall Trap - Bucket	R158289
18/08/2004	SS07	<i>Menetia greyii</i>		Pitfall Trap - Bucket	R158290
18/08/2004	SS07	<i>Menetia greyii</i>		Hand Captured	R158291
18/08/2004	SS14	<i>Glaphyromorphus isolepis</i>	Female	Pitfall Trap - Bucket	R158292
18/08/2004	SS01	<i>Ctenophorus femoralis</i>	Female	Pitfall Trap - Bucket	R158293
18/08/2004	SS06	<i>Varanus brevicauda</i>		Pitfall Trap - Bucket	R158294
18/08/2004	SS03	<i>Diplodactylus conspicillatus</i>		Pitfall Trap - Bucket	R158295
18/08/2004	SS03	<i>Heteronotia binoei</i>		Pitfall Trap - PVC	R158296
17/08/2004	SS15	<i>Lerista bipes</i>		Hand Captured	R158297
18/08/2004	SS01	<i>Ctenophorus femoralis</i>	Female	Pitfall Trap - Bucket	R158298
18/08/2004	SS01	<i>Ctenophorus femoralis</i>	Male	Pitfall Trap - Bucket	R158299
18/08/2004	SS19	<i>Pseudomys hermannsburgensis</i>	Male	Pitfall Trap - Bucket	M
18/08/2004	SS13	<i>Pseudomys hermannsburgensis</i>	Male	Pitfall Trap - Bucket	M
17/08/2004	SS01	<i>Pseudomys hermannsburgensis</i>	Male	Pitfall Trap - PVC	M56549
17/08/2004	SS17	<i>Pseudomys hermannsburgensis</i>	Male	Pitfall Trap - Bucket	M56550
17/08/2004	SS03	<i>Sminthopsis youngsoni</i>	Male	Pitfall Trap - PVC	M56551
17/08/2004	SS01	<i>Pseudomys hermannsburgensis</i>	Female	Pitfall Trap - PVC	M56552
17/08/2004	SS14	<i>Pseudomys hermannsburgensis</i>	Female	Pitfall Trap - Bucket	M56553
17/08/2004	SS14	<i>Pseudomys hermannsburgensis</i>	Female	Pitfall Trap - Bucket	M56554
17/08/2004	SS14	<i>Pseudomys hermannsburgensis</i>	Female	Pitfall Trap - PVC	M56555
17/08/2004	SS14	<i>Pseudomys hermannsburgensis</i>	Male	Pitfall Trap - Bucket	M56556
18/08/2004	SS03	<i>Sminthopsis youngsoni</i>	Male	Pitfall Trap - PVC	M56557
18/08/2004	SS05	<i>Sminthopsis youngsoni</i>	Male	Pitfall Trap - PVC	M56558
18/08/2004	SS05	<i>Sminthopsis youngsoni</i>	Male	Pitfall Trap - PVC	M56559
18/08/2004	SS15	<i>Mus musculus</i>	Male	Pitfall Trap - PVC	M56560
18/08/2004	SS12	<i>Sminthopsis youngsoni</i>	male	Pitfall Trap - Bucket	M56561
18/08/2004	SS18	<i>Pseudomys hermannsburgensis</i>	Male	Pitfall Trap - PVC	M56563
18/08/2004	SS12	<i>Pseudomys hermannsburgensis</i>	Male	Pitfall Trap - Bucket	M56564
18/08/2004	SS13	<i>Pseudomys hermannsburgensis</i>		Pitfall Trap - Bucket	M56565
18/08/2004	SS14	<i>Pseudomys hermannsburgensis</i>		Pitfall Trap - PVC	M56567



18/08/2004	SS12	<i>Mus musculus</i>		Pitfall Trap - Bucket	M56568
18/08/2004	SS09	<i>Notomys alexis</i>	Female	Pitfall Trap - PVC	M56569
18/08/2004	SS14	<i>Dasykaluta rosamondae</i>	Male	Pitfall Trap - PVC	M56570
18/08/2004	SS19	<i>Mus musculus</i>	Male	Pitfall Trap - Bucket	M56571
19/08/2004	SS13	<i>Pseudomys hermannsburgensis</i>	Female	Pitfall Trap - Bucket	M56572
19/08/2004	SS18	<i>Sminthopsis youngsoni</i>	Male	Pitfall Trap - PVC	M56573
19/08/2004	SS03	<i>Sminthopsis youngsoni</i>	Female	Pitfall Trap - PVC	M56574
19/08/2004	SS09	<i>Sminthopsis macroura</i>		Pitfall Trap - PVC	M56575
19/08/2004	SS13	<i>Sminthopsis youngsoni</i>		Pitfall Trap - PVC	M56576
19/08/2004	SS09	<i>Sminthopsis macroura</i>	Female	Pitfall Trap - PVC	M56577
20/08/2004	SS13	<i>Pseudomys hermannsburgensis</i>	Female	Pitfall Trap - Bucket	M56578



## Appendix 5

Comparisons of Fauna  
Recorded during the Current  
Study with other Surveys in the  
Locality



Comparisons of Herpetofauna Records from this Study and others in the locality (sources: Biota 2005c, WA Museum 2005, this study).

