

Forrestania Fauna Survey

Fauna and Faunal Assemblages Report



Prepared for
Western Areas NL

Prepared by
Biota Environmental Sciences Pty Ltd

February 2006

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Forrestania Fauna Survey

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1.0 Summary

1.1 Background and Methods

Western Areas NL is currently operating the Flying Fox nickel sulphide box cut mine, east of Hyden (32° 25'S, 119° 41'E). Western Areas NL is seeking approval to clear land within a 23 ha area spanning both outside and within the mining area. The proposed works consist of clearing drill line access tracks and drill pads. The clearing application will also allow for expansion of the waste dump and other infrastructure areas over the life of the mine.

Biota Environmental Sciences was commissioned to undertake a fauna habitat and fauna assemblage survey within the Forrestania project area in February/March 2005 and November 2005.

The primary aims of the survey were to:

- collect information on the presence of vertebrate fauna and selected invertebrate taxa (potential short range endemics);
- document the relative abundance of species recorded; and
- assess the local and regional conservation significance of the fauna assemblage and habitats present in the project area.

The survey was planned and implemented, where practicable, in accordance with the Environmental Protection Authority (EPA) Position Statement No. 3 "Terrestrial Biological Surveys as an Element of Biodiversity Protection" (EPA 2002) and Guidance Statement No. 56 "Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia" (EPA 2004). The central component of the systematic censusing consisted of 10 trapping grids, each located within a defined habitat. Each grid consisted of a single row of six pitfall traps (alternating 20 litre buckets and PVC tubes), spaced at approximately 10m intervals and connected with a single length of 30 cm high flywire fence. In addition, a single line of 6 medium sized, baited Elliott traps was installed over a 60m transect at each site. Finally, a single cage trap was installed at each site.

Two additional Elliott trap lines were installed, consisting of 15 traps installed 25 m apart over a 375m transect. Further, a single trap line comprising 15 cage traps spaced 50 m apart over a 750m transect was installed.

Bat echolocation calls were recorded using two Anabat II bat detectors, which detect and transform ultrasonic echolocation emitted during bat foraging. Sampling was undertaken at two locations.

Avifauna censuses were conducted across 10 sites during the survey. Censuses were typically conducted from 6 a.m. through to 10 a.m.

Targeted invertebrate groups were sampled through systematic and opportunistic collections during the survey and included:

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

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

1.2 Results

The field survey recorded a combined total of 106 vertebrate species including 60 species of bird, 15 native mammals, three introduced mammals, and 28 reptiles.

The reptiles comprised six geckos, four pygopods, five agamids, eight skinks, four elapid snakes and one blind snake.

The total of 60 species of birds comprised 24 families, and included 18 non-passerine and 42 passerine species.

The mammals comprised four dasyurids, two macropods, one burramyid, one tarsiped, three vespertilionid bats, two molossid bats, two native and one introduced murid rodent, one felid, and one leporid.

Invertebrate taxa were also recorded from the study site, many of which were not identified beyond family level.

The survey recorded nine species of conservation significance:

Species	Conservation Significance	
	State Level	Federal Level
<i>Calyptorhynchus latirostris</i> - Short-billed (Carnaby's) Black Cockatoo	Schedule 1	Endangered
<i>Dasyurus geoffroii</i> - Western Quoll (Chuditch)	Schedule 1	Vulnerable
<i>Platycercus icterotis xanthogenys</i> - Western Rosella	Schedule 1	–
<i>Macropus irma</i> - Western Brush Wallaby	Priority 4	–
<i>Pomatostomus superciliosus ashbyi</i> - White-browed Babbler	Priority 4	–
<i>Morelia spilota imbricata</i> - Carpet Python	Priority 4	–
<i>Oreoica gutturalis</i> - Crested Bellbird	Priority 4	–
<i>Hylacola cauta whitlocki</i> - Shy Groundwren (western)	Priority 4	–
<i>Merops ornatus</i> - Rainbow Bee-eater	–	Migratory sp.

1.3 Recommendations

The following recommendations arise from the two-phase fauna survey of the Forrestania study area:

1. The proponent has agreed to utilise existing cleared and disturbed areas for proposed new disturbances. The use of these disturbed areas should be maximised as part of project design.
2. All members of the work force on site will be provided with an environmental induction to ensure they are familiarised with the presence of Schedule 1 fauna. This will include driving speed restrictions, ensuring that off-road driving is minimised, in addition to fire risk minimisation.
3. Western Areas NL has agreed to implement a feral animal baiting program targeting areas around the Cosmic Boy Camp, Flying Fox mine, Drillers Camp and in some accessible areas of Lake Cronin Nature Reserve. This will ensure predatory feral animal numbers are kept to a minimum with the aim to reduce predation on native fauna.

The baiting program will involve employing a licensed contractor to conduct biannual, week long trapping runs which would incorporate the use of 1080 baits and cage traps. This program will be developed in consultation with the Department of Conservation and Land Management. In addition, Western Areas NL will where possible, assist in maintaining the existing wild dog control program that is currently undertaken in Forrestania by the Department of Agriculture.

4. In the camp waste disposal area, waste will be covered with a layer of soil to minimum depth of 100 mm, at least monthly. In addition, the waste disposal area should be enclosed with chain-wire fencing (Cyclone® fencing). This will limit the availability of edible waste to

both native and feral animals and will help reduce the likelihood of the Western Quoll (*Dasyurus geoffroii*) being attracted to the area.

5. Any future fauna survey work will include area searches for evidence of fox and cat activity (i.e. scats, tracks or evidence of predation).
6. Future fauna surveys will include specific targeting of Western Quoll (*Dasyurus geoffroii*). Extra cage traps will be set with bait specifically used to target dasyurid marsupials.

2.0 Introduction

2.1.1 Project Background

Western Areas NL is currently operating the Flying Fox nickel sulphide box cut mine, east of Hyden (32° 25'S, 119° 41'E). Western Areas NL is seeking approval to clear land within a 23 ha area spanning both outside and within the mining area. The proposed works consist of clearing drill line access tracks and drill pads. The clearing application will also allow for expansion of the waste dump and other infrastructure areas over the life of the mine. The proponent has made a commitment to conduct an inventory survey of the lease to determine the species present in the area and provide a baseline from which to assess any potential impacts.

In order to assess potential fauna issues associated with the development, Biota Environmental Sciences conducted a two phase fauna survey, with Phase 1 conducted in February/March 2005 and Phase 2 conducted in November 2005. This report summarises the findings of these surveys and identifies any potential fauna issues associated with the proposed development.

2.2 Existing Environment

2.2.1 Beard's Vegetation Mapping

The Forrestania Tableland straddles an ancient watershed dividing the Swan-Avon Basin from palaeodrainage heading east (Beard 1981). The Forrestania System is developed on a greenstone belt, and comprises a variety of communities that are controlled by the underlying geology in a mosaic form (Beard 1981). The greenstones weather to form a flat tract of country with a heavy soil supporting eucalypt woodland broken by numerous small salt lakes. There are also granites and quartzites which form siliceous soils, accounting for areas of mallee, thicket and scrub-heath within the mosaic. The sclerophyll woodlands comprise only two major tree species, *Eucalyptus salmonophloia* and *E. longicornis*.

2.2.2 Land Systems

Land System (Rangelands) mapping, covering the project area is currently unavailable. Future surveys to be carried out by the Western Australian Department of Agriculture are pending.

2.3 Aims

This report documents the results of the two-phase survey encompassing the Forrestania project area. The aims of the work were to:

- collect information on the presence of vertebrate fauna and selected invertebrate taxa (potential short range endemics);
- document the relative abundance of species recorded; and
- assess the local and regional conservation significance of the fauna assemblage and habitats present in the project area.

3.0 Methodology

3.1 Survey Timing and Weather

The Phase 1 survey (including trap installation) was conducted over an eight-day period between 27/02/05 and 07/03/05.

Minimum temperatures during the survey ranged from 13.5°C to 19.2°C and maximum temperatures ranged from 25.1°C to 34.2°C (Table 3.3). A total of 2.2 mm of rainfall was recorded in Hyden during the survey, but none fell in the actual study area. A total of 50.1 mm of rain fell in Hyden from October 2004 to February 2005, compared to an expected rainfall of 91.4 mm for this period (based on long term averages); this indicates that the Phase 1 survey was conducted during a relatively dry period (Table 3.1 and Table 3.2).

The Phase 2 survey was conducted over a six-day period between 17/11/05 to 23/11/05.

Minimum temperatures during the survey ranged from 5.4°C to 15.3°C, and maximum temperatures ranged from 24.0°C to 35.6°C (Table 3.4). A total of 0.6 mm of rainfall was recorded in Hyden during the survey. Since the beginning of May 2005, a total of 271.3 mm of rain had fallen in Hyden, compared to an expected rainfall of 229.0 mm from May to October inclusive, indicating that the survey was conducted during a relatively wet period (Table 3.1 and Table 3.2).

3.2 Fauna Survey Team

During Phase 1, the study team comprised Mr. Roy Teale and Dr. Michael Craig (both of Biota), with Mr. Mike Greenham (Biota) and Mr. Rory Cooper (contractor) assisting during set-up.

The Phase 2 study team comprised Mr. Dan Kamien (Biota) and Mr Greg Harold (contractor). The fauna survey was conducted under "Licence To Take Fauna For Scientific Purposes" No. SF004873 issued to Mr Roy Teale, which also authorised Mr. Mike Greenham, Dr. Mike Craig, Mr. Greg Harold and Mr. Daniel Kamien (Appendix 1). Mr Brad Maryan (WA Museum) assisted with confirmation of herpetofauna.

Analyses of bat recordings were completed by Mr. Dan Kamien (Biota). Dr. Kyle Armstrong (Kyoto University) was consulted regarding species identifications. Invertebrate identifications were undertaken by Ms. Leah Beesley (Biota).

3.3 Systematic Censusing

The central component of the systematic census consisted of 15 trapping grids (Table 3.5, Table 3.6 and Figure 3.1), each located within a defined habitat. In selecting survey sites, consideration was given to accessibility of sites such that trap lines could be regularly checked.

Ten trapping grids (FR03-FR12) consisted of a single row of six pitfall traps (alternating 20 litre buckets and 60cm long PVC tubes) spaced at approximately 10m intervals and connected with a single length (60m) of 30 cm high flywire fence. A single cage trap and five medium-sized Elliott traps were also installed at each of the pitfall sites.

Two additional sites (FR13 and FR14) were installed, consisting solely of 15 medium-sized Elliott traps laid 25m apart along a 375m transect. The final site (FRC) consisted of 15 cage traps spaced 50m apart along a 750m transect.

The majority of captured specimens were released following identification. However, reptiles with ambiguous characteristics or unresolved species complexes were transported live to the Western Australian Museum for identification and lodgement.

Table 3.1: Climatological summary for Hyden using data from 1969 to 2004 (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)	33.6	32.8	29.7	25.5	20.5	17.1	16.2	17.2	20.2	24.2	28.1	31.9	
Mean Daily Minimum Temperature (°C)	15.4	15.7	14.0	11.1	7.6	5.6	4.7	4.7	5.9	8.1	11.3	13.9	
Mean Total Monthly Rainfall (mm)	18.5	20.6	20.5	24.3	40.4	51.7	47.9	41.1	27.2	20.7	17.9	13.7	344.5

Table 3.2: Climatological summary for Hyden 2005 (data provided by the Western Australian Bureau of Meteorology).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Mean Maximum Temperature 2005 (°C)	34.1	33.6	32.4	26.4	22.6	16.5	17.0	17.2	19.4	22.8	28.0	30.4	
Mean Minimum Temperature 2005 (°C)	14.6	15.4	17.0	11.0	10.9	6.2	3.1	3.5	4.7	6.8	10.5	11.7	
Total Monthly rainfall 2005 (mm)	0.0	4.6	16.2	16.4	81.1	44.2	11.8	51.5	35.6	47.1	6.6	3.6	318.7

Table 3.3: Daily meteorological observations at Hyden for Phase 1 of survey at 27/02/05 to 07/03/05 (data provided by the Western Australian Bureau of Meteorology).

Date	27/02	28/02	01/03	02/03	03/03	04/03	05/03	06/03	07/03	Mean
Maximum Temp (°C)	29.0	27.1	25.1	29.6	32.6	30.6	28.2	32.2	34.2	29.8
Minimum Temp (°C)	19.2	15.6	14.2	15.5	18.3	14.3	14.0	13.5	15.0	15.5
Rainfall (mm)	1.0	1.2	0	0	0	0	0	0	0	0.2

Table 3.4: Daily meteorological observations at Hyden for Phase 2 of survey at 17/11/05 to 23/11/05 (data provided by the Western Australian Bureau of Meteorology).

Date	17/11	18/11	19/11	20/11	21/11	22/11	23/11	Mean
Maximum Temp (°C)	24.0	26.5	30.5	34.6	29	35.6	31.4	30.2
Minimum Temp (°C)	13.5	5.4	8.7	11.5	14.3	14.0	15.3	11.8
Rainfall (mm)	0.6	0	0	0	0	0	0	0.1

Table 3.5: Phase 1 trapping grid location and trap effort (Datum WGS84, Zone 50).

