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Environmental Monitoring at Balijup Farm & Fauna Sanctuary, Tenterden, WA

Balijup Citizen Science Report-February 2019

This project is supported by funding from the Western Australian Government's State Natural Resource Management Program, supported by Royalties for Regions.

Green Skills' Balijup, Biodiversity and wetland conservation activities have also received support from the Parks and Wildlife Service of the WA Department of Conservation, Biodiversity and Attractions, Bush Heritage Australia, The University of WA (Albany), and Conservation Council of WA. The Feb 2019 citizen science event formed part of the South Coast Festival of Birds & Biodiversity, which was supported by Lotterywest, BirdLife Australia and Green Skills.

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1 Summary

Bandicoots, Birds and Bushland Monitoring: A Citizen Science Based Ecological Monitoring Project at Balijup Farm and Fauna Sanctuary, Tenterden

Green Skills has established a 111ha fenced fauna conservation sanctuary involving a feral predator exclusion fence in Wandoo & Jarrah woodland at Balijup - see https://chuffed.org/project/balijup). A Green Skills short film on Balijup is viewable at https://www.youtube.com/watch?v=oLaxA5Lc1Sc

31 January to 4 February 2019

Between Thursday 31st January and Monday 4th February 2019 Green Skills and Conservation Council of WA held a four day citizen science camp at Balijup Farm, 861 Nunijup Road, Tenterden near Cranbrook. The program involved environmental monitoring on Balijup, a special property forming part of the Gondwana Link Forests to Stirling's section.

Twenty participants worked with wildlife ecologist Joe Porter and Basil Schur of Green Skills and Andrew McCreery, wildlife biologist contracted to the Conservation Council of WA on a range of citizen science monitoring activities at Balijup farm including: Southern Brown Bandicoot (Quenda) and other fauna trapping; Phascogale nest box monitoring, vegetation photo point monitoring and bird surveying. This report details the results of that work.

Acknowledgments

This project is supported by funding from the Western Australian Government's State Natural Resource Management Program, supported by Royalties for Regions.

This report was prepared by Basil Schur and Tony Peterson for Green Skills. Dr Nic Dunlop and AdnrewMcCreery of the Conservation Council of WA and Wildlife Biologist Joe Porter, provided documentation that contributed to this report based on the Feburary 2019 monitoring activity. Photomonitoring images taken and provided by Geraldine and Steve Janicke. Other photographs by Basil Schur (Green Skills) Maps prepared by Maren Heckel. Aerial photos by Martin Regtien of AirPix. The Balijup Fauna Sanctuary project was funded through support of Lotterywest, the WA Government's State NRM Office and South Coast NRM as well as public donations. The City of Albany provided the original permission to translocate Quenda from their Mount Melville Reserve and also provided maps and advice. The WA Parks and Wildlife Servuce (DBCA) and Bush Heritage Australia and UWA Albany have also supported the project by providing technical advice or loaning trap cages. Many volunteers have contributed to the Citizen Science Weekends. Other assistance by Alan Hordacre (co-owner of Bailjup), Simon Smale (Bush Heritage Australia), Angela Sanders (Bush Heritge Australia), Peter Speldewinde and David Tunbridge(University of Western Australia, Albany) Peter Collins, Erica Alaks, Sarah Comer and Deon Utber (DBCA), Anne Bondin (BirdLife WA), Sylvia Leighton and Sandra Gilfillan is gratefully acknowledged. The Feb 2019 citizen science event formed part of the South Coast Festival of Birds & Biodiversity, which was supported by Lotterywest, BirdLife Australia and Green Skills.

This citizen science event formed part of the South Coast Festival of Birds and Biodiversity 2019, supported by Green Skills BirdLife Australia and Lotterywest

The Balijup Fauna Conservation Sanctuary project has received support from the WA Government's State NRM program, the Parks and Wildlife Service, Bush Heritage Australia, The University of WA (Albany), and Lotterywest. The support and encouragement of the owners of Balijup is also acknowledged.

2 Assessment of Bandicoot Establishment within the Balijup Predator Exclosure

2.1 Background

The Balijup predator exclosure is located on the Hordacre/Vanderbyl farm at Balijup in the Forest to Stirling's segment of the Gondwana Link (www.gondwanalink.org).

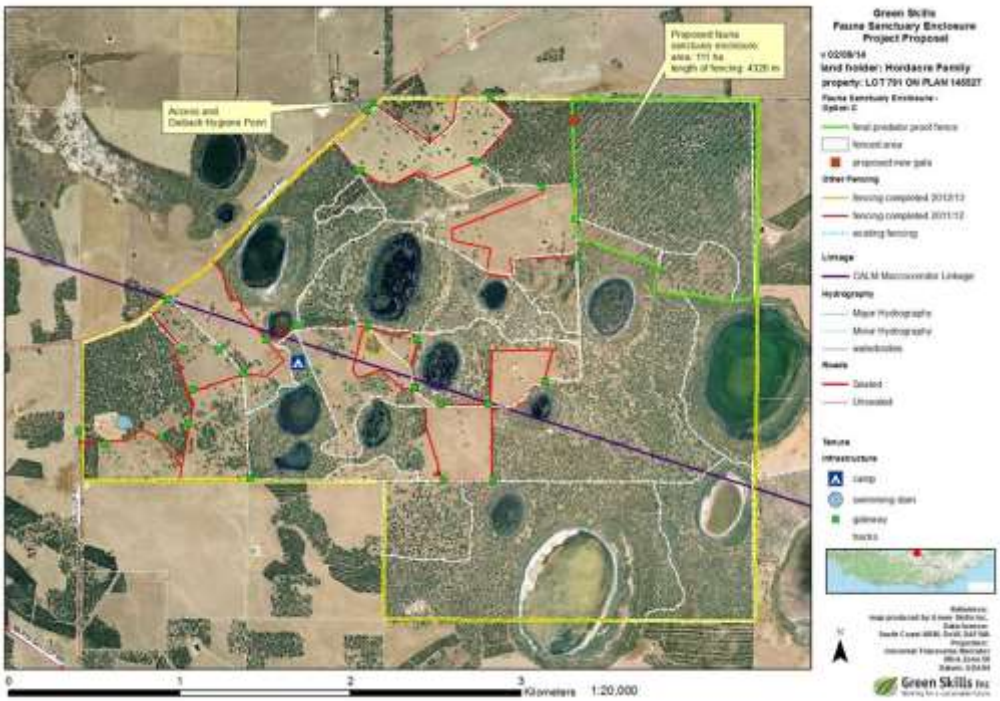


Figure 1: Map of Balijup Farm and Fauna Sanctuary

Figure 2: Photograph: Aerial view of Balijup (Photo by Martin Regtien of AirPix)

During August 2015 sixteen Quenda, *Isoodon obesulus* were translocated from bushland in the town of Albany to the 111 Ha predator exclosure area at Balijup Farm.

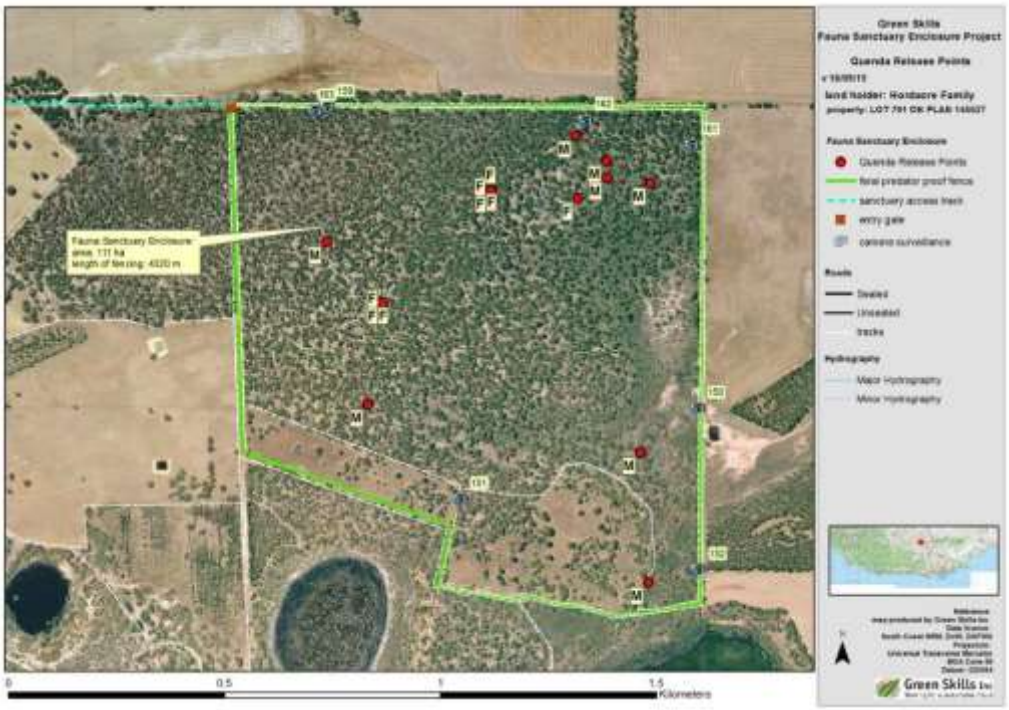


Figure 3: Release points for Bandicoots in the Sanctuary.