YANNARIE SALT	ONSLow	WAM TUBRIDGI	COMBINED	COMMON TO ALL	ONSLow ONLY	YANNARIE ONLY	TUBRIDGI ONLY
	<i>Acanthophis pyrrhus</i>	<i>Acanthophis pyrrhus</i>	<i>Acanthophis pyrrhus</i>				
	<i>Aspidites melanocephalus</i>	<i>Aspidites melanocephalus</i>	<i>Aspidites melanocephalus</i>				
<i>Ctenophorus femoralis</i>	<i>Ctenophorus femoralis</i>	<i>Ctenophorus femoralis</i>	<i>Ctenophorus femoralis</i>	1			
<i>Ctenophorus nuchalis</i>	<i>Ctenophorus nuchalis</i>	<i>Ctenophorus nuchalis</i>	<i>Ctenophorus nuchalis</i>	1			
		<i>Ctenophorus isolepis isolepis</i>	<i>Ctenophorus isolepis isolepis</i>				1
<i>Ctenophorus rubens</i>	<i>Ctenophorus rubens</i>	<i>Ctenophorus rubens</i>	<i>Ctenophorus rubens</i>	1			
	<i>Ctenotus grandis titan</i>	<i>Ctenotus grandis titan</i>	<i>Ctenotus grandis titan</i>				
<i>Ctenotus hanloni</i>	<i>Ctenotus hanloni</i>	<i>Ctenotus hanloni</i>	<i>Ctenotus hanloni</i>	1			
<i>Ctenotus iapetus</i>	<i>Ctenotus iapetus</i>	<i>Ctenotus iapetus</i>	<i>Ctenotus iapetus</i>	1			
	<i>Ctenotus maryani</i>	<i>Ctenotus maryani</i>	<i>Ctenotus maryani</i>				
<i>Ctenotus pantherinus ocellifer</i>	<i>Ctenotus pantherinus ocellifer</i>	<i>Ctenotus pantherinus ocellifer</i>	<i>Ctenotus pantherinus ocellifer</i>	1			
<i>Ctenotus rufescens</i>		<i>Ctenotus rufescens</i>	<i>Ctenotus rufescens</i>				1
<i>Ctenotus saxatilis</i>	<i>Ctenotus saxatilis</i>	<i>Ctenotus saxatilis</i>	<i>Ctenotus saxatilis</i>				
		<i>Cyclorana maini</i>	<i>Cyclorana maini</i>				1
<i>Delma haroldi</i>			<i>Delma haroldi</i>			1	
	<i>Delma tincta</i>	<i>Delma tincta</i>	<i>Delma tincta</i>				
<i>Demansia psammophis cupreiceps</i>		<i>Demansia psammophis cupreiceps</i>	<i>Demansia psammophis cupreiceps</i>				
<i>Diplodactylus conspicillatus</i>	<i>Diplodactylus conspicillatus</i>	<i>Diplodactylus conspicillatus</i>	<i>Diplodactylus conspicillatus</i>	1			
		<i>Diplodactylus jeanae</i>	<i>Diplodactylus jeanae</i>				1
		<i>Diplodactylus pulcher</i>	<i>Diplodactylus pulcher</i>				1
<i>Diplodactylus stenodactylus</i>	<i>Diplodactylus stenodactylus</i>	<i>Diplodactylus stenodactylus</i>	<i>Diplodactylus stenodactylus</i>	1			
<i>Diporiphora winneckeii</i>		<i>Diporiphora winneckeii</i>	<i>Diporiphora winneckeii</i>				1
<i>Ephalophis greyae</i>	<i>Ephalophis greyae</i>		<i>Ephalophis greyae</i>				
<i>Eremiascincus fasciolatus</i>	<i>Eremiascincus fasciolatus</i>	<i>Eremiascincus fasciolatus</i>	<i>Eremiascincus fasciolatus</i>	1			
	<i>Furina ornata</i>		<i>Furina ornata</i>		1		
<i>Gehyra pilbara</i>	<i>Gehyra pilbara</i>	<i>Gehyra pilbara</i>	<i>Gehyra pilbara</i>	1			
<i>Gehyra variegata</i>	<i>Gehyra variegata</i>	<i>Gehyra variegata</i>	<i>Gehyra variegata</i>	1			
	<i>Lophognathus sp.</i>	<i>Lophognathus sp.</i>	<i>Lophognathus sp.</i>				
<i>Glaphyromorphus isolepis</i>			<i>Glaphyromorphus isolepis</i>			1	
<i>Heteronotia binoei</i>	<i>Heteronotia binoei</i>	<i>Heteronotia binoei</i>	<i>Heteronotia binoei</i>	1			
<i>Hydrelaps darwiniensis</i>	<i>Hydrelaps darwiniensis</i>		<i>Hydrelaps darwiniensis</i>				
<i>Lerista bipes</i>	<i>Lerista bipes</i>	<i>Lerista bipes</i>	<i>Lerista bipes</i>				

