Koala Monitoring Program

Yarrabilba Priority Development Area

Koala Capture / Monitoring Event March 2018

Summary Report

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Introduction

This report presents the latest findings from the Koala Monitoring Program that has been implemented for the Yarrabilba Priority Development Area by the Koala Ecology Group (University of Queensland) in partnership with Austecology. The Koala Monitoring Program has been developed to monitor koala health and use of koala habitat offsets under the Commonwealth's EPBC 2013/6791 Approval.

The *Koala Monitoring Program* comprises three key elements:

1. ***Koala Capture / Monitoring Events*** - This component of the program will involve fieldwork to catch, examine and tag selected koalas for monitoring purposes.
2. ***Koala Monitoring Events*** - This component is designed to track and establish the location of collared koalas in order to visually assess their well-being (using binoculars) as well as their tree use preferences.
3. ***Koala Population Survey Events*** – This component will provide a series of systematic transect searches throughout the full extent of the designated "Fauna Corridor", and the seven EPBCA Offset Areas.

During March 2018 the second *Koala Capture / Monitoring Event* was conducted at the Yarrabilba site. The aims of the fieldtrip were to 1. Assess the health status of the four collared koalas, 2. Visually check the condition of the tree-mounted LX base stations, and 3. Deploy the remaining LX base station and koala collars.

This report summaries the main findings from the recent event and incorporates the movement data that had been remotely logged by the koala collars up to that date.

Methodology

The second koala monitoring event occurred from the 19th – 21st March 2018. The study team comprised five personnel, three from the Koala Ecology Group (Ben Barth, Bill Ellis, and Sean FitzGibbon) and two from Austecology (Lindsay Agnew and Heath Agnew).

At the time of the fieldtrip, four koalas were collared. These koalas were located by radio-tracking, as each collar emits a unique VHF radio signal. Attempts were made to recapture these individuals so that their health could be checked and the collar could be inspected. Captures were implemented by one tree climber and a ground support team using the traditional "flagging" method.

In addition to recapturing collared koalas, efforts were made to locate new koalas (i.e. "cleanskins") at the site, to fit with collars. The nominated target habitat area within EPBCA Offset Area 1 was searched throughout the field work period and when a koala was detected, suitability for capture was assessed.

Captured koalas were restrained in a cloth bag in a cool location and processed at the site. Processing took approximately 45mins per animal, during which time the koala was briefly anaesthetised (5mins) to facilitate a basic health examination and the collection of body measurements, as well as eye and urogenital swabs for disease testing. Measurements included

body weight, head length and width, testes width (males), and an assessment of tooth wear (to age the koala) and body condition (from 1 to 10, with 1 being very poor condition and 10 being excellent condition).

Cleanskin koalas were fitted with a coloured ear tag stamped with a unique number, following previous protocols (right ear for females and left for males). A small stainless steel numbered tag was inserted in the opposite ear as back-up identification. It is important to note that the coloured tags are often visible from the ground, permitting easy identification of study animals by anyone that observes a koala at the site. Binoculars would be required if the koala was located high in a tree.

Cleanskin koalas were then fitted with collars to enable them to be radio-tracked (during Koala Monitoring Events) as well as monitored using the online Koala Tracker system (see http://trackkoalas.com.au/ for further information on this koala-specific tracking system). For koalas that were already collared, the collar fit was checked to ensure it was neither too tight nor loose.

After processing, captured koalas were allowed time to fully recover from anaesthesia before being released in the same tree from which they were captured. All procedures were in accordance with our current DEHP Scientific Purposes Permit and University of Queensland Animal Ethics Certificate.

Results & Discussion

A total of five adult koalas (3F, 2M) were captured during the March koala capture/monitoring event (Fig. 1). Two of the females (Sue-Bob and Jean) were already tagged and collared, while the third female (Kobe) was a new individual that had not been captured previously. Similarly, one of the captured males (Cain) was already collared, while the second (Bomber) had been tagged previously but not collared.

Details of the captured koalas are provided in the remainder of the report, as are pictures that were taken during processing and plots of their movements as recorded using the LX collars and base stations. A complete set of tag and collar details are provided in Appendix 1.

A third base station was successfully deployed during the March fieldtrip (Fig. 1). The station was mounted up an ironbark in the south of the focal area, to provide coverage for koalas that utilise this area (Note: Jean has been detected using this area but at those times she has been out of range of the two previously deployed base stations). It is hoped that this third base station will provide the additional coverage required to ensure that the collared koalas are detectable by the LX system at all times.