This introduced population has been sampled using cage traps on at least a bi-annual basis since these animals were released into the protected area. Indirectly this trapping has also provided some information on other fauna populations within the exclosure including Brush-tailed Possum's, Black Rats and Heath Monitors..

Ongoing monitoring activity has included brief trapping programs between 13 and 16 January 2017, between 17 and 20 June 2018, and monitoring of motion-triggered cameras within the enclosure from 2015.

2.2 Balijup February 2019 Fauna Survey

2.2.1 Survey Method

Between 31 January and 4 February 2019 104 cage-traps were set on 11 traplines to deliver a survey of 416 cage-trap nights. The trap layout is presented on the map below. Trapping was conducted only at night with no traps set during the day.

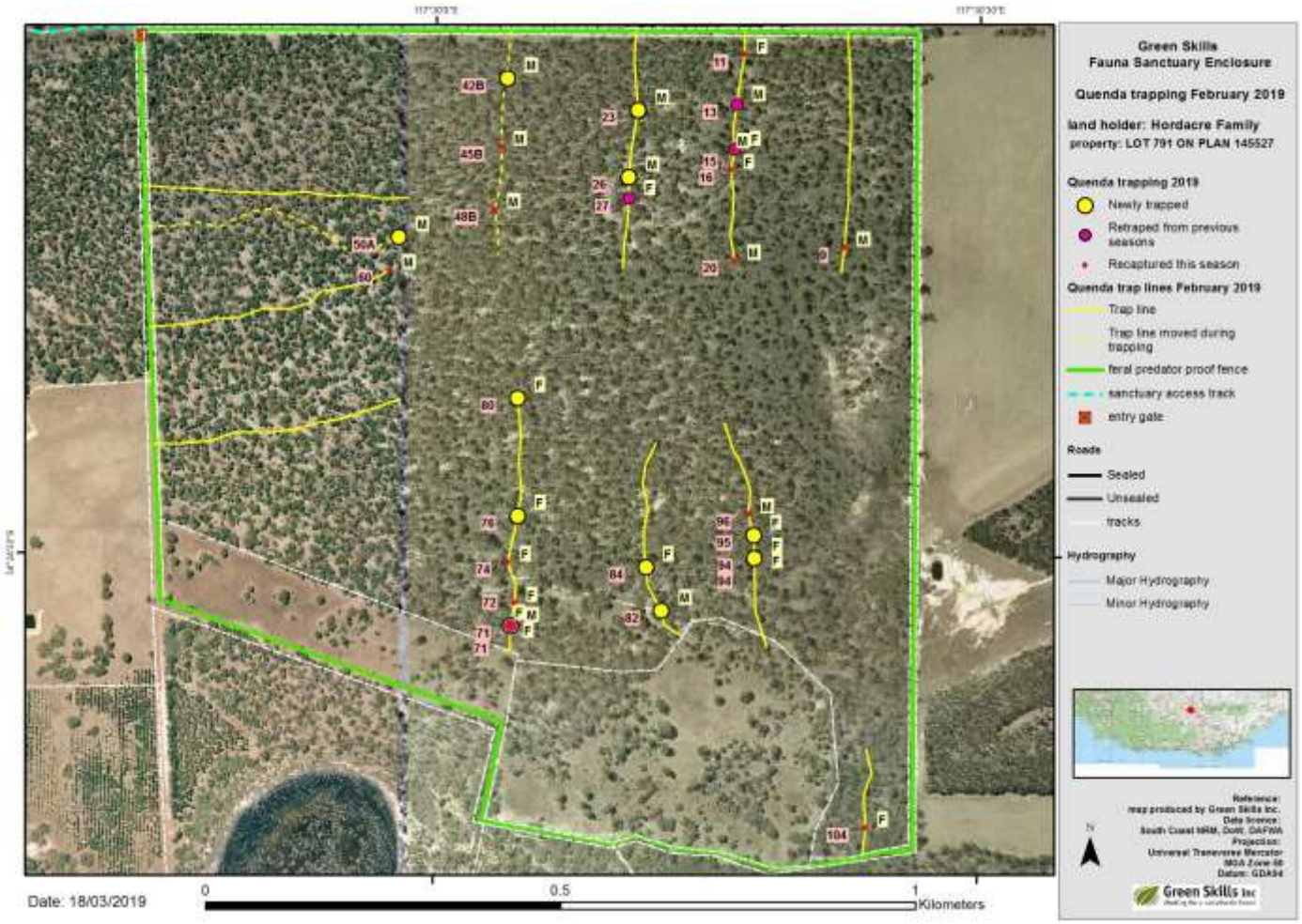
The areas sampled were similar to previous surveys but the effort was approximately double that employed previously (due to primarily to increased field days) on monitoring surveys.

Figure 4: Transect lines and locations of the February 2019 Quenda Survey

2.2.2 Quenda Capture Results

Quenda's were captured 29 times. There were 4 animals previously tagged with implantable transponders (PIT). Two of these animals were then recaptured 3 times and two twice. None of these animals was from the founder population of 2015. One of these recaptures (5592897) was a founder. This old adult female was not breeding when first recaptured in June 2018 but had one advanced pouch young in February 2019. Two of the other recaptures were very recent (tagged in June 2018). Based on sex and measurements there were at least another 12 individuals captured (8 females and 4 males). These were almost all young, half grown animals that will have been mainly produced from the late winter and spring months of 2018. All Quendas handled were healthy and in good condition.

Weather conditions and seasonal factors clearly have an impact on catch rates, however the February 2019 monitoring period indicated a significant jump in population size. This is the first time that we can confidently predict that the current population is larger than the founder population, meeting an important milestone for successful establishment. Further, the population is for the first time dominated by young animals. Maximum life expectancy for Quenda is about 4 years and the last known surviving founder is about that age. So the current generations have been produced entirely from within the exclosure, a second milestone for establishment. The reason for the sudden increase in productivity within the exclosure are not known.



Map: Quenda Trap results for 31 Jan – 4 Feb 2019 Citizen Science Monitoring Event.

The details of each Bandicoot capture are set out in the following Table.

Table 1: February 2019 Quenda captures/recaptures in Balijup predator exclosure.

Date:	Trap #	N=new R= Retrap RE= recap	Individual	sex (M/F)	Microchip no.	No. of Pouch Young	Comments
1/02/2019	15	R	1	F	982 000365592897	1	
1/02/2019	13	R	2	M	982 000365479043		
1/02/2019	26	N	3	M	982 000365475116		
1/02/2019	50	N	4	M	982 000365479324		
1/02/2019	84	N	5	F	-	0	
2/02/2019	15	RE	2	M	982 000365479043		Left hind leg outer nail missing
2/02/2019	71	RE	5	F	-	0	recap from un-microchipped quenda
2/02/2019	60	RE	3	M	982 000365475116		
3/02/2019	20	RE	2	M	982 000365479043		left hind limb outer toenail missing
3/02/2019	42	N	6	M			kink in tail approx 2cm from end
3/02/2019	71	N	7	F		0	full tail, 2 very enlarged teets, large sack og milk
3/02/2019	76	N	8	F		2	full tail, soft release, ejected young
3/02/2019	23	N	9	M			stumpy tail
3/02/2019	27	R	16	F	982 000365590897	1	
3/02/2019	48	RE	4	M	982 000365479324		
3/02/2019	74	RE	5	F		0	teats range from 2-8 mm, diff teat stages, no markings
3/02/2019	80	N	10	F		1	no markings
3/02/2019	94	N	11	F			2-5mm enlarged teets, no markings
4/02/2019	9	RE	2	M	982 000356479043		caught day before
4/02/2019	82	N	12	M			full tail
4/02/2019	104	RE	7	F		0	
4/02/2019	11	RE	8	F		1	
4/02/2019	16	RE	16	F	982 000365590897		
4/02/2019	45	RE	4	M	982 000365479324		
4/02/2019	71	R	13	M	982 000365475062		
4/02/2019	72	RE	11	F	-	0	3 large, 5 mod enlarged teets
4/02/2019	94	N	14	F	-	0	no markings
4/02/2019	95	N	15	F	-	0	stumpy tail
4/02/2019	96	RE	3	M	982 000365475116		

A tabular summary of the Quenda capture data, including Morphometrics is attached as Appendix 1 of this report.