Site	Location (WGS84)	Trap Type	Date Opened	Date Closed	Nights Open	No. of Traps	Total Effort (trap nights)
FR03	756560mE 6410921mN	Cage	02/03/05	07/03/05	5	1	5
		Elliott	02/03/05	07/03/05	5	6	30
		Pit	02/03/05	07/03/05	5	6	30
FR04	756577mE 6410575mN	Cage	02/03/05	07/03/05	5	1	5
		Elliott	02/03/05	07/03/05	5	6	30
		Pit	02/03/05	07/03/05	5	6	30
FR05	756652mE 6409679mN	Cage	02/03/05	07/03/05	5	1	5
		Elliott	02/03/05	07/03/05	5	6	30
		Pit	02/03/05	07/03/05	5	6	30
FR06	755794mE 6410186mN	Cage	02/03/05	07/03/05	5	1	5
		Elliott	02/03/05	07/03/05	5	6	30
		Pit	02/03/05	07/03/05	5	6	30
FR07	753516mE 6410559mN	Cage	02/03/05	07/03/05	5	1	5
		Elliott	02/03/05	07/03/05	5	6	30
		Pit	02/03/05	07/03/05	5	6	30
FR08	753476mE 6410794mN	Cage	02/03/05	07/03/05	5	1	5
		Elliott	02/03/05	07/03/05	5	6	30
		Pit	02/03/05	07/03/05	5	6	30
FR09	754769mE 6414582mN	Cage	02/03/05	07/03/05	5	1	5
		Elliott	02/03/05	07/03/05	5	6	30
		Pit	02/03/05	07/03/05	5	6	30
FR10	752921mE 6410518mN	Cage	02/03/05	07/03/05	5	1	5
		Elliott	02/03/05	07/03/05	5	6	30
		Pit	02/03/05	07/03/05	5	6	30
FR11	753699mE 6408666mN	Cage	02/03/05	07/03/05	5	1	5
		Elliott	02/03/05	07/03/05	5	6	30
		Pit	02/03/05	07/03/05	5	6	30
FR12	751906mE 6408179mN	Cage	02/03/05	07/03/05	5	1	5
		Elliott	02/03/05	07/03/05	5	6	30
		Pit	02/03/05	07/03/05	5	6	30
FR13	753715mE 6410165mN	Elliott	03/03/05	07/03/05	4	15	60
FR14	757249mE 6411002mN	Elliott	03/03/05	07/03/05	4	15	60
FRC	756553mE 6411305mN	Cage	03/03/05	07/03/05	4	15	60
					Total	Elliott Pit Cage	420 300 110

Table 3.6: Phase 2 trapping grid location, trap effort and Anabat location (Datum WGS84, Zone 50).

Site	Location (WGS84)	Trap Type	Date Opened	Date Closed	Nights Open	No. of Traps	Total Effort (trap nights)
FR03	756560mE 6410921mN	Cage	18/11/05	23/11/05	5	1	5
		Elliott	18/11/05	23/11/05	5	6	30
		Pit	18/11/05	23/11/05	5	6	30
FR04	756577mE 6410575mN	Cage	18/11/05	23/11/05	5	1	5
		Elliott	18/11/05	23/11/05	5	6	30
		Pit	18/11/05	23/11/05	5	6	30
FR05	756652mE 6409679mN	Cage	18/11/05	23/11/05	5	1	5
		Elliott	18/11/05	23/11/05	5	6	30
		Pit	18/11/05	23/11/05	5	6	30
		Anabat II	18/11/05	23/11/05	5		
FR06	755794mE 6410186mN	Cage	18/11/05	23/11/05	5	1	5
		Elliott	18/11/05	23/11/05	5	6	30
		Pit	18/11/05	23/11/05	5	6	30
		Anabat I	18/11/05	23/11/05	5		
FR07	753516mE 6410559mN	Cage	18/11/05	23/11/05	5	1	5
		Elliott	18/11/05	23/11/05	5	6	30
		Pit	18/11/05	23/11/05	5	6	30
FR08	753476mE 6410794mN	Cage	18/11/05	23/11/05	5	1	5
		Elliott	18/11/05	23/11/05	5	6	30
		Pit	18/11/05	23/11/05	5	6	30
FR09	754769mE 6414582mN	Cage	18/11/05	23/11/05	5	1	5
		Elliott	18/11/05	23/11/05	5	6	30
		Pit	18/11/05	23/11/05	5	6	30
FR10	752921mE 6410518mN	Cage	18/11/05	23/11/05	5	1	5
		Elliott	18/11/05	23/11/05	5	6	30
		Pit	18/11/05	23/11/05	5	6	30
FR11	753699mE 6408666mN	Cage	18/11/05	23/11/05	5	1	5
		Elliott	18/11/05	23/11/05	5	6	30
		Pit	18/11/05	23/11/05	5	6	30
FR12	751806mE 6408179mN	Cage	18/11/05	23/11/05	5	1	5
		Elliott	18/11/05	23/11/05	5	6	30
		Pit	18/11/05	23/11/05	5	6	30
FR13	753715mE 6410165mN	Elliott	18/11/05	23/11/05	5	15	75
FR14	757249mE 6411002mN	Elliott	19/11/05	23/11/05	4	15	60
FRC	756553mE 6411305mN	Cage	19/11/05	23/11/05	4	15	60
					Total	Elliott Pit Cage	435 300 110

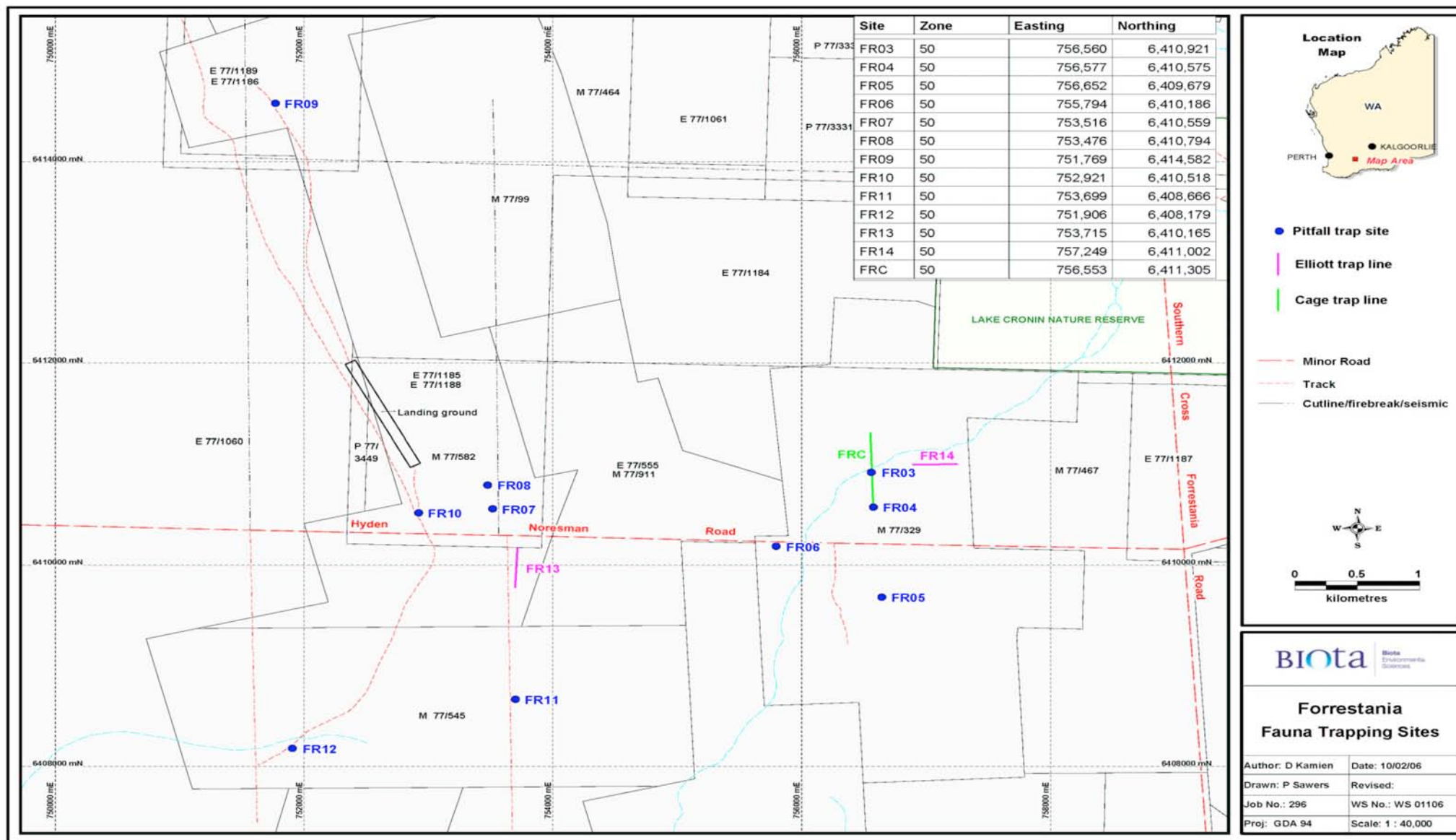


Figure 3.1: Forrestania fauna trapping sites.

3.3.1 Avifauna

The avifauna was sampled using an unbounded area search. For both phases of the survey, a total of 20 area searches were conducted across 10 sites for a period of 40 minutes, so that each site was surveyed twice during each survey phase (Table 3.7 and Table 3.8). Censuses were typically conducted between 06:00 and 10:00 each morning.

Table 3.7: Systematic avifauna censuses undertaken at each fauna site during Phase 1.

Date	FR03	FR04	FR05	FR06	FR07	FR08	FR09	FR10	FR11	FR12
03/03/05	07:31-08:11	06:47-07:27	06:00-06:40	08:18-08:58	09:53-10:33	–	–	–	09:09-09:49	–
04/03/05	–	–	10:01-10:41	–	–	08:37-09:17	07:46-08:26	06:55-07:35	–	06:05-06:45
05/03/05	–	–	–	–	05:54-06:34	06:34-07:14	07:23-08:03	08:12-08:52	–	09:02-09:42
06/03/05	07:57-08:37	08:40-09:20	–	06:54-07:34	–	–	–	–	06:02-06:42	–

Table 3.8: Systematic avifauna censuses undertaken at each fauna site during Phase 2.

Date	FR03	FR04	FR05	FR06	FR07	FR08	FR09	FR10	FR11	FR12
19/11/05	09:56-10:36	09:52-10:32	–	–	–	–	–	–	–	–
20/11/05	–	–	06:55-07:35	07:50-08:30	06:37-07:17	07:18-07:58	–	–	08:50-09:30	9:00-9:40
21/11/05	–	–	08:52-09:32	09:00-09:40	10:20-11:00	10:13-10:53	06:43-07:23	8:12-8:52	–	–
22/11/05	06:57-07:37	07:00-07:40	–	–	–	–	09:10-09:50	09:29-10:09	8:00-8:40	08:20-09:00

3.3.2 Bats

Bats were sampled during Phase 2 by recording echolocation calls only. Given the nature of the proposed development and the affected habitats, a comprehensive survey of bats was not undertaken during the survey. Echolocation calls were recorded using an Anabat II bat detector, which detects and transforms ultrasonic echolocation emitted during bat foraging. Sampling was undertaken at two locations (FR05 and FR06) for a period of five nights

The calls were stored on a compact flash card after being processed by an Anabat CF ZCAIM. Calls were visualised on Analook 4.3f software. Dr. Kyle Armstrong (Kyoto University) was consulted to confirm identification. Only sequences containing good quality search phase calls were considered for identification.

3.3.3 Invertebrates

Invertebrate groups were sampled through systematic collections from pit-traps during the survey, as well as opportunistic collections. Invertebrate groups targeted during the survey included:

- Araneae (spiders, in particular Trapdoor and Wolf Spiders);
- Pseudoscorpionida (pseudoscorpions);
- Scorpionida (scorpions); and
- Diplopoda (millipedes).

Trapdoor spiders were targeted using pit-traps, in addition to burrow searches and burrow excavation. Individuals were subsequently preserved in 70% ethanol, with one leg removed and placed in 100% ethanol for future genetic studies.

Hand foraging was undertaken for pseudoscorpions, involving peeling bark and lifting rocks. The latter technique was also used to search for scorpions, with additional specimens collected from pit traps. Millipedes were searched for whilst raking leaf litter and other debris.

In addition, representative samples of other invertebrates from pit traps were collected, placed in 70% ethanol and lodged with the WA Museum.

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

3.4 Database Searches

A search was commissioned of the Threatened Fauna Database held by the Department of Conservation and Land Management (CALM) in January 2006 for threatened fauna records in the vicinity of the study area. The bounding coordinates used were:

- 31.9361°S, 120.2642°E; and
- 32.8866°S, 119.1458°E.

