Vertebrate fauna survey of the Colville 1:100,000 map sheet area; northern Nullarbor

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Cover images from left to right: *Moloch horridus* (J. Jackson), Naretha blue bonnet (T. Handasyde), *Sminthopsis crassicaudata* (L. Gibson), *Tiliqua occipitalis* (L. Gibson)

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Summary

A biological survey of the vertebrate fauna in the Colville 1:100,000 topographic map sheet area was undertaken from the 27 August – 11 September 2015. In total, we recorded 83 species of vertebrate fauna including 40 birds, 27 reptiles, 12 native mammals and four introduced mammals. No frogs were detected. Commonly encountered species included the barred wedge-snouted ctenotus (*Ctenotus schomburgkii*), Boulenger's snake-eyed skink (*Morethia boulengeri*), fat-tailed dunnart (*Sminthopsis crassicaudata*), sandy inland mouse (*Pseudomys hermannsburgensis*) and yellow-throated minor (*Manorina flavigula*). We detected 14 previously unrecorded native species in the local survey area (9 reptiles, 3 bats, 1 small mammal and 1 bird). Three of these, the southern spiny-tailed gecko (*Strophurus intermedius*), desert wood gecko (*Diplodactylus wiru*) and inland forest bat (*Vespadelus baverstocki*), have not been previously recorded in the broader Nullarbor-Northern Band (NUL1) biogeographical subregion. We recorded one species of conservation significance (WA listed – Priority 4) within the survey area – the Naretha blue bonnet (*Platycercus haematogaster narethae*). Introduced species we detected included the camel (*Camelus dromedarius*), cat (*Felis catus*), rabbit (*Oryctolagus cuniculus*) and house mouse (*Mus musculus*). While the comprehensiveness of the species lists will undoubtedly improve with further surveys in the area, the results presented here build on the collective biological knowledge in the region, and thereby help facilitate land use decisions.

1 Introduction

Financial support to undertake biological surveys to fill spatial gaps in biological knowledge across the Australian continent has been provided by the Federal Government. The selection of survey areas under this programme is based on the 1:100,000 topographic map sheets that have the least number of collection records in State and National databases. The remote western deserts of Australia are particularly lacking in biological information, and several map sheets in this region have been nominated for survey. In 2014, a survey was conducted by the Western Australian Department of Parks and Wildlife covering the Peterswald (3644) 1:100,000 map sheet in the north western sector of the Great Victoria Desert bioregion. Here, we present the results of a biological survey in the Colville (4238) 1:100,000 map sheet area. The results of the vertebrate fauna sampling are presented in this report.

The Colville map sheet is bounded by the latitudes 29º30'S and 30º00'S, and longitudes 126º30'E and 127º00'E (Figure 1) and is located within the Nullarbor-Northern Band (NUL1) biogeographical subregion (as defined by the IBRA classification system) approximately 60 km south of the bordering Great Victoria Desert (GVD) bioregion and 190 km west of the South Australian border. The Aboriginal community of Tjuntjuntjara lies 20 km north east of the map sheet. The majority of the map sheet is Unallocated Crown Land however a small section of the Great Victoria Desert Nature Reserve is located within the north-eastern corner.

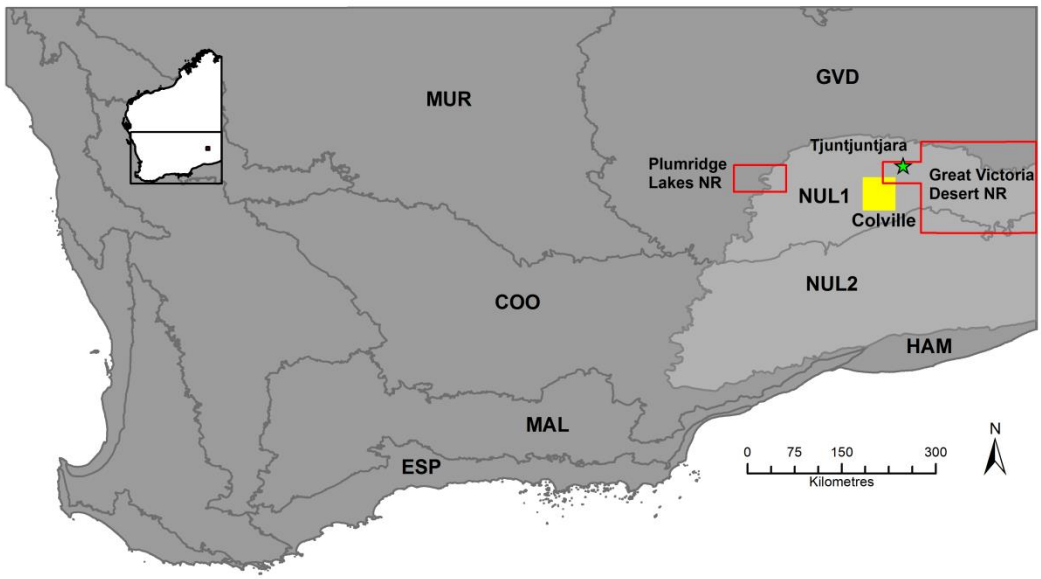

Figure 1. Location of the Colville 1:100,000 map sheet (yellow box) in the Nullarbor- Northern Band biogeographical subregion (NUL1). The neighbouring subregion (Nullarbor-Central Band; NUL2), biogeographic regions (Great Victoria Desert – GVD; Hampton – HAM; Mallee – MAL; Esperance – ESP; Coolgardie – COO and Murchison – MUR) and locations mentioned in the text are also shown.

The Colville map sheet falls within the Jubilee (SH52-5) 1:250,000 Geology of Western Australia Sheet (Lowry 1970). This area covers the northern section of the topographically subdued Bunda Plateau and includes sections of both the Nyanga and Carlisle Plains (Lowry 1970). Surficial geology mainly comprises Colville Sandstone (sandstone, claystone and minor limestone) which either crops

out or is overlain by residual sand (or clay) and kankar ($CaCO_3$ nodules). In the south-eastern section of the map sheet, Colville Sandstone grades into Nullarbor Limestone overlain by calcareous clay and kankar. Soils derived from Colville Sandstone tend to be relatively deep with a sandy-loam texture whereas the limestone derived soils are more fine and silty (Lowry 1970). A small ephemeral freshwater lake (Lake Colville) occurs on the northern edge of the map sheet. The area experiences an arid hot climate with seasonally uniform, but locally variable and unpredictable rainfall (McKenzie et al. 1989). Average annual rainfall for the NUL1 subregion is 150 – 200 mm (Barton and Cowan 2002).

Beard (1974) describes the plant formation of the area as succulent steppe with low open woodland (either lightly or thickly wooded) and three classifications: western myall (*Acacia papyrocarpa*) over saltbush (*Atriplex* spp.) and bluebush (*Maireana sedifolia*), mulga (*Acacia aneura*) and sheoak (*Casuarina pauper*) over bluebush, and western myall over bluebush (Figure 2). Bluebush is the dominant ground layer plant regardless of the overstorey taxa. Myall tends to be the dominant tree in the more lightly wooded areas whereas mulga tends to replace myall in the more thickly wooded areas with soils of higher sand content (Beard 1974). An examination of fire history for the area (DPaW corporate GIS data; accessed 20 February 2016) indicates that approximately half of the map sheet was last burnt in late 2011 (Figure 2).

