

Dakalanta Wildlife Sanctuary Ecohealth Report 2020



Summary

Australian Wildlife Conservancy (AWC) has implemented an Ecological Health Monitoring Program (Ecohealth) to measure the changes in ecological health on Dakalanta Wildlife Sanctuary. This report provides a summary of the biodiversity and threat metrics monitored at Dakalanta, the associated surveys designed and conducted on Dakalanta, as well as a summary of the Ecohealth metric results associated with the most recent surveys (conducted in 2018) and trends over time where possible.

Environmental change in highly modified semi-arid environments is usually slow, such that surveys are not required every year. Surveys are best carried out during wetter or drier than normal years when major changes in the fauna assemblages may be expected.

No ecological surveys were conducted on Dakalanta during 2020. Terrestrial vertebrate fauna surveys (for small-medium mammals and reptiles) were conducted annually from 2011 – 2014 inclusive, and again in 2018. Bird surveys were conducted annually from 2011-2015, and in 2018.

During 2018, a total of 4,920 live-trap nights and 123 bird surveys were conducted. A total of 66 bird species and 25 reptile species were recorded across 41 monitoring sites. Four of the reptile species were recorded for the first time on Dakalanta in the 2018 surveys. The Western Pygmy Possum was the only small mammal indicator species recorded during the 2018 surveys; it occupied 8% of sites. There was an average of 2.5 small-medium reptile species per site, at an abundance of 10.8 individual reptiles per 100 trap nights. On average, 20.9 individual birds and 7.6 bird species were recorded per site. Ground active birds occupied 93% of survey sites.

The higher average species richness and abundance of small-medium reptiles and birds in 2018 compared to earlier surveys is likely due to the survey now being conducted in spring, and the inclusion of additional sites with increased vegetative cover in the revised suite of monitoring sites.

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Document citation: Bellchambers K, Crisp H, Wauchope M, Pierson J, Joseph L, Kanowski J (2021) *Dakalanta Wildlife Sanctuary Ecohealth Report 2020*. Australian Wildlife Conservancy, Perth, WA.

Cover photographs (Clockwise): Juvenile emus amongst regrowth *Callitris gracillis*, AWC/Wayne Lawler; Southern Hairy-nosed Wombat at dusk, AWC/Wayne Lawler; Mallee Triodia habitat, AWC/Wayne Lawler; Tawny Frogmouth in remnant Drooping She-oak. AWC/James Dunlop

Introduction

Australian Wildlife Conservancy (AWC) owns or works in partnership across 30 properties in Australia, covering almost 6.5 million hectares, to implement our mission: *the effective conservation of Australian wildlife and their habitats*. AWC relies on information provided by an integrated program of monitoring and research to measure progress in meeting its mission and to improve conservation management.

AWC's Ecohealth-Monitoring Program has been designed to measure and report on the status and trends of species, ecological processes and threats on each of these properties (Kanowski et al. 2018). The program focuses on selected indicator species, guilds, processes and threats using metrics that are derived from data collected through a series of purpose-designed surveys. The structure of the Ecohealth Program on each AWC property is as follows. Based on the guidance provided by AWC's over-arching program framework, above, Ecohealth Monitoring Plans are developed, describing the conservation values or assets of each property, and threats to these assets; and setting out the monitoring program that will be used to track the status and trend of selected indicators of these conservation assets and threats. Annual survey plans and schedules are developed to implement these plans. The outcomes of these surveys are presented in annual Ecohealth Reports and summary Ecohealth Scorecards.

This document is the first annual Ecohealth Report for Dakalanta Wildlife Sanctuary ('Dakalanta'). The companion Ecohealth Scorecard presents the indicators and their metrics in a summary format.

Dakalanta Wildlife Sanctuary

Dakalanta is 13,607 ha in size, located in the central-west of the Eyre Peninsula in South Australia (Figure 1). The property is in the Eyre-Yorke Block Bioregion, at the transition between the coastal Talia and the inland Eyre Mallee Subregions (IBRA 7.0). Dakalanta was acquired from Earth Sanctuaries Ltd (ESL) in 2002.

