



Browse LNG Precinct



Browse Liquefied Natural Gas Precinct Strategic Assessment Report

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December 2010

Appendix C-17

James Price Point Terrestrial Fauna Survey:
Wet Season 2009



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Prepared for Department of State Development

December 2009



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James Price Point Fauna Survey: Wet Season 2009

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1.0 Summary

1.1 Background

The State Government is currently investigating the development of a Liquefied Natural Gas (LNG) facility on the Kimberley coast at James Price Point, on the Dampier Peninsula to enable processing of gas from the Browse Basin.

The Study area comprises a 10,000 ha area around the potential LNG site extending some 24 km along the coast from Flat Rock to just south of Quondong Point, and approximately 6 km inland. The location of the study area is shown in Figure 2.1. Only a small portion of the large area surveyed is proposed to be used for the LNG facility.

Biota Environmental Sciences Pty Ltd (Biota) was commissioned by the Department of State Development (DSD) to undertake a wet season fauna survey of the preferred site. The scope of this study was to:

- undertake a Level 2 fauna survey consistent with relevant EPA Guidance Statements;
- identify and assess the local and regional conservation significance of the fauna assemblage and habitats present in the study area;
- document the vertebrate and short-range endemic (SRE) invertebrate fauna assemblage within the defined study area using established sampling techniques; and
- identify fauna of particular conservation significance (particularly Schedule and Priority listed species, as well as potential SRE taxa).

1.2 Methodology

The single-phase fauna survey was conducted from 5th to 31st of March 2009. A systematic census of terrestrial fauna assemblages, including avifauna, mammals and herpetofauna, was completed at 15 trapping sites located within the seven primary habitat types identified from the survey area. These comprised:

- pindan shrubland;
- coastal communities;
- coastal heath;
- open forest;
- monsoon vine thicket;
- tall closed scrub; and
- drainage basin.

The central component of the survey consisted of trapping grids comprising two lines of six pitfall traps (alternating 20 l buckets and 15 cm diameter PVC tubes), with pitfalls spaced at 8 m intervals and connected by a single 100 m length of 300 mm high flywire fence. Of the 15 sites, eight comprised an additional 60 m trapping line consisting of 12 funnel traps spaced in pairs along the length of the flywire drift fence at 8 m intervals. A further eight sites comprised 15 small Elliott box traps, five medium Elliott box traps and three cage traps placed 5 m apart in a transect. Trapping effort at each location is shown in Table 4.2.

Bats were sampled via direct capture using harp nets and through echolocation call recordings. Bat echolocation calls were recorded using Anabat II and Anabat SD1 bat detector units, which detect and record ultrasonic echolocation calls emitted during bat flight.

In total, 97 avifauna censuses were completed across 15 trapping sites. Avifauna was sampled using 10 to 45-minute censuses at established trapping grids. Censuses were conducted between 7:50 am and 1:35 pm, and were supplemented by recording avifauna species observed opportunistically while driving within the study area.

Specific invertebrate groups were sampled using both systematic and non-systematic collections during the survey. Invertebrate groups targeted, primarily those considered to support SRE taxa, included:

- Mygalomorphae (Trapdoor Spiders);
- Diplopoda (Millipedes);
- Pulmonata (Land Snails); and
- Pseudoscorpionida (Pseudoscorpions).

Searches and habitat assessment were conducted in the vicinity of all of the systematic fauna trapping grids and at additional opportunistic locations within the study area to check for sign of SREs and to determine the likelihood that SREs were be present.

1.3 Results

The James Price Point fauna survey recorded a combined total of 122 vertebrate species, representing 51 families. Table 5.2 provides a summary of the number of species recorded from each major vertebrate group during the survey.

Table 1.1: Number of species recorded during the James Price Point fauna survey.

Fauna Group	Number of Species
Amphibians	4
Reptiles	39
Native volant mammals (bats)	4
Native non-volant mammals	3
Introduced mammals	2
Avifauna	70
Total	122

1.3.1 Herpetofauna

The single-phase survey yielded a combined total of 43 herpetofauna species from the study area. The tally comprised one ground frog (*Myobatrachidae*) three tree frogs (*Hylidae*), six geckos (*Gekkonidae*), three legless lizards (*Pygopodidae*), 13 skinks (*Scincidae*), four dragons (*Agamidae*), four monitors (*Varanidae*), one blind snake (*Typhlopidae*), one python (*Pythonidae*) and seven front-fanged snakes (*Elapidae*).

The skink *Ctenotus inornatus* was the most abundant species encountered during the survey, with 327 records, representing over 25% of all herpetofauna recorded. *C. inornatus* was recorded in all habitat types within the study area. Also common were the skinks *Glaphyromorphus isolepis* (n=258) and *Lerista griffini* (n=117). Pindan bushland habitat and open forest habitat exhibited the highest herpetofauna richness within the study area, both with 28 species. The results from these habitats represented 62% of all herpetofauna species recorded during the survey. Both of these habitats were, however, common within the survey area and as a result were sampled more frequently than the other habitats.

1.3.2 Mammals

Five non-volant (ground-dwelling) mammal species were recorded during the survey, comprising one macropod (kangaroos and wallabies), two murids (murid rodents), one canid (dingo) and one feline (cat) (Table 5.4). The most commonly recorded mammal species was *Pseudomys delicatulus* (Delicate Mouse), with 104 records representing almost 92% of the non-volant

mammal records during the survey. *P. delicatulus* was recorded from all habitats sampled within the study area.

At least four bat species were found to occur within the study area. Two individuals of the Arnhem Long-eared Bat (*Nyctophilus arnhemensis*) were captured in a harp trap. Based on bat echolocation calls, at least an additional three species were identified as being present.

1.3.3 Avifauna

Sixty-eight bird species were recorded within the study area during the survey. The total species tally comprised 30 non-passerine species and 38 passerine species from 34 families. The Singing Honeyeater (*Lichenostomus virescens*) was the most abundant species recorded (445 records), representing 21% of recorded avifauna.

The honeyeaters (Meliphagidae) were the most speciose family of birds recorded within the study area with nine species recorded. Coastal communities habitat exhibited the highest avifauna richness during the survey, with 42 species comprising over 60% of total recorded species.

1.3.4 Invertebrates

Three species of land snail were represented amongst the specimens collected during the survey, all of which belonged to the family Camaenidae. Specimens were recorded from eight locations within the survey area, and opportunistically at two locations outside of the project area. Two species were recorded from within the James Price Point survey area; *Quistrachia leptogramma* and *Rhagada bulgana*. Both were recorded from several locations and both were previously known from outside of this area. While there is some morphological variation amongst the collected material, it is unclear whether this represents species-level difference. The third species, *Rhagada reinga*, was only collected opportunistically from a vine thicket near the Broome port and is not known from the James Price Point area.

Several spirobolid millipedes similar to the genus *Austrostrombus* were collected from vine thicket site JPP10. They appear to represent an undescribed taxon and have been lodged with the WA Museum to contribute to ongoing taxonomic work. The taxonomy of this group is poorly resolved (Mark Harvey, WA Museum, pers. comm.) and there is insufficient information to make any further comment on their regional representation.

1.4 Conservation Significance

In respect of the habitats present in the James Price Point survey area, only the monsoon vine thicket habitat is of elevated conservation significance (listed by DEC as a TEC). This TEC occurs behind sand dunes along the coastal stretch north of Broome, and is well represented around James Price Point. Community analysis also indicates that the faunal assemblages of this habitat type are distinct from those of pindan and open woodland units further into the hinterland. Aside from this unit, the terrestrial habitats of the study area are well represented within, and typical of, the Pindandland subregion of the Dampierland bioregion.

Two species of land snail were recorded from the survey area, both of which were previously described from other locations on the Dampierland peninsula. A single collection of *Austrostrombus* millipedes was also made from vine thicket habitat during the survey, but the poorly resolved taxonomic status of this group means no further comment can be made on their status.

Six species of conservation significance were confirmed from within the James Price Point study area during the field survey:

- Peregrine Falcon (*Falco peregrinus*) (State: Schedule 4);
- Dampierland Burrowing Snake (*Simoselaps minimus*) (State: Priority 2);
- Bush Stone-curlew (*Burhinus grallarius*) (State Priority 4);

- *Lerista separanda* (State Priority 4);
- Rainbow Bee-eater (*Merops ornatus*) (Commonwealth: Migratory); and
- White-bellied Sea Eagle (*Haliaeetus leucogaster*) (Commonwealth: Migratory).

A further five Schedule listed species are considered likely to occur based on habitats and database records. All of the species of elevated conservation significance currently confirmed to be present also occur more widely on the Dampierland peninsula, and most (with the exception of *Simoselaps minimus*) are widely distributed in coastal habitats in the Kimberley and Pilbara bioregions.

2.0 Introduction

2.1 Project background

The State Government is currently investigating the development of an LNG facility on the Kimberley coast to enable processing of gas from the Browse Basin. The preferred site, James Price Point, is located approximately 66 km north of the town of Broome, in the south-west of the Kimberley region of Western Australia (Figure 2.1).

The study area for this survey comprised a 10,000 ha area centred on the preferred precinct site, extending for some 24 km along the coast from Flat Rock to just south of Quondong Point, and approximately 6 km inland. The extent of the study area is shown in Figure 2.1. Only a small portion of the large area surveyed is proposed to ultimately be used for the LNG facility.

The initial baseline biological work by ENV Australia (2008a, 2008b, 2008c) was conducted during the dry season, and the focus of this work was spread over the four sites under consideration at the time. In view of this, Biota was commissioned by DSD to undertake a wet-season flora and fauna survey of the James Price Point study area in March 2009. This document describes the methodology and findings of the terrestrial fauna survey. The terrestrial vegetation and flora component of the James Price Point study is presented in a separate report (Biota 2009).

2.2 Study Objectives and Scope

The survey was planned and implemented in accordance with EPA Position Statement No. 3 "Terrestrial Biological Surveys as an Element of Biodiversity Protection" (EPA 2002), Guidance Statement No. 56 "Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia" (EPA 2004) and Guidance Statement No. 20 "Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia" (EPA 2009).

The scope of the study was to:

- undertake a Level 2 fauna survey consistent with relevant EPA Guidance Statements;
- identify and assess the local and regional conservation significance of the fauna assemblage and habitats present in the study area;
- document the vertebrate and short-range endemic (SRE) invertebrate fauna assemblage within the defined study area using established sampling techniques; and
- identify fauna of particular conservation significance (particularly Schedule and Priority listed species, as well as potential SRE taxa).



Figure 2.1: Location of the James Price Point Study area.

3.0 Regional Context of the Study Area

3.1 Geology and Landforms

The Dampier Peninsula is underlain by Jurassic marine sediments (sandstone and mudstone), with occasional outcrops of Early Cretaceous and Cainozoic rocks in some locations, including calcrete in coastal situations on Waterbank Station (McKenzie and Kenneally 1983). There are areas of coastal travertine limestone at Sarubin Block and running northward in Holocene sections (T. Willing, pers. comm.).

The primary surfaces of the Dampier Peninsula in the vicinity of the James Price Point study area comprise:

- coastal saline mudflats;
- Holocene coastal beach sand and sand dunes, with some lime-indurated beach-rock;
- local exposures of Broome sandstone at Quondong Point and James Price Point;
- widespread pindan red earths of Quaternary sandplains of mixed alluvial and aeolian origin, exposed as pindan cliffs at places along the coastline; and
- scattered seasonal fresh-water swamps, which are poorly developed (McKenzie and Kenneally 1983; DoIR 2008).

3.2 IBRA Bioregion and Subregions

The Interim Biogeographic Regionalisation for Australia (IBRA) recognises 85 distinct bioregions (Environment Australia 2000). The James Price Point study area is located within the Dampierland bioregion, which is divided into two biological subregions: Pindanland and Fitzroy Trough. The James Price Point study area is located in the DL2 (Pindanland) subregion (Graham 2001). This subregion covers 5,198,904 ha.

Graham (2001) outlined three basic components to the subregion. These comprised:

- Quaternary sandplain overlying Jurassic and Mesozoic sandstones with Pindan. There are hummock grasslands on hills.
- Quaternary marine deposits on coastal plains, with mangal, samphire – *Sporobolus* spp. grasslands, *Melaleuca alsophila* low forests, and *Spinifex* spp. - *Crotalaria* spp. strand communities.
- Quaternary alluvial plains associated with the Permian and Mesozoic sediments of Fitzroy Trough support tree savannahs of ribbon grass (*Chrysopogon* spp.) - bluegrass (*Dichanthium* spp.) grasses with scattered coolibah (*Eucalyptus microtheca*) - *Bauhinia cunninghamii*. There are riparian forests of river red gum (*Eucalyptus camaldulensis*) and Cadjeput (*Melaleuca* spp.) fringe drainages.

The Pindanland subregion comprises sandplains of the Dampier Peninsula and the western part of Dampier Land, including the hinterland of Eighty Mile Beach. It is a fine-textured sand-sheet with subdued dunes and includes the paleodelta of the Fitzroy River. The vegetation is described primarily as pindan. This is the coastal, semi-arid, north-western margin of the Canning Basin.

3.3 Land Systems

Land Systems (Rangeland) mapping covering the study area has been prepared by the Western Australian Department of Agriculture from data in Speck et al. (1964). Land Systems are comprised of repeating patterns of topography, soils, and vegetation (Christian and Stewart 1953) (i.e. a series of "land units" that occur on characteristic physiographic types within the Land Systems). Three Land Systems are mapped within the James Price Point study area (Table 3.1 and Figure 3.1).

Table 3.1: Land Systems within the James Price Point study area.

Land System	Description	Distribution	Extent in the study area (ha)	Total area in Pindandland subregion (ha)	% of total area in Pindandland subregion
Carpenteria	Coastal flats, associated sandy margins and dunes; saline sands and muds; supporting various vegetation types including paperbark thickets, samphire meadows, and extensive bare mud flats with fringing mangrove forests.	Widespread through coastal areas of the Kimberley from Broome to the Northern Territory border. Mapped in narrow bands along the coast of the study area south of James Price Point.	631	92,573	0.7%
Wanganut	Low-lying alluvial sandplains and dune fields with coordinated through-going drainage supporting pindan Acacia shrublands / woodlands with emergent Eucalypt trees over spinifex hummock grasslands and/or tussock grasslands	Mapped only within the Dampierland bioregion of the Kimberley, but widespread and well-represented through the northern half of this bioregion. Dominates the northern third of the study area and a broad band through the central section.	5,921	557,252	1.0%
Yeeda	More elevated sandplains and dunes with red and yellow sands with uncoordinated drainage supporting pindan Acacia shrublands / woodlands with emergent Eucalypt trees over spinifex hummock grasslands and/or tussock grasslands	Primarily mapped within the Dampierland bioregion of the Kimberley, where it is widespread and well-represented; extending into the adjacent Ord-Victoria Plains bioregion and (to a lesser extent) the Central Kimberley and Great Sandy Desert bioregions. Occurs over two areas in the central and south parts of the study area.	8,544	1,652,629	0.5%

3.4 Vegetation Mapping

The vegetation of the Kimberley region was mapped at the 1:1,000,000 scale by Beard (1979).

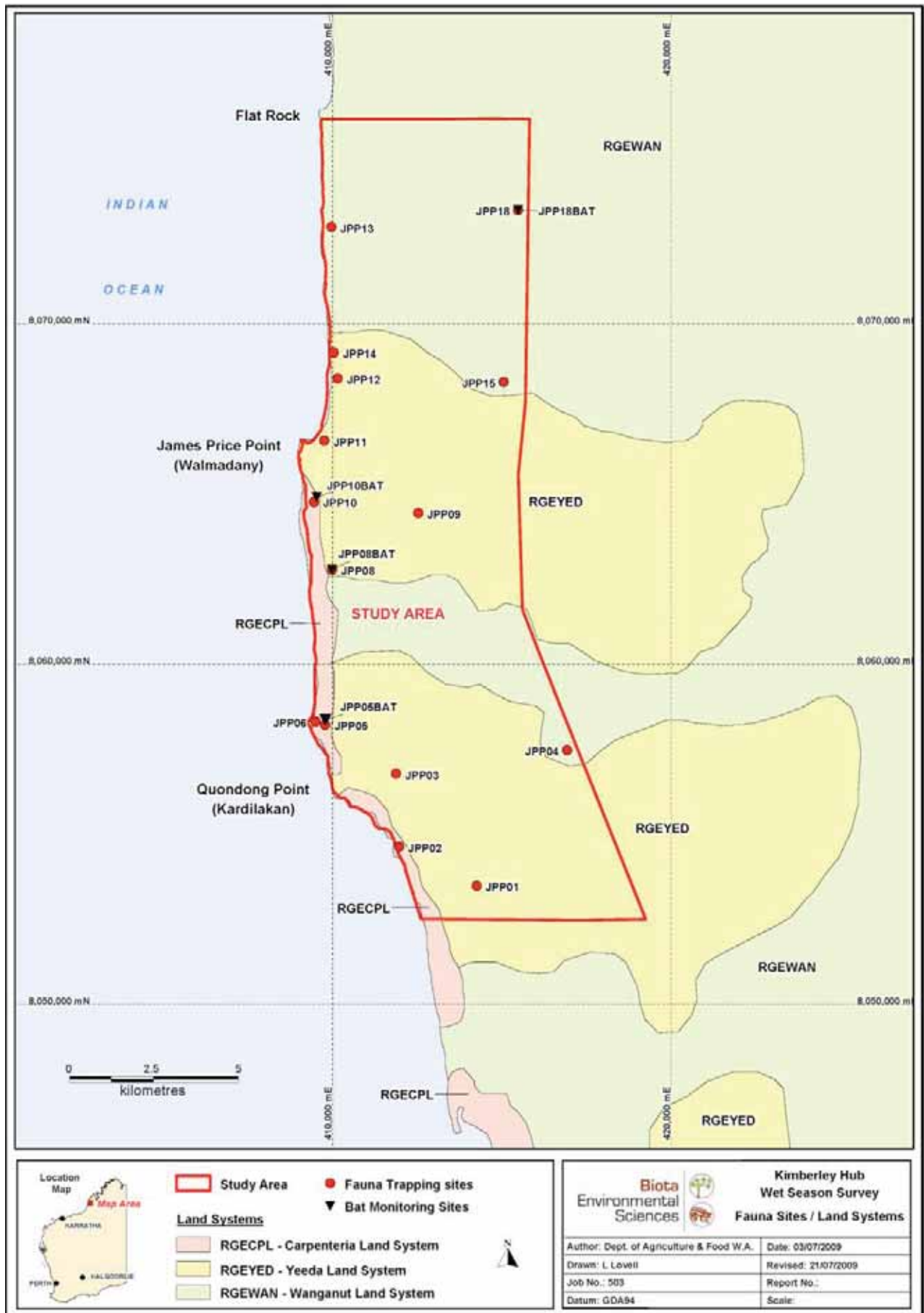
The James Price Point locality lies within the Dampier Botanical District, which broadly corresponds with the Dampierland IBRA bioregion.

The vegetation is characteristically pindan on sandplains, more or less densely wooded according to rainfall; tall-grass savanna with or without scattered trees on clay plains; spinifex steppe on sandstone and limestone outcrops (Beard 1979).

The area surrounding James Price Point was mapped by Beard (1979) as two units:

- "pindan woodland on monotonous sandplain comprising *Eucalyptus tectifica* and *Corymbia grandifolia* woodland over *Acacia tumida* shrubland over *Chrysopogon* and *Triodia* grasslands" (Beard's unit 750), dominating the sandy plains; and
- "bare areas of drift sand" (Beard's unit 129), mapped in narrow bands along the coast.

Given the necessarily broad scale of Beard's mapping (1:1,000,000, in order to map the entire State), these units are of only general relevance to the James Price Point study area.



© Current:503 (Kimberley Hub Wet Season):Spatial Data/Report Figures/Fauna/Fauna_Rangelands_21July2009.pdf

Figure 3.1: Rangelands and Fauna trapping sites within the James Price Point Study Area.

The vegetation of the Dampier Peninsula was also described by McKenzie and Kenneally (1983). Vegetation types described within the Land Systems and habitats occurring within the James Price Point study area comprised:

- Coastal dune and beach communities of the Carpenteria Land System;
- Sub-coastal vine thickets to closed vine forests of the Carpenteria Land System; and
- Sandplain communities of the Yeeda and Wanganut Land Systems.

The most detailed vegetation mapping and vegetation descriptions specific to the James Price Point study area were completed by ENV (2008a) and refined in more detail by Biota (2009). These are discussed further in Biota (2009).

3.5 Conservation Reserves in the Locality

The only existing conservation reserve in the vicinity of James Price Point is the Coulomb Point Nature Reserve, located between Cape Bertholet and Coulomb Point, and spanning an area of 28,676 ha. The southern border of this reserve is some 14 km north of the northern border of the James Price Point study area.

The 1991 Department of Conservation and Land Management (CALM) report "Nature Conservation Reserves in the Kimberley" (Burbidge et al. 1991) recommended the creation of a Dampierland National Park, broadly extending south and east from the Point Coulomb Nature Reserve on the pre-existing Waterbank pastoral lease. A primary factor behind this recommendation was the fact that the pindan shrublands and woodlands of the Dampier Peninsula are not reserved within the Coulomb Point Nature Reserve, and these would be well represented within the proposed Dampierland National Park (Professor Kevin Kenneally, UWA, pers. comm.). In 1996, the WA Government purchased the Waterbank pastoral lease, and the land became Unvested Crown Land.

The Waterbank Structure Plan (Department of Land Administration 2000) recommended creation of a 93,000 ha Reserve for Conservation and Aboriginal Heritage, extending south-east from the Point Coulomb Nature Reserve as far as the Cape Leveque Road. The southern boundary of this proposed Reserve runs east from a point approximately 1 km south of Kundandu Creek, with a coastal "panhandle" lying west of a realigned Manari Road extending south towards Barred Creek. The latter point almost coincides with the boundary of the current survey.

An additional area, adjoining Willie Creek, was proposed as the Nimalarragun Wetland Reserve, to conserve the spring-fed wetlands of Nimalarragun and Crescent Lake for the combined purposes of Conservation and Aboriginal Heritage.

3.6 Previous Fauna Surveys in the Locality

There has been little previous systematic fauna surveys in the vicinity of the James Price Point study area. The main survey of reference is the Perpendicular Head-North Head, Packer Island and Gourdon Bay Vertebrate Fauna Assessment completed by ENV (2008b).

4.0 Methodology

4.1 Database Searches

A search of the Department of Environment and Conservation (DEC) Threatened Fauna Database was conducted for the James Price Point study area (Appendix 1). The NatureMap database (<http://NatureMap.dec.wa.gov.au>) was also accessed for fauna records from the area (Appendix 2). NatureMap is a joint project of the DEC and the Western Australian Museum (WAM) and presents the most comprehensive source of information on the distribution of Western Australia's flora and fauna. These investigations were conducted using an area search with a 50 km buffer in the survey area for this study. Bounding coordinates for these searches were 17.04°S, 122.14°E and 18.03°S, 122.70°E, excluding areas over the Indian Ocean.