The Western Australian Museum FaunaBase database was also searched for records of vouchered fauna specimens between:

- 31.9361°S, 120.2642°E; and
- 32.8866°S, 119.1458°E.

Searches include a 50km buffer extending beyond the study site. Results of the two searches are contained in Appendices 2 and 3 respectively.

3.5 Survey Limitations

Not all sections of the study area were ground-truthed or equally sampled for fauna. Parts of the proposed expansion area were inaccessible by vehicle and as a result regular checking of fauna traps in these areas would not have been possible. However, 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 present within the expansion area.

Physical trapping of bats was not carried out. As a result, confirmation of presence of bats not readily recorded by microphone could not be undertaken. Moreover, identifying bats based on call characteristics is not definitive.

4.0 Vertebrate Fauna Inventory

4.1 Background

The project area comprised a number of different habitat types (Table 4.1).

Table 4.1: Habitat description for each trapping site.

Trapping Grid	Habitat Description
FR03	Mallee. Relatively dense mid-storey of mallee eucalypts to 3 m over a relatively dense understorey of <i>Lepidosperma</i> to 0.5 m. Very occasional emergent eucalypts to 10 m.
FR04	Mallee. Overstorey consisting primarily of mallee eucalypts to 3 m, with some acacias to the same height. The mixed understorey was dominated by <i>Lepidosperma</i> to 0.4 m.
FR05	Woodland. Relatively dense woodland of <i>Eucalyptus salmonophloia</i> to 9 m, with most trees showing no signs of senescence. Mid-storey primarily of melaleucas, with some <i>Acacia</i> growing in dense patchy clumps to 2 m. Understorey very open and consisting mostly of acacias to 0.6 m.
FR06	Woodland. Very open overstorey of <i>Eucalyptus salmonophloia</i> to 10 m, with a relatively dense mid-storey of mallee eucalypts to 2 m. Very sparse understorey, primarily of acacias to 0.7 m.
FR07	Shrubland. Very dense mid-storey of melaleucas to 2 m with an open overstorey of eucalypts to 6 m. Very little understorey.
FR08	Tall heath. Relatively open tall heath with main strata relatively species poor and consisting primarily of acacias to 0.5 m. Very scattered overstorey of eucalypts to 3 m.
FR09	Tall heath. Relatively open tall heath with main strata relatively species poor and consisting primarily of <i>Acacia</i> and <i>Allocasuarina</i> to 0.8 m. Patchy, clumped, sparse overstorey of eucalypts to 3 m.
FR10	Heath. Open mallee eucalypts to 2.5 m over a species rich, relatively open heath to 0.4 m.
FR11	Heath. Main strata a species rich heath to 0.3 m with some proteaceous emergents to 0.6 m. Very scattered overstorey of mallees to 2 m.
FR12	Tall heath. Species rich tall heath to 1m with acacias dominating. Very scattered emergents of <i>Grevillea</i> and eucalypts to 2 m.
FR13	Shrubland. Very dense mid-storey of melaleucas to 2 m.
FR14	Mallee. Relatively dense mid-storey of mallee eucalypts to 3 m over a relatively dense understorey of <i>Lepidosperma</i> to 0.5 m. Very occasional emergent eucalypts to 10 m.
FRC	Mallee. Relatively dense mid-storey of mallee eucalypts to 3 m over a relatively dense understorey of <i>Lepidosperma</i> to 0.5 m. Very occasional emergent eucalypts to 10 m.



Plate 4.1: Site FR03: Mallee *Eucalyptus* over *Lepidosperma*.



Plate 4.2: Site FR04: Mallee *Eucalyptus* and *Acacia* over *Lepidosperma*.



Plate 4.3: Site FR05: *Eucalyptus salmonophloia* woodland over *Melaleuca* over *Acacia*.



Plate 4.4: Site FR06: *Eucalyptus salmonophloia* open woodland over mallee *Eucalyptus* over *Acacia*.



Plate 4.5: Site FR07: *Eucalyptus* open woodland over dense *Melaleuca* shrubland.



Plate 4.6: Site FR08: *Eucalyptus* sparse woodland over *Acacia* heath.



Plate 4.7: Site FR09: *Eucalyptus* sparse mallee over open *Acacia* and *Allocasuarina* tall heath.



Plate 4.8: Site FR10: *Eucalyptus* open mallee over a species rich, open heath.



Plate 4.9: Site FR11: *Eucalyptus* sparse / scattered mallee over species rich heath with proteaceous emergents.



Plate 4.10: Site FR12: *Eucalyptus* and *Grevillea* sparse / scattered emergents over *Acacia* heath.

The survey of the Forrestania site recorded a combined total of 106 vertebrate species. Table 4.2 provides a summary of the number of species recorded from each major vertebrate group during the survey.

Table 4.2: Number of species recorded during the survey of the Forrestania study site.

Fauna Group	Total
Avifauna	60
Native Mammals	15
Introduced Mammals	3
Reptiles	28
Total	106

4.2 Herpetofauna

4.2.1 The Assemblage

Twenty-eight reptile species were recorded from the project area during the study (Table 4.3). The reptiles comprised six geckos, four pygopods, five agamids, eight skinks, four elapid snakes and one blind snake (common names after Wilson and Swan 2003, and Reptiles of Australia web page – <http://www.kingsnake.com/oz/>). Specimens lodged with the WA Museum have been assigned numbers R156268 - 156949. These are given below where relevant.

4.2.2 Annotated List

Scincidae

Callose-palmed Shining Skink - *Cryptoblepharus plagiocephalus*

A single specimen recorded at site FR07 in Phase 1. Single individuals were recorded at sites FR04 and FR05 during Phase 2.

Odd Striped Ctenotus - *Ctenotus impar*

Recorded during Phase 1 only; a single specimen was recorded at FR08 and three individuals were recorded at FR11 (R156278 and R156287) in pit-fall traps.

Barred Wedge-snout Ctenotus - *Ctenotus schomburgkii*

Recorded on four occasions during Phase 1 and two occasions during Phase 2. Single specimens were captured at sites FR03, FR08 (R156286) and FR11. Three individuals were recorded at FR07 (R156284).

Crevice Skink - *Egernia richardi*

Recorded on four occasions across four sites. Single individuals were captured at sites FR04 (R156273) and FR014 (R156291) during Phase 1 of the survey. Similarly, during Phase 2 single individuals were captured at FR05 and FR14.

Southwestern Earless Skink - *Hemiergis initialis*

Recorded on four occasions from FR05 (R156275 and R156283) and one occasion at FR10 during Phase 1. Single individuals were recorded at FR05 and FR11 during Phase 2 of the survey.

Southern Robust Slider - *Lerista picturata*

Recorded on a single occasion at site FR06 (R156940) during Phase 2 of the survey.

Shrubland Morethia Skink - *Morethia obscura*

Recorded on 10 occasions throughout the survey. A single specimen was recorded from site FR04 during Phase 2, six records were noted at FR05 (R156279) during both survey phases, and single individuals were recorded at FR14, FR06 and FR10 (R156268) during Phase 1.

Shingle-Back - *Tiliqua rugosa*

Recorded on two occasions from site FR06 during Phase 2 of the survey.

AgamidaeCrested Dragon - *Ctenophorus cristatus*

Recorded on six occasions from three sites in the project area. Two records were noted at FR05 (R156288) during both survey phases. Single individuals were recorded at sites FR06 and FR14 (R156270) during Phase 1.

Spotted Dragon - *Ctenophorus maculatus*

Recorded on 10 occasions across eight sites throughout the study area. During Phase 1, single individuals were recorded at FR06, FR07, FR09 and FR12 (R156289). During Phase 2, six specimens were recorded at sites FR04, FR08 (R156939), FR02, FR14 and FRC.

Thorny Devil - *Moloch horridus*

This species was recorded on four occasions in heath habitat. Single individuals were recorded at FR11 (R156269) and FR12 during both phases of the study.

Dwarf Bearded Dragon - *Pogona Minor*

Although not recorded during Phase 1 of the survey, this species was recorded on four occasions during Phase 2. Single individuals were recorded from pit traps at sites FR09, FR10, and FR11. One individual was captured by Elliott trap at FR13.



Plate 4.11: *Pogona minor* (photo Dan Kamien).

Queen Adelaide Dragon - *Rankinia adalaidensis*

Not recorded during Phase 1 of the survey, but recorded on nine occasions during Phase 2. Single specimens were recorded at FR03 and FR08. Four and three individuals were recorded from FR10 and FR11 respectively.

GekkonidaeClawless Gecko - *Crenadactylus ocellatus*

Recorded from pit-traps on 11 occasions during Phase 1, and six occasions during Phase 2. *C. ocellatus* was found at sites FR03, FR05 (R156276 and R156285), FR06, FR07 and FR09.

Diplodactylus granariensis

Recorded from pit-traps and opportunistically at sites FR03, FR05, FR06 (R156943, R156944 and R156947), FR01 and FR12. Three individuals were recorded during Phase 1 and nine were recorded during Phase 2 of the survey.

Diplodactylus maini

The most common reptile recorded during the survey. *D. maini* was recorded on six occasions during Phase 1 and on 27 occasions during Phase 2. Specimens were collected at sites FR05 (R156290, R156938, R156941 and R156949), FR06 (R156942), FR08, FR09 and FR10. The majority of individuals were captured in woodland habitat at sites FR05 (n=9) and FR06 (n=15).

Diplodactylus pulcher

An uncommon species within the study area, *D. pulcher* was recorded on two occasions at FR09 (R156946 and R156948) during Phase 2 only.

Tree Gecko - *Gehyra variegata*

Uncommon within the study area, *G. variegata* was recorded at site FR03 (R156280) during Phase 1 of the survey only.

Reticulated Velvet Gecko - *Oedura reticulata*

Recorded at FR05 (R15627) during both phases of the survey, and at FR07 (R156272) during Phase 1.

PygopodidaeMarble-faced Worm Lizard - *Delma australis*

Recorded on a single occasion from site FR10 (R156274) during Phase 1 of the survey.

Fraser's Delma - *Delma fraseri*

Uncommon within the study area; recorded from site FR03 (R156277) during Phase 1 and site FR12 during Phase 2 of the survey.

Burton's Legless Lizard - *Lialis burtonis*

Not recorded during Phase 1, this species was recorded on two occasions during Phase 2 at FR03 and FR10.



Plate 4.12: *Lialis burtonis* (photo Dan Kamien).

Common Scaly Foot - *Pygopus lepidopodus*

Recorded opportunistically on a single occasion at site FR14.

ElapidaeGould's Hooded Snake - *Parasuta gouldii*

Recorded on five occasions during Phase 1 of the survey; one individual was noted at FR03, and two individuals were recorded at both FR04 and FR05.

Mitchell's Short-tailed Snake - *Parasuta nigriceps*

Recorded on a single occasion during Phase 1 at site FR06 (R156292).

Dugite - *Pseudonaja affinis*

Recorded on three occasions during Phase 1 at site FR12 (R156282) and site FR13.

Jan's Banded Snake - *Simoselaps bertholdi*

Recorded on two occasions during Phase 2 of the survey at site FR06.

Typhlopidae

Southern Blind Snake - *Ramphotyphlops australis*

Recorded on a single occasion during Phase 2 at site FR06 (R156945).

4.2.3 Discussion

The number of reptile species recorded in this survey ($n = 28$) comprises 54% of the total number of species recorded by the Western Australian Museum (Appendix 3). This indicates that the study area supported a subset of reptile species typically found in this region. This may be explained by the low habitat diversity within the confines of the study area.

The woodland sites (FR05 and FR06) had the greatest species diversity (10 and 12 species respectively). This is not unexpected given that these habitats contain considerable quantities of leaf litter providing microhabitats for several litter-inhabiting species (e.g. *Hemiergis initialis* and *Diplodactylus* species), as well as providing habitat for arboreal species (e.g. *Oedura reticulata*).

Specimens of *Diplodactylus granariensis*, *D. maini* and *D. pulcher* were vouchered and submitted to the Western Australian Museum as part of taxonomic studies aimed at resolving existing species complexes.

Table 4.3: Herpetofauna records from the Forrestania survey sites during Phase 1 (P1) and Phase 2 (P2) of the study.

