Bruce Highway Cooroy to Curra (Section C: Traveston to Woondum)

March 2018 Progress Report

Prepared for:

Department of Transport and Main Roads

Prepared by:

Detection Dogs for Conservation

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Executive Summary

This is the second Annual report of the research proposal submitted in accordance with Condition 7 of EPBC Act approval EPBC 2014/7394 for the Bruce Highway Cooroy to Curra (Section C: Traveston to Woondum) Project: 'Non-invasive monitoring of fragmented and rehabilitated koala habitats using detection dogs: maximising koala conservation outcomes from mitigation strategies (e.g. offsets)'. The aims of the research project are twofold:

Aim 1 - Measure the long-term effects of habitat fragmentation on koala health dynamics and how these may be mitigated by the introduction of corridors (underground passages etc).

- Training and testing of the two TMR dogs (all koala scats and fresh scat only detection dogs) is continuous and showing both dogs have high accuracy with their handlers. Training of an additional detection dog for the identification of Chlamydia in koala scats has also occurred (as a DDC in-kind).

- Surveys conducted during the last 12 months include:
    - Tinana (Nov 2017) - 2 handlers, 2 dogs - 13 surveys - 9 koalas - 20 genetic samples.
    - Gympie:
        - June 2017 - 2 handlers, 2 dogs - 17 surveys - 33 genetic samples.
        - December 2017 - 2 handlers, 2 dogs - 21 surveys - 1 koala - 21 genetic samples.

- Genetic genotyping of the Moreton Bay koalas is now complete. Total number of koalas genotyped is 448. This data is now currently being analysed.

Aim 2 - Measure the long-term recolonisation patterns of koalas into rehabilitated landscape (including offsets) to assess whether rehabilitated landscapes can support sustainable populations of koalas.

- USC have surveyed a total 236 sites since the start of the project, with 101 sites with koala scats detected and 187 scats sampled for genetic analyses.

Peer-reviewed articles:

Published:

1. Schultz, Anthony J. Cristescu, Romane H. Littleford-Colquhoun, Bethan L. Jaccoud, Damian Frère, Céline H. (2018) Fresh is best: Accurate SNP genotyping from koala scats. *Ecology and Evolution* 10.1002/ece3.3765 (see Appendix 1).

In Review:

2. Cristescu, Romane H., Schultz, Anthony J., Schoeman D., Scales K., Frère, Céline H. The impact of misrepresentation of species distributions in Environmental Impact Assessments: A case study of koalas in Queensland, Australia. *Animal Conservation*. ACV-09-17-OM-200.

   Summary: The DDC compiled several Environmental Impact Assessment surveys which were designed without *a priori*, i.e., the koala surveys covered the whole impacted zone. It was found that is some areas, especially if the landscape had been previously disturbed (urban areas in particular), koalas can be present outside vegetation types that are typically classified as "high probability of being koala habitat" and where most designs would focus survey effort.
   The paper has been through a first round of reviews, the DDC has answered all comments and the paper is now in its second review time.

In Preparation:

3. Cristescu, Romane H., Miller R., Hulse L., Frère, Céline H. Developing best methodology to detect Chlamydia in koala scats; Dogs on top.

   Summary: The DDC tested the accuracy of three methods to detect Chlamydia in koala scats. These included two molecular methods (quantitative PCR and DaRT sequencing) and one detection dog. Analyses have now been conducted and results are being written up.

4. Frère, Céline H., Strickland K., Cristescu, Romane H., Sherwin W. Fine-scale landscape genomics of koalas in a highly urbanised setting: what key ecological characteristics prevent gene-flow over short distances.

   Summary: Data has now been generated and analyses are under way.

5. Cristescu, Romane H., Strickland K., Frère, Céline H. Is there any health consequences of being inbred: koalas and Chlamydia.

   Summary: Data has now been generated and analyses are under way.

Introduction

In February 2016, the Department of Transport and Main Roads (TMR) research project for the Bruce Highway Cooroy to Curra (Section C: Traveston to Woondum), with the University of the Sunshine Coast (USC), officially started.