2.2.3 Brush-tailed Possum Capture results

Sixty Brush-tailed Possum's were captured which was an extraordinary catch-rate, even allowing for the frequent re-capture of some trap-happy individuals). Although arboreal, Brush-tailed Possum's do benefit from fox control and is likely the exclosure is allowing the density of these animals to increase, possibly above sustainable levels. More management attention should now be directed at the possum population including that Brush-tailed Possum's also be micro-chipped during the Bandicoot snapshot mark-release-recapture project. Also that Possum densities should also be assessed outside the exclosure and any movements across the fence detected. The option of getting Departmental approval for relocation of some brush-tailed possums to bushland on Balijup outside the Balijup Sanctuary should be investigated.

Table 2: February 2019 Brush-tailed Possum captures in Balijup predator exclosure.

Date:	Trap #	N=new R= Retrap RE= recap	sex (M/F)	No. of PY	Comments
1/02/2019	6	N	F	0	
1/02/2019	11	N	F	0	Virgin pouch
1/02/2019	55	N	F	2	
1/02/2019	59	N	F	0	Virgin pouch
1/02/2019	68	N	F	0	ET 5mm
1/02/2019	67	N	F	0	ET 7mm
1/02/2019	99	N	F	0	Virgin pouch?
1/02/2019	25	N	F	0	Enlarged teets
1/02/2019	27	N	F	0	Enlarged teets
1/02/2019	36	N	F	0	Enlarged teets
1/02/2019	80	N	F	0	
1/02/2019	90	N	F		
1/02/2019	86	N	F	0	
2/02/2019	6		F	0	White tip on tail end
2/02/2019	10		M		tail small white tip
2/02/2019	18		M		black tail, rufous on flanks
2/02/2019	11		F	0	half tail white, 120mm black
2/02/2019	80		F	0	1/4 tail white - 100mm
2/02/2019	78		F	0	black tail
2/02/2019	103		F	0	tail tiny white tip
2/02/2019	23		F	0	
2/02/2019	26		F	0	
2/02/2019	28		F	0	
2/02/2019	50		F	0	
2/02/2019	31		F	1	
2/02/2019	35		F	0	
2/02/2019	82		M		possible growth on testes
2/02/2019	86		F	0	virgin pouch

3/02/2019	2	RE	M		rufous neck, full black tail, caught 2/2
3/02/2019	9	RE	M		black tail, white tip, caught 2/2
3/02/2019	13		F	0	half tail white 120mm, 2 non active teets
3/02/2019	33		F	1	black tail with white tip 7cm
3/02/2019	34		F	0	black tail
3/02/2019	35		M		black tail, red spots on scrotum
3/02/2019	38		M		black tail, growth on scrotum
3/02/2019	60		F	0	black tail, virgin pouch
3/02/2019	86		F	0	black tail
3/02/2019	88		M		tail with white tip
3/02/2019	90		F		black tail
3/02/2019	21		F	0	black tail, virgin pouch
3/02/2019	26		F	0	scabies/mites on right foot (orange), all black tail
3/02/2019	50		F	0	black tail
3/02/2019	49				5cm white tip on tail
3/02/2019	46		F	0	black tail
3/02/2019	63		F	0	2 very large, 1 large and 1 mod enlarged teats
3/02/2019	77		F	0	
4/02/2019	21		F	0	virgin pouch, black tail
4/02/2019	24		F	0	black tail
4/02/2019	27		M		black tail, small testes
4/02/2019	65		F	0	black tail
4/02/2019	89		M		black tail with very small white tip
4/02/2019	14		F	0	white tip on tail 11cm
4/02/2019	48		F	0	black tail
4/02/2019	49		M		black tail, srotum markings
4/02/2019	77		F	0	tail- base half grey, end half black
4/02/2019	79		F	0	tail 1/3 grey, 2/3 black, hairy pouch
4/02/2019	100		F	0	tail 2/3 black, 1/3 grey

A tabular summary of the Possum capture data, including Morphometrics is attached as Appendix 2 of this report.

2.2.4 Rabbits

- A reasonable amount of rabbit activity (burrows and sightings) was visible both inside and outside the exclosure.
- Several recently deceased rabbits were noted in the Sanctuary. One of these was take to the Department of Primary Industry and Regional Development in Albany on 4th February and submitted for testing. Communications regarding the results were as follows.

" The wild rabbit submitted to CSIRO for rabbit calicivirus testing on 13/2/2019, was negative for RHDV1, RHDV2, RHDVa and RHDVa-K5" Nina Huang, Research Projects Officer, CSIRO Pers. Email Communication 21 Feb 2019

" The rabbit showed no obvious outward signs of myxoma infection, and there were no distinctive (I'm not a vet though!) abnormalities with internal organs." Dr Susan Campbell, DPIRDPers Email Communitcation 21 Feb 2019

" Since we only received a liver sample I cannot guess as to cause of death in this rabbit. There are many things that causes sudden death in groups of rabbits including (but not limited to) infectious diseases such as calicivirus, myxomatosis, pasteurella, clostridia; nutritional; toxic; heat stress; trauma etc. These tests are very accurate and the probability of getting a false negative result is extremely low. " Robyn Hall, Research Scientist, CSIRO (personal email communication 22 Feb 2019)

It appears that rabbits are persisting inside the Sanctuary. However mortality has been observed, the cause of which is as yet undetermined.

Eliminating rabbits from the Balijup Sanctuary remains an important management objective.

2.2.5 Other Observations

- Kangaroos were observed within the enclosure on at least three occasions.From camera recordings it appears that as of February 2019 there are 8 Western Grey kangaroos within the enclosure.
- There was no obvious damage or problem with the parts of the exclosure perimeter fence that were traversed.

3 Balijup Sanctuary Bird Surveys

3.1 February 2019 Bird Surveys

Standard Search Bush-bird Sampling
Eight more replicate Standard Search Counts (4 inside and 4 outside the exclosure) were completed in January 2019, and a bird list was generated for species observed on the Balijup property over the 4 days .

The data is now accumulating but is not as yet sufficient to analyse trends.

3.1.1 Survey Methods

A standard two-step search count was used whereby the observers:

1. Utilized the standard 20 minute search over 2 Ha (BirdLife Atlas method) to generate an initial species-list and count.
2. Observed more widely in the target area until independent duplicate sightings of half the species previously recorded was achieved (Standard Search Method).

A bird list was also compiled for all 34 bird species sighted or heard over the weekend on the property, including incidental sightings and birds noted in surveys.

3.1.2 Survey Results

Date 2/02/2019
Site Balijup - north-east corner outside sanctuary
Coords (UTM 50 H) E 545402, S 6193072
Start time 5:50
End time 6:13

Species	Time 1st contact	Time 2nd contact	Count 20 mins	Count post 20 mins
Grey Fantail	5:51	6:01	1, 1	1
Purple-crowned Lorikeet	5:52		11	
Australian Ringneck	5:56	5:57	1, 1	
Weebill	6:01		2	
Australian Raven	6:02	6:04	1, 1	
Red-capped Parrot	6:03		1	
Western Yellow Robin	6:10	6:13	1	1
Western Rosella	6:12			1

Date 2/02/2019
Site Balijup - north-west corner inside sanctuary
Coords (UTM 50 H) E 545668, S 6193034
Start time 6:25
End time 6:53

Species	Time 1st contact	Time 2nd contact	Count 20 mins	Count post 20 mins
Western Whistler	6:26	6:54	1	1
Grey Shrike Thrush	6:26	6:39	1, 1	
Australian Ringneck	6:27	6:29	1, 2	5
Weebill	6:31		3	
Grey Fantail	6:34	6:50	1	1

Australian Raven	6:35		1	
Spotted Pardelotte	6:46		2	
Western Yellow Robin	6:49	6:53	1	1
Western Gerygone	6:53		1	

Date 2/02/2019
Site Balijup - south-west corner inside sanctuary
Coords (UTM 50 H) E 545756, S 6192542
Start time 11:00
End time 11:20

