INNAMINCKA REGIONAL RESERVE

BIRDS, MAMMALS & VEGETATION SURVEY 2019

THE OLD STRZELECKI & LOOP TRACKS

~ REPEAT OF 2015 SURVEY ~

A project undertaken by the Friends of the Innamincka Reserves

2015 **2019**

The Old Strzelecki Track (top) and Loop Track (lower), Innamincka Regional Reserve

REPORT ON THE OLD STRZELECKI & LOOP TRACKS
BIRDS, MAMMALS & VEGETATION SURVEY 2019 – REPEAT OF 2015 SURVEY

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REPORT ON THE OLD STRZELECKI & LOOP TRACKS BIRDS, MAMMALS & VEGETATION SURVEY 2019 – REPEAT OF 2015 SURVEY

INTRODUCTION

A. PROJECT FIELD TEAM AND COORDINATOR

This project was carried out as a volunteer activity by members of the Friends of the Innamincka Reserves (FOIR). There was no external funding for the project.

Field Team: L to R - Euan Moore, Jenny Rolland, Vern Treilibs, Rose Treilibs, Jan Walker, Merilyn Browne

Mark Anderson was unable to attend the 2019 survey, but assisted with survey and report preparation.

Project Coordinator: Kate Buckley

B. BACKGROUND

In 2013 FOIR volunteers established a survey method which could be used to monitor the impacts of both short- and long-term changes in environmental conditions on populations of bird, mammal and vegetation species in the Innamincka Regional Reserve. Using this methodology, the volunteers obtained baseline survey data for four 80-110 km spans along roads radiating out from Innamincka - the Bore Track North in 2013[1], the Coongie Road in 2014[2], the Old Strzelecki and Loop Tracks in 2015[3] and the Cordillo Downs Road in 2017[4]. In 2016, high rainfall prevented access to the Reserve for a survey. In 2018, the first repeat

[1] FOIR Bore Track North Survey Project Report 2013
[2] FOIR Coongie Road Survey Project Report 2014
[3] FOIR Old Strzelecki and Loop Tracks Survey Project Report 2015
[4] FOIR Cordillo Downs Road Survey Project Report 2017

survey was performed along the Bore Track North[5]. In this report, results are presented for the second repeat survey - the Old Strzelecki and Loop Tracks - conducted in 2019 using the same methodology at the same sites as in the 2015 survey. The volunteers had planned to repeat the Coongie Rd survey in 2019, but this was not possible as some sections remained impassable due to flooding earlier in the year. It was decided to repeat the Old Strzelecki and Loop Tracks survey as they were the next earliest surveys that had not been repeated.

The Old Strzelecki Track extends from Innamincka south-west to Merty Merty, while the Loop Track extends from the Cordillo Downs Road 5 km north of Innamincka to join the Arrabury Road in Queensland. The survey areas were within a 50 km radius of the town of Innamincka. Together the two tracks encompass a range of habitat types from dry open woodlands and grasslands, dune systems and wetlands along the Old Strzelecki Track, to gibber plains and mesa country, known as the Merninie System, along the Loop Track.

While average rainfall is low (180 mm per annum), the Innamincka area is in a region of maximum rainfall variability for Australia. Although rainfall records are not available from the Bureau of Meteorology for Innamincka station after 2017, records are available for Moomba (66 km south-west of Innamincka) up to 2019 and the Queensland Government SILO site for Innamincka Station shows charts including interpolated data for the missing years (Appendix VI). In 2010 the area experienced extreme rainfall in terms of scale and intensity, resulting in closure of several roads during 2010-2011. Since the 2015 survey, there were good rains in 2016 with a total of 270 mm spread over several months[6]. In the preceding 12 months before the 2019 survey, there was patchy rain recorded at Moomba – of note, 16 mm in November 2018, 13 mm in March 2019 and 7 mm in May 2019 which could have resulted in the new plant growth noted for some of the transect surveys in this report.

Interestingly, there had been minor flooding of the Cooper Creek in the months before the 2019 survey due to heavy rains much further upstream earlier that year. Some roads around Innamincka were still closed at the survey time. However this did not affect the habitat beyond the flood-line resulting in what can be called a ‘dry flood’.

The FOIR surveys provide data for monitoring changes in populations of terrestrial birds, mammals and vegetation as the weather conditions change between ‘normal’, dry and ecological boom. They also enable assessment of the impacts of other environmental changes such as mining, road-making and grazing.

C. APPROACH

Surveys were conducted along the Old Strzelecki and Loop Tracks within the Innamincka Regional Reserve, following as closely as possible the transects and methodology of the baseline surveys conducted in 2015. There were five census stops, each 10 km apart, along the Old Strzelecki Track, with the most south-westerly census stop just south of the Dillon Highway but still within the Innamincka Regional Reserve. Another five census stops were surveyed along the Loop Track, each 10 km apart except for the middle one which was 5 km from adjacent census stops in order to sample the mesa country. This also ensured that all surveys along the Loop Track were completed within the Reserve.

[5] FOIR Bore Track North – Repeat of 2013 Survey Project Report 2018
[6] Bureau of Meteorology

Landscape conditions did not require modification of census stop locations or routes for the baseline 2015 survey. Surveys at each census stop comprised transects along two 500 m-sided quadrants, one on each side of the track.

D. OBJECTIVES

1. To collect data systematically for bird, mammal and plant species, at a series of survey transects spanning ~80 km in total along the Old Strzelecki and Loop Tracks within the Innamincka Regional Reserve.
2. To relate species occurrence to short-term climatic and environmental variables.
3. To compare the survey data with that collected for the baseline Old Strzelecki and Loop Tracks survey conducted in 2015, assessing the impacts of longer-term changes in climate and environment on populations and species.
4. To use a bird survey technique equivalent to a 'fixed-route' survey as specified for the Birdlife Australia Atlas project.
5. To use these data to facilitate further monitoring of the change in flora and fauna population diversity and abundance as the conditions change to drier or wetter or due to other environmental impacts such as mining and road-making.

E. PROGRAMME OF RESEARCH

Surveys were conducted between 27 July and 1 August, 2019. The original survey was undertaken between 1 and 3 August 2015.

METHODS

1. Survey overview and terminology

The tracks were surveyed using the method used in 2015 and described below, travelling an average of 20-30 km per day along the track, with census stops at approximately every 10 km of track length, except for Census Stop SL08 which was 5 km from adjacent census stops. The survey method is adapted from methodology used by Rob Clemens and Richard Fuller (School of Biological Sciences, University of Queensland) for similar surveys in outback SA. The survey technique is equivalent to a 'fixed-route' survey as specified for the Birdlife Australia Atlas project.

Key terminology (see also diagram in Fig. 1 below):

A **census stop** is one of the points placed at intervals along the road. The census stop forms a central point for conducting surveys in the surrounding habitat. The locations of all census stops are provided as GPS waypoints. If the exact location of the waypoint proves to be inaccessible, then the point is established along the road closest to the waypoint location.

A **corner point** is one of the corner points of a survey square.

A **transect** is one of the sides of a survey square.

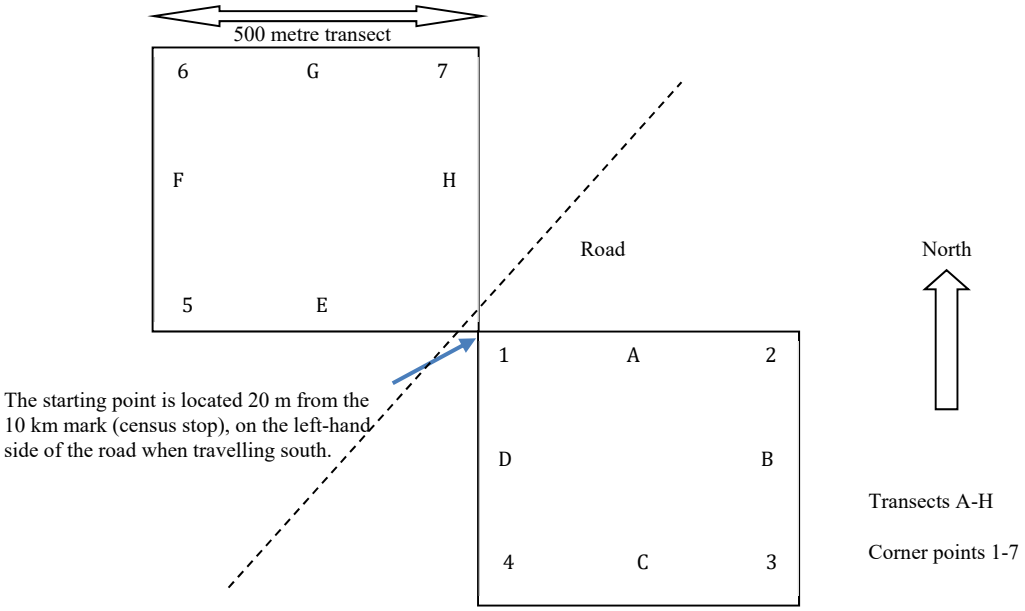


Fig. 1. Diagram of survey transect squares for each census stop

2. A typical day

A typical day commences at first light, travelling to the first census stop, surveying until around 11am-noon, when bird activity begins to decline noticeably. After a break during the heat of the day, surveys continue late in the afternoon when bird activity has increased again. Key equipment items for the surveys are listed in Appendix VIII.

3. Communication

The team maintains contact using vehicle and hand-held UHF radios.

4. Briefing session

Before commencing surveys, leaders should brief the group on GPS technique for the survey

and how to complete the survey sheets to ensure consistent data collection. The GPS co-ordinate system used is UTM and members must be familiar with how to select this on their GPS. A practice field session on using the GPS to complete a square is recommended. Two alternative methods for using the GPS to navigate a survey square are given in Appendix VII.

5. Survey work at each census stop

The following protocol was adopted for the baseline surveys and is being followed as closely as possible in future repeat surveys. If there are sufficient members in the group, half the group will take the east survey and the other half the west survey at each census stop.

(i) Upon arriving at a census stop, park the vehicle safely and place a hazard indicator (e.g. witch's hat) behind the cars if deemed necessary. Walk off the road 20 m from the census stop, left of the road when travelling south. Mark this starting location in the GPS (see diagram above, Fig. 1). Erect star dropper and attach metal tag with identifying detail e.g. 2015 FOIR 1 (see photos). This is corner point 1 in Fig. 1. For repeat surveys, relocate the star dropper that was put in place during the original survey. Attach an additional metal identifier tag for the current survey.

(ii) Write the co-ordinates onto the survey sheet to ensure they are not lost and note the weather details. Note down the dominant habitat type in the area surrounding the starting point (corner point 1). Choose from gibber, grassland, dunes, shrubland, lignum, woodland, wetland. Record dominant species in the vegetation if known. Take a photo of the survey sheet and then take representative photographs of the habitat at the starting point, one towards the centre of the eastern transect square and one towards the centre of the western transect square. When walking around each transect square in a clockwise direction (as was done for this survey), representative habitat photos are also taken at each corner, first towards the right (into the square) and then the left (outside the square).

(iii) Using a GPS to guide you, walk east for 500 m, conducting a line transect survey as you go (see methods below under 6. Line Transect method and Appendix VII - Using a GPS to navigate transect squares). As each transect line follows grid north/south or east/west, maintaining a constant grid northing or easting as appropriate allows the navigator to stay on the transect line. If your route must deviate around obstacles etc., return to the transect once the obstacle has been passed.

(iv) At 500 m from the starting point, i.e. at corner point 2, write the co-ordinates onto the survey sheet, note the time, and take a photo of the survey sheet and then of the habitat towards the centre and outside of the transect square as before. Continue in this fashion following the scheme in the diagram until 8 line transects have been completed. For repeat surveys, if copies of the original corner photos are available, use landmarks in these photos to help line up the repeat photos.

(v) Aim to complete all the survey work for each census stop within 1.5-2 hours if working as two teams.

6. Line Transect method

(i) Walk slowly along the transect line, looking and listening for birds. Pay careful attention for birds that are flushed from ground cover as you approach. For each individual or group of birds seen, note down (a) the species including age and sex if determined, (b) the number of birds in the group, (c) whether you heard and/or saw the birds, and (d) any evidence of breeding or feeding activity. Use a separate survey sheet for each 500 m transect. Avoid double counting on adjacent transects.

(ii) If you need to stop to check birds do so but try to keep a roughly even averaged slow walking pace throughout the transect.

(iii) There is no maximum distance for recording birds – every bird detected should be noted.

(iv) Note down any change in the dominant habitat type through which the transect passes (write across the line in the data collection columns). Record dominant species in the vegetation if known. Take representative photographs of the habitat. Ensure there is a photo of the survey sheet prior to the habitat photo so it is always clear which transect the photo belongs to.

(v) Note (write across the line in the data collection columns) and photograph any tracks or other traces and sightings of mammals/reptiles/birds. A photograph of tracks showing the gait of the animal/bird (i.e. set of prints) together with a ruler or measuring card (see photo) is useful for identification. A GPS reading for any significant sightings should be recorded.

Photograph of tracks with ruler

(vi) Record any threats or impacting factors noted e.g. soil erosion, weeds e.g. Buffel Grass (*Cenchrus ciliaris),* Mimosa Bush *(Vachellia farnesiana,* previously *Acacia farnesiana*), feral animals, mining, road-making, grazing, fire, water/drainage disturbance, strong wind.

7. Incidental surveys while driving between census stops

(i) When driving between census stops, sightings such as a particularly large group of birds, something very rare, or anything in the environment relevant to the aims of the study is recorded. These incidental survey records include a GPS reading followed by a 5 minute point count. The reason for the survey is noted e.g. “Cinnamon Quail-thrush crossed the road” and the surveys entered as an incidental survey in the Birdlife Australia Atlas database (Birdata).

(ii) Any wetlands that are visible from the road are surveyed with a count of any water-birds present (2 ha/20 min, 500 m radius or 5 min incidental survey as appropriate). The GPS location is recorded and the wetland photographed.

(iii) A count of all mammals (feral and domestic) is recorded.

(iv) Make a note of any items left on or near the road such as tyres, garbage or equipment and record any threats (as described above, 6(vi)).

RESULTS AND DISCUSSION

As for the baseline survey, 10 census stops were surveyed along the Old Strzelecki and Loop Tracks within the Innamincka Regional Reserve, following the transect routes for the 2015 survey. In most cases, time-of-day was closely matched with the original surveys. The exact locations of the census stops and the co-ordinates for the survey points for the 2019 survey are given in Appendix I.

In 2015, rainfall was near average as shown by local figures for Innamincka Station (the closest weather station to the survey area) (Appendix VI). However rainfall records for Innamincka Station have not been available since November 2017. Rainfall records from Moomba, 35 km to 95 km from the census stops of this survey, were the closest available and showed significantly below average rainfall for the two years preceding the repeat survey in 2019. Interpolated data for Innamincka shown by the Queensland Government SILO site and a comparison of annual rainfall decile ranks for the region (Fig. 8) show similar trends. Earlier in the year a minor flood in Cooper Creek had overflowed into Strzelecki Creek. This was caused by rainfall in the upper catchment of Cooper Creek rather than local rainfall, so impacts were restricted to the immediate channels and flood plains of the main rivers.

Because of the significant differences in habitat types between the Old Strzelecki Track and the Loop Track (flood plain vs gibber plains and mesas) the data in the following tables and figures have been split into separate sections for each area.

A. BIRD SURVEY DATA

2019 Report and Comparison with 2015 survey

Bird surveys were conducted over five days between 27 July and 1 August, 2019. Surveying was carried out before 1 pm or after 3pm when conditions were cooler and winds generally not so strong. Details of the 2019 bird survey data are given in Tables 1 and 2 and Appendix II, and comparisons with the 2015 survey data are presented in Tables 3-5 and Figures 2-5.

Overall the number of bird species recorded across the entire survey dropped from 47 to 42, however this masks the change in species with a number of species being recorded on the 2015 survey but not in 2019 and vice-versa (Tables 4 and 5).

The number of individual birds recorded dropped by almost 2/3rds from 1709 in 2015 to just 622 in 2019. The density of birds, expressed as birds per kilometre of transect showed a decline from 42.75 to 15.55 birds per kilometre. The majority of birds were found at the Old Strzelecki Track Census Stops SL01-SL05 and at Census Stop SL06 on the Loop Track where habitats included flood plains and environmental conditions were better.

Eight of 10 census stops showed a reduction in the number of species (Fig. 2) while 9 of 10 showed a reduction in the number of individuals (Fig. 3). Only Census Stop SL02 on the flood plain of the Strzelecki Creek showed an increase in both species (+10%) and individuals (+40%). Census Stop SL03, on low dunes and sand plain near the flood plain showed a small increase in species but a decline in the number of individuals.

This survey crossed two quite distinct areas. The census stops along the Old Strzelecki Track were on the flood plain of Strzelecki Creek or surrounding low sand dunes and sand plains. In contrast, most of the census stops along the Loop Track were on gibber plains or mesas with trees generally confined to ephemeral creek lines. In order to do a more detailed comparison between 2015 and 2019 these two areas have been analysed separately.