Family	FR03		FR04		FR05		FR06		FR07		FR08		FR09		FR10		FR11		FR12		FR13		FR14		FRC		Total	
Species name	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Scincidae																												
<i>Cryptoblepharus plagiocephalus</i>	–	–	–	1	–	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	2	2
<i>Ctenotus impar</i>	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	4	–
<i>Ctenotus schomburgkii</i>	–	1	–	–	–	–	–	–	3	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	4	2
<i>Egernia richardi</i>	–	–	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	2	2
<i>Hemiergis initialis</i>	–	–	–	–	4	1	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	–	–	–	–	–	5	2
<i>Lerista picturata</i>	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
<i>Morethia obscura</i>	–	–	–	1	2	4	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–	–	5	5
<i>Tiliqua rugosa</i>	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Agamidae																												
<i>Ctenophorus cristatus</i>	–	–	–	–	2	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	4	2
<i>Ctenophorus maculatus</i>	–	–	–	1	–	–	1	–	1	–	–	1	1	2	–	–	–	–	1	–	–	–	–	1	–	1	4	6
<i>Moloch horridus</i>	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	1	1	–	–	–	–	–	–	2	2
<i>Pogona minor</i>	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–	1	–	–	–	1	–	–	–	–	–	4
<i>Rankinia adelaidensis</i>	–	1	–	–	–	–	–	–	–	–	–	1	–	–	–	4	–	3	–	–	–	–	–	–	–	–	–	9
Gekkonidae																												
<i>Crenadactylus ocellatus</i>	4	2	–	–	6	1	–	2	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	11	6
<i>Diplodactylus granariensis</i>	–	1	–	–	1	2	1	5	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	3	9
<i>Diplodactylus maini</i>	–	–	–	–	1	8	4	11	–	–	–	1	1	2	–	5	–	–	–	–	–	–	–	–	–	–	6	27
<i>Diplodactylus pulcher</i>	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	2
<i>Gehyra variegata</i>	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
<i>Oedura reticulata</i>	–	–	–	–	1	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	1
Pygopodidae																												
<i>Delma australis</i>	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–
<i>Delma fraseri</i>	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1	1
<i>Lialis burtonis</i>	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	2
<i>Pygopus lepidopodus</i>	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1
Elapidae																												
<i>Parasuta gouldii</i>	1	–	–	–	2	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	–
<i>Parasuta nigriceps</i>	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
<i>Pseudonaja affinis</i>	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	1	–	–	–	–	–	3	–
<i>Simoselaps bertholdi</i>	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Typhlopidae																												
<i>Ramphotyphlops australis</i>	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Number of individuals	7	6	1	3	19	21	10	24	8	0	2	3	2	8	2	11	4	7	4	3	1	1	4	3	0	1	66	91
Number of species	4	5	1	3	8	9	6	7	6	0	2	3	2	5	2	4	2	5	3	3	1	1	4	3	0	1	19	22
Number of species – both phases	8		4		10		12		6		5		5		7		6		5		2		6		1		28	

4.3 Avifauna

4.3.1 The Assemblage

Sixty bird species were recorded during the survey. This total comprised 24 families and included 18 non-passerine and 42 passerine species (Table 4.4).

4.3.2 Annotated List

Acanthizidae

Broad-tailed Thornbill - *Acanthiza apicalis*

Widespread through inland Australia. Recorded on 68 occasions during Phase 1, across all 12 birding sites. This species was recorded on six occasions during Phase 2 of the survey at sites FR03, FR04, FR07, and FR08.

Redthroat - *Pyrholaemus brunneus*

An uncommon, sedentary inhabitant of inland Australia. Recorded on six occasions during survey Phase 1 and two occasions during Phase 2.

Shy Groundwren - *Hylacola cauta*

An uncommon inhabitant of mallee areas. Recorded six times during Phase 1 (FR04 and FR08), and on seven occasions during Phase 2 (FR04, FR07, and FR11).

Weebill - *Smicrornis brevirostris*

Common throughout much of mainland Australia. Abundant throughout the study site during Phase 1, being recorded on 123 occasions at all birding sites. During Phase 2, only two individuals were noted at FR07.

Yellow-rumped Thornbill - *Acanthiza chrysorrhoa*

Common throughout Australia except the driest deserts and the far north. Recorded on a single occasion at FR03 during Phase 1 of the survey.

Accipitridae

Square-tailed Kite - *Hamirostra isura*

An uncommon species. Recorded on one occasion at site FR12 during Phase 2 of the survey.

Collared Sparrowhawk - *Accipiter cirrhocephalus*

Widespread, but uncommon throughout Australia. Recorded on a single occasion at FR07 during Phase 1 of the survey.

Wedge-tailed Eagle - *Aquila audax*

Found throughout Australia. Recorded on a single occasion at FR05 during Phase 1 of the survey.

Aegothelidae

Australian Owlet-Nightjar - *Aegotheles cristatus*

Common and widespread throughout Australia. Recorded on a single occasion at FR05 during Phase 1 of the survey.

Artamidae

Black-faced Woodswallow - *Artamus cinereus*

A common species. Recorded on four occasions at FR07 during Phase 1 and on one occasion at FR04 during Phase 2.

Dusky Woodswallow - *Artamus cyanopterus*

Common in southern Australia and the east coast. Recorded on 35 occasions during Phase 1, predominantly at FR04. Recorded on a single occasion during Phase 2 at FR05.

Campephagidae

Black-faced Cuckoo-Shrike - *Coracina novaehollandiae*

Widespread and common throughout Australia. Recorded on three occasions during both Phase 1 (FR04, FR11) and Phase 2 (FR07 and opportunistically).

White-winged Triller - *Lalage suerii*

Common and widespread throughout Australia. Recorded on a single occasion during Phase 2 at site FR11.

Casuariidae

Emu - *Dromaius novaehollandiae*

Common on mainland Australia. Recorded on two occasions during Phase 1 and on one occasion during Phase 2.

Cinclosomatidae

Chestnut Quail-Thrush - *Cinclosoma castanotus*

Occurs in patchy distribution in southern Australia. Recorded on two occasions during Phase 1 of the survey at FR04 and FR06.

Climacteridae

Rufous Treecreeper - *Climacteris rufa*

Common in suitable habitat in south-west Australia. Recorded opportunistically on a single occasion during Phase 2 of the survey.

Columbidae

Common Bronzewing - *Phaps chalcoptera*

Widespread and common through most of Australia. Recorded on a single occasion during Phase 1 at FR04. Recorded on 10 occasions during Phase 2 at FR03, FR05, FR08, FR09, FR10 and FR11.

Brush Bronzewing - *Phaps elegans*

Locally common, but scarce in southern Australia. Recorded on seven occasions during Phase 1 of the survey, but absent during Phase 2.

Corvidae

Australian Raven - *Corvus coronoides*

Common in south-west and eastern Australia. Recorded twice during Phase 1 and three times during Phase 2.

Cracticidae

Australian Magpie - *Gymnorhina tibicen*

Common and abundant through most of Australia. Recorded on six occasions during Phase 1 (FR03, FR04, and FR09). Recorded once during Phase 2 at site FR05.

Grey Butcherbird - *Cracticus torquatus*

Widespread, but mostly uncommon. Recorded 16 times at most sites during Phase 1 of the survey. Recorded on six occasions during Phase 2.

Pied Butcherbird - *Cracticus nigrogularis*

Common through most of mainland Australia except the driest deserts. Not recorded from the study site during Phase 1, but recorded on two occasions during Phase 2.

Grey Currawong - *Strepera versicolor*

Common to uncommon in southern Australia. Recorded on four occasions at FR06 and FR12 during Phase 1 of the survey. Recorded once during Phase 2 (FR12).

Dicruridae

Willie Wagtail - *Rhipidura leucophrys*

Common and widespread throughout Australia. Recorded on six occasions during Phase 1 (FR04, FR05, FR06 and FR07), and once during Phase 2 (FR05).

Grey Fantail - *Rhipidura fuliginosa*

Widespread, except driest deserts. Recorded once during Phase 1 at FR05.

Falconidae

Australian Kestrel - *Falco cenchroides*

Widespread throughout Australia. Recorded once during Phase 2 of the survey. Not recorded during Phase 1.

Brown Falcon - *Falco berigora*

Common throughout Australia. Recorded on two occasions during Phase 2 of the survey, but not recorded during Phase 1.

Hirundinidae

Tree Martin - *Hirundo nigricans*

Common through much of Australia, except the driest deserts. Not common within the study area, but sighted in large flocks. A flock of 60 individuals was sighted during Phase 1 at FR05. Another flock comprising 50 birds was sighted opportunistically during Phase 2.

Maluridae

Blue-breasted Fairy-wren - *Malurus pulcherrimus*

Common in south-west Western Australia. Recorded on 33 occasions during Phase 1 of the survey (FR03, FR05, FR06, FR09, FR11 and FR12). Recorded on two occasions during Phase 2 (FR03 and FR09).

Southern Emu-Wren - *Stipiturus malachurus*

Distributed coastally in the southern half of Australia. Recorded on 13 occasions during Phase 1 of the survey. Not recorded during Phase 2.

Meliphagidae

Spiny-cheeked Honeyeater - *Acanthagenys rufogularis*

An uncommon species ranging throughout much of Australia. Recorded on one occasion during Phase 1 (FR05) and on two occasions during Phase 2 (FR05 and FR06).

Brown Honeyeater - *Lichmera indistincta*

Very common within the project area. Recorded on 68 occasions across most sites during Phase 1. Recorded on 49 occasions during Phase 2.

Red Wattlebird - *Anthochaera carunculata*

Common in southern Australia and common within the study area. Recorded on 29 occasions during Phase 1 (FR03, FR04, FR05, FR06, FR07 and FR09). Recorded on 63 occasions during Phase 2 (FR03, FR04, FR05, FR06, FR07, FR08, FR09 and FR11).

Singing Honeyeater - *Lichenostomus virescens*

Common in suitable habitat throughout much of Australia. Recorded on two occasions during Phase 1 (FR12) and once during Phase 2 (FR12).

White-eared Honeyeater - *Lichenostomus leucotis*

Widespread, but patchy in suitable habitats. This honeyeater was common within the project area with 69 records across all sites during Phase 1. Recorded on five occasions during Phase 2 (FR03, FR04, FR06 and FR09).

Yellow-plumed Honeyeater - *Lichenostomus ornatus*

Locally common through southern Australia. Recorded on 31 occasions during Phase 1 (FR03, FR04, FR05, FR06, and FR07). Recorded on four occasions during Phase 2 (FR05).

Purple-gaped Honeyeater - *Lichenostomus cratitius*

An uncommon species. Recorded on 11 occasions during Phase 1 (FR04, FR05, FR07 and FR08). Not recorded during Phase 2 of the survey.

Tawny-crowned Honeyeater - *Phylidonyris melanops*

Fairly common in southern Australia. Recorded on 18 occasions during Phase 1 (FR03, FR04, FR07, FR10, FR11 and FR12), and 29 occasions during Phase 2 (FR09, FR10, FR11, FR12).

White-fronted Honeyeater - *Phylidonyris albifrons*

Locally common across most of Australia. Recorded on four occasions during Phase 1 (FR03, FR04 and FR11), and once during Phase 2 (FR05).

Brown-headed Honeyeater - *Melithreptus brevirostris*

Widespread and common through southern and eastern Australia. Recorded on 49 occasions during Phase 1 (FR05, FR06 and FR07). Not recorded during Phase 2 of the survey.

Yellow-throated Miner - *Manorina flavigula*

Widespread and common through much of mainland Australia. Recorded on three occasions during Phase 1 at FR05. Not recorded during Phase 2.

Meropidae

Rainbow Bee-eater - *Merops ornatus*

Common throughout most of Australia. Recorded opportunistically on two occasions during Phase 2. Not recorded during Phase 1.

Pachycephalidae

Crested Bellbird - *Oreoica gutturalis*

Widespread on mainland Australia. Recorded on four occasions during Phase 1 (FR03, FR04, FR06 and FR09), and on three occasions during Phase 2 (FR05, and FR09).

Golden Whistler - *Pachycephala pectoralis*

Ranging from southern Australia to the east coast. Recorded on five occasions during Phase 1 (FR05, FR06 and FR07), and on one occasion during Phase 2 (FR06).

Grey Shrike-Thrush - *Colluricincla harmonica*

Common throughout most of Australia. Recorded on eight occasions during Phase 1 (FR03, FR04, FR05, FR07 and FR12), but not recorded during Phase 2.

Pardalotidae

Spotted Pardalote - *Pardalotus punctatus*

Common in southern and eastern Australia. Recorded on 29 occasions during Phase 1 (FR03, FR04, FR05, FR06 and FR07), and on three occasions during Phase 2 (FR10).

Striated Pardalote - *Pardalotus striatus*

Common throughout most of Australia. Recorded on 36 occasions during Phase 1 (FR03, FR04, FR05, FR06, FR07 and FR11), and on 12 occasions during Phase 2 (FR03, FR04, FR05 and FR06).

Petroicidae

Jacky Winter - *Microeca fascinans*

Common through most of mainland Australia. Recorded during Phase 1 on a single occasion at FR05 and on five occasions during Phase 2 (FR06).

Western Yellow Robin - *Eopsaltria griseogularis*

Common in south-west Australia. Recorded during Phase 1 on eight occasions (FR05, FR06, FR07 and FR08). Not recorded during Phase 2.

Southern-Scrub-Robin - *Drymodes brunneopygia*

Uncommon in south-west Western Australia. Recorded on five occasions during Phase 1 (FR07, FR08, FR10 and FR11). Not recorded during Phase 2.

Podargidae

Tawny Frogmouth - *Podargus strigoides*

Common throughout Australia. Recorded opportunistically on a single occasion during Phase 2 of the survey.

Pomatostomidae

White-browed Babbler - *Pomatostomus superciliosus*

Listed as a Priority 4 taxon under the State *Wildlife Conservation Act* (i.e. taxa in need of monitoring). Recorded on 10 occasions during Phase 1 (FR05 and FR07), and on six occasions during Phase 2 (FR06).