Species	Time 1st contact	Time 2nd contact	Count 20 mins	Count post 20 mins
Weebill	11:01	11:05	3, 2, 1, 2	
Western Gerygone	11:04	11:12	1, 1	
Restless Flycatcher	11:08		1	
Striated Pardelote	11:11	11:17	1, 1	
Australian Raven	11:12		1	
Grey Fantail	11:12	11:14	1, 3, 1	
Australian Ringneck	11:15	11:18	1, 1	
Western Yellow Robin	11:18		1	
Rufous Tree Creeper	11:19		1	

Date 3/02/2019
Site Balijup - south-west corner outside sanctuary
Coords (UTM 50 H) E 545192, S 6192809
Start time 6:10
End time 6:30

Species	Time 1st contact	Time 2nd contact	Count 20 mins	Count post 20 mins
Striated Pardalote	6:15	6:25	1, 2	
Weebill	6:18		2	
Australian Ringneck	6:26	6:28	2, 1	
Australian Raven	6:26		1	

Date 3/02/2019
Site Balijup - north-west corner outside sanctuary
Coords (UTM 50 H) E 545251, S 6193108
Start time 6:35
End time 6:55

Species	Time 1st contact	Time 2nd contact	Count 20 mins	Count post 20 mins
Rufous Treecreeper	6:36	6:49	2, 1	
Australian Ringneck	6:37	6:41	1, 1	
Australian Raven	6:38	6:39	2, 1	
Western Yellow Robin	6:41	6:46	3, 5	
Western Whistler	6:41	6:53	1, 1	
Weebill	6:47		2	
Grey Fantail	6:49		1	
Gilberts Honeyeater	6:51		1	

Date 3/02/2019

Site Balijup - north-east corner in sanctuary
Coords (UTM 50 H) E 545409, S 6192746
Start time 7:30
End time 8:25

Species	Time 1st contact	Time 2nd contact	Count 20 mins	Count post 20 mins
Western Yellow Robin	7:31	8:25	1	1
Western Whistler	7:32		1	
Western Thornbill	7:32		1	
Western Spinebill	7:34		1	
Grey Fantail	7:36	7:55	1	1, 1, 1
Gilberts Honeyeater	7:36	7:45	1, 2	2, 1
Australian Raven	8:04	8:07		2, 1

Date 3/02/2019
Site Balijup - north-west corner in sanctuary
Coords (UTM 50 H) E 545893, S 6193084
Start time 8:30
End time 8:50

Species	Time 1st contact	Time 2nd contact	Count 20 mins	Count post 20 mins
Rufous Treecreeper	8:30		2	
Gilberts Honeyeater	8:32		2	
Grey Fantail	8:32	8:35	1, 1	
Western Thornbill	8:39	8:45	2, 1	
Australian Ringneck	8:41	8:50	1, 1	
Western Yellow Robin	8:50		1	

Date 3/02/2019
Site Balijup - south-east corner outside sanctuary
Coords (UTM 50 H) E 545409, S 6192746
Start time 11:24
End time 12:02

Species	Time 1st contact	Time 2nd contact	Count 20 mins	Count post 20 mins
Weebill	11:24	11:35	2, 3	1
Grey Fantail	11:27	11:47	1	1
Western Yellow Robin	11:27	11:31	1, 2	
Stiated Pardelote	11:31	11:38	2, 1	1
Australian Ringneck	11:34		1	
Grey Shrike Thrush	11:35	11:42	1, 1	
Gilberts Honeyeater	11:38		1	
Rufous Treecreeper	11:39		1	
Western Gerygone	11:40		1	

3.1.3 February 2019 Bird list

Common Bronzewing	*Phaps chalcoptera*
Crested Pigeon	*Ocyphaps lophotes*
White-faced Heron	*Egretta novaehollandiae*
Wedge-tailed Eagle	*Aquila audax*
Carnaby's Cockatoo	*Calyptorhynchus latirostris*
Australian Ringneck	*Barnardius zonarius semitorquatus*
Western Rosella	*Platycercus icterotis*
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*
Rufous Treecreeper	*Climacteris rufus*
Splendid Fairy-wren	*Malurus splendens*
Western Gerygone	*Gerygone fusca*
Inland Thornbill	*Acanthiza apicalis*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
Western Thornbill	*Acanthiza inornata*
Weebill	*Smicrornis brevirostris*
Striated Pardalote	*Pardalotus striatus*
Spotted Pardalote	*Pardalotus punctatus*
New-holland Honeyeater	*Phylidonyris Novaehollandiae*
Gilbert's Honeyeater	*Melithreptus chloropsis*
Varied Sitella	*Daphoenositta chrysoptera pileata*
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
Western Whistler	*Pachycephala occidentalis*
Grey Shrike Thrush	*Colluricincla harmonica*
Australian Magpie	*Cracticus tibicen dorsalis*
Australian Raven	*Corvus coronoides*
Willie Wagtail	*Rhipidura leucophrys*
Grey Fantail	*Rhipidura albiscapa*
Restless Flycatcher	*Myiagra inquieta*
Scarlet Robin	*Petroica boodang*
Western Yellow Robin	*Eopsaltria griseogularis*
Silvereye	*Zosterops lateralis*
Tree Martin	*Petrochelidon nigricans*
Western Wattlebird	*Anthochaera lunulata*
Red-capped Parrot	*Purpureicephalus spurius*

4 Camera Monitoring

4.1 Camera locations

Since the last report of June 2018 Green Skills has periodically installed up to 7 motion triggered cameras inside the Balijup Fauna Sanctuary.

Two camera locations at the Gate, and the "Salt Flat sump", are positioned close to water sources or routes to water, provide coverage of areas inside and outside the exclosure fence, and are not baited. These cameras are intended to monitor feral predators (none detected in the period) and the movement of people around the exclosure fence.

Four camera locations near the Northern fence and one location close to the Southern fence were baited with cat biscuits when installed or checked, and are intended to monitor quenda and native mammals.

The following summary observations are from the period July to December 2018.

Camera ID	Name/Description	Easting mE Zone 50 H	Northing mN	Quenda	Brush Tailed Possum	Kangaroo	Rabbit
DENGNSKL804*	Salt Flat Sump, East Fence	0546623	6192493	N	N	Y	N
DENGNSKL007*	Northern Fence Most Easterly, Tall camera pole	0546351	6193158	Y	Y	Y	Y
DENGNSKL888*	Northern Fence Most Easterly, short camera pole	0546365	6193166	Y	Y	Y	Y
DENGNSKL979*	Northern Fence Central	0545754	6193170	Y	Y	Y	Y
DENGNSKL018*	Northern Fence, Most Westerly	0545548	6193126	Y	Y	Y	Y
DENGNSKL972*	Southern Corner Fence	0546050	6192228	N	Y	N	N
DENGNSKL008*	Gate	0545540	6193178	N	N	Y	N

4.2 Results

4.2.1 Feral Predator Monitoring

No feral predators, either inside or outside the exclosure, were observed on camera during the period July-December 2018.

4.2.2 Native Vertebrate Monitoring

Quenda and Brush Tailed Possums were observed at all baited traps during the reporting period, except for Camera 972 which stopped triggering one day after installation.

During the reporting period, cameras DENGNSKL979 and DENGNSKL018 both recorded occurrences of 2 Quendas within the same image(s) with camera 979 showing interaction between the Quendas..


MOULTRIE
9°C
DENGNSKL979
31 JUL 2018 11:47 pm


MOULTRIE
10°C
DENGNSKL979
31 JUL 2018 11:51 pm

During the reporting period camera DENGNSKL979 also captured images of a Quenda foraging in the late afternoon during daylight, evidencing behaviour that has been observed in the North East area of the exclosure when installing cameras.

4.2.3 Herbivorous Competitor Monitoring

Camera images show that there are now 8 kangaroos within the exclosure, up from the 5 recorded in the previous reporting period.

Rabbit observations have been increasing since the last natural calicivirus outbreak in February 2017 and the scheduled RHDV1-K5 Boost release of March 2017.

4.3 Camera Monitoring Discussion Points

4.3.1 Technical Discussion

As noted in the June 2018 report, the motion detector cameras are approaching 2 years in age, and several wear and tear issues are becoming apparent. All mounting straps need replacement due to UV-light related deterioration. Five of the cameras are suffering from detector issues, with one losing sensitivity to movement, and three suffering intermittent bouts of continuous triggering from the day of installation until the SD card is full. A strap replacement, general clean-up, and SD card re-initialising is underway to address these issues.