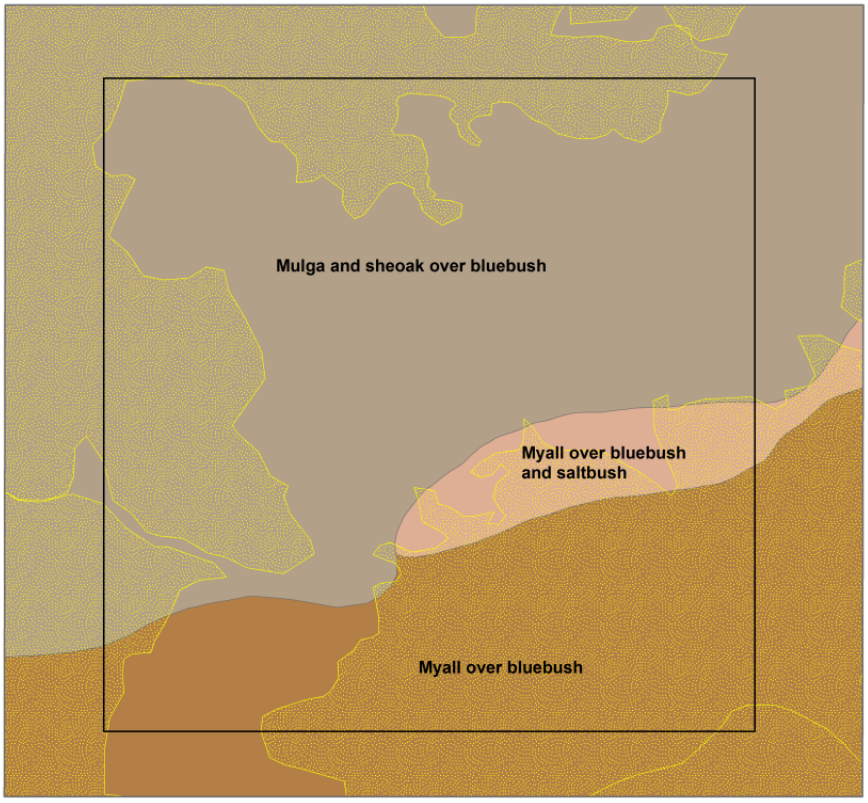

Figure 2. Beard's 1:1,000,000 vegetation mapping covering the Colville map sheet. 2011 fire scars are also shown (yellow pattern).

A systematic biological survey of the Nullarbor region was undertaken in 1984 (McKenzie and Robinson 1987) with 10 sites located in the Western Australian section of the NUL1 subregion. These 10 sites consist of two clusters of five, one located in Plumridge Lakes Nature Reserve (Plumridge sites) to the west and the other just east and extending north of the Colville map sheet

(Jubilee sites) (Figure 3). Apart from the few sites sampled during this survey, there is limited biological survey information available for the NUL1 subregion. More recently, a baseline terrestrial fauna survey was undertaken for the Lost Sands (Pty Ltd) Cyclone Mineral Sands Project (Outback Ecology 2014). Most of the area surveyed for the Lost Sands project occurs within the Great Victoria Desert Nature Reserve and encompassed a proposed mine site and associated haul route. A section of the haul route intersects the NUL1 subregion, but only four sites were sampled in this area (120 km east of the Colville map sheet). The Lost Sands survey follows on from earlier reconnaissance surveys (foot and vehicle traverses) associated with the same operation (Bamford Consulting Ecologists 2011, 2012).

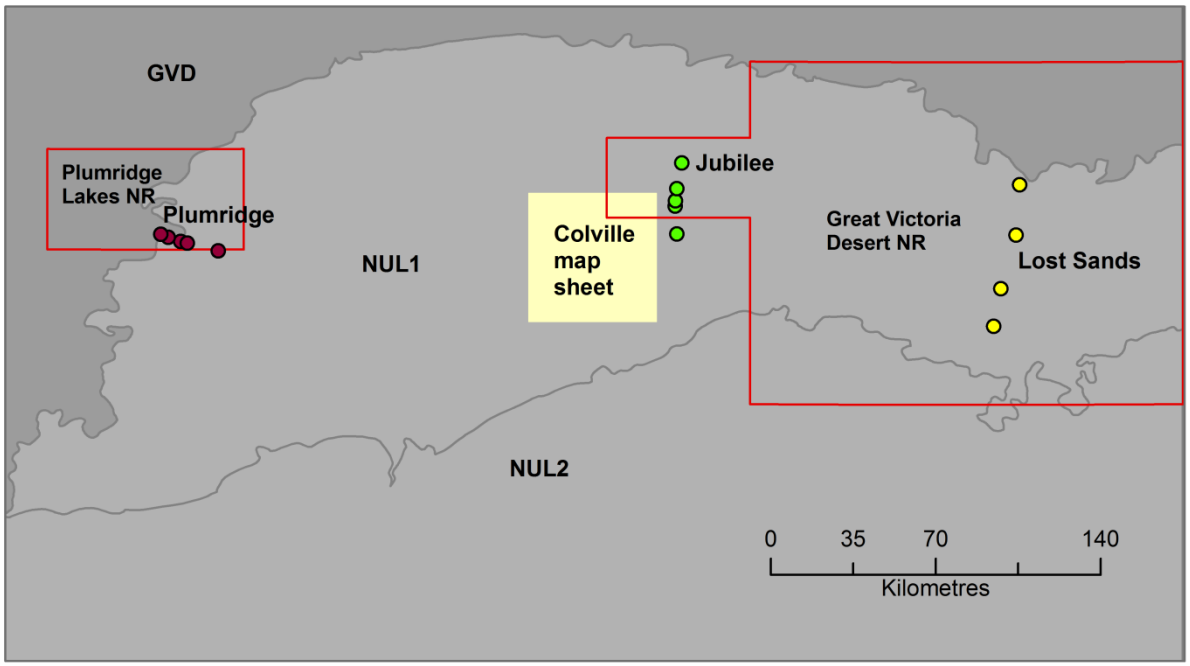

Figure 3. Location of sites mentioned in the text and previously surveyed in the NUL1 subregion.

Within the Colville map sheet, the Western Australian Museum database lists five reptile species collected from three locations, mainly by the field naturalist Harry Butler in the early 1960s, and two other reptiles collected in the early 1970s, but the accuracy of the locations is uncertain. For instance, one of the listed sites, Lake Nyanga, is well west of the Colville sheet. Eight bird species are also listed in the Atlas of Australian Birds database and 11 bird species are listed in the Department of Parks and Wildlife's fauna survey returns database (the latter was submitted by Mike Bamford following the reconnaissance surveys mentioned above).

2 Methods

2.1 Site selection

Limited access to the map sheet restricted where we could establish sites. We placed nine sites along a little used four-wheel drive (4WD) track which traversed the northern section of the sheet (Figure 4). Another three sites were established along an unsealed north-south road (Tjuntjuntjara to Yackadunyah) adjacent to the eastern edge of the sheet. Jubilee sites from the 1984 Nullarbor

regional survey were also located along this road. We placed the remaining four sites along a minor hunting track that extended for a short distance into the map sheet. We investigated several other hunting tracks as access points but all of these ended before the map sheet was reached. Despite the limited access, we endeavoured to select sites to capture the major variation in habitat types within the area (Table 1, Appendix 6).

Table 1 Generalised description of the habitat type at each of the main trap sites sampled.