Psittacidae

Australian Ringneck - *Platycercus zonarius*

Common in Western Australia. Recorded on nine occasions during Phase 1 (FR03, FR04, FR05 and FR06), and on three occasions during Phase 2 (FR05).

Carnaby's Cockatoo - *Calyptorhynchus latirostris*

This species is Federally listed as "endangered" under the *EPBC Act*. It is also listed as a Schedule 1 taxon under the *Wildlife Conservation Act* (i.e. fauna that is rare or is likely to become extinct). Six individuals were recorded flying over site FR12 during Phase 2 of the survey.

Elegant Parrot - *Neophema elegans*

Occurs in south-west Western Australia. Recorded on a single occasion during Phase 2 (FR05), but not recorded during Phase 1 of the survey.

Galah - *Cacatua roseicapilla*

Widespread and very common throughout Australia. Recorded once during Phase 2 (FR05), and not recorded during Phase 1 of the survey.

Regent Parrot - *Polytelis anthopeplus*

Occurs in south-west Western Australia. Recorded on eight occasions during Phase 2 at site FR05. Not recorded during Phase 1.

Western Rosella - *Platycercus icterotis*

Listed as a Schedule 1 taxon under the *Wildlife Conservation Act* (i.e. fauna that is rare or is likely to become extinct). Eight individuals were recorded during Phase 1 in *Eucalyptus salmonophloia* woodland (FR05 n=7, and FR06 n=1). A single individual was also recorded opportunistically during Phase 2 of the survey.

Purple crowned Lorikeet - *Glossopsitta porphyrocephala*

Fairly common and locally abundant in southern Australia. Very abundant during Phase 1 of the survey, with a total of 414 records across all sites. This species was not recorded during Phase 2.

Zosteropidae

Silvereye - *Zosterops lateralis*

Common in south-west Western Australia. Recorded on four occasions during Phase 1 (FR05).

4.3.3 Discussion

Species diversity of avifauna displayed similar patterns to that of the herpetofauna, with one woodland site (FR05) yielding the highest species diversity (33 species), and the other (FR06) having the third highest (26 species). This is likely to be a result of FR05 and FR06 being located within the tallest habitats in the study area, with bird diversity known to correlate well with the height of the tallest strata.

Other habitats with a high diversity of birds include one mallee site (FR04; 27 species) and the shrubland site (FR07; 25 species). The high species diversity of the shrubland site was probably due to the presence of an open overstorey to 6 m, meaning that some species typical of woodlands (e.g. the Yellow-plumed Honeyeater, Western Yellow Robin and Black-faced Cuckoo-shrike) were present. It is less clear why the mallee site (FR04) had a high diversity of species, however prior to Phase 1 of the survey a fire had recently burnt an area, creating a more open habitat and increasing habitat heterogeneity. It should be noted that species diversity at both mallee sites (FR03 and FR04) was significantly less during Phase 2 of the survey.

31

[illegible]

Family		FR03		FR04		FR05		FR06		FR07		FR08		FR09		FR10		FR11		FR12		Opp		Total	
Species name	Common name	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Meliphagidae																									
<i>Lichmera indistincta</i>	Brown Honeyeater	2	–	6	–	18	1	4	–	5	14	1	–	–	6	–	7	31	2	1	1	–	–	68	49
<i>Anthochaera carunculata</i>	Red Wattlebird	8	5	6	5	1	22	1	11	3	7	–	7	1	3	–	–	–	3	–	–	–	–	29	63
<i>Lichenostomus virescens</i>	Singing Honeyeater	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	1	–	–	–	2	1
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	–	–	–	–	1	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	2
<i>Phylidonyris melanops</i>	Tawny-crowned Honeyeater	4	–	1	–	–	4	–	–	1	–	–	2	–	2	2	6	8	14	2	1	–	–	18	29
<i>Lichenostomus leucotis</i>	White-eared Honeyeater	1	1	12	2	5	–	9	1	6	–	6	–	4	1	5	–	6	–	6	–	–	–	69	5
<i>Phylidonyris albifrons</i>	White-fronted Honeyeater	1	–	1	–	–	1	–	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	4	1
<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater	1	–	2	–	25	4	2	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	31	4
<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater	–	–	4	–	2	–	–	–	2	–	3	–	–	–	–	–	–	–	–	–	–	–	11	–
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	–	–	–	–	15	–	23	–	11	–	–	–	–	–	–	–	–	–	–	–	–	–	49	–
<i>Manorina flavigula</i>	Yellow-throated Miner	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–
Meropidae																									
<i>Merops ornatus</i>	Rainbow Bee-eater	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	2	–
Pachycephalidae																									
<i>Oreoica gutturalis</i>	Crested Bellbird	1	–	1	–	–	1	1	–	–	–	–	–	1	2	–	–	–	–	–	–	–	–	4	3
<i>Pachycephala pectoralis</i>	Golden Whistler	–	–	–	–	3	–	1	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	5	1
<i>Colluricincla harmonica</i>	Grey Shrike-Thrush	2	–	2	–	2	–	–	–	1	–	–	–	–	–	–	–	–	1	–	–	–	–	8	–
Pardalotidae																									
<i>Pardalotus punctatus</i>	Spotted Pardalote	9	–	5	–	4	–	1	–	1	–	–	–	–	–	3	–	–	–	–	–	–	–	29	3
<i>Pardalotus striatus</i>	Striated Pardalote	6	2	5	3	15	5	7	2	1	–	–	–	–	–	–	–	2	–	–	–	–	–	36	12
Petroicidae																									
<i>Microeca fascians</i>	Jacky Winter	–	–	–	–	–	1	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	1
<i>Eopsaltria griseogularis</i>	Western Yellow Robin	–	–	–	–	1	–	4	–	2	–	1	–	–	–	–	–	–	–	–	–	–	–	8	–
<i>Drymodes brunneopygia</i>	Southern Scrub-Robin	–	–	–	–	–	–	–	–	2	–	1	–	–	–	1	–	1	–	–	–	–	–	5	–
Podargidae																									
<i>Podargus strigoides</i>	Tawny Frogmouth	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–
Pomatostomidae																									
<i>Pomatostomus superciliosus</i>	White-browed Babbler	–	–	–	–	6	6	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–	–	10	6
Psittacidae																									
<i>Platycercus zonarius</i>	Australian Ringneck	3	–	3	–	2	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9	3
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–	–	–	6
<i>Neophema elegans</i>	Elegant Parrot	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
<i>Cacatua roseicapilla</i>	Galah	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
<i>Polytelis anthopeplus</i>	Regent Parrot	–	–	–	–	–	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8
<i>Platycercus icterotis</i>	Western Rosella	–	–	–	–	7	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	8	1
<i>Glossopsitta porphyrocephala</i>	Purple crowned Lorikeet	27	–	48	–	47	–	1	–	6	–	19	–	43	–	149	–	2	–	72	–	–	–	414	–
Zosteropidae																									
<i>Zosterops lateralis</i>	Silvereye	–	–	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	–
	Number of individuals	115	14	157	16	264	74	111	22	84	32	57	13	78	20	172	18	94	23	104	19	0	107	1224	368
	Number of species	19	9	25	8	29	18	22	9	22	8	10	4	11	10	8	5	14	6	12	5	0	6	48	44
	Number of species both phases	21		27		33		26		25		13		16		11		18		17		7		60	

4.4 Mammals

4.4.1 The Assemblage

Eighteen mammal species (15 native and three introduced) were recorded from the project area (Table 4.5). The mammals comprised four dasyurids (carnivorous marsupials), two macropods (kangaroos and wallabies), one burramyid (pygmy possums), one tarsiped (honey possum), three vespertilionids (vespertilionid bats), two molossids (freetail bats), two native and one introduced murid (murid rodents), one felid (cats), and one leporid (rabbits).

Based on examination of call sequences, five bat species are likely to be present within the project area: *Chalinolobus gouldii* (Figure 4.1), *Chalinolobus morio* (Figure 4.2), *Mormopterus planiceps* (Figure 4.3), *Tadarida australis* (Figure 4.4), and *Vespadelus* sp. (Figure 4.5).

4.4.2 Annotated List – Non-volant Mammals

Burramyidae

Western Pygmy Possum - *Cercartetus concinnus*

A common species captured in pit traps within the study area. Recorded on 17 occasions during Phase 1 of the survey (FR03, FR04, FR06, FR09 and FR10). Recorded on 18 occasions during Phase 2 (FR03, FR04, FR05, FR06, FR07, FR011 and FR12).

Dasyuridae

Western Quoll (Chuditch) - *Dasyurus geoffroii*

Federally listed as "vulnerable" under the EPBC Act. It is also listed as a Schedule 1 taxon under the State Wildlife Conservation Act (i.e. fauna that is rare or is likely to become extinct). A single individual was recorded during Phase 2, captured in an Elliott trap in dense *Melaleuca* shrubland at site FR13.

Gilbert's Dunnart - *Sminthopsis gilberti*

Recorded on a single occasion during both Phase 1 (FR03) and Phase 2 (FR06) of the study.

White-tailed Dunnart - *Sminthopsis granulipes*

The most common mammal captured during the survey. Recorded on 18 occasions during Phase 1 (FR08, FR09, FR10, FR11 and FR12) and on 53 occasions during Phase 2 (FR04, FR06, FR07, FR08, FR09, FR10, FR11, FR12 and FR13). This species was particularly common in open heath habitat (FR08, FR09, FR10 and FR11).

Grey-bellied Dunnart - *Sminthopsis griseoventer*

Recorded on a single occasion during Phase 2 of the survey at site FR04. Not recorded during Phase 1.

Macropodidae

Western Grey Kangaroo - *Macropus fuliginosus*

This common species was sighted on eight occasions during Phase 1 (FR07, FR09, FR11 and FR12) and eight occasions during Phase 2 (FR06, FR08, FR10, and FR12).

Western Brush Wallaby - *Macropus irma*

Listed as a Schedule 4 taxon under the State Wildlife Conservation Act (i.e. taxa in need of monitoring). Sighted during Phase 2 of the survey at site FR09.

Muridae

Mitchell's Hopping Mouse - *Notomys mitchellii*

Recorded on 18 occasions during Phase 2 of the survey (FR03, FR07, FR08, FR10, FR11, FR12 and FR13). The majority of these were captured in Elliott traps. *N. mitchellii* was not recorded during Phase 1 of the survey.

Ash-grey Mouse - *Pseudomys albocinereus*

Recorded on two occasions during Phase 1 of the survey (FR10), and on one occasion during Phase 2 (FR10), in open mallee eucalyptus heath habitat.

Tarsipedidae

Honey Possum - *Tarsipes rostratus*

Recorded on two occasions during Phase 1 at site FR10. Not recorded during Phase 2 of the survey.

INTRODUCED MAMMALS

Felidae

Feral Cat – *Felis catus*

Tracks of feral house cats were noted during Phase 1 (FR03) and Phase 2 (FR08) of the survey.

Leporidae

European Rabbit - *Oryctolagus cuniculus*

Sighted twice during Phase 1 (FR06, and FR12) and twice during Phase 2 (FR05, and FR08).

Muridae

House Mouse - *Mus musculus*

Recorded during Phase 1 on 35 occasions (FR03, FR04, FR05, FR07, FR08, FR09, FR10, FR11, FR12, and FR13). Also recorded during Phase 2 on 6 occasions (FR06, FR07, FR11 and FR12).

4.4.3 Annotated list - Bats

Molossidae

White-striped Freetail Bat - *Tadarida australis*

Calls were recorded during Phase 2 of the survey at both Anabat sites (FR05 and FR06). Calls were also heard during Phase 1 at site FR06.

Inland Freetail Bat - *Mormopterus planiceps*

Calls were recorded at site FR05 during Phase 2 of the survey. It should be noted that the calls of the Inland Freetail Bat (*M. planiceps* - short penis form) and the Western Freetail Bat (*M. planiceps* - long penis form) are indistinguishable. Both forms could occur within the study area based on their distribution.

Vespertilionidae

Gould's Wattled Bat - *Chalinolobus gouldii*

Calls of this widespread species were recorded from sites FR05 and FR06 during Phase 2. A single specimen was also noted roosting at the office block of the Flying Fox mine.

Chocolate Wattled Bat - *Chalinolobus morio*

Calls were recorded from site FR05 during Phase 2 of the survey.

Forest Bat sp. - *Vespadelus* sp.

The calls of the Inland Forest Bat (*V. baverstocki*) and the Southern Forest Bat (*V. regulus*) are indistinguishable, hence the two species cannot be reliably separated based solely on calls. Calls of one or both of these species were recorded during Phase 2 at FR05 and FR06.

4.4.4 Discussion

The mammal fauna displayed different patterns of species diversity from the reptile and bird fauna. Although non-volant mammal species diversity was modest, the highest totals were from heath (FR10; seven species) and tall heath (FR12; six species), with the lowest total being from a woodland site (FR05; three species). It should be noted that a total of nine non-volant species were recorded during Phase 1 compared to 12 species during Phase 2.