The Federal *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* Protected Matters database was also searched for fauna of environmental significance within the study area (Appendix 3). A search encompassing the Dampier Peninsula was conducted in this case.

4.2 Survey Timing and Weather

The James Price Point single-phase fauna survey was conducted between the 5th and 31st of March 2009. Minimum temperatures recorded at the nearest observation station at Broome during the survey ranged between 22.7°C and 28.9°C, with maximum temperatures ranging between 32.4°C and 38.4°C (Table 3.1).

Table 4.1: Daily meteorological observations for Broome recorded during the survey.

Date	5/3	6/3	7/3	8/3	9/3	10/3	11/3	12/3	13/3	Mean/ total
Maximum (°C)	36.5	38.4	35.5	37.4	37.2	33.6	32.7	34.5	34.5	
Minimum (°C)	25.9	28.8	28.2	23.2	23.2	22.7	23.9	23.4	23.6	
Rainfall (mm)	0	0	0	0	0	0	0	0	0	
Date	14/3	15/3	16/3	17/3	18/3	19/3	20/3	21/3	22/3	
Maximum (°C)	35.9	34.6	35.8	32.4	33.5	33.0	33.0	33.5	32.6	
Minimum (°C)	24.6	25.2	23.1	27.7	25.0	24.4	28.6	28.4	28.2	
Rainfall (mm)	0.2	0	46.2	0	0	1.2	0	0	0	
Date	23/3	24/3	25/3	26/3	27/3	28/3	29/3	30/3	31/3	
Maximum (°C)	33.1	33.5	33.7	33.6	37.4	38.4	34.7	35.6	35.6	
Minimum (°C)	28.2	28.1	28.9	25.1	23.9	25.1	25.1	25.7	24.8	
Rainfall (mm)	0	0	0	0	4.0	0	0	0	0	

A total of 545 mm of rain fell in Broome during the six months prior to the survey between September and February inclusive. This compares with a long-term average rainfall of 422.5 mm for this period. In summary the recent survey was conducted under hot conditions following a period of above average rainfall (Figure 4.1 and Figure 4.2).

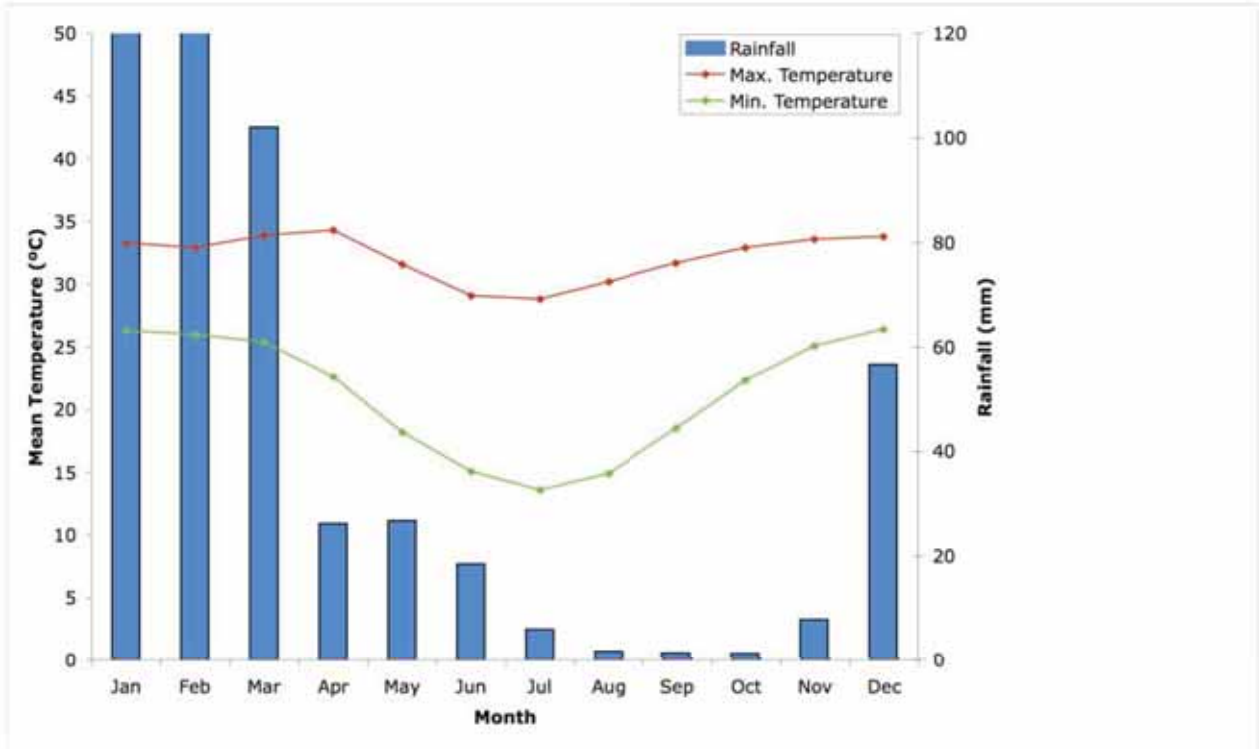


Figure 4.1: Climatological summary for Broome leading up to the survey period 2009 (data provided by the Australian Bureau of Meteorology; arrow indicates timing of survey).

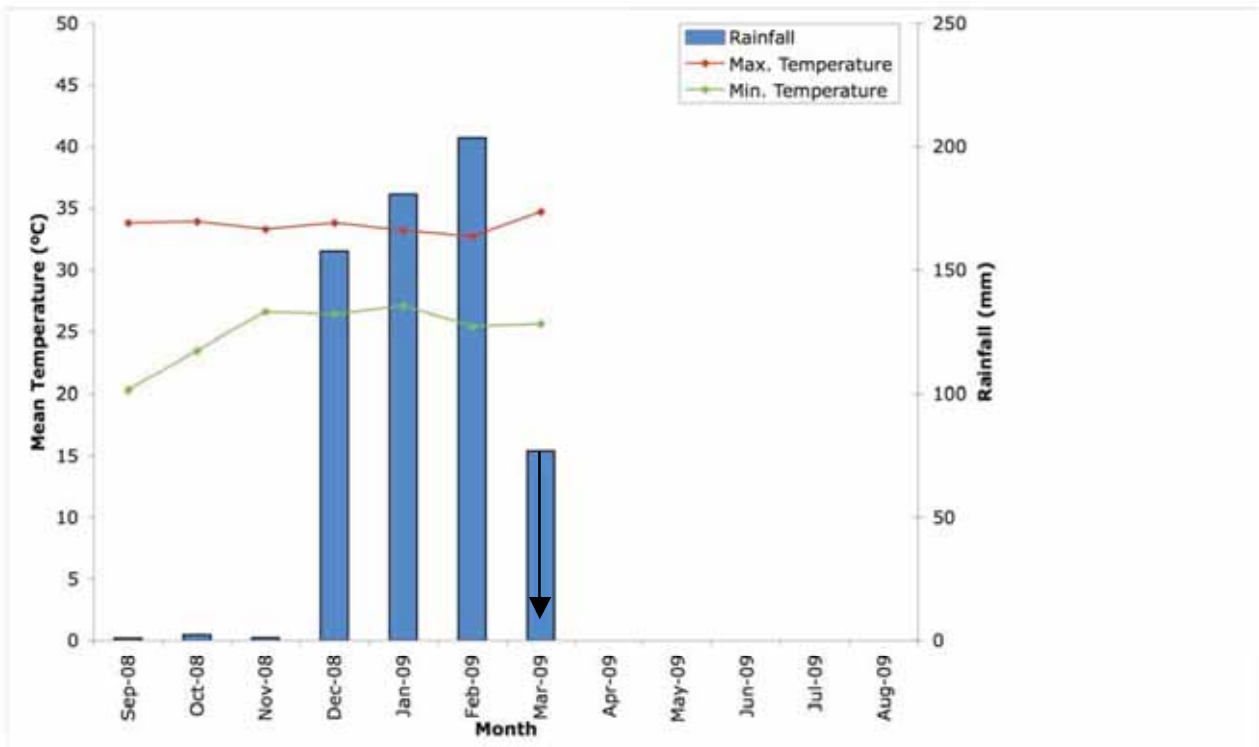


Figure 4.2: Climatological summary for Broome leading up to the survey period 2009 (data provided by the Australian Bureau of Meteorology; arrow indicates timing of survey).

4.3 Fauna Survey Team

The vertebrate fauna sampling for the field survey component was conducted under “Licence to Take Fauna for Scientific Purposes” No. SF56763 issued to Mr Roy Teale (Appendix 4). The fauna survey team comprised Mr Roy Teale, Mr Dan Kamien, Mr Michael Greenham, Mr Paul Sawers, Mr Tim Sachse, Mr David Keirle and Mr Sean McCulloch (all of Biota); Mr Mark Cowan and Mr Greg Harold (private contractors); and Mr Jeremy Shepherdson (Ecotec WA).

Analysis of bat recordings was completed by Dr Kyle Armstrong (Specialised Zoological). Invertebrate identifications were undertaken by Mr Roy Teale, and Dr Volker Framenau (WA Museum). Mr Brad Maryan (WA Museum) assisted with confirmation of ambiguous herpetofauna identifications. Geographical Information System (GIS) analysis and maps in this report were prepared by Mr Paul Sawers (Biota).

4.4 Fauna Sampling

4.4.1 Selection and Location of Survey Sites

The principal component of the survey consisted of systematic fauna sampling centred on 15 trapping sites. These sites were located in habitats considered by the survey zoologists to represent the range of habitats available within the study area. Each survey site was installed within a defined habitat and was selected such that equal weight was given to accessibility of the sites in terms of regular inspection of traps. Locations of trapping sites are shown in Figure 3.1 with representative photos presented in Section 4.1.

4.4.2 Trapping Effort and Layout of Trapping Grids

Systematic censusing of terrestrial fauna assemblages consisted of two trapping lines at 14 of the 15 sites (Section 4.1). These sites consisted of two lines of six pitfall traps, comprising alternating 20 l buckets and PVC tubes (150 mm diameter, 600 mm deep) spaced at 8 m intervals, connected by a 60 m long by 30 cm high flywire drift fence.

Of the 15 sites, eight comprised an additional 60 m trapping line consisting of 12 funnel traps spaced in pairs along the length of the flywire drift fence at 8 m intervals. A further eight sites comprised 15 small Elliott box traps, five medium Elliott box traps and three cage traps placed 5 m apart in a transect. Trapping effort at each location is shown in Table 3.2.

Table 4.2: Location of sites and trap effort for the James Price Point survey (coordinates in WGS84 Zone 50).

Site	Easting mE	Northing mN	Trap Type	Date Opened	Date Closed	Nights Open	No. of Traps	Trap Effort
JPP01	414257	8053486	Pit A	8/03/09	18/03/09	10	6	60
	414204	8053555	Pit B	8/03/09	18/03/09	10	6	60
JPP02	411966	8054642	Pit A	8/03/09	18/03/09	10	6	60
	411956	8054715	Pit B	8/03/09	18/03/09	10	6	60
JPP03	411871	8056791	Pit A	8/03/09	18/03/09	10	6	60
	411845	8056839	Pit B	8/03/09	18/03/09	10	6	60
	411905	8056754	Funnel	8/03/09	18/03/09	10	6 pair	60
JPP04	416924	8057478	Pit A	20/03/09	30/03/09	10	6	60
	416891	8057535	Pit B	20/03/09	30/03/09	10	6	60
	416954	8057437	Funnel	20/03/09	30/03/09	10	6 pair	60
JPP05	409779	8058222	Pit A	8/03/09	18/03/09	10	6	60
	409755	8058227	Pit B	8/03/09	18/03/09	10	6	60
JPP06	409495	8058321	Pit A	8/03/09	18/03/09	10	6	60
	409516	8058409	Pit B	8/03/09	18/03/09	10	6	60
JPP08	409988	8062775	Pit A	9/03/09	19/03/09	10	6	60
	409973	8062828	Pit B	9/03/09	19/03/09	10	6	60
	409963	8062853	Elliott/cage	9/03/09	19/03/09	10	23	230
JPP09	412531	8064443	Pit A	20/03/09	30/03/09	10	6	60
	412564	8064484	Pit B	20/03/09	30/03/09	10	6	60
	412615	8064515	Funnel	20/03/09	30/03/09	10	6 pair	60
	412564	8064484	Elliott/cage	20/03/09	30/03/09	10	23	230
JPP10	409451	8064767	Pit A	9/03/09	19/03/09	10	6	60
	409484	8064769	Pit B	9/03/09	19/03/09	10	6	60
	409486	8064912	Funnel	9/03/09	19/03/09	10	6 pair	60
	409496	8064774	Elliott/cage	9/03/09	19/03/09	10	23	230
JPP11	409758	8066576	Pit A	9/03/09	19/03/09	10	6	60
	409804	8066562	Pit B	9/03/09	19/03/09	10	6	60
	409738	8066583	Elliott/cage	9/03/09	19/03/09	10	23	230

Table 4.2: Location of sites and trap effort for the James Price Point survey (coordinates in WGS84 Zone 50).

Site	Easting mE	Northing mN	Trap Type	Date Opened	Date Closed	Nights Open	No. of Traps	Trap Effort
JPP12	410158	8068395	Funnel	13/03/09	19/03/09	5	6 pair	30
	410150	8068406	Elliott/cage	13/03/09	19/03/09	5	23	115
JPP13	409963	8072846	Pit A	9/03/09	19/03/09	10	6	60
	409968	8072911	Pit B	9/03/09	19/03/09	10	6	60
	409961	8072820	Elliott/cage	9/03/09	19/03/09	10	23	230
JPP14	410031	8069159	Pit A	9/03/09	19/03/09	10	6	60
	410032	8069234	Pit B	9/03/09	19/03/09	10	6	60
	410033	8069094	Funnel	9/03/09	19/03/09	10	6 pair	60
JPP15	415054	8068303	Pit A	20/03/09	30/03/09	10	6	60
	415068	8068355	Pit B	20/03/09	30/03/09	10	6	60
	415078	8068398	Funnel	20/03/09	30/03/09	10	6 pair	60
	415057	8068309	Elliott/cage	20/03/09	30/03/09	10	23	230
JPP18	415476	8073343	Pit A	19/03/09	29/03/09	10	6	60
	415448	8073424	Pit B	19/03/09	29/03/09	10	6	60
	415486	8073273	Funnel	19/03/09	29/03/09	10	6 pair	60
	415457	8073408	Elliott/cage	19/03/09	29/03/09	10	23	230
Total pit trap effort								1,680
Total funnel effort								390
Total small Elliott effort								1,125
Total medium Elliott effort								375
Total cage effort								225

4.4.3 Avifauna Sampling

Sampling of avifauna was carried out using a combination of techniques, including:

- unbounded area searches conducted at the systematic sampling grids;
- unbounded area searches conducted at opportunistic locations containing habitats or microhabitats likely to support previously unrecorded species; and
- opportunistic observation of birds while driving around the study area.

In total, 97 avifauna censuses were completed across 15 trapping sites (Table 4.3). Avifauna was sampled using 10 to 45-minute censuses at established trapping grids. Censuses were conducted between 7:50 am and 1:35 pm, and were supplemented by recording avifauna species observed opportunistically while driving within the study area. A total of 52.4 hours was dedicated to systematic avifauna censusing during the survey. Avifauna censusing at site JPP04 was limited due to time and noise constraints associated with the helicopter use necessary to access this site.

Table 4.3: Date and time of avifauna censuses undertaken within the James Price Point survey area.

Date	Site														
	JPP01	JPP02	JPP03	JPP04	JPP05	JPP06	JPP08	JPP09	JPP10	JPP11	JPP12	JPP13	JPP14	JPP15	JPP18
10/3/09	7:51-8:21	8:30-8:50	9:05-9:35	–	–	9:44-10:14	11:00-11:30	–	10:50-11:30	9:50-10:30	–	8:20-9:00	9:10-9:40	–	–
11/3/09	11:10-11:50	10:30-11:10	9:15-9:55	–	8:30-9:10	7:30-8:10	7:12-7:42	–	7:42-8:12	10:00-10:30	–	8:40-9:10	9:30-10:00	–	–
12/3/09	7:25-7:45	6:55-7:20	7:50-8:20	–	–	9:25-9:55	9:20-9:50	–	7:30-8:10	8:30-9:10	–	–	9:35-10:15	–	–
13/3/09	10:55-11:35	10:00-10:40	9:00-9:40	–	8:05-8:45	7:00-7:40	7:00-7:30	–	7:37-8:07	8:40-9:00	–	–	9:10-9:40	–	–
14/3/09	6:50-7:10	7:15-7:35	7:45-8:05	–	–	8:20-9:05	9:30-10:00	–	7:00-7:40	10:10-10:50	–	8:00-8:40	9:00-9:40	–	–
15/3/09	7:00-7:40	8:00-8:40	9:15-9:55	–	11:10-11:50	10:15-10:55	12:20-13:00	–	–	10:05-10:35	9:40-10:00	8:00-8:30	–	–	–
16/3/09	–	9:05-9:35	6:50-7:10	–	–	7:25-8:15	8:25-8:55	–	7:10-7:50	10:20-11:00	–	8:10-8:50	9:15-9:55	–	–
17/3/09	7:00-7:40	8:00-8:40	9:10-9:50	–	11:00-11:40	10:10-10:50	12:00-12:40	–	7:00-7:45	12:55-13:35	7:55-8:35	8:40-9:30	9:45-10:25	–	–
18/3/09	–	–	–	–	–	–	–	–	7:20-8:00	8:30-9:10	–	9:25-10:05	10:30-11:10	–	–
21/3/09	–	–	–	–	–	–	–	–	–	–	–	–	–	9:20-9:50	8:30-9:00

Table 4.3: Date and time of avifauna censuses undertaken within the James Price Point survey area.

Date	Site														
	JPP01	JPP02	JPP03	JPP04	JPP05	JPP06	JPP08	JPP09	JPP10	JPP11	JPP12	JPP13	JPP14	JPP15	JPP18
22/3/09	–	–	–	–	–	–	–	10:34-10:56	–	–	–	–	–	9:38-10:02	8:39-9:07
24/3/09	–	–	–	7:26-7:36	–	–	–	9:17-9:37	–	–	–	–	–	10:15-10:41	10:04-11:24
25/3/09	–	–	–	–	–	–	–	10:25-10:45	–	–	–	–	–	9:32-9:42	8:27-8:58
26/3/09	–	–	–	–	–	–	–	9:48-10:08	–	–	–	–	–	8:50-9:15	10:23-10:53
27/3/09	–	–	–	–	–	–	–	9:02-9:22	–	–	–	–	–	9:56-10:17	10:40-11:04
28/3/09	–	–	–	–	–	–	–	10:46-11:00	–	–	–	–	–	9:57-10:17	8:53-9:15
Survey-minutes	210	255	260	10	160	285	260	134	305	320	60	270	280	156	180

4.4.4 Bats

Bats were sampled using both direct capture methods via harp traps, and echolocation call recordings from monsoon vine thicket and tall closed scrub habitats (Table 4.4).

Bat echolocation calls were recorded using Anabat II and Anabat SD1 bat detector units, which detect and record ultrasonic echolocation calls emitted during bat flight. The calls were stored on a compact flash card after being processed by an Anabat CF ZCAIM. Calls were visualised on Analook 3.3f software. Only sequences containing good quality search phase calls were considered for identification.

Table 4.4: Locations and effort of harp traps and Anabat units deployed during the James Price Point fauna survey (coordinates in WGS84 datum zone 50).

Site	Location	Habitat	Sampling Method	Opened	Closed	Trap Effort (nights)
JPP05Bat	409787mE 8058367mN	Monsoon vine thicket	Anabat Harp Trap	10/03/09 10/03/09	14/03/09 16/03/09	4 6
JPP08Bat	409988mE 8062775mN	Tall closed scrub (still water present).	Anabat	14/03/09	16/03/09	2
JPP10Bat	409530mE 8064911mN	Monsoon vine thicket	Anabat	10/03/09	15/03/09	5
JPP18Bat	415476mE 8073343mN	Open Forest	Anabat	24/03/09	27/03/09	3

4.4.5 Marine Turtles

Targeted searches for nesting activity of marine turtles were undertaken on suitable beaches where access was possible (on 14/3 and 16/3/09) and were supplemented by occasional helicopter transects. Any evidence of nesting females (e.g. tracks or body holes) and hatchling emergences were recorded using hand-held GPS units.

4.4.6 Invertebrate Fauna Sampling

Specific invertebrate groups were sampled using both systematic and non-systematic collections during the survey. The invertebrate groups targeted were primarily those considered to have the potential to include SRE taxa. These included:

- Mygalomorphae (trapdoor spiders);
- Diplopoda (millipedes);
- Pulmonata (land snails); and
- Pseudoscorpionida (pseudoscorpions).

Searches and habitat assessment were conducted in the vicinity of all of the systematic fauna trapping grids and at additional opportunistic locations within the study area to check for evidence of SREs and to determine the likelihood that SREs were be present. Sampling and searching methods employed comprised:

- Trapdoor spiders were specifically targeted by walking in a grid pattern while searching for burrows. Any located burrows were then carefully excavated to collect the resident spider.
- Potential land snail habitat was initially examined for the presence of snail shells by searching the ground, tree trunks and branches and via light excavation of vegetation and leaf litter. The presence of dead shells is often an indication that live snails will also be present. Where snail shells were observed, further, more comprehensive searching was carried out by digging under spinifex hummocks, under bushes and by raking leaf litter.
- Tree bark was pulled back to expose potential pseudoscorpion habitat. Rocks within the study area were also turned in an attempt to find pseudoscorpions.
- Millipedes were searched for by raking leaf litter and lifting logs.

4.4.7 Non-systematic Sampling

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

- habitat specific searches for Schedule and Priority listed fauna species;
- documentation of opportunistic sightings and records;
- identification of road kills and other animal remains;
- recording and identification of secondary signs (where possible) including tracks, scats and diggings; and
- road spotting and head-torching at night.

4.5 Data Analysis

4.5.1 Ordination and Cluster Analysis

Analysis of the fauna survey data was undertaken to explore similarities or dissimilarities in communities. PRIMER v6, multivariate statistical software (Clarke and Gorley 2006), was used to conduct these analyses.

Non-metric Multidimensional Scaling (MDS) was used in this study to display patterns in species assemblages (ordination). In addition, similarity profiles (SIMPROF) were compiled in conjunction with the average linkage method cluster analyses (UPGMA) to examine similarities in the fauna assemblage structure in an *a posteriori* framework (i.e. not based on previously known habitat types; *a priori*) (Clarke et al. 2008).

The collected data were subjected to a square-root transformation prior to the computation of triangular similarity matrices based on the Bray-Curtis similarity measure. Only records obtained from pit traps (the main sampling method) were use in the analyses to eliminate potential confounding caused by combining results from different sampling methods.