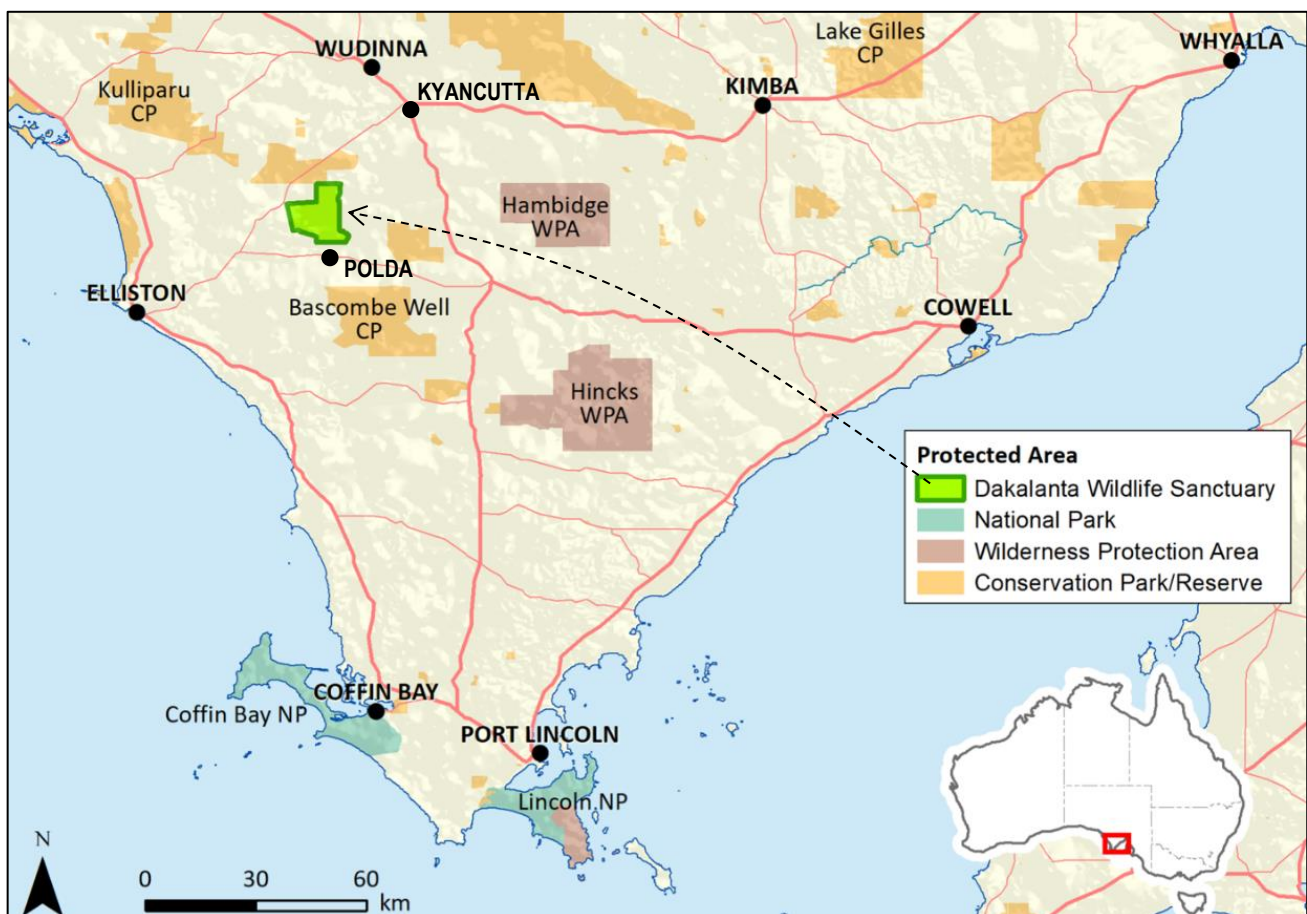


Figure 1. Location and regional context of Dakalanta Wildlife Sanctuary

Prior to its purchase for conservation purposes in the late 1980s by ESL, Dakalanta was known as Minaro Downs. It supported a sheep grazing enterprise concentrated in the southern portion of the property. There

was also an opportunistic cropping enterprise located on deeper, sandier pockets of soil in the cleared central part of the property. Some areas of the property were cleared for cropping and grazing, particularly for sheep. Some sections were chained (i.e., the vegetation was cleared by a chain running between two bulldozers), but were not further developed, allowing the mallee to re-establish. During this time, the property became the subject of a Heritage Agreement between the SA State Government and the landowners, preventing further agricultural land use development, for which the owners were compensated.

Conservation values

Dakalanta contributes to the protection of the ecosystems in the transition area between the two subregions of the Eyre-Yorke Block: the grassy woodlands of the Talia subregion to the south and west, and the mallee woodlands of the Eyre Mallee subregion to the north and east. The area around Dakalanta has a number of conservation reserves and Heritage Agreement areas (Figure 1). Part of Dakalanta's northern boundary is shared with Cocata Conservation Park, administered by the SA Department for Environment and Water. Otherwise, Dakalanta is bounded by broad-scale sheep and/ or cattle grazing properties, some of which have conserved areas of native vegetation via Heritage Agreements.

Vegetation

Dakalanta has 12 broad vegetation communities (Figure 2). The distribution of vegetation communities varies with topography, soil type and past land management practices. The southern portion of the property consists of low rises and flats of calcrete with very shallow soils, which have predominantly been cleared of the original Drooping She-oak (*Allocasuarina verticillata*) grassy woodlands by chaining or grazing. These areas now support extensive grasslands of native and introduced species. Native species of perennial grasses and forbs that remain, such as Wallaby Grass (*Austrodanthonia* spp.), Kangaroo Grass (*Austrostipa* spp.), and Black Grass (*Gahnia lanigera*), are patchily distributed amongst various weed species such as wild oats (*Avena* spp.), nutgrass (*Romulea* spp.), medics (*Medicago* spp.) and Ward's weed (*Carrichtera annua*). This area contains small but important remnant areas of River Red Gum (*Eucalyptus camaldulensis*) woodland, Swamp Paperbark (*Melaleuca halmaturorum*) shrubland and Drooping She-oak grassy woodlands. Southern Cypress Pine (*Callitris gracilis*) is quickly re-establishing in these areas following the removal of livestock.

The central and northern portion of Dakalanta supports a more intact vegetation, consisting of mixed mallee species including Mallee Box (*Eucalyptus porosa*), Coastal White Mallee (*E. diversifolia*), White Mallee (*E. dumosa*), Yalata Mallee (*E. yalatensis*) and White Mallee (*E. phenax*); and Southern Cypress Pine woodlands on low sand ridges or shallow calcareous loam flats, both on the shallow underlying calcrete sheet rock. These northern vegetation communities have been less impacted by past agricultural practices, although some are regenerating from past clearing. There are relatively few weeds within these more intact communities. The understory is generally dominated by shrubs such as wattles (*Acacia* spp.), hopbush (*Dodonaea* spp.), fringe myrtles (*Calytrix* spp.) on the shallower soils, and Spinifex (*Triodia irritans*) on sandier soils.

During 2016 and 2017, with the support of AWC, Landcare Australia established a revegetation program over approximately 1,200 ha of open and degraded vegetation in the southern portion of the sanctuary. This program aimed to recreate the Drooping She-oak grassy woodlands that this area would have originally supported. Locally-collected seed of species associated with this vegetation community was direct sown into the area (Walsh et al. 2019). The Drooping She-oak woodland is a regionally rare plant community, much reduced due to past land management practices and grazing by feral animals.

Dakalanta protects more than 165 native plant species. Sand Bitter-pea (*Davesia arenaria*) and Limestone Bush-pea (*Pultenaea elachista*) are regionally rare species. Up to eight species of native ground orchid have been recorded and some may be threatened species.