Site	Description
COL01	Mulga over litter
COL02	Scattered mallee and mulga at the perimeter of a lake
COL03	Senna shrubland with scattered myall and mulga
COL04	Low rosewood (*Alectryon oleifolius*) over open bluebush and saltbush
COL05	Very open myall over bluebush and saltbush
COL06	Regenerating bluebush, Eremophila and Senna over grassy herbland
COL07	Open myall over bluebush, Eremophila, Senna and Ptilotus shrubland
COL08	Austrostipa grassland with patches of Senna
COL09	Open myall over saltbush and bluebush over herbs
COL10	Rosewood (*A. oleifolius*) and occasional myall and Pittosporum over saltbush and bluebush
COL11	Open myall over bluebush and saltbush over herbs
COL12	Very open myall over bluebush, saltbush and Senna over herbs
COL13	Very open myall over saltbush and bluebush over Austrostipa and herbs
COL14	Mulga over Austrostipa and herbs
COL15	Open myall and Casuarina woodland over open Acacia, Eremophila, bluebush shrubland
COL16	Occasional myall over saltbush and bluebush over herbs

2.2 Sampling

Sampling was undertaken from the 27 August – 11 September 2015. We sampled the survey sites from a single camp site (Figure 4). Eight of the 16 sites were sampled for the first seven nights and then closed. The remaining eight sites were then sampled for seven nights. At each site, we established one pitfall trap line consisting of a 60 m drift fence of 30 cm high aluminium flywire with 6 x 20 L buckets (40 cm diameter) located along the fence at approximately 10 m intervals. To provide shelter for captured animals, egg carton sections were added to the pits. We also placed up to six funnel traps in pairs along the fence (one either side of the fence) and midway between pits. Funnel traps were covered with vegetation to negate any potential heat stress issues on captured animals. We checked traps each morning within three hours of sunrise.

Additional detection techniques were used opportunistically. In some areas, we used lines of up to 25 medium Elliott traps, placed 10 metres apart and baited with a mixture of peanut butter and rolled oats (Figure 4, Appendix 1). Trap nights varied for this technique as their placement was dependent on time availability. We also undertook active diurnal and nocturnal searches for reptiles. Diurnal searches included raking of soil and leaf litter, peeling loose bark off trees, log rolling, rock turning and investigation of burrows. Indirect sign such as tracks, diggings and scats was also noted. Head-torching for nocturnal species was conducted for 1–2 hrs on a small number of nights as very low night-time temperatures reduced activity on most nights. Additionally, we placed a total of 12 passive infrared triggered cameras (Reconyx PC900) at selected locations, mostly in the vicinity of the trap lines (Figure 4; Appendix 1). These were set on 450 mm pegs and baited with peanut butter and rolled oats scattered 1.5–2 m in front of the camera.

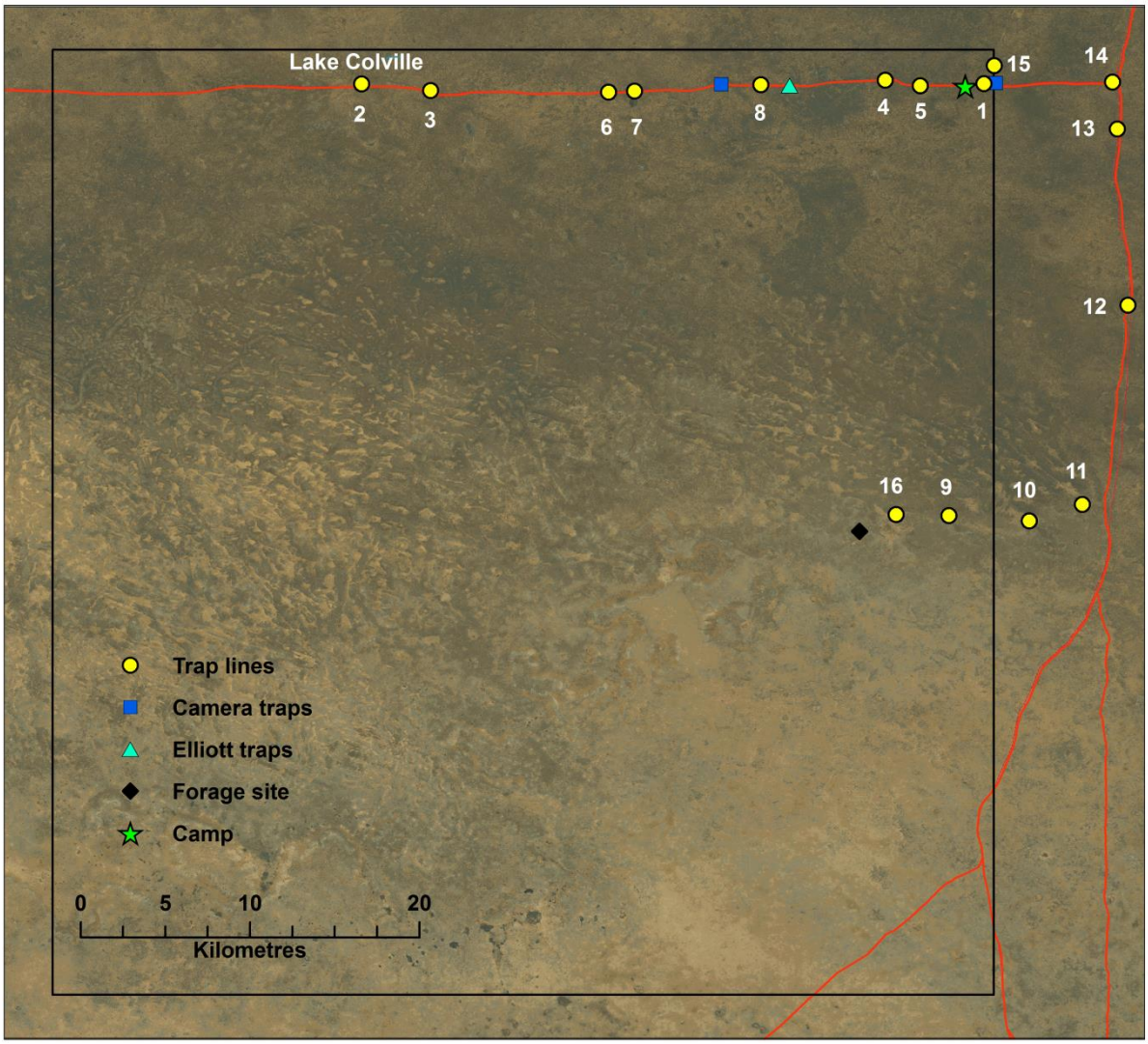

Figure 4. Location of survey sites and the camp site in the Colville map sheet area. Camera traps, Elliott trap lines and a forage site (that did not coincide with pitfall trap lines) are also shown. Vehicle access tracks are shown in red.

We sampled bats using a Wildlife Acoustics SM2BAT full-wave ultrasound recorder (384 kHz sampling rate). An ultrasonic omni-directional microphone was tied to the tip of a stake, about 1.5 m above the ground and several metres from obstructions. It was orientated upwards to minimise echoes. The recorder was pre-programmed to switch on at late dusk and recorded until dawn. Data were captured on 16GB high speed SD cards for later analysis. Six locations were sampled for one night each (Appendix 1).