4.5.2 Accumulation Curves and Species Estimates

Sampling adequacy may be assessed by plotting species accumulation curves and examining the trend in the resultant curves over time. PRIMER v6 (Clarke and Gorley 2006) was used to calculate smoothed species accumulation curves based on random sampling events of individuals recorded at each of the 10 sampling days. Actual observed accumulation curves were also plotted.

Species accumulation curves alone cannot be used to reliably extrapolate predicted species richness for hypothetical future biological sampling. In order to estimate asymptotic richness (i.e. extrapolation of species richness), asymptotic estimators were used (Clarke and Gorley 2006).

During this study, three estimators were used to extrapolate species richness within the James Price Point study area. These included:

- Bootstrap estimator;
- Chao 1 richness estimator; and
- Jackknife richness estimator.

Herpetofauna data obtained via Elliott trapping were excluded from rarefaction curves and species richness estimates, as Elliott trapping is a less effective method of herpetofauna assemblage sampling and as a result may bias the results. Any sites that were not sampled with pitfalls were also excluded from the analyses for the same reason

4.6 Study Limitations

Not all sections of the study area were ground-truthed or equally sampled for fauna. Parts of the James Price Point study area were inaccessible by vehicle, and grid establishment and 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 study area.

Terrestrial invertebrate sampling was targeted at a small number of specific groups and collection of other taxa was largely opportunistic.

This study represents a single-phase survey and may therefore not have documented the full suite of fauna occurring in the study area. Further effort would be likely to yield additional species, but it is considered that the current survey provides data suitable to characterise the terrestrial fauna communities of the study area.

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5.0 Results

5.1 Fauna Habitats

Seven main habitat units were sampled within the James Price Point study area. These were distinguished on the basis of differences in substrate, vegetation and landform (Table 5.1 and Plate 5.1 to Plate 5.15).

Table 5.1: Fauna habitats and trapping grid characteristics within the James Price Point study area.

Site	Landform	Vegetation Description	Soils	Years since last burnt
Pindan Shrubland				
JPP01	Plain	<i>Corymbia flavescens</i> scattered low trees over <i>Acacia eriopoda</i> , <i>Grevillea refracta</i> and <i>Gyrostemon tepperi</i> shrubland.	Ferruginous gravel	3
JPP03	Plain	<i>Corymbia dampieri</i> and <i>Corymbia polycarpa</i> scattered low trees over <i>Acacia eriopoda</i> open shrubland.	Pindan	1
JPP09	Plain	<i>Corymbia bella</i> scattered low trees over <i>Acacia eriopoda</i> tall open scrub over <i>Aristida holathera</i> var. <i>holathera</i> scattered tussock grassland.	Pindan	5-10
JPP12	Gully	<i>Corymbia</i> sp. scattered low trees over <i>Acacia monticola</i> shrubland over mixed open grassland.	Eroded coastal pindan	3
JPP13	Plain	<i>Corymbia</i> sp. low trees over <i>Acacia monticola</i> , <i>Acacia colei</i> , <i>Acacia eriopoda</i> tall open scrub over mixed open grassland.	Pindan	5-10
Coastal Communities				
JPP02	Dune	<i>Crotalaria cunninghamii</i> low shrubland over <i>Spinifex longifolius</i> closed tussock grassland in dune swales.	Coastal sand	3
JPP06	Dune	<i>Terminalia ferdinandiana</i> and <i>Terminalia petiolaris</i> low woodland over <i>Acacia colei</i> var. <i>colei</i> tall open shrubland over <i>Spinifex longifolius</i> very open grassland. Scattered creepers on primary dunes.	Coastal sand	5-10
Coastal Heath				
JPP14	Dune swale	<i>Eucalyptus miniata</i> , <i>Terminalia ferdinandiana</i> low open woodland over <i>Acacia tumida</i> var. <i>kulparn</i> low closed heath over <i>Triodia schinzii</i> very open hummock grassland on exposed coastal fringe.	Coastal sand	3
Open Forest				
JPP04	Plain	<i>Eucalyptus miniata</i> , <i>Brachychiton diversifolius</i> and <i>Terminalia ferdinandiana</i> low woodland over mixed low shrubland over <i>Triodia schinzii</i> open hummock grassland and <i>Chrysopogon pallidus</i> very open tussock grassland on inland yellow sandplains.	Sand	5-7
JPP15	Plain	<i>Eucalyptus miniata</i> and <i>Corymbia dampieri</i> low open forest over <i>Acacia tumida</i> shrubland over <i>Triodia schinzii</i> open hummock grassland with <i>Chrysopogon pallidus</i> very open tussock grassland on inland yellow sandplains.	Sand	2
JPP18	Plain	<i>Eucalyptus miniata</i> and <i>Bauhinia cunninghamii</i> low open woodland over <i>Acacia eriopoda</i> and <i>Acacia platycarpa</i> tall open scrub over mixed open shrubland and mixed tussock grassland on inland yellow sandplains.	Sand	2
Monsoon Vine Thicket				
JPP05	Dune	<i>Terminalia ferdinandiana</i> shrubland over <i>Acacia tumida</i> var. <i>kulparn</i> low open heath over <i>Eragrostis</i> aff. <i>Eriopoda</i> very open tussock grassland on coastal dunes.	Coastal sand	3
JPP10	Dune	<i>Diospyros humilis</i> low open forest over <i>Spinifex longifolius</i> very open grassland on coastal dunes	Coastal sand	5-7
Tall Closed Scrub				
JPP11	Plain	<i>Corymbia dampieri</i> scattered low trees over <i>Acacia monticola</i> and <i>Acacia eriopoda</i> tall closed scrub over <i>Distichostemon hispidulus</i> var. <i>aridus</i> open shrubland.	Pindan	5-7
Drainage Basin				
JPP08	Drainage Basin	<i>Lophostemon grandiflorus</i> subsp. <i>grandiflorus</i> and <i>Melaleuca dealbata</i> low open woodland over <i>Acacia colei</i> var. <i>colei</i> open heath in areas behind coastal sand dunes subject to flooding, ponding or seepage.	Pindan	5-7



Plate 5.1: **Site JPP01**



Plate 5.2: **Site JPP02**



Plate 5.3: **Site JPP03**



Plate 5.4: **Site JPP04**



Plate 5.5: **Site JPP05**



Plate 5.6: **Site JPP06**



Plate 5.7: **Site JPP08**



Plate 5.8: **Site JPP09**



Plate 5.9: Site JPP10



Plate 5.10: Site JPP11



Plate 5.11: Site JPP12



Plate 5.12: Site JPP13



Plate 5.13: Site JPP14



Plate 5.14: Site JPP15



Plate 5.15: Site JPP18

5.2 Vertebrate Fauna Overview

The James Price Point fauna survey recorded a combined total of 122 vertebrate species, representing 51 families. Table 5.2 provides a summary of the number of species recorded from each major vertebrate group during the survey.

Table 5.2: Number of species recorded during the James Price Point fauna survey.

Fauna Group	Number of Species
Amphibians	4
Reptiles	39
Native volant mammals (bats)	4
Native non-volant mammals	3
Introduced mammals	2
Avifauna	70
Total	122

5.3 Herpetofauna

5.3.1 The Assemblage

The single-phase survey yielded a combined total of 43 herpetofauna species from the study area (Table 5.3). The tally comprised one ground frog (Myobatrachidae), three tree frogs (Hylidae), six geckos (Gekkonidae), three legless lizards (Pygopodidae), 13 skinks (Scincidae), four dragons (Agamidae), four monitors (Varanidae), one blind snake (Typhlopidae), one python (Pythonidae) and seven front-fanged snakes (Elapidae).

The skink *Ctenotus inornatus* was the most abundant species encountered during the survey, with 327 records, representing over 25% of all herpetofauna recorded. *C. inornatus* was recorded in all habitat types within the study area. Also common were the skinks *Glaphyromorphus isolepis* (n=258) and *Lerista griffini* (n=117).

Pindan bushland habitat (sites JPP01, JPP03, JPP09, JPP12 and JPP13) and open forest habitat (sites JPP04, JPP15 and JPP18) exhibited the highest herpetofauna richness within the study area, both with 28 species. The results from these habitats represented 62% of all herpetofauna species recorded during the survey. Both of these habitats were, however, common within the survey area and as a result were sampled more frequently than the other habitats. As is commonly the case, the Scincidae was the most speciose herpetofauna family with 13 species (29% of all herpetofauna species recorded).

5.3.2 Regional Endemism and Restricted Taxa

Simoselaps minimus was the only herpetofauna species recorded during the survey that is considered endemic to Dampierland Bioregion (see Section 5.3.3).

5.3.3 Herpetofauna of Conservation Significance

Two herpetofauna species of elevated conservation significance were recorded from the study area; *Simoselaps minimus* and *Lerista separanda* (both listed as Priority 2 by DEC; Section 6.3).

5.3.4 Marine Turtles

Evidence of Flatback Turtle *Natator depressus* nesting was recorded from the southernmost end of the survey area: Quondong Beach to the south of Quondong Point at 17°33'52.91"S, 122° 8'56.05"E (recent tracks) and 17°34'6.76"S, 122° 9'5.22"E (numerous body holes). Activity was also noted on the beach immediately to the south of Coulomb Point to the north of the study area (body holes at 17°29'54.44"S, 122° 8'40.21"E).

Most of the coastline immediately adjacent to the James Price Point survey area is inundated during high tide and is therefore unsuitable for nesting. Surveys during the peak-nesting season will need to be undertaken to more thoroughly establish the level of use by nesting turtles.

Table 5.3: Herpetofauna recorded within the James Price Point study area.

Family/species	Pindan Bushland				Coastal Communities		Coastal Heath	Open Forest			Monsoon Vine Thicket		Tall Scrub	Drainage Basin	Total
	JPP01	JPP03	JPP09	JPP12	JPP13	JPP02		JPP06	JPP04	JPP15	JPP18	JPP05			
Myobatrachidae															
<i>Opisthodon ornatus</i>	-	-	-	-	-	-	-	-	-	-	-	3	-	4	7
Hylidae															
<i>Cyclorana australis</i>	8	1	-	-	2	2	1	-	-	-	-	-	-	8	22
<i>Cyclorana longipes</i>	4	-	-	-	-	-	-	-	1	-	-	-	-	-	5
<i>Litoria caerulea</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	1	2
Pygopodidae															
<i>Delma tincta</i>	3	1	1	-	-	1	5	-	-	-	3	-	-	1	16
<i>Lialis burtonis</i>	-	-	1	-	-	-	-	-	-	5	-	1	-	2	9
<i>Pygopus steelscottii</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Gekkonidae															
<i>Diplodactylus conspicillatus</i>	-	3	-	-	-	-	-	1	2	-	1	-	-	-	7
<i>Gehyra pilbara</i>	1	1	1		1			1							5
<i>Gehyra punctata</i>	1	1	3	4	-	-	2	14	3	1	-	-	-	2	31
<i>Heteronotia binoei</i>	-	1	-	4	1	-	8	5	-	-	-	1	8	2	31
<i>Lucasium stenodactylum</i>	-	4	-	-	-	1	-	-	4	10	-	-	-	-	19
<i>Strophurus ciliaris</i>	3	1	4	-	1	1	-	6	-	-	-	3	-	6	25
Scincidae															
<i>Carlia rufilatus</i>	4	2	13	-	1	-	-	-	10	6	9	-	-	4	5
<i>Cryptoblepharus ruber</i>	-	-	-	-	-	1	-	-	-	-	-	1	-	-	2
<i>Ctenotus inornatus</i>	5	4	11	20	39	29	2	140	16	14	22	-	9	12	4
<i>Ctenotus serventyi</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
<i>Glaphyromorphus isolepis</i>	6	1	2	1	16	3	48	5	2	6	1	57	93	7	10
<i>Lerista apoda</i>	-	-	1	-	-	-	-	-	1	-	1	-	-	-	3
<i>Lerista bipes</i>	-	-	1	-	-	9	49	2	-	-	5	-	39	-	105
<i>Lerista griffini</i>	25	8	4	-	8	2	8	11	-	-	10	8	10	19	4
<i>Lerista separanda</i>	-	1	-	-	-	-	-	-	1	-	-	-	-	-	2
<i>Morethia storri</i>	-	2	-	-	-	-	-	-	3	2	6	-	-	-	13
<i>Problepharus tenius</i>	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
<i>Tiliqua multifasciata</i>	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
<i>Tiliqua scincoides</i>	-	-	-	-	2	1	1	-	-	-	-	1	8	3	16
Agamidae															
<i>Amphibolurus gilberti</i>	1	-	-	-	1	1	3	1	-	-	2	3	5	10	6
<i>Chlamydosaurus kingii</i>	-	-	-	-	-	-	-	-	-	1	1	-	-	-	2
<i>Diporiphora pindan</i>	25	6	4	-	-	2	-	9	9	1	9	-	-	-	1
<i>Pogona minor</i>	-	-	-	-	-	-	-	1	1	1	-	-	-	-	3

Table 5.3: Herpetofauna recorded within the James Price Point study area.

Family/species	Pindan Bushland					Coastal Communities		Coastal Heath	Open Forest			Monsoon Vine Thicket		Tall Scrub	Drainage Basin	Total
	JPP01	JPP03	JPP09	JPP12	JPP13	JPP02	JPP06	JPP14	JPP04	JPP15	JPP18	JPP05	JPP10	JPP11	JPP08	
Varanidae																
Varanus brevicauda	-	1	-	-	2	-	-	3	-	-	1	-	-	-	-	7
Varanus gouldii	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Varanus panoptes	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	3
Varanus tristis	-	-	3	-	2	-	2	-	2	-	-	-	1	-	2	12
Typhlopidae																
Ramphotyphlops diversus	2	-	1	-	2	3	2	2	1	-	1	2	1	1	1	19
Pythonidae																
Antaresia stimsoni	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	2
Elapidae																
Brachyurophis roperi	1	4	7	-	3	1	2	4	2	1	5	1	3	5	-	39
Demansia angusticeps	-	-	-	-	-	-	-	2	1	-	1	-	1	-	-	5
Furina ornata	-	-	-	-	-	-	11	-	1	-	-	-	2	-	-	14
Pseudechis australis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Pseudonaja nuchalis	-	-	-	-	-	1	-	-	-	-	-	1	2	-	-	4
Simoselaps minimus	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Suta punctata	-	-	-	-	-	1	-	1	-	-	-	-	-	-	4	6
Number of individuals	89	44	58	30	81	60	144	209	61	50	79	74	190	75	54	1,299
Number of species	15	19	17	6	15	18	15	19	19	14	18	9	18	15	16	43
Number species/habitat	28				21		28			17			15		16	

5.4 Mammals

5.4.1 The Assemblage

Five non-volant (ground-dwelling) mammal species were recorded during the survey, comprising one macropod (kangaroos and wallabies), two murids (murid rodents), one canid (dingo) and one feline (cat) (Table 5.4). The most commonly recorded mammal species was *Pseudomys delicatulus* (Delicate Mouse), with 104 records representing almost 92% of the non-volant mammal records during the survey. *P. delicatulus* was recorded from all habitats sampled within the study area. There was no substantive variation in ground mammal species richness amongst the habitats (Table 5.4).

Table 5.4: Non-volant mammals recorded within the James Price Point study area.

	Pindan Bushland					Coastal Communities		Coast Heath	Open Forest			Monsoon Vine Thicket		Tall Scrub	Drain Basin	Total
Family/species	JPP 01	JPP 03	JP 09	JPP 12	JPP 13	JPP 02	JPP 06	JPP 14	JP 04	JPP 15	JPP 18	JPP 05	JPP 10	JPP 11	JPP 08	
Macropodidae																
<i>Macropus agilis</i>	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Muridae																
<i>Mus musculus*</i>	-	-	-	-	-	4	-	-	-	-	-	1	-	1	1	7
<i>Pseudomys delicatulus</i>	13	30	8	-	4	2	2	3	4	4	26	-	3	2	3	104
Canidae																
<i>Canis lupus dingo</i>	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Felidae																
<i>Felis catus*</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
No. of individuals	14	30	8	0	4	7	2	3	4	5	26	1	3	3	4	114
No. of species	2	1	1	0	1	3	1	1	1	2	1	1	1	2	2	5
No. of species/habitat	2					3		1	2			2		2	2	

- * denotes non-native introduced species.

At least four bat species were found to occur within the study area (Table 5.5). Two individuals of the Arnhem Long-eared Bat (*Nyctophilus arnhemensis*) were captured in the harp trap at site JPP05Bat. Based on bat echolocation calls, at least an additional three species were identified as being present, with the possibility of others that cannot be distinguished reliably from each other based on acoustic recordings (Table 5.5 and Appendix 5).

Table 5.5: Volant mammals (bats) recorded during the James Price Point survey.

		Monsoon vine thicket		Tall scrub	Open forest
Family Species Name	Common Name	JPP05Bat	JPP10Bat	JPP08Bat	JPP18Bat
Emballonuridae					
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat			E	E
Molossidae					
<i>Chaerephon jobensis</i>	Northern Freetail Bat	-	-	E	E
Vespertilionidae					
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	-	E	-	E
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	-	E	E	E
<i>Scotorepens greyii</i>	Little Broad-nosed Bat	-	E	E	E
<i>Scotorepens sanborni</i>	Northern Broad-nosed Bat	-	E	E	E
<i>Nyctophilus arnhemensis</i>	Arnhem Long-eared Bat	2	-	-	-

'E' denotes echolocation call recording.

Shading indicates species with ambiguous call identification. Recorded calls may be one all of these species.

5.4.2 Regional Endemism and Restricted Taxa

There were no Dampierland bioregional endemic mammals recorded during the James Price Point fauna survey.

5.4.3 Mammals of Conservation Significance

No mammals of conservation significance were recorded within the James Price Point study area.

5.5 Avifauna

5.5.1 The Assemblage

Sixty-eight bird species were recorded within the study area during the survey. The total species tally comprised 30 non-passerine species and 38 passerine species from 34 families (Table 5.6). The Singing Honeyeater (*Lichenostomus virescens*) was the most abundant species recorded (445 records), representing 21% of recorded avifauna. The honeyeaters (Meliphagidae) were the most speciose family of birds recorded within the study area with nine species recorded. Coastal communities habitat exhibited the highest avifauna richness during the survey, with 42 species comprising over 60% of total recorded species.

5.5.2 Regional Endemism and Restricted Taxa

There were no Dampierland bioregional endemic birds recorded during the James Price Point fauna survey. Other avifauna of conservation significance that may potentially occur in the area are discussed in Section 6.3.

5.5.3 Avifauna of Conservation Significance

Bird species of elevated conservation significance recorded within the James Price Point study area include:

- Peregrine Falcon (*Falco peregrinus*). Listed as Schedule 4 by the DEC.
- Bush Stone-curlew (*Burhinus grallarius*). Listed as Priority 4 by the DEC.
- White-bellied Sea-eagle (*Haliaeetus leucogaster*). Listed as Migratory under the Commonwealth EPBC Act 1999.
- Rainbow Bee-eater (*Merops ornatus*). Listed as Migratory under the Commonwealth EPBC Act 1999.

For further discussion of these species, see Section 6.3.

Table 5.6: Avifauna recorded within the James Price Point study area.

Family/species	Common Name	Pindan Bushland						Coastal Communities			Coastal heath		Open Forest			Monsoon Vine Thicket			Tall Scrub		Drainage Basin
		JPP 01	JPP 03	JPP 09	JPP 12	JPP 13	JPP	JPP 02	JPP 06	JPP 14	JPP 04	JPP 15	JPP 18	JPP 05	JPP 10	JPP 11	JPP 08				
Phasianidae																					
<i>Coturnix ypsilophora</i>	Brown Quail	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	
Fregatidae																					
<i>Fregata ariel</i>	Lesser Frigatebird	-	-	-	-	1	-	1	2	-	-	-	1	-	7	3	15				
Ardeidae																					
<i>Nycticorax caledonicus</i>	Rufous Night Heron	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2		
Scolopacidae																					
<i>Tringa hypoleucos</i>	Common Sandpiper	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1		
Burhinidae																					
<i>Burhinus grallarius</i>	Bush Stone-curlew	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1		
Haematopodidae																					
<i>Haematopus longirostris</i>	Pied Oystercatcher	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2		
Accipitridae																					
<i>Accipiter fasciatus</i>	Brown Goshawk	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	2		
<i>Pandion haliaetus</i>	Osprey	-	-	-	-	-	-	5	2	-	-	-	-	-	-	-	-	-	7		
<i>Hamirostra isura</i>	Square-tailed Kite	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1		
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	-	-	-	-	-	2	3	3	-	-	-	-	-	-	-	-	-	8		
Falconidae																					
<i>Falco cenchroides</i>	Australian Kestrel	-	1	-	-	-	1	-	2	-	-	-	-	1	-	-	-	-	5		
<i>Falco berigara</i>	Brown Falcon	-	5	1	1	-	1	-	1	-	1	-	-	-	-	-	-	-	10		
<i>Falco peregrinus</i>	Peregrine Falcon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1		
Columbidae																					
<i>Geopelia humeralis</i>	Bar-shouldered Dove	13	-	-	-	24	4	36	-	-	-	-	20	72	18	34	221				
<i>Ocyphaps lophotes</i>	Crested Pigeon	2	12	-	2	-	2	-	-	-	-	-	-	-	-	-	18				
<i>Geopelia cuneata</i>	Diamond Dove	-	-	-	2	-	-	1	-	-	-	-	-	-	3	-	6				
<i>Geopelia striata</i>	Peaceful Dove	10	3	-	7	8	9	3	-	-	-	-	9	25	5	14	93				
Psittacidae																					
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	-	-	-	-	-	-	15	-	-	-	-	-	4	-	-	19				
<i>Aprosmictus erythropterus</i>	Red-winged Parrot	8	3	-	-	20	-	8	2	-	2	12	1	15	1	42	114				
<i>Trichoglossus versicolor</i>	Varied Lorikeet	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	2				
Cuculidae																					
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1				
<i>Cacomantis variolosus</i>	Brush Cuckoo	1	-	-	-	-	-	1	-	-	-	-	-	-	-	1	3				
<i>Chrysococcyx basalis</i>	Horsfield's Bronze Cuckoo	-	2	-	1	-	-	-	-	-	-	-	-	1	-	-	4				

Table 5.6: Avifauna recorded within the James Price Point study area.