Table 1: Summary of counts by census stop for each bird species along the Old Strzelecki Track – 2019 survey							
Species	**No. of census stops where present**	**Total count**	**Min. count /stop when present**	**Max. count /stop when present**	**Average /stop when present**	**Average for all 5 stops**	**Birds per km of transect**
Pacific Black Duck	1	2	2	2	2.00	0.40	0.10
Black-breasted Buzzard	1	1	1	1	1.00	0.20	0.05
Brown Falcon	3	3	1	1	1.00	0.60	0.15
Nankeen Kestrel	2	2	1	1	1.00	0.40	0.10
Inland Dotterel	1	3	3	3	3.00	0.60	0.15
Crested Pigeon	4	13	2	6	3.25	2.60	0.65
Diamond Dove	1	1	1	1	1.00	0.20	0.05
Galah	3	8	2	4	2.66	1.60	0.40
Little Corella	4	81	12	36	20.25	16.20	4.05
Australian Ringneck	1	1	1	1	1.00	0.20	0.05
Bourke's Parrot	1	2	2	2	2.00	0.40	0.10
Budgerigar	4	32	1	15	8.00	6.40	1.60
Horsfield's Bronze Cuckoo	1	1	1	1	1.00	0.20	0.05
Red-backed Kingfisher	1	1	1	1	1.00	0.20	0.05
White-winged Fairy-wren	4	13	2	4	3.25	2.60	0.65
Red-browed Pardalote	1	2	2	2	2.00	0.40	0.10
Singing Honeyeater	1	2	2	2	2.00	0.40	0.10
Yellow-throated Miner	2	2	1	1	1.00	0.40	0.10
Crimson Chat	3	30	1	25	10.00	6.00	1.50
Chirruping Wedgebill	2	4	1	3	2.00	0.80	0.20
Chestnut-crowned Babbler	3	9	1	7	3.00	1.80	0.45
Willie Wagtail	2	6	1	5	3.00	1.20	0.30
Black-faced Woodswallow	5	69	4	44	13.80	13.80	3.45
White-browed Woodswallow	1	1	1	1	1.00	0.20	0.05
Masked Woodswallow	5	110	1	34	22.20	22.20	5.55
White-winged Triller	4	20	2	7	5.00	4.00	1.00
Australian Raven	2	4	2	2	2.00	0.80	0.20
Little Crow	5	32	4	15	6.40	6.40	1.60
Crow/Raven sp.	1	5	5	5	1.00	1.00	0.25
White-backed Swallow	2	7	2	5	3.50	1.40	0.35
Fairy Martin	1	15	15	15	15.00	3.00	0.75
Tree Martin	3	7	1	4	2.33	1.40	0.35
Australian Pipit	1	3	3	3	3.00	0.60	0.15

Rufous Songlark	2	7	1	6	3.50	1.40	0.35
Zebra Finch	4	37	2	15	9.25	7.40	1.70
Total Species		**33**					
Total Individuals		**536**					

Table 2: Summary of counts by census stop for each bird species along the Loop Track – 2019 survey

Species	**No. of census stops where present**	**Total count**	**Min. count /stop when present**	**Max. count /stop when present**	**Average /stop when present**	**Average for all 5 stops**	**Birds per km of transect**
Brown Falcon	4	4	1	1	1.00	0.80	0.20
Crested Pigeon	4	11	2	4	2.75	2.20	0.55
Galah	1	10	10	10	10.00	2.00	0.50
Cockatiel	1	5	5	5	5.00	1.00	0.25
Bourke's Parrot	3	6	1	3	2.00	1.20	0.30
Singing Honeyeater	3	4	1	2	1.25	0.80	0.20
Spiny-cheeked Honeyeater	2	2	1	1	1.00	0.40	0.10
Yellow-throated Miner	1	2	2	2	2.00	0.40	0.10
Red-capped Robin	1	1	1	1	1.00	0.20	0.05
Hooded Robin	1	3	3	3	3.00	0.60	0.15
Rufous Whistler	1	1	1	1	1.00	0.20	0.05
Grey Shrike-thrush	2	2	1	1	1.00	0.40	0.10
Cinnamon Quail-thrush	2	4	1	3	2.00	0.80	0.20
Chestnut-crowned Babbler	1	4	4	4	4.00	0.80	0.20
Willie Wagtail	3	6	1	3	2.00	1.20	0.30
Grey Fantail	1	2	2	2	2.00	0.40	0.10
Black-faced Woodswallow	3	12	3	5	4.00	2.40	0.60
Australian Raven	2	3	1	2	1.50	0.60	0.15
Little Crow	2	2	1	1	1.00	0.20	0.10
Crow/Raven sp.	1	1	1	1	1.00	0.20	0.05
Zebra Finch	1	1	1	1	1.00	0.20	0.05
Total Species		**22**					
Total Individuals		**86**					

Table 3: Comparison of numbers of birds observed for each census stop for baseline (2015) and repeat (2019) surveys						
Census Stop	**2015**		**2019**		**% change from baseline ***	
	No. of species	**No. of individuals**	**No. of species****	**No. of individuals**	**No. of species****	**No. of individuals**
SL01	13	177	10	49	(23%)	(72%)
SL02	11	73	13	102	10%	40%
SL03	14	251	15	126	7%	(50%)
SL04	20	141	14	84	(30%)	(40%)
SL05	33	351	27	166	(21%)	(53%)
SL06	20	457	18	49	(10%)	(89%)
SL07	14	86	9	14	(36%)	(84%)
SL08	7	119	5	13	(29%)	(89%)
SL09	12	50	6	9	(50%)	(82%)
SL10	4	4	1	1	(75%)	(75%)
Total	**47**	**1709**	**42**	**622**	**(11%)**	**(64%)**
Average	**15**	**171**	**12**	**62**	**(20%)**	**(64%)**

* Decreases in parentheses ** Excludes unidentified corvids

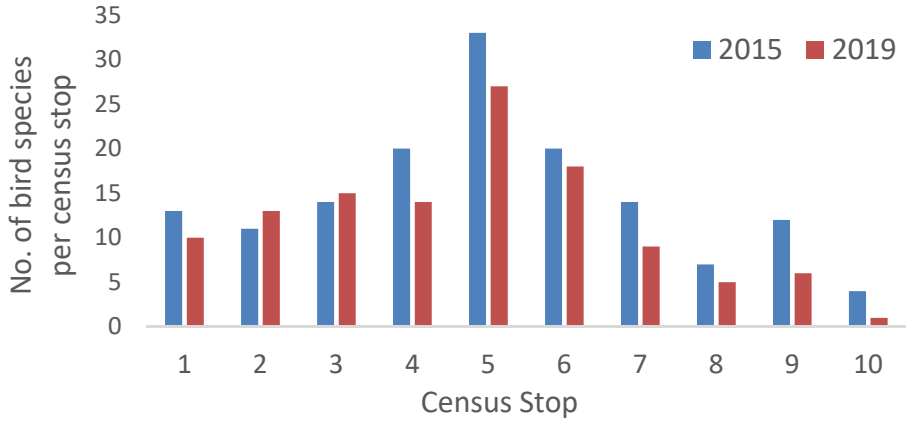


Fig. 2 Comparison of no. of bird species at each census stop

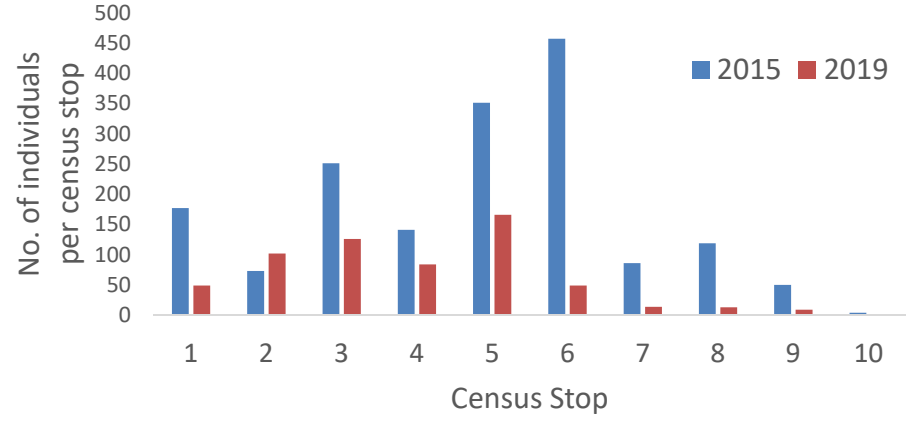


Fig. 3 Comparison of no. of individual birds at each census stop

(i) Old Strzelecki Track

Along the Old Strzelecki Track (Census Stops SL01 – SL05) there are more widespread shrubs, mainly *Acacia*, *Senna* and *Hakea spp*., along with scattered Coolibah trees and River Red Gums close to the creek. Ground cover consists of sparse grasses and forbs. At SL05 the transect crosses the end of a semi-permanent water hole although water levels were lower in 2019 than in 2015.

There were 47 species recorded across the 2015 and 2019 surveys for the Old Strzelecki Track. Crow/Raven sp. is not counted as an additional species as both Little Crow and Australian Raven were recorded at the census stops.

Fourteen species recorded in 2015 were not recorded in 2019 (Table 4). Of these, the Glossy Ibis is probably best considered a vagrant to this area while the absence of Whistling Kite, White-faced Heron, Brolga, Peaceful Dove, White-plumed Honeyeater, Black-faced Cuckoo-shrike and Magpie-lark is most likely a result of the drier conditions resulting in less productive trees along the creek lines and the lack of surface water. All these latter species are strongly associated with permanent water and riparian trees along the main rivers. Although only present in low numbers in 2015, the absence of Spiny-cheeked Honeyeater, Cinnamon Quail-thrush and Australian Magpie in 2019 was unexpected as these species are usually present in these habitats. The remaining species not recorded in 2019 tend to be highly mobile ranging over wide areas.

Emus were not recorded during the 2019 survey although this species is still present in the area surveyed as their tracks and scats were recorded at SL02.

There were six additional species recorded in 2019. Most of these were nomadic species that are not present in the area every year. The Black-breasted Buzzard is a wide-ranging species whose territory would extend well beyond the limits of the survey. Of the nomadic species, an important sighting was an adult Inland Dotterel with two dependant young at SL02.

Inland Dotterel with nearby young using broken wing distraction display

In 2019, the most frequently encountered species were (numbers for 2015 and 2019 in brackets) Budgerigar (311, 32), Little Corella (170, 81), Zebra Finch (103, 37) and Black-faced Woodswallow (87, 69) (Fig. 4). Except for the Black-faced Woodswallow which is an arid grassy woodland specialist these are all birds whose numbers and location fluctuate greatly due to the boom and bust cycles. Masked Woodswallows were the most numerous bird in 2019 but had not been recorded in the previous survey. When taken as a group, corvids (Australian Raven and Little Crow) were present in almost identical numbers in both surveys.

Table 4: Comparison of counts for each bird species for baseline (2015) and repeat (2019) surveys						
Old Strzelecki Track						
Name	**2015**			**2019**		
	No. of census stops where present	**Count**	**Birds per km of transect**	**No. of census stops where present**	**Count**	**Birds per km of transect**
Emu	1	2	0.10	0	0	0.00
Pacific Black Duck	1	15	0.75	1	2	0.10
Black-breasted Buzzard	0	0	0.00	1	1	0.25
Black Kite	1	5	0.25	0	0	0.00
Whistling Kite	1	2	0.10	0	0	0.00
Brown Falcon	3	3	0.15	3	3	0.15
Nankeen Kestrel	3	5	0.25	1	2	0.10
White-faced Heron	1	1	0.05	0	0	0.00
Glossy Ibis	1	1	0.05	0	0	0.00
Brolga	1	2	0.10	0	0	0.00
Inland Dotterel	0	0	0.00	1	3	0.15
Crested Pigeon	4	21	1.05	4	13	0.65
Peaceful Dove	1	2	0.10	0	0	0.00
Diamond Dove	1	1	0.05	1	1	0.05
Little Corella	2	170	8.50	4	81	4.05
Galah	5	25	1.25	3	8	0.40
Cockatiel	2	9	0.45	0	0	0.00
Bourke's Parrot	1	2	0.10	1	2	0.10
Budgerigar	5	311	15.55	4	32	1.60
Horsfield's Bronze Cuckoo	2	4	0.20	1	1	0.05
Red-backed Kingfisher	1	1	0.05	1	1	0.05
White-winged Fairy-wren	3	11	0.55	4	13	0.65
Red-browed Pardalote	3	5	0.25	1	2	0.10
White-plumed Honeyeater	3	40	2.00	0	0	0.00
Singing Honeyeater	3	8	0.40	1	2	0.10
Spiny-cheeked Honeyeater	1	2	0.10	0	0	0.00
Yellow-throated Miner	2	9	0.45	2	2	0.10
Crimson Chat	4	48	2.40	3	30	1.50
Cinnamon Quail-thrush	2	2	0.10	0	0	0.00
Chirruping Wedgebill	2	3	0.15	2	4	0.20
Chestnut-crowned Babbler	3	14	0.70	3	9	0.45
Willie Wagtail	3	12	0.60	2	6	0.30
Magpie-lark	1	1	0.05	0	0	0.00

Black-faced Cuckoo-shrike	1	1	0.05	0	0	0.00
Black-faced Woodswallow	5	87	4.35	5	69	3.45
Masked Woodswallow	0	0	0.00	5	111	5.55
White-browed Woodswallow	0	0	0.00	1	1	0.05
White-winged Triller	0	0	0.00	4	20	1.00
Rufous Whistler	1	1	0.05			
Little Crow	1	20	1.00	5	35	1.75
Australian Raven	4	9	0.45	2	5	0.25
Crow/Raven sp.	2	16	0.80	1	4	0.20
Australian Magpie	2	5	0.25	0	0	0.00
Australian Pipit	1	1	0.05	1	3	0.15
Rufous Songlark	1	6	0.30	2	7	0.35
Fairy Martin	0	0	0.00	1	15	0.75
Tree Martin	2	6	0.30	3	7	0.35
Zebra Finch	5	103	5.15	4	37	1.85
Total Individuals		**992**	**49.6**		**532**	**26.6**

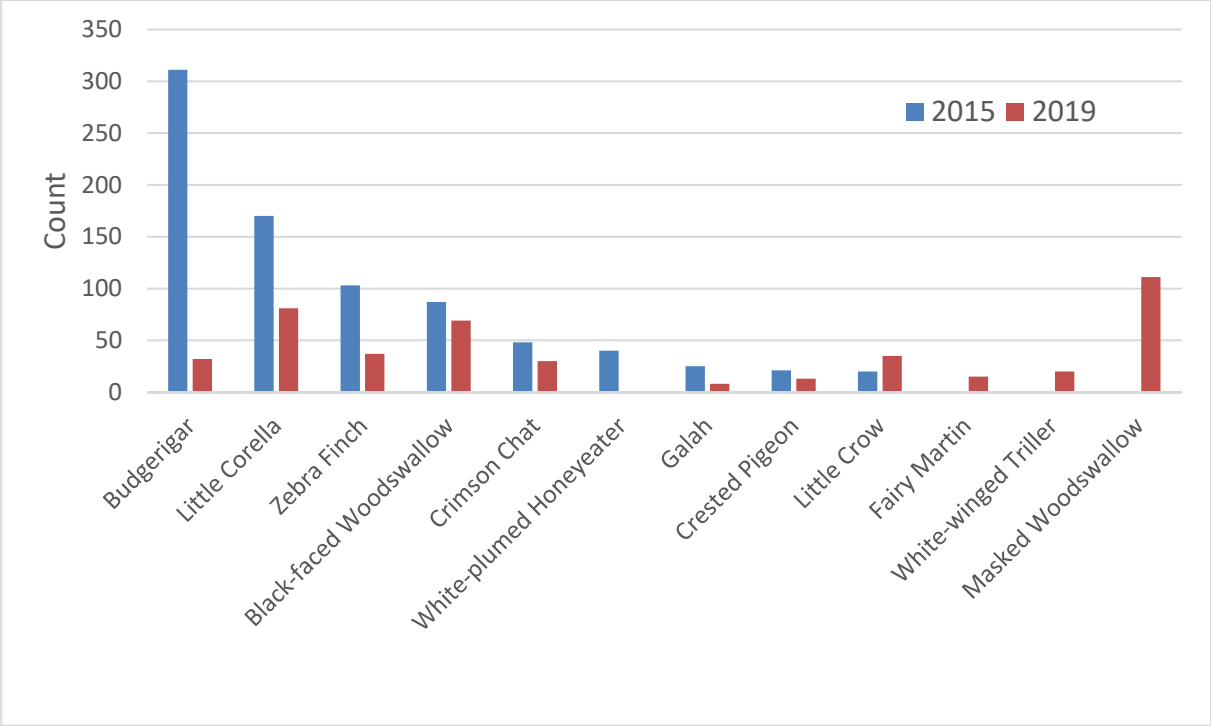


Fig. 4 Comparison of counts for the 9 top-listed birds for the 2015 and 2019 Old Strzelecki Track surveys

(ii) Loop Track

The very rocky habitat along the Loop Track creates a very different and much harsher environment compared to the Old Strzelecki Track. The number of birds and species is much lower in this area (Table 3). A total of 36 species has been recorded for these five census stops during the 2015 and 2019 surveys.

In 2015, 31 species were recorded with a total of 716 individual birds. By 2019 the number of birds had dropped by 88% with only 88 individuals being recorded. Twenty-one species were recorded, a drop of 33%. Sixteen of those species recorded in 2015 were not seen in 2019, however six additional species were recorded in 2019.

Over half the decline in number of individuals was caused by the absence of a single species in 2019. A large flock of Little Corellas was recorded in 2015. This species forms large flocks that range out from the rivers to feed in the grasslands. Their absence in this area in 2019 is attributed to the low availability of seeds and tubers as a result of the dry conditions. Budgerigars were also absent in 2019 and Zebra Finches, while recorded, were only present in low numbers.

