FINAL REPORT ON PROJECT SUPPORTED BY PADDY PALLIN SCIENCE GRANT

Instructions to Project Leaders for Completing This Form
Progress reports are required to be submitted 12 months after the start of the project, and then at 18-24 months as a final report. Grants usually begin on the 30th October in the year in which the grant was awarded. Payment of the second grant installment is contingent upon the receipt of this material. Updates are to be provided during the tenure of the grant, and at the time the final report is submitted. Payment of the final grant installment is contingent upon receipt of the final summary which is to summarize the outcomes of the project during the tenure of the grant.

1. PROJECT IDENTIFICATION

1.1 PROJECT TITLE
Effective methods for robust population estimates of a nocturnal predator: Chuditch (*Dasyurus geoffroii*) across the south-west, Western Australia

1.2 ADMINISTERING ORGANISATION
Murdoch University

1.3 PROJECT LEADER AND PARTICPANTS
<u>Project leader</u>
Melissa Taylor (PhD candidate, Murdoch University)
<u>Participants</u>
Dr. Kate Bryant (Principal Supervisor, Murdoch University)
Dr. Adrian Wayne (Co-Supervisor, Department of Biodiversity, Conservation and Attractions)
A/Prof Mike Calver (Co-Supervisor, Murdoch University)
A/Prof Nicola Armstrong (Co-Supervisor, Curtin University)

2. PROJECT DESCRIPTION & OBJECTIVES

2.1 100- Word Project Summary
Current population estimates for chuditch (*Dasyurus geoffroii*) are highly varied and not reliable for evaluating conservation status. This is due to chuditch data being collected using multi-species surveying methods. This project aims to use camera traps with spatially-explicit capture-recapture (SECR) statistical models to develop a chuditch-specific surveying method. This will be achieved by using existing data and comparative field trials to develop a survey method that will be further tested at a number of chuditch populations at different densities and within different habitats across southwestern Australia.

2.2 Summary of original objectives (150 words max)
This project had three original objectives:
1. Analyse, explore and compare existing detection data on chuditch provided by the Department of Biodiversity, Conservation and Attractions (DBCA) and collaborators to inform study designs to be trialled;
2. Conduct field trials at Julimar Sate Forest to develop, refine and test detection methods; and
3. Apply the best of these methods to other sites to test broadscale applicability and effectiveness.

3. PROJECT OVER DURATION OF FOUNDATION GRANT

3.1 Have there been any changes to the project? If yes give details

This could include changes to the research Project resulting from funding from the Foundation being at a lower level than requested. By indicating changes to the budget, aims and research plan in the Report, you are requesting approval from the Foundation for a revision of the Project. A 'satisfactory' assessment of the Report and the Project by the Paddy Pallin Grants Committee means that the revision has been approved.

Yes, the cage trapping portion of this project was removed. The details on how this decision was made can be found in the 2021 progress report for this project.

The sites for the multi-site comparison of the method developed in Julimar state forest were updated. Original sites were Julimar state forest, Wellington National Park and the Upper Warren Region (UWR), with Dryandra National Park and Fitzgerald River National Park to be added pending further funding/time available. Wellington National Park was substituted for Batalling State Forest due to chuditch cage trapping results shared by the Wellington District of DBCA. Dryandra National Park was confirmed thanks to the financial aid of the Peel-Harvey Catchment Council. Fitzgerald River National Park was dropped due to time constraints of the project. It was deemed the additional fieldwork, data processing and analysis workload would likely result in the proposed thesis submission deadline being missed.

3.2 What were your research plans and objectives for the period covered by this report? (150 words max)*(The answer to this question should be consistent with the original Application or the preceding Progress Report).*

The research plan for the 2021/22 period was to run a camera deployment to procure more accurate movement parameters for chuditch to be used with SECR. This data was to be used to run SECR simulations to obtain an optimal inter-trap spacing. From there, a grid layout and one with cameras spaced along roads were to be run with SECR density estimates compared for precision and accuracy using their standard error and confidence interval values along with the perceived realism of the density estimates that they produced. From this, the layout that was deemed to produce the more accurate estimate would then be tested at the other sites within the south-west. This would be to see if it would work unaltered at different natural densities and with other populations or if it will need to be adjusted depending on site.