Abundances varied between species and between the two survey phases. With the exception of the House Mouse (*Mus musculus*), abundances were higher during Phase 2. This may be explained by the fact that Phase 1 was carried out following a drier than usual

summer, while Phase 2 was carried out following winter rain, which would benefit the majority of species. The House Mouse (*Mus musculus*) is known to increase in numbers following dry conditions (Saunders and Giles 1977).

There was a relatively high diversity of bats (five species) within the study area. A broad range of habitat types are represented within the study area, providing a variety of roosting and foraging niches.

Table 4.5: Mammal records from the Forrestania survey sites during Phase 1 (P1) and Phase 2 (P2) of the study.

Family		FR03		FR04		FR05		FR06		FR07		FR08		FR09		FR10		FR11		FR12		FR13		FRC		Opp		Total		
Species name	Common name	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P1	P2	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	
Burramyidae																														
<i>Cercartetus concinnus</i>	Western Pygmy Possum	1	1	5	7	–	2	4	2	–	2	–	–	4	–	3	–	–	2	–	2	–	–	–	–	–	–	–	17	18
Dasyuridae																														
<i>Dasyurus geoffroii</i>	Western Quoll	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	
<i>Sminthopsis gilberti</i>	Gilbert's Dunnart	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	
<i>Sminthopsis granulipes</i>	White-tailed Dunnart	–	–	–	3	–	–	–	3	–	4	1	10	4	6	9	18	3	8	1	3	–	1	–	–	–	–	18	53	
<i>Sminthopsis griseoventer</i>	Grey-bellied Dunnart	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	
Felidae																														
<i>Felis catus</i> *	House Cat	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	
Leporidae																														
<i>Oryctolagus cuniculus</i> *	European Rabbit	–	–	–	–	–	1	1	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	2	2	
Macropodidae																														
<i>Macropus fuliginosus</i>	Western Grey Kangaroo	–	–	–	–	–	–	–	1	2	–	–	2	2		–	4	1	–	3	1	–	–	–	–	–	–	8	8	
<i>Macropus irma</i>	Western Brush Wallaby	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	
Muridae																														
<i>Mus musculus</i> *	House Mouse	3	–	3	–	2	–	–	2	1	1	4	–	2	–	3	–	3	1	3	2	8	–	3	–	–	–	35	6	
<i>Notomys mitchellii</i>	Mitchell's Hopping Mouse	–	1	–	–	–	–	–	–	–	2	–	2	–	–		1	–	2	–	2	–	7	–	–	–	–	–	17	
<i>Pseudomys albocinereus</i>	Ash-grey Mouse	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	–	–	–	–	2	1	
Tarsipedidae																														
<i>Tarsipes rostratus</i>	Honey Possum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	2	–	
Vespertilionidae																														
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	–	–	–	–	–	C	–	C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	3	
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	–	–	–	–	–	C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	
<i>Vespadelus</i> sp.	Forest Bat sp.	–	–	–	–	–	C	–	C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	
Molossidae																														
<i>Tadarida australis</i>	White striped Freetail Bat	–	–	–	–	–	C	C	C	–	–	–	–	–	–	–	–	–	C	–	–	–	–	–	–	–	–	2	2	
<i>Mormopterus planiceps</i>	Inland Freetail Bat	–	–	–	–	–	C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	
	Number of individuals	6	2	8	11	2	8	6	12	3	9	5	16	12	7	19	24	7	13	8	10	8	9	3	–	–	1	88	111	
	Number of species	4	2	2	3	1	7	3	8	2	4	2	5	4	2	5	4	3	4	5	5	1	3	1	–	–	1	10	17	

* Denotes introduced species.

C Denotes calls.

T Denotes tracks.

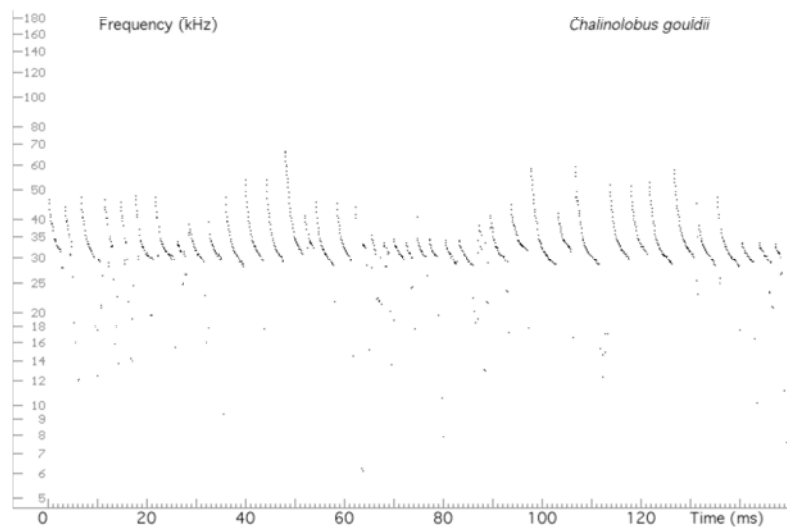


Figure 4.1: Call sequence identified as *Chalinelobus gouldii*.

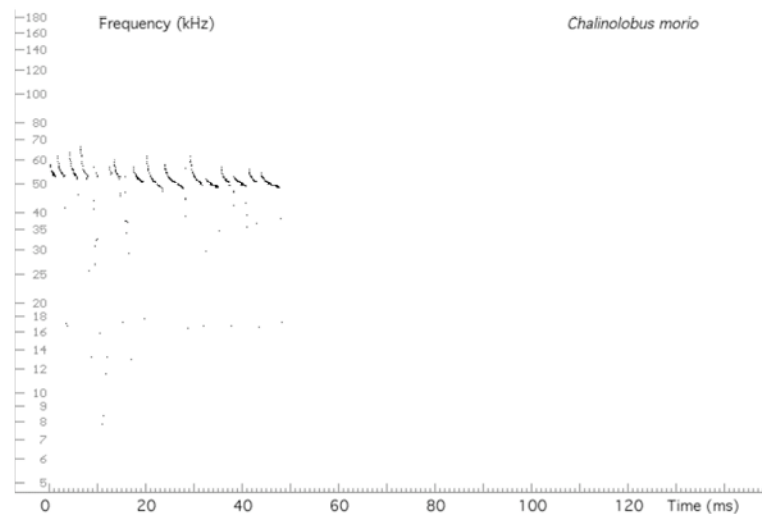


Figure 4.2: Call sequence identified as *Chalinelobus morio*.

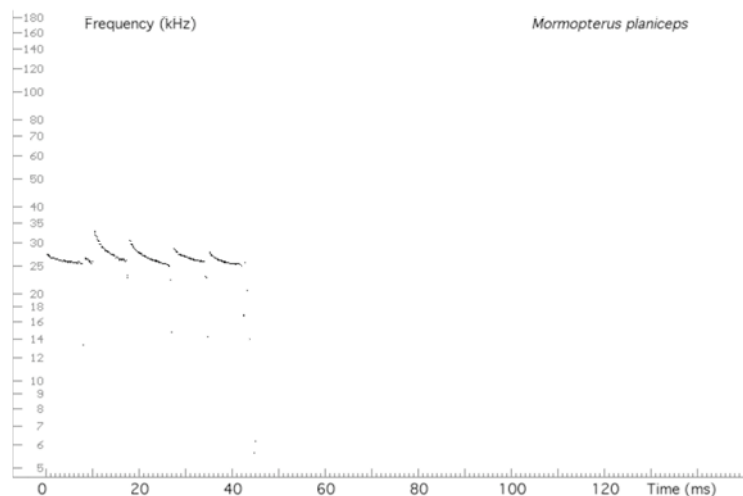


Figure 4.3: Call sequence identified as *Mormopterus planiceps*.

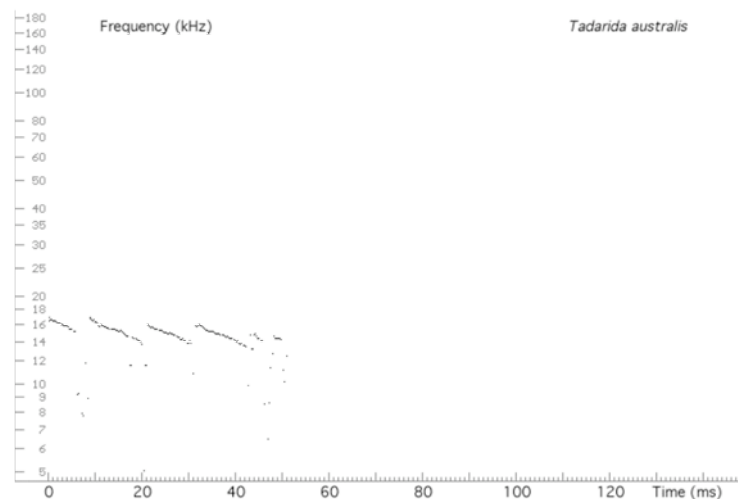


Figure 4.4: Call sequence identified as *Tadarida australis*.

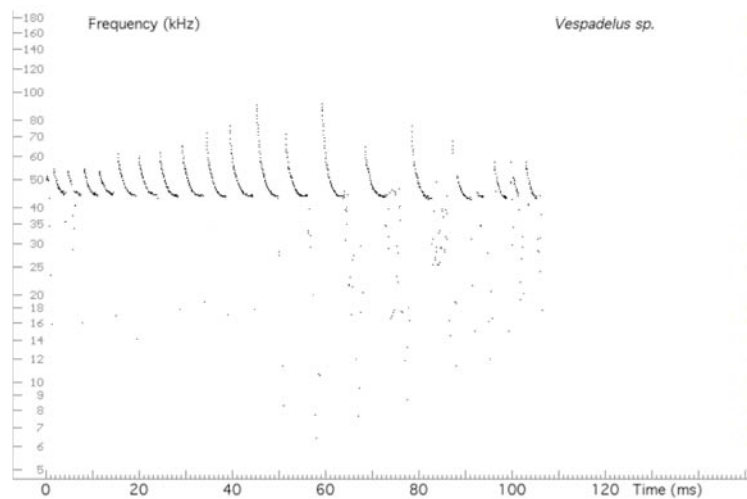


Figure 4.5: Call sequence identified as *Vespadelus* sp.

5.0 Invertebrate Fauna Inventory

5.1 Overview

Taxonomic groups of invertebrates with naturally small distributions are described as short-range endemics and are in part characterised by poor dispersal capabilities, confinement to disjunct habitats and low fecundity (Harvey 2002, Ponder and Colgan 2002). Given the importance of short-range endemism to the conservation of biodiversity, the assessment of such invertebrate taxa is a potentially important component of impact assessment. Examples of taxonomic groups that show high levels of short-range endemism in this respect include mygalomorph spiders, millipedes, pseudoscorpions and freshwater and terrestrial molluscs.

5.2 Arachnida

5.2.1 Mygalomorph Spiders

Two species of mygalomorph spiders were recorded from the Forrestania project area. A total of seven unidentified *Aname* sp. (Nemesiidae) were captured. These comprised a single individual during Phase 1 and six individuals during Phase 2 of the survey. In addition, one unidentified specimen of the Idiopidae family was recorded during Phase 2 (Table 5.1).

Table 5.1: Mygalomorphs recorded in the project area.

Species	FR03	FR04	FR05	FR06	FR07	FR08	FR09	FR10	FR11	FR12	FR13	Total
<i>Aname</i> sp.1	–	–	–	1	–	–	3	–	–	3	–	7
Idiopidae sp.1	–	–	–	1	–	–	–	–	–	–	–	1

5.2.2 Other Spiders

Several other spiders were collected during the survey, both from pit traps and opportunistic searches. These include representatives of the following families: Clubonidae, Gnaphosidae, Lamponidae, Lycosidae, Memetidae, Miturgidae, Pisauridae, Prodidomidae, Salticidae, Sparassidae, Theridiidae, Thomisidae, Trochanteriidae, Zodariidae and Zoridae.

5.3 Scorpionida

Two species of scorpion were collected from the study area. Three individuals of the genus *Lychas* were captured during Phase 2 of the survey. Ten individuals of the genus *Urodacus* were also recorded (one during Phase 1 and nine during Phase 2) (Table 5.2).

Table 5.2: Scorpions recorded in the project area.

Species	FR03	FR04	FR05	FR06	FR07	FR08	FR09	FR10	FR11	FR12	FR13	Total
<i>Lychas</i> sp.	–	–	1	1	–	1	–	–	–	–	–	3
<i>Urodacus</i> sp.	1	–	2	–	2	6	–	–	–	–	–	10

5.4 Pseudoscorpions and Millipedes

Thorough hand searches were conducted for pseudoscorpions and millipedes, however no records of either group were noted.

6.0 Conservation Significance

6.1 Threatened Fauna Statutory Framework

Native fauna species that 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, many of these species are listed under the Federal *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)*.