The species recorded in 2019 for the first time were mainly insectivores (Robins and Cinnamon Quail-thrush), but also the Yellow-throated Miner (an omnivore) and Brown Falcon which feeds on both vertebrates and invertebrates.

Species seen in 2015 but not recorded in 2019 included three raptors, Budgerigar, Black-eared Cuckoo, Fairy-wrens and two honeyeaters amongst others (Table 5, Fig. 5). The dry conditions will have caused a major reduction in the flowering of trees and shrubs as well as only sparse growth of forbs. This in turn will have caused a decline in insect numbers and of species that feed on insects as well as those birds dependent on flowers and seeds.

Although not recorded on any of the transects, Australian Magpies were recorded as the group approached Census Stop SL10. Another species of interest was a flock of Apostlebirds seen at one of the creek lines between Census Stops SL09 and SL010 but not recorded on any of the transects.

Part of the group of Apostlebirds near Census Stop SL09

Table 5: Comparison of counts for each bird species for baseline (2015) and repeat (2019) surveys						
Loop Track						
Name	**2015**			**2019**		
	No. of census stops where present	**Count**	**Birds per km of transect**	**No. of census stops where present**	**Count**	**Birds per km of transect**
Wedge-tailed Eagle	1	4	0.20	0	0	0.00
Brown Falcon	0	0	0.00	4	4	0.20
Australian Hobby	1	1	0.05	0	0	0.00
Nankeen Kestrel	3	3	0.15	0	0	0.00
Crested Pigeon	3	9	0.45	4	11	0.55
Little Corella	2	417	20.85	0	0	0.00
Galah	2	6	0.30	1	10	0.50
Cockatiel	1	1	0.05	1	5	0.25
Bourke's Parrot	2	9	0.45	3	6	0.30
Budgerigar	1	14	0.70	0	0	0.00
Black-eared Cuckoo	1	1	0.05	0	0	0.00
Purple-backed Fairy-wren*	1	3	0.15	0	0	0.00
White-winged Fairy-wren	1	4	0.20	0	0	0.00
Striated Pardalote	1	2	0.10	0	0	0.00
Pied Honeyeater	1	1	0.05	0	0	0.00
White-plumed Honeyeater	2	10	0.50	0	0	0.00
Singing Honeyeater	4	30	1.50	3	4	0.20
Spiny-cheeked Honeyeater	2	8	0.40	2	2	0.10
Yellow-throated Miner	0	0	0.00	1	2	0.10
Crimson Chat	3	26	2.30	0	0	0.00
Red-capped Robin	0	0	0.00	1	1	0.05
Hooded Robin	0	0	0.00	1	3	0.15
Rufous Whistler	1	1	0.05	1	1	0.05
Grey Shrike-thrush	1	1	0.05	2	2	0.10
Cinnamon Quail-thrush	0	0	0.00	2	4	0.20
Chestnut-crowned Babbler	1	1	0.05	1	4	0.20
Grey Fantail	0	0	0.00	1	2	0.10
Willie Wagtail	2	4	0.20	3	6	0.30
Black-faced Woodswallow	4	26	1.30	3	12	0.60
Black-faced Cuckoo-shrike	2	6	0.30	0	0	0.00
Grey Shrike-thrush	1	1	0.05	2	2	0.10

Little Crow	3	8	0.40	2	3	0.15
Australian Raven	2	4	0.20	2	3	0.15
Australian Magpie	3	6	0.30	0	0	0.00
Grey Butcherbird	1	1	0.05	0	0	0.00
Tree Martin	1	1	0.05	0	0	0.00
Zebra Finch	3	107	5.35	1	1	0.05
Total Individuals		**716**	**35.7**		**88**	**4.25**

* Purple-backed Fairy-wren was recorded as Variegated Fairy-wren in 2015. This change is a result of a recent taxonomic split.

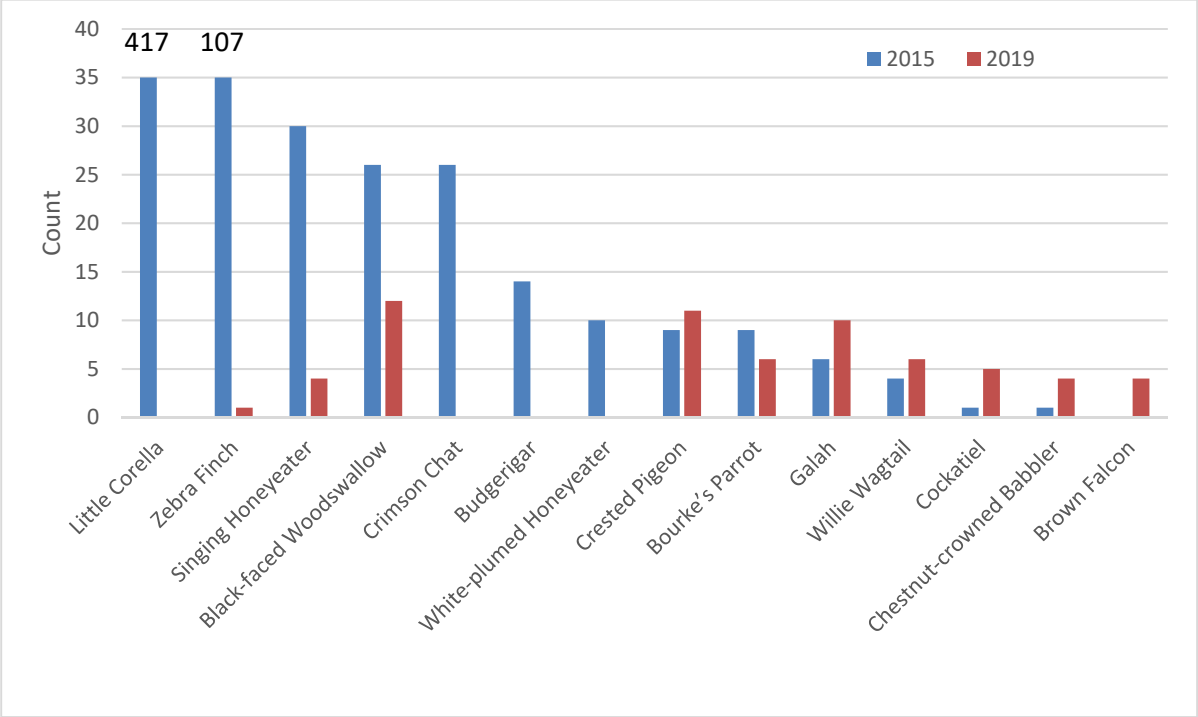


Fig. 5 Comparison of counts for the 9 top-listed birds for the 2015 and 2019 Loop Track surveys

B. HABITATS

1. 2019 Report

(i) Old Strzelecki Track

The landforms along the Old Strzelecki Track are part of the Cooper Creek System. Here they are predominantly Coolibah floodplain which generally has gentle gradients and low relief. The floodplain consists of friable silts and 'gilgai' or cracking muds and clays which are dissected intermittently by ephemeral lakes, channels and waterholes, largely associated with Strzelecki Creek. Interspersed in the flood plain are the occasional undulating sand plain and low rising sand ridge. Soil varied from fine silt to sand to sandy or clay loam to clay.

Strzelecki Creek

Although this region had not had significant recent rainfall, it had benefitted from a small flood earlier in the year which had overflowed from the Cooper into Strzelecki Creek and filled some of the waterholes. Evidence of recent patchy rain was shown by the scattered fields of drying, seeding grasses which were attracting small birds such as chats, finches, Budgerigars and trillers. The percentage vegetation cover across the surveyed area of the Old Strzelecki Track generally ranged from 25-60 %, although it was more commonly around 40% cover.

Watercourses, waterholes and their associated flood-out areas mainly support an open Coolibah woodland. One of the larger waterholes, Burlieburlie, had a denser Coolibah canopy and more complex woodland including *Eremophila longifolia* and Whitewood (*Atalaya hemiglauca)* associated with it. The occasional pink sand ridge contained some dense stands of Hop Bush (*Dodonea viscosa*) and scattered desiccated Desert Rattlepod (*Croatalaria eremea*). The lower slopes were sparsely scattered with *Senna spp*. and wattles. The swales with less runoff tended to support a low sparse understorey of chenopods and grasses. The gentle rising sand plains contained scattered stands of Silver Needlewood (*Hakea leucoptera*) or Whitewood. The gilgai floodplain supported a sparse covering of low Coolibah with a scattered understorey of drying Golden Goosefoot (*Chenopodium auricomum*). Scattered amongst these were the occasional fields of herbs and seeding grasses such as Button Grass and Five Minute Grass. Small clay pans devoid of vegetation were occasionally encountered.

(ii) Loop Track

The other half of the survey was conducted in the Merninie System. Five transects were carried out along a 50 km section of the Loop Track between Innamincka Station and the Queensland border. The habitat in this area consists of treeless gibber rises, stony plains, and low ranges of mesas and hills. The road crossed several major and minor dry creek beds. These were evident by their dark tree-lined vegetation dominated by Gidgee (*Acacia*

cambagei) with its blue-grey foliage and often accompanied by Red Mulga (*Acacia cyperophylla*) with its red peeling bark, Coolibah (*Euc. coolabah*) and River Red Gum (*Euc. camaldulensis*) in the largest creek beds.

As for the Old Strzelecki Track, the lack of rainfall over preceding months along the Loop Track was very apparent with little sign of living vegetation away from the creek lines. Although trees and shrubs persisted along the creeks there were very few grasses or other herbs, even in the most favourable sites. Where there was vegetation cover, the vegetation was usually dead or desiccated with any living tissue being below ground level. Generally total vegetation cover at the corner points varied between 5% and 20% which included dead plants and leaf litter. The remaining cover was bare soil or rocks. The greatest vegetation and leaf litter cover occurred on those flood plains that had been invaded by Buffel Grass, where it sometimes reached a high of 40%-50% with Buffel Grass out-competing native plants. These flood plains at SL06 were the main site where a few plants were seen to be in flower.

Low desiccated tussocks and forbs, such as Cannonball (*Dissocarpus paradoxus)* formed a very sparse grey patchwork against the red sand flats and gibber rises. The steeper slopes leading to mesas and rocky ridges were interspersed with isolated *Eremophila* and *Senna* shrubs. Flowering herbs were rarely seen, and then only in the creek beds. The majority of the woodland birds were found in and around the tree-lined creeks.

2. Comparison with 2015 survey

In most areas along the **Old Strzelecki Track**, the tussock grass seen during the 2015 survey was dead or absent, leaving bare ground. However, the patchy recent rainfall had resulted in the growth of some annual grasses in a few areas. This in turn had brought the insect and seed-eating birds such as chats and Budgerigars to these localized areas. The comparisons of habitat along the Old Strzelecki Track between the 2015 and 2019 surveys shown in Appendix III reveal a marked reduction in ground cover and small shrubs at the majority of corner points, and thinning of the tree canopy at wooded areas (see examples below).

When compared to the 2015 survey of the Merninie System of the **Loop Track**, the amount and quality of the vegetation was much reduced. This area had not had extensive browsing as there was little food for herbivores. Much of the tussock grass was dead or desiccated. Along some creeks and on flood plains there had been a partial loss of woody vegetation since the original survey. There had also been a loss of woody vegetation, mainly *Senna artimisioides*, *Acacia spp.* and *Eremophila spp.* in the mesa country and gullies. The majority of the shrubby vegetation on gibber plains and slopes, such as saltbush, *Maireana* and *Atriplex,* was dead.

These changes can be seen clearly in the comparative photos of the vegetation cover taken at the same corner points in 2015 and 2019 (Appendix III), examples of which are shown below.

2015 **2019**

Census Stop SL01 Corner Point 1 – showing loss of ground cover grasses leaving bare ground

Census Stop SL05 Corner Point 4 – showing loss of grasses, small shrubs and thinning of the tree canopy.

Census Stop SL09 Corner Point 3 – showing residual dead or desiccated grass and forbs

Census Stop SL07 Corner Point 4 - showing thinning of the tree canopy along the creek-line

A comparison of the number of bird species by vegetation type at each census stop is shown in Table 6 below. As for 2015, species richness was greatest for the more wooded areas of Census Stops SL01-SL06. The increased number of bird species at Census Stops SL02 and SL03 is consistent with the effects of patchy rain noted above, but for all other census stops, the number of species was reduced.

Table 6: Bird species by vegetation type at census stops

Census stop	Topography	Vegetation types		No. of bird species	
				2015	2019
SL01	Floodplain	Sparse bluebush 60%	Open Coolibah shrub and grassland 40%	13	10
SL02	Floodplain and low dune	Open Coolibah woodland 80%	Tussock grassland with Whitewood 20%	12	13
SL03	Floodplain and low dunes	Open Coolibah woodland with lignum 40%	Lightly wooded dunes with tussock grassland 60%	14	15
SL04	Floodplain	Open Coolibah woodland with bluebush 100%		20	14
SL05	Floodplain with river channel. Low dunes	Floodplain with Coolibah and shrubs. River Red Gum riparian strip 70%	Tussock grassland with open shrubland 30%	34	27
SL06	Gibber slopes grading to floodplain	*Acacia* woodland on floodplain. Riparian River Red Gum and Coolibah 30%	Open grassland and herbs on gibber plains 60%	20	18
SL07	Stony rises and creek-line	Riparian River Red Gum, Coolibah and *Acacia sp.* 25%	Open *Eremophila* shrubland with sparse grasses and forbs 75%	14	9
SL08	Stony rises, gullies and mesas	Sparse *Eremophila* and *Acacia* shrubland with forbs and Mitchell Grass 100%		7	5
SL09	Stony rises dissected by creek-lines	Sparse *Eremophila* and *Acacia* shrubland with forbs and Mitchell Grass 90%	Riparian *Acacia sp.* 10%	12	6
SL10	Stony plains	Sparse Mitchell Grass and forbs 100%		4	1

C. FLORA

1. Old Strzelecki Track – Coolibah Floodplain

The region around the Old Strzelecki Track to the south-west of Innamincka is essentially a floodplain of low open Coolibah woodland associated with the Strzelecki Creek. Included in the survey area were undulating sandplains and low-rise pink dunes which dissected the gilgai floodplain together with the occasional ephemeral channel and waterhole. The recent although variable rains had resulted in some areas containing emergent annuals and grasses.

Descriptions of the floral communities have been divided up into three habitat types: ephemeral waterholes and channels, sand ridges and swales, and low rises and clay pans or gilgai.

(i) Ephemeral waterholes and channels

Salsola australis Australian Tumbleweed/Rolypoly

Only one large waterhole which contained some remnant water was encountered on the survey (Census Stop SL05). This waterhole was the most floristically complex and contained three to four layers. The large fringing Coolibah (*Euc. coolabah*) and River Red Gum (*Euc. camaldulensis*) dominated the tree canopy. Moving away from the bank were scattered shorter trees, including smaller *Euc. coolabah, Er. bignoniflora, Er. longifolia, Atalaya hemiglauca* and *Santalum lanceolatum.* A third understorey layer included plants which were one to two metres high such as *Acacia victoriae*, *Eremophila glabra*, *Er. maculata*, *Crinum flacidum, Muehlenbekia florulenta*, *Maireana sp.* and *Atriplex sp*. A fourth ground layer, a half metre or less included a scattered layer of forbs such as *Sclerolaena sp., Salsola australis, Enchylaena tomentosa*, *Tribulus terrestris*, scattered dry tussock grasses such as *Aristida sp.* and Bottle Washers (*Enneapogon sp*.), and herbs such as *Swainsona sp.* and *Erodium crinitum.*

Ephemeral shallow channels were lined with sparse, stunted Coolibah (*Euc. coolabah*) and the occasional chenopod.

(ii) Sand ridges and swales

The low-rise pink sand ridges had variable cover both in terms of type and distribution reflecting to some extent the variable nature of the rainfall. The tops of the dunes were fairly broad with mild undulations, and contained a variety of scattered plants, including stands of Hop Bush (*Dodonea viscosa*), *Senna artemesoides*, *Acacia ligulata* and the occasional Spinifex clump *(Triodia basedowii*) was seen. On the lower slopes, scattered *Senna sp.,* some *Croatalaria eremea* and the occasional *Acacia tetragonaphylla* and *Atriplex sp.* were seen along with an isolated Queensland Bean-tree (*Lysiphyllum gilvum)*. Both the tops and slopes contained patches of herbs such as *Senecio gregorii, Polycalymma stuartii, Ptilotus sp., Swainsona sp*. and *Sclerolaena sp.* Some of the erosion channels on the lower dune slopes contained some *Goodenia sp*., *Eragrostis dieselii, Calotis hispidula, Trianthema triquetra*, *Lepidium sp.* and *Alternanthera nodiflora.*

(iii) Low rises and clay pans or gilgai

The low rises encountered had a scattered covering of *Atalaya hemiglauca* and some *Senna sp.* and one had an open stand of *Hakea leucoptera.* The gilgai or mudflats typically contained a sparse covering of low, stressed *Euc. coolabah*, with a sparse understorey of *Chenopodium auricomum*, some *Atriplex velutinella*, *Duma florulenta* and some scattered *Sclerolaena sp*. with very occasional *Eremophila glabra* and *Ac tetragonophylla*. A variety of sparsely scattered herbs was also seen such as *Goodenia sp.*, *Rhodanthe moschata, Swainsona sp., Erodium crinitum, Calotis hispidula, Nicotiana velutina, Euphorbia tanensis, Portulaca oleracea, Tribulus terrestris* and *Eryngium supinum.* Occasionally some dense patches of seeding grasses were encountered, such *as Eragrostis sp.,* Five Minute Grass *(Tripogon loliiformis)* and Button Grass *(Dactyloctenium radulans).* Other mudflats were just bare.