Family/species	Common Name	Pindan Bushland				Coastal Communities			Coastal heath	Open Forest			Monson Vine Thicket			Tall Scrub		Drainage Basin
		JPP 01	JPP 03	JPP 09	JPP 12	JPP 13	JPP 02	JPP 06	JPP 14	JPP 04	JPP 15	JPP 18	JPP 05	JPP 10	JPP 11	JPP 08	Total	
Centropodidae																		
<i>Centropus phasianinus</i>	Pheasant Coucal	3	-	-	2	7	4	2	-	1	-	-	4	1	2	26		
Podargidae																		
<i>Podargus strigoides</i>	Tawny Frogmouth	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2		
Halcyonidae																		
<i>Dacelo leachii</i>	Blue-winged Kookaburra	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4		
<i>Todiramphus pyrrhopygia</i>	Red-backed Kingfisher	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1		
<i>Todiramphus sanctus</i>	Sacred Kingfisher	-	-	-	-	-	-	2	-	-	-	-	1	-	-	3		
Meropidae																		
<i>Merops ornatus</i>	Rainbow Bee-eater	-	9	8	7	5	5	-	-	1	14	-	4	2	4	59		
Coraciidae																		
<i>Eurystomus orientalis</i>	Dollarbird	-	1	-	-	-	-	2	-	-	1	-	-	-	-	4		
Neositidae																		
<i>Daphoenositta chrysoptera</i>	Varied Sittella	-	-	-	4	-	-	-	-	-	5	-	-	-	-	9		
Maluridae																		
<i>Malurus melanocephalus</i>	Red-backed Fairy-wren	-	-	-	-	6	12	-	8	-	1	7	-	-	-	34		
<i>Malurus lamberti</i>	Variegated Fairy-wren	1	-	-	-	-	-	5	-	-	3	-	-	7	10	26		
Pardalotidae																		
<i>Pardalotus rubricatus</i>	Red-browed Pardalote	-	-	-	-	-	-	-	-	-	-	1	1	1	2	5		
<i>Pardalotus striatus</i>	Striated Pardalote	-	16	-	3	1	-	-	-	7	5	-	-	-	-	32		
Acanthizidae																		
<i>Smicrornis brevirostris</i>	Weebill	-	-	-	-	-	-	-	-	4	2	-	-	-	-	6		
<i>Gerygone olivacea</i>	White-throated Gerygone	-	-	-	-	-	-	1	-	-	-	-	-	-	3	4		
Meliphagidae																		
<i>Meliphreptus gularis</i>	Black-chinned Honeyeater	-	-	-	-	-	-	6	-	-	1	-	2	-	-	9		
<i>Lichmera indistincta</i>	Brown Honeyeater	6	-	5	2	45	3	7	-	2	24	34	-	12	2	203		
<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater	-	-	-	-	-	-	-	-	-	6	1	-	-	-	7		
<i>Philemon citreogularis</i>	Little Friarbird	1	10	3	-	1	4	5	-	1	14	22	5	24	2	95		
<i>Conopophila rufogularis</i>	Rufous-throated Honeyeater	-	-	-	-	-	-	-	-	-	2	-	-	-	13	15		
<i>Lichenostomus virescens</i>	Singing Honeyeater	47	54	13	8	21	40	39	3	3	9	18	22	85	53	445		
<i>Lichenostomus unicolor</i>	White-gaped Honeyeater	-	-	-	-	-	-	42	-	-	-	-	14	16	2	74		
<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater	-	-	-	-	-	-	-	-	-	3	-	-	-	-	3		
<i>Lichenostomus flavescens</i>	Yellow-tinted Honeyeater	-	-	-	-	-	-	-	-	-	-	3	-	-	-	3		
Pachycephalidae																		

Table 5.6: Avifauna recorded within the James Price Point study area.

Family/species	Common Name	Pindan Bushland						Coastal Communities			Coastal heath	Open Forest			Monsoon Vine Thicket			Tall Scrub	Drainage Basin
		JPP 01	JPP 03	JPP 09	JPP 12	JPP 13	JPP	JPP 02	JPP 06	JPP 14	JPP 04	JPP 15	JPP 18	JPP 05	JPP 10	JPP 11	JPP 08	Total	
Colluricincla harmonica	Grey Shrike-thrush	6	4	-	1	7	1	7	-	-	-	1	9	19	9	2	66		
Pachycephala rufiventris	Rufous Whistler	11	-	-	-	4	-	10	-	2	-	-	3	3	5	9	47		
Pomatostomidae																			
Pomatostomus temporalis	Grey-crowned Babbler	6	24	-	1	3	6	15	-	-	1	3	15	21	10	5	110		
Petroicidae																			
Microeca fascians	Jacky Winter	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1		
Dicruridae																			
Myiagra rubecula	Leaden Flycatcher	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1		
Rhipidura rufiventris	Northern Fantail	-	-	-	-	-	-	3	-	-	-	-	1	-	-	6	10		
Myiagra inquieta	Restless Flycatcher	-	-	-	-	-	-	4	-	-	-	-	1	1	-	3	9		
Rhipidura leucophrys	Willie Wagtail	7	12	-	1	-	-	3	-	-	-	-	1	-	-	2	26		
Ptilonorhynchidae																			
Ptilonorhynchus nuchalis	Great Bowerbird	2	1	-	-	-	-	8	-	-	-	-	1	7	1	3	23		
Campephagidae																			
Coracina novaehollandiae	Black-faced Cuckoo-shrike	1	5	-	-	2	-	1	-	-	4	3	1	2	1	-	20		
Artamidae																			
Artamus cinereus melanops	Black-faced Woodswallow	2	1	-	-	-	-	-	-	-	-	-	-	9	-	-	12		
Artamus minor	Little Woodswallow	-	-	2	-	-	1	-	-	-	-	3	-	10	-	-	16		
Artamus leucorynchus	White-breasted Woodswallow	-	-	-	2	-	-	90	-	-	-	-	3	2	-	-	97		
Cracticidae																			
Cracticus torquatus	Grey Butcherbird	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1		
Cracticus nigrogularis	Pied Butcherbird	5	11	2	2	-	-	-	-	2	7	8	-	-	1	-	38		
Corvidae																			
Corvus orru ceciliae	Torresian Crow	-	3	7	-	-	-	-	-	-	2	-	-	-	-	1	13		
Hirundinidae																			
Hirundo nigricans	Tree Martin	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1		
Sylviidae																			
Cisticola exilis	Golden-headed Cisticola	-	-	-	-	1	6	-	-	-	-	-	-	-	-	-	7		
Passeridae																			
Taeniopygia bichenovii	Double-barred Finch	-	-	-	-	2	-	1	-	-	-	-	-	-	-	7	10		
Poephila acuticauda	Long-tailed Finch	-	-	-	-	-	-	-	-	-	-	5	-	-	-	4	9		
Taeniopygia guttata	Zebra Finch	-	-	-	5	-	-	-	-	-	-	-	-	-	-	1	6		
Motacillidae																			
Anthus australis australis	Australian Pipit	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1		

Table 5.6: Avifauna recorded within the James Price Point study area.

Family/species	Common Name	Pindan Bushland						Coastal Communities			Coastal heath	Open Forest			Monson Vine Thicket		Tall Scrub	Drainage Basin	
		JPP 01	JPP 03	JPP 09	JPP 12	JPP 13	JPP 13	JPP 02	JPP 06	JPP 14	JPP 27	JPP 04	JPP 15	JPP 18	JPP 05	JPP 10	JPP 11	JPP 08	Total
	Number of individuals	132	178	42	51	159	18	103	330	27	11	88	154	272	110	342	131	272	2130
	Number of species	18	20	9	17	18	18	18	32	11	6	16	22	19	24	19	19	29	68
	Number of species/habitat	37						41			11	28			29		19	29	

5.6 Vertebrate Data Analysis

5.6.1 Ground Fauna Species Accumulation

Based on data from the recent James Price Point survey, the species accumulation curve for all ground dwelling native taxa (amphibians, reptiles and ground mammals), has not yet reached asymptote, but is approaching asymptote, indicating a reduced rate at which additional new species are likely to be recorded with continued survey effort (Figure 5.1).

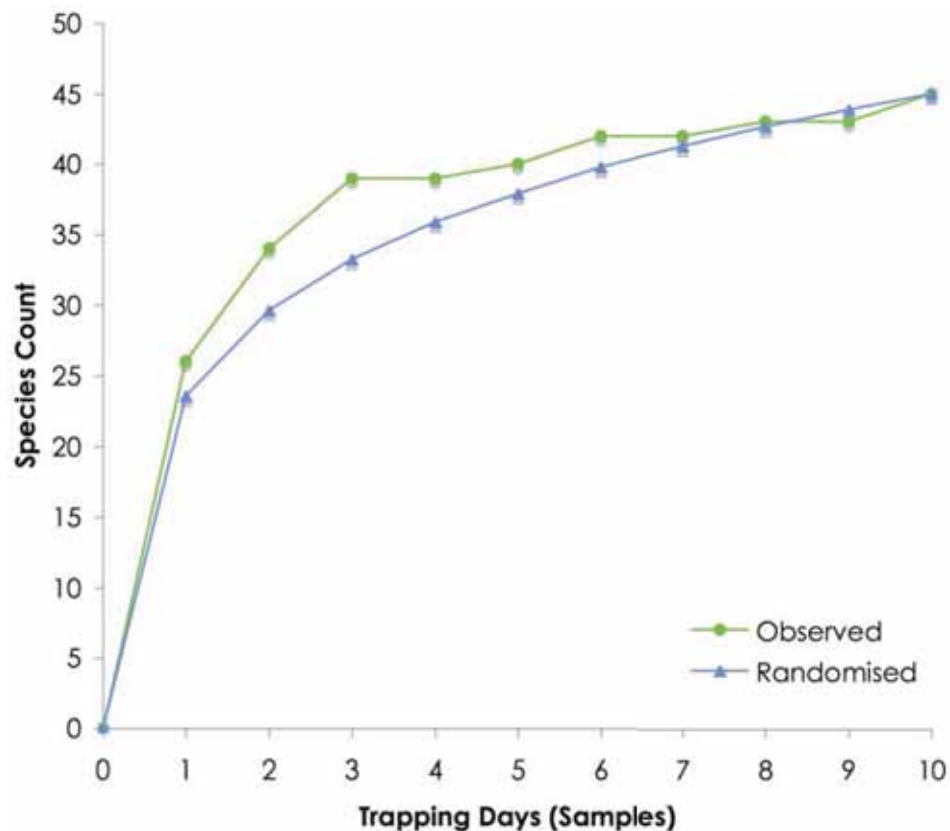


Figure 5.1: A sample-based observed and randomised species accumulation curve for all ground dwelling native fauna collected within the James Price Point study area (generated using Primer v6; Clarke and Gorley 2006).

For these ground dwelling taxa, non-parametric estimators predict total species richness (S_{\max}) within the James Price Point study area could range from 49.6 to 54.9 species (mean estimate of 51.6 species; Table 5.7). These estimates appear consistent with the trajectory of the species accumulation curve (Figure 5.1).

Table 5.7: Observed and estimated ground dwelling native fauna species richness at James Price Point, based on three non-parametric estimators (calculated using Primer v6; Clarke and Gorley 2006).

Actual Observed Species	45
Species Richness Estimator	Estimated S_{\max}
Chao 1	50.3
Jackknife 1	54.9
Bootstrap	49.6

5.6.2 Ground Fauna Community Similarity

The UPGMA cluster analysis revealed a number of groupings based on assemblage similarity, as plotted on the MDS ordination (Figure 5.2).

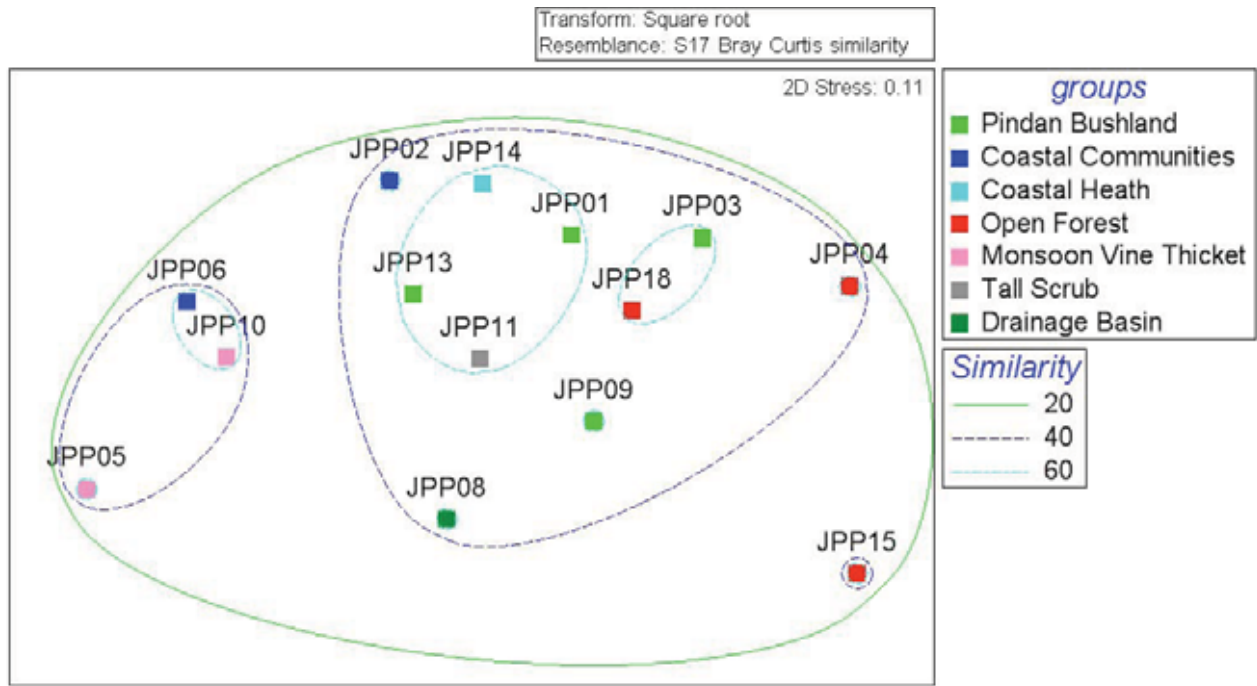


Figure 5.2: An MDS plot of all ground fauna pit trap data from the James Price Point study area, calculated using abundance data.

Based on the SIMPROF, there are three significantly distinct fauna assemblage structures at the 40% similarity level ($p < 0.05$; Figure 5.2). In general the coastal communities and monsoon vine thicket fauna communities are similar, with fauna recorded from the remaining habitat types representing a separate, distinct assemblage. Site JPP15 remains as an outlier.

5.6.3 Avifauna Species Accumulation

Similar to the ground fauna (Section 5.6.1), the species accumulation curve for avifauna records at James Price Point is also approaching asymptote indicating a reduced rate at which additional new species are likely to be recorded with continued survey effort (Figure 5.3).

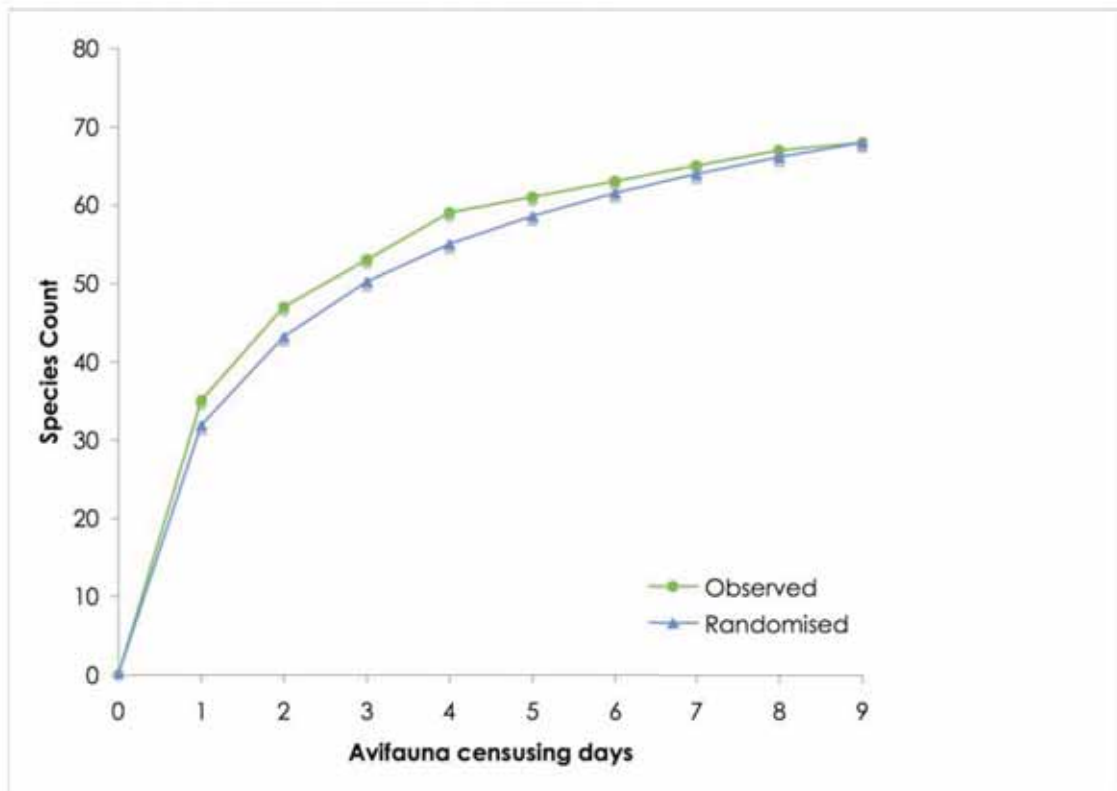


Figure 5.3: A sample-based observed and randomised species accumulation curve for avifauna recorded within the James Price Point study area.

For avifauna, non-parametric estimators predict total species richness (S_{\max}) within the James Price Point study area to range from 75.3 to 100.7 species (mean estimate of 86.3 species; Table 5.8).

Table 5.8: Observed and estimated avifauna species richness at James Price Point, based on three non-parametric estimators (calculated using Primer v6; Clarke and Gorley 2006).

Actual Observed Species	68
Species Richness Estimator	Estimated S_{\max}
Chao 1	100.7
Jackknife 1	83.1
Bootstrap	75.0

5.6.4 Avifauna Community Similarity

For avifauna the SIMPROF revealed five significantly distinct fauna assemblage structures at the 40% similarity level ($p < 0.05$; Figure 5.4). These assemblage differences do not appear to be associated with different habitat types within the project area (Figure 5.4) or recent fire history at each site (Table 5.1). This probably reflects lower habitat specificity and greater vagility of most avifauna species compared to the ground fauna.

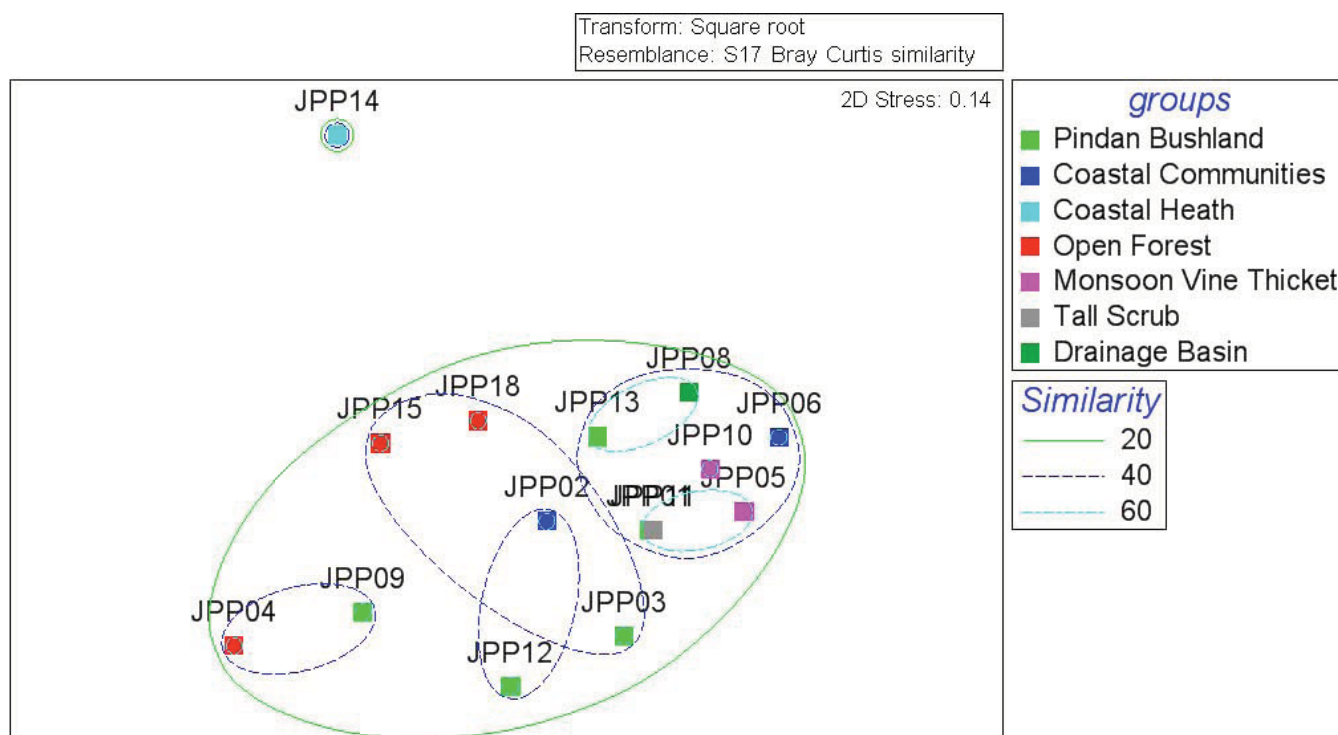


Figure 5.4: An MDS plot of recorded avifauna from the James Price Point study area, calculated using abundance data.

5.7 Invertebrates

5.7.1 Potential Terrestrial SRE Invertebrates

Taxonomic groups of invertebrates with naturally small distributions are described as SRE taxa and are in part characterised by poor dispersal capabilities, confinement to disjunct habitats and low fecundity (Harvey 2002, Ponder and Colgan 2002, EPA 2009). 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.

Three species of land snail were represented amongst the specimens collected during the survey, all of which belonged to the family Camaenidae (Table 5.9). Specimens were recorded from eight locations within the survey area, and opportunistically at two locations outside of the project area (Table 5.10). Species identifications have been tentatively assigned based on published descriptions by Solem (1981, 1984, 1991 and 1997) and current regional understanding of taxa within the genera *Quistrachia* and *Rhagada* (examples shown in Plate 5.16 and Plate 5.17 respectively). Two species were recorded from within the James Price Point survey area, *Quistrachia leptogramma* and *Rhagada bulgana*. Both were recorded from several locations and both were previously known from outside of this area (Table 5.9; Table 5.10; Figure 5.5; Section 6.4). While there is some morphological variation amongst the collected material, it is unclear whether this represents species-level difference (see Section 6.4). The third species, *Rhagada reinga* (Plate 5.17), was only collected opportunistically from a vine thicket near the Broome port and is not known from the James Price Point area.

Table 5.9: Land snails species collected during the James Price Point wet season fauna survey.