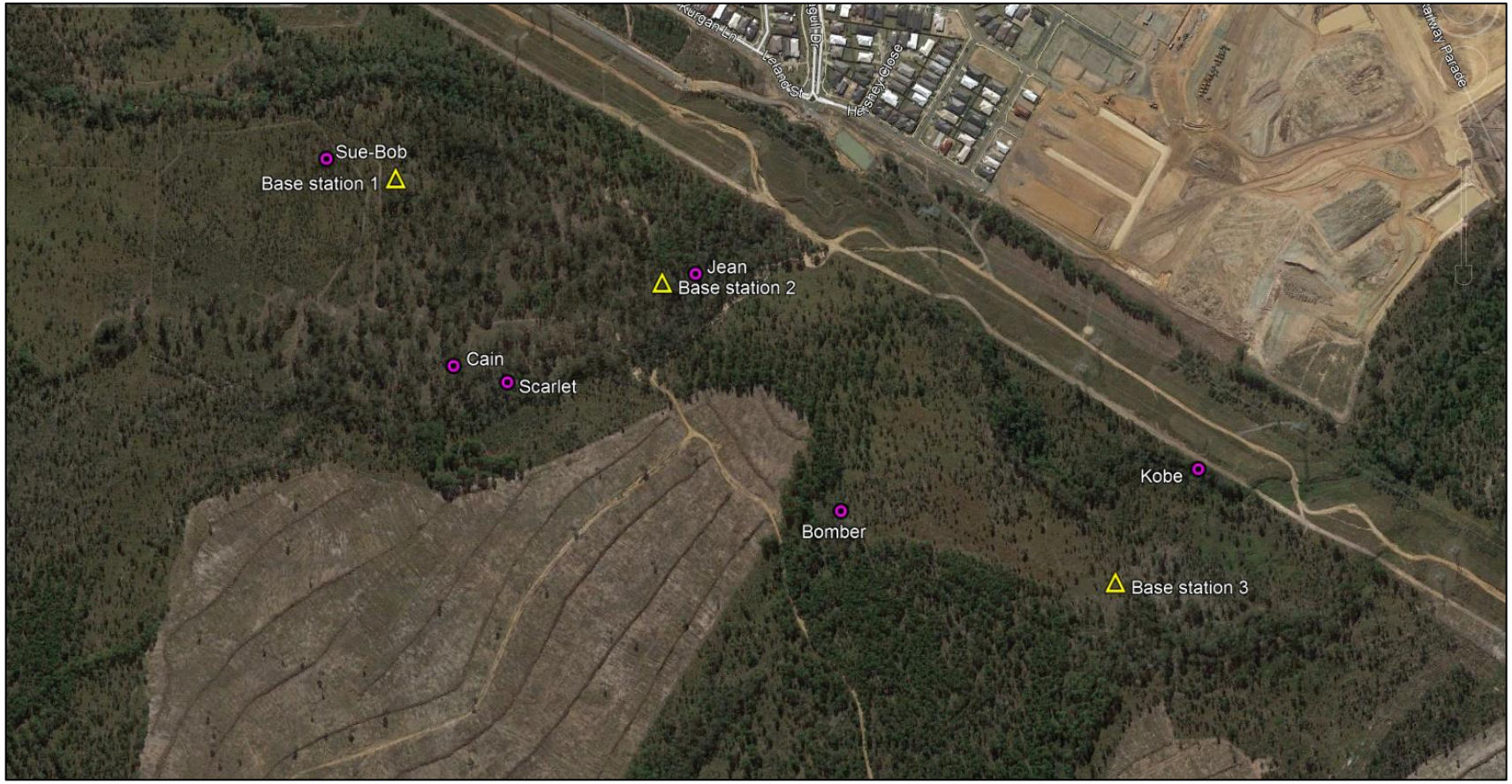

Figure 1. Plot of the initial location of koalas that were tracked and/or captured during the March 2018 fieldtrip, and the base stations that have been deployed to monitor their movements.

Jean (13486)

This female koala was first captured in October 2017, at which time she was carrying a large back young (Emily 13487). Radio-tracking during the monthly monitoring events revealed that Jean weaned her offspring between the 5th December 2017 (young present) and the 26th January 2018 (young absent). When she was examined in March 2018 she was found to be carrying a new pouch young (estimated to be only 1-2 months old). Jean was still average size (weight 5.4kg) and in fair body condition (body score 5/10). She was still carrying her ear tags: orange F15 in her right ear, small metal tag UQ800 in her left ear. Jean's tooth wear suggests she is 3-6 years of age.

The eye and urogenital swab samples that were collected from Jean at first capture (Oct'17) were later sent for laboratory analysis and all three returned a negative test result (Appendix 2). These findings strongly suggest that Jean is not infected with Chlamydia, which is the main bacterial pathogen that affects koalas and can lead to blindness, incontinence and infertility. This is a very encouraging result because many koalas in south-east Queensland are infected with Chlamydia, which is regarded as a sexually transmitted disease.

When Jean was examined during the most recent fieldtrip, her eyes and rump still appeared clear and free of obvious disease e.g. conjunctivitis or cystitis/"dirty tail" (see Fig. 2 below).

Figure 2. Pictures of Jean during her health examination (left) and at release (below). Jean's coloured tag (orange F15) is clearly visible in her right ear.

A plot of Jean's movements over the past six months is shown in Figure 3. The figure shows two locations per day, collected at approximately 10am and 10pm. It can be seen that Jean makes extensive use of habitat along Quinzeh Creek in the centre of the site. Interestingly, she also regularly crosses through an area dominated by exotic plantation pine in the east of her range,

presumably to access food trees that are scattered throughout (see circled area in Fig. 3). Jean was recaptured from an exotic pine tree in this area during the March fieldtrip, highlighting that she actually uses this tree species for shelter. She was radio-tracked the day after recapture and was found to be sheltering in yet another exotic pine at the edge of Quinzeh Creek.