Bird surveys were conducted at each survey site using visual and/or aural identification. Birds were recorded as occurring on the site if they were located within 50m of the survey site, or adjacent/overhead. Each site was surveyed for at least an hour and on at least two occasions. The prevailing weather conditions (i.e. cold and/or windy) significantly influenced bird activity; sites were re-visited at a later stage if the weather was inclement. The country surrounding and between survey sites was surveyed opportunistically. A post-dusk and pre-dawn vehicle survey of the survey area was conducted in an attempt to locate nocturnal species. The bird taxonomy used in this report accords with the most recent Western Australian Museum Checklist (Johnstone 2015).

We identified captured animals in the field, or at camp for the more cryptic species. We recorded morphological measurements including sex, mass, and snout-vent length and tail length for reptiles and pes and cranium lengths for mammals and released animals at their point of capture.

The primary sources of information to assist with field identifications were the Western Australian Museum field guides (Storr et al. 1983, 1990, 1999, 2002), Menkhorst and Knight (2011), Van Dyck et al. (2013), Wilson and Swan (2013) for reptiles and mammals, and Morcombe (2004) for birds.

We retained at least one voucher specimen of most reptile and mammal species for lodgement in the Western Australian Museum (WAM). This material was re-examined in Perth to confirm field identifications. Voucher specimens were fixed in 10% formalin for seven days and then transferred to 70% ethanol for preservation after flushing for 12 hours in water. Tissue samples were taken from most of the captured animals, either a liver sample from vouchered specimens or a tail tip/ear notch before animals were released, and stored in 100% ethanol for future molecular analyses. Tissue samples are lodged in the WAM.

Historical records for the survey area were obtained from the Department of Parks and Wildlife's NatureMap (https://naturemap.dpaw.wa.gov.au/). The query area was extended to encompass the 1984 sampling sites just east of the Colville map sheet boundary.

3 Results and Discussion

3.1 Survey conditions

Climate data for the period of the survey were obtained for the two nearest weather stations from the Bureau of Meteorology website (www.bom.gov.au). Forrest station (011052), which has daily temperature and rainfall data, is located approximately 150 km SW of the Colville map sheet and Ilkurlka station (12240), which has daily rainfall data only, is ca. 135 km NW of the map sheet. Minimum and maximum temperatures at Forrest ranged from 1.9^{0}C to 13.2^{0}C and 15.5^{0}C to 30.7^{0}C, respectively (Figure 5). Temperatures fluctuated quite considerably over the duration of the survey, although on average, conditions were moderately cool, particularly during the evening. A small amount of rainfall (Figure 5) was recorded during the first week of the survey which also coincided with a period of high relative humidity (Figure 6). Another peak in relative humidity was experienced midway through the second week of trapping. Low overnight temperatures were likely to have reduced vertebrate activity and hence our trap success. Peaks in high humidity coincided with more vertebrate captures, particularly of geckos.

3.2 Vertebrate records

In total, we recorded 83 species of vertebrate fauna including 40 birds, 27 reptiles, 12 native mammals and four introduced mammals in the survey area (Appendices 2 and 3). No frogs were detected. Among the reptiles, we detected five dragons, 10 geckoes, nine skinks, two snakes and one varanid species. Native mammal species included five bats, two dasyurids, two rodents, two macropods and the dingo.

Species accumulation data of the small mammals and reptiles combined show that 34 species were detected from 319 individuals (Figure 7). The Chao2 and Jacknife 2 species accumulation indices both predict a species count of around 50, indicating that with additional surveys, more species are likely to be detected.

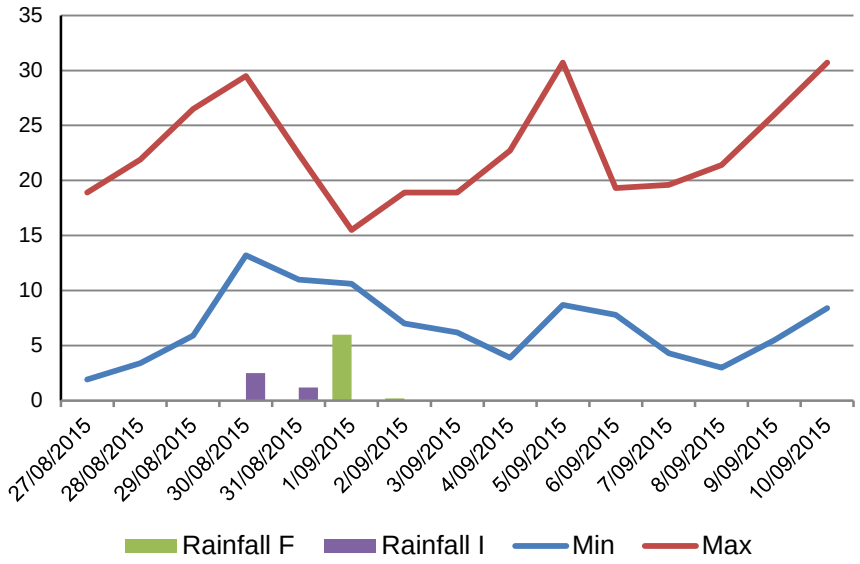

Figure 5. Maximum (Max) and minimum (Min) temperatures (ºC) recorded at Forrest station, and rainfall (mm) recorded at Forrest (F) and Ilkurlka (I) stations during the survey.

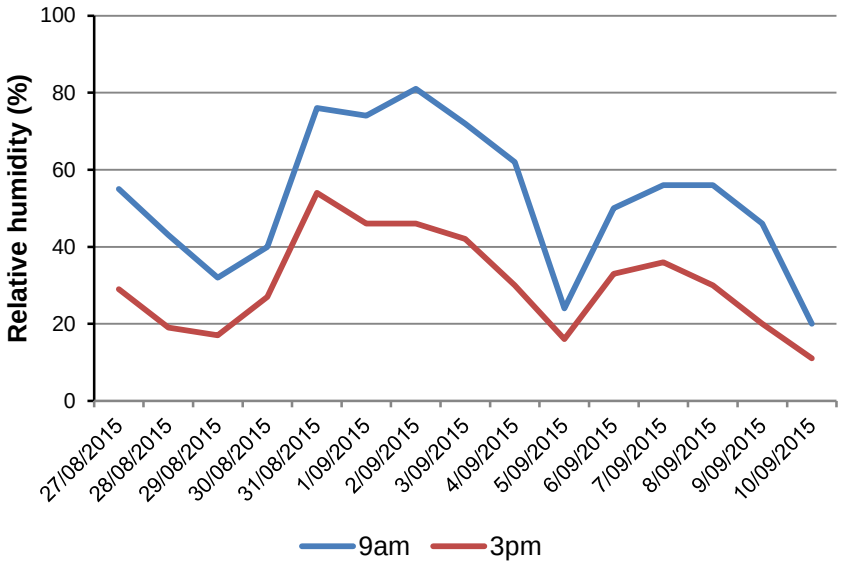

Figure 6. Relative humidity recorded at Forrest (F) station during the survey.

3.3 Historical records

The Western Australian Museum (WAM) reptile database lists 20 species that have previously been recorded within our survey area (Appendix 2). Many of these are voucher specimens from the Jubilee sites. Four species in this list were not recorded during our survey. Two of these (*Morethia adelaidensis* and *Nephurus laevissimus*) were collected by Harry Butler in the early 1960s with questionable accuracy. Another reptile species (*Lerista bipes*) was apparently collected from the Jubilee sites but it is not listed in the survey report (McKenzie and Robinson 1987). The only mammal listed in the WAM mammal database is the dingo (*Canis familiaris*).