2. Loop Track - The Gibber Rises and Mesas

The region to the north-east of Innamincka is known as the Merninie System and consists of two major landforms. Firstly, gibber flats and stony rises and secondly mesas. These are dissected by generally dry channels or creek beds of varying sizes. The vast expanses of treeless gibber vary in size of stone and density of ground cover. This in turn affects the density of vegetation. Persistent winds and exposure to the elements on the open rises limits the overall plant growth to a metre or less in height, with most less than half that height. The sparseness of the ephemeral herbaceous species and annual grasses suggested that the rainfall recorded in the previous 8 months at the nearby Moomba Airport station (Appendix VI) had had little impact on this landform. The percentage vegetation cover varied from 5-20 % except along the large creek-lines or flood-outs where it increased to around 40%.

The floral communities are described under two main habitats: the first creek beds and watercourses, the second gibber flats and stony rises.

(i) Creek beds and watercourses

Large creek beds were the most floristically complex containing three layers. The overstorey was dominated by Gidgee (*Acacia cambagei*) but also contained Red Mulga (*Acacia cyperophylla*) and very occasionally some Coolibah (*Euc. coolabah*) and River Red Gum (*Euc. camaldulensis)* along the largest creek lines. The midstorey frequently contained *Eremophila longifolia, Er. glabra, Acacia victoriae, Ac. tetragonophylla, Senna artemesoides* and *Santalum lanceolatum*. In the sparse low understorey, only desiccated herbs and chenopods were seen. Small creek beds tended to contain two layers, a low overstorey of Gidgee (*Acacia cambagei*) with perhaps some Red Mulga (*Ac. ceratophylla*) and a sparse ground layer of desiccated forbs such as *Sclerolaena sp*. Narrow watercourses and erosion channels were generally lined with low species such as *Eremophila freelingii* and desiccated forbs.

Acacia cambagei, Senna sp. & Santalum sp.

(ii) Gibber flats and stony rises

The gibber flats and stony rises were sparsely covered with low vegetation, generally no more

than a metre in height. The tallest plants being thinly scattered *Acacia* species such as *Ac. tetragonaphylla*, *Ac. victoriae*, some *Eremophila sp*. including *Er. glabra* and *Frankenia sp.* Below these were scattered desiccated chenopods such as *Atriplex sp.*, *Maireana sp*., *Sclerolaena sp.* and *Dissocarpus paradoxus,* often giving a dull grey appearance to the landscape.

Photographs of flora seen on the different transects are given in Appendix IV and a full list of flora recorded during the 2019 survey is given in Appendix V.

D. MAMMALS

1. Cattle

Cattle tracks were recorded at four of the five census stops along the Old Strzelecki Track. These varied in age but in most cases were fairly recent. Cattle were seen at Census Stop SL03 where they were moving towards a nearby waterhole on the Strzelecki Creek. Numerous cattle tracks were seen at Census Stop SL04, some of which were deeply indented in the soil surface.

There was no recent sign of cattle at any of Census Stops SL06 – SL10 (Loop Track). Yards near SL06 and a tank between SL09 and SL10 are part of the grazing infrastructure, indicating that when conditions are right there is grazing in this area.

2. Feral horses/donkeys

Fresh tracks were recorded at several points at Census Stop SL04 including one set of tracks from a juvenile animal. Tracks and scats (fresh & old) were seen at Census Stop SL05 of horses/donkeys coming in for water at the water hole.

3. Rabbits

Rabbit warrens were seen on the rises and in the layer of softer sediments just below the top of the mesas at Census Stop SL08. These were not as extensive as in 2015 but still active. Another rabbit burrow was seen on the opposite sector of Census Stop SL08, in rocky soil beneath a *Scaevola spinescens* shrub.

4. Dingo

The only evidence of dingos during the survey was some scats seen at Census Stop SL04. Dingos appeared to be in low numbers in the Innamincka region at the time of the 2019 survey with only occasional animals being seen or heard in the vicinity of camping areas along Cooper Creek.

5. Cat

No evidence of cats was recorded during the survey. Cats are cryptic animals, rarely observed, but certain to be present in the region.

6. Fox

No evidence of foxes was recorded during the surveys.

7. Camel

Old but still identifiable camel tracks were seen at Census Stop SL01 in the south and at Census Stop SL05 at the northern end of the Old Strzelecki Track. Reasonably fresh camel tracks and scatters of camel scats were seen along well developed animal tracks that crossed Census Stop SL10. This site is gibber country with little living vegetation.

8. Kangaroos

Evidence of kangaroos was observed at many census stops (SL01 scats, SL02 tracks, SL03 fresh scats, scrape, SL04 fresh scratchings and scats, SL05 scats and tracks, SL06 tracks Red Kangaroo?, SL09, SL10 old scats).

9. Other mammals

Pig scats were recorded at Census Stop SL03. This census stop is fairly close to a semi-permanent waterhole in Strzelecki Creek, so it is likely pigs have been using the creek to enable them to forage over a wider area.

E. REPTILES AND AMPHIBIANS

A Central Bearded Dragon, *Pogona vitticeps*, was seen inside but near the entrance to its hole at Census Stop SL01. No other reptiles were seen during the survey. There were very few reptile tracks recorded during the survey.

Central Bearded Dragon, *Pogona vitticeps*

F. INVERTEBRATES

Apart from flies in areas where cattle were present, insects and spiders seemed to be in fairly low numbers. The most frequently encountered insects were Lesser Budworm Moths (*Heliothis punctifera*) and various grasshoppers. Saltbush Blue Butterflies (*Theclinesthes serpentata*) along with a number of wasps, bee flies and bees were seen near plants that were flowering although such occurrences were relatively few (see photos in Appendix IV).

Lesser Budworm Moth, *Heliothis punctifera*

G. ARCHAEOLOGICAL SITES

The Innamincka area is of great aboriginal historical importance. On this survey, stone flake sites were observed in sand blowouts at three census stops (SL02, SL03, SL04) and in gibber country on the slopes of a mesa at Census Stop SL07 indicating areas for stone tool working. A grindstone fragment was seen at Census Stop SL05 at the same location as reported in 2015.

A gully with exposed banks of white ochre seen on Census Stop SL07 may be an indigenous ochre quarry which would require investigation by suitably qualified people.

No European archaeological relics were found on this survey, although some had been seen in 2015 and are discussed in that report[7].

Flakes from worked stones

[7] FOIR Old Strzelecki and Loop Tracks Survey Project Report 2015

G. THREATS AND POTENTIAL IMPACTING FACTORS

1. Cattle grazing

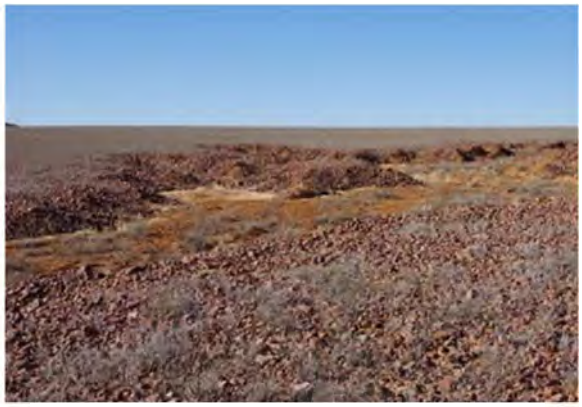
At the time of the survey there were cattle grazing at various locations along the Old Strzelecki Track. Cattle were not seen along the Loop Track. Grazing that is too intense destroys the vegetation and damages fragile soils. This represents a loss of habitat and food for both cattle and native species which can threaten the viability of grazing and the survival of native species.

2. Soil Erosion

Areas along the Old Strzelecki Track that have been heavily grazed with most vegetation removed are subject to wind erosion. There are areas of water erosion in the form of small gullies on the gentle slopes of low dunes. These gullies often commence as cattle tracks which break the organic crust on the soil surface to expose the more friable clays and sands below.

Along the Loop Track most erosion was gully erosion caused by water running off the higher ground. In many cases these eroded gullies had been caused by the bulldozed shot-lines that crossed the country at regular intervals. The shot-lines make no allowance for topography so they often funnel water along narrow channels which increases the erosion. All these shot-lines were created by early oil exploration that occurred more than 50 years ago.

Erosion forming along cattle tracks



Erosion spreading from an old shot-line

3. Weeds

The most significant weed encountered on the survey was Buffel Grass *(Cenchrus ciliaris)* which was recorded at Census Stops SL05 and SL06.

At Census Stop SL05 this highly invasive weed is spreading across the flood plain, mainly on the eastern side of Strzelecki Creek. In some areas it is the dominant ground cover (see photo on page 3). It is likely that this infestation extends south from near Innamincka as it has been observed along the road and in some creek lines closer to Innamincka.

The infestation at Census Stop SL06 is predominantly along the banks of the unnamed creek that flows approximately parallel to the road from the mesa area north east of Innamincka to join Cooper Creek near the Innamincka causeway. There is a strip of Buffel Grass on the banks of this creek where it forms almost 100% plant cover beneath the Coolibahs and River Red Gums. There are also scattered plants further out on the flood plain.

Both these infestations will be dispersed by water and have the potential to spread widely across the catchment following major floods.

Occasional plants of Mimosa Bush, *Vachellia farnesiana*, were recorded in the creeks at Census Stops SL06 and SL07. There are likely to be scattered plants of this species along much of the main creek running parallel to the south-western end of the Loop Track.

4. Feral animals

As for the 2015 survey, the density of feral animals in the area appeared to be low. Tracks and scats of camels, horses/donkeys and pigs were recorded as noted above and shown in the photos in Appendix IV.

5. Mining, tourism and other human activity

Both roads surveyed are popular tourist routes. The Old Strzelecki Track also provides access to a number of oil and gas wells which require regular maintenance visits. Trucks accessing these oil wells also use the track when delivering equipment and construction materials. There is also some traffic from Innamincka Station. Tourist vehicles are restricted to the main routes, while mining and station works vehicles use the public roads and private side roads.

Old mining exploration shot-lines were encountered at several census stops. These were most noticeable along the Loop Track where they have tended to channel water run-off resulting in accelerated erosion. Shot-lines across the flood plains had caused less impact and after some 50 years were merging back into the surface.

In spite of the high level of use, very little rubbish was recorded along the public roads during the survey. There were few signs of off-road driving with most informal tracks and shot-lines having been created during the early years of mining activity.

6. Fire

No evidence of wildfire was recorded at any of the census stops. The combination of very dry conditions in recent years along with grazing in the southern part of the survey area mean that there is insufficient vegetation and plant debris to carry a fire.

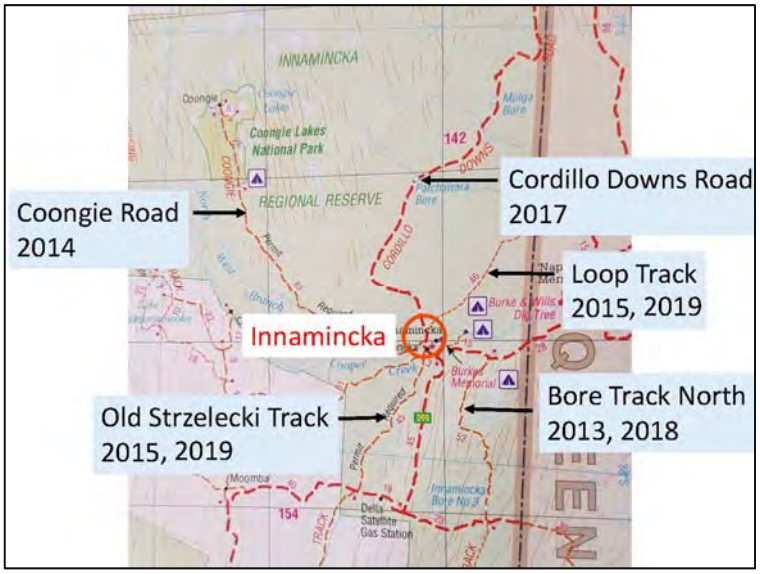
SUMMARY AND CONCLUSIONS

The Innamincka Regional Reserve encompasses a diversity of land systems, including large areas of the Cooper Creek System (one of the world's last unregulated arid freshwater systems, a key component of the Lake Eyre Basin), the Marqualpie Land System (jumbled dunefield interspersed with small claypans and lakes in swales), the Merninie Land System (gibber slopes with occasional mesas) and the Tingana Land System (red longitudinal sand dunes with interdune swales of sand and cracking clay). The area falls within an under-protected bioregion of the National Reserve System. The landscape is also of profound spiritual and cultural significance to the traditional custodians of the land, the Yandruwandha and Yawarrawarrka people.

The area is listed for its outstanding ecological processes, its status as an unregulated natural water system, and its migratory birds, waterfowl and fish diversity. The Cooper and Strzelecki Creeks and their permanent and semi-permanent waterholes provide critical wildlife habitat during dry periods, enabling numerous species to persist in the region. The Innamincka Regional Reserve Management Plan (2018) notes that the reserve protects habitat for eighteen migratory bird species listed under bilateral migratory bird agreements, four threatened fauna species listed under the EPBC Act (Night parrot, Kowari, Dusky Hopping Mouse, Plains Mouse), 39 other threatened fauna species listed under the *National Parks and Wildlife Act (SA)*, and one of the most diverse frog communities in South Australia. The Cooper Creek catfish and Cooper Creek turtle are endemic to the region. An abundance of flora species are also found in the reserve, with 20 listed as threatened under the *National Parks and Wildlife Act (SA).*

As a regional reserve, the area is not only managed for the protection of natural and cultural values, but allows for grazing and utilisation of natural resources including oil and gas. Further challenging the integrity of the natural ecosystems are the effects of climate change. Whilst the area is naturally subject to large variations in rainfall and flooding events along the waterways leading to boom and bust events, temperatures are increasing (Appendix VI) and there are prolonged periods of low rainfall.

For these reasons, the Friends of the Innamincka Reserves commenced bird, mammal and vegetation surveys in the area in 2013 to provide an important data set for long-term monitoring of the natural values of the reserve. Survey sites have been established along four roadways radiating out from the Innamincka township - the Bore Track North (2013), the Coongie Road (2014), the Old Strzelecki/ Loop Tracks (2015) and the Cordillo Downs Road (2017). In this way, a wide area of the reserve is being monitored, encompassing several different land systems and habitat types. For each roadway, substantial areas are surveyed by performing eight 500 m line transects along the sides of two quadrants at 8-10 sites along a road length of 60-100 km. The survey



procedures are well documented and designed for ease of reproducibility, enabling repeat surveys to be conducted to assess long-term changes in the flora and fauna of the region. Bird data are entered into the Birdlife Australia database (Birdata) and the full reports on birds, mammals and vegetation surveys provided to IRR Park rangers, DEW regional managers, the State Library of SA, the National Archives of Australia and loaded on to the FOIR website.

In 2018, the Bore Track North survey was repeated and in 2019 the Old Strzelecki and Loop Track survey was repeated as reported here. While confirming the ecological richness of the area both in flora and fauna, the 2019 results show a decline in the quality of habitat across the area surveyed with the greatest decline along the Loop Track. This was evident by the marked decline in bird and other vertebrate species in 2019 compared to the original survey in 2015. Across the whole survey area, the number of individual birds was reduced markedly from 1709 to 622 (64% reduction). While there was only 11% reduction in species richness (number of bird species reduced from 47 to 42), the mix of species differed substantially. In particular there was a loss of water-dependent and seed-eating birds, consistent with the ongoing severe drought conditions in 2019. A minor flood earlier in the year had eased conditions on the lower flood plains of the Strzelecki Creek, although this was largely restricted to areas close to the creek. There had been insufficient rain to cause any improvement in conditions across the wider area.

The added impact of cattle grazing on the habitat was starkly evident as shown in the comparisons of corner point photos (Appendix III). Along the Loop track, there was little evidence of recent cattle grazing although the infrastructure remains for better times. Here, ground cover and small shrubs were present but desiccated. In contrast, along the Old Strzelecki Track there was clear evidence of recent cattle presence from tracks and scats, and cattle were observed at four of five census stops. Comparisons of corner point photos between 2019 and 2015 show marked loss of grasses, forbs and small shrubs and increased bare ground. Cattle were the predominant grazing animal in the region. There was limited evidence of the recent presence of feral animals such as horses, donkeys, camels and pigs. Most had probably succumbed to the drought or in the case of more mobile species such as camels and horses, moved to other areas.

Together these findings flag the challenges of managing a multi-use reserve such as the Innamincka Regional Reserve, pointing to the need for pastoral activities to work in harmony with the natural ecosystems to achieve sustainable land use and prevent further environmental decline and potential species loss. Ongoing attention to controlling invasive weeds, especially Buffel Grass, is also needed to avoid compounding loss of habitat for native species – large infestations of Buffel Grass were seen at Census Stops SL05 and SL06. The impact of mining and tourism must also be monitored carefully, especially to avoid creation or exacerbation of erosion sites due to inappropriate vehicle passage. During all surveys, evidence of earlier aboriginal occupancy has been seen such as worked stones, grinding stones and middens, emphasising the additional overall need to respect aboriginal heritage and protect cultural sites in the area.