Peer discussion reveals that the cameras are holding up well to almost continuous use since purchase, with a low rate of failure compared to the averages encountered by other organisations. The capital cost per month of use, to date, is around $6 per month per camera.

Camera triggering issues seem to be reduced when good quality (more expensive) alkali batteries are used. Cheaper batteries have a 1 month effective use in the cameras compared to the 2 month effective life of the more expensive batteries. Battery cost for the camera monitoring is around $6 per month per camera (8 * batteries @ $1.5 per battery for a 2 month useful life).

All star-picket mounting-posts for the cameras are now due for re-positioning because they now require re-hammering at each visit to stop “post-wobble”.

4.3.2 Procedural Discussion

Prior to May 2017 the cameras were checked each 4-6 weeks whereas from May 2017 to present the cameras have been checked on an 8-9 weekly basis due to unavailability of the volunteer worker.

Three issues are related to the extended time between checks:

- A reduced number of images are captured once bait has been eaten from the location. (Baits appear to be effective for 2-3 weeks maximum)
- Technical issues with an individual camera results in twice as many “days lost” in capturing images from that site.
- The number of images captured becomes too large for effective processing/analysis in a single day, and too large for easy transfer of images via a USB memory stick.

A 4 week camera monitoring period appears to be optimal, with one day spent retrieving camera cards, checking cards on-site for camera issues, and replacing cards/re-positioning cameras as required, followed by a full day of viewing images, tabulating image-captures, and reporting. This may have to occur every second month if volunteer availability is limited.

4.3.3 Results discussion

Both trapping and camera trap monitoring are occurring in the same areas around the margins of the exclosure. Discussion needs to take place to determine if it will be useful to establish one or two North – South transects across the exclosure to ensure that the centre is monitored, and also to discuss if camera locations need to coincide with trap-lines so that results can be compared.

5 Phascogale Surveys and Investigations

Background
One of the next proposed projects for Balijup Sanctuary is the translocation of Brush-tailed Phascogales (*Phascogale tapoatafa wambenger*) into the exclosure.
Brush-tailed Phasgogales were historically observed on the property by the original owners, but were not trapped during the 2011-2013 Fauna Survey. Nor have they been caught in any of the fauna monitoring activities undertaken since that time.

In 2017 it was decided that for the translocation to occur:

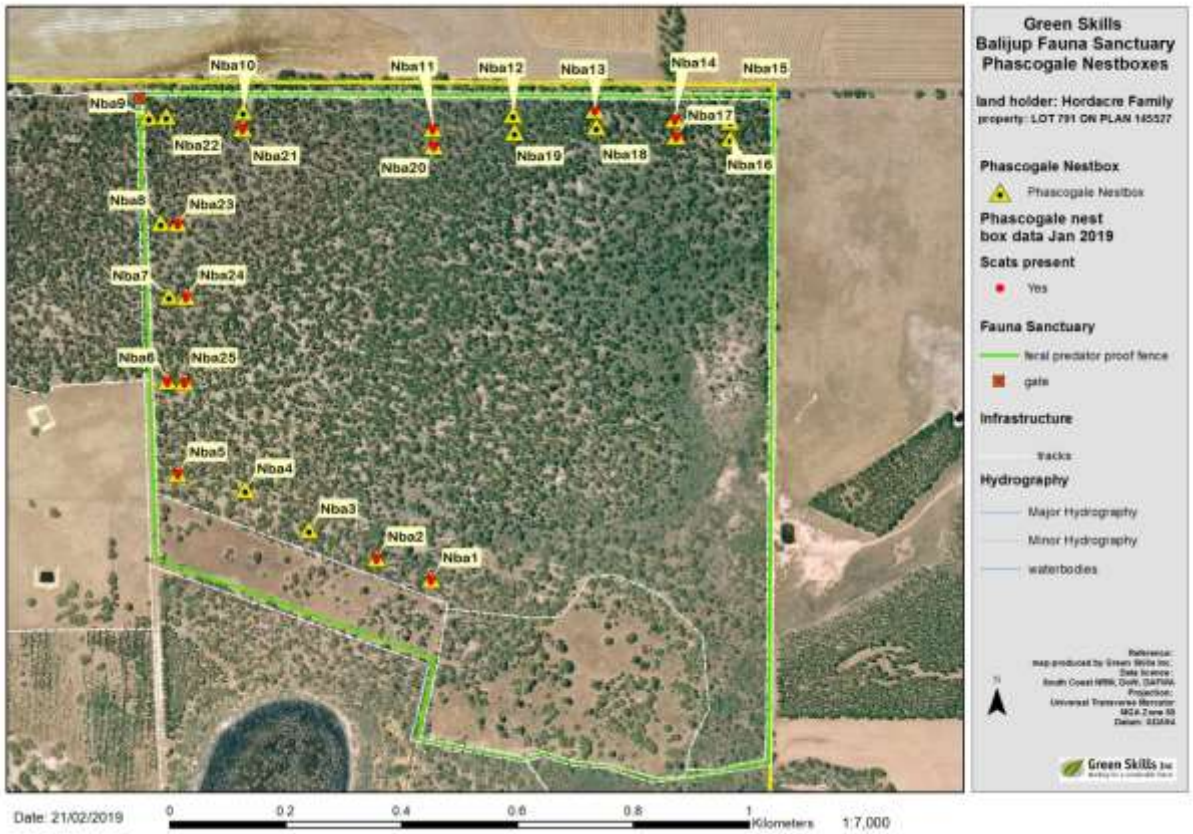
- Surveys need to be performed to determine if a Phascogale population currently exists in the Balijup Sanctuary.
- If no population is extant in the Balijup Sanctuary, then a source population needs to be found from which to take individuals for translocation. A translocation plan would be developed based on this information and submitted to the Department of Biodiversity, Conservation and Attractions for approval,

5.1 Balijup Nest-box Monitoring

To assist in establishing if Phascogales were present, 25 nest-boxes have been installed, 15 in September 2017 and 10 in March 2018 as shown in Figure7 These have been checked and monitored since that time.

5.1.1 February 2019 Phascogale Survey

In January 2019 14 of the 25 (56 %) phascogale next boxes contained scat / pellet material consistent with a species of phascogale. At this stage we assume that the occupants were Brush-tailed Phascogale although the ranges of these species abut in this area. Many of the boxes that had no indication of use had previously contained feral bees. The distribution of utilised boxes is shown on the map below.



These records indicate that Brush Tailed Phascogales are present within the exclosure and possibly elsewhere in Jarrah or Wandoo Woodland elsewhere at Balijup. One possible way to monitor the effect of the exclosure on phascogale abundance would be to also monitor a similar number of nest-boxes in suitable habitat patches outside the exclosure and compare the different occupation rates. Genetic methods (using the scats or fur) might be the only way of tracking population size (but this would be expensive).

Feb 2019 Balijup Nest box observations and actions.