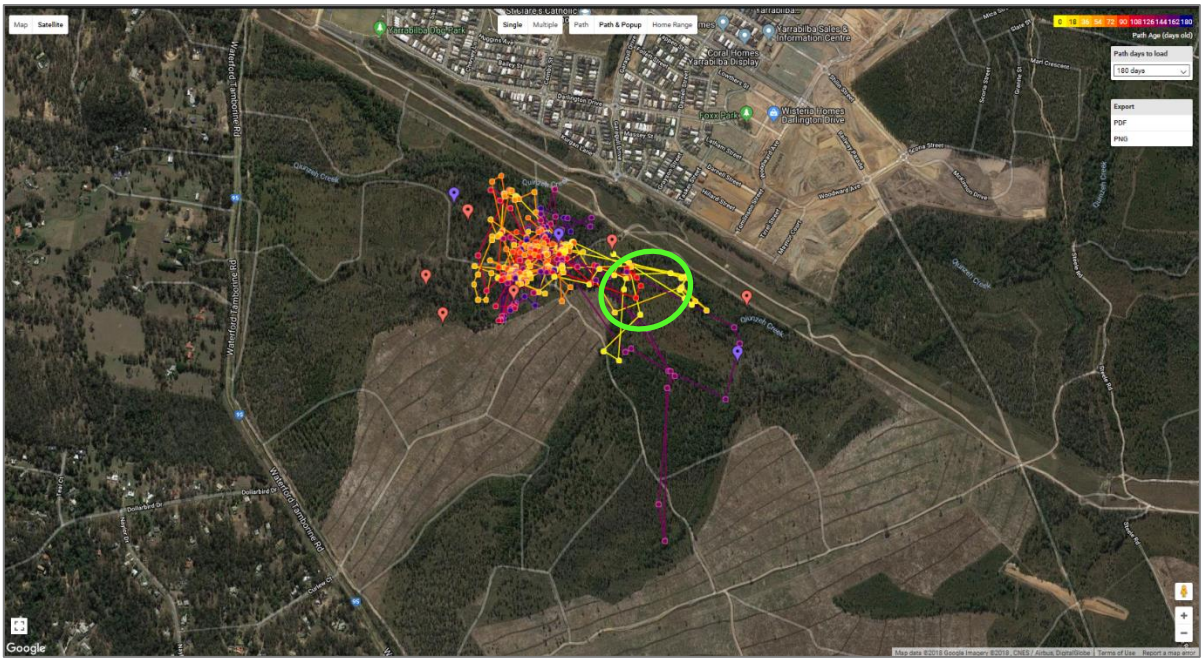

Figure 3. Plot of Jean's movements over the past 180 days, using a colour-coded time scale: yellow points are the most recent (1-30 days ago) while dark purple points are the oldest (150-180 days ago). The green circle shows the area dominated by exotic pine that Jean regularly utilises.

Cain (13488)

This adult male koala was first captured in October 2017 and was found to have a severely infected right eye (see Fig. 4). The tissue around the eye and conjunctiva was inflamed and was likely impairing vision. He was given a brief examination at the site (for tagging and measuring purposes) and then taken immediately to Australia Zoo Wildlife Hospital (AZWH) for treatment. Cain's tooth wear suggested he was quite young, aged between 2 – 4 years. He was fitted with a royal blue ear tag (#G8, left ear).

Swabs collected just prior to treatment at AZWH revealed that the infection in his right eye was due to Chlamydia (Appendix 2). No infection was detected in the left eye or penis, despite Cain's rump appearing somewhat stained. The colouration may have been a result of staining from tree bark, as this is known to occur in captive koalas.

The antibiotic treatment at AZWH was successful and in early December 2017, Cain was released back at the site in the original area of capture. He was recaptured during the March 2018 fieldtrip and his eyes and rump still appeared clear and free of obvious disease e.g. conjunctivitis or cystitis/"dirty tail" (see Fig. 5). Eye swabs were collected again and these tested negative for

Chlamydia (Appendix 2). At the most recent capture (19/3/18), Cain was in good condition (body score 7.5/10) and weighed 8.1kg (an increase of ~250g since treatment).