APPENDIX I – LOCATION OF CENSUS STOPS

A. CENSUS STOP AND CORNER POINT CO-ORDINATES

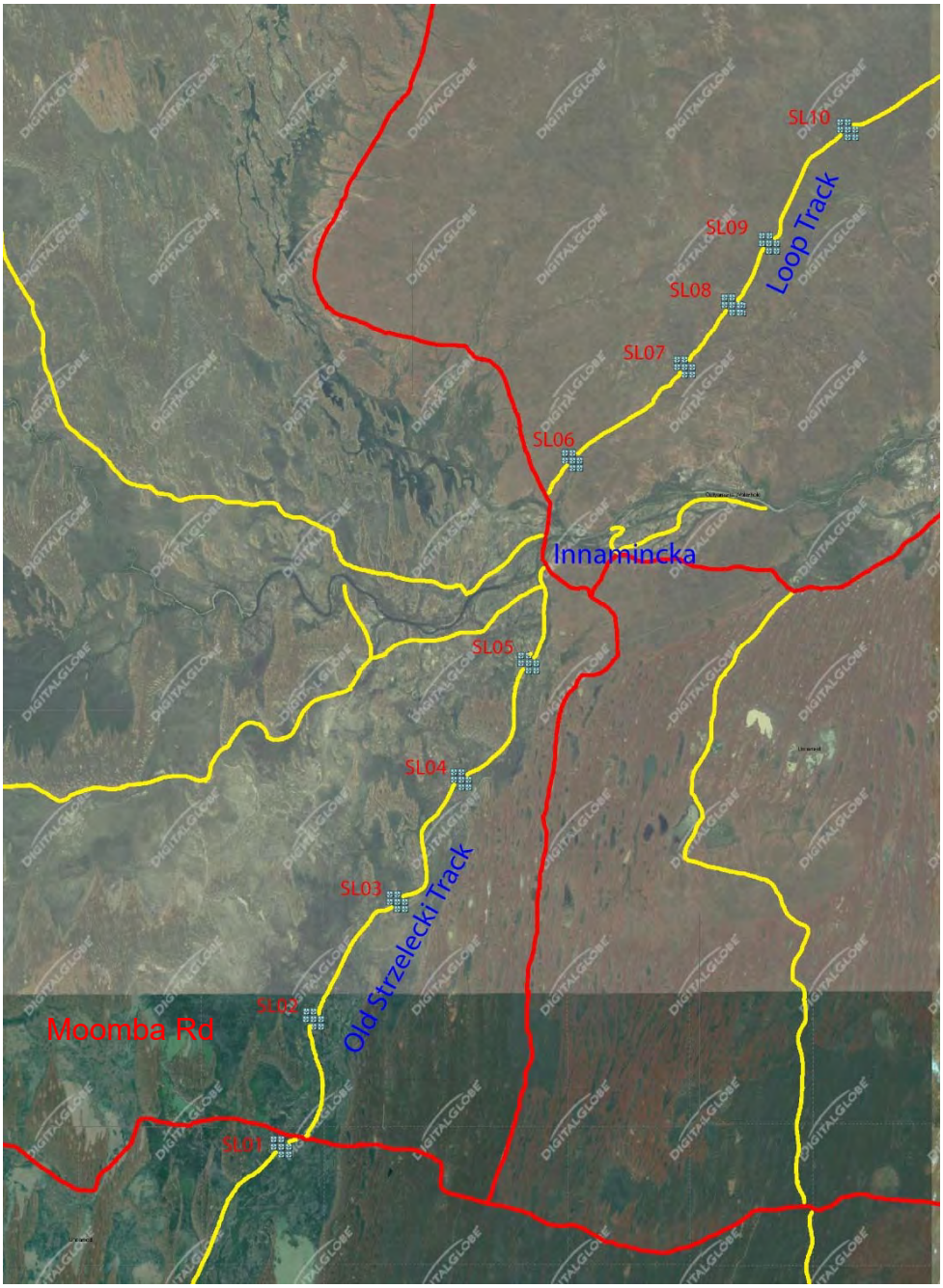
The following table lists the co-ordinates recorded for each census stop for both the baseline 2015 survey and the repeat 2019 survey. The co-ordinate system used is UTM. The census stops are also shown on the following Map.

Census Stop	Corner Point	AMG zone	Easting	Northing
SL01	1	54J	456197	6892122
	2	54J	456697	6892122
	3	54J	456697	6891622
	4	54J	456197	6891622
	5	54J	455697	6892122
	6	54J	455697	6892622
	7	54J	456197	6892622
SL02	1	54J	458418	6900714
	2	54J	458918	6900714
	3	54J	458918	6900214
	4	54J	458418	6900214
	5	54J	457918	6900714
	6	54J	457918	6901214
	7	54J	458418	6901214
SL03	1	54J	464013	6908576
	2	54J	464513	6908576
	3	54J	464513	6908076
	4	54J	464013	6908076
	5	54J	463513	6908576
	6	54J	463513	6909076
	7	54J	464013	6909076
SL04	1	54J	468316	6916675
	2	54J	468816	6916675
	3	54J	468816	6916175
	4	54J	468316	6916175
	5	54J	467816	6916675
	6	54J	467816	6917175
	7	54J	468316	6917175
SL05	1	54J	472788	6924481
	2	54J	473288	6924481
	3	54J	473288	6923981
	4	54J	472788	6923981
	5	54J	472288	6924481
	6	54J	472288	6924981
	7	54J	472788	6924981

Census Stop	Corner Point	AMG zone	Easting	Northing
SL06	1	54J	475692	6938086
	2	54J	476192	6938086
	3	54J	476192	6937586
	4	54J	475692	6937586
	5	54J	475192	6938086
	6	54J	475192	6938586
	7	54J	475692	6938586
SL07	1	54J	483491	6944210
	2	54J	483991	6944210
	3	54J	483991	6943710
	4	54J	483491	6943710
	5	54J	482991	6944210
	6	54J	482991	6944710
	7	54J	483491	6944710
SL08	1	54J	486668	6948365
	2	54J	487168	6948365
	3	54J	487168	6947865
	4	54J	486668	6947865
	5	54J	486168	6948365
	6	54J	486168	6948865
	7	54J	486668	6948865
SL09	1	54J	489000	6952474
	2	54J	489500	6952474
	3	54J	489500	6951974
	4	54J	489000	6951974
	5	54J	488500	6952474
	6	54J	488500	6952974
	7	54J	489000	6952974
SL10	1	54J	494261	6960067
	2	54J	494761	6960067
	3	54J	494761	6959567
	4	54J	494261	6959567
	5	54J	493761	6960067
	6	54J	493761	6960567
	7	54J	494261	6960567

B. MAP SHOWING CENSUS STOP LOCATIONS ALONG THE OLD STRZELECKI AND LOOP TRACKS

Source: VantagePoint™/DigitalGlobe™ overlaid with FOIR transect square coordinates



Key

Major roads

Minor roads

10 km

APPENDIX II - BIRD SURVEY DATA
Combined data for all 8 transects at each census stop

Date and time	Census Stop	Species	Seen/ Heard	Number	Co-ordinates
30/07/2019	SL01	Brown Falcon	S	1	54 J
St. 09:05		Nankeen Kestrel	S	1	456197E
Fin. 10:45		Inland Dotterel	S	3	6892122N
		Crested Pigeon	S	2	
		Galah	S	4	
		Little Corella	S	12	
		White-winged Fairy-wren	S	2	
		White-winged Fairy-wren	H	2	
		Black-faced Woodswallow	S	5	
		Masked Woodswallow	S	1	
		Australian Raven	S	1	
		Australian Raven	H	1	
		Little Crow	S	15	
30/07/2019	SL02	Crested Pigeon	S	3	54J
St. 11:30		Budgerigar	S	1	458418E
Fin. 12:55		Little Corella	S	36	6900714N
		Horsfield's Bronze Cuckoo	H	1	
		White-winged Fairy-wren	H	2	
		Singing Honeyeater	H	2	
		Chirruping Wedgebill	S	1	
		Chirruping Wedgebill	H	2	
		Willie Wagtail	S	5	
		Black-faced Woodswallow	S	11	
		Masked Woodswallow	S	11	
		Masked Woodswallow	H	6	
		White-winged Triller	S	1	
		White-winged Triller	H	1	
		Little Crow	S	8	
		Zebra Finch	S	10	
		Zebra Finch	H	1	
01/08/2019	SL03	Brown Falcon	S	1	54J
St. 10:50		Little Corella	S	20	0464013E
Fin. 12:53		Bourke's Parrot	S	2	6908576N
		Budgerigar	S	6	
		Budgerigar	H	1	
		Crimson Chat	S	25	
		Chestnut-crowned Babbler	S	1	
		Black-faced Woodswallow	S	5	

		Masked Woodswallow	S	26	
		White-winged Triller	S	2	
		White-winged Triller	H	3	
		Little Crow	S	4	
		Tree Martin	S	4	
		White-backed Swallow	S	2	
		Rufous Songlark	S	6	
		Australian Pipit	S	3	
		Zebra Finch	S	15	

01/08/2019	SL04	Brown Falcon	H	1	54J
St. 8:45		Crested Pigeon	S	1	468316E
Fin. 10:24		Crested Pigeon	H	1	6916675N
		Galah	S	2	
		Budgerigar	S	15	
		White-winged Fairy-wren	S	3	
		Yellow-throated Miner	H	1	
		Crimson Chat	S	4	
		Chestnut-crowned Babbler	S	7	
		Black-faced Woodswallow	S	4	
		Masked Woodswallow	S	34	
		White-winged Triller	S	5	
		White-winged Triller	H	2	
		Little Crow	S	3	
		Little Crow	H	1	
		Tree Martin	S	1	
		Zebra Finch	S	2	

31/07/2019	SL05	Pacific Black Duck	S	2	54J
St. 10:42		Black-breasted Buzzard	S	1	472788E
Fin. 12:40		Nankeen Kestrel	S	1	6924481N
		Crested Pigeon	S	6	
		Diamond Dove	H	1	
		Little Corella	S	13	
		Galah	S	2	
		Australian Ringneck	S	1	
		Budgerigar	S	7	
		Budgerigar	H	2	
		Red-backed Kingfisher	S	1	
		Red-browed Pardalote	S	1	
		Red-browed Pardalote	H	1	
		White-winged Fairy-wren	H	4	
		Yellow-throated Miner	H	H	
		Crimson Chat	S	1	
		Willie Wagtail	S	1	

		Chirruping Wedgebill	H	1	
		Chestnut-crowned Babbler	H	1	
		White-winged Triller	S	6	
		Black-faced Woodswallow	S	44	
		Masked Woodswallow	S	33	
		White-browed Woodswallow	S	1	
		Australian Raven	S	3	
		Little Crow	S	3	
		Little Crow	H	1	
		White-backed Swallow	S	5	
		Fairy Martin	S	15	
		Tree Martin	S	2	
		Rufous Songlark	S	1	
		Zebra Finch	S	9	

27/07/2019	SL06	Brown Falcon	S	1	54J
St. 8:45		Crested Pigeon	S	2	475692E
Fin. 10:30		Crested Pigeon	H	1	6938086N
		Galah	S	10	
		Cockateil	S	5	
		Bourke's Parrot	S	3	
		Singing Honeyeater	S	2	
		Spiny-cheeked Honeyeater	S	1	
		Yellow-throated Miner	S	1	
		Yellow-throated Miner	H	1	
		Grey Shrike-thrush	H	1	
		Red-capped Robin	S	1	
		Grey Fantail	S	2	
		Willie Wagtail	S	3	
		Chestnut-crowned Babbler	S	4	
		Cinnamon Quail-thrush	S	2	
		Cinnamon Quail-thrush	H	1	
		Black-faced Woodswallow	S	4	
		Little Crow	H	1	
		Australian Raven	S	2	
		Zebra Finch	H	1	

27/07/2019	SL07	Brown Falcon	S	1	54J
St. 11:10		Crested Pigeon	S	2	483491E
Fin. 12:52		Singing Honeyeater	H	1	6944210N
		Spiny-cheeked Honeyeater	H	1	
		Grey Shrike-thrush	H	1	
		Willie Wagtail	S	1	
		Willie Wagtail	H	1	

		Black-faced Woodswallow	H	3	
		Little Crow	S	1	
		Little Crow	H	1	
		Australian Raven	H	1	

28/07/2019	SL08	Crested Pigeon	H	2	54J
St. 10:45		Bourke's Parrot	H	2	486668E
Fin. 12:23		Hooded Robin	S	3	6948365N
		Cinnamon Quail-thrush	S	1	
		Black-faced Woodswallow	S	5	

28/07/2019	SL09	Brown Falcon	S	1	54J
St. 8:55		Crested Pigeon	S	3	489000E
Fin. 10:13		Crested Pigeon	H	1	6952474N
		Bourke's Parrot	H	1	
		Singing Honeyeater	S	1	
		Rufous Whistler	H	1	
		Willie Wagtail	H	1	

27/07/19	SL10	Brown Falcon	S	1	54J
St. 15:45					494261E
Fin. 17:05					6960067N

APPENDIX III – CORNER POINT PHOTOS: 2015 vs 2019

Census stop SL01	2015	2019
Corner point 1		
Right (to centre of eastern quadrant)		
Left (to centre of western quadrant)		
Corner point 2		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL01	2015	2019
Corner point 3		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		
Corner point 4		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL01	2015	2019
Corner point 5		
Right (to centre of western quadrant)		
Left (away from western quadrant)		
Corner point 6		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL01	2015	2019
Corner point 7		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL02	2015	2019
Corner point 1		
Right (to centre of eastern quadrant)		
Left (to centre of western quadrant)		
Corner point 2		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL02	2015	2019
Corner point 3		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		
Corner point 4		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL02	2015	2019
Corner point 5		
Right (to centre of western quadrant)		
Left (away from western quadrant)		
Corner point 6		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL02	2015	2019
Corner point 7		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL03	2015	2019
Corner point 1		
Right (to centre of eastern quadrant)		
Left (to centre of western quadrant)		
Corner point 2		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL03	2015	2019
Corner point 3		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		
Corner point 4		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL03	2015	2019
Corner point 5		
Right (to centre of western quadrant)		
Left (away from western quadrant)		
Corner point 6		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL03	2015	2019
Corner point 7		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL04	2015	2019
Corner point 1		
Right (to centre of eastern quadrant)		
Left (to centre of western quadrant)		
Corner point 2		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL04	2015	2019
Corner point 3		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		
Corner point 4		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL04	2015	2019
Corner point 5		
Right (to centre of western quadrant)		
Left (away from western quadrant)		
Corner point 6		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL04	2015	2019
Corner point 7		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

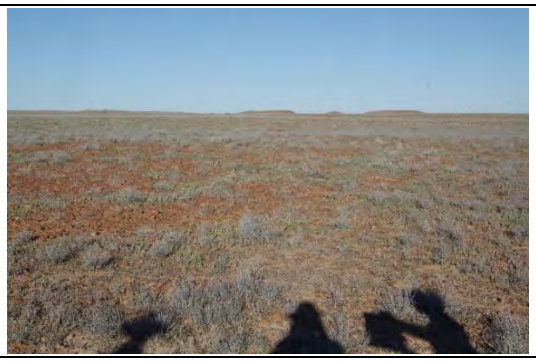
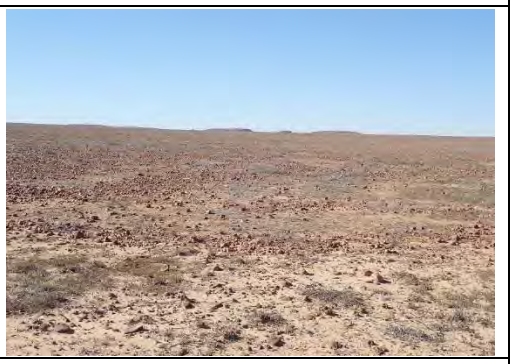
Census stop SL05	2015	2019
Corner point 1		
Right (to centre of eastern quadrant)		
Left (to centre of western quadrant)		
Corner point 2		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

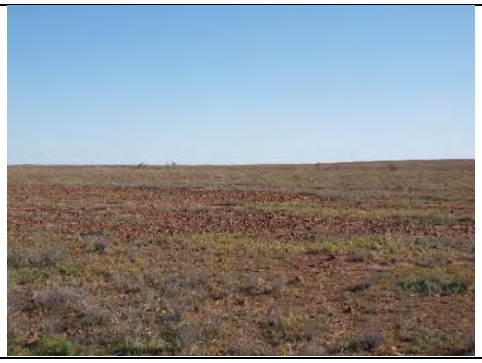
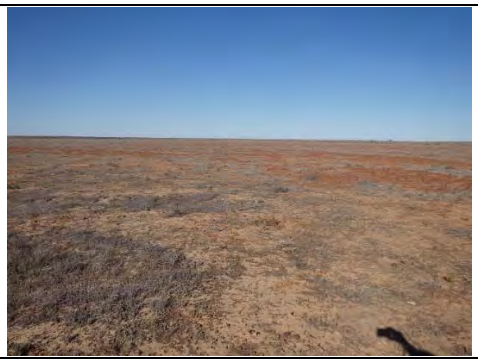
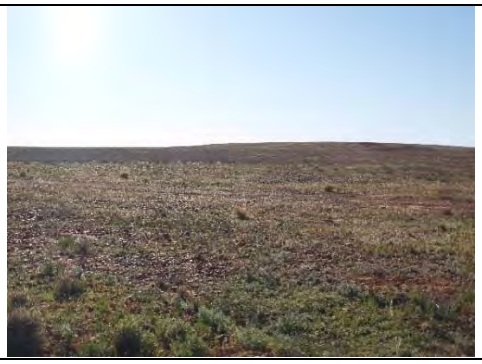
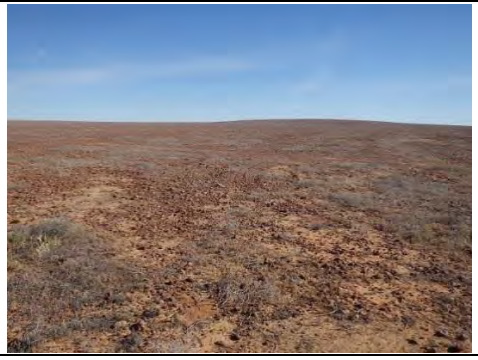
Census stop SL05	2015	2019
Corner point 3		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		
Corner point 4		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL05	2015	2019
Corner point 5		
Right (to centre of western quadrant)		
Left (away from western quadrant)		
Corner point 6		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL05	2015	2019
Corner point 7		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL06	2015	2019
Corner point 1		
Right (to centre of eastern quadrant)		
Left (to centre of western quadrant)		
Corner point 2		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL06	2015	2019
Corner point 3		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		
Corner point 4		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL06	2015	2019
Corner point 5		
Right (to centre of western quadrant)		
Left (away from western quadrant)		
Corner point 6		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL06	2015	2019
Corner point 7		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