Species	Inside study area								Outside study area		Total
	JPP 01	JPP 10	JPP 18	QU 14	QU 20	QU 31	QU 32	QU 33	BRMV K01	QUSN 01	
<i>Quistrachia leptogramma</i>		2	13	13	20	1	4	18		4	76
<i>Rhagada bulgana</i>	1		7			1	2	2			13
<i>Rhagada reinga</i>									7		7
Total	1	2	20	13	20	2	6	20	7	4	97

Table 5.10: Location data for snail collect sites inside and outside of the study area (WGS84, Zone 51).

Inside study area			Outside study area		
Site	Easting	Northing	Site	Easting	Northing
JPP01	414260mE	8053486mN	BRMVK01	415973mE	8009886mN
JPP10	409488mE	8064860mN	QUSN01	411977mE	8078432mN
JPP18	415451mE	8073423mN			
QU14	409587mE	8064091mN			
QU20	410105mE	8059716mN			
QU31	415322mE	8073707mN			
QU32	415528mE	8072534mN			
QU33	415428mE	8071159mN			



Plate 5.16: *Quistrachia leptogramma*.



Plate 5.17: *Rhagada reinga*.

Several spirobolid millipedes similar to the genus *Austrostrophus* were collected from vine thicket site JPP10 (Figure 5.5). They appear to represent an undescribed taxon and have been lodged with the WA Museum to contribute to ongoing taxonomic work. The taxonomy of this group is poorly resolved (Mark Harvey, WA Museum, pers. comm.) and there is insufficient information to make any further comment on their regional representation.

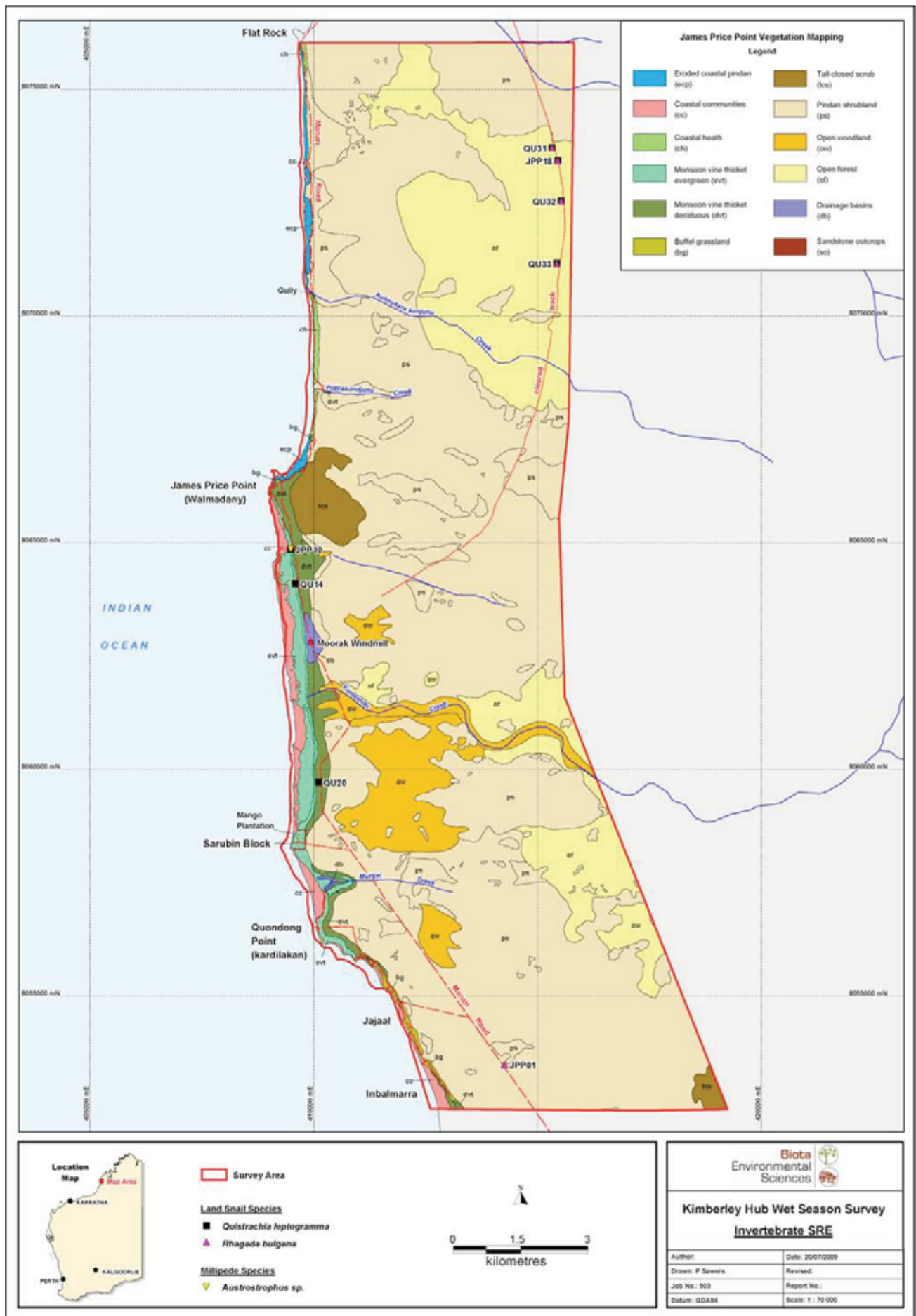


Figure 5.5: Locations of potential SRE invertebrate collections within the survey area.

5.7.2 Subterranean Fauna

5.7.2.1 Background

Two broad categories of fauna are generally considered to comprise the true subterranean fauna:

1. Stygofauna: groundwater-dwelling, aquatic fauna (including stygobites; obligate groundwater dwellers); and
2. Troglifauna: obligate cave or karst-dwelling, terrestrial subterranean fauna occurring above the watertable.

Stygofauna inhabit groundwater, sometimes occurring close to the surface. They are highly specialised to, and obligate dwellers of, subterranean groundwater habitats ('stygobites'; Humphreys 2000). Stygofauna are known to be present in a variety of rock types including karst (limestones), fissured rock (e.g. granite) and porous rock (e.g. alluvium) (Marmonier et al. 1993). Stygal animals known from Western Australia include a range of crustacean taxa (often the most abundant), platyhelminthes, oligochaetes, water mites and beetles (Humphreys 1999, Watts and Humphreys 1999).

Troglobites occur in the strata between the superficial soil layer and the watertable, where suitable habitat space is available. Troglobitic fauna has historically been collected primarily from karstic limestone systems in Western Australia (at Cape Range, Barrow Island and in the Kimberley; Harvey 1988, Biota 2002, Humphreys 2001). Recent work along the Robe River has, however, also collected this fauna from vuggy and cavernous strata in pisolitic mesa formations (Biota 2006). In the Kimberley, troglobites have also been recorded from ironstone conglomerates on the Maret Islands (Biota 2008). It is becoming increasingly apparent that this fauna could occur in any geological formation with sufficient habitat space and suitable humid microclimates.

5.7.2.2 Likelihood of Subterranean Fauna Occurrence

Given the lack of boreholes within the James Price Point survey area, no sampling could be completed to determine if subterranean fauna occur as part of this study. There have also been no published subterranean fauna surveys on the Dampierland peninsula. Given this, an assessment based on broad habitats was conducted as a very preliminary assessment.

The Dampier Peninsula stratigraphic and landform units in the study area comprise:

- coastal saline mudflats;
- Holocene coastal beach sand and sand dunes, with some lime-indurated beach-rock;
- local exposures of Broome sandstone at Quondong Point and James Price Point;
- widespread pindan red earths of Quaternary sandplains of mixed alluvial and aeolian origin, exposed as pindan cliffs at places along the coastline

Considering that:

- the study area is dominated by pindan sandplain, mudflats and dunes; units which has little or no cavernous or vuggy habitat space;
- the area is relatively low-lying and of flat topography, and may therefore have been subject to historical marine transgressions and eustatic changes,

there appears to be a relatively low risk that there will be significant or troglifauna values associated with it. Some of the more coastal and southern areas may have calcrete or limestone strata and these could possibly support troglobitic animals. The relative depth to the water table is also relevant as this dictates the depth of habitat available within which any putative troglobitic community could have persisted in the long-term.

The situation is similar with respect to stygofauna. The majority of the area is dominated by clays and sands strata in pindan units; meaning there may be limited saturated habitat space beneath the watertable. Some stygal taxa, particularly smaller and vermiform types like oligochaetes and copepods, may still occur in sand aquifers, but in these habitat settings individual species are usually not restricted at small spatial scales. At this early stage then, it is difficult to envisage any subterranean species being restricted to an area of pindan the nominal size of the plant footprint.

The only way to improve the resolution of this preliminary assessment is to complete field sampling of the plant footprint after a suitably designed drilling programme provides access to subterranean environments. This would best be done once a final site for the LNG plant is identified, as subterranean faunal values are likely to be linked to specific locations on the peninsula.

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 *WA Wildlife Conservation Act 1950-1979*. In addition, many of these species are listed under the Commonwealth *EPBC Act 1999*.

6.1.1 Commonwealth *EPBC Act 1999*

Fauna species of national conservation significance are listed under the *EPBC Act 1999*, and have been classified as 'critically endangered', 'endangered', 'vulnerable' or 'conservation dependent' (broadly consistent with International Union for Conservation of Nature (IUCN) categories: <http://intranet.iucn.org/webfiles/doc/SSC/RedList/redlistcatsenglish.pdf>).

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); and
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

6.1.2 Western Australian *Wildlife Conservation Act 1950-1979*

Classification of rare and endangered fauna under the *Wildlife Conservation (Specially Protected Fauna) Notice 2008* recognises four distinct schedules of taxa:

Schedule 1 - taxa are fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection;

Schedule 2 - taxa are fauna which are presumed to be extinct and are declared to be fauna in need of special protection;

Schedule 3 - taxa are birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, which are declared to be fauna in need of special protection; and

Schedule 4 - taxa are fauna that are in need of special protection, otherwise than for the reason mentioned in paragraphs (1), (2) and (3).

In addition to the above, fauna are also classified by DEC under five different Priority codes:

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

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

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

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

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

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

Priority Four Taxa in need of monitoring.

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

Priority Five Taxa in need of monitoring.

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

6.2 Fauna Habitat Conservation Value

No TECs listed under the Commonwealth *EPBC Act 1999* are known to occur in the vicinity of James Price Point or in the broader Kimberley region. However, TECs listed by the DEC for the Dampierland bioregion include:

- monsoon (vine) thickets on coastal sand dunes of the Dampier Peninsula;
- a species-rich faunal community of the intertidal mudflats of Roebuck Bay; and
- assemblages of various organic mound springs (DEC 2006).

These TECs are considered likely to be at risk from fragmentation, grazing pressure, changed fire regime, pollution and other human impacts, and weed invasion (May and McKenzie 2003).

Of the above TECs, only monsoon vine thickets occur in the James Price Point locality (Biota 2009). This TEC occurs behind sand dunes along the coastal stretch north of Broome, and is well represented around James Price Point. The habitat represented by this community type contains potential SRE taxa (Section 6.4) and a vertebrate fauna assemblage distinct from the remaining habitats of the study area (Section 5.6).

In addition, a number of Priority Ecological Communities (PECs) have been identified by the DEC for the Kimberley region (DEC 2008), however only two occur in habitats that have equivalent landforms in the James Price Point study area:

- Dwarf pindan heath community of Broome coast (Priority 1); occurs between the racecourse and Gantheaume Point lighthouse; insufficient survey outside of Broome townsite area to determine full extent (Biota 2009); and
- *Corymbia paractia* dominated community on dunes (Priority 1); *C. paractia* behind dunes in the Broome township area, Dampier Peninsula; transition zone where coastal dunes (with vine thickets) merge with Pindan (desert) vegetation; also in the port area north of Broome (Biota 2009).

There are a number of other ecosystems in the Pindandland subregion that are considered by the DEC to be "at risk", particularly by changed fire regimes. These include:

- Assemblages of permanent/ephemeral wetlands, damplands, and riparian habitat of the Dampierland bioregion;
- The Nimalaica clay pan community, inland from Willie Creek; and
- Vine thickets on heavily ferruginised Emeriau sandstone at the northern end of the Dampier Peninsula (Graham 2001).

Aside from the above considerations, the terrestrial habitats of the study area are well represented within, and typical of, the Pindandland subregion of the Dampierland bioregion and do not have particular conservation value for fauna.

6.3 Schedule and Priority Fauna

Six species of conservation significance were recorded within the James Price Point study area during the field survey:

- Peregrine Falcon (*Falco peregrinus*) (State: Schedule 4): Recorded on one occasion at site JPP08 in drainage basin habitat.
- Dampierland Burrowing Snake (*Simoselaps minimus*) (State: Priority 2): A single individual was recorded at site JPP10 within monsoon vine thicket habitat.
- *Lerista separanda* (State: Priority 4): A single individual from sandy pindan woodland.
- Bush Stone-curlew (*Burhinus grallarius*) (State Priority 4): A single individual was recorded at site JPP13 within pindan bushland habitat.
- Rainbow Bee-eater (*Merops ornatus*) (Commonwealth: Migratory): Recorded on 59 occasions across 10 sites representing a range of habitat types.
- White-bellied Sea Eagle (*Haliaeetus leucogaster*) (Commonwealth: Migratory): Recorded on eight occasions across three coastal sites.

Based on the outputs of the database searches commissioned for this study (Section 4.1), 37 species of elevated conservation significance may potentially occur in the locality including the James Price Point study area (Table 6.1). Note that as the extent of the current study ends at the low water mark, exclusively marine species or ocean-going birds have been excluded from this discussion (e.g. whales, dolphins, Dugong (*Dugong dugon*), Leatherback Turtles (*Dermochelys coriacea*), sawfish, pipefish, seasnakes and Whale Sharks (*Rhincodon typus*)).

Table 6.1: Fauna of conservation significance occurring or potentially occurring within the James Price Point study area.

Species Name	Common Name	Conservation Significance	
		State	Commonwealth
<i>Erythrura gouldiae</i>	Gouldian Finch	Schedule 1, Endangered	Endangered, Migratory
<i>Caretta caretta</i>	Loggerhead Turtle	Schedule 1, Endangered	Endangered, Migratory
<i>Chelonia mydas</i>	Green Turtle	Schedule 1, Vulnerable	Vulnerable, Migratory
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	Schedule 1, Vulnerable	Vulnerable, Migratory
<i>Natator depressus</i>	Flatback Turtle	Schedule 1, Vulnerable	Vulnerable, Migratory
<i>Rostratula benghalensis subsp. australis</i> #	Australian Painted Snipe	Schedule 1, Vulnerable	Vulnerable, Migratory
<i>Erythrotriorchis radiatus</i>	Red Goshawk	Schedule 1, Vulnerable	Vulnerable
<i>Isodon auratus</i> #	Golden Bandicoot	Schedule 1, Vulnerable	–
<i>Macrotis lagotis</i> #	Bilby	Schedule 1, Vulnerable	Vulnerable
<i>Crocodylus porosus</i>	Saltwater Crocodile	Schedule 4	Migratory
<i>Falco peregrinus</i> ^#	Peregrine Falcon	Schedule 4	–
<i>Tyto novaehollandiae kimberli</i>	Masked Owl	Priority 1	Vulnerable
<i>Lerista separanda</i> ^	–	Priority 2	–
<i>Simoselaps minimus</i> ^	Dampierland Burrowing Snake	Priority 2	–
<i>Ixobrychus flavicollis subsp. australis</i>	Black Bittern	Priority 3	–
<i>Wyulda squamicaudata</i> #	Scaly-tailed Possum	Priority 3	–
<i>Dasycercus blythi</i>	Brush-tailed Mulgara	Priority 4	–

Table 6.1: Fauna of conservation significance occurring or potentially occurring within the James Price Point study area.

Species Name	Common Name	Conservation Significance	
		State	Commonwealth
<i>Burhinus grallarius</i> ^	Bush Stone-curlew	Priority 4	–
<i>Falco hypoleucos</i> #	Grey Falcon	Priority 4	–
<i>Heteromunia pectoralis</i> #	Pictorella Mannikin	Priority 4	–
<i>Ixobrychus minutus</i> #	Little Bittern	Priority 4	–
<i>Numenius madagascariensis</i> #	Eastern Curlew	Priority 4	–
<i>Phaps histrionica</i> #	Flock Bronzewing	Priority 4	–
<i>Polytelis alexandrae</i>	Princess Parrot	Priority 4	–
<i>Hydromys chrysogaster</i>	Water-rat	Priority 4	–
<i>Mesembriomys macrurus</i> #	Golden-backed Tree-rat	Priority 4	–
<i>Tumix castanota</i> subsp. <i>magnifica</i> #	Chestnut-backed Button-quail	Priority 4	–
<i>Ardeotis australis</i>	Australian Bustard	Priority 4	–
<i>Ardea alba</i>	Great Egret	–	Migratory
<i>Ardea ibis</i>	Cattle Egret	–	Migratory
<i>Charadrius veredus</i>	Oriental Plover	–	Migratory
<i>Glareola maldivarum</i>	Oriental Pratincole	–	Migratory
<i>Haliaeetus leucogaster</i> ^	White-bellied Sea-eagle	–	Migratory
<i>Hirundo rustica</i>	Barn Swallow	–	Migratory
<i>Merops ornatus</i> ^	Rainbow Bee-eater	–	Migratory
<i>Numenius minutus</i>	Little Curlew	–	Migratory
<i>Poecilodryas superciliosa cerviniventris</i>	White-browed Robin	–	Migratory

^ denotes species recorded during the recent James Price Point survey

denotes species recorded in the locality on the DEC Threatened and Priority Fauna database (Appendix 1)

6.3.1 Schedule 1 Species

***Erythrura gouldiae* (Gouldian Finch)** (Commonwealth: 'Endangered', 'Migratory')

Distribution: The Gouldian Finch was once widespread through the grassy sub-coastal woodlands of northern Australia, extending from the Kimberley region to the Cape York Peninsula. Populations have now contracted, with those around the Gulf of Carpentaria and on the Cape York Peninsula almost gone (Schodde and Tidemann 1990). The species is still locally common in savannas in the Kimberley and Arnhem Land, however bird numbers have declined from flocks of thousands to just tens and hundreds (Schodde and Tidemann 1990).

Ecology: Gouldians are the only Australian finch species that nests exclusively in tree hollows or in termite mounds. This species usually feeds on a range of seeding grasses, however during breeding they become almost entirely insectivorous (Schodde and Tidemann 1990). They are partly migratory, following grass seeding patterns.

Likelihood of Occurrence: Based on their known distribution, the Gouldian Finch does not extend down onto the Dampier Peninsula, and this species would therefore be unlikely to occur in the James Price Point study area.

***Caretta caretta* (Loggerhead Turtle)** (Commonwealth: 'Vulnerable', 'Migratory')

Distribution: The Loggerhead Turtle occurs in tropical and warm temperate waters worldwide, including along the Australian coast.

Ecology: Loggerheads are mainly carnivorous, eating molluscs, crustaceans, sea urchins and jellyfish (Wilson and Swan 2008), and often foraging in deep water (Cogger 2000).

Likelihood of Occurrence: This species is listed as potentially occurring in the locality under the EPBC Act Protected Matters Search (Appendix 3), and there is a record off the west coast of the Dampier Peninsula (as shown on NatureMap). The major Western Australian rookeries occur on

Dirk Hartog Island, Northwest Cape and Muiron Islands and this species would not be expected to nest on the beaches of the Dampierland Peninsula.

***Chelonia mydas* (Green Turtle)** (Commonwealth: 'Vulnerable', 'Migratory')

Distribution: This species occurs in tropical and warm temperate waters throughout the world (Wilson and Swan 2008).

Ecology: Green Turtles are primarily herbivorous, feeding on seagrass and algae (Cogger 2000). Although Green Turtles make long reproductive migrations between foraging grounds and nesting beaches (Prince 1993), foraging studies indicate that they have a small home range (Limpus et al. 1984, 1994).

Likelihood of Occurrence: This species has been recorded from the broader locality (NatureMap database; Appendix 2), and nests on islands further north along the Dampier Peninsula (as shown on NatureMap). This species may utilise the beaches in the vicinity of the study area.

***Eretmochelys imbricata* (Hawksbill Turtle)** (Commonwealth: 'Vulnerable', 'Migratory')

Distribution: This species occurs in tropical and warm temperate waters throughout the world, including Australia, particularly in rocky areas and coral reefs (Wilson and Swan 2008).

Ecology: Hawksbills feed mainly on sponges and also soft corals, seagrasses and molluscs (Wilson and Swan 2008).

Likelihood of Occurrence: This species has been recorded from the broader locality (NatureMap database; Appendix 2), and nests on islands further north along the Dampier Peninsula (as shown on NatureMap). The major Western Australian rookeries occur off the Pilbara coast and this species would not be expected to nest on any of the beaches of the Dampierland Peninsula.

***Natator depressus* (Flatback Turtle)**

Distribution: The only sea turtle that is restricted to Australian waters, this species occurs between the Pilbara and the east coast of Queensland.

Ecology: Flatback Turtles are carnivorous and feed mainly on soft-bodied prey such as sea cucumbers, soft coral and jellyfish (Wilson and Swan 2008). Flatbacks prefer inshore waters and shallow bays. Flatbacks have the smallest migratory range of any marine turtle species, though they do make long reproductive migrations of up to 1,300 km.

Likelihood of Occurrence: This species has been recorded from the broader locality (NatureMap database; Appendix 3), and there are several records along the west coast of the Dampier Peninsula (as shown on NatureMap). Evidence of Flatback nesting was recorded from Quondong Beach to the south of Quondong Point, as well as on the beach immediately to the south of Coulomb Point.

***Rostratula benghalensis* (Australian Painted Snipe)** (Commonwealth: 'Vulnerable', 'Migratory')

Distribution: This species is widely distributed, extending from northern WA throughout eastern Australia including Tasmania, with a disjunct population in the south-west of WA.

Ecology: Painted Snipe prefer shallow freshwater swamps, and are most active at night, dawn and dusk. They are typically solitary, and mostly eat aquatic insects, grasshoppers, crickets, earthworms and some plant seeds (Schodde and Tidemann 1990).

Likelihood of Occurrence: This species was recorded from the Dampier Peninsula during the most recent Birds Australia Bird Atlas Project (Barrett et al. 2003) and by the DEC in the vicinity of the project area in 1993, 1999 and 2002 (Appendix 1). It may also occur in the current survey area.

***Erythrotriorchis radiatus* (Red Goshawk)** (Commonwealth: 'Vulnerable')

Distribution: Although it has a broad distribution from northern WA through to New South Wales, the Red Goshawk is Australia's rarest and most poorly-known raptor (Schodde and Tidemann 1990). There were a small number of records of this species from the far northern Kimberley during the most recent Birds Australia Bird Atlas Project (Barrett et al. 2003).

Ecology: This species is secretive and solitary. Its hunting and breeding habitat comprises taller woodlands, open forests and stream-side galleries of trees (Schodde and Tidemann 1990). It

hunts for prey by stealth through and beneath the tree canopy; birds are the main targets, but mammals, reptiles and large insects are occasionally taken (Schodde and Tidemann 1990). Established pairs appear to occupy the same territory and nest for years.