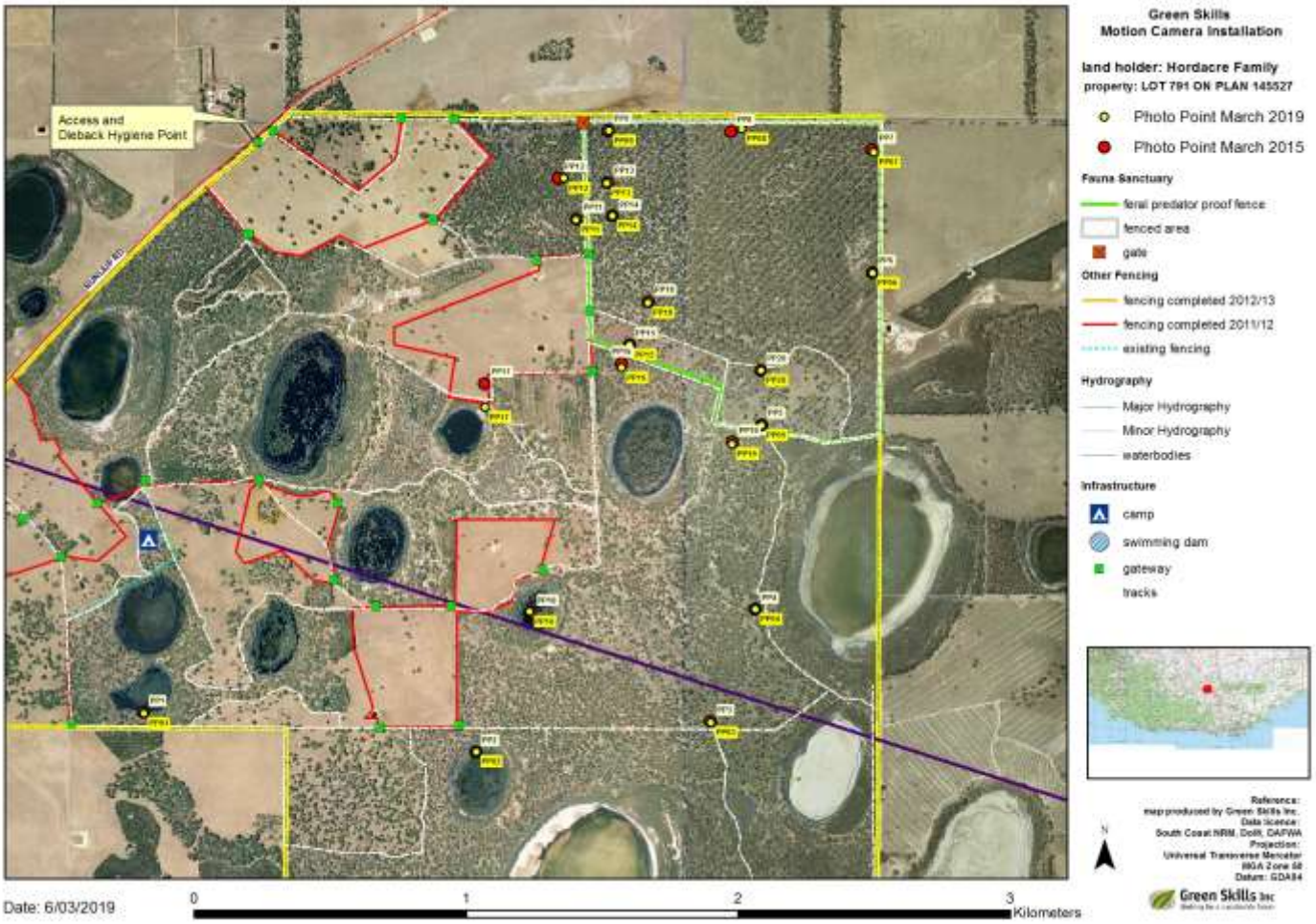
Nest box ID on map	ID number on box	Phascogale present or absent	Activity	Bee's	Comments:	Action:
Nba1	A1	Absent	Yes	No	Scats/Pellets around sides	-
Nba2	A2	Absent	Yes	No	Scats/Pellets present	Sample taken
Nba3	A3	No Box - Termites destroyed. Removed from previous survey				
Nba4	A4	Previous bee activity, lid opended. Needs cleaning out				Lid left open
Nba5	A5	Absent	Yes	No	A few Scats/Pellets	-
Nba6	A6	Absent	Yes	No	Scats/Pellets and spider	Sample taken
Nba7	A7	Absent	No	No	Old honeycomb present	wool added
Nba8	A8	Absent	No	No	Native cockroach, spiders	wool added
Nba9	A9	Absent	No	No	Bettle exoskeleton, spiders	wool added
Nba10	A10	Absent	No	Old	Remnant bee activity - remove, clean out.	-
Nba11	A11	Absent	Yes	No	Scats/Pellets	-
Nba12	A12	Absent	No	No	-	-
Nba13	A13	Absent	Yes	No	Scats/Pellets	-
Nba14	A14	Absent	Yes	No	Pellets + urine?	Samples taken
Nba15	A15	Absent	Yes	No	Scats/Pellets	Samples taken
Nba16	Nest box previously absent and currently not visible					
Nba17	A17	Absent	Yes	No	A few Scats/Pellets	-
Nba18	A18	Absent	No	No	Bettle fragments	Sample taken
Nba19	A19	Absent	No	No	Carpet fallen off lid	-
Nba20	A20	Absent	Yes	No	Scats/Pellets around sides	-
Nba21	A21	Absent	Yes	No	Scats/Pellets around sides	Sample taken
Nba22	A22	Absent	No	No	Huntsman spider	-
Nba23	A23	Absent	Yes	No	Fresh Scats/Pellets	Samples taken
Nba24	A24	Absent	Yes	No	Scats/Pellets and leaves	Samples taken
Nba25	A25	Absent	Yes	No	Old and New Scats/Pellets in (nest?) located in bottom corner	-

Scats/Pellets present in the following nest boxes		
Box ID	Camera trap recommendations	

A1		
A2	Yes	
A5		
A6	Yes	
A11		
A13		
A14	Yes	
A15	Yes	
A17		
A20	Yes	
A21		
A23	Yes	
A24	Yes	
A25	Yes	

6 Vegetation Photopoint monitoring

The Twenty permanent photo monitoring points on Balijup were photographed on Sunday 3rd February 2019 and the images are displayed in the Appendix in this report. The posts for two sites were not relocated and new sites were established for these points.



7 Conclusions and Forward Planning

The environmental monitoring documented in this report provide informative data on which to assess the progress being made with the Balijup Fauna Conservation Sanctuary and in helping plan future activities. These findings and build on the findings of monitoring as reported in the January 2017 Balijup report and June 2018 Balijup report. (https://greenskills.org.au/download/environmental-monitoring-balijup-farm-citizen-science-report-2016-17/) .

Some of this monitoring (i.e.bird surveys) will require a longer period of surveying before trends can be ascertained.

The surveys indicate that a population southern brown bandicoots *(Isoodon obesulus)* have survived in the Sanctuary, since being introduced in August 2015 The the February 2019 monitoring result indicated a significant increase in population size compared to the results of the June 2018 monitoring event. This is the first time that we can confidently predict that the current population is larger than the founder population, meeting an important milestone for successful establishment. Further, the population is for the first time dominated by young animals. Maximum life expectancy for Quenda is about 4 years and the last known surviving founder is about that age. So the current generations have been produced entirely from within the exclosure, a second milestone for establishment. The reasons for the increase in productivity within the exclosure are not known but may also be a reflection of the great trap effort in the February monitoring 4 night event than previous events.

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The offer of the Parks and Wildlife Service of the Department of Biodiversity, Conservation and Attractions (Sarah Comer, personal communication, Jan 2017) to consider relocating bandicoots being displaced by development in the Perth area to Balijup would provide a valuable addition of genetically different bandicoots into the Balijup population. It is recommended that particular focus be placed on introducing additional fertile female bandicoots into Balijup.

It can also be reported that Brush Tailed Possums *(Trichosurus vulpecula)* have established themselves successfully in the Balijup Sanctuary and are actively breeding. The numbers of Brush-tailed Possums should be monitored as over-grazing of the tree canopy may result within an area protected from predators. It is recommended that he option of relocating some possums to bushland outside the Sanctury on Balijup should be followed up. . Camera monitoring indicates that eight kangaroos are currently resident within the Sanctuary. It is recommended that they be culled, in part to prevent them increasing their numbers, and in particular to prevent damage to the Sanctuary fence.

The January 2017 citizen science survey results indicated that Rosenberg's or southern heath monitor (Varanus rosenbergi) appear to be doing well in the Sanctuary and their numbers are likely to be increasing. Given that its diet includes mammals (https://en.wikipedia.org/wiki/Rosenberg's_monitor#Description) it is possible that it is predating on bandicoots in the Sanctuary. The numbers of Southern Heath Monitori may also increase above natural levels leading to increased predation on small mammals and bush birds. It is therefore recommended that ongoing monitoring of this species within the Sanctuary take place. One option is for some animals of this species to be re-located to suitable bushland on Balijup outside the fenced area.

There are reguarlly up to 10 Green Skills' wildlife monitoring motion triggered cameras installed within the Sanctuary on an ongoing basis. This is an important source data in relation to monitoring of native and feral fauna inside and immediately outside the fence. However it is recommended that further ways of checking for the presence of cats, foxes, rabbits and black rats be investigated and implemented for the Sanctuary. It is recommended that the rehabilitation of the edge of the salt affected area to increase habitat for translocated fauna should be considered. This could involve establishing salt tolerant species such as Melaleuca cuticularis, and assisting the neighbouring farmer to revegetate part of the catchment above the salt affected area.

Now that the Balijup Fauna Sanctuary project is established and functioning it is recommended that investigation commence into the viability of introducing other native marsupial fauna species into the Sanctuary. This could include some of these species documented in the original scoping document for the Sanctuary, the Balijup Fauna Sanctuary project (http://www.greenskills.org.au/pub/balijup/Balijup_Fauna_Conservation_Enclosure_report.pdf)

It could also involve actively monitoring for Mardo (Yellow footed antechinus or *Antechinus flavipes leucogaster*) within the Balijup Sancutary and installing suitable nesting boxes for that species. It is recommended that Green Skills continue to investigate collaborative partnerships between the Balijup Sanctuary project and other fenced sanctuaries.