6.1.1 *Wildlife Conservation Act 1950-1979*

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

- Schedule 1** Taxa that are rare or likely to become extinct and are declared to be fauna in need of special protection;
- Schedule 2** Taxa that are presumed to be extinct and are declared to be fauna in need of special protection;
- Schedule 3** Birds that 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
- Schedule 4** Taxa 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, fauna are also classified under five different Priority codes:

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

6.1.2 **EPBC Act 1999**

Fauna species of national conservation significance are listed under the *EPBC Act 1999*, and may be classified as 'critically endangered', 'endangered', 'vulnerable' or 'conservation dependent' (consistent with IUCN categories (see http://www.redlist.org/info/categories_criteria2001.html)). Migratory wader species are also protected under the *EPBC Act 1999*. The national List of Migratory Species consists of those species listed under the following International Conventions:

- Japan-Australia Migratory Bird Agreement (JAMBA);
- China-Australia Migratory Bird Agreement (CAMBA);
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

6.2 **Schedule and Priority Fauna**

Eight species of Schedule and Priority fauna were recorded within the Forrestania project area:

- Short-billed (Carnaby's) Black Cockatoo – listed as Schedule 1 at State level and Endangered at the Federal level. Recorded during Phase 2 at site FR12.
- Western Quoll (Chuditch) – listed as Schedule 1 at State level and vulnerable at the Federal level. Recorded at FR13 during Phase 2 of the survey.
- Western Rosella (inland sub-species) - listed as Schedule 1 at State level. Recorded during survey 1 at sites FR05 and FR06. Also recorded opportunistically during Phase 2 of the survey.
- Western Brush Wallaby - listed as Priority 4 at the State level. Recorded during Phase 2 of the survey at site FR09.
- Carpet Python - listed as Priority 4 at the State level. Recorded during site inspection prior to the survey.
- White-browed Babbler (western Wheatbelt) - listed as Priority 4 at the State level. Recorded during Phase 1 at sites FR05 and FR07. Also recorded during Phase 2 at site FR05.
- Crested Bellbird - listed as Priority 4 at the State level. Recorded during Phase 1 at sites FR03, FR04, FR06 and FR09. Also recorded during Phase 2 at FR09.
- Shy Groundwren (western) - listed as Priority 4 at the State level. Recorded during Phase 1 at sites FR04 and FR08. Also recorded during Phase 2 at sites FR04, FR07 and FR11.

Based on habitats available and known distributions, 18 Schedule or Priority species could potentially occur within the project area (Table 6.1 and Appendix 2).

Table 6.1: Schedule and Priority fauna listed at State and Federal levels recorded or potentially occurring in the Forrestania project area.

Species	Conservation Significance	
	State Level	Federal Level
* <i>Calyptrorhynchus latirostris</i> - Short-billed (Carnaby's) Black Cockatoo	Schedule 1	Endangered
^ <i>Phascogale calura</i> - Red-tailed Phascogale	Schedule 1	Endangered
^ <i>Pseudomys shortridgei</i> - Heath Mouse	Schedule 1	Vulnerable
* <i>Dasyurus geoffroyi</i> - Western Quoll (Chuditch)	Schedule 1	Vulnerable
^ <i>Myrmecobius fasciatus</i> - Numbat	Schedule 1	Vulnerable
^ <i>Leipoa ocellata</i> - Malleefowl	Schedule 1	Vulnerable
* <i>Platycercus icterotis xanthogenys</i> - Western Rosella	Schedule 1	–
^ <i>Falco peregrinus</i> - Peregrine Falcon	Schedule 4	–
* <i>Macropus irma</i> - Western Brush Wallaby	Priority 4	–
^ <i>Pseudomys occidentalis</i> - Western Mouse	Priority 4	–
* <i>Pomatostomus superciliosus ashbyi</i> - White-browed Babbler	Priority 4	–
* <i>Morelia spilota imbricata</i> - Carpet Python	Priority 4	–
^ <i>Ardeotis australis</i> - Australian Bustard	Priority 4	–
* <i>Oreoica gutturalis</i> - Crested Bellbird	Priority 4	–
* <i>Hylacola cauta whitlocki</i> - Shy Groundwren (western)	Priority 4	–
^ <i>Calamanthus campestris montanellus</i> - Rufous Fieldwren	Priority 4	–
* <i>Merops ornatus</i> - Rainbow Bee-eater	–	Migratory sp.
^ <i>Apus pacificus</i> - Fork-tailed Swift	–	Migratory sp.

* Recorded in project area.

^ Potentially occurring in project area.

Accounts of the ecology, status and likelihood of occurrence of these threatened species follow.

Schedule One Species

- Short-billed (Carnaby's) Black-Cockatoo *Calyptrorhynchus latirostris* (Endangered under the State *Wildlife Conservation Act 1950-1979* and Endangered under the Federal *EPBC Act 1999*). A small flock of six was recorded during Phase 2 of this fauna survey at site FR12. This species is also listed for the general region on the Birds Australia Atlas Database and the WA Museum FaunaBase. It is probably widespread throughout the study area on an occasional basis, primarily in woodland, but also occurring in mallee. Breeding records exist from this area, but breeding is confined to woodland where large Salmon Gum (*Eucalyptus Salmonophloia*) provide hollows of a suitable size (Ron Johnstone pers. Comm., Western Australian Museum, Feb. 2006).
- Chuditch *Dasyurus geoffroyi* (Vulnerable under the *Wildlife Conservation Act 1950-1979* and Vulnerable under the *EPBC Act 1999*). Recorded during Phase 2 of the survey and recorded for the area on the WA Museum FaunaBase and CALM Threatened Fauna Database. The species has a large home range and only occurs at very low densities; it probably utilises all habitats. A single record within the study area does not constitute a matter of national environmental significance (<http://www.deh.gov.au/epbc/policy/administrative/index.html>), and does not require Federal referral (Dr. Peter Mawson pers. comm., CALM, February 2006).
- Numbat *Myrmecobius fasciatus* (Vulnerable under the *Wildlife Conservation Act 1950-1979* and Vulnerable under the *EPBC Act 1999*). No individuals were recorded during the survey, however the CALM Threatened Fauna Database indicates that a single individual was recorded in 1961.
- Malleefowl *Leipoa ocellata* (Vulnerable under the *Wildlife Conservation Act 1950-1979* and Vulnerable under the *EPBC Act 1999*). No individuals were recorded during the site inspection or the fauna survey, although the species is listed for the general region on the Birds Australia Atlas Database, the WA Museum FaunaBase and CALM Threatened Fauna Database. Staff at the Cosmic Boy camp report regular sightings of this species

throughout the study area, and the lack of records during the site visits probably reflects the elusive nature and low density of the species. It is probably present in most habitats in the study area, except heath.

- Red-tailed Phascogale *Phascogale calura* (Endangered under the *Wildlife Conservation Act 1950-1979* and Endangered under the *EPBC Act 1999*). Not recorded during the site visit or this survey, but the species is very cryptic. Recorded for the general area on the WA Museum FaunaBase. The species occurs in eucalypt woodlands but is most abundant where Rock Oak (*Allocasuarina huegeliana*) grows over a shrub layer on rocky substrates (Strahan 1995, Menkhurst and Knight 2001). This species is unlikely to occur in the study area but, if present, is probably confined to the eucalypt woodlands.
- Heath Mouse *Pseudomys shortridgei* (Vulnerable under the *Wildlife Conservation Act* and Vulnerable under the *EPBC Act 1999*). Not recorded during the fauna survey. This species typically inhabits heath, with a strong preference for recently burnt areas (Strahan 1995, Menkhurst and Knight 2001). The species has only been recorded as far north as Dragon Rocks Nature Reserve, about 60 km south-west of the study area (Menkhurst and Knight 2001), so it probably does not occur in the project area. However, the complete distribution of this species is not well known in Western Australia and the study area contains suitable habitat. The Heath Mouse is recorded from the general area on the WA Museum FaunaBase, and this record presumably refers to Dragon Rocks.
- Western Rosella *Platycercus icterotis xanthogenys* (Vulnerable under the *Wildlife Conservation Act 1950-1979*). During Phase 1, eight individuals of this species were recorded from the woodland sites (seven at FR05 and one at FR06). One individual was recorded opportunistically during Phase 2 of the survey. The species is also recorded from the general region on the Birds Australia Database and the WA Museum FaunaBase. The subspecies is probably widespread in the area in woodland and, to a lesser extent, mallee; it is likely that the locality supports a considerable population.

Schedule Four Species

- Peregrine Falcon *Falco peregrinus* (Other Specially Protected Fauna under the *Wildlife Conservation Act 1950-1979*). This species was not recorded during the site inspection or the fauna survey but has been seen over woodland at Digger Rocks (Dr Mike Craig, pers. obs.). The species is also listed for the general region on the Birds Australia Atlas Database, the WA Museum FaunaBase and CALM Threatened Fauna Database. Home ranges of this species are large (Marchant and Higgins 1993), and the species probably occurs periodically in all habitats throughout the study area at low densities. Of most significance for this species are nest sites, since the Peregrine Falcon requires either cliffs or tall trees for nesting and often uses nest sites on a traditional basis.

Priority Four Species

- Carpet Python *Morelia spilota imbricata* (Priority 4 under the *Wildlife Conservation Act 1950-1979*). This species was recorded in the study area during the site inspection only. The lack of records during the fauna survey probably reflects the low densities at which this species occurs, combined with its cryptic behaviour. The species would be expected to occur in most or all habitats within the study area at a low density.
- Australian Bustard *Ardeotis australis* (Priority 4 under the *Wildlife Conservation Act 1950-1979* and classified as Near-Threatened by Garnett and Crowley (2000)). This species was not recorded during the site inspection or the current survey, but probably occurs in the study area. It typically inhabits low shrublands and grasslands and is particularly attracted to burnt areas (Marchant and Higgins 1993). In the study area, it probably occurs in heaths and open areas with a sparse understorey.
- Shy Groundwren *Hylacola cauta whitlocki* (Priority 4 under the *Wildlife Conservation Act 1950-1979* and classified as Near-Threatened by Garnett and Crowley (2000)). During Phase 1, six individuals were recorded; four from mallee (FR04) and two from tall heath (FR08). Similarly, during Phase 2, four individuals were recorded; two from FR04 and two from heath (FR11). This species was also recorded for the general region in the Birds Australia Atlas Database. It is probably more widespread throughout the study area locality, in mallee, gimlet and woodland with a dense understorey.

- Rufous Fieldwren *Calamanthus campestris montanellus* (Priority 4 under the *Wildlife Conservation Act 1950-1979* and classified as Near-Threatened by Garnett and Crowley (2000)). Not recorded during the survey but listed for the general region in the Birds Australia Database and the WA Museum FaunaBase. The subspecies typically inhabits saltbush, samphire and heaths (Higgins and Peter 2002), so it is only likely to be present in heaths, particularly low heath, throughout the study area.
- Crested Bellbird *Oreoica gutturalis gutturalis* (Priority 4 under the *Wildlife Conservation Act 1950-1979* and classified as Near-Threatened by Garnett and Crowley (2000)). Four individuals were recorded during Phase 1; one each from the mallee sites (FR03 and FR04) and one from woodland (FR06) and tall heath (FR09). During Phase 2, three individuals were recorded; one from woodland (FR05) and two from tall heath (FR09). This species is also recorded from the area on the Birds Australia Atlas Database. The subspecies inhabits woodland, mallee and *Acacia* shrublands (Higgins and Peter 2002), so it is probably widespread throughout the study area at low densities.
- Western Brush Wallaby *Macropus irma* (Priority 4 under the *Wildlife Conservation Act 1950-1979*). Recorded during Phase 2 of the fauna survey at heath site FR09. In addition, staff at the Cosmic Boy mine have reported several sightings of the species around Cosmic Boy and Digger Rocks. It is also recorded for the area on the WA Museum FaunaBase and CALM Threatened Fauna Database. The species is typically recorded in open woodlands with grassy understorey for foraging and thickets of shrubs for resting (Strahan 1995, Menkhorst and Knight 2001).
- Western Mouse *Pseudomys occidentalis* (Priority 4 under the *Wildlife Conservation Act 1950-1979*). Not recorded during the fauna survey but recorded for the region on the WA Museum FaunaBase and CALM Threatened Fauna Database. The species inhabits shrublands on loam soils and all occupied areas are characterised by an extremely dense shrub layer between 0.5 and 2.5 m in height (Strahan 1995, Menkhorst and Knight 2001). The species may be present in suitable habitat in the study area.

Migratory species

- The Fork-tailed Swift *Apus pacificus* and Rainbow Bee-eater *Merops ornatus* are listed as migratory species under the *EPBC Act 1999*. The Fork-tailed Swift is also listed under the China-Australia Migratory Bird Agreement (CAMBA) and the Japan-Australia Migratory Bird Agreement (JAMBA), and the Rainbow Bee-eater is listed under JAMBA. The Fork-tailed Swift was not recorded during the site visits and is not listed for the general region on any of the avifauna databases. However, the occurrence of this species is extremely patchy on both a temporal and spatial basis; it probably occurs in the study area at irregular intervals, and would be likely over all habitats. Two Rainbow Bee-eaters were recorded opportunistically during Phase 2 of the survey. This species is also listed for the general region on the Birds Australia Atlas Database. The Rainbow Bee-eater forages on aerial insects and nests in burrows in the ground (Higgins 1999). It probably occurs in most habitats in the study area that provide suitable soil for nesting and a tall stratum of vegetation for perching.