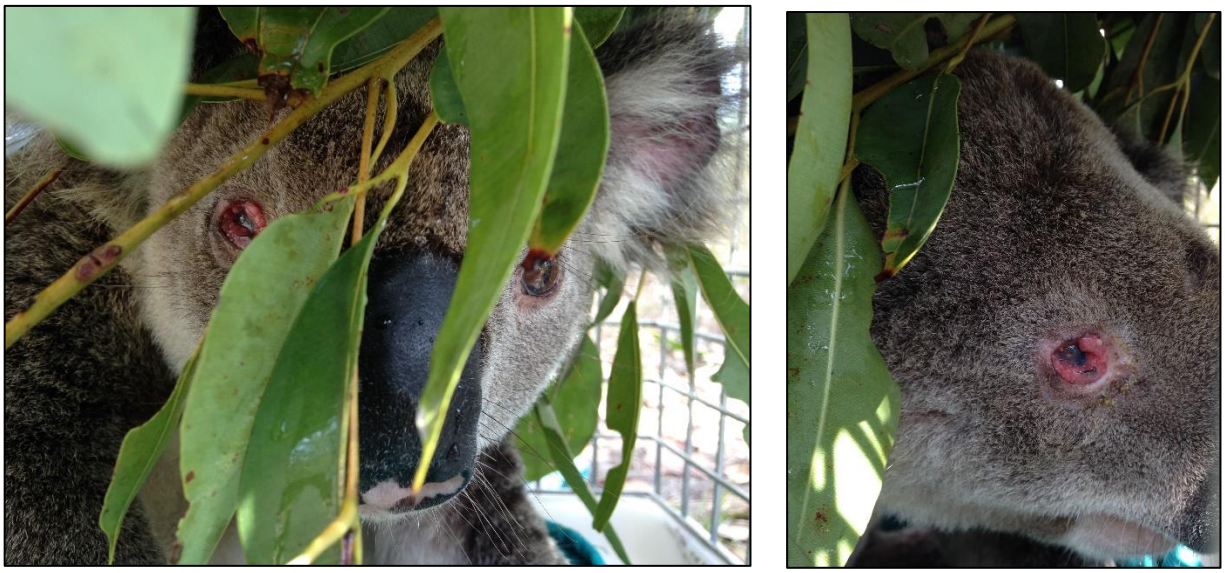

Figure 4. Images of Cain at first capture (Oct'17) showing the inflamed tissue around his infected right eye.

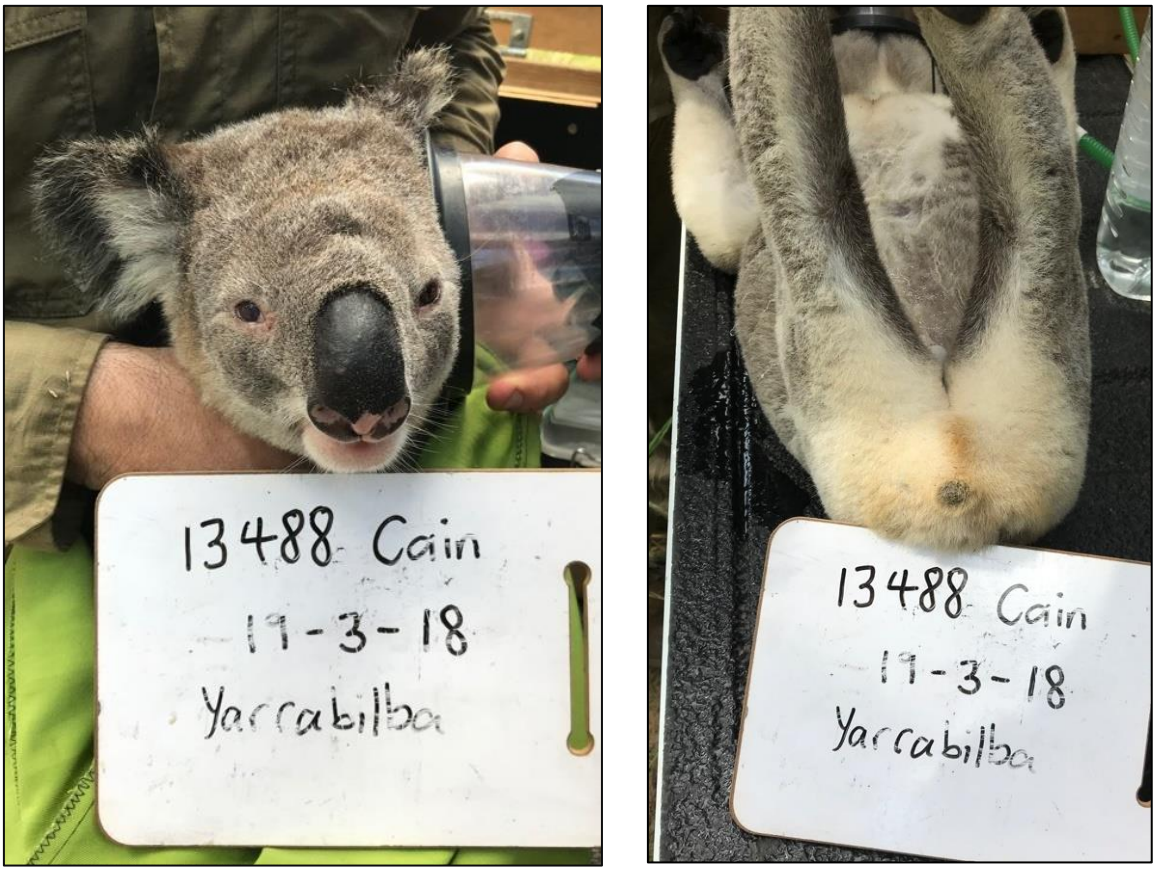

Figure 5. Images of Cain at the most recent capture (19th March 2018) showing that his previously infected right eye was still clear (left image) and that his rump was clean and unstained (right image).