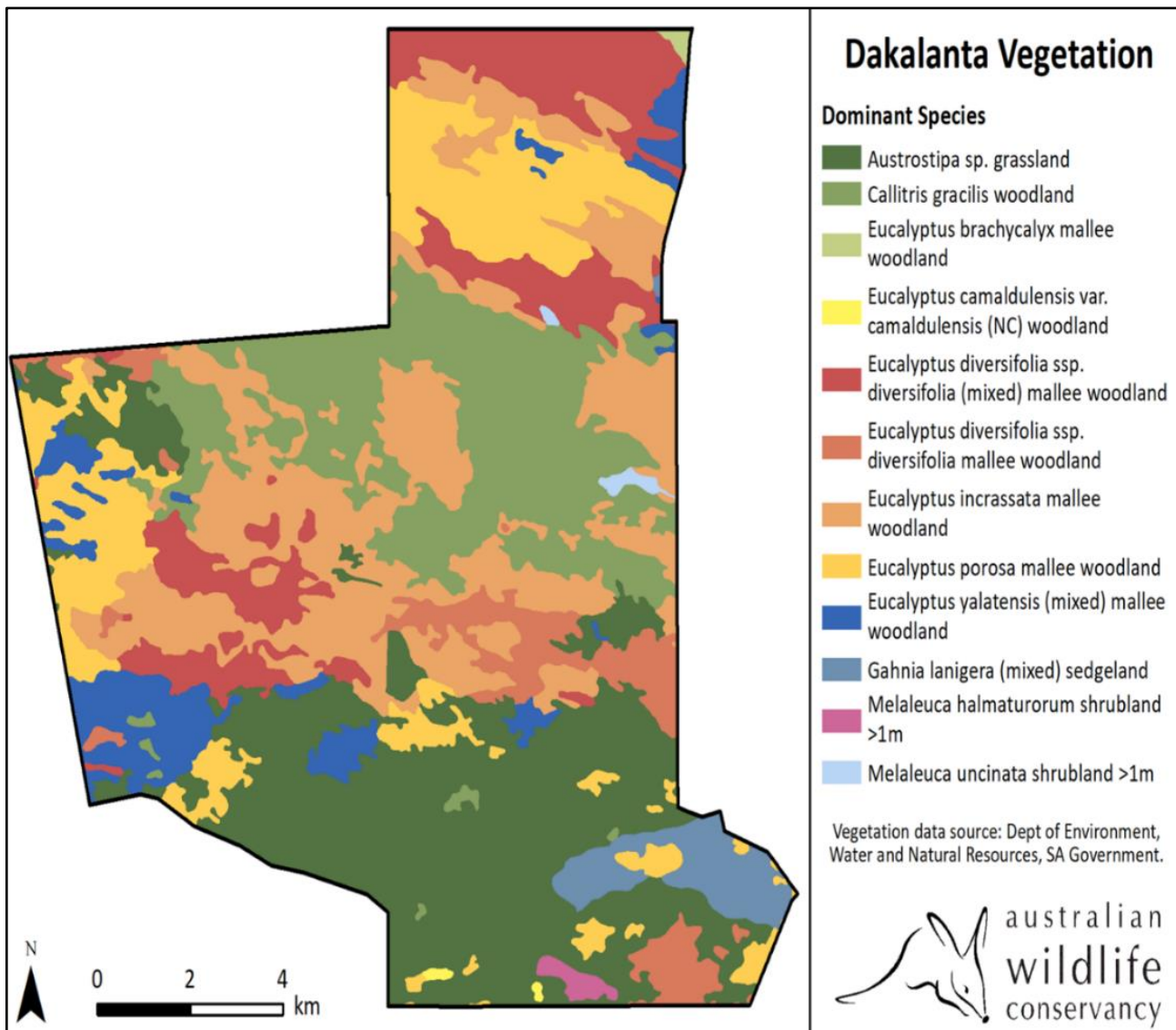


Figure 2. Major vegetation types of Dakalanta Wildlife Sanctuary

Fauna

A total of 179 species of native vertebrates are currently known or considered likely to occur on Dakalanta. These include 14 mammals, 109 birds, 54 reptiles, and two frogs.

Vertebrate assemblages on the Eyre Peninsula are influenced by a biogeographic barrier called the Eyrean Barrier (Keast 1961; Ford 1974). This conceptual dividing line runs through Spencer Gulf and the northern Flinders Ranges. Throughout recent evolutionary history, it split populations of the arid and semi-arid species to the east and west, hindering dispersal. A number of eastern (Bassian) species are not found on Eyre Peninsula, while Eyre Peninsula is the eastern limit of some western (Eyrean) species. The Nullarbor Plain to the west acts as another biogeographic barrier.

Due to the paucity of historic information, the presence of mammal species on Dakalanta prior to European occupation must be deduced from records outside of the region and from present known habitat requirements of these species. Up to 15 vertebrate species of the estimated 42 species thought to have been present on Eyre Peninsula at time of settlement have been lost from Dakalanta (Watts and Ling 1985; Brandle 2010).

More than 170 species of land birds have been recorded from Eyre Peninsula. No bird species are thought to have become extinct on Eyre Peninsula following European settlement. Two species (Diamond Firetail (*Stagonopleura guttata*) and Bush Stone Curlew (*Burhinus grallarius*)) are locally extinct at Dakalanta but are still extant in low numbers elsewhere on Eyre Peninsula.

There are 92 reptile species and four frog species recorded from the Eyre Peninsula. Although little is known of pre-European assemblages, no reptile or frog species are thought to have become extinct in the region.

Threats

Feral animals

A substantial portion of Dakalanta is impacted by feral herbivores, particularly European rabbits (*Oryctolagus cuniculus*). Rabbits generally use burrows of the Southern Hairy-nosed Wombats (*Lasiorninus latifrons*) as warrens, which precludes control by warren ripping. Goats (*Capra hircus*), red deer (*Cervus elaphus*) and fallow deer (*Dama dama*) are uncommonly encountered in small numbers. AWC conducts opportunistic culling of feral herbivores on Dakalanta annually.