7.0 Potential Impacts and Management

7.1 Generic impacts and Management

Below is a list of generic impacts that are typically associated with mining and associated infrastructure proposals of a similar scale to the proposed Forrestania project.

Direct fauna habitat disturbance and modification

The principal impacts arising from the proposed development are associated with the clearing of fauna habitat associated with establishment of:

- associated mine infrastructure (e.g. waste dumps, roads); and
- drill line access tracks and drill pads.

Indirect fauna habitat disturbance and modification

A number of indirect modifications may also occur to fauna habitat as a result of exploration drilling, the operation of the mine and expansion of associated infrastructure. These include changes to noise, weed introduction or spread, and feral animal spread.

7.1.1 Direct Loss of Habitat

Habitat supporting three Schedule 1 taxa may be cleared as part of the proposal to allow for exploration drilling, and expansion of the waste dump and mine infrastructure over the life of the mine. It is considered unlikely that the loss of habitat will affect the conservation status of the Western Quoll, Western Rosella or Carnaby's Cockatoo.

7.1.2 Direct Loss of Individual Fauna

It is inevitable that there will be some localised loss of fauna due to direct mortality arising from construction activities, including that which may occur during the clearing of habitat. Ongoing impacts may also arise from more frequent vehicle movements, haulage movements and machinery operation. For all vertebrate and the majority of invertebrate taxa, it is unlikely that the loss of individuals associated with such direct mortalities would be significant enough to affect the overall conservation status of any of the species recorded from the study area.

We have not fully established the distribution of the potential short range taxa (mygalomorph spiders) recorded from the study area to determine whether impacts may be significant. However, the habitat type from which they were recorded appears widespread.

In relation to both habitat loss and direct loss of fauna, it is noted that cumulative effects of a variety of disturbances (eg. exploration drilling, mining proposals; road construction and maintenance; wildfires; increased road usage; and feral animals) in the region may impact negatively on some species.

7.1.3 Noise

Noise from mining activities including drilling, blasting, haulage and general mining operations may impact on fauna. However, we did not record any particularly sensitive habitats or communities within the study area that may be at particular risk (eg. there were no significant bat roosts or breeding populations of birds).

7.1.4 Weed Spread

Ground disturbance associated with exploration drilling, mine operation and expansion of infrastructure provides an opportunity for the infiltration and spread of weeds. The

consequences of weed infiltration on the biodiversity of fauna are not well documented, however precautions should be taken to prevent the introduction or spread of weeds.

Feral Animal Spread

Ground disturbance and construction of roads or tracks also offers opportunity for spread of feral animals that use these disturbances as pathways for travel. Feral animals may be predators or competitors of native fauna and their spread should be kept to a minimum.

7.2 Recommendations

The following recommendations arise from the two-phase fauna survey of the Forrestania study area:

1. The proponent has agreed to utilise existing cleared and disturbed areas for proposed new disturbances. The use of these disturbed areas should be maximised as part of project design.
2. All members of the work force on site will be provided with an environmental induction to ensure they are familiarised with the presence of Schedule 1 fauna. This will include driving speed restrictions, ensuring that off-road driving is minimised, in addition to fire risk minimisation.
3. Western Areas NL has agreed to implement a feral animal baiting program targeting areas around the Cosmic Boy Camp, Flying Fox mine, Drillers Camp and in some accessible areas of Lake Cronin Nature Reserve. This will ensure predatory feral animal numbers are kept to a minimum with the aim to reduce predation on native fauna.

The baiting program will involve employing a licensed contractor to conduct biannual, week long trapping runs which would incorporate the use of 1080 baits and cage traps. This program will be developed in consultation with the Department of Conservation and Land Management. In addition, Western Areas NL will where possible, assist in maintaining the existing wild dog control program that is currently undertaken in Forrestania by the Department of Agriculture.
4. In the camp waste disposal area, waste will be covered with a layer of soil to minimum depth of 100 mm, at least monthly. In addition, the waste disposal area should be enclosed with chain-wire fencing (Cyclone® fencing). This will limit the availability of edible waste to both native and feral animals and will help reduce the likelihood of the Western Quoll (*Dasyurus geoffroii*) being attracted to the area.
5. Any future fauna survey work will include area searches for evidence of fox and cat activity (i.e. scats, tracks or evidence of predation).
6. Future fauna surveys will include specific targeting of Western Quoll (*Dasyurus geoffroii*). Extra cage traps will be set with bait specifically used to target dasyurid marsupials.

8.0 References

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Appendix 1

CALM Regulation 17 Permit

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DPS
LICENSING OFFICER
(ROY JOHN)

AMENDED
4.11.05
Date Initial

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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 PROGENY 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 AT 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 DEPARTMENT OF THE ENVIRONMENT AND HERITAGE, PHONE 02 6274 1900. 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 BIOPROSPECTING 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

FORESTANNIA FAUNA SURVEY FOR PROPOSED FLYING FOX NICKEL PROJECT.

AUTHORISED PERSONS

GARTH HUMPHRIES, MIKE GREEHAM, DR MIKE CRAIG,
 GREG HAROLD, DANIEL KAMIEN.

Appendix 2

CALM Threatened Fauna Search

Threatened and Priority Fauna Database

Page 1 of 2

31.6361 °S 120.2642 °E / 32.8866 °S 119.1458 °E Forrestania area east of Hyden

* Date Certainty Seen Location Name

Method

Schedule 1 - Fauna that is rare or is likely to become extinct

Dasyurus geoffroii Chuditch 1 records

This carnivorous marsupial occupies large home ranges, is highly mobile and appears able to utilise bush remnants and corridors.

1985	1	2	HYDEN	Dead
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Myrmecobius fasciatus Numbat 1 records

This diurnal marsupial feeds almost exclusively on termites and is very vulnerable to predation by foxes and cats. It occurs in a variety of habitats including woodland and shrubland where it shelters in hollow logs, tree hollows and burrows.

1961	1	1	Norseman	
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Leipoa ocellata Malleefowl 1 records

This species was once widely distributed across southern Australia. It prefers woodland or shrubland with an abundant litter layer that provides essential material for the construction of its nest mound.

1995	1	16	Varley/Mount Sheridan	Day sighting
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Platycercus icterotis xanthogenys Western Rosella (inland ssp) 3 records

This subspecies of the Western Rosella occurs in eucalypt and casuarina woodlands and scrubs, especially of Salmon Gum and tall mallees.

1969	1	1	Lake Varley Nature Reserve	Day sighting
1991	1	2	Lake Cronin Nature Reserve	Day sighting
1991	1	3	Lake Cronin Nature Reserve	Day sighting

Schedule 4 - Other specially protected fauna

Falco peregrinus Peregrine Falcon 1 records

This species is uncommon and prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land.

1991	1	1	Lake Cronin Nature Reserve	Day sighting
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Priority Four: Taxa in need of monitoring

Macropus irma Western Brush Wallaby 3 records

This species occurs in areas of forest and woodland supporting a dense shrub layer.

1969	1	3	Lake Varley Nature Reserve	Day sighting
1998	1	5	Mount Sheridan	Day sighting
1999	2	2	Jilbadji NR	Day sighting

Pseudomys occidentalis Western Mouse 1 records

This species occurs most frequently in areas of long-unburnt vegetation on sandy clay or loam with a matrix of gravel. It is known to feed on the seeds of quandong (*Santalum acuminatum*) and various sedge species.

1	Hatter Hill
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Pomatostomus superciliosus ashbyi White-browed Babbler (western wheath) 1 records

This species of bird lives in eucalypt forests and woodlands, and forages on or near the ground for insects and seeds.

1982	1	Tapper Road Nature Reserve	Day sighting
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Friday, 20 January 2006

Department of Conservation and Land Management



Threatened and Priority Fauna Database

Page 2 of 2

31.6361 °S 120.2642 °E / 32.8866 °S 119.1458 °E

Forrestania area east of Hyden

<i>* Date</i>	<i>Certainty</i>	<i>Seen</i>	<i>Location Name</i>	<i>Method</i>
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* 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

Friday, 20 January 2006

Department of Conservation and Land Management



Appendix 3

Western Australian Museum FaunaBase Search

Amphibians collected between 31.6361°S, 120.2642°E and 32.8866°S, 119.1458°E.**Hylidae***Litoria cyclorhyncha***Myobatrachidae***Crinia pseudinsignifera**Crinia* sp*Heleioporus albopunctatus**Limnodynastes dorsalis**Myobatrachus gouldii**Neobatrachus albipes**Neobatrachus kunapalari**Neobatrachus pelobatooides**Neobatrachus* sp*Neobatrachus sutor**Pseudophryne guentheri**Pseudophryne occidentalis***Reptiles collected between 31.6361°S, 120.2642°E and 32.8866°S, 119.1458°E.****Agamidae***Ctenophorus cristatus**Ctenophorus maculatus**Ctenophorus maculatus griseus**Ctenophorus ornatus**Ctenophorus salinarum**Moloch horridus**Pogona minor**Pogona minor minor**Rankinia adelaidensis chapmani***Elapidae***Echiopsis curta**Neelaps bimaculatus**Notechis curtus**Parasuta gouldii**Paroplocephalus atriceps**Pseudonaja affinis affinis**Pseudonaja nuchalis**Simoselaps bertholdi***Gekkonidae***Crenadactylus ocellatus**Crenadactylus ocellatus ocellatus**Diplodactylus granariensis granariensis**Diplodactylus maini**Diplodactylus pulcher**Gehyra variegata**Heteronotia binoei**Nephurus stellatus**Oedura reticulata**Strophurus spinigerus inornatus**Underwoodisaurus milii***Pygopodidae***Delma australis**Delma butleri**Delma fraseri fraseri**Gehyra variegata**Lialis burtonis**Pygopus lepidopodus***Scincidae***Cryptoblepharus plagiocephalus**Ctenotus atlas**Ctenotus impar**Ctenotus schomburgkii**Ctenotus* sp*Ctenotus uber uber**Cyclodomorphus melanops elongatus**Egernia inornata**Egernia multiscutata bos**Egernia richardi**Hemiergis initialis**Hemiergis initialis initialis**Hemiergis peronii peronii**Lerista distinguenda**Menetia greyii**Morethia butleri**Morethia obscura**Tiliqua occipitalis***Typhlopidae***Ramphotyphlops australis**Ramphotyphlops waitii***Varanidae***Varanus gouldii**Varanus rosenbergi***Birds collected between 31.6361°S, 120.2642°E and 32.8866°S, 119.1458°E.****Acanthizidae***Acanthiza apicalis**Calamanthus campestris**Hylacola cauta**Pyrrholaemus brunneus***Accipitridae***Hamirostra isura***Cinclosomatidae***Cinclosoma castanotus***Columbidae***Phaps elegans***Dicruridae***Rhipidura albicauda***Halcyonidae***Dacelo novaeguineae***Maluridae***Malurus pulcherrimus**Stipiturus malachurus westernensis***Megapodiidae***Leipoa ocellata***Meliphagidae***Anthochaera carunculata**Lichenostomus cratitius**Lichenostomus leucotis**Lichenostomus leucotis novaenorcaiae**Lichenostomus ornatus**Manorina flavigula***Motacillidae***Anthus australis australis*

Pachycephalidae

Falcunculus frontatus
Oreoica gutturalis
Pachycephala inornata

Pardalotidae

Pardalotus punctatus punctatus
Pardalotus striatus

Petroicidae

Drymodes brunneopygia
Eopsaltria australis griseogularis
Microeca fascians assimilis
Petroica goodenovii

Pomatostomidae

Pomatostomus superciliosus

Psittacidae

Neophema elegans
Platycercus icterotis
Platycercus zonarius
Platycercus zonarius zonarius
Polytelis anthopeplus anthopeplus

Scolopacidae

Calidris acuminata

Strigidae

Ninox novaeseelandiae

Tytonidae

Tyto alba

Zosteropidae

Zosterops lateralis gouldi

Mammals collected between 31.6361°S, 120.2642°E and 32.8866°S, 119.1458°E.**Burramyidae**

Cercartetus concinnus

Dasyuridae

Ningauia yvonneae
Sminthopsis dolichura
Sminthopsis gilberti
Sminthopsis granulipes

Leporidae

Oryctolagus cuniculus

Macropodidae

Macropus fuliginosus

Molossidae

Mormopterus planiceps
Tadarida australis

Muridae

Mus musculus
Notomys mitchellii
Pseudomys albocinereus
Pseudomys occidentalis
Pseudomys shortridgei

Tachyglossidae

Tachyglossus aculeatus

Tarsipedidae

Tarsipes rostratus

Vespertilionidae

Chalinolobus gouldii
Nyctophilus geoffroyi
Vespadelus regulus