

# **Effects of global climate change on an abundant and widely distributed reptile (*Amalosia lesueurii*)**

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Submitted in fulfilment of the requirements for the degree of  
Master of Science (Research)

School of Life Sciences  
Faculty of Science  
University of Technology Sydney

Australia  
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# **Certificate of Original Authorship**

I, Santiago Cuartas Villa declare that this thesis is submitted in fulfilment of the requirements of the degree of Master in Science (Research) in the School of Life Sciences, Faculty of Science, at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualification at any other academic institution. This research was supported by the Australian Government Research Training Programme.

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Santiago Cuartas Villa

25<sup>th</sup> November 2019

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# Preface

The main body of this thesis consists of four chapters, including two data chapters that are ready to submit. I have therefore formatted each chapter to general guidelines of ecology journals. This has caused some unavoidable repetition in the species description, and background information in some of the chapters.

At the beginning of each chapter, I have acknowledged all authors involved, in the same order as they appear in the manuscripts soon to be submitted. In all of the chapters, I am listed as the first author and was primarily responsible for conceiving, designing and implementing the research and writing the manuscripts.

# Table of Contents

|  |     |
|--|-----|
| Certificate of Original Authorship .....   | i   |
| Acknowledgments .....  | ii  |
| Preface .....  | iv  |
| Table of Contents .....  | v   |
| List of Figures .....  | vii |
| List of Tables .....   | x   |
| Abstract .....   | xi  |
| 1. Chapter 1. Introduction.....  | 1   |
| 1.1. General threats to biodiversity .....   | 1   |
| 1.2. The effects of climate change on biodiversity .....   | 2   |
| 1.3. Effects of the thermal environment on reptiles.....   | 6   |
| 1.4. Embryonic stages and nest selection in reptiles .....   | 8   |
| 1.5. Range shifts.....   | 12  |
| 1.6. Current knowledge gaps .....  | 14  |
| 1.7. Velvet gecko as a model species.....  | 15  |
| 1.8. Aims of the study .....   | 19  |
| 1.9. Thesis structure .....  | 20  |
| 1.10. Ethics and permits .....   | 21  |
| 1.11. References .....   | 21  |
| 2. Chapter 2. Geographic variation in nest site selection in the velvet gecko<br>( <i>Amalosia lesueurii</i> ) ..... | 33  |
| 2.1. Abstract.....   | 33  |
| 2.2. Introduction .....  | 34  |
| 2.3. Materials and methods.....  | 36  |
| 2.3.1. Study species .....   | 36  |
| 2.3.2. Nest sites.....   | 37  |
| 2.3.3. Nest site attributes .....  | 38  |
| 2.3.4. Available nest sites.....   | 41  |
| 2.3.5. Statistical analyses .....  | 42  |
| 2.4. Results.....  | 44  |

|  |     |
|--|-----|
| 2.4.1. Physical structure and incident light .....   | 44  |
| 2.4.2. Thermal regime .....  | 48  |
| 2.5. Discussion .....  | 54  |
| 2.6. References .....  | 58  |
| Appendix.....  | 64  |
| 3. Chapter 3. Geographic range and shifts under climate change for the<br>Australian endemic velvet gecko ( <i>Amalosia lesueurii</i> )..... | 66  |
| 3.1. Abstract.....   | 66  |
| 3.2. Introduction .....  | 67  |
| 3.3. Materials and methods.....  | 70  |
| 3.3.1. Study species .....   | 70  |
| 3.3.2. Occurrences records .....   | 71  |
| 3.3.3. Species distribution model.....   | 72  |
| 3.4. Results.....  | 74  |
| 3.5. Discussion .....  | 80  |
| 3.6. References .....  | 84  |
| Appendix.....  | 92  |
| 4. Chapter 4. General Discussion .....   | 107 |
| 4.1. Introduction .....  | 107 |
| 4.2. Future research .....   | 110 |
| 4.3. References .....  | 113 |

# List of Figures

|  |    |
|--|----|
| Figure 1. Summary of some of the predicted aspects of climate change and some examples of their likely effects on different levels of biodiversity. Adapted from (Bellard <i>et al.</i> , 2012). .....   | 3  |
| Figure 2. Illustration of geographic range shifts due to climate change on the southern hemisphere (modified from Wiens, 2016).....  | 5  |
| Figure 3. Distribution of <i>A. lesueurii</i> (Cogger, 2014). .....  | 15 |
| Figure 4. Sandstone plateaus, habitat of the velvet gecko ( <i>Amalosia lesueurii</i> ). (A) Morton National Park, NSW. (B) Yengo National Park, NSW. ....   | 16 |
| Figure 5. Usual configuration of the nest of <i>A. lesueurii</i> at Dharawal National Park. Showing nests from general sandstone habitat to detailed crevice nest from A to D. ....  | 18 |
| Figure 6. Correlation between air and nests temperatures (modified from Dayananda <i>et al.</i> 2016). ....  | 19 |
| Figure 7. Study sites. Blue mark point: Yengo National Park; yellow mark point: Morton National Park; green area: species' range.....  | 38 |
| Figure 8. Photo of the inside of a nest with the deployed Thermochron IButton next to the eggshells. ....  | 39 |
| Figure 9. Statistical analyses performed on this study specifying the paths followed for each factor, and each type of variable. ....  | 43 |
| Figure 10. Boxplot of physical structure variables comparing sites and types of crevices. Orange: nests