Feral predators on Dakalanta are the red fox (*Vulpes vulpes*) and feral cat (*Felis catus*). Numbers of these predators likely fluctuate with rabbit numbers. Since 2010, AWC has implemented an annual 1080 poison baiting program on Dakalanta to control foxes, with one or two baiting events per year. Foxes and cats are also shot opportunistically.

Weeds

Dakalanta supports a number of introduced plant species including African boxthorn (*Lycium ferocissimum*), a 'Weed of National Significance', as well as groundcovers such as onion weed (*Asphodelus fistulosus*), horehound (*Marrubium vulgare*) and salvation Jane (*Echium plantagineum*). Weed management on Dakalanta has largely focused on boxthorn, with over 100 individuals located, mapped and killed to date.

Changed fire regimes

Pre-European fire regimes in the region are poorly known, although fine scale fire management was presumably practiced by Aboriginal people (Gammage 2012). Following European colonisation, pastoralists burnt the grassy woodlands to create forage for livestock, and later settlers cleared the mallee for cropping. Wildfires have been reported on Dakalanta occasionally, but to date have been relatively limited in extent and low intensity.

Climate and weather summary

Dakalanta is located near the boundary of the warm temperate and semi-arid climate zones. It experiences hot dry summers and mild winters. It falls within the winter-dominated rainfall zone.

There are three long-term Bureau of Meteorology recording stations near Dakalanta (Figure 1): Polda (BOM Station #018139), ~5 km to the south-east (ceased operations in 2005); Elliston (BOM Station #018069) on the west coast, and Kyancutta (BOM station #018044) to the north-east. Climate data for the three locations are shown in Table 1.

At Polda, mean minimum and maximum temperatures range from 5°C to 31°C; mean annual rainfall is 397 mm. There is a rainfall gradient from the coast (426 mm at Elliston) inland (311 mm at Kyancutta); Dakalanta is situated somewhere in the middle of this gradient.

Like much of southern Australia, over the last few years, Dakalanta has experienced higher than average temperatures and drought conditions. Annual rainfall at Kyancutta was below average in 2018 and 2019 (251 mm and 225 mm, respectively); 2020 records are incomplete. Conditions throughout 2020 were similar to long term average values for these metrics.

Table 1. Long term average monthly maximum and minimum temperatures and monthly rainfall for Kyancutta, Elliston and Polda weather stations (source: Bureau of Meteorology)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Kyancutta (1930-2021)	Mean max (°C)	33.1	32.4	29.9	25.5	21.1	17.8	17.2	18.7	22.0	25.4	28.7	31.0	
	Mean min (°C)	14.5	14.4	12.4	9.5	7.4	5.3	4.8	5.0	6.3	8.4	10.9	13.0	
	Mean rain (mm)	15	16	14	19	32	38	40	39	31	26	21	20	311
Elliston (Temp 1962-2021, rain 1882-2021)	Mean max (°C)	26.0	25.7	24.3	22.5	19.5	17.2	16.5	17.2	19.4	21.8	23.7	24.8	
	Mean min (°C)	15.8	15.9	14.4	12.3	10.4	8.4	7.9	8.3	9.6	11.2	13.1	14.7	
	Mean rain (mm)	11	14	15	27	52	72	70	59	39	30	19	17	426
Polda (1967- 2005)	Mean max (°C)	31.0	31.3	28.2	24.6	20.4	17.2	16.7	17.7	20.2	23.7	26.9	29.0	
	Mean min (°C)	14.6	14.9	12.8	9.8	7.6	5.6	4.9	5.4	6.7	8.7	11.4	13.4	
	Mean rain (mm)	14	14	15	22	43	53	61	58	45	31	21	23	397

Methods

Indicators and metrics

Dakalanta's Ecohealth Monitoring Program has been designed to measure and report on the status and trends of species, ecological processes and threats on the sanctuary. The program focuses on selected biodiversity and threat indicators, using metrics derived from data collected through a series of purpose-designed surveys. A selection of species or guilds were chosen as biodiversity indicators which fit into one or more of the following categories: (1) declining and/or threatened species or guilds, (2) strong drivers of ecosystem function, or (3) are a member of the full range of taxa (to enable ongoing surveillance monitoring of a range of taxonomic groups to provide early warning of any unexpected declines).

There are 21 biodiversity indicators (species and guilds); the rationale for their selection is recorded for each indicator in Table 2. No surveys were carried out on Dakalanta in 2020. As such, in this report, the methods and results are presented for 16 indicators surveyed most recently in 2018.

Threat metrics are selected to monitor the status and trends of introduced weeds, predators and herbivores and changed fire regimes (Table 3). Ongoing threat control programs, including baiting and weed removal are in place on Dakalanta, however, targeted surveys to monitor threats are under development. As such, with the exception of fire, none of the threat metrics are reported on in this report or the Scorecard.

Table 2. Biodiversity indicators for Ecohealth monitoring program for Dakalanta.

Rationale for selection: T = threatened or declining; D = strong driver of ecosystem function; S = surveillance monitoring. Metric definitions: Population estimate = number of individuals on Dakalanta; abundance = number of individuals/ 100 trap nights (small mammals and reptiles) or mean count per site (birds); occupancy = percentage of sites recorded; richness = mean number of species/ site.