The research project involves the use of detection dogs to conduct fine-scale monitoring of koala populations across (1) fragmented koala populations, and (2) rehabilitated sites. The use of detection dogs is a cost-effective and non-invasive methodology to identify koala locations and their scats (Cristescu *et al.* 2015). From scats, the following ecological information about koalas can be measured: presence / absence of koalas at survey site, utilisation rate, and additionally, from fresh scats: sex, genetic and disease characteristics.

Progress Outcomes

Aim 1 - Measure the long-term effects of habitat fragmentation on koala health dynamics and how these may be mitigated by the introduction of corridors

1. Fieldwork:

We are presently monitoring three sites for the assessment of the long-term effects of habitat fragmentation on koala health dynamics. These sites include: Section C: Traveston to Woondum of the Bruce Highway Cooroy to Curra upgrade, Tinana and Moreton Bay Railway.

In the last 12 months, we undertook the following fieldwork:

- Tinana (19-22 Nov 2017) - 2 handlers, 2 dogs 13 surveys - 9 koalas - 20 genetic samples
- Section C Gympie:
    - June 2017 - 2 handlers, 2 dogs - 17 surveys - 33 genetic samples.
    - December 2017 - 2 handlers, 2 dogs - 21 surveys - 1 koalas - 21 genetic samples.

2. Genetic analysis:

In the last 12 months, our focus was on genotyping all samples collected during the Moreton Bay Railway (MBR) project and Tinana surveys. This is because these two datasets contain most information about pre- and post- genetic consequences of fragmentation. Genotyping for both populations has now been finalised and we are currently analysing data on more than 448 koalas for the MBR Project and 72 for Tinana (20 more to add from late last year).

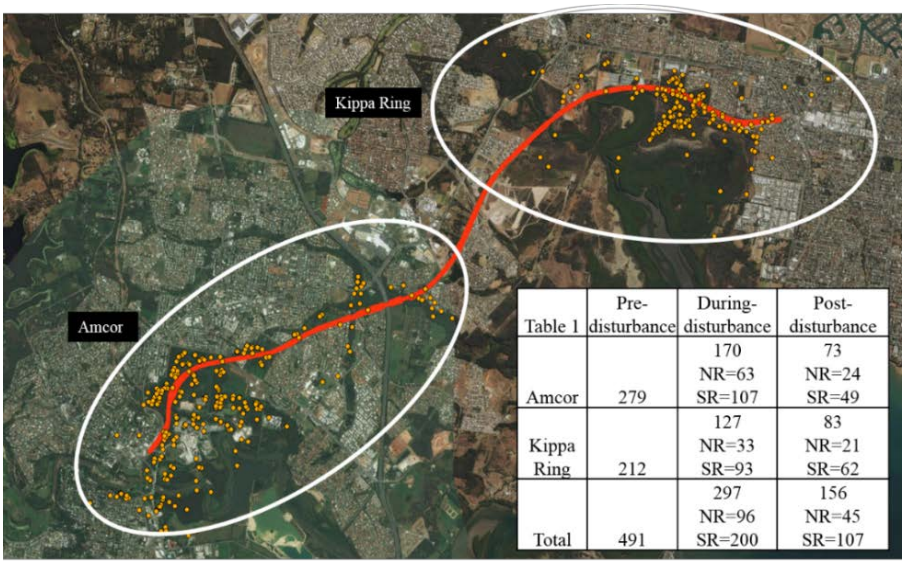

Table 1	Pre-disturbance	During-disturbance	Post-disturbance
Amcor	279	170 NR=63 SR=107	73 NR=24 SR=49
Kippa Ring	212	127 NR=33 SR=93	83 NR=21 SR=62
Total	491	297 NR=96 SR=200	156 NR=45 SR=107

Figure 1. Distribution of the MBR koala samples based on their home range centroid. The red line represents the rail extension. Table 1 represents the number of koala samples. NR stands for north and SR for south of the railway.

Preliminary analysis ran on the MBR koalas (Figure 1) indicate the presence of two distinctive genetic clusters (Figure 2). We are currently in the process of analysing this data for publication.

This data is also currently being used to assess the health consequences of being inbred.

The Tinana genetic dataset is currently being analysed and mapped.