From NatureMap, 21 bird species have been previously recorded in our survey area; four of these we did not detect during our survey (Appendix 3) – the brown goshawk (*Accipiter fasciatus*), Nullarbor

quail-thrush (*Cinclosoma alisteri*), slaty-backed thornbill (*Acanthiza robustirostris*) and white-winged fairy-wren (*Malurus leucopterus*). Although a species of thornbill, possibly the slaty-backed thornbill, was detected but could not be positively identified (not included in the tallies).

3.4 Comparison with other surveys

In comparison with other surveys in the NUL1 subregion, a total of 70 (incl. 41 birds) and 85 (incl. 48 birds) vertebrate fauna species were recorded at the Jubilee and Plumridge sites, respectively, during the Nullarbor regional survey (McKenzie and Robinson 1987; Appendices 2 and 3). We detected an additional 13 reptile species to those at the Jubilee sites, as well as four additional native mammals, three of which were bats. An echidna (*Tachyglossus aculeatus*) and one reptile (*Lerista timida*) was detected at the Jubilee sites but not during our survey. Compared to the Plumridge sites, we detected 12 additional reptile species, but there were five reptiles that we did not detect, as well as three additional native mammals. However, the Plumridge survey area also included sandy habitats not present within the Colville survey area.

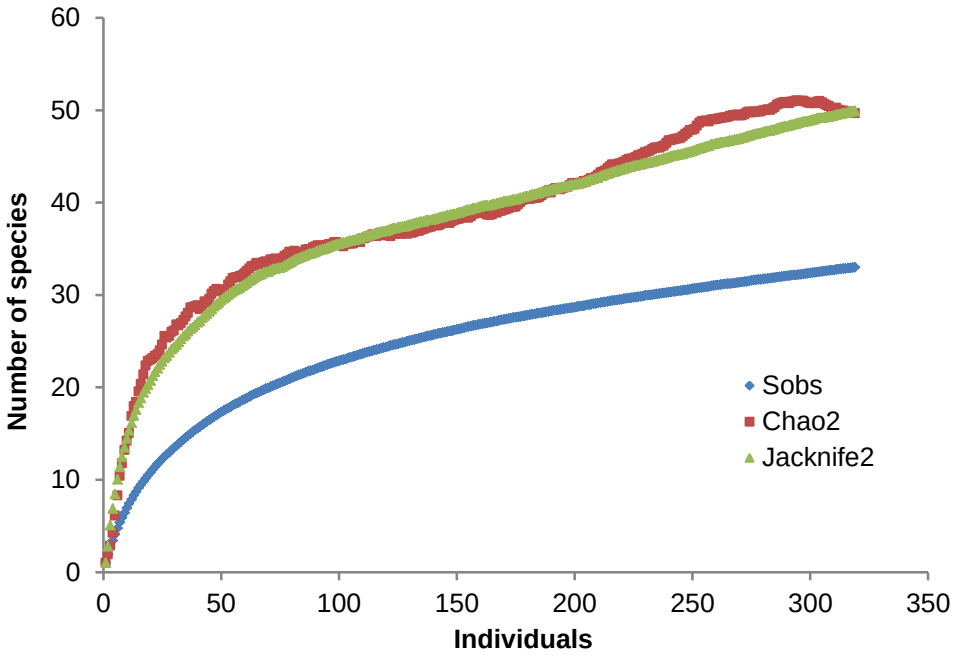

Figure 7. Species accumulation for species observed (Sobs) along with predicted species richness from the Chao2 and Jacknife2 indices.

Extracting the species records for just the sites sampled in the NUL1 subregion during the fauna assessment for the Cyclone Mineral Sands Project (Lost Sands) showed a total of 79 species detected, including 42 birds (Outback Ecology 2014; Appendices 2 and 3). Ten additional reptiles and one native mammal were detected during this survey that we did not record. However, we recorded 14 species (11 reptiles and 3 native mammals) that were not detected at these sites. These sites were approximately 120 km to the east of the Colville survey area, and one site was located just south of the Great Victoria Desert bioregion, which may explain the differences observed.

Although there were similar tallies of bird species between our survey and the other three survey areas examined, there was some variation between the bird species recorded (Appendix 3). There were three species recorded at all other survey locations which we did not detect during our survey – the chestnut-rumped thornbill (*Acanthiza uropygialis*), white-fronted honeyeater (*Purnella albifrons*)

and rufous whistler (*Pachycephala rufiventris*). The only additional species we recorded during the Colville survey was the scarlet-chested parrot (*Neophema splendida*).

3.5 Number of detections

Among the reptiles, the most commonly caught species were the barred wedge-snouted ctenotus (*Ctenotus schomburgkii*; 68 individuals across 14 sites) and the Boulenger's snake-eyed skink (*Morethia boulengeri*; 41 individuals across 15 sites – Appendix 4). We also encountered moderate numbers of the great desert slider (*Lerista desertorum* – 19), common dwarf skink (*Menetia greyii* – 18) and inland snake-eyed skink (*Cryptoblepharus australis* – 15), although the latter was detected at one survey site only (one other was detected at a nearby foraging site – Figure 4). Six reptile species were represented by a single record (Appendix 4). The most common mammal species captured were the fat-tailed dunnart (*Sminthopsis crassicaudata*) (41 across 10 sites) and the sandy inland mouse (*Pseudomys hermannsburgensis*) (14 across 7 sites). A small number of the Ooldea dunnart (*S. ooldea* – 6) was detected at three sites and the Bolam's mouse (*P. bolami* – 2) was recorded at two sites.

The most commonly detected bird species among the survey sites was the yellow-throated minor (13 sites), followed by the singing honeyeater (8) and black-faced woodswallow (6) (Appendix 5). Other species regularly detected in the general area included the Australian pipit, masked woodswallow, little crow, Naretha blue bonnet and white-browed babbler. There were also several sightings of the Australian bustard.

3.6 Named taxa newly recorded for the survey area

A comparison with the fauna collections data in the Western Australian Museum database combined with records from the Jubilee sites (above) shows that we detected 15 previously unrecorded native reptile and mammal species in the local survey area (Appendix 1) and one bird species (Appendix 2). Seven of these were also not recorded from the Plumridge and Lost Sands sites – the southern spiny-tailed gecko (*Strophurus intermedius*), western blue-tongue (*Tiliqua occipitalis*), mulga snake (*Pseudechis australis*), south coast gecko (*Diplodactylus calcicolus*), desert wood gecko (*D. wiru*), inland forest bat (*Vespadelus baverstocki*) and scarlet-chested parrot (*Neophema splendida*). All of these species, except for the southern spiny-tailed gecko, desert wood gecko and inland forest bat, have been recorded in the broader NUL1 subregion (NatureMap).

3.7 Conservation significant species

We detected one species of conservation significance within the survey area, the Naretha blue bonnet (*Platycercus haematogaster narethae*), which was observed at four sampling sites. This species is listed as Priority 4 (Rare, Near Threatened and other species in need of monitoring) on the Department of Parks and Wildlife's list of Priority Fauna list (https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/threatened_and_priority_fauna_rankings.pdf).