Indicator	Rationale			Survey method	Metric/s
	T	D	S		
Mammals					
Small-medium mammals					
Little Long-tailed Dunnart (<i>Sminthopsis dolichura</i>)	*		*	Box traps, pitfall traps, funnel traps	Abundance, Occupancy
Western Pygmy Possum (<i>Cercartetus concinnus</i>)	*		*	Box traps, pitfall traps, funnel traps	Abundance, Occupancy
Small-medium mammals – all	*		*	Box traps, cage traps, pitfall traps, funnel traps	Abundance, Occupancy
Small-medium mammals – Dasyurid guild	*		*	Box traps, cage traps, pitfall traps, funnel traps	Abundance, Occupancy
Small-medium mammals – Rodent guild	*		*	Box traps, cage traps, pitfall traps, funnel traps	Abundance, Occupancy
Reptiles					
Small-medium reptiles					
Spotted Skink (<i>Ctenotus orientalis</i>)			*	Pitfall traps, funnel traps	Abundance, Occupancy
Barking Gecko (<i>Underwoodisaurus milii</i>)			*	Pitfall traps, funnel traps	Abundance, Occupancy
Peninsula Dragon (<i>Ctenophorus fioni</i>)			*	Pitfall traps, funnel traps	Abundance, Occupancy
Small-medium reptiles - all			*	Box traps, cage traps, pitfall traps, funnel traps	Abundance, Richness
Small reptiles – Agamid guild			*	Pitfall traps, funnel traps	Abundance, Richness
Small reptiles – Skink guild			*	Pitfall traps, funnel traps	Abundance, Richness
Small reptiles – Gecko guild			*	Pitfall traps, funnel traps	Abundance, Richness
Birds					
Malleefowl (<i>Leipoa ocellata</i>)	*			Targeted surveys being developed	TBD
Birds - all			*	Standard bird survey: 2 ha plot 20-min counts	Mean abundance, Richness
Honeyeaters - guild			*	Standard bird survey: 2 ha plot 20-min counts	Mean abundance, Occupancy

Indicator	Rationale			Survey method	Metric/s
	T	D	S		
Woodland birds - guild			*	Standard bird survey: 2 ha plot 20-min counts	Mean abundance, Occupancy
Ground active birds - guild			*	Standard bird survey: 2 ha plot 20-min counts	Mean abundance, Occupancy
Frogs					
Spotted Grass Frog (<i>Limnodynastes tasmaniensis</i>)			*	TBD	Abundance, Occupancy
Frogs – guild			*	TBD	Abundance, Richness
Vegetation					
Drooping She-oak grassy woodland	*		*	Targeted surveys being developed.	TBD
Ground orchids	*			Targeted surveys being developed.	TBD

Table 3. Threat indicators for Ecohealth monitoring program for Dakalanta

Indicator	Rationale	Survey method	Metric/s
Feral predators			
Cat (<i>Felis catus</i>)	Major threat to wildlife	Targeted survey methods under development.	TBD
Fox (<i>Vulpes vulpes</i>)	Major threat to wildlife	Targeted survey methods under development.	TBD
Feral herbivores			
Goat (<i>Capra hircus</i>), red deer (<i>Cervus elaphus</i>), fallow deer (<i>Dama dama</i>)	Threat to vegetation, facilitates weed dispersal	Targeted survey methods under development.	TBD
Rabbit (<i>Oryctolagus cuniculus</i>)	Threat to vegetation, sustains populations of feral predators	Targeted survey methods under development.	TBD
Weeds			
Weeds	Threat to vegetation	Vegetation surveys, targeted surveys under development	TBD
Fire			
Suite of ecologically-relevant metrics calculated for wildfire	Key driver of veg dynamics, structure and composition, habitat attributes	Remote sensing, ground traverse	Extent of wildfire; other metrics TBD

Survey types and history

No surveys were conducted in 2020 due to logistical constraints including reduced travel capability due to Covid-19 regulations. The metrics in this report reflect the survey effort in 2018, which is summarised in Table 4. Standard Trapping Surveys and Diurnal Bird Surveys commenced in 2011.

Table 4. Survey effort for Ecohealth Monitoring Plan surveys on Dakalanta Wildlife Sanctuary in 2018

Survey name	Description/Comment	Previous Surveys
Standard Trapping Survey	41 sites with pitfall, Elliot, and funnel traps. 4,920 trap nights. Stratified to cover a range of geography and major vegetation types.	2011-14 annually: 2014 – 38 sites, 4,560 trap nights
Diurnal Bird Survey	41 survey sites, total of 123 surveys. Each survey was a 20 minute - 2 ha survey on 3 consecutive mornings shortly after dawn with a single observer.	2011-14 annually: 38 sites, total of 114 surveys

References for previous surveys: Bellchambers et al. (2011, 2012, 2013, 2016, in prep).

Survey design

The Dakalanta Ecohealth Monitoring Program is based on 41 permanent survey sites. Three to 12 sites are located in each of five main habitat types (Figure 3). Survey sites were selected based on vegetation type, accessibility, and depth to underlying sheet limestone. Replicates in a habitat type are located at least 500 m apart. Previous surveys covered 38 sites; these were surveyed annually from 2011 to 2014, in March. For the 2018 survey, the number and location of survey sites were revised to better reflect the relative area of each of the five main habitat types on the sanctuary. This revision resulted in some of the original 38 sites being discontinued and new sites being established resulting in a net slight increase in the number of permanent survey sites (to 41). The timing of the survey was also changed from autumn to spring to better fit with survey effort elsewhere in the region. In addition, the planned frequency of surveys was reduced from annually to nominally every three years, as environmental change in semi-arid environments is usually slow enough that surveys are not required every year. Surveys are best carried out during wetter or drier than normal years, when major changes in the fauna assemblages may be expected (Bellchambers and Roshier 2015).