It is proposed thus that the priority projects that should be planned and funding soutght would include the following: 1) Ongoing camera monitoring within the Sanctuary 2) Further cage trapping program events focussing in the Santuary during the summer months 3) Ongoing monitoring of Southern Heath Monitors within the Sanctuary and relocation of some of these, if captured to suitable bushland on Balijup outside the Sanctuary 4) Control, and if possible complete removal, of rabbits and Western grey Kangaroos within the Sanctuary 5) Ongoing monitoring of the feral proof fence and maintenance of the firebreaks either side of the fence 6) Onoging monitoring and maintenance of the phascogale boxes installed within the Sanctuary and development of further research projects of Brush-Tailed Phascogales at Balijup7) Ongong monitoring of the phascogale nesting boxes on the three properties they have been installed next to the Stirling Range National Park and one property near Youngs Siding on the Nullaki. 8) Other vegetation, bird and wetland monitoring both within the Sanctuary and Balijup property as per the Balijup monitoring framework. 9) Development of a fox (and ideally cat) baiting program for the whole of Balijup property and the implementation of this from 2019 onwards.

8 Photos

8.1 Feb 2019 -Balijup Citizen Science Monitoring - 4 Day Event

Photographs	Notes
	Repair to gate at Balijup Sanctguary 31 Jan – 4 Feb 2019
	Cage Traps for Balijup Sanctuary 31 Jan – 4 Feb 2019

	Cage Traps for Balijup Sanctuary 31 Jan – 4 Feb 2019
	Setting Cage Traps for Balijup Sanctuary 31 Jan – 4 Feb 2019
	Monitoring Cage Traps for Balijup Sanctuary 31 Jan – 4 Feb 2019

	Proecessing Balijup Sanctuary 31 Jan – 4 Feb 2019
	Proecessing Balijup Sanctuary 31 Jan – 4 Feb 2019
	Proecessing Balijup Sanctuary 31 Jan – 4 Feb 2019
	Releasing Quenda at Balijup Sanctuary 31 Jan – 4 Feb 2019

	Released Quenda at Balijup Sanctuary 31 Jan – 4 Feb 2019
	Checking log with released Quenda at Balijup Sanctuary 31 Jan – 4 Feb 2019
	Quenda diggings at Balijup Sanctuary 31 Jan – 4 Feb 2019

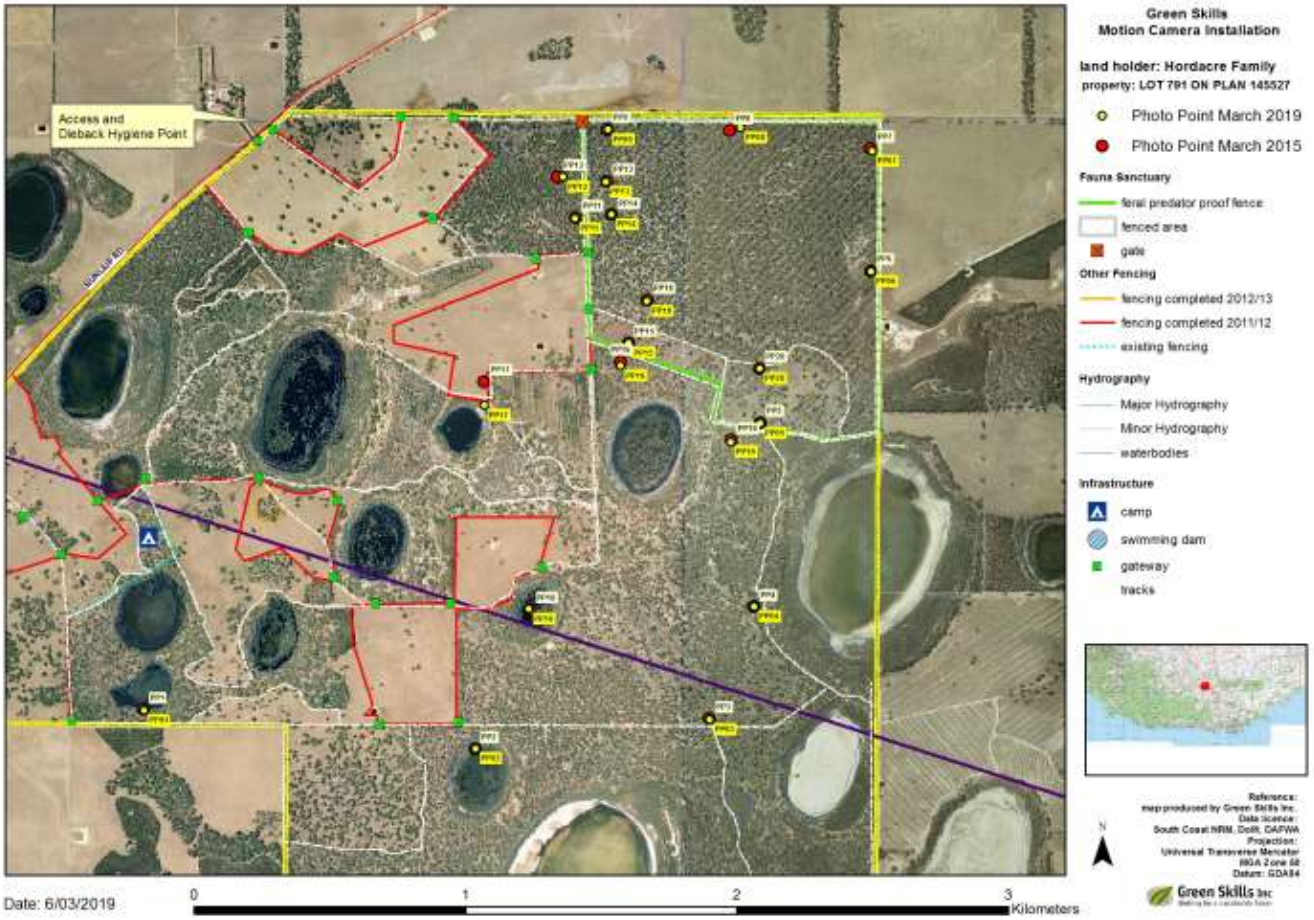
	Quenda diggings at Balijup Sanctuary 31 Jan – 4 Feb 2019
	Photomonitoring at Balijup 31 Jan – 4 Feb 2019
	Photomonitoring at Balijup 31 Jan – 4 Feb 2019

	Visit to Eddy and Donna Wajon's Mondurup View Property near Stirling Range NP 1 Feb 2019
	Checking 10 Phascogale Nestging boxes at Eddy and Donna Wajon's Mondurup View Property near Stirling Range NP 1 Feb 2019
	Brush Tailed Phascogale scats from nesting box at Balijup Sanctuary 31 Jan – 4 Feb 2019
	Brush Tailed Phascogale scats from nesting box at Balijup Sanctuary 31 Jan – 4 Feb 2019

		Brush Tailed Phascogale nesting box at Balijup Sanctuary 31 Jan – 4 Feb 2019
		Looking inside Brush Tailed Phascogale nesting box at Balijup Sanctuary 31 Jan – 4 Feb 2019
		Looking inside Brush Tailed Phascogale nesting box at Balijup Sanctuary 31 Jan – 4 Feb 2019

		Visit to Eco Restoration sites on Sandiland Farm, Kendenup 31 Jan – 4 Feb 2019
		Visit to Eco Restoration sites on Sandiland Farm, Kendenup 31 Jan – 4 Feb 2019
		Visit to Eco Restoration sites on Sandiland Farm, Kendenup 31 Jan – 4 Feb 2019
		At the Jeffery homestead – project base 31 Jan – 4 Feb 2019

8.2 Photopoint vegetation Monitoring



PP01	

PP02

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Appendix 1 – Quenda (Southern Brown Bandicoot) data including Morphometrics.