3.8 Introduced species

We detected four introduced species in the study area including the camel (*Camelus dromedarius*), cat (*Felis catus*), rabbit (*Oryctolagus cuniculus*) and house mouse (*Mus musculus*). Camels were observed in the study area on several occasions during the survey and sign of their presence was widespread. A feral cat was observed on a remote camera and numerous tracks were observed on

the roads (Appendix 2). Rabbits were also observed on remote cameras, as well as several general sightings in the survey area, and a juvenile was captured in a pitfall trap. House mice were recorded at several of the survey sites. We did not detect foxes (*Vulpes vulpes*) during our survey but this species was recorded at both the Jubilee and Plumridge sites during the Nullarbor regional survey (McKenzie and Robinson 1987), and the NUL1 sites surveyed during the Lost Sands/Cyclone Mineral Sands Project (Outback Ecology 2014).

4 Conclusion

Limited access into the Colville map sheet resulted in the establishment of survey sites to the periphery of the north-eastern section of the sheet, and five of these were just outside the eastern boundary. However, as there is little geological variation in this area (Lowry 1970), the selected sites are likely to be representative of the habitat types within the map sheet. The relatively cool overnight temperatures during the survey are likely to have reduced our species detection rate due to low vertebrate activity levels, particularly of reptiles. This is reflected by the species accumulation curve which estimates that we detected around 70% of the reptile and small mammal species across the habitats sampled. Despite this, we detected 15 previously unrecorded native species in the local survey area. The results of this survey help to fill a gap in biological knowledge for this relatively poorly known area. The tissue samples collected (>230) will allow for subsequent molecular analyses and contribute to taxonomic studies. The voucher specimens and site-specific datasets resulting from this survey are an enduring resource that can be used to facilitate conservation and land management decisions.

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Appendices

Appendix 1. Details of sites surveyed within the Colville map sheet area.

Site	Latitude	Longitude	Datum	Opened	Closed	No. traps	No. nights	No. funnels	Detection method
COLCAMP	-29.5146	126.9848	WGS84						Camp
COL01	-29.5132	126.9946	WGS84	27/08/2015	03/09/2015	6	7	6	Pitfall
COL02	-29.5133	126.6642	WGS84	27/08/2015	03/09/2015	6	7	4	Pitfall
COL03	-29.5169	126.7008	WGS84	27/08/2015	03/09/2015	6	7	4	Pitfall
COL04	-29.5114	126.9422	WGS84	27/08/2015	03/09/2015	6	7	4	Pitfall
COL05	-29.5144	126.9608	WGS84	27/08/2015	03/09/2015	6	7	4	Pitfall
COL06	-29.5178	126.7953	WGS84	28/08/2015	04/09/2015	6	7	4	Pitfall
COL07	-29.5172	126.8092	WGS84	28/08/2015	04/09/2015	6	7	2	Pitfall
COL08	-29.5138	126.8762	WGS84	28/08/2015	04/09/2015	6	7	4	Pitfall
COL09	-29.7425	126.9760	WGS84	04/09/2015	12/09/2015	6	7	6	Pitfall
COL10	-29.7453	127.0186	WGS84	04/09/2015	12/09/2015	6	7	6	Pitfall
COL11	-29.7366	127.0468	WGS84	03/09/2015	11/09/2015	6	7	6	Pitfall
COL12	-29.6309	127.0711	WGS84	03/09/2015	11/09/2015	6	7	6	Pitfall
COL13	-29.5373	127.0654	WGS84	03/09/2015	11/09/2015	6	7	6	Pitfall
COL14	-29.5124	127.0629	WGS84	03/09/2015	11/09/2015	6	7	6	Pitfall
COL15	-29.5036	127.0001	WGS84	03/09/2015	11/09/2015	6	7	6	Pitfall
COL16	-29.7419	126.9481	WGS84	04/09/2015	12/09/2015	6	7	6	Pitfall
COLGECKO	-29.7509	126.9286	WGS84						Foraging site
COLBAT1/CAMP	-29.5150	126.9847	WGS84	31/08/2015	01/09/2015	1	1		SM2/bat
COLBAT2/COL15	-29.5039	127.0003	WGS84	04/09/2015	05/09/2015	1	1		SM2/bat
COLBAT3/COL01	-29.5139	126.9936	WGS84	05/09/2015	06/09/2015	1	1		SM2/bat
COLBAT4/COL04	-29.5111	126.9422	WGS84	07/09/2015	08/09/2015	1	1		SM2/bat
COLBAT5/COL05	-29.5142	126.9611	WGS84	06/09/2015	07/09/2015	1	1		SM2/bat
COLBAT6/CAMP	-29.5150	126.9846	WGS84	10/09/2015	11/09/2015	1	1		SM2/bat
COLET1/COL03	-29.5169	126.7008	WGS84	29/08/2015	02/09/2015	20	4		Elliott
COLET2	-29.5142	126.8914	WGS84	30/08/2015	02/09/2015	25	3		Elliott
COLET3/COL16	-29.7422	126.9519	WGS84	05/09/2015	10/09/2015	24	5		Elliott

Site	Latitude	Longitude	Datum	Opened	Closed	No. traps	No. nights	No. funnels	Detection method
COLET4/COL14	-29.5130	127.0623	WGS84	05/09/2015	10/09/2015	24	5		Elliott
YP206/COL16	-29.7419	126.9483	WGS84	07/09/2015	11/09/2015	1	4		Camera
YP208	-29.5128	127.0008	WGS84	31/08/2015	09/09/2015	1	8		Camera
YP211/COL01	-29.5128	126.9942	WGS84	01/09/2015	09/09/2015	1	8		Camera
YP212/COL14	-29.5128	127.0628	WGS84	05/09/2015	11/09/2015	1	6		Camera
YP213/COL06	-29.5178	126.7953	WGS84	01/09/2015	09/09/2015	1	8		Camera
YP214/COL03	-29.5169	126.7008	WGS84	01/09/2015	09/09/2015	1	8		Camera
YP215/COLET2	-29.5136	126.8550	WGS84	01/09/2015	09/09/2015	1	8		Camera
YP216/COL05	-29.5142	126.9606	WGS84	31/08/2015	09/09/2015	1	9		Camera
YP217/COL04	-29.5114	126.9422	WGS84	31/08/2015	09/09/2015	1	9		Camera
YP218/COL11	-29.7366	127.0468	WGS84	07/09/2015	11/09/2015	1	4		Camera
YP219/COL07	-29.5172	126.8089	WGS84	01/09/2015	09/09/2015	1	8		Camera
YP220/COL09	-29.7419	126.9758	WGS84	07/09/2015	11/09/2015	1	4		Camera

Appendix 2. Reptile and mammal species detected in the Colville survey area. Lists are also shown for the Jubilee and Plumridge survey sites (sampled during the Nullarbor regional survey; McKenzie and Robinson 1987), NUL1 Lost Sands sites surveyed by Outback Ecology (Outback Ecology 2014) and historical records in the Western Australian Museum (WAM) databases. * indicates an introduced species.