Genetic samples collected for Section C Gympie sites are currently being processed for genotyping.

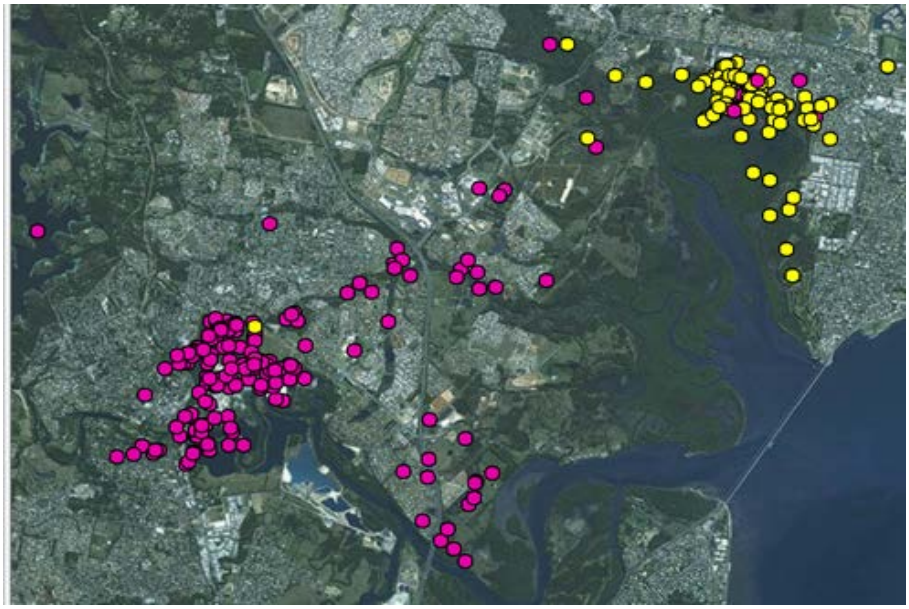

Figure 2. Distribution of the MBR koala samples based on their home range centroid. Genetic structure analysis identified the presence of two distinct genetic clusters (pink and yellow).

3. Chlamydia analysis:

We have been testing three non-invasive methodologies to detect Chlamydia in koala scats. Measuring presence of Chlamydia in koala scats is key to aim 1 as it provides direct information about health. Results are currently being written as a stand-alone paper.

Aim 2 - Measure the long-term recolonisation patterns of koalas into rehabilitated landscape (including offsets) to assess whether rehabilitated landscapes can support sustainable populations of koalas

Rehabilitated sites have been identified through an intensive consultation phase – this involved running workshops and talks, involving koala stakeholders including private rehabilitation business, consultancy and not-for-profit environmental groups, as well as several Councils sending emails and letters to their network.

To date, we have undertaken 236 surveys of which 101 were positive for koala scats (Figure 3). From these surveys, we have collected 187 scats for genetic analyses (Figure 4).

We are currently analysing this data to investigate whether certain ecological characteristics (e.g. elevation, temperature, age of rehab, etc) correlate with presence/absence of koala scats.