Likelihood of Occurrence: Although very little is known of the Red Goshawk, the small number of records from WA are from the far northern Kimberley, and this species would therefore be very unlikely to occur within the James Price Point study area.

***Isodon auratus* (Golden Bandicoot)**

Distribution: Formally widespread through central and northern Australia, this taxon is now confined to hummock grass on sandstone, grassy woodlands and vine thickets in the Kimberley region (Menkhorst and Knight 2001).

Ecology: The Golden Bandicoot is mostly nocturnal, solitary and territorial. It is omnivorous, feeding on arthropods, tubers, fruits and seeds (Menkhorst and Knight 2001).

Likelihood of Occurrence: This species was not recorded at James Price Point during the current survey, however the distribution and habitat requirements are such that it may potentially occur within the study area. The last DEC record was in 1971 from the Coulomb Point Nature Reserve (Appendix 1).

***Macrotis lagotis* (Bilby) (Commonwealth: 'Vulnerable')**

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

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

Likelihood of Occurrence: Although no signs of the Bilby were recorded during the recent survey, this species could potentially occur within the James Price Point study area. The latest DEC record was at Roebuck on the Dampier Peninsula in 2001 (Appendix 1).

6.3.2 Schedule 4 Species

***Crocodylus porosus* (Saltwater Crocodile) (Commonwealth: 'Migratory')**

Distribution: Saltwater Crocodiles inhabit coastal rivers, mangroves, swamps and open sea in northern Australia, extending inland via major rivers and floodplains (Wilson and Swan 2008).

Ecology: Adult Saltwater Crocodiles feed on fish, turtles, birds and mammals. The breeding season occurs during the wet season, between October and May. Females construct a mound of grasses and reeds, usually close to permanent water.

Likelihood of Occurrence: This species occurs along the coast of the Dampier Peninsula and would be expected to occur on the beachfront of the James Price Point study area at times.

***Falco peregrinus* (Peregrine Falcon)**

Distribution: The Peregrine Falcon has an almost cosmopolitan distribution, but is absent from most deserts and the Nullarbor Plain (Johnstone and Storr 1998).

Ecology: The Peregrine Falcon, like other birds of prey, is a relatively long-lived species, with low reproductive rates and low population density. These factors, combined with the fact that they are a top end predator and limited by their prey, make them particularly vulnerable to human impact. This species inhabits a wide range of habitats including forest, woodlands, wetlands and open country (Pizzey and Knight 1997).

Likelihood of Occurrence: A single Peregrine Falcon was recorded within the James Price Point study area during the recent survey. This occurred within drainage basin habitat at site JPP08 (Table 5.6).

6.3.3 Priority 1 Species

***Tyto novaehollandiae kimberli* (Masked Owl (Northern))** (Commonwealth: 'Vulnerable')

Distribution: This subspecies typically occurs in the north and north-west coastal Kimberley (Johnstone and Storr 1998).

Ecology: Masked Owls usually keep to heavier forested eucalypt country, roosting in large hollows in trees, in crevices in cliffs and occasionally in caves (Schodde and Tidemann 1990).

Likelihood of Occurrence: There is a single record of the Northern Masked Owl (NatureMap database) in the vicinity of Broome. However, there were no records of the subspecies from the Dampier Peninsula during the most recent Birds Australia Bird Atlas Project (Barrett et al. 2003). Given the paucity of roosting sites in the James Price Point study area and the lack of records from the locality, this species would be unlikely to occur.

6.3.4 Priority 2 Species

Lerista separanda

Distribution: *L. separanda* occurs on sandy areas along the south-west Kimberley coast, between Kimbleton and Nita Downs (Wilson and Swan 2008).

Ecology: Little is known about the ecology of this species.

Likelihood of Occurrence: *L. separanda* was recorded on a single occasion in open forest habitat on sandy soil during the current survey at James Price Point (Table 5.3).

***Simoselaps minimus* (Dampierland Burrowing Snake)**

Distribution: *S. minimus* is only known from the Dampier Peninsula (Wilson and Swan 2008).

Ecology: This species typically occurs on coastal dunes and at the sandy junction between dunes and adjacent *Acacia* shrublands. It is presumed to be similar to other species of *Simoselaps*; a sand-swimmer feeding largely or wholly on skinks of the genus *Lerista* (Wilson and Swan 2008).

Likelihood of Occurrence: During the recent survey at James Price Point *S. minimus* was recorded on a single occasion within monsoon vine thicket habitat on coastal sand (Table 5.3).

6.3.5 Priority 3 Species

***Ixobrychus flavicollis australis* (Black Bittern)**

Distribution: The Black Bittern occurs along the eastern, northern and western coasts of mainland Australia, as well as from New Guinea and the Solomon Islands to China and India (Schodde and Tidemann 1990).

Ecology: This species typically inhabits freshwater pools, swamps and lagoons and forages on reptiles, fish and invertebrates (Johnstone and Storr 1998). During the day, the Black Bittern roosts in trees or on the ground amongst dense reeds (Marchant and Higgins 1990).

Likelihood of Occurrence: There were a small number of records from the southern Dampier Peninsula during the most recent Birds Australia Bird Atlas Project (Barrett et al. 2003). *I. flavicollis australis* would be unlikely to occur in the habitats present in the James Price Point study area.

***Wyulda squamicaudata* (Scaly-tailed Possum)**

Distribution: The Scaly-tailed Possum is a Kimberley endemic, with a distribution that appears to coincide with areas receiving greater than 900 mm rainfall between King Sound and Admiralty Gulf (Strahan 2004). This species is known from just 24 specimens in the collection of the WAM, and there are 35 records on the NatureMap database. The current listing as a Priority 3 taxon reflects the paucity of information on this species and its relatively small distribution.

Ecology: This medium-sized possum appears to shelter deep within rockpiles from which it emerges at night to feed. It has been observed to forage on blossoms in the wild and to take fruit, nuts and leaves in captivity (Strahan 2004). Females have been recorded carrying a single pouch young between March and August.

Likelihood of Occurrence: There are no rockpiles in the vicinity of the James Price Point study area, and this species would not be expected to occur. However, this species was recorded on two occasions by the DEC in Broome in 1970 (Appendix 1).

6.3.6 Priority 4 Species

***Dasycercus blythi* (Brush-tailed Mulgara)**

Status: Until recently, there was considerable taxonomic confusion within the genus *Dasycercus*. For the last 30 years only one species, *D. cristicauda*, was recognised, and this was listed as Schedule 1, Vulnerable. More recently, based on genetic and morphological attributes, two species are now recognised: the Crest-tailed Mulgara, *D. cristicauda* and the Brush-tailed Mulgara, *D. blythi* (Woolley 2005, 2006). The former species is still listed by the DEC as Schedule 1, while *D. blythi* is listed as a Priority 4 species.

Woolley (2005, 2006) distinguished these two species on the following characteristics:

- appearance of black hairs on the distal half of the tail (a brush in *D. blythi* versus a dorsal crest in *D. cristicauda*);
- the number of upper pre-molar teeth (two in *D. blythi* versus three in *D. cristicauda*); and
- in females, the number of teats (six in *D. blythi* versus eight in *D. cristicauda*).

It should be noted that at the date of this report, NatureMap has distinguished between the two species of *Dasycercus*, however the identification of records has yet to be fully resolved. DEWHA have not yet updated the EPBC Act 1999 database and do not currently distinguish between the two species, currently listed as *D. cristicauda* only.

Likelihood of occurrence: There are no records of Brush-tailed Mulgara from the Dampier Peninsula or surrounds within the Naturebase database or DEC threatened and Priority fauna database. This species would be highly unlikely to occur in the James Price Point study area.

***Burhinus grallarius* (Bush Stone-curlew)**

Distribution: The Bush Stone-curlew is widespread in Australia and southern New Guinea. It remains common in tropical Australia, but has declined alarmingly in temperate Australia and has disappeared from many regions (Marchant and Higgins 1993). This species is found in the Kimberley and western portion of the remainder of the State (west of a line joining Port Hedland, Leonora and Albany).

Ecology: The Bush Stone-curlew is nocturnal and inhabits sparsely grassed, lightly timbered forest or woodland. Individuals have an estimated home range of about 250 ha (Johnson and Baker-Gabb 1993). This species is typically most easily detected by calls, which are given most frequently in Spring (Marchant and Higgins 1993).

This species breeds from July to January, when the eggs are either laid directly on the ground or in a small scrape (Johnstone and Storr 1998). The Bush Stone-curlew is a terrestrial feeder and is quite wide-ranging in its diet. It feeds primarily on invertebrates, particularly beetles, but also eats small lizards, frogs, snakes, vegetation and seeds (Marchant and Higgins 1993). Foxes are usually considered the primary cause for their decline, hence their relative abundance in the tropics, but habitat clearance has also been identified as a threatening process (Garnett and Crowley 2000).

Likelihood of Occurrence: This species was recorded on one occasion during the recent James Price Point survey in Pindan Bushland habitat (Table 5.6).

***Falco hypoleucos* (Grey Falcon)**

Distribution: In Western Australia, the Grey Falcon is a scarce species that typically occurs north of 26°S.

Ecology: This species mainly inhabits lightly wooded coastal and riverine plains (Johnstone and Storr 1998). *F. hypoleucos* may also occur near wetlands where surface water attracts prey. This falcon preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. It utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse. The peak laying season is in late winter and early spring, when two or three eggs are laid.

Likelihood of Occurrence: Although the Grey Falcon was not recorded during the recent survey, this species has been recorded for the broader locality (NatureMap database; Appendix 2), and there were incidental records from the Dampier Peninsula during the most recent Birds Australia Bird Atlas Project (Barrett et al. 2003). It may be a periodic visitor to the survey area.

***Heteromunia pectoralis* (Pictorella Mannikin)**

Distribution: The Pictorella Mannikin occurs through northern Australia, from Broome east to the Gulf of Carpentaria (Schodde and Tidemann 1990).

Ecology: This species frequents arid acacia-dotted savannas of the near inland, ranging into spinifex (Schodde and Tidemann 1990). It is nomadic and irruptive, following food, tending to disperse south and inland during the summer, wet season and concentrate north towards receding coastal waters in the dry (Schodde and Tidemann 1990).

Likelihood of Occurrence: There were no records of the Pictorella Mannikin from the western Dampier Peninsula during the most recent Birds Australia Bird Atlas Project (Barrett et al. 2003). However, two records were sighted at Broome by the DEC (Appendix 1). Suitable habitat occurs within the James Price Point study area, and although this species may occur, it is unlikely to be common.

***Ixobrychus minutus* (Little Bittern)**

Distribution: The Little Bittern occurs in south-western WA, and from the Kimberley region around the Top End and around the east coast to South Australia (Schodde and Tidemann 1990, Barrett et al. 2003).

Ecology: This cryptic species inhabits dense reeds and rushes bordering swamps, lakes and watercourses.

Likelihood of Occurrence: There were a small number of records from the Dampier Peninsula during the most recent Birds Australia Bird Atlas Project (Barrett et al. 2003) and the DEC threatened fauna database (Appendix 1). This species occurs in dense, swampy, freshwater reed beds. Given that there is no suitable habitat within the James Price Point study area, this species would be unlikely to occur within the study area.

***Numenius madagascariensis* (Eastern Curlew)**

Distribution: The Eastern Curlew occurs throughout coastal Western Australia, south to Bunbury (Johnstone and Storr 1998). There were numerous records of this species during the most recent Birds Australia Bird Atlas Project from coastal areas extending from south-west WA around the coast to west of Adelaide (Barrett et al. 2003).

Ecology: This species occurs mainly on tidal mudflats, and also on sandy beaches and rarely near coastal lakes, including saltfield ponds (Johnstone and Storr 1998). The Eastern Curlew breeds in northern Asia and is a summer migrant to Australia. It is common in the Kimberley during passage, with flocks of hundreds of individuals in September, October and March (Johnstone and Storr 1998).

Likelihood of Occurrence: Although there is no core habitat (tidal mudflats) for the Eastern Curlew within the James Price Point study area, there are mudflats in the vicinity, and areas of beachfront are present. This species therefore has the potential to occur within the study area. A number of records exist for Broome and Roebuck Bay (Appendix 1).

***Phaps histrionica* (Flock Bronzewing)**

Distribution: This species inhabits coastal riverine plains of north-west WA, south to Carnarvon, also occurring in the Kimberley and arid north-eastern interior of Australia (Johnstone and Storr 1998).

Ecology: The Flock Bronzewing is typically found on treeless or sparsely wooded grassy plains and is probably nomadic (Marchant and Higgins 1993, Johnstone and Storr 1998). It has declined greatly in the last century due to the degradation of its habitat by livestock. There were a small number of records of this species from the Dampier Peninsula during the most recent Birds Australia Bird Atlas Project (Barrett et al. 2003).

Likelihood of Occurrence: This species has the potential to occur within the James Price Point study area. It should be noted that populations of the Flock Bronzewing fluctuate dramatically throughout space and time, and it is known as a 'boom-bust' species. This species can be locally abundant following good seasons but then vanish and may not reappear in the area for decades. DEC recorded this species on Roebuck Plains in 1988 (Appendix 1).

***Polytelis alexandrae* (Princess Parrot)**

Distribution: The Princess Parrot is a rare and highly nomadic inhabitant of the arid interior, extending from Fitzroy River and Coolgardie in WA, eastwards to the southern Northern Territory, northern South Australia and lower Diamantina River in south-western Queensland (Schodde and Tidemann 1990).

Ecology: This nomadic species typically inhabits lightly wooded country such as open mallee-spinifex and open gum woodland (Johnstone and Storr 1998).

Likelihood of Occurrence: There were no records of this species from the Kimberley during the most recent Birds Australia Bird Atlas Project (Barrett et al. 2003). However, the Princess parrot was recorded by DEC in Broome in 1999. Although still possible, this species is considered unlikely to occur within the James Price Point study area.

***Hydromys chrysogaster* (Water-rat)**

Distribution: The Water Rat has a broad distribution around much of coastal Australia and inland up the more substantial rivers. In WA, the species has a disjunct distribution that includes the Kimberley, Pilbara coast and offshore islands, Bernier and Dorre Islands and the South-west. This species generally occurs in permanent fresh or brackish water, but can also be found in marine environments.

Ecology: *H. chrysogaster* is a rodent specialised for an aquatic existence. It is mostly nocturnal, foraging in water or adjacent vegetation. It feeds on aquatic invertebrates, fish, frogs and small birds (Menkhorst and Knight 2001). It is known to forage on land and may move considerable distances when doing so. Water Rats undertake regular movements along shorelines, where their tracks and runs may be readily seen, and also follow regular routes when crossing bodies of water (Harris 1978).

Breeding can occur throughout the year, but young are typically born from September through January. Nesting occurs in burrows in banks of lakes, streams, and other bodies of water (Strahan 2004).

Likelihood of Occurrence: This species could occur along coastal parts of the James Price Point study area.

***Mesembriomys macrurus* (Golden-backed Tree-rat)**

Distribution: Previously distributed throughout much of the Kimberley and the northern section of the Northern Territory, this species is now restricted to the north-west Kimberley (Menkhorst and Knight 2001).

Ecology: The Golden-backed Tree-rat is semi arboreal, inhabiting tropical woodland and adjacent vine thickets, rainforest and beaches. It roosts in tree hollows and less commonly in loosely woven nests under Pandanus crowns.

Likelihood of Occurrence: This species is represented by 77 specimen records (Faunamap database), mostly from the north-west Kimberley. A single Faunamap record occurs for Broome, and three DEC records occur on the Dampier Peninsula (dates unknown; Appendix 1). *M. macrurus* is therefore considered uncommon and unlikely to occur in the James Price Point study area.

***Turnix castanota magnifica* (Chestnut-backed Button-quail)**

Distribution: The Chestnut-backed Button-quail occurs in the subhumid north and west Kimberley (Johnstone and Storr 1998).

Ecology: The core habitat of this species comprises savanna woodlands in sandstone and lateritic country (Johnstone and Storr 1998).

Likelihood of Occurrence: The Chestnut-backed Button-quail was recorded in 2000 at Roebuck Plains, approximately 25km east of Broome (Appendix 1). This species has potential to occur within the James Price Point study area, although its core is absent from the study area.

***Ardeotis australis* (Australian Bustard)**

Distribution: The Australian Bustard occurs over much of Western Australia, with the exception of the more heavily wooded southern portions of the State.

Ecology: This species prefers open or lightly wooded grassland, including *Triodia* sandplains, and is considered scarce to common depending on season and habitat (Johnstone and Storr 1998).

Likelihood of Occurrence: Although not recorded during the recent James Price Point survey nor represented in the Faunamap database or DEC threatened fauna database this species has potential to occur on James Price Point. Records have been noted at Gourdon Bay immediately south of Broome (ENV 2008b).

6.3.7 Migratory Species

Database searches indicate that nine migratory bird species listed under the EPBC Act 1999 may potentially occur in the locality according to the Protected Matters Search results (Table 6.1 and Appendix 3). They include:

- *Ardea alba* (Great Egret);
- *Ardea ibis* (Cattle Egret);
- *Charadrius veredus* (Oriental Plover);
- *Glareola maldivarum* (Oriental Pratincole);
- *Haliaeetus leucogaster* (White-bellied Sea-eagle); recorded on eight occasions within the James Price Point study area (Table 5.6);
- *Hirundo rustica* (Barn Swallow);
- *Merops ornatus* (Rainbow Bee-eater); recorded on 59 occasions throughout the James Price Point study area (Table 5.6);
- *Numenius minutus* (Little Curlew); and
- *Poecilodyas superciliosa cerviniventris* (White-browed Robin).

However, these would only likely be periodic visitors to the study area and only likely to utilise the beach front on the most western margin of the study area. This beach is relatively narrow, lacks sheltered areas and is exposed to high winds. It is therefore unlikely to represent significant wader habitat, compared to other regional sites like Roebuck Bay, and migratory waders are not considered further here.

6.4 Invertebrates

The land snail fauna of the Kimberley region fall into two broad groups, the Camaenidae and the non-camaenids (or micro-snails). The non-camaenids are for the most part considered to have relatively broad distributions encompassing northern Australia and even extending into Indonesia and Polynesia (Solem 1991, 1997). Only a few are confined to the Kimberley - Northern Territory region. It is the Camaenidae that are considered most likely to support SREs with some taxa exhibiting highly restricted distributions (Solem 1981, 1984, 1991, and 1997). Prior to the current survey, four described and one undescribed camaenid were known to occur on the Dampierland Peninsula, comprising:

- *Rhagada cygna*: largely confined to the area about the One Arm Point community and according to Solem (1997) has a distribution of about a 10 km radius. This species as currently recognised has a highly restricted distribution and qualifies as an SRE.
- *Rhagada bulgana*: previously known from near Cape Leveque in the north to Point Coulomb in the south. It is replaced by *R. cygna* at One Arm Point. Its occurrence east of the Broome – Cape Leveque Road is unclear. This species was recorded within the James Price Point study area (Section 5.7.1).
- *Rhagada reinga*: previously known only from the immediate surrounds of Broome. This species was opportunistically recorded from Broome during this survey (Section 5.7.1).
- *Quistrachia leptogramma*: known from Cape Leveque and One arm Point in the north to Broome in the south. This species was also recorded within the James Price Point study area.
- *Rhagada* sp: the *Rhagada* specimens previously collected from the vine thickets at Cape Leveque do not match the description of *R. bulgana* and may represent a new taxon.

Two species of land snail were confirmed from the study area during this survey (*Rhagada bulgana* and *Quistrachia leptogramma*; Section 5.7.1). The majority of the *Rhagada* specimens collected during the current survey match the description of *Rhagada bulgana* and appear similar to specimens previously collected near Beagle Bay and several sites along the Broome – Cape Leveque Road. All collections of *R. bulgana* type specimens were made from woodland or pindan habitat and extend the distribution nearly 28 km to the south of Point Coulomb partially filling the collection gap noted by Solem (1997).

However, some *Rhagada* shells collected from the vine thickets at James Price Point did not properly match the description for *R. bulgana* being notably smaller in size. Furthermore, it is not clear whether these shells are from a still extant population or are remnants of a now extinct population as no live material was collected. The shells are most similar in shape and size to the other Dampierland vine thicket snails (i.e. *R. cygna*, *R. reinga* and the undescribed *Rhagada* sp. from Cape Leveque). If the shells represent a still extant and new taxon, and given the highly restricted distributions shown by *R. cygna*, *R. reinga* and *Rhagada* sp., it is possible that this species is similarly highly restricted. A plausible alternative is that the naturally fragmented coastal vine thickets support a single similarly fragmented species of *Rhagada* encompassing *R. cygna*, *R. reinga* and the undescribed forms at Cape Leveque and James Price Point. More thorough regional collections and molecular analysis would be required to better evaluate these alternatives.

The specimens of *Quistrachia leptogramma* collected from the study area also fell into two clear groups based on size: large specimens collected from woodland and pindan habitats, and smaller specimens collected from the coastal vine thickets. This size disparity was noted by Solem (1997) who observed that "Specimens from Broome and Coulomb Point are distinctly smaller than those from the northern part of Dampier Land." However, the recent collections suggest that large specimens also occur in the southern part of Dampierland, but only in the woodland and pindan habitats. This larger taxon appears to be replaced by small-shelled populations in the vine thickets. It is unclear whether there are any underlying taxonomic differences between the large and small-shelled populations.

6.5 Conservation Significance Summary

In respect of the habitats present in the James Price Point survey area, only the monsoon vine thicket habitat is of elevated conservation significance (listed by DEC as a TEC; Section 6.2). This TEC occurs behind sand dunes along the coastal stretch north of Broome, and is well represented around James Price Point. Community analysis also indicates that the faunal assemblages of this habitat type are distinct from those of pindan and open woodland units further into the hinterland (Section 5.6.2). Aside from this unit, the terrestrial habitats of the study area are well represented within, and typical of, the Pindandland subregion of the Dampierland bioregion.

Two species of land snail were recorded from the survey area, both of which were previously described from other locations on the Dampierland peninsula. It is possible that other currently unrecognised land snail taxa occur in the area, but these are not of formal conservation status and their distribution cannot be determined without further work (see Section 6.4 for a related discussion). A single collection of *Austrostrophus* millipedes was also made from vine thicket habitat during the survey, but the poorly resolved taxonomic status of this group means no further comment can be made on their status.

Six species of conservation significance were confirmed from within the James Price Point study area during the field survey:

- Peregrine Falcon (*Falco peregrinus*) (State: Schedule 4);
- Dampierland Burrowing Snake (*Simoselaps minimus*) (State: Priority 2);
- Bush Stone-curlew (*Burhinus grallarius*) (State Priority 4);
- *Lerista separanda* (State Priority 4);
- Rainbow Bee-eater (*Merops ornatus*) (Commonwealth: Migratory); and
- White-bellied Sea Eagle (*Haliaeetus leucogaster*) (Commonwealth: Migratory).