A plot of Cain's movements over the past three months is shown below in Figure 6. The figure shows two locations per day, collected at approximately 10am and 10pm. Cain's activity was focused on the west of the site. He regularly crossed the old plantation pine area that separates two branches of Quinzeh Creek (see green circle in Fig. 5). The data suggest that Cain may have briefly crossed Waterford-Tamborine Road on two occasions, although GPS inaccuracy for these two points cannot be ruled out.

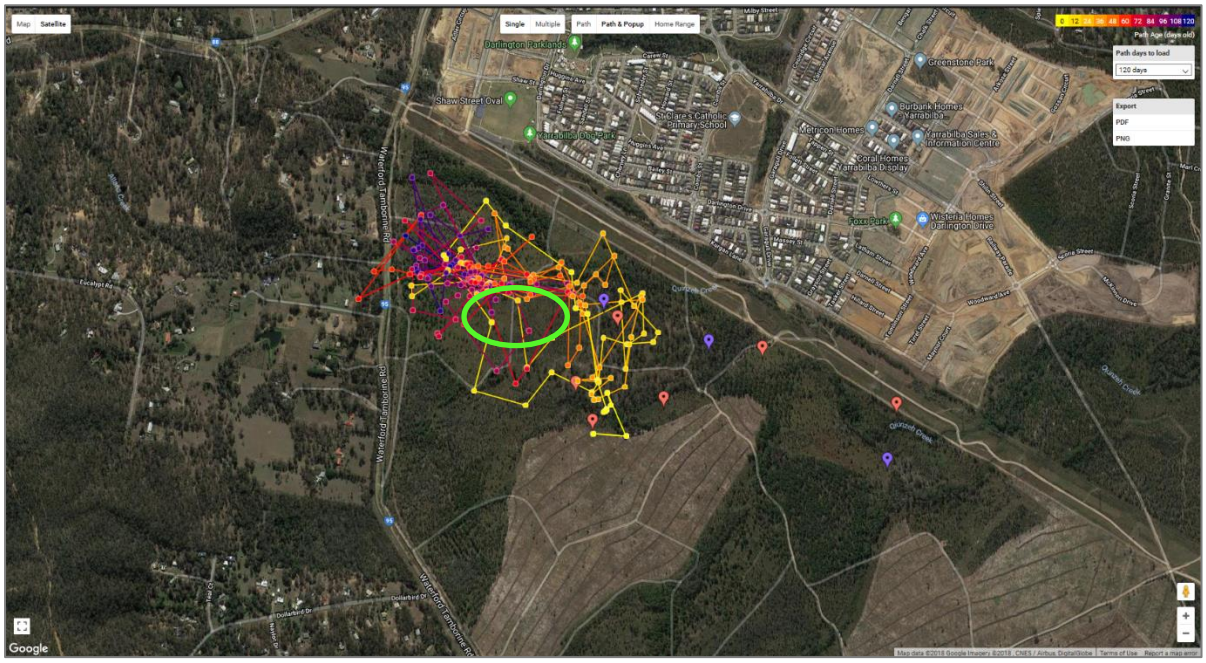

Figure 6. Plot of Cain's movements over the past 120 days, using a colour-coded time scale: yellow points are the most recent (1-20 days ago) while dark purple points are the oldest (100-120 days ago). The green circle shows the old planation pine area that Cain regularly traverses.

Sue-Bob (13490)

This female koala was first captured in October 2017, at which time she was carrying a large back young. As with Jean, radio-tracking during the monthly monitoring events revealed that Sue-Bob weaned her offspring between the 5th December 2017 (young present) and the 26th January 2018 (young absent). During the recent fieldtrip she was recaptured and found to be carrying a new pouch young. Although she was still in poor condition (body score 4/10), since October 2017 she had actually gained 100g and increased one point on the body score scale. Her ear tags were still in place: orange F20 in the right ear, small metal tag UQ799 in the left. Sue-Bob's tooth wear suggests she is an older koala aged between 5-10 years.

The swab samples collected from the eyes and urogenital sinus at first capture (Oct'17) all returned negative test results, suggesting Sue-Bob is not infected with Chlamydia (Appendix 2). This is further encouraging news because both Jean and Sue-Bob have successfully weaned young since the monitoring program commenced, and it is highly likely that they have producing uninfected offspring (Note: in addition to sexual transmission, Chlamydia can also be transmitted vertically from mother to offspring). However, infection status can change rapidly – a single sexual encounter with an infected male can lead to chlamydial disease, which can manifest in a short period of time. Given the

prevalence of Chlamydia within koala populations of south-east Queensland, infection is an ever-present threat for sexually mature females. When Sue-Bob was examined during the most recent fieldtrip, her eyes and rump still appeared clear and free of obvious disease (see Fig. 7).

Figure 7. Image of Sue-Bob taken during her recent health examination (March 2018), showing her clear eyes.