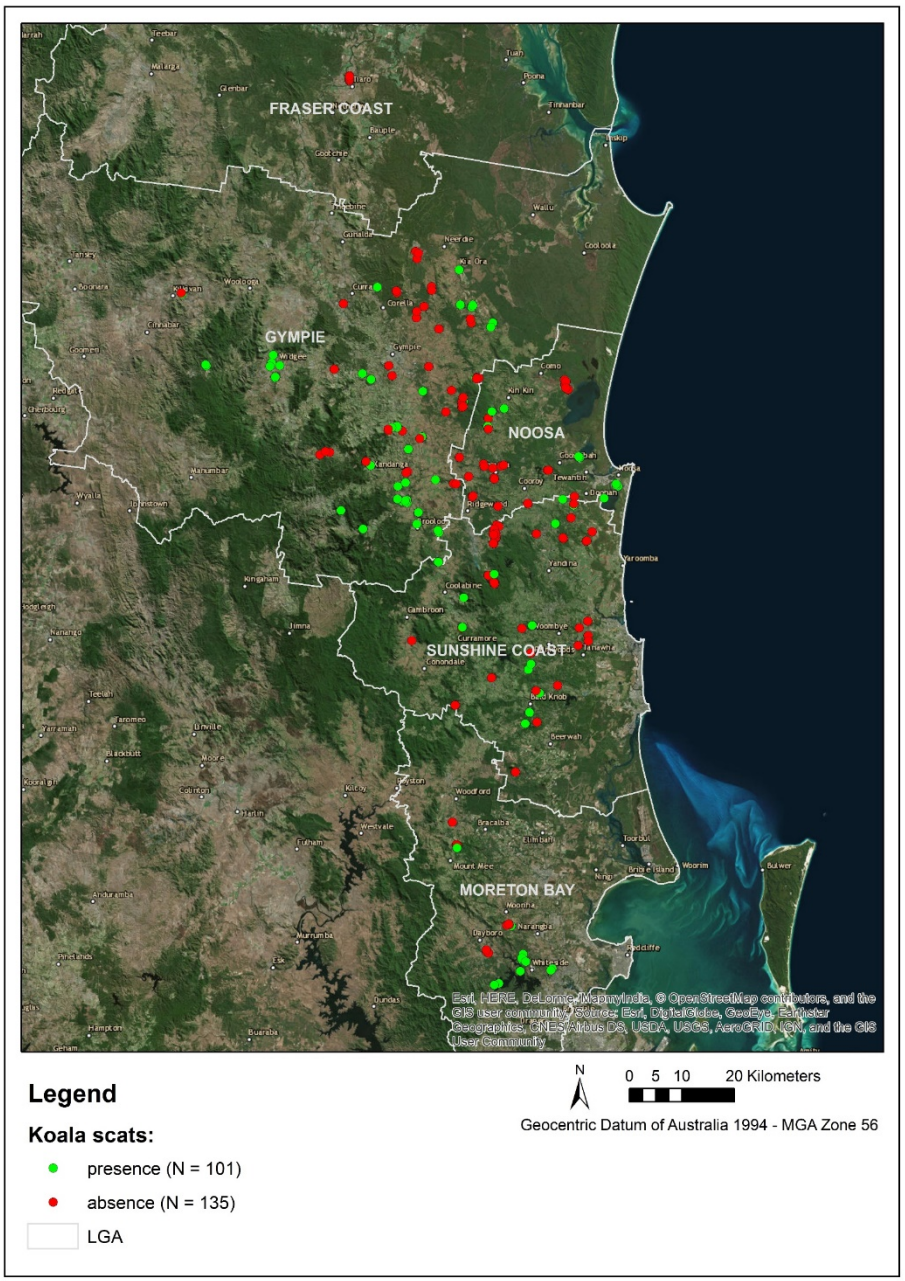

Figure 3. Distribution of surveys conducted on rehabilitated sites. Green indicate presence of koala scats.