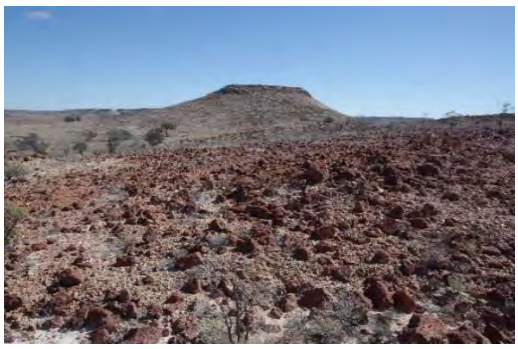
Census stop SL07	2015	2019
Corner point 1		
Right (to centre of eastern quadrant)		
Left (to centre of western quadrant)		
Corner point 2		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL07	2015	2019
Corner point 3		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		
Corner point 4		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL07	2015	2019
Corner point 5		
Right (to centre of western quadrant)		
Left (away from western quadrant)		
Corner point 6		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL07	2015	2019
Corner point 7		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

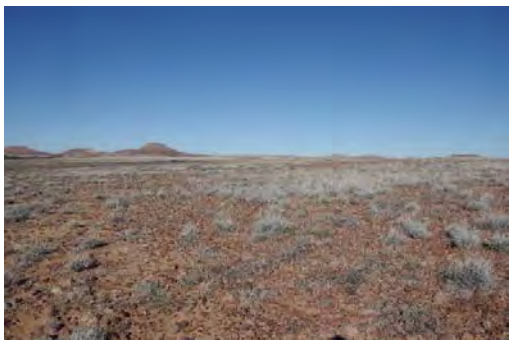
Census stop SL08	2015	2019
Corner point 1		
Right (to centre of eastern quadrant)		
Left (to centre of western quadrant)		
Corner point 2		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL08	2015	2019
Corner point 3		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		
Corner point 4		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL08	2015	2019
Corner point 5		
Right (to centre of western quadrant)		
Left (away from western quadrant)		
Corner point 6		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

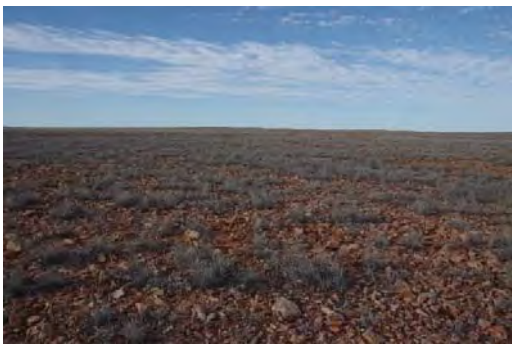
Census stop SL08	2015	2019
Corner point 7		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL09	2015	2019
Corner point 1		
Right (to centre of eastern quadrant)		
Left (to centre of western quadrant)		
Corner point 2		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL09	2015	2019
Corner point 3		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		
Corner point 4		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL09	2015	2019
Corner point 5		
Right (to centre of western quadrant)		
Left (away from western quadrant)		
Corner point 6		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL09	2015	2019
Corner point 7		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL10	2015	2019
Corner point 1		
Right (to centre of eastern quadrant)		
Left (to centre of western quadrant)		
Corner point 2		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL10	2015	2019
Corner point 3		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		
Corner point 4		
Right (to centre of eastern quadrant)		
Left (away from eastern quadrant)		

Census stop SL10	2015	2019
Corner point 5		
Right (to centre of western quadrant)		
Left (away from western quadrant)		
Corner point 6		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

Census stop SL10	2015	2019
Corner point 7		
Right (to centre of western quadrant)		
Left (away from western quadrant)		

APPENDIX IV – TRANSECT PHOTOS

Original photographs are available from FOIR for analysis if required.

See Appendix I for census stop locations and Fig. 1 for survey method. Line transects (A-H) were carried out along the sides of the two 500m-sided squares at each census stop.

Census stop SL01 Date: 30/07/2019 Commenced: 09:05
Weather: Cool (15C), strong wind
Number of observers: 6

Transect A	Floodplain with saltbush and occasional Coolibah. 20% vegetation cover	
		
Hole with tracks	*Atriplex nummularia*	*Atriplex nummularia*
		
Bulbine alata	*Leiocarpa leptolepis*	*Atriplex holocarpa*
		
Euphorbia stevenii	Red Spinach (*Trianthema triquetra*)	
Transect B	Floodplain with low saltbush. 80% vegetation cover	
		
Roepera ammophila	*Euphorbia stevenii*	Stone flake

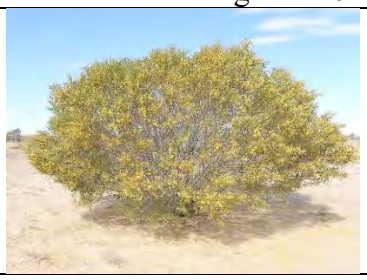
		
Salsola australis Australian Tumbleweed		Cattle tracks
Transect C	Floodplain. Desiccated forbs. 10% vegetation cover. Saltbush to south and east.	
		
Ant/termite castings?	Unusual, very heavy rock - meteorite?	Cattle pad
		
Rhodanthe microglossa	*Rhodanthe microglossa*	
Transect D	Edge of sandy rise. Saltbush, ephemeral forbs. 50% vegetation cover.	
		
Calotis multicaulis	*Triraphis mollis*	*Tribulus sp.*
		
Erodium cygnorum	*Swainsona villosa*	*Euphorbia ferdinandi var. ferdinandi*

		
Gnephosis eriocarpa	*Euphorbia drummondii*	*Leiocarpa leptolepis*
		
Central Bearded Dragon in hole		
Transect E	Sandy floodplain with scattered saltbush and occasional emergent Coolibah and desiccated *Sclerolaena*.	
		
Scattered saltbush	Kangaroo Scats	*Erodium cygnorum*
		
Eremophila glabra	Drought affected *Senna* shrubs	*Maireana aphylla*
		
Corvid tracks		

Transect F	Floodplain. Emergent *Hakea*. Depression. 40% vegetation cover.	
		
Gnephosis eriocarpa	Sandplain	*Senna artemisioides*
Transect G	Floodplain - undulating with *Senna* and Whitewood	
		
Bulbine alata		
Transect H	Saltbush floodplain.	
		
Red Spinach (*Trianthema triquetra*)	*Rhodanthe microglossa*	*Leiocarpa leptolepis*, Billy Button and spider hole
		
Sclerolaena sp.		

Census stop SL02 Date: 30/7/2019 Commenced: 11:30
Weather: Fine, cloudy, stiff breeze, cool.
Number of observers: 6

Transect A	Coolibah floodplain with scattered desiccated forbs. 40% vegetation cover.	
		
Lizard hole and tracks	Ant nest & daisy seed husks	*Eremophila maculata*
		
Kangaroo scrape and pellets	Stone flake	
Transect B	Floodplain in open Coolibah woodland. 40% vegetation cover.	
		
Euc. coolabah	Kangaroo tracks	*Rhodanthe sp.*
		
Seeds of Darling Lily, *Crinum flaccidum*	*Calotis sp.*	

Transect C	Floodplain, saltbush and scattered Coolibah. 40% vegetation cover.	
		
Cattle pad	Old vehicle track/shot-line at 270 m	*Sclerolaena bicornis*
		
Acacia ligulata	*Acacia ligulata*	*Atalaya hemiglauca,* Whitewood
		
Podaxis pistillaris, Desert Shaggymane	Dessicated *Ptilotus sp.*	
Transect D	Crest of white dune. Scattered Whitewood, desiccated forbs and tussock grass. 40% vegetation cover.	
		
Ptilotus xerophilus	*Acacia ligulata*	*Acacia ligulata*

Transect E	Coolibah floodplain with scattered desiccated forbs. 40% vegetation cover.	
		
Eremophila maculata	Depression with dried forbs	
Transect F	Coolibah floodplain, scattered lignum saltbush. Depressions with dried forbs. 20% vegetation cover.	
		
Chenopodium auricomum, Golden Goosefoot		
Transect G	Coolibah floodplain with scattered saltbush. 40% vegetation cover.	
No photos		
Transect H	Floodplain with scattered saltbush and dried forbs in depressions. 20% vegetation cover.	
		
General terrain		

Census stop SL03 Date: 1/8/2019 Commenced: 10:50
Weather: Fine, cool, southerly breeze.
Number of observers: 6

Transect A	Dune slope with Coolibah and Whitewood. Ephemeral herb understory.	
		
Ant nest with seed husks	Some of the many cattle pads; fresh tracks, erosion	*Ptilotus sp.*
		
Ptilotus sessilifolius	*Hakea leucoptera* & *Acacia tetragonophylla*	*Acacia tetragonophylla* regeneration
		
Herbs inc. *Senecio gregorii*	*Senecio gregorii*	Bee Fly
Transect B	Dune slope, grassland with scattered *Hakea*. 70% vegetation cover.	
		
Gnephosis eriocarpa	*Beplessia dispar*, Lumpy Beplessia	*Nacaduba biocellata*, Double-spotted Line Blue

		
Theclinesthes serpentata, Saltbush Blue	*Nacaduba biocellata*, Double-spotted Line Blue	*Acacia victoriae*
		
Cattle pad, fresh tracks	*Swainsona flavicarinata* & *Rhodanthe microglossa*	Pig scats
Transcect C	Coolibah floodplain with Goosefoot and Old Man Saltbush, ephemeral grasses and herbs. 90% vegetation cover.	
		
Fresh kangaroo scrape and droppings		Pig droppings at 200m
Transcect D	Dune slope with open shrubs – *Hakea*, *Senna*, scattered Whitewood. 50% vegetation cover.	
		
Polycalymma stuartii	Stone flakes on scald	

		
Sclerolaena bicornis	*Atalaya hemiglauca*, Whitewood along drainage line.	*Heliothis punctifera*, Lesser Budworm Moth
		
Seeds around an ant nest	*Tragus australianus* Small Burr-grass	*Eragrostis dieselii*
Transect E	Undulating – low dune – Coolibah and Whitewood, ephemeral herb understory.	
		
Ephemeral grass cover – quite dense *Aristida*, *Panicum*		*Erodium cygnorum*
		
Calotis sp.		
Transect F	Undulating Coolibah sandplain with understory of *Sc. dicantha*, ephemeral herbs, grasses. 50% vegetation cover.	
		
Maireana campanulata fruiting	Developing erosion swale/channel; cattle tracks	Cow splat, fairly recent

		
Rhodanthe & Calotis flowers in channel	*Neobassia proceriflora*	
Transect G	Low dune slope. Coolibah with scattered saltbush and lignum; one *Er. bignoniflora*. Understory of ephemeral herbs and grasses. 60% vegetation cover.	
		
Cattle pad	*Acacia victoriae*	Good cover of grasses
		
View to saltbush-filled flood plain and opposite towards low dune		*Acacia oswaldii*
		
View to stand of *Senna artemesoides* and *Atalaya hemiglauca* at crest of dune and up low slope		*Swainsona villosa*
		
Goodenia cycloptera		

Transect H	Dune slope with mix of *Dodonea* and *Senna* with understory of *Sclerolaena dicantha* and ephemeral herbs and grasses. 25% vegetation cover.	
		
Gnephosis eriocarpa	Erosion channel down side of dune	Stand of Golden Goosefoot

Census stop SL04 Date: 1/8/2019 Commenced: 08:45
Weather: Fine, cool, steady southerly breeze.
Number of observers: 6

Transect A	Coolibah floodplain with understory of ephemeral herbs and scattered Golden Goosefoot.	
		
Termite casting	Horse/donkey tracks, fresh	*Duma florulenta* & juvenile *Euc. coolabah*
		
Old, deep cattle pad		
Transect B	Floodplain with Coolibah and scattered lignum. 25% vegetation cover.	
		
Cattle tracks, fresh	Coolibah regeneration @50m	Stone flake @140 m
		
Enneapogon avenaceus	*Euc. coolabah*	Dingo scats

Transect C	Coolibah floodplain, grassy understory with claypan. 50% vegetation cover.	
		
Ephemeral plants succumbing to drought	*Acacia sp.* on claypan	
		
Red Spinach (*Trianthema triquetra*)	*Euphorbia stevenii*	*Sclerolaena sp.* & dry *Dactyloctenium radulans*
		
Scats? dingo	Dry grass	
Transect D	Floodplain with Goosefoot. 50% vegetation cover.	
		
Eremophila maculata	*Euc. coolabah* with understory shrubs	*Duma florulenta*
		
Sclerolaena sp.	*Beplessia dispar*, Lumpy Beplessia	Goat? scats

Transect E	Coolibah floodplain, understory of ephemeral herbs and scattered Golden Goosefoot. 20% vegetation cover.	
		
Cattle pad	Stressed Coolibah, *Euc. coolabah*	Stand of lignum *Duma florulenta*
		
Stressed *Chenopodium auricomum*, Golden Goosefoot		
Transect F	Coolibah floodplain. Golden Goosefoot. Understory of Button Grass. 10% vegetation cover.	
		
Cattle pad	*Eremophila bignoniiflora*	
Transect G	Coolibah floodplain with scattered dry Golden Goosefoot and Button Grass. 20% vegetation cover.	
		
Panicum decompositum (dried)	Babblers' nest in Coolibah	

Transect H	Coolibah floodplain with Golden Goosefoot, lignum. 10% vegetation cover.	
		
Red Spinach (*Trianthema triquetra*)	Babblers' nest	

Census stop SL05 Date: 31/7/2019 Commenced: 10:42
Weather: Fine, cool, steady southerly wind.
Number of observers: 6

Transect A	Coolibah floodplain with scattered *Eremophila* and forbs. 40-50% vegetation cover.	
		
Horse/donkey scats	Cattle print	Strzelecki Creek
		
Buffel Grass near Strzelecki Creek	Active lizard burrow	*Rhodanthe moschata,* Musk Sunray
Transect B	Coolibah floodplain with Eremophila and grassy understory. 40% vegetation cover.	
		
Cattle tracks on flood plain	*Eremophila maculata*	
		
Horse/donkey scats	Small mammal or reptile scat	

Transect C	Coolibah floodplain with grass and forbs. 60% vegetation cover.	
		
Dentella pulvinata	Feathers ?Little Eagle	Grindstone found lodged in tree fork.
		
Strzelecki Creek	Waterhole on Strzelecki Creek	*Senecio lacustrinus*
Transect D	Coolibah floodplain near waterhole. Riparian. 60% vegetation cover.	
		
Erosion gullies		
Transect E	Coolibah floodplain with scattered *Eremophila* and desiccated forbs. 40% vegetation cover.	
		
Sand plain with sparse trees	*Hakea* & *Senna* shrubland	*Atalaya hemiglauca* & *Eremophila sp.*

		
Senna artemisioides subsp. petiolaris	*Tragus australianus* Small Burr-grass	Dessicated ephemeral herbs
		
Horse droppings	*Senna pleurocarpa*	*Ptilotus obovatus*
		
Dodonaea viscosa subsp. angustissima		
Transect F	Dune edge – undulating sandplain. 50% vegetation cover.	
		
Wind erosion on sand plain	*Eragrostis dieselii*	*Triraphis mollis*
		
Small mammal or reptile scats	*Rhodanthe moschata,* Musk Sunray	*Gnephosis eriocarpa*

		
Acacia ligulata		
Transect G	Dune crest with scattered *Ac. ligulata* and *Ac. victoriae*. Understory of forbs. 50% vegetation cover.	
		
Cracking flood plain with dead *Dactyloctenium radulans* (Button Grass)		
Transect H	Coolibah floodplain with occasional emergent *Eremophila*. Understory of ephemeral grasses and herbs. 20% vegetation cover.	
		
Horse droppings		

Census stop SL06 Date: 27/7/2019 Commenced: 08:45
Weather: Fine, cool breeze.
Number of observers: 6

Transect A	Gibber plain with creek-line. 90% gibber, 10% vegetation.	
		
Vehicle tracks across gibber plain	*Rhodanthe stricta*	*Rhodanthe microglossa*
		
Senna artemisioides	*Euphorbia tannensis*	Flood plain from gibber rise
		
Cenchrus ciliaris, Buffel Grass on flood plain	*Rhodanthe microglossa* & *Lepidium sp.*	Dead *Acacia* on the flood plain
Transect B	Open Red Mulga. Many dead *Acacia*. 25% vegetation cover.	
		
Reptile hole?	*Ptilotus xerophilus*	

Transect C	Gibber. 20% vegetation cover.	
		
Gnephosis eriocarpa	*Leiocarpa leptolepis*	Highly stressed River Red Gum in creek-line
Transect D	Floodplain, scattered Buffel Grass. 50% vegetation cover.	
		