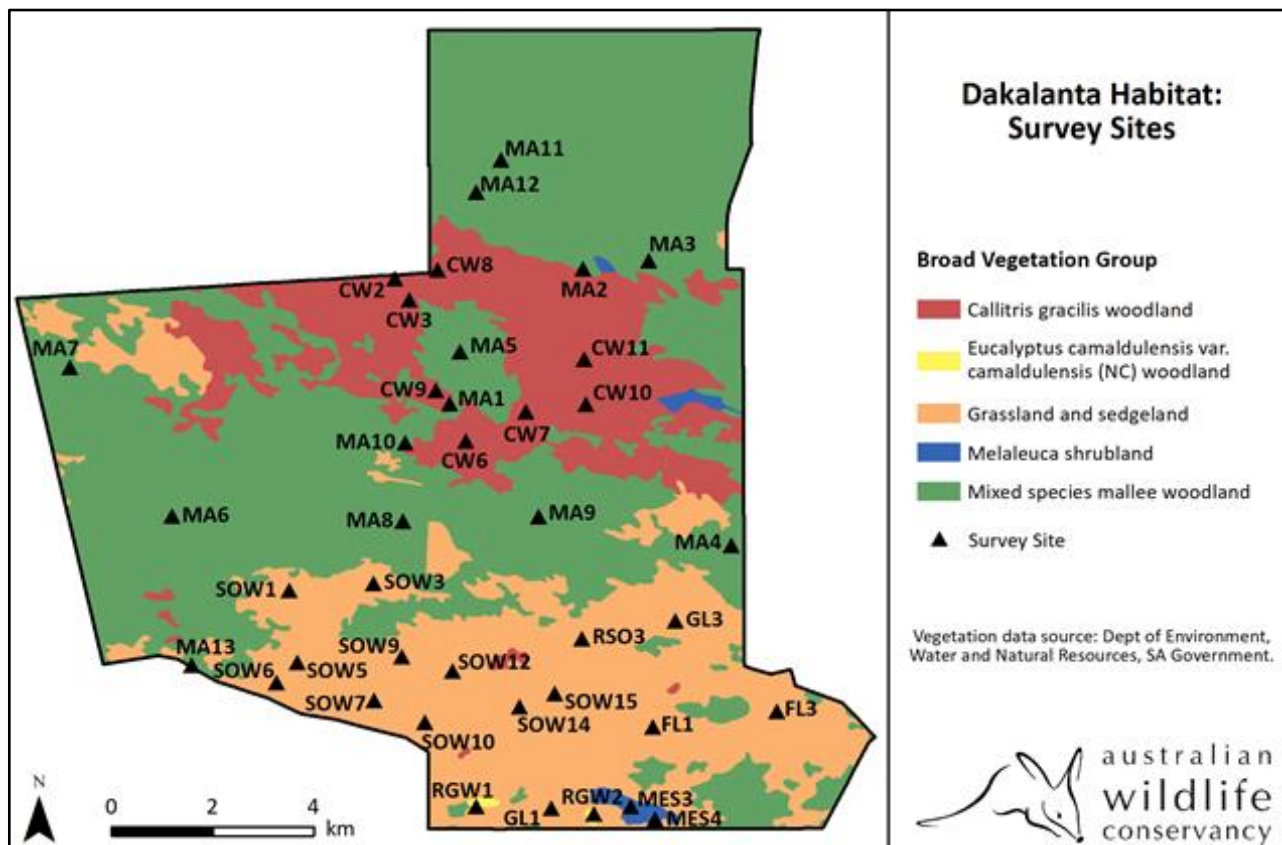


Figure 3. Major vegetation types of Dakalanta indicating locations and names of monitoring sites.

Survey methods

Standard Trapping Survey

The Standard Trapping Survey for small terrestrial vertebrate fauna uses a combination of standard trapping techniques (Elliott box traps, pitfall traps and funnel traps) centred at each of the 41 permanent sites. Each site consisted of two back-to-back 'Y' shapes (each with three 10 m 'wings', joined at the middle) separated by about 10 m (Figure 4) which includes eight pitfall, 12 funnel, 20 Elliott traps at each site. Each pair of funnel traps was covered with air-cell insulation. Nesting material was placed in the bottom of pitfalls to provide protection for trapped animals. Elliott traps were baited with a mixture of rolled oats and peanut paste.

Each trap site was operated for three nights. All traps were checked in the morning and evening (the Elliotts were closed during the day, and re-opened and re-baited each evening).

All native species were measured and individually marked (except amphibians) before release. Small mammals were identified, weighed, sexed and breeding condition was determined. Reptiles and amphibians were identified, snout-vent length was measured, and sex was determined if possible.

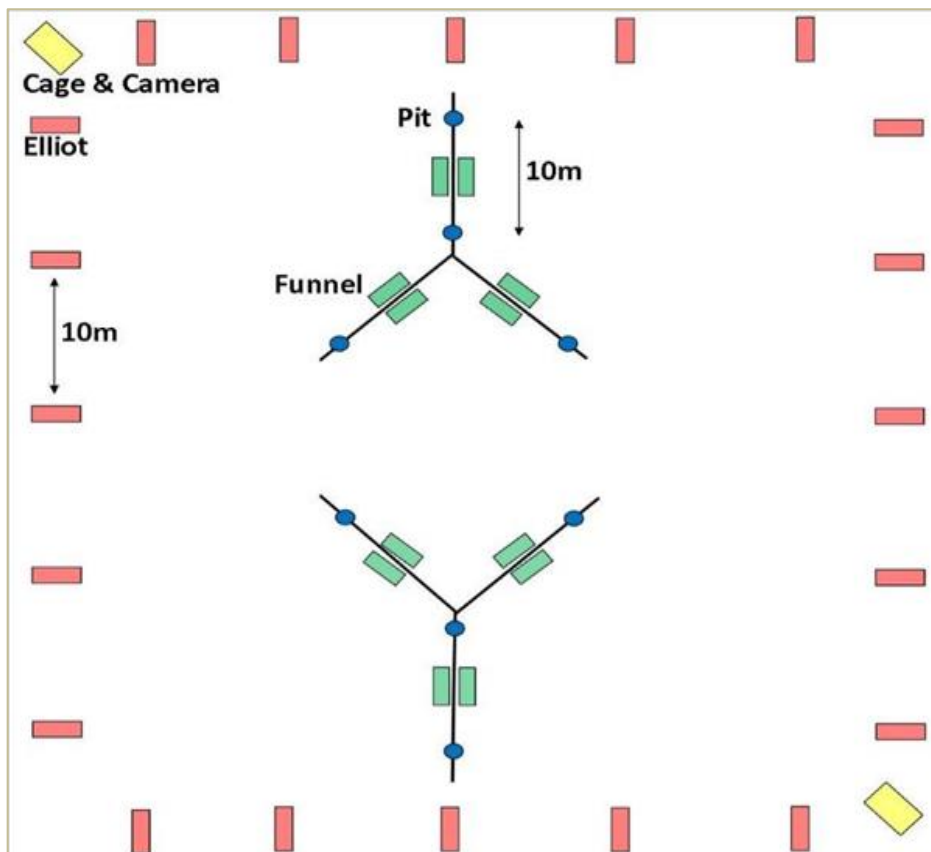


Figure 4. Schematic layout of survey site indicating trap type and placement (note: cage and camera traps were not used in the 2018 survey).