Date:	Trap #	Species	N=new R= Retrap RE= recap	Individual	sex (M/F)	Total wt (g)	Bag wt (g)	Body wt (g)	Microchip no.	Head length (mm)	Right Pes (long) (mm)	Tail length (mm)	No. of PY	PY size (mm)	PY fur (pink/fur)	Enlarged teets	Males: scrotum width (mm)	Fate R=released D=died E=escaped)	Comments
1/02/2019	15	Quenda	R	1	F	1005	120	885	982 000365592897	91.7	52.8	98.5	1	70	Fur	-		R	
1/02/2019	13	Quenda	R	2	M	1610	75	1535	982 000365479043	82.3	57.2	150					31.3	R	
1/02/2019	26	Quenda	N	3	M	1600	120	1480	982 000365475116	95.5	57.8	170					28.2	R	
1/02/2019	50	Quenda	N	4	M	1595	110	1485	982 000365479324	89	57.5	143					29.5	R	
1/02/2019	84	Quenda	N	5	F	840	110	730	-	72.7	48.9	137	0			3		R	
2/02/2019	15	Quenda	RE	2	M	1625	115	1510	982 000365479043	90.6	60.9	155					33.1	R	Left hind leg outer nail missing
2/02/2019	71	Quenda	RE	5	F	825	125	700	-	77.8	51.3	135	0			3		R	recap from un-microchipped quenda
2/02/2019	60	Quenda	RE	3	M	1600	120	1480	982 000365475116	89.2	58	140					21.1	R	
3/02/2019	20	Quenda	RE	2	M	1635	125	1510	982 000365479043	94.7	60.3	140					32	R	left hind limb outer toenail missing
3/02/2019	42	Quenda	N	6	M	1465	200	1265		87.7	61	150					25.5	R	kink in tail approx 2cm from end
3/02/2019	71	Quenda	N	7	F	1135	200	935		86.9	53.9	140	0			2 lge		R	full tail, 2 very enlarged teets, large sack og milk
3/02/2019	76	Quenda	N	8	F	-	-	#VALUE!			52.8	130	2	50	pink			R	full tail, soft release, ejected young
3/02/2019	23	Quenda	N	9	M	1060	120	940		80.8	56	21.2					25.8	R	stumpy tail
3/02/2019	27	Quenda	R	16	F	1050	120	930	982 000365590897	81.9	50.3	101.8	1	50	furred			R	
3/02/2019	48	Quenda	RE	4	M	1540	120	1420	982 000365479324	90.2	56.4	130					28.5	R	
3/02/2019	74	Quenda	RE	5	F	840	120	720		77.5	54.6	125	0					R	teats range from 2-8 mm, diff teat stages, no markings
3/02/2019	80	Quenda	N	10	F	1070	120	950			52.1	110	1	40	pink			R	no markings
3/02/2019	94	Quenda	N	11	F	750	120	630		77.6	49.9	112				3		R	2-5mm enlarged teets, no markings
4/02/2019	9	Quenda	RE	2	M	1680	120	1560	982 000356479043									R	caught day before
4/02/2019	82	Quenda	N	12	M	800	200	600		73.1	51.1	125					13.5	R	full tail
4/02/2019	104	Quenda	RE	7	F	1105	200	905		84.1	53.8	125	0			4		R	
4/02/2019	11	Quenda	RE	8	F	1170	125	1045		83.9	53.1	125	1	60	pink			R	
4/02/2019	16	Quenda	RE	16	F	1050	120	930	982 000365590897									R	
4/02/2019	45	Quenda	RE	4	M	1520	130	1390	982 000365479324									R	
4/02/2019	71	Quenda	R	13	M	1130	120	1010	982 000365475062	91.5	57.2	165					27.1	R	
4/02/2019	72	Quenda	RE	11	F	795	120	675	-	75.7	49.9	110	0			8		R	3 large, 5 mod enlarged teets
4/02/2019	94	Quenda	N	14	F	885	60	825	-	74.5	52.3	123	0			3		R	no markings
4/02/2019	95	Quenda	N	15	F	1015	120	895	-	76.7	50.5	33.6	0			3		R	stumpy tail
4/02/2019	96	Quenda	RE	3	M	1560	120	1440	982 000365475116	91.3	58	146.7					32	R	

(Note: Image of Original Spreadsheet data)

Appendix 2 – Brush-tailed Possum data including Morphometrics

Date:	Trap #	N=new R= Retrap RE= recap	sex (M/F)	Total wt (g)	Bag wt (g)	Body wt (g)	Microchip no.	Head length (mm)	Right Pes (long) (mm)	Tail length (mm)	No. of PY	PY size (mm)	PY fur (pink/fur)	Enlarged teets	Males: scrotum width (mm)	Comments
1/02/2019	6	N	F	1600	120		-	90	45.7	245	0			0		
1/02/2019	11	N	F	1550	70						0					Virgin pouch
1/02/2019	55	N	F	2190	70						2		No Fur			
1/02/2019	59	N	F	1560	70						0					Virgin pouch
1/02/2019	68	N	F	1620	70						0			1		ET 5mm
1/02/2019	67	N	F	1845	75						0			2		ET 7mm
1/02/2019	99	N	F	1320	70						0					Virgin pouch?
1/02/2019	25	N	F	1800	120				54.1		0			?		Enlarged teets
1/02/2019	27	N	F	1920	100			79.9	56.7		0			?		Enlarged teets
1/02/2019	36	N	F	1800	110			88.3	61.3		0			?		Enlarged teets
1/02/2019	80	N	F	1570	110			83.3	55.1		0			0		
1/02/2019	90	N	F	1950	110			86.3	50					1		
1/02/2019	86	N	F	1850	110				57.4		0			1		
2/02/2019	6		F	1370	125			80.9	50	280	0					White tip on tail end
2/02/2019	10		M	895	115			68.3	56.3	240					17.7	tail small white tip
2/02/2019	18		M	1855	120			86.2	53.2	275					38.2	black tail, rufous on flanks
2/02/2019	11		F	1580	115					260	0					half tail white, 120mm black
2/02/2019	80		F	1575	120	1455			58.3	255	0					1/4 tail white - 100mm
2/02/2019	78		F	1555	120			82.8	50.6	255	0					black tail
2/02/2019	103		F	2050	205						0			1		tail tiny white tip
2/02/2019	23		F	1515	120			82.1	50.7		0			0		
2/02/2019	26		F	1720	120			82.5	52.1		0			0		
2/02/2019	28		F	1850	120			82.4	51.1		0			0		
2/02/2019	50		F	1610	120						0			1		
2/02/2019	31		F	2190	120						1	80	furred			
2/02/2019	35		F	1730	120				52.9		0			1		
2/02/2019	82		M	2040	140			73.4	50.2							possible growth on testes
2/02/2019	86		F	1310	120			75.9	48.7		0					virgin pouch

3/02/2019	2	RE	M	1800	115			91.8	54.3	295					35.9	rufous neck, full black tail, caught 2/2
3/02/2019	9	RE	M	925	115			63.4	50	245					16.5	black tail, white tip, caught 2/2
3/02/2019	13		F	1495	115			76	49.2	263	0					half tail white 120mm, 2 non active teets
3/02/2019	33		F	2225	190					295	1	150				black tail with white tip 7cm
3/02/2019	34		F	1745	185						0			2 mod		black tail
3/02/2019	35		M	2095	190										38.2	black tail, red spots on scrotum
3/02/2019	38		M	1835	65											black tail, growth on scrotum
3/02/2019	60		F	1580	185						0					black tail, virgin pouch
3/02/2019	86		F	1900	190						0					black tail
3/02/2019	88		M	2040	190											tail with white tip
3/02/2019	90		F	1815	200											black tail
3/02/2019	21		F	1500	120			81.6	57.6	260	0					black tail, virgin pouch
3/02/2019	26		F	1625	120				59.8	260	0			1		scabies/mites on right foot (orange), all black tail
3/02/2019	50		F	1640	120				53	28	0			1		black tail
3/02/2019	49															5cm white tip on tail
3/02/2019	46		F	1810	120				48.2	250	0			1		black tail
3/02/2019	63		F	1790	120						0			4		2 very large, 1 large and 1 mod enlarged teats
3/02/2019	77		F	1460	120			84.4	48.9	300	0			1		

4/02/2019	21		F	1480	120						0					virgin pouch, black tail
4/02/2019	24		F	1615	125						0					black tail
4/02/2019	27		M	1160	120											black tail, small testes
4/02/2019	65		F	1805	130						0			1		black tail
4/02/2019	89		M	1975	195											black tail with very small white tip
4/02/2019	14		F	1350	130						0					white tip on tail 11cm
4/02/2019	48		F	1740	120						0			1		black tail
4/02/2019	49		M	1830	130											black tail, srotum markings
4/02/2019	77		F	1780	120						0			2		tail- base half grey, end half black
4/02/2019	79		F	1410	120						0			1		tail 1/3 grey, 2/3 black, hairy pouch
4/02/2019	100		F	1640	120						0			2		tail 2/3 black, 1/3 grey