YANNARIE SALT	ONSLOW	WAM TUBRIDGI	COMBINED	COMMON TO ALL	ONSLOW ONLY	YANNARIE ONLY	TUBRIDGI ONLY
		<i>Lerista connivens</i>	<i>Lerista connivens</i>				1
<i>Lerista elegans</i>		<i>Lerista elegans</i>	<i>Lerista elegans</i>				
<i>Lerista muelleri 'clarus'</i>	<i>Lerista muelleri 'clarus'</i>	<i>Lerista muelleri 'clarus'</i>	<i>Lerista muelleri 'clarus'</i>	1			
<i>Lerista onsloviana</i>		<i>Lerista onsloviana</i>	<i>Lerista onsloviana</i>				
		<i>Lerista uniduo</i>	<i>Lerista uniduo</i>				1
<i>Lialis burtonis</i>	<i>Lialis burtonis</i>	<i>Lialis burtonis</i>	<i>Lialis burtonis</i>				
		<i>Litoria rubella</i>	<i>Litoria rubella</i>				1
<i>Menetia greyii</i>	<i>Menetia greyii</i>	<i>Menetia greyi</i>	<i>Menetia greyi</i>	1			
	<i>Anteresia stimsoni</i>	<i>Anteresia stimsoni</i>	<i>Anteresia stimsoni</i>				
		<i>Neobatrachus aquilonius</i>	<i>Neobatrachus aquilonius</i>				1
<i>Neobatrachus fulvus</i>			<i>Neobatrachus fulvus</i>			1	
<i>Nephrurus levis occidentalis</i>	<i>Nephrurus levis occidentalis</i>	<i>Nephrurus levis occidentalis</i>	<i>Nephrurus levis occidentalis</i>	1			
<i>Notaden nicholli</i>		<i>Notaden nicholli</i>	<i>Notaden nicholli</i>				
<i>Notoscincus ornatus ornatus</i>			<i>Notoscincus ornatus ornatus</i>			1	
	<i>Pogona minor minor</i>	<i>Pogona minor minor</i>	<i>Pogona minor minor</i>				
	<i>Pseudechis australis</i>	<i>Pseudechis australis</i>	<i>Pseudechis australis</i>				1
<i>Pseudonaja modesta</i>		<i>Pseudonaja modesta</i>	<i>Pseudonaja modesta</i>				
	<i>Pseudonaja nuchalis</i>	<i>Pseudonaja nuchalis</i>	<i>Pseudonaja nuchalis</i>				
	<i>Pygopus nigriceps nigriceps</i>	<i>Pygopus nigriceps nigriceps</i>	<i>Pygopus nigriceps nigriceps</i>				
	<i>Ramphotyphlops ammodytes</i>		<i>Ramphotyphlops ammodytes</i>		1		
<i>Ramphotyphlops grypus</i>	<i>Ramphotyphlops grypus</i>	<i>Ramphotyphlops grypus</i>	<i>Ramphotyphlops grypus</i>	1			
	<i>Ramphotyphlops hamatus</i>	<i>Ramphotyphlops hamatus</i>	<i>Ramphotyphlops hamatus</i>				
	<i>Rhyncheodura ornata</i>		<i>Rhyncheodura ornata</i>		1		
<i>Strophurus strophurus</i>		<i>Strophurus strophurus</i>	<i>Strophurus strophurus</i>				
	<i>Suta punctata</i>	<i>Suta punctata</i>	<i>Suta punctata</i>				
	<i>Tiliqua multifasciata</i>	<i>Tiliqua multifasciata</i>	<i>Tiliqua multifasciata</i>				
	<i>Varanus acanthurus</i>		<i>Varanus acanthurus</i>				
<i>Varanus brevicauda</i>	<i>Varanus brevicauda</i>	<i>Varanus brevicauda</i>	<i>Varanus brevicauda</i>	1			
<i>Varanus eremius</i>	<i>Varanus eremius</i>	<i>Varanus eremius</i>	<i>Varanus eremius</i>				
<i>Varanus gouldii</i>	<i>Varanus gouldii</i>	<i>Varanus gouldii</i>	<i>Varanus gouldii</i>	1			
	<i>Vermicella anomala</i>	<i>Vermicella anomala</i>	<i>Vermicella anomala</i>				
36	43	53	63	18	3	4	11