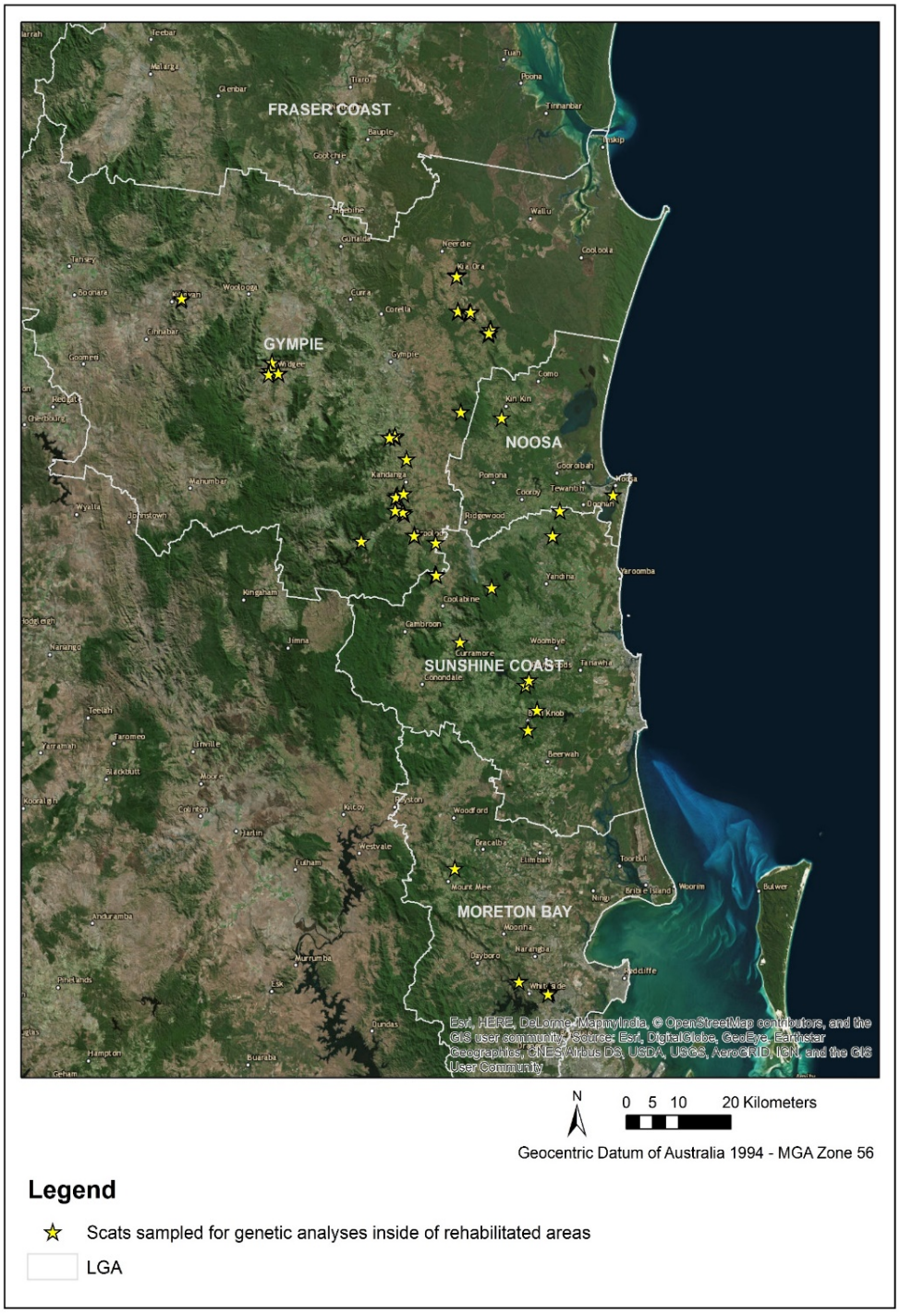

Figure 4. Distribution of surveys sites were koala scats were collected for genetic analyses.

Detection dogs

Both TMR trained detection dogs have now become central to this research. Baxter is deployed to detect koala presence and confirm koalas use rehabilitated sites. Billie, the fresh scat detection dog, has significantly improved our ability to collect scats for genetic analyses.

We have now also added a detection dog for Chlamydia which has proven accurate in detecting sign of the disease in koala scats. This was funded as an in-kind contribution by DDC. Together, these detection dogs are enhancing our research ability and capacity.

Conclusion

Data analysis for Aim 1 is on-going and we are now beginning to write sections of the results as stand-alone peer-reviewed publications. This will allow us to begin our investigation into the genetic consequences of habitat fragmentation.

The field work for Aim 2 is also on-going, we have now gathered sufficient data to begin investigating whether we can identify any ecological characteristics which help explain presence/absence of koala scats in rehabilitated sites.

The USC research team is continuing to grow: Dr Celine Frere, research fellow and Dr Romane Cristescu, postdoc, have been joined by four PhD students, two Master students, two part-time research assistants, two Honours students, and many volunteers. We have also built strong collaborations with the Australian Museum and the University of New South Wales to undertake in depth and state of the art genetic analyses.

References

1.

Cristescu, R.H., Foley, E., Markula, A., Jackson, G., Jones, D. & Frère, C. (2015). Accuracy and efficiency of detection dogs: a powerful new tool for koala conservation and management. *Scientific Reports*, 5, 8349.