Flood plain with scattered Buffel Grass	*Grevillea striata*, Beefwood	
		
Acacia ligulata	*Goodenia cycloptera*	*Atriplex holocarpa*
		
Enneapogon avenaceus	*Astrebla pectinata*	
Transect E	Gibber rise dissected with creek-line. 10% vegetation cover.	
		
Gibber plain & creek-line	*Acacia cyperophylla*	

		
Maireana sp.	*Euphorbia stevenii* & *Sclerolaena sp.*	*Sclerolaena sp.*
Transect F	Gibber plain dissected with *Acacia cyperophylla* creek-line. 20% vegetation cover.	
No photos		
Transect G	Main creek –*Acacia cyperophylla* – Gibber rise, erosion – *Sclerolaena*, *Rhodanthe*, *Atriplex*, Mitchell Grass. 40% vegetation cover.	
		
Gibber plain & creek-line	*Frankenia sp.*	*Rhodanthe microglossa* & *Goodenia sp.*
		
Erodium aureum	*Ptilotus xerophilus*	*Rhodanthe stricta*
		
Senna artemisioides subsp. oligophylla	*Euphorbia tanensis* & *Sclerolaena sp.*	*Sclerolaena sp.*

		
Atriplex holocarpa		
Transect H	Gibber rise, *Sclerolaena*. 20% vegetation cover.	
		
Ephemeral saltbushes	Red Spinach (*Trianthema triquetra*)	

Census stop SL07 Date: 27/7/2019 Commenced: 11:10
Weather: Fine, cool, light northerly breeze.
Number of observers: 6

Transect A	Stony rises, creek-lines with *Acacia*, Coolibah. 20% vegetation cover.	
		
Frankenia sp.	Buffel Grass along the creek	*Acacia cyperophylla & Acacia aneura*
		
Acacia cyperophylla		
Transect B	Gibber / creek-line with Mulga. 25% vegetation cover.	
		
Acacia aneura	Creek-line with *Acacia aneura*	
Transect C	Gibber plain with scattered *Astrebla* and dead ephemerals. 5% vegetation cover.	
		
Dead vegetation on gibber plain		

Transect D	Edge of creek/gibber. 40% vegetation cover.	
		
Dead *Acacia* & *Eremophila sp.* along erosion channel		
Transect E	Stony rises – dissected with *Ac. ceratophylla* creek-line and Mulga further up hillside.	
		
Acacia cambagei, Senna sp. & Santalum sp.	*Acacia cambagei* at base of hill	Gibber slopes with sparse vegetation
		
Stone flakes	Drought stressed *Maireana sp.*	*Acacia cambagei* trees with *Acacia tetragonifolia* & *Eremophila freelingii*
Transect F	Steep, rocky hillside with scattered *Ac. eremophila*. 15% vegetation cover.	
		
Small mammal or reptile pop-hole.	Ochre cliffs	Ridge top view across to mesas

		
Conglomerate rock (star burst)	Scattered shrubs across slopes leading to nearby gully	
		
Eremophila freelingii Rock fuschia		
Transect G	Rocky hillside. 15% vegetation cover.	
		
Creek with *Acacia* woodland		
Transect H	Stony rise. 15% vegetation cover.	
		
Stressed and dying shrubs	Small amount of vegetation on road verge	

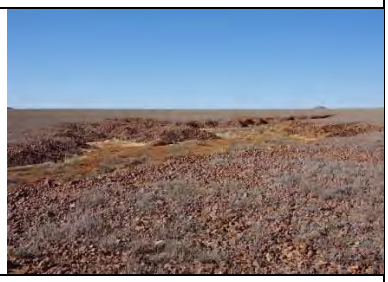
Census stop SL08 Date: 28/7/2019 Commenced: 10:45
Weather: Fine, strong breeze.
Number of observers: 6

Transect A	Gibber rise with Mulga creek-line. 20% vegetation cover.	
		
Emu scats	*Acacia* woodland along creek-line	
		
Kangaroo scats	Stressed *Acacia* along creek	*Heliothis punctifera*, Lesser Budworm Moth
Transect B	Stony rise with creek-line. Some dead Red Mulga. 20% vegetation cover.	
		
Saltbushes on stony rise	Dark strata on gibber rise	*Minuria leptophylla*
		
Kangaroo scratchings	Kangaroo scats	Rabbit warren on upper slopes of mesa (inactive?)

		
Rabbit warren on upper slopes of mesa	Soft chalky strata at top of mesa with boulders from former hard cap of mesa	*Eremophila* shrubs and dead *Acacia* on slope of mesa
Transect C	Mesa. Open shrubland - *Eremophila*, *Scaevola*, saltbush. Mulga on lower slopes.	
		
Eroding cap of mesa	Stony slopes with sparse *Acacia cambagei*	
Transect D	Gibber slopes. Desiccated forbs. Occasional shrubs. 20% vegetation cover.	
		
Sida sp.		
Transect E	Gibber rise and mesa. Desiccated forbs with very occasional remnant Mitchell Grass tussock. 20% vegetation cover.	
		
Acacia cambagei on creek-line	Gibber plain between creeks	

Transect F	Gibber slope to Gidgee creek-line. 30% vegetation cover of desiccated forbs – Burr Daisy and occasional saltbush.	
		
Euphorbia tannensis	*Acacia cambagei* at head of creek	
Transect G	Rocky hillside with 15% vegetation cover including dead forbs with occasional emergent Gidgee and *Senna*.	
		
Views along transect		*Scaevola spinescens*
		
Saltbushes	*Sclerolaena sp.*	*Senna sp.*
		
Dessicated tussock between rocks	View along transect	
Transect H	Gibber slopes and eroded mesas. Dissected erosion channels with Gidgee, *Eremophila* and Mulga. 20% vegetation cover.	
No photos		

Census stop SL09 Date: 28/7/2019 Commenced: 08:55
Weather: Fine, cool, light breeze.
Number of observers: 6

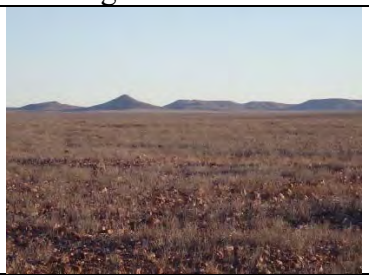
Transect A	Gibber rise dissected by major creek filled with Gidgee and Red Mulga.	
		
Gibber plain with distant creek-line	Camel droppings (old)	
Transect B	Edge of creek-line. 5% vegetation cover on surrounding gibber. 20% vegetation cover on creek-line.	
		
Seedling wattles on creek-line	*Acacia sp.* along creek-line	Erosion spreading from old shot-line
		
Dead saltbush on gibber plain	Surface of gibber plain	
Transect C	Gibber slopes, many dead forbs. 10% vegetation cover.	
		
Ant nest	Kangaroo scrape and scats	

Transect D	Gibber plain, dead forbs. 10% vegetation cover.	
		
Camel footprint	Conglomerate rock	Dead herbs
		
Euphorbia stevenii	Egg, species unknown	
Transect E	Gibber rise dissected by major creek filled with Gidgee and Red Mulga (*Ac. cyperophylla)*, scattered dead forbs. 20% vegetation cover.	
		
Acacia spp. at creek-line	*Acacia cyperophylla*	Gibber plain
		
Acacia spp. at creek-line		
Transect F	Gibber rise. 20% vegetation cover.	
		
Euphorbia stevenii	Gibber plain	*Acacia* at creek-line

		
Erodium sp. at base of dead shrub		
Transect G	Gibber slope with erosion channels and desiccated forbs. 15% vegetation cover.	
		
Gibber plain		
Transect H	Gibber rise with 20% vegetation cover of desiccated forbs. Burr Daisy prevalent.	
		
Creek-line		

Census stop SL10 Date: 27/7/2019 Commenced: 16:05
Weather: Fine, light breeze, 25C.
Number of observers: 6

Transect A	Stone/gibber plain. 15% vegetation cover.	
		
Strata of black rocks on gibber plain		
Transect B	Stony plain. 5% vegetation cover. Few living plants.	
		
Reptile hole		Dessicated plants of *Dissocarpus paradoxus*
		
Cracking clay and dessicated herbs	Camel print and track	Cattle and camel tracks along old shot-line
Transect C	Gibber plain. 5% vegetation cover. Few living plants.	
		
Camel print	Camel scats	
Transect D	Gibber plain. Few living plants. 5% vegetation cover.	
No photos		

Transect E	Stony rise. 15% vegetation cover – dead forbs.	
No photos		
Transect F		
		
Dessicated plants of *Dissocarpus paradoxus*	Gibber plain	Erosion chanel in gilgai with dead saltbushes
		
Spongy clay in gilgai		
Transect G	Stony/gibber rise dissected with erosion channels. 40% vegetation cover – dead *Dissocarpus*.	
		
Cracking gilgai with dead forbs	Gibber plain with dead forbs	
Transect H	Stony rises. Undulations dissected with erosion lines. 35% vegetation cover.	
		
Gibber plain with dead chenopods	Gibber plain with dead chenopods	

APPENDIX V – LIST OF FLORA

Grasses	
Astrebla pectinate	Mitchell Grass
Astrebla squarrosa	Mitchell Grass
Aristida halosericea	Kerosene Grass
Aristida	
Cenchrus ciliaris	Buffel Grass
Chloris pectinate	Comb Windmill Grass
Dactyloctenium radulans	Button Grass
Enneapogon avenaceus	Common Bottlewasher
Enteropogogon acicularis	Curly Windmill Grass
Eragrostis australasicus	Swamp Canegrass
Eragrostis dieselii	Lovegrass
Eragrostis eropoda	Woolybutt
Leptochloa digitate	Umbrella Canegrass
Panicum decompositum	Native Millet
Paractaenum refractum	Bristlebrush Grass
Tragus australianus	Small Burr-grass
Triodia basedowii	Hard Spinifex
Triraphis mollis	Purple Plume Grass
Tripogon loliiformis	Five Minute Grass
Zygochloa paradoxa	Sandhill Canegrass
Forbs Herbs Small shrubs	
Abutilon otocarpum	
Alternanthera nodiflora	
Atriplex halocarpa	Pop Saltbush
Atriplex nummalaria	
Atriplex velutinella	
Boerhavia sp.	
Bulbine alata	Bulbine Lily
Calotis multicaulis	Bogan Flea
Chenopodium auricomum	Golden Goosefoot
Cleome viscosa	Tick Weed
Crinum flaccidum	Darling Lily
Crotalaria cunninghamii	Bird of Paradise
Crotalaria eremaea	Desert Rattlepod
Datura leichardtii	Datura Apple
Daucus glochidiatus	Wild Carrot
Dentella pulvinata	
Dissocarpus paradoxus	Cannonball
Duma florulenta	Lignum
Einadia nutans	
Enchylaena tomentosa	Ruby Saltbush
Eriochlamys behrii	
Erodium aureum	
Erodium cygnorum	

Euphorbia drummondii	
Euphorbia ferdinandi var.ferdinandi	
Euphorbia stevenii	
Euphorbia tanensis	Caustic Weed
Frankenia serpyllifolia	
Gnephosis eriocarpa	
Goodenia cycloptera	
Goodenia strongfordii	
Lavatera plebeian	
Leiocarpa leptolepis	
Lepidium rotundum	Peppercress
Malvastrum americanum	
Maireana aphylla	
Maireana sp.	
Marsilea drumondii	Nardoo
Minuria leptophylla	
Myriocephalus stuartii	Billy Buttons
Neobassia proceriflora	Soda Bush
Nicotiana megalosiphon	Tobacco Bush
Podax pistillaris	Desert Shaggymane
Portulaca oleracea	
Psoralea cinereal	
Pterocaulon sphaceolatum	Fruit salad plant
Ptilotus macrocephalus	
Ptilotus nobilis	
Ptilotus obovatus	
Ptilotus xerophilus	
Rhodanthe microglossa	Clustered Sunray
Rhodanthe moschata	Musk Sunray
Rhodanthe stricta	
Roepera ammophila	
Salsola australis	Tumbleweed/Rolypoly
Sclerolena bicornis	Goathead Burr
Sclerolena lanicuspis	
Sclerolena dicantha	
Senecio gregorii	Fleshy Daisy
Sida sp.	
Solanum sp.	
Swainsona villosa	
Trianthema triquetra	Red Spinach
Tribulus terrestris	Calthrop
Trichodesma zeylanicum	Cattle Bush
Zaleya galericulata	Hogweed
Zygophyllum sp.	
Trees	
Acacia cambagei	Gidgee
Acacia cyperophylla	Red Mulga

Acacia ligulata	Sandhill W
Acacia murrayana	
Acacia oswaldi	
Acacia stenophylla	River Wattle
Acacia tetragonophylla	Dead Finish
Acacia victoriae	
Atalaya hemiglauca	Whitewood
Capparis mitchelli	Native Orange
Corymbia tumescens	Bloodwood
Dodonea viscosa var. angustissima	Hop Bush
Eremophila bignoniflora	
Eremophila freelingi	
Eremophila maculata	
Eucalyptus camaldulensis	River Red Gum
Eucalyptus coolabah	Coolibah
Grevillea stenobotrya	Sandhill Grevillea
Grevillea striata	Beefwood
Hakea divaricarta	
Hakea leucoptera	Silver Needlewood
Lysiphyllum gilvum	Queensland Bean Tree
Melaleuca linariifolia var. trichostachya	Paperbark
Owenia acidula	Sour Apple
Senna artemisioides subs petiolaris	
Senna artemisioides subs oligophylla	
Senna pleurocarpa	

APPENDIX VI – CLIMATE

The area surveyed falls within the arid zone of north-east South Australia.

A. Rainfall

The closest weather station to the survey area is Bureau of Meteorology (BOM) station number 17028 at Innamincka Station. The rainfall record for this station goes back to 1883, but records are incomplete, with data for several years missing including 2018 and 2019. The nearest station with recent records is the Moomba Airport station, number 17123, about 66 km south-west of Innamincka, for which complete records are available from 1996. However, interpolated data for the missing years for Innamincka Station are shown on the Queensland Government SILO website for Innamincka Station. Fig. 6 shows a comparison of the monthly rainfall data for these two stations since 1996. For both sites, the annual rainfall is seen to be extremely variable with both showing an overall downward trend. The BOM gives the mean annual rainfall for Innamincka as 179.5 mm and for Moomba as 164.1 mm.

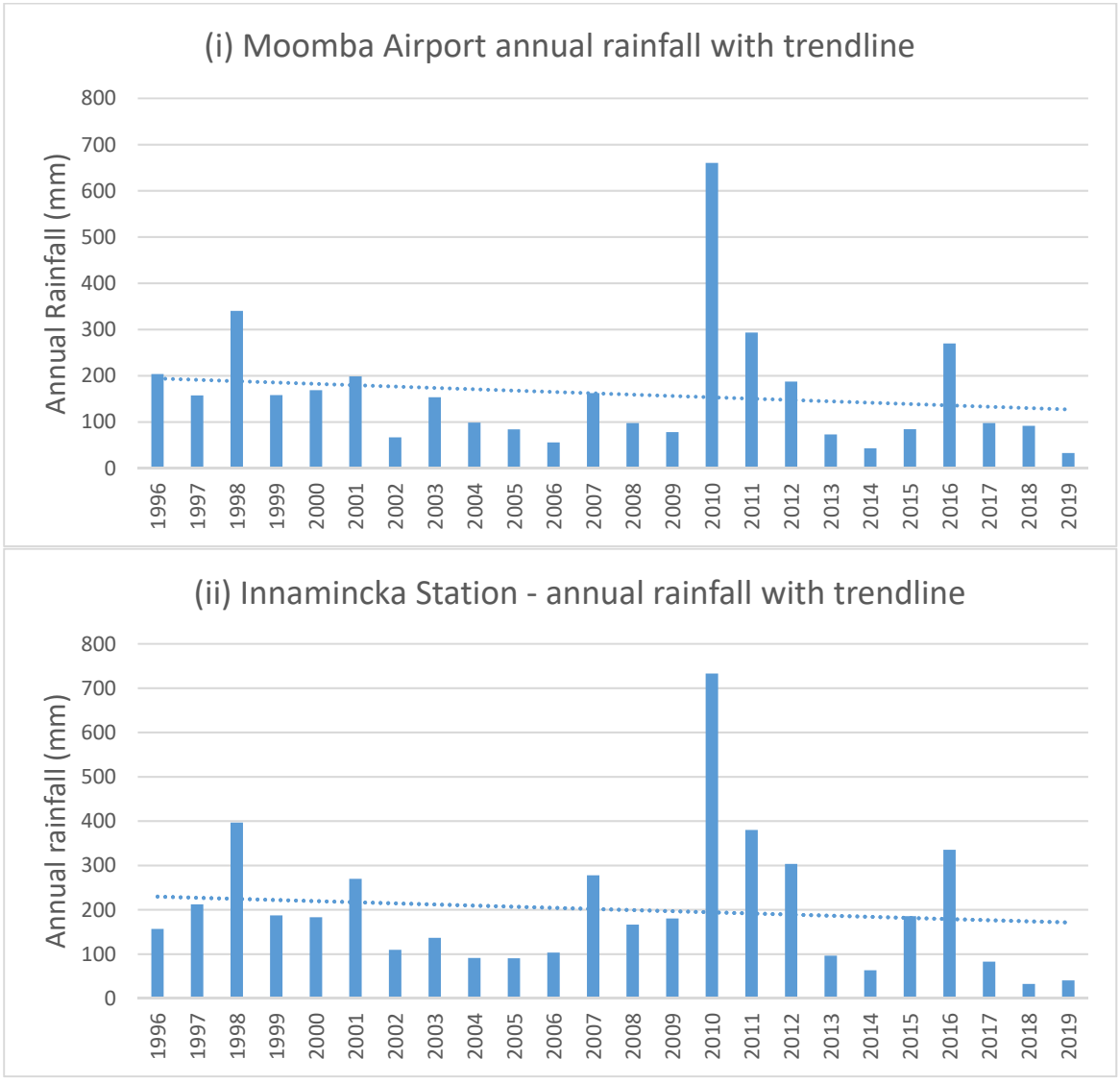


Fig. 6. Rainfall totals per year since 1996 with linear trends. Source: (i) Bureau of Meteorology and (ii) interpolated data from https://www.longpaddock.qld.gov.au/silo/

Of particular relevance for this project are the rainfall records for the 12 months preceding the survey period. Fig. 7 shows that there were some small rainfall events recorded at 2, 4 and 8 months prior to the 2019 survey. Fig. 8 shows a comparison of the overall rainfall data for the region for the years leading up to both the baseline (2015) and repeat (2019) surveys revealing a moderately increased rainfall before the 2015 survey followed by a high rainfall in 2016, but then a progressive and marked fall in overall rainfall preceding the 2019 survey.