A further five Schedule listed species are considered likely to occur based on habitats and database records (Section 6.3). All of the species of elevated conservation significance currently confirmed to be present, also occur more widely on the Dampierland peninsula, and most (with the exception of *Simoselaps minimus*) are widely distributed in coastal habitats in the Kimberley and Pilbara bioregions.

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7.0 References

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Appendix 1

DEC Threatened Fauna Database Search Results



COMMON_NAME	SCIENTIFIC_NAME	DECLIST	RANKING	YEAR	CERTAINTY_EXPANDED	NUMSEEN	LOCNAME	METHOD	STATUS_EXPANDED	SPECIES_NOTES
Grey Falcon	<i>Falco hypoleucos</i>	PRIORITY FAUNA	P4	1997	Very certain	1	Broome	Day sighting	Priority Four: Taxa in need of monitoring	A nomadic species inhabiting lightly timbered riverine plains.
Peregrine Falcon	<i>Falco peregrinus</i>	OTHER SPECIALLY PROTECTED FAUNA		1976	Very certain	1	Coulomb Point	Day sighting	Schedule 4 - Other specially protected fauna	This species is uncommon and prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land.
Pictorella Mannikin	<i>Heteromunia pectoralis</i>	PRIORITY FAUNA	P4	2005	Very certain	0	Broome	Day sighting	Priority Four: Taxa in need of monitoring	This species of finch occurs in the drier northern tropical grasslands of Australia.
Pictorella Mannikin	<i>Heteromunia pectoralis</i>	PRIORITY FAUNA	P4	2005	Very certain	9	Broome	Day sighting	Priority Four: Taxa in need of monitoring	This species of finch occurs in the drier northern tropical grasslands of Australia.
Golden Bandicoot , Wintarru	<i>Isoodon auratus auratus</i>	DECLARED THREATENED FAUNA	VU	1971	Moderately certain	1	Coulomb Point Nature Reserve	Night sighting	Schedule 1 - Fauna that is rare or is likely to become extinct	The mainland subspecies of the Golden Bandicoot has suffered a drastic decline and contraction in distribution. It is known to occur in a wide range of habitats but is vulnerable to predation by foxes and cats.
Golden Bandicoot , Wintarru	<i>Isoodon auratus auratus</i>	DECLARED THREATENED FAUNA	VU		Very certain	1	Waterbank		Schedule 1 - Fauna that is rare or is likely to become extinct	The mainland subspecies of the Golden Bandicoot has suffered a drastic decline and contraction in distribution. It is known to occur in a wide range of habitats but is vulnerable to predation by foxes and cats.
Little Bittern	<i>Ixobrychus minutus</i>	PRIORITY FAUNA	P4	2001	Very certain	1	Waterbank	Day sighting	Priority Four: Taxa in need of monitoring	This cryptic species inhabits dense reeds and rushes bordering swamps, lakes and watercourses.

COMMON_ NAME	SCIENTIFIC_ NAME	DECLIST	RANKING	YEAR	CERTAINTY_ EXPANDED	NUMSEEN	LOCNAME	METHOD	STATUS_ EXPANDED	SPECIES_ NOTES
	<i>Lerista separanda</i>	PRIORITY FAUNA	P2	1971	Very certain	1	Coulomb Point Nature Reserve		Priority Two: Taxa with few, poorly known populations on conservation lands	Very few specimens of this skink have been collected and little is known of its biology.
Bilby, Dalgyte, Ninu	<i>Macrotis lagotis</i>	DECLARED THREATENED FAUNA	VU	1963	Very certain	1	Dampier Peninsula	Dead	Schedule 1 - Fauna that is rare or is likely to become extinct	This species shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.
Bilby, Dalgyte, Ninu	<i>Macrotis lagotis</i>	DECLARED THREATENED FAUNA	VU	1963	Very certain	1	Waterbank	Caught or trapped	Schedule 1 - Fauna that is rare or is likely to become extinct	This species shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.
Bilby, Dalgyte, Ninu	<i>Macrotis lagotis</i>	DECLARED THREATENED FAUNA	VU	1963	Very certain	1	Dampier Peninsula		Schedule 1 - Fauna that is rare or is likely to become extinct	This species shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.
Bilby, Dalgyte, Ninu	<i>Macrotis lagotis</i>	DECLARED THREATENED FAUNA	VU	1965	Very certain	1	Dampier Peninsula		Schedule 1 - Fauna that is rare or is likely to become extinct	This species shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.

COMMON_ NAME	SCIENTIFIC_ NAME	DECLIST	RANKING	YEAR	CERTAINTY_ EXPANDED	NUMSEEN	LOCNAME	METHOD	STATUS_EXPANDED	SPECIES_ NOTES
										stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.
Bilby, Dalgyte, Ninu	<i>Macrotis lagotis</i>	DECLARED THREATENED FAUNA	VU	1970	Very certain	1	Coulomb Point	Bones	Schedule 1 - Fauna that is rare or is likely to become extinct	This species shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.
Bilby, Dalgyte, Ninu	<i>Macrotis lagotis</i>	DECLARED THREATENED FAUNA	VU	1970	Moderately certain	1	Roebuck	Night sighting	Schedule 1 - Fauna that is rare or is likely to become extinct	This species shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.
Bilby, Dalgyte, Ninu	<i>Macrotis lagotis</i>	DECLARED THREATENED FAUNA	VU	1987	Very certain	1	County Downs	Caught or trapped	Schedule 1 - Fauna that is rare or is likely to become extinct	This species shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.
Bilby, Dalgyte, Ninu	<i>Macrotis lagotis</i>	DECLARED THREATENED FAUNA	VU	1989	Very certain	1	Roebuck	Dead	Schedule 1 - Fauna that is rare or is likely to become extinct	This species shelters in burrows and occupies a range of habitats from grassland on clayey and

COMMON_NAME	SCIENTIFIC_NAME	DECLIST	RANKING	YEAR	CERTAINTY_EXPANDED	NUMSEEN	LOCNAME	METHOD	STATUS_EXPANDED	SPECIES_NOTES
										stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.
Bilby, Dalgyle, Ninu	<i>Macrotis lagotis</i>	DECLARED THREATENED FAUNA	VU	2001	Very certain	0	Roebuck	Definite signs	Schedule 1 - Fauna that is rare or is likely to become extinct	This species shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.
Golden-backed Tree-rat	<i>Mesembriomys macrurus</i>	PRIORITY FAUNA	P4		Very certain	3	Waterbank	Caught or trapped	Priority Four: Taxa in need of monitoring	This species occurs in a variety of near-coastal habitats in the north-west Kimberley.
Eastern Curlew	<i>Numenius madagascariensis</i>	PRIORITY FAUNA	P4	1998	Very certain	13	Broome	Day sighting	Priority Four: Taxa in need of monitoring	This species is a migratory visitor and has been observed on reef flats and sandy beaches along the West Australian coast and in coastal estuaries.
Eastern Curlew	<i>Numenius madagascariensis</i>	PRIORITY FAUNA	P4	2001	Very certain	20	Roebuck Bay		Priority Four: Taxa in need of monitoring	This species is a migratory visitor and has been observed on reef flats and sandy beaches along the West Australian coast and in coastal estuaries.
Australian Snubfin Dolphin	<i>Orcaella heinsohni</i>	PRIORITY FAUNA	P4	1965	Very certain	1	Cable Beach	Day sighting	Priority Four: Taxa in need of monitoring	
Australian Snubfin Dolphin	<i>Orcaella heinsohni</i>	PRIORITY FAUNA	P4	1965	Very certain	2	Crab Creek	Day sighting	Priority Four: Taxa in need of monitoring	
Australian Snubfin	<i>Orcaella heinsohni</i>	PRIORITY FAUNA	P4	1985	Very certain	0	Broome	Day sighting	Priority Four: Taxa in need of	

COMMON_NAME	SCIENTIFIC_NAME	DECLIST	RANKING	YEAR	CERTAINTY_EXPANDED	NUMSEEN	LOCNAME	METHOD	STATUS_EXPANDED	SPECIES_NOTES
Dolphin									monitoring	
Australian Snubfin Dolphin	<i>Orcaella heinsohni</i>	PRIORITY FAUNA	P4	2004	Very certain	6	Roebuck Bay	Day sighting	Priority Four: Taxa in need of monitoring	
Flock Bronzewing	<i>Phaps histrionica</i>	PRIORITY FAUNA	P4	1988	Very certain	1	Roebuck Plains	Day sighting	Priority Four: Taxa in need of monitoring	This species is gregarious and occurs in treeless or sparsely wooded grassy plains within reach of open water.
Princess Parrot	<i>Polytelis alexandrae</i>	PRIORITY FAUNA	P4	1999	Moderately certain	1	Broome	Day sighting	Priority Four: Taxa in need of monitoring	Little is known about this species as its occurrence is sporadic through the arid interior. Occurs on red desert sandplains and dunes and along tree-lined watercourses.
Australian Painted Snipe	<i>Rostratula benghalensis australis</i>	DECLARED THREATENED FAUNA	VU	1993	Very certain	1	Waterbank	Day sighting	Schedule 1 - Fauna that is rare or is likely to become extinct	A rare summer visitor to the watered areas of the north-west and swamps on the Swan Coastal Plain.
Australian Painted Snipe	<i>Rostratula benghalensis australis</i>	DECLARED THREATENED FAUNA	VU	1999	Very certain	2	Roebuck	Day sighting	Schedule 1 - Fauna that is rare or is likely to become extinct	A rare summer visitor to the watered areas of the north-west and swamps on the Swan Coastal Plain.
Australian Painted Snipe	<i>Rostratula benghalensis australis</i>	DECLARED THREATENED FAUNA	VU	2002	Very certain	7	Roebuck Plains	Caught or trapped	Schedule 1 - Fauna that is rare or is likely to become extinct	A rare summer visitor to the watered areas of the north-west and swamps on the Swan Coastal Plain.
Chestnut-backed Button-quail	<i>Turnix castanota magnifica</i>	PRIORITY FAUNA	P4	2000	Very certain	8	Roebuck Plains		Priority Four: Taxa in need of monitoring	
Scaly-tailed Possum	<i>Wyulda squamicaudata</i>	PRIORITY FAUNA	P3	1970	Moderately certain	1	Broome		Priority Three: Taxa with several, poorly known populations, some on conservation	This species of possum lives in rugged rocky country often associated with rainforest patches.

COMMON_ NAME	SCIENTIFIC_ NAME	DECLIST	RANKING	YEAR	CERTAINTY_ EXPANDED	NUMSEEN	LOCNAME	METHOD	STATUS_EXPANDED	SPECIES_ NOTES
									lands	

Appendix 2

WAM/DEC NatureMap Search



Amphibians	
	<i>Cyclorana australis</i> Giant Frog
	<i>Cyclorana longipes</i> Long-footed Frog
	<i>Litoria caerulea</i> Green Tree Frog
	<i>Litoria rothii</i> Northern Laughing Tree Frog
	<i>Litoria rubella</i> Little Red Tree Frog
	<i>Notaden nicholli</i> Desert Spadefoot
	<i>Opisthodon ornatus</i> Ornate Burrowing Frog
	<i>Uperoleia aspera</i> Derby Toadlet
	<i>Uperoleia talpa</i> Mole Toadlet
Reptiles	
	<i>Acalyptophis peronii</i>
	<i>Aipysurus apraefrontalis</i>
	<i>Aipysurus eydouxii</i>
	<i>Aipysurus laevis</i>
	<i>Aipysurus tenuis</i>
	<i>Amphibolurus gilberti</i> subsp. <i>gilberti</i>
	<i>Antaresia childreni</i> Children's Python
	<i>Antaresia stimsoni</i> subsp. <i>stimsoni</i>
	<i>Aspidites melanocephalus</i> Black-headed Python
	<i>Brachyurops roperi</i>
	<i>Carlia munda</i>
	<i>Carlia rufilatus</i>
	<i>Chelodina rugosa</i> Northern Long-necked Turtle
	<i>Chelonia mydas</i> Green Turtle T
	<i>Chelosania brunnea</i> Chameleon Dragon
	<i>Chlamydosaurus kingii</i> Frill-necked Lizard
	<i>Cryptoblepharus ruber</i>
	<i>Cryptoblepharus tythos</i>
	<i>Ctenophorus isolepis</i> subsp. <i>isolepis</i>
	<i>Ctenophorus nuchalis</i> Central Nettle Dragon
	<i>Ctenotus colletti</i>
	<i>Ctenotus inornatus</i>
	<i>Ctenotus saxatilis</i> Rock Ctenotus
	<i>Ctenotus serventyi</i>
	<i>Delma tincta</i>
	<i>Dendrelaphis punctulata</i> Green Tree Snake
	<i>Diplodactylus conspicillatus</i> Fat-tailed Gecko
	<i>Diporiphora pindan</i>
	<i>Diporiphora winneckei</i> Blue-lined Dragon
	<i>Disteira major</i>
	<i>Disteira stokesii</i>
	<i>Ephalophis greyae</i>
	<i>Eretmochelys imbricata</i> Hawksbill Turtle
	<i>Fordonia leucobalia</i> White-bellied Mangrove Snake
	<i>Furina ornata</i> Moon Snake
	<i>Gehyra pilbara</i>
	<i>Gehyra variegata</i>
	<i>Glaphyromorphus isolepis</i>
	<i>Hemidactylus frenatus</i> Asian House Gecko
	<i>Heteronotia binoei</i> Bynoe's Gecko
	<i>Hydrelaps darwiniensis</i>
	<i>Lerista apoda</i>
	<i>Lerista bipes</i>
	<i>Lerista griffini</i>
	<i>Lerista separanda</i> P2
	<i>Lialis burtonis</i>
	<i>Liasis mackloti</i> subsp. <i>fuscus</i>
	<i>Liasis olivaceus</i> subsp. <i>olivaceus</i>
	<i>Lucasium stenodactylum</i>
	<i>Menetia greyii</i>
	<i>Menetia maini</i>
	<i>Morethia ruficauda</i> subsp. <i>ruficauda</i>
	<i>Morethia storri</i>
	<i>Natator depressus</i> Flatback Turtle T
	<i>Oedura rhombifer</i>
	<i>Pogona minor</i> subsp. <i>mittelli</i>
	<i>Pseudonaja nuchalis</i> Gwardar
	<i>Ramphotyphlops braminus</i>
	<i>Ramphotyphlops diversus</i>
	<i>Ramphotyphlops gryp</i>
	<i>Rhynchoedura ornata</i> Beaked Gecko
	<i>Simoselaps minimus</i> P2
	<i>Strophurus ciliaris</i> subsp. <i>aberrans</i>

	<i>Suta punctata</i> Spotted Snake
	<i>Tiliqua scincoides</i> subsp. <i>intermedia</i>
	<i>Varanus acanthurus</i> Spiny-tailed Monitor
	<i>Varanus brevicauda</i> Short-tailed Pygmy Monitor
	<i>Varanus gouldii</i> Bungarra or Sand Monitor
	<i>Varanus panoptes</i>
	<i>Varanus tristis</i> Racehorse Monitor
Birds	
	<i>Accipiter fasciatus</i> Brown Goshawk
	<i>Acrocephalus australis</i> Australian Reed Warbler
	<i>Anhinga melanogaster</i> subsp. <i>novaeollandiae</i>
	<i>Anous stolidus</i> Common Noddy
	<i>Anseranas semipalmata</i> Magpie Goose (Pied Goose)
	<i>Anthus australis</i> subsp. <i>australis</i>
	<i>Aprosmictus erythropterus</i> Red-winged Parrot
	<i>Apus pacificus</i> Fork-tailed Swift
	<i>Aquila audax</i> Wedge-tailed Eagle
	<i>Aquila morphnoides</i> Little Eagle
	<i>Ardea garzetta</i> Little Egret
	<i>Ardea novaeollandiae</i> White-faced Heron
	<i>Ardea sacra</i> subsp. <i>sacra</i>
	<i>Arenaria interpres</i> Ruddy Turnstone
	<i>Artamus cinereus</i> Black-faced Woodswallow
	<i>Artamus leucorhynchus</i> White-breasted Woodswallow
	<i>Aythya australis</i> Hardhead
	<i>Bulweria bulwerii</i> Bulwer's Petrel
	<i>Burhinus grallarius</i> Bush Stone-curlew P4
	<i>Butorides striatus</i> subsp. <i>stagnatilis</i>
	<i>Cacatua roseicapilla</i> subsp. <i>roseicapilla</i>
	<i>Cacatua sanguinea</i> Little Corella
	<i>Calidris acuminata</i> Sharp-tailed Sandpiper
	<i>Calidris alba</i> Sanderling
	<i>Calidris canutus</i> Red Knot
	<i>Calidris ferruginea</i> Curlew Sandpiper
	<i>Calidris ruficollis</i> Red-necked Stint
	<i>Calidris tenuirostris</i> Great Knot
	<i>Calonectris leucomelas</i> Streaked Shearwater
	<i>Centropus phasianinus</i> Pheasant Coucal
	<i>Charadrius leschenaultii</i> Greater Sand Plover
	<i>Charadrius melanops</i> Black-fronted Dotterel
	<i>Charadrius mongolus</i> Lesser Sand Plover
	<i>Charadrius ruficapillus</i> Red-capped Plover
	<i>Charadrius veredus</i> Oriental Plover Migratory
	<i>Chenonetta jubata</i> Australian Wood Duck (Wood Duck)
	<i>Chrysococcyx basalis</i> Horsfield's Bronze Cuckoo
	<i>Chrysococcyx lucidus</i> subsp. <i>plagosus</i>
	<i>Chrysococcyx minutillus</i> Little Bronze Cuckoo
	<i>Chrysococcyx osculans</i> Black-eared Cuckoo
	<i>Cisticola exilis</i> subsp. <i>exilis</i>
	<i>Climacteris melanura</i> subsp. <i>melanura</i>
	<i>Colluricincla harmonica</i> Grey Shrike-thrush
	<i>Conopophila rufogularis</i> Rufous-throated Honeyeater
	<i>Coracina novaeollandiae</i> Black-faced Cuckoo-shrike
	<i>Corvus bennetti</i> Little Crow
	<i>Coturnix ypsilophora</i> Brown Quail
	<i>Cracticus nigrogularis</i> Pied Butcherbird
	<i>Cracticus torquatus</i> Grey Butcherbird
	<i>Cracticus tibicen</i> Australian Magpie
	<i>Cuculus saturatus</i> Oriental Cuckoo
	<i>Dacelo leachii</i> Blue-winged Kookaburra
	<i>Daphoenositta chrysoptera</i> subsp. <i>leucoptera</i> Varied Sittella
	<i>Dendrocygna eytoni</i> Plumed Whistling Duck
	<i>Dicaeum hirundinaceum</i> Mistletoebird
	<i>Diomedea chrysostoma</i> Grey-headed Albatross T
	<i>Elanus scriptus</i> Letter-winged Kite
	<i>Epthianura crocea</i> Yellow Chat
	<i>Epthianura tricolor</i> Crimson Chat
	<i>Erythrogonyx cinctus</i> Red-kneed Dotterel
	<i>Erythrura gouldiae</i> Gouldian Finch T
	<i>Esacus neglectus</i> Beach Stone-curlew
	<i>Eurostopodus argus</i> Spotted Nightjar
	<i>Eurystomus orientalis</i> subsp. <i>pacificus</i>
	<i>Falco berigora</i> Brown Falcon
	<i>Falco berigora</i> subsp. <i>berigora</i>

	<i>Falco cenchroides</i> Australian Kestrel
	<i>Falco hypoleucos</i> Grey Falcon P4
	<i>Falco longipennis</i> subsp. <i>longipennis</i>
	<i>Falco peregrinus</i> subsp. <i>macropus</i> S
	<i>Gallinago megala</i> Swinhoe's Snipe
	<i>Gallirallus philippensis</i> Buff-banded Rail
	<i>Geopelia humeralis</i> Bar-shouldered Dove
	<i>Geopelia striata</i> Peaceful Dove
	<i>Geophaps plumifera</i> Spinifex Pigeon
	<i>Gerygone levigaster</i> subsp. <i>levigaster</i>
	<i>Gerygone olivacea</i> subsp. <i>rogersi</i>
	<i>Gerygone tenebrosa</i> Dusky Gerygone
	<i>Glareola maldivarum</i> Oriental Pratincole Migratory
	<i>Grallina cyanoleuca</i> Magpie-lark
	<i>Grus rubicunda</i> Brolga
	<i>Haliastur indus</i> Brahminy Kite
	<i>Haliastur spheurnus</i> Whistling Kite
	<i>Hamirostra melanosternon</i> Black-breasted Buzzard
	<i>Heteromunia pectoralis</i> Pictorella Mannikin P4
	<i>Himantopus himantopus</i> Black-winged Stilt
	<i>Hirundo neoxena</i> Welcome Swallow
	<i>Hirundo nigricans</i> Tree Martin
	<i>Ixobrychus flavicollis</i> subsp. <i>australis</i> P3
	<i>Ixobrychus minutus</i> Little Bittern P4
	<i>Lalage tricolor</i> White-winged Triller
	<i>Larus novaehollandiae</i> Silver Gull
	<i>Lichenostomus flavescens</i> subsp. <i>flavescens</i>
	<i>Lichenostomus unicolor</i> subsp. <i>unicolor</i>
	<i>Lichenostomus virescens</i> Singing Honeyeater
	<i>Lichmera indistincta</i> Brown Honeyeater
	<i>Limicola falcinellus</i> Broad-billed Sandpiper
	<i>Limnodromus semipalmatus</i> Asian Dowitcher
	<i>Limosa lapponica</i> Bar-tailed Godwit
	<i>Limosa lapponica</i> subsp. <i>menzbieri</i>
	<i>Limosa limosa</i> Black-tailed Godwit
	<i>Limosa limosa</i> subsp. <i>melanuroides</i>
	<i>Malurus lamberti</i> subsp. <i>assimilis</i>
	<i>Malurus melanocephalus</i> Red-backed Fairy-wren
	<i>Malacorhynchus membranaceus</i> Pink-eared Duck
	<i>Melithreptus gularis</i> subsp. <i>laetior</i>
	<i>Merops ornatus</i> Rainbow Bee-eater
	<i>Microeca fascinans</i> Jacky Winter
	<i>Microeca flavigaster</i> subsp. <i>tormenti</i> Kimberley Flycatcher
	<i>Milvus migrans</i> Black Kite
	<i>Mirafra javanica</i> subsp. <i>horsfieldii</i>
	<i>Motacilla flava</i> Yellow Wagtail
	<i>Myiagra inquieta</i> Restless Flycatcher
	<i>Myiagra rubecula</i> Leaden Flycatcher
	<i>Myiagra ruficollis</i> subsp. <i>mimikae</i>
	<i>Myzomela erythrocephala</i> Red-headed Honeyeater
	<i>Myzomela erythrocephala</i> subsp. <i>erythrocephala</i>
	<i>Ninox connivens</i> Barking Owl
	<i>Ninox novaeseelandiae</i> subsp. <i>boobook</i>
	<i>Numenius madagascariensis</i> Eastern Curlew P4
	<i>Numenius minutus</i> Little Curlew Migratory
	<i>Nycticorax caledonicus</i> subsp. <i>hilli</i>
	<i>Oceanites oceanicus</i> Wilson's Storm Petrel
	<i>Oriolus sagittatus</i> Olive-backed Oriole
	<i>Pachycephala lanioides</i> White-breasted Whistler
	<i>Pachycephala rufiventris</i> subsp. <i>rufiventris</i>
	<i>Pandion haliaetus</i> Osprey
	<i>Pardalotus striatus</i> subsp. <i>uropygialis</i>
	<i>Passer montanus</i> Eurasian Tree Sparrow
	<i>Pelecanoides urinatrix</i> subsp. <i>exsul</i>
	<i>Phaps histrionica</i> Flock Bronzewing (Flock Pigeon) P4
	<i>Philemon citreogularis</i> Little Friarbird
	<i>Pitta moluccensis</i> Blue-winged Pitta
	<i>Platalea flavipes</i> Yellow-billed Spoonbill
	<i>Pluvialis squatarola</i> Grey Plover
	<i>Podargus strigoides</i> Tawny Frogmouth
	<i>Poephila acuticauda</i> Long-tailed Finch
	<i>Polytelis alexandrae</i> Princess Parrot P4
	<i>Pomatostomus temporalis</i> Grey-crowned Babbler
	<i>Porphyrio porphyrio</i> subsp. <i>melanotus</i>
	<i>Ptilinopus regina</i> subsp. <i>ewingii</i>