A plot of Sue-Bob's movements over the past six months is shown in Figure 8. The figure shows two locations per day, collected at approximately 10am and 10pm. Her activity was heavily concentrated in a relatively small area of the site, bounded by two branches of Quinzeh Creek.

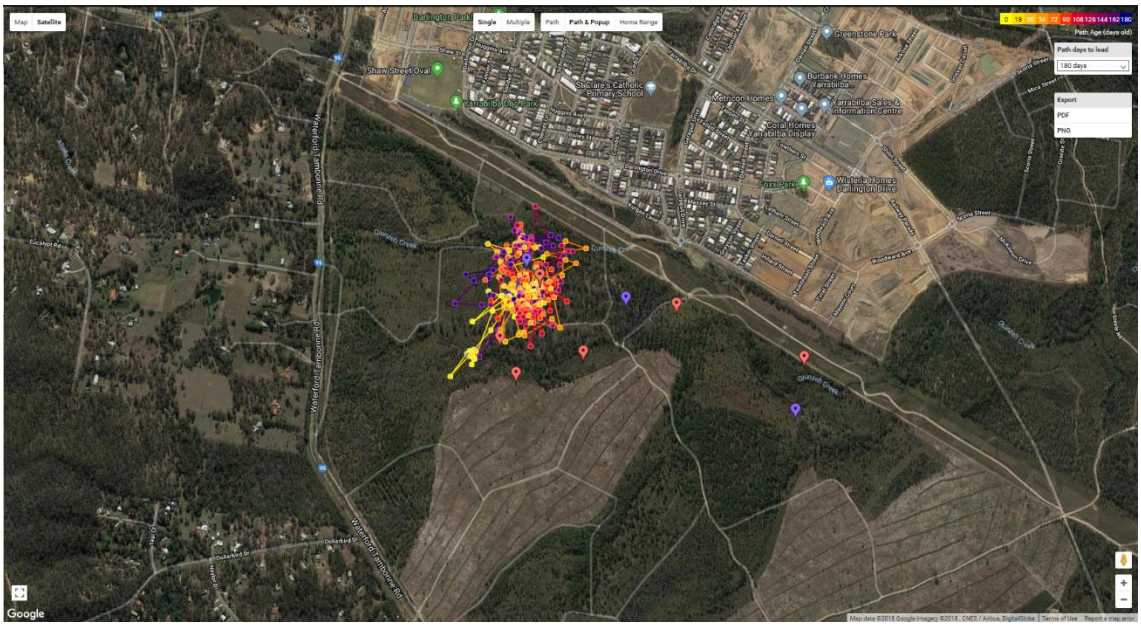

Figure 8. Plot of Sue-Bob's movements over the past 180 days, using a colour-coded time scale: yellow points are the most recent (1-30 days ago) while dark purple points are the oldest (150-180 days ago).

Kobe (13495)

This new female koala was encountered just prior to sunset while searching the site during the March 2018 fieldtrip. She was captured from a medium-sized narrow leaved ironbark (*Eucalyptus crebra*) and anaesthetised to facilitate examination (Fig. 9). Kobe's tooth wear suggested she was relatively young, estimated to be between 3 – 6 years old. She weighed slightly more than 5kg and despite being sexually mature and in good body condition (7.5/10), her pouch was empty. Her eyes appeared clear and free of overt infection but her rump looked slightly discoloured (Fig. 9). As mentioned previously, such staining can be due to tree bark rather than infection. However, laboratory testing of the collected swab samples revealed that Kobe had a high level chlamydial infection in her urogenital tract (Appendix 2).

It is possible that Kobe's infection may already have led to disease in her reproductive tract, which can impair fertility and the ability to rear young in female koalas. This can only be confirmed by ultrasound. It is suggested that Kobe be taken to a wildlife hospital at the next available opportunity so that her health can be thoroughly examined, and a decision made on the best course of treatment.

Figure 9. Pictures of Kobe taken during examination after her first capture. Eye and urogenital swabs were collected while she was anaesthetised (left); her rump was appeared to be mildly stained (right).

Bomber (13008)

This male koala was first captured and tagged in May 2017, during a preliminary survey of the site. He evaded detection during the fieldtrip in October 2017 and hence had never been collared. Bomber was sighted in a blue gum (*E. tereticornis*) during habitat searches of the site on 21st March 2018. He was identifiable from the ear tags that were fitted in 2017.

Bomber was successfully captured using the flagging technique and was anaesthetised to facilitate examination. Based on tooth wear, Bomber was estimated to be between 5 – 10 years old. He weighed 8.9kg, approximately 300g less than at first capture, and was in fair condition (body score 6/10). His face appeared to be somewhat swollen either side of his nose but there was no sign of injury (Fig. 10). Both eyes and the rump appeared clear of overt infection and laboratory testing of the collected swab samples were negative for Chlamydia (Appendix 2).

After fitting Bomber with an LX tracking collar, he was returned to the tree from which he was captured.

Figure 10. Image of Bomber taken during his recent health examination (March 2018). His face appeared slightly swollen on either side of the nose but there was no obvious injury.