Family	Species	Common Name	Colville	Jubilee	Plumridge	Lost Sands	WAM
Agamidae	*Ctenophorus cristatus*	Crested dragon				+	
	Ctenophorus pictus	Painted dragon	+	+	+		
	Ctenophorus reticulatus	Western netted dragon	+	+	+	+	+
	Moloch horridus	Thorny devil	+			+	
	Pogona minor	Dwarf bearded dragon	+	+		+	+
	Tympanocryptis houstoni	Nullarbor earless dragon	+				+
Carphodactylidae	*Nephrurus laevissimus*	Pale knob-tailed gecko					+
	Nephrurus levis	Smooth knob-tailed gecko			+		
	Underwoodisaurus milii	Common thick-tailed gecko	+	+		+	+
Diplodactylidae	*Lucasium bungabinna*	Southern sandplain gecko	+			+	
	Lucasium damaeum	Sandplain gecko		+			
	Lucasium maini	Main's ground gecko	+		+		+
	Rhynchoedura ornata	Western beaked gecko	+	+	+	+	+
	Strophurus intermedius	Southern spiny-tailed gecko	+				
Egerniidae	*Liopholis inornata*	Desert skink	+		+	+	
	Tiliqua occipitalis	Western blue-tongue	+				
	Tiliqua rugosa	Shingle-back				+	+
Elapidae	*Brachyurophis semifasciatus*	Southern shovel-nosed snake			+	+	
	Pseudechis australis	Mulga snake	+				
	Simoselaps bertholdi	Jan's banded snake	+	+	+	+	+
	Pseudonaja modesta	Ringed brown snake			+		
Eugongylidae	*Cryptoblepharus australis*	Inland snake-eyed skink	+		+		
	Crptoblepharus plagiocephalus	Peron's snake-eyed skink			+		
	Menetia greyii	Common dwarf skink	+	+	+	+	+
	Morethia adelaidensis	Adelaide snake-eyed skink					+
	Morethia boulengeri	Boulenger's snake-eyed skink	+	+	+		+
Gekkonidae	*Diplodactylus calcicolus*	South coast gecko	+				
	Diplodactylus conspicillatus	Burrow-plug gecko				+	

Family	Species	Common Name	Colville	Jubilee	Plumridge	Lost Sands	WAM
	Diplodactylus pulcher	Pretty gecko	+		+	+	
	Diplodactylus wiru	Desert wood gecko	+				
	Gehyra purpurascens	Purple dtella				+	
	Gehyra variegata	Variegated dtella	+	+	+	+	+
	Heteronotia binoei	Bynoe's gecko	+	+	+	+	+
Sphenomorphidae	*Ctenotus pantherinus*	Leopard ctenotus				+	
	Ctenotus regius	Pale-rumped ctenotus	+	+	+	+	+
	Ctenotus schomburgkii	Barred wedge-snouted ctenotus	+	+	+	+	+
	Eremiascincus richardsonii	Broad-banded sand-swimmer				+	
	Lerista bipes	Western two-toed slider			+		+
	Lerista desertorum	Great desert slider	+	+	+	+	+
	Lerista labialis	Eastern two-toed slider	+	+			+
	Lerista timida	Dwarf three-toed slider		+			+
Typhlopidae	*Ramphotyphlops endoterus*	Interior blind snake				+	
Varanidae	*Varanus gilleni*	Pygmy mulga monitor				+	
	Varanus gouldii	Sand goanna	+			+	
Molossidae	*Austronomous australis*	White-striped freetail bat	+	+	+	+	
Vespertilionidae	*Chalinolobus gouldii*	Gould's wattled bat	+		+	+	
	Nyctophilus geoffroyi	Lesser long-eared bat	+	+		+	
	Scotorepens balstoni	Inland broad-nosed bat	+		+	+	
	Vespadelus baverstocki	Inland forest bat	+				
Dasyuridae	*Ningaui ridei*	Wongai Ningaui			+		
	Sminthopsis crassicaudata	Fat-tailed dunnart	+	+	+		
	Sminthopsis dolichura	Little long-tailed dunnart			+		
	Sminthopsis hirtipes	Hairy-footed dunnart				+	
	Sminthopsis ooldea	Ooldea dunnart	+	+	+	+	
Macropodidae	*Macropus fuliginosus*	Western grey kangaroo	+	+	+	+	
	Ospranter rufus	Red kangaroo	+	+	+	+	
Tachyglossidae	*Tachyglossus aculeatus*	Echidna		+			
Muridae	*Notomys alexis*	Spinifex hopping mouse			+		
	Pseudomys bolami	Bolam's mouse	+		+		
	Pseudomys hermannsbergensis	Sandy inland mouse	+	+	+	+	

Family	Species	Common Name	Colville	Jubilee	Plumridge	Lost Sands	WAM
	*Mus musculus**	House mouse	+	+	+		
Camelidae	*Camelus dromedarius**	Camel	+	+	+	+	
Canidae	*Canis familiaris*	Dingo	+	+	+	+	+
	*Vulpes vulpes**	Fox		+	+	+	
Felidae	*Felis catus**	Cat	+				
Leporidae	*Oryctolagus cuniculus**	Rabbit	+	+	+	+	
Total			**43**	**29**	**37**	**37**	**21**

Appendix 3. Bird species detected in the Colville survey area. Lists are also shown for the Jubilee and Plumridge survey sites (sampled during the Nullarbor regional survey; McKenzie and Robinson 1987), NUL1 Lost Sands sites surveyed by Outback Ecology (Outback Ecology 2014) and historical records in NatureMap.

Family	Species	Common name	Colville	Jubilee	Plumridge	Lost Sands	NatureMap
Acanthizidae	*Acanthiza apicalis*	Broad-tailed thornbill		+		+	
	Acanthiza chrysorrhoa	Yellow-rumped thornbill		+	+		
	Acanthiza robustirostris	Slaty-backed thornbill					+
	Acanthiza uropygialis	Chestnut-rumped thornbill		+	+	+	
	Aphelocephala leucopsis	Southern whiteface	+	+	+	+	+
	Gerygone fusca	Western gerygone			+		
	Smicrornis brevirostris	Weebill			+	+	
Accipitridae	*Accipiter fasciatus*	Brown goshawk					+
	Aquila audax	Wedge-tailed eagle	+	+	+		+
	Hamirostra isura	Square-tailed kite			+		
	Hamirostra melanosternon	Black-breasted buzzard		+			
	Hieraaetus morphnoides	Little eagle			+		
Aegothelidae	*Aegotheles cristatus*	Australian owlet-nightjar			+		
Artamidae	*Artamus cinereus*	Black-faced woodswallow	+	+	+	+	+
	Artamus personatus	Masked woodswallow	+		+	+	
	Artamus superciliosus	White-browed woodswallow	+				
Cacatuidae	*Cacatua roseicapilla*	Galah	+		+		
Campephagidae	*Coracina maxima*	Ground cuckoo-shrike	+	+	+		
	Coracina novaehollandiae	Black-faced cuckoo-shrike	+	+	+	+	
	Lalage tricolor	White-winged triller	+	+	+	+	
Charadriidae	*Elseyornis melanops*	Black-fronted dotterel			+		
	Vanellus tricolor	Banded lapwing	+	+		+	
Climacteridae	*Climacteris affinis*	White-browed treecreeper		+	+	+	
Corvidae	*Corvus bennetti*	Little crow	+	+		+	+
Cracticidae	*Cracticus nigrogularis*	Pied butcherbird			+	+	
	Cracticus tibicen	Australian magpie	+	+	+	+	+
	Cracticus torquatus	Grey butcherbird	+	+	+	+	
	Strepera versicolor	Grey currawong		+			