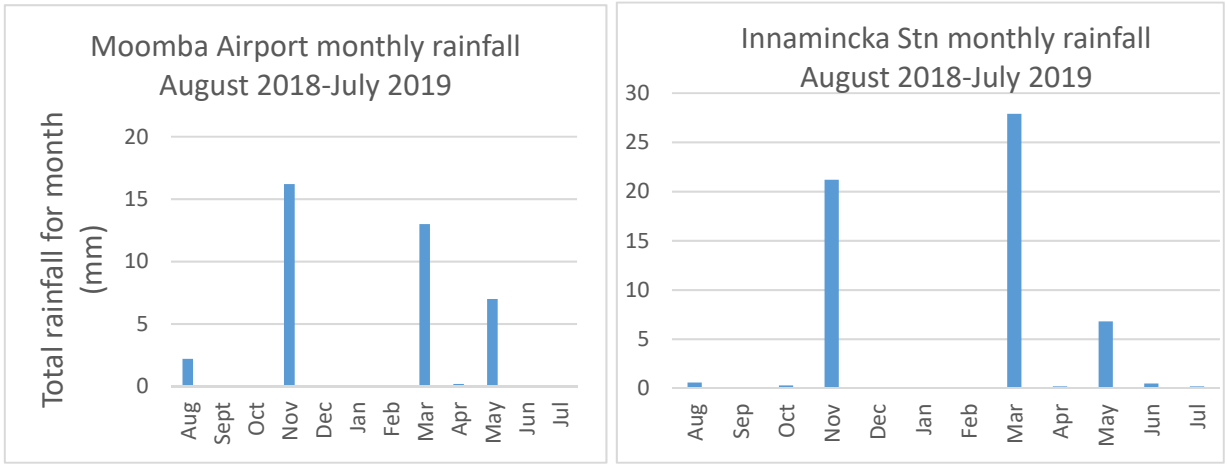


Fig. 7 Monthly rainfall for the 12 months preceding the 2019 survey (Aug 2018-July 2019) Source: Moomba Airport - Bureau of Meteorology; Innamincka Station - SILO

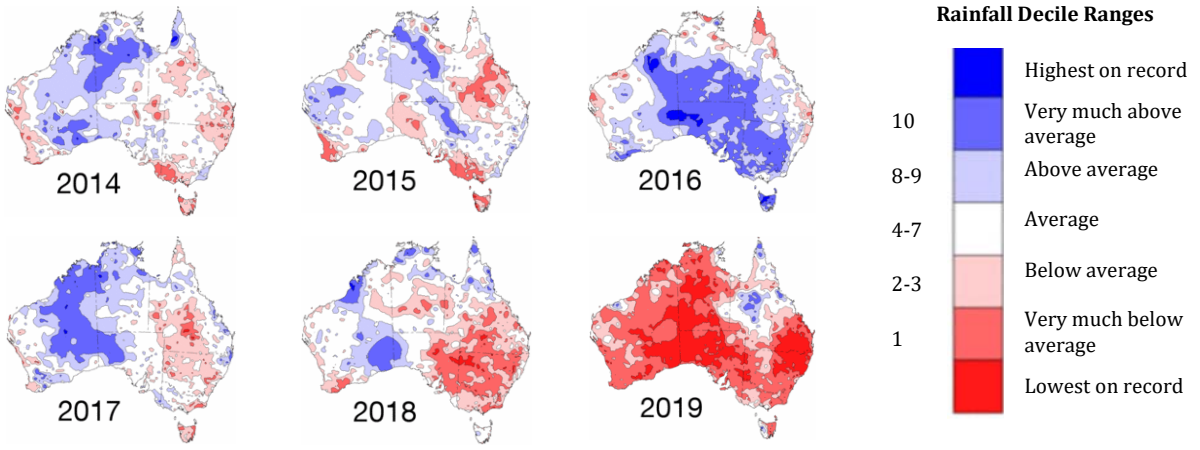


Fig. 8 Maps showing the decile rank of rainfall for each calendar year (2014-2019) based on 120 years of rainfall data[1].
Source: Bureau of Meteorology

[1] **Deciles** are used to give an element a ranking. If, for example, you had 40 years of annual rainfall records, you would first arrange the totals in ascending order (from lowest to highest). Next split them into 10 equal groups, so that in this example there would be 10 groups of four. The first group (four lowest annual rainfalls on record) would be in decile range one, the second group in decile range two, up to the four highest annual totals (highest 10 per cent) being in decile range 10.

B. Temperature

The closest weather station to the survey area that records temperature is Bureau of Meteorology station number 17123 at Moomba Airport. The temperature records go back to 1996. There has been an upward trend in mean daily maximum temperature per year over the period records have been collected (Fig. 9). The Queensland Government SILO temperature chart for the Innamincka Station (albeit including interpolated data) shows a similar trend, as do 12-month mean temperature anomalies compared to a reference period (1961–1990) for the region over the last several years (Fig. 10).

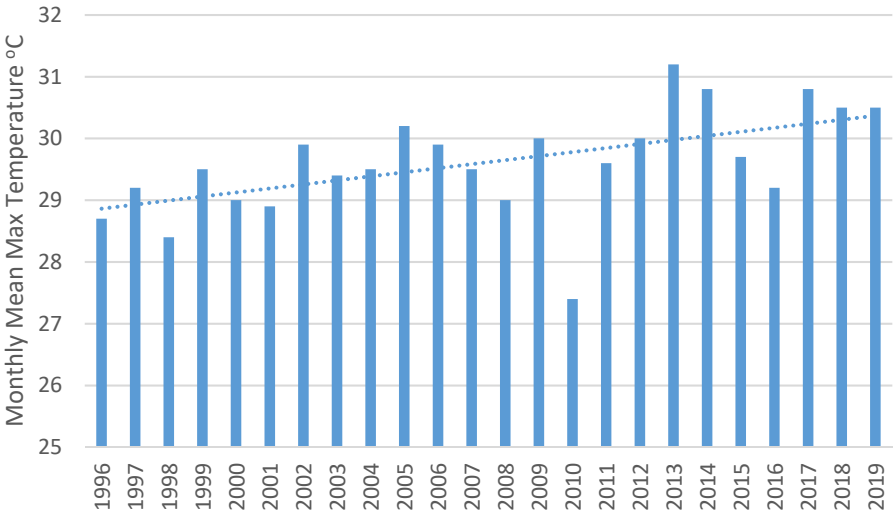


Fig. 9 Moomba Airport (17123) monthly mean maximum temperature with trend (1996-2019).

The monthly mean maximum temperature is the average of all available daily maxima for the month. The daily maximum air temperature is nominally recorded at 9 am local clock time. It is the highest temperature for the 24 hours leading up to the observation, and is recorded as the maximum temperature for the previous day.

Source: Bureau of Meteorology

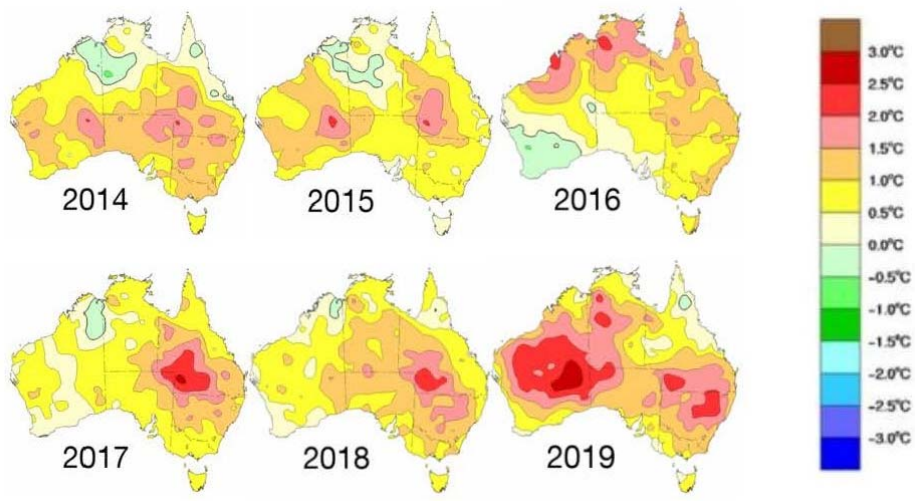


Fig. 10 12-monthly mean temperature anomaly

These maps show the anomaly of mean temperature (°C) for each calendar year, compared to the average over the standard reference period of 1961–1990.

Source: Bureau of Meteorology

APPENDIX VII – USING A GPS TO NAVIGATE TRANSECT SQUARES

Each survey team needs to have at least one member with a GPS unit and some basic skills in using it. Given that a variety of GPS units will be brought to the survey task by different volunteers, the following guidelines are generic in nature.

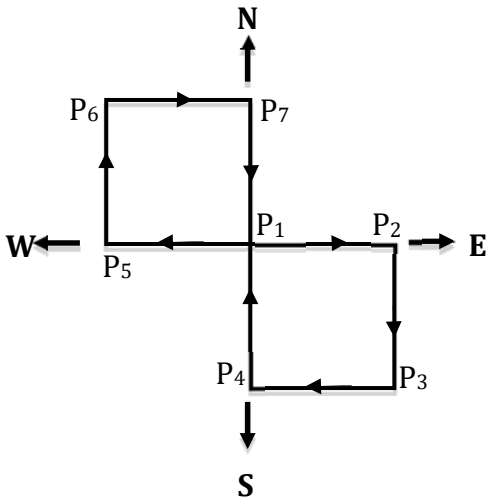
Two alternative methods are given below for navigating the two transect squares for each census stop.

Preliminary Skills

Users should come to the task knowing how to:

1. set up their GPS units to locate positions using
   (a) metric units
   (b) UTM position format
   [for the Innamincka area the UTM zone/band is 54 J and the position is given by a 6 or 7 digit **easting** (depending on whether or not the leading zero is shown) and and a 7 digit **northing**. E.g. 54 J 0467632 6929509. These numbers may appear on two lines, with the easting on the top line. The "54 J" may or may not be shown]
2. mark and find waypoints
3. show, not necessarily on the same page/screen
   (a) the easting and northing for the current position
   (b) the distance from a given waypoint

METHOD 1



Navigating Transect Squares

Starting at census stop 1 corner point 1 (P_1 in the diagram), the survey consists of two transect squares with the 500 m sides oriented along the principal compass directions as shown.

1. Mark P_1 as a waypoint on the GPS unit (e.g. call it waypoint 101). Record the easting and northing in a notebook (see Table below).
2. Select "Find" or "GoTo" waypoint 101 – your unit should tell you that you are already there!
3. Walk in an easterly direction by keeping the northing constant (you may need to adjust it by veering southwards to reduce the northing to the desired value, or by veering northwards to increase the northing to the desired value). It is not necessary to be exactly due east of P_1 at all times so it is quite OK to make detours around obstacles such as thorn bushes!
4. While proceeding eastwards, check your distance from P_1 from time to time. When this distance approaches 500 m adjust your position so that your northing is exactly the same as at P_1 and your distance from P_1 is exactly 500 m. Mark this point as P_2 (e.g. waypoint 102) and record the easting and northing in your notebook.
5. Repeat the above process to locate P_3 , 500 m south of P_2 . This time you will need to keep the easting constant and the northing will decrease as you go.
6. Repeat the above process for each side of the two transect squares.

Notes

- Eastings get larger as you move eastwards and smaller as you move westwards. Northings get larger as you move northwards and smaller as you move southwards.

- A possible format for your record book is shown. Note that eastings and northings are alternatively equal as you move from one point to the next.

Census stop 1 Waypoints

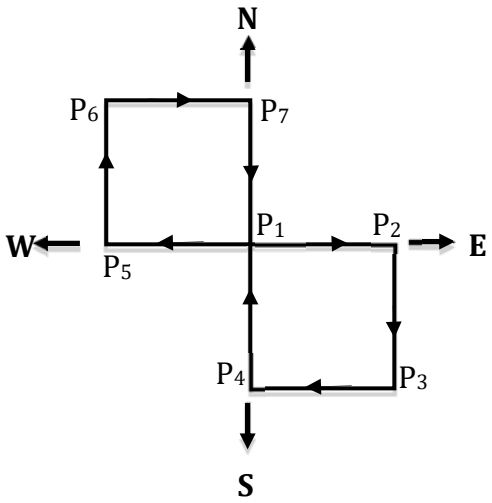
Waypoint	Easting	Northing
101 (P_1)	a	b
102 (P_2)	c	b
103 (P_3)	c	d
104 (P_4)	a	d
101 (P_1)	a	b
105 (P_5)	e	b
106 (P_6)	e	f
107 (P_7)	a	f
101 (P_1)	a	b

METHOD 2

Navigating Transect Squares

Starting at census stop 1 corner point 1 (P_1 in the diagram), the survey consists of two transect squares with the 500 m sides oriented along the principal compass directions as shown.

1. Mark P_1 as a waypoint on the GPS unit (e.g. call it waypoint 101). In a notebook draw up a table as shown below and record the easting ('*e*') and northing ('*n*') of P_1.
2. Calculate the eastings and the northings for the other seven corner points of the survey squares by adding or subtracting 500 as shown by the formulas in the table. Enter all eastings and northings on your table.



Census Stop 1 Waypoints

Waypoint	Easting	Northing
101 (P_1)	*e*	*n*
102 (P_2)	*e*+500	*n*
103 (P_3)	*e*+500	*n*-500
104 (P_4)	*e*	*n*-500
101 (P_1)	*e*	*n*

105 (P_5)	*e*-500	*n*
106 (P_6)	*e*-500	*n*+500
107 (P_7)	*e*	*n*+500
101 (P_1)	*e*	*n*

3. Walk in an easterly direction by keeping the northing constant (you may need to adjust it by veering southwards to reduce the northing to the desired value, or by veering northwards to increase the northing to the desired value). It is not necessary to be exactly due east of P_1 at all times so it is quite OK to make detours around obstacles such as thorn bushes!
4. While proceeding eastwards, monitor the easting of your current position. When this approaches the desired easting (*e*+500) adjust your position so that your northing is exactly the same as at P_1 (*n*) and your easting is exactly (*e*+500). You have now reached the point P_2 (waypoint 102).
5. Repeat the above process to locate P_3, 500 m south of P_2. This time you will need to keep the easting constant and the northing will decrease as you go.
6. Repeat the above process for each side of the two transect squares.

Note

- Eastings get larger as you move eastwards and smaller as you move westwards. Northings get larger as you move northwards and smaller as you move southwards.
- Example calculation:

Census Stop 1 Waypoints

Waypoint	Easting		Northing	
101 (P_1)	*e*	0431028	*n*	6953816
102 (P_2)	*e*+500	0431528	*n*	6953816
103 (P_3)	*e*+500	0431528	*n*-500	6953316
104 (P_4)	*e*	0431028	*n*-500	6953316
101 (P_1)	*e*	0431028	*n*	6953816
105 (P_5)	*e*-500	0430528	*n*	6953816
106 (P_6)	*e*-500	0430528	*n*+500	6954316
107 (P_7)	*e*	0431028	*n*+500	6954316
101 (P_1)	*e*	0431028	*n*	6953816

While it would be possible to manually input these co-ordinates into the GPS unit and to then use the "Find" or "GoTo" function, the process would be time-consuming and tedious and the following of the direction arrow is not likely to give a more precise transect square than the method of maintaining eastings and northings detailed above.

APPENDIX VIII - EQUIPMENT LIST

- EPIRB (if you have one) or Satellite phone (if you have one)
- Hand-held UHF radio for staying in contact while surveying (*to be carried on your person at all times when out of the car, along with at least one set of spare batteries*)
- GPS for each group (*to be carried at all times when out of the car, along with at least one set of spare batteries*)
- Compass (*to be carried on your person at all times when out of the car*)
- Plenty of spare batteries
- Survey sheets and a clip board, notebook and pencils
- Watch for telling the time (or use GPS clock)
- Digital camera with large memory card. Set camera clock to local time to enable you to better relate photos to location.
- Small ruler or measuring card for photographing with tracks etc.
- Car chargers for the various pieces of electronic equipment / rechargeable batteries
- Star picket / dropper, plastic dropper cap, star dropper plunger
- Census stop marker plate stamped for census stop e.g. FOIR CS01, bolt, washer and nut, spanner
- Personal protective equipment (PPE)
- First Aid kit including snake bite kit