	<i>Ptilonorhynchus nuchalis</i> subsp. <i>nuchalis</i>
	<i>Puffinus huttoni</i> Hutton's Shearwater
	<i>Puffinus pacificus</i> Wedge-tailed Shearwater
	<i>Recurvirostra novaehollandiae</i> Red-necked Avocet
	<i>Rhipidura fuliginosa</i> subsp. <i>alisteri</i>
	<i>Rhipidura leucophrys</i> Willie Wagtail
	<i>Rhipidura rufiventris</i> subsp. <i>isura</i>
	<i>Rostratula benghalensis</i> subsp. <i>australis</i> T
	<i>Sphecotheres viridis</i> Figbird
	<i>Sterna anaethetus</i> Bridled Tern
	<i>Sterna bengalensis</i> Lesser Crested Tern
	<i>Sterna bergii</i> Crested Tern
	<i>Sterna caspia</i> Caspian Tern
	<i>Sterna dougallii</i> Roseate Tern
	<i>Sterna fuscata</i> Sooty Tern
	<i>Sterna hirundo</i> subsp. <i>longipennis</i>
	<i>Sterna hybrida</i> Whiskered Tern
	<i>Sterna nilotica</i> subsp. <i>macrotarsa</i> Australian Gull-billed Tern
	<i>Stiltia isabella</i> Australian Pratincole
	<i>Sturnus vulgaris</i> Common Starling
	<i>Sula leucogaster</i> Brown Booby
	<i>Sula leucogaster</i> subsp. <i>plotus</i>
	<i>Tachybaptus novaehollandiae</i> Australasian Grebe (Black-
	<i>Taeniopygia bichenovii</i> subsp. <i>annulosa</i>
	<i>Taeniopygia guttata</i> subsp. <i>castanotis</i>
	<i>Threskiornis spinicollis</i> Straw-necked Ibis
	<i>Todiramphus chloris</i> subsp. <i>sordida</i>
	<i>Todiramphus sanctus</i> Sacred Kingfisher
	<i>Trichoglossus haematodus</i> Rainbow Lorikeet
	<i>Trichoglossus haematodus</i> subsp. <i>rubritorquis</i> Red-collared
	<i>Tringa brevipes</i> Grey-tailed Tattler
	<i>Tringa cinerea</i> Terek Sandpiper
	<i>Tringa glareola</i> Wood Sandpaper
	<i>Tringa nebularia</i> Common Greenshank
	<i>Tringa stagnatilis</i> Marsh Sandpiper
	<i>Turnix maculosa</i> subsp. <i>melanota</i>
	<i>Turnix pyrrhothorax</i> Red-chested Button-quail
	<i>Turnix velox</i> Little Button-quail
	<i>Tyto alba</i> Barn Owl
	<i>Tyto capensis</i> subsp. <i>longimembris</i>
	<i>Tyto longimembris</i> Eastern Grass Owl (name not current)
	<i>Tyto novaehollandiae</i> Masked Owl subsp. <i>kimberlii</i> is T
	<i>Zosterops luteus</i> Yellow White-eye
Mammals	
	<i>Bettongia lesueur</i> subsp. <i>graii</i> Burrowing Bettong, Boodie
	<i>Chaerephon jobensis</i> Northern Freetail-bat
	<i>Chalinolobus gouldii</i> Gould's Wattled Bat
	<i>Chalinolobus nigrogriseus</i> Hoary Wattled Bat
	<i>Dugong dugon</i> Dugong S
	<i>Hydromys chrysogaster</i> Water-rat P4
	<i>Isodon auratus</i> subsp. <i>auratus</i> Golden Bandicoot (name not
	<i>Macropus agilis</i> Agile Wallaby
	<i>Macroctis lagotis</i> Bilby, Dalgyle T
	<i>Megaptera novaehollandiae</i> Humpback Whale T
	<i>Mesembriomys macrurus</i> Golden-backed Tree-rat P4
	<i>Miniopterus schreibersii</i> subsp. <i>orianae</i> Common Bentwing-bat
	<i>Mormopterus beccarii</i> Beccari's Freetail-bat
	<i>Mormopterus loriae</i> Little Northern Freetail-bat
	<i>Mus musculus</i> House Mouse
	<i>Nyctophilus arnhemensis</i> Arnhem Land Long-eared Bat
	<i>Nyctophilus bifax</i> subsp. <i>daedalus</i> Northwestern Long-eared
	<i>Nyctophilus geoffroyi</i> Lesser Long-eared Bat
	<i>Orcaella heinsohni</i> Australian Snubfin Dolphin P4
	<i>Phascogale tapoatafa</i> subsp. <i>pirata</i> Northern Brush-tailed
	<i>Pseudomys delicatulus</i> Delicate Mouse
	<i>Pseudomys nanus</i> Western Chestnut Mouse
	<i>Pteropus alecto</i> Black Flying-fox
	<i>Pteropus scapulatus</i> Little Red Flying-fox
	<i>Rattus rattus</i> Black Rat
	<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat
	<i>Scotorepens greyii</i> Little Broad-nosed Bat
	<i>Scotorepens sanborni</i> Northern Broad-nosed Bat
	<i>Trichosurus vulpecula</i> subsp. <i>arnhemensis</i> Northern Brushtail
	<i>Wyulda squamicaudata</i> Scaly-tailed Possum P3

Conservation	
T -	Rare or likely to become extinct
X -	Presumed extinct
IA -	Protected under international agreement
S -	Other specially protected fauna
1 -	Priority 1
2 -	Priority 2
3 -	Priority 3
4 -	Priority 4
5 -	Priority 5

Appendix 3

EPBC Act 1999 Protected Matters Report



THREATENED SPECIES			
Species Name	Common Name	Status	Presence
Birds			
<i>Erythrotriorchis radiatus</i>	Red Goshawk	Vulnerable	Species or species habitat may occur
<i>Erythrura gouldiae</i>	Gouldian Finch	Endangered	Species or species habitat may occur
<i>Rostratula australis</i>	Australian Painted Snipe	Vulnerable	Species or species habitat may occur
<i>Tyto novaehollandiae kimberli</i>	Masked Owl (northern)	Vulnerable	Species or species habitat may occur
Mammals			
<i>Balaenoptera musculus</i>	Blue Whale	Endangered	Species or species habitat may occur
<i>Dasyercus cristicauda</i>	Mulgara	Vulnerable	Species or species habitat may occur
<i>Macrotis lagotis</i>	Greater Bilby	Vulnerable	Species or species habitat may occur
<i>Megaptera novaeangliae</i>	Humpback Whale	Vulnerable	Species or species habitat may occur
Reptiles			
<i>Caretta caretta</i>	Loggerhead Turtle	Endangered	Species or species habitat may occur
<i>Chelonia mydas</i>	Green Turtle	Vulnerable	Species or species habitat may occur
<i>Dermochelys coriacea</i>	Leatherback Turtle	Endangered	Species or species habitat may occur
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	Vulnerable	Species or species habitat may occur
<i>Natator depressus</i>	Flatback Turtle	Vulnerable	Species or species habitat may occur
Migratory Species			
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Migratory	Species or species habitat may occur
<i>Hirundo rustica</i>	Barn Swallow	Migratory	Species or species habitat may occur
<i>Merops ornatus</i>	Rainbow Bee-eater	Migratory	Species or species habitat may occur
<i>Poecilodryas superciliosa cerviniventris</i>	Derby White-browed Robin	Migratory	Species or species habitat may occur
<i>Ardea alba</i>	Great Egret	Migratory	Species or species habitat may occur
<i>Ardea ibis</i>	Cattle Egret	Migratory	Species or species habitat may occur
<i>Charadrius veredus</i>	Oriental Plover, Oriental Dotterel	Migratory	Species or species habitat may occur
<i>Glareola maldivarum</i>	Oriental Pratincole	Migratory	Species or species habitat may occur
<i>Numenius minutus</i>	Little Curlew, Little Whimbrel	Migratory	Species or species habitat may occur
<i>Rostratula benghalensis s. lat.</i>	Painted Snipe	Migratory	Species or species habitat may occur
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory	Species or species habitat may occur
<i>Sterna albifrons</i>	Little Tern	Migratory	Species or species habitat may occur

Appendix 4

DEC Regulation 17 Permit





DEPARTMENT OF ENVIRONMENT AND CONSERVATION

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 Telephone: 08 9334 0333
 Facsimile: 08 9334 0242

Correspondence: Locked Bag 30
 Bentley Delivery Centre WA 6983



PAGE 1
 NO. SF006763
 PERSON NO. 54407

RECEIPT NO. AMOUNT
 \$0.00

WILDLIFE CONSERVATION ACT 1950
 REGULATION 17

LICENCE TO TAKE FAUNA FOR SCIENTIFIC PURPOSES

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

DIRECTOR GENERAL

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 DIRECTOR GENERAL, 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 DIRECTOR GENERAL. 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 DIRECTOR GENERAL, 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 DEPT OF THE ENVIRONMENT AND WATER RESOURCES, 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 DEC'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 DIRECTOR GENERAL OF DEC.
- 9 FURTHER CONDITIONS (NUMBERED TO) ARE ATTACHED.

PURPOSE

CAPTURE AND RELEASE VERTEBRATE FAUNA SURVEY AT UP TO 20 SITES; 12 DRY PITFALL TAPS PER SITE; UP TO 100 FUNNEL TRAPS AT THE 20 SITES OR ON A FENCE LINE WITH UP TO 20 FUNNEL TRAPS PER LINE; UP TO 200 ELLIOT TRAPS AT THE 20 SITES OR OTHER SUITABLE SITES; 5 HARP TRAPS EITHER AT THE 20 SITES OR OTHER SITES SUITABLE FOR TRAPPING BATS AT JAMES PRICE POINT DAMPIERLAND.

AUTHORISED PERSONS

DR RIC HOW
 MR GREG HAROLD
 MR MARK COWAN



DEPARTMENT OF ENVIRONMENT AND CONSERVATION

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PAGE 2
NO. SF006763
PERSON NO. 54407

DATE OF ISSUE 05/02/2009
VALID FROM 05/02/2009
DATE OF EXPIRY 31/03/2009

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(ROY JOHN)

- - - - -

Appendix 5

Bat Call Identification Report





Bat call identification from James Price Point, WA

Type:	Bat Call Analysis
Prepared for:	Biota Environmental Sciences
Date:	6 July 2009
Job No.:	SZ117
Prepared by:	Specialised Zoological Kyle Armstrong and Yuki Konishi ABN 92 265 437 422 0404 423 264 kyle.armstrong@graduate.uwa.edu.au kyle.n.armstrong@gmail.com

SZ117: Bat call identification from James Price Point, WA

SUMMARY

Bat identifications from Anabat echolocation call recordings are provided from James Price Point, in the Kimberley region of Western Australia. At least three species were identified as being present, with the possibility of others that cannot be distinguished reliably from each other based on acoustic recordings (Table 1).

The calls of the hoary wattled bat *Chalinolobus nigrogriseus*, little broad-nosed bat *Scotorepens greyii* and northern broad-nosed bat *Scotorepens sanborni* are similar and cannot be distinguished reliably. Likewise, some calls of the yellow-bellied sheath-tailed bat *Saccolaimus flaviventris* can be confused with those of the northern free-tailed bat *Chaerephon jobensis*, and they could not be separated here.

Details supporting the identifications are provided, as recommended by the Australasian Bat Society (ABS 2006). A summary of pulse parameters is provided in Table 2, and representative call sequences are illustrated in Figure 1. Further data is available should verification be required.

METHODS

Signals as recorded with Anabat SD1 detectors were supplied as downloaded sequences, which were examined in AnalookW 3.7a software. Three call variables were measured on good quality search phase pulses in representative call sequences: pulse duration (milliseconds), maximum frequency (kHz) and characteristic frequency (equivalent to minimum frequency; kHz). Species were identified based on information in Milne (2002). Nomenclature follows Armstrong and Reardon (2006). Species designations of Churchill (2008) are not followed until formal publication of the relevant taxonomic study.

REFERENCES

- ABS (2006). Recommendations of the Australasian Bat Society Inc for reporting standards for insectivorous bat surveys using bat detectors. *The Australasian Bat Society Newsletter* 27: 6–9. [ISSN 1448-5877]
- Armstrong, K. and Reardon, T. (2006). Standardising common names of bats in Australia. *The Australasian Bat Society Newsletter* 26: 37–42.
- Churchill, S.K. (2008). *Australian bats*. 2nd ed. Allen and Unwin, Crows Nest, NSW.
- Milne, D.J. (2002). *Key to the bat calls of the Top End of the Northern Territory*. Parks and Wildlife Commission of the Northern Territory, Technical Report No. 71.

SZ117: Bat call identification from James Price Point, WA

TABLE 1. Species identifications, with the degree of confidence indicated by a code. Date correlates with site; see Table 2 for full species names.

	<i>C. gouldii</i>	<i>C. jobensis</i> / <i>S. flaviventris</i>	<i>C. nigrogriseus</i> / <i>S. greyii</i> / <i>S. sanborni</i>
Date			
Serial 3709 090311			
10/03/2009	—	—	—
11/03/2009	—	—	—
12/03/2009	—	—	—
13/03/2009	—	—	—
14/03/2009	—	—	—
Serial 3709 090315			
14/03/2009	—	NC	NC
15/03/2009	—	—	—
16/03/2009	—	—	—
Serial 3726			
10/03/2009	H	—	NC
11/03/2009	—	—	NC
12/03/2009	—	—	—
14/03/2009	—	—	—
15/03/2009	—	—	—
24/03/2009	—	—	—
25/03/2009	H	NC	NC
26/03/2009	H	—	NC
27/03/2009	—	—	NC

Definition of confidence level codes:

H High. Unambiguous identification of the species at the site based on measured call characteristics and comparison with available reference material. Greater confidence in this ID would come only after capture and supported by morphological measurements or submission of a specimen/tissue to a museum.

NC Needs Confirmation. Either call quality was poor, or the species cannot be distinguished reliably from another that makes similar calls. Alternative identifications are indicated in the Summary section of this report. If this is a species of conservation significance, further survey work might be required to confirm the record.

SZ117: Bat call identification from James Price Point, WA

TABLE 2. Summary of variables from representative call sequences.

Species	s,p ¹	Duration (msec) ²	Max Frequency (kHz) ²	Char frequency (kHz) ²
Gould's wattled bat <i>Chalinolobus gouldii</i>	3,30	6.2 ± 0.9 4.3 – 7.6	50.4 ± 8.7 35.9 – 72.7	30.6 ± 1.0 29.4 – 32.3
Northern free-tailed bat <i>Chaerophon jobensis</i> / Yellow-bellied sheath-tailed bat <i>Saccolaimus flaviventris</i>	1,5	15.0 ± 1.6 12.7 – 17	24.2 ± 0.9 22.9 – 25.2	19.6 ± 0.2 19.4 – 20.0
Hoary wattled bat <i>Chalinolobus nigrogriseus</i> / Little broad-nosed bat <i>Scotorepens greyii</i> / Northern broad-nosed bat <i>Scotorepens sanborni</i>	3,29	5.9 ± 0.7 4.6 – 7.2	63.1 ± 8.6 46.8 – 74.8	38.1 ± 0.6 37.0 – 39.2

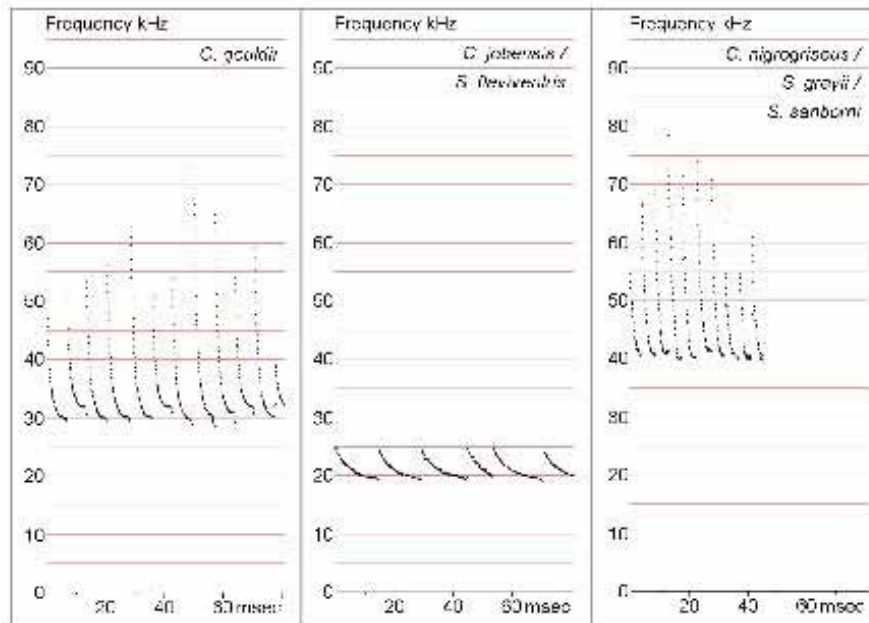
¹ s,p: number of sequences measured, combined total number of pulses measured;² Mean ± SD; range.

FIGURE 1. Representative call sequences of the species identified (time is compressed between pulses).

Appendix 6

Full List of All Vertebrate Fauna Recorded During the Survey



Herpetofauna

Myobatrachidae

Opisthodon ornatus

Hylidae

Cyclorana australis

Cyclorana longipes

Litoria caerulea

Pygopodidae

Delma tinctoria

Lialis burtonis

Pygopus steelscottii

Gekkonidae

Diplodactylus conspicillatus

Gehyra pilbara

Gehyra punctata

Heteronotia binoei

Lucasium stenodactylum

Strophurus ciliaris

Scincidae

Carlia rufilatus

Cryptoblepharus ruber

Ctenotus inornatus

Ctenotus serventyi

Glaphyromorphus isolepis

Lerista apoda

Lerista bipes

Lerista griffini

Lerista separanda

Morethia storri

Problepharus tenius

Tiliqua multifasciata

Tiliqua scincoides

Agamidae

Amphibolurus gilberti

Chlamydosaurus kingii

Diporiphora pindan

Pogona minor

Varanidae

Varanus brevicauda

Varanus gouldii

Varanus panoptes

Varanus tristis

Typhlopidae

Ramphotyphlops diversus

Pythonidae

Antaresia stimsoni

Elapidae

Brachyurops roperi

Demansia angusticeps

Furina ornata

Pseudechis australis

Pseudonaja nuchalis

Simoselaps minimus

Suta punctata

Mammals

Macropodidae

Macropus agilis

Muridae

*Mus musculus**

Pseudomys delicatulus

Canidae

Canis lupus dingo

Felidae

*Felis catus**

Emaballonuridae

Saccolaimus flaviventris

Mollossidae

Chaerephon jobensis

Vespertilionidae

Chalinolobus gouldii

Chalinolobus nigrogriseus

Scotorepens greyii

Scotorepens sanborni

Nyctophilus arnhemensis

Avifauna

Phasianidae

Coturnix ypsilophora

Fregatidae

Fregata ariel

Ardeidae

Nycticorax caledonicus

Scolopacidae

Tringa hypoleucos

Burhinidae

Burhinus grallarius

Haematopodidae

Haematopus longirostris

Accipitridae

Accipiter fasciatus

Pandion haliaetus

Hamirostra isura

Haliaeetus leucogaster

Falconidae

Falco cenchroides

Falco berigora

Falco peregrinus

Columbidae

Geopelia humeralis

Ocyphaps lophotes

Geopelia cuneata

Geopelia striata

Psittacidae

Trichoglossus haematodus

Aprosmictus erythropterus

Trichoglossus versicolor

Cuculidae

Chrysococcyx osculans

Cacomantis variolosus

Chrysococcyx basalis

Centropodidae

Centropus phasianinus

Podargidae

Podargus strigoides

Halcyonidae

Dacelo leachii

Todiramphus pyrrhopygia

Todiramphus sanctus

Meropidae

Merops ornatus

Coraciidae

Eurystomus orientalis

Neosittidae*Daphoenositta chrysoptera***Maluridae***Malurus melanocephalus**Malurus elegans**Malurus lamberti***Pardalotidae***Pardalotus rubricatus**Pardalotus punctatus**Pardalotus striatus***Acanthizidae***Smicrornis brevirostris**Gerygone olivacea***Meliphagidae***Melithreptus gularis**Lichmera indistincta**Lichenostomus plumulus**Philemon citreogularis**Conopophila rufogularis**Lichenostomus virescens**Lichenostomus unicolor**Lichenostomus penicillatus**Lichenostomus flavescens***Pachycephalidae***Colluricincla harmonica**Pachycephala rufiventris***Pomatostomidae***Pomatostomus temporalis***Petroicidae***Microeca fascinans***Dicruridae***Myiagra rubecula**Rhipidura rufiventris**Myiagra inquieta**Rhipidura leucophrys***Ptilonorhynchidae***Ptilonorhynchus nuchalis***Campephagidae***Coracina novaehollandiae***Artamidae***Artamus cinereus melanops**Artamus minor**Artamus leucorhynchus***Cracticidae***Cracticus torquatus**Cracticus nigrogularis***Corvidae***Corvus orru ceciliae***Hirundinidae***Hirundo nigricans***Sylviidae***Cisticola exilis***Passeridae***Taeniopygia bichenovii**Poephila acuticauda**Taeniopygia guttata***Motacillidae***Anthus australis australis*