Family	Species	Common name	Colville	Jubilee	Plumridge	Lost Sands	NatureMap
Cuculidae	*Cacomantis pallidus*	Pallid cuckoo	+	+	+	+	
	Chrysococcyx basalis	Horsfield's bronze cuckoo	+		+	+	+
Dromaiidae	*Dromaius novaehollandiae*	Emu	+	+			
Estrildidae	*Taeniopygia guttata*	Zebra finch	+				
Falconidae	*Falco berigora*	Brown falcon	+	+	+	+	
	Falco cenchroides	Australian kestrel	+	+	+	+	
Hirundinidae	*Cheramoeca leucosterna*	White-backed swallow			+		
Locustellidae	*Megalurus cruralis*	Brown songlark	+	+	+		
	Megalurus mathewsi	Rufous songlark				+	
Maluridae	*Malurus lamberti*	Variegated fairy-wren	+			+	
	Malurus leucopterus	White-winged fairy-wren					+
	Malurus splendens	Splendid fairy-wren				+	
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked honeyeater	+	+	+	+	+
	Epthianura tricolor	Crimson chat	+	+	+	+	
	Gavicalis virescens	Singing honeyeater	+	+	+	+	+
	Manorina flavigula	Yellow-throated miner	+	+	+	+	+
	Ptilotula plumula	Grey-fronted honeyeater			+	+	
	Purnella albifrons	White-fronted honeyeater		+	+	+	
Meropidae	*Merops ornatus*	Rainbow bee-eater				+	
Motacillidae	*Anthus australis*	Australian pipit	+	+	+	+	+
Neosittidae	*Daphoenositta chrysoptera*	Varied sittella	+	+	+	+	
Oreoicidae	*Oreoica gutturalis*	Crested bellbird	+	+	+	+	+
Otididae	*Ardeotis australis*	Australian bustard	+	+			+
Pachycephalidae	*Colluricincla harmonica rufiventris*	Grey shrike-thrush	+	+	+	+	
	Pachycephala rufiventris	Rufous whistler		+	+	+	+
Pardalotidae	*Pardalotus striatus*	Striated pardalote			+		
Petroicidae	*Melanodryas cucullata*	Hooded robin	+	+	+	+	+
	Microeca fascinans	Jacky winter			+	+	
	Petroica goodenovii	Red-capped robin	+	+	+	+	
Podargidae	*Podargus strigoides*	Tawny frogmouth	+	+			
Pomatostomidae	*Pomatostomus superciliosus*	White-browed babbler	+	+	+	+	+
Psittacidae	*Melopsittacus undulatus*	Budgerigar		+	+		

Family	Species	Common name	Colville	Jubilee	Plumridge	Lost Sands	NatureMap
	Neophema splendida	Scarlet-chested parrot	+				
	Neopsephotus bourkii	Bourke's parrot				+	
	Platycercus haematogaster narethae	Naretha blue bonnet	+	+	+	+	+
	Platycercus varius	Mulga parrot	+	+	+	+	
	Platycercus zonarius	Australian ringneck	+		+	+	
Psophodidae	*Cinclosoma alisteri*	Nullarbor quail-thrush					+
Rhipiduridae	*Rhipidura leucophrys*	Willie wagtail	+	+	+	+	+
Turnicidae	*Turnix velox*	Little button quail	+	+	+		
Total			**40**	**41**	**48**	**42**	**21**

Appendix 4. Number of individuals per reptile and mammal species detected at each survey site during the Colville survey.

Species	COL 01	COL 02	COL 03	COL 04	COL 05	COL 06	COL 07	COL 08	COL 09	COL 10	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	Total
Cryptoblepharus australis																15	**15**
Ctenophorus pictus									2	1	1						**4**
Ctenophorus reticulatus											1			1			**2**
Ctenotus regius					2							1			1	1	**5**
Ctenotus schomburgkii			2	1	5	1	1	7	5	4	6	7	6	12	3	8	**68**
Diplodactylus calcicolus									1	1	1					2	**5**
Diplodactylus pulcher							1			1	2					1	**5**
Diplodactylus wiru									1								**1**
Gehyra variegata		3		1	1												**5**
Lerista desertorum		1	6		3							5		4			**19**
Lerista labialis														1			**1**
Liopholis inornata			1														**1**
Lucasium buggabinna				1		2						1					**4**
Lucasium maini											1						**1**
Menetia greyii		4	1	1	2	1			4			2		1		2	**18**
Moloch horridus			1														**1**
Morethia boulengeri	3	7	1	1	1		2				3	3	1	2	2		**26**
Pogona minor					1									2	2		**5**
Rhynchoedura ornata			4	1	3						1		1				**10**
Simoselaps bertholdi					1												**1**
Strophurus intermedius					1												**1**
Tympanocryptis houstoni																1	**1**
Underwoodisaurus milii												2					**2**
Mus musculus					1		1	2		1		1				1	**7**
Oryctolagus cuniculus			1														**1**
Pseudomys bolami									1							1	**2**
Pseudomys hermannsbergensis		1	4				3		1			2		2		1	**14**
Sminthopsis crassicaudata			2				2		6	2	5	6	4	3	4	7	**41**

Species	COL 01	COL 02	COL 03	COL 04	COL 05	COL 06	COL 07	COL 08	COL 09	COL 10	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	Total
Sminthopsis ooldea			4	1									1				**6**

Appendix 5. Number of survey sites where each bird species was detected during the Colville survey (x - adjacent to survey site; xx - overhead). Off-site records are also indicated (not included in total). No birds were detected at COL10.

Species	Off-site	COL 01	COL 02	COL 03	COL 04	COL 05	COL 06	COL 07	COL 08	COL 09	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	Total
Australian bustard	1																**0**
Australian kestrel			1							1							**2**
Australian magpie							x							x			**2**
Australian pipit							x		1		x	1				x	**5**
Australian ringneck		1															**1**
Banded lapwing	1																**0**
Black-faced cuckoo-shrike		xx													1		**2**
Black-faced woodswallow				1	1				x		1		1			1	**6**
Brown falcon			1					1									**2**
Brown songlark									x			1					**2**
Crested bellbird				x						1		1	x		1		**5**
Crimson chat				1								x				1	**3**
Emu	1																**0**
Galah			1														**1**
Grey butcherbird				1			1								x		**3**
Grey shrike-thrush				1	1		x						1		x		**5**
Ground cuckoo-shrike	1																**0**
Hooded robin	1																**0**
Horsfield's bronze cuckoo				x			1									1	**3**
Little button quail									x								**1**
Little crow			1	xx				1				1		1			**5**
Masked woodswallow				1	1				x				1				**4**
Mulga parrot	1																**0**
Naretha blue bonnet					1				x			1	1	1			**5**
Pallid cuckoo	1																**0**

Species	Off-site	COL 01	COL 02	COL 03	COL 04	COL 05	COL 06	COL 07	COL 08	COL 09	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	Total
Red-capped robin	1																**0**
Scarlet-chested parrot	1																**0**
Singing honeyeater			1	1	1				x	1		1	1			1	**8**
Southern whiteface				x													**1**
Spiny-cheeked honeyeater				x													**1**
Tawny frogmouth														1			**1**
Thornbill species		1															**1**
Varied sittella					1												**1**
Variegated fairy-wren		1															**1**
Wedge-tailed eagle			1	x											xx		**3**
White-browed babbler		1		x					x						1		**4**
White-browed woodswallow			1														**1**
White-winged triller				1	1							1					**3**
Willie wagtail				x			1				1						**3**
Yellow-throated miner	1	1	1		1	1	1	1		1	1	1	1	1	1	1	**13**
Zebra finch	1											x					**1**

Appendix 6. Survey site images in the Colville map sheet area where pitfall trap lines were established.

COL01

COL02

COL03

COL04

COL05

COL06

Appendix 6 cont.

COL07

COL08

COL09

COL10

COL11

COL12

Appendix 6 cont.

COL13

COL14

COL15

COL16