3.3 Did the research project proceed as planned? What have you achieved over this period? Outline the research findings to date (200 words max)

Yes, the research objectives for this period were met. The camera deployment at Julimar to obtain movement parameters was conducted from October to December 2021. Individual detection data was used to run a SECR analysis and gave us the parameters needed to run simulations for optimal inter-trap distance. This was found to be 1km.

The grid deployment was run from March to April 2022 and the road deployment April to May 2022. Density estimates were very similar for both deployments at around 1 chuditch/km^2 and both had low standard errors and small confidence intervals. The grid deployment did work slightly better and had a higher proportion of chuditch detections that were useable in the analysis, and was therefore chosen for the multi-site test.

The multi-site test is currently ongoing. Julimar is running for the duration as a comparison site and one month deployments at Dryandra National Park and Batalling State Forest have been completed. The Upper Warren Region deployment is currently deployed and will be removed mid-November. Julimar will be removed the week after.

3.4 Have you experienced any difficulties that have affected the progress of the research project? If yes give details (150 words max)

Due to human error, in the second fortnight of deployment to obtain movement parameters many cameras were not turned on. Cameras were left for an additional fortnight to compensate.

Data processing for the grid and road camera deployments went slightly longer than anticipated, resulting in a two-week delay of the multi-site comparison starting.

There was also an unusual difference in the proportion of chuditch detections that could be identified to the individual level between the grid and road deployments that we are still investigating (199/236 vs 99/190).

3.5 What are your research plans and objectives, including publication plans, for the coming year? (150 words max) *(Please note that in your next Report you should report progress against these plans and objectives)*

In the 2022/23 year the plan is to complete the multi-site trial with the current completion date being the 23 November 2022. Images from the multi-site trial will be processed and individual chuditch identified to run SECR analyses for each site and obtain density estimates. These will be investigated for accuracy and precision to determine if the method is suitable for broadscale use. If not, simulations using the movement parameters from each site will be run to determine what adjustments (number of cameras, duration of deployment, etc.) could be implemented to improve estimate accuracy.

Three scientific papers are planned to be written up and submitted for publication. These are for the camera comparison trial from early 2021 (details in progress update), the optimisation of inter-trap spacing and spatial layout, and the multi-site test with site-specific recommendations.

PhD thesis submission is planned for September 2023.

4. ACADEMIC OUTPUTS

4.1 Publications and other academic outputs directly related to this project. *(Please list all publications and those manuscripts accepted for publication, for the period covered by this report)*

A manuscript is being edited for submission for the camera comparison. A draft for the spacing and spatial layout component of this project has been started. The results of the camera comparison trial were also presented at the Australian Mammal Society Conference in 2021.

4.2 Evidence of scholarly impact and contribution. Is there evidence that this reseach project is having/has had an impact in the research field or the broader public domain? *Include examples of formal training (PhD /Masters) as well as other training.*

If yes, give details *(For instance, standard citation data on articles published in ISI journals, citations to books, re-publication, translations, reviews, invited keynote addresses, other invitations, newspaper/media/expert commentary).*

To date, there are no documented impacts other than:

- correspondence with other researchers interested in individual identifications of animals from camera traps
- acceptance of a speed talk entitled 'pattern recognition software to identify uniquely marked individuals' at the Australian Mammal Society Conference in Perth, Western Australia, in September 2022.

4.3 End-user interaction and other project outcomes If there are examples of the impact of this research Project not covered in item 4.2 above please provide details. *For example, introduction or modification of standards/protocols within an industry sector, preparation of proposals for funding from other agencies as a result of outcomes from this project.*

The investigation of optimal spacing from this project allowed DBCA to get a larger inter-trap spacing of 500m rather than 200m approved for cage trap monitoring targeting chuditch. It is expected that this research will lead to recommendations to DBCA to alter current camera trap surveying and monitoring practices to gain a better understanding of the conservation status. This will include written methodology of the optimal spacing, the spatial layout of cameras and possible recommendations based on the study's findings.

5. ATTACHMENTS & OTHER MATERIAL

Please provide, as separate files, any figures, graphs, images and other material that cannot be included in this form. Please also provide updated material (text and images) that can be used to revise your project summary on the Foundation's web site. Please provide text in Microsoft Word format and images in JPEG format with a minimum size of 600 x 400 pixels. If this is the final project report, the web page summary must be updated to reflect the outcomes of the project. Is any material being forwarded as additional attachments?