Scarlet (13489)

This koala was first captured and tagged in October 2017, at which time her pouch was empty but she was considered to be a young, sexually mature female (~3yrs old). During the March 2018 fieldtrip, Scarlet was tracked and an unsuccessful attempt was made to recapture her; the catch was abandoned because it was very hot and Scarlet was behaving erratically, jumping between branches high up the tree. She was tracked over the next two days but on both occasions she was located in very tall trees (>20m) so no further attempts were made to recapture her.

During the capture attempt it was noticed that Scarlet had a bulging pouch, indicating that she was carrying a young. Her coat looked healthy and she did not appear to be skinny, suggesting that she was in at least fair condition (Note: In October 2017, her body score was 6.5/10). Her rump and eyes appeared free of obvious infection. Further, the swab samples collected from Scarlet's eyes and urogenital sinus at first capture (Oct'17) all returned negative test results, suggesting she is not infected with Chlamydia (Appendix 2).

A plot of Scarlet's movements over the past six months is shown in Figure 11. The figure shows two locations per day, collected at approximately 10am and 10pm. Her activity was heavily concentrated on the southern branch of Quinzeh Creek, running east-west across the site.

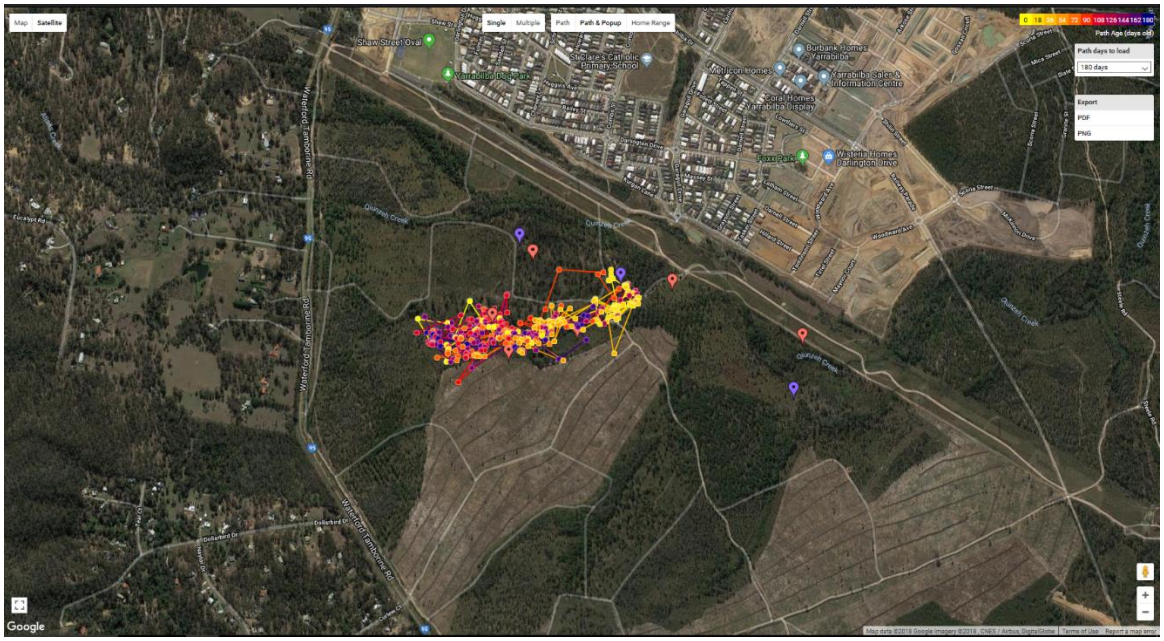

Figure 11. Plot of Scarlet's movements over the past 180 days, using a colour-coded time scale: yellow points are the most recent (1-30 days ago) while dark purple points are the oldest (150-180 days ago).

Conclusion

The *Koala Capture / Monitoring Event* conducted during March 2018 was the second under the adopted Koala Monitoring Program. It was an extremely successful trip in that two new koalas were collared (Kobe and Bomber) and three of the four previously collared koalas were recaptured (Jean, Sue-Bob and Cain).

Three of the four collared females were carrying new pouch young and these three females tested negative for Chlamydia, so we expect that they will rear uninfected young. This high level of reproduction is extremely encouraging, although the opportunities for dispersal and home range establishment are limited by nearby urban development. Further research is required to examine the fate of weaned young as they disperse from their natal areas.

The treatment of Cain's infected right eye in late 2017 appears to have been highly successful, as he was in good condition when recaptured and his eyes were clear and tested negative for Chlamydia.

Laboratory testing revealed that the new female, Kobe, has a heavy chlamydial infection in her urogenital tract. We recommend that this koala is taken in for veterinary assessment and treatment at the next available opportunity. It is possible that this infection has already caused reproductive cysts and rendered her infertile, but this can only be confirmed using ultrasound examination.

At the end of the March 2018 fieldtrip, six koalas had been fitted with LX tracking collars and all were successfully communicating with the three deployed base stations. This latest-technology system will permit the collared koalas to be remotely monitored in near-to real-time; the system will upload two locations each day for each of the collared koalas (approximately 10pm and 10am).