Diurnal Bird Survey

Surveys were carried out using the BirdLife Australia Atlas methodology (Blakers et al. 1984). The observer spent 20 minutes actively searching 2 ha centred on the survey site. All sightings or vocalisations were identified and recorded. Additional individuals of a species were only recorded if the observer was certain that they had not been recorded previously. Surveys were repeated on three mornings.

Analysis methods

Standard Trapping Survey

The metrics derived from this survey were abundance, occupancy, and richness. An index of abundance, catch per unit effort, was calculated by dividing the total number of individuals captured of each species or guild by the total number of trap nights at all survey sites, multiplied by 100 trap nights. Occupancy was calculated as the percentage of sites a species or guild was detected. Richness was the average number of species detected per site.

Diurnal Bird Survey

The 'mean abundance' metric was calculated by first averaging the total (raw) bird counts across three survey mornings for each site to obtain a 'site average'; secondly, summing all 'site averages' and dividing this by the total number of sites. In years where the Diurnal Bird Survey was conducted more than once, these values are also averaged across surveys. Occupancy is the percentage of sites a species or guild was recorded. Data were also used to compute a species richness metric: the average number of species per site.

Fire

In the case of the occurrence of fires, fire scar data are gathered by on-ground mapping using a handheld GPS annually. The area of the scars for planned and unplanned fires is calculated in hectares using ArcMap 10 with Spatial Analyst (Environmental System Research Institute Inc., Redlands, CA, USA).

Results

Biodiversity indicators

Small-medium mammals

The only Ecohealth indicator species recorded in 2018 was the Western Pygmy Possum, recorded on only a few sites (occupancy = 8%) at a low abundance (0.2 individuals/ 100 TN). While not directly comparable to previous surveys, due to a different number and configuration of sites, and different survey period, these results are broadly similar to previous years.

Table 5. Small-medium mammal abundance and occupancy on Dakalanta in 2018. Abundance is number of individuals per 100 trap-nights of effort. Occupancy is the percent of sites occupied.

Species	Abundance Index	Occupancy
Little Long-tailed Dunnart	0.0	0%
Western Pygmy Possum	0.2	8%
Small-medium mammals – all	0.2	8%
Small-medium mammals – dasyurid guild	0.0	0%
Small-medium mammals – rodent guild	0.0	0%

Small-medium reptiles

The 2018 small terrestrial vertebrate fauna survey detected several reptile species at Dakalanta for the first time. In 2018, average species richness for ‘all reptiles’ was 2.5 species per site, at an abundance of 10.8 individuals per 100 trap nights (Figure 5). The increase in reptile species richness and abundance since the previous survey in 2014 is likely explained by the switch to surveying during more favourable reptile weather in spring compared to autumn, and an increased number of more vegetated sites in the revised suite of 41 trapping sites.

In 2018, geckos were slightly more abundant than skinks (5.0 and 4.0 individuals per 100 trap nights respectively; Figure 5), while species richness was relatively similar between the two guilds (0.83 and 0.95 species per site respectively; Figure 5). Agamids were less diverse (on average 0.3 species per site) and less abundant (0.8 individuals per 100 trap nights) than the other guilds (Figure 5). Of the three indicator species, the Barking Gecko was relatively abundant (3.45 individuals per 100 trap nights; Figure 5) and widespread (49% occupancy; Figure 6). The Spotted Skink was moderately abundant (1.45 individuals per 100 trap nights; Figure 5) and widespread (28% occupancy; Figure 6), while the Peninsula Dragon was relatively rare in both abundance (0.3 individuals per 100 trap nights; Figure 5) and distribution (8% occupancy; Figure 6).

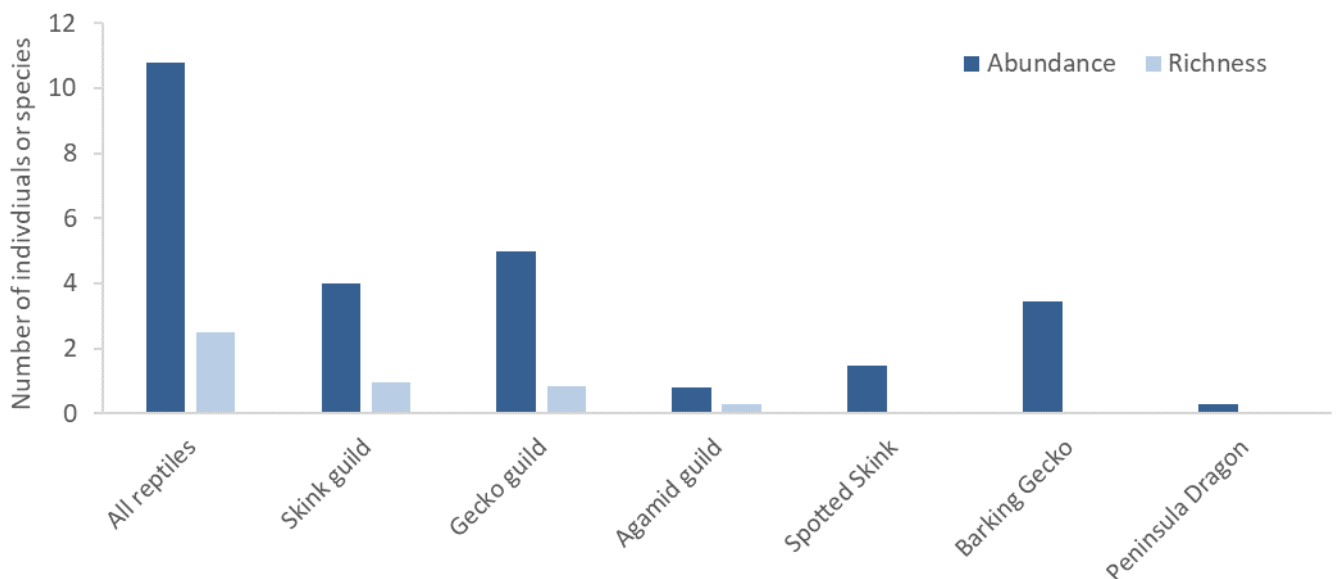


Figure 5. Reptile abundance and richness from 2018 small terrestrial vertebrate fauna surveys. Abundance is number of individuals/ 100 trap nights. Richness is average number of species detected per site (for guilds).

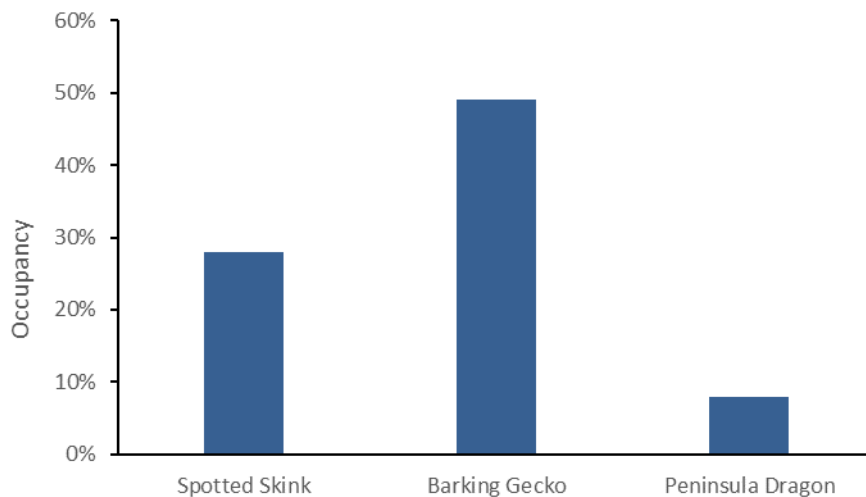


Figure 6. Occupancy of three reptile indicator species from the 2018 terrestrial vertebrate fauna survey. Occupancy is the percentage of sites surveyed that the species is detected.

Diurnal birds

Bird surveys were conducted in spring 2018. Conditions were very dry throughout the year and little vegetation was flowering. A total of 66 species were recorded, with an average abundance of 20.9 individuals and richness of 7.6 species per site (Table 6). These figures are slightly higher than those recorded in previous surveys. The increase in bird species richness and abundance since 2014 is likely explained by the switch to surveying in more favourable weather in spring compared to autumn and an increased number of more vegetated sites in the revised suite of 41 survey sites.

In 2018, diurnal bird abundance was spread relatively evenly across the three guilds (Table 6). The ground active birds were the most abundant, followed by woodland birds and then honeyeaters (Table 6). Occupancy was high across all guilds, with ground active birds found at almost all sites, and honeyeaters and woodland birds detected at a majority of sites.

Table 6. Bird abundance, occupancy, and richness in 2018. Abundance index is the average count (number of individuals) per survey. Occupancy is the percent of sites occupied, and richness is the average number of species detected per site.

Species	Abundance Index (A)	Occupancy (O)	Richness (SR)
All birds	20.9	-	7.6
Honeyeaters guild	5.5	68%	-
Ground active birds guild	7.5	93%	-
Woodland birds guild	6.2	85%	-

Threat indicators

No targeted surveys were carried out for threat indicators in 2020 as methods under development. There were no fires on Dakalanta in 2020.

Discussion

Dakalanta is a medium-sized sanctuary within the AWC property portfolio that provides important connectivity in the Eyre Peninsula region. The sanctuary's range of vegetation communities supports a diversity of fauna and flora, including several declining and regionally significant bird species.

In 2018, only one small mammal species was detected in the terrestrial vertebrate fauna survey; the Western Pygmy Possum, which occupied 8% of sites. The small mammal fauna of Dakalanta is very attenuated from pre-settlement levels with only two species being recorded in very low numbers within specific habitats.

Reptiles on the sanctuary were generally abundant and relatively widespread in 2018 surveys, although the Peninsula Dragon had low abundance of 0.3 individuals per 100 trap nights. The overall increase in average species richness and abundance of reptiles from prior years is likely due to the survey now being undertaken in spring (when conditions for reptiles are more favourable), and more heavily-vegetated sites being included in the recently-revised suite of monitoring sites.

The 2018 diurnal bird survey saw the highest species richness and abundance of birds since surveys commenced in 2011. Encouragingly, ground-active birds were present at 93% of survey sites, while woodland birds and honeyeaters were present at most sites. These results are also likely to reflect the change in survey timing from autumn to spring, and the inclusion of more vegetated sites in 2018.

The highest priority management issues on Dakalanta are feral animals, which impact on conservation-dependent flora and fauna through overgrazing, predation and competition. Over-grazing also impedes the recovery of the historically highly degraded grassy woodland habitat.

Moving forward, Dakalanta's Ecohealth Monitoring Program will include: targeted monitoring of feral predators; targeted surveys and research on the Southern Hairy-Nosed Wombat; determining if the Malleefowl is present, and targeted surveys for ground orchids.

Acknowledgments

AWC acknowledges the Traditional Owners of the country on which Dakalanta Wildlife Sanctuary resides. We also acknowledge their continuing connection to land, culture and community. We pay our respects to Traditional Owner Elders past present and emerging.

AWC's Ecohealth Program is only possible because of the generosity of AWC's supporters. Various components of the field work are carried out with the invaluable assistance of volunteers.

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Enquiries should be made to John.Kanowski@australianwildlife.org