The next (third) *Koala Capture / Monitoring Event* is scheduled to occur during May/June 2018. The focus during that fieldtrip will be to conduct required recaptures (incl. Scarlet) and to check the state of the base stations. Opportunistic searches will also be conducted to try and locate additional koalas. The koalas that have already been collared will be routinely radio-tracked under the *Koala Monitoring Events* component of the program.

Appendix 1. Summary of tag, collar and other details for all koalas that have been captured at the site to date (March 2018). Those koalas that are currently collared are highlighted.

UQ #	Name	Sex	Mass	Age	Left ear tag	Right ear tag	1st Capture	Latitude	Longitude	Frequency	Notes from March 2018
13007	Heath	M	3.83	2+	Orange F10	Yellow H10	17/05/2017	-27.8113490	153.1062150	not collared	Unsighted since first capture
13009	Caitlin	F	5.92	4	Pink 866	Yellow H6	18/05/2017	-27.8219730	153.1313310	not collared	Unsighted since first capture
13008	Bomber	M	9.28	5-10	Light Blue 621	Pink 886	18/05/2017	-27.8121970	153.1072190	149.693	Fair condition; collar on duty cycle (1:40pm on)
13486	Jean	F	5.56	3-6	metal UQ800	Orange F15	9/10/2017	-27.8121559	153.1086764	150.871	Fair condition; carrying new pouch young
13487	Emily	F	1.065	1	metal UQ724	metal UQ789	9/10/2017	-27.8121559	153.1086764	not collared	Unsighted since first capture
13488	Cain	M	8.073	2-4	Royal Blue G8	metal UQ796	9/10/2017	-27.8132431	153.1039776	150.754	Good condition; right eye still uninfected
13489	Scarlet	F	4.805	1-3	metal UQ753	Royal Blue G14	10/10/2017	-27.8110978	153.1049627	151.874	Fair condition; carrying new pouch young
13490	Sue-Bob	F	5.655	5-10	metal UQ799	Orange F20	10/10/2017	-27.8122096	153.1063710	150.691	Poor condition; carrying new pouch young
13495	Kobe	F	5.055	3-6	metal UQ175	Yellow C20	20/03/2018	-27.8137242	153.1169157	151.712	Good body score; urogenital chlamydial infection

Appendix 2. Summary of PCR laboratory testing for Chlamydia, including swab samples collected in March 2018. Positive test results are highlighted.

ID	Name	Sex	Date	Swab site	23S Chlamydia	C.pecorum	IFU/mL	C.pneumoniae	NOTES
13486	JEAN	F	9/10/2017	L EYE	NEGATIVE	NEGATIVE		NEGATIVE	
				R EYE	NEGATIVE	NEGATIVE		NEGATIVE	
				UGT	NEGATIVE	NEGATIVE		NEGATIVE	
13487	EMILY	F	9/10/2017	L EYE	NEGATIVE	NEGATIVE		NEGATIVE	Young of Jean in 2017
				R EYE	NEGATIVE	NEGATIVE		NEGATIVE	
				UGT					
13488	CAIN	M	9/10/2017	L EYE	NEGATIVE	NEGATIVE		NEGATIVE	
				R EYE	POSITIVE	POSITIVE	1,250	NEGATIVE	
				UGT					
13488	CAIN	M	10/10/2017	L EYE		NEGATIVE		NEGATIVE	Swabs collected at AZWH at admission
				R EYE		POSITIVE	1,226	NEGATIVE	
				UGT		NEGATIVE		NEGATIVE	
13488	CAIN	M	21/11/2017	L EYE		NEGATIVE		NEGATIVE	Swabs at 2wks after end of treatment (pre-release)
				R EYE		NEGATIVE		NEGATIVE	
				UGT		NEGATIVE		NEGATIVE	
13488	CAIN	M	19/03/2018	L EYE		NEGATIVE		NEGATIVE	Swabs at first recapture following return to the wild
				R EYE		NEGATIVE		NEGATIVE	
				UGT		No result		No result	
13489	SCARLET	F	10/10/2017	L EYE	NEGATIVE	NEGATIVE		NEGATIVE	
				R EYE	NEGATIVE	NEGATIVE		NEGATIVE	
				UGT	NEGATIVE	NEGATIVE		NEGATIVE	
13490	SUEBOB	F	10/10/2017	L EYE	NEGATIVE	NEGATIVE		NEGATIVE	
				R EYE	NEGATIVE	NEGATIVE		NEGATIVE	
				UGT	NEGATIVE	NEGATIVE		NEGATIVE	
13495	KOBE	F	20/03/2018	L EYE		NEGATIVE		NEGATIVE	
				R EYE		NEGATIVE		NEGATIVE	
				UGT		POSITIVE	36,976	NEGATIVE	Heavy UGT infection
13008	BOMBER		22/03/2018	L EYE		NEGATIVE		NEGATIVE	
				R EYE		No result		No result	
				UGT		NEGATIVE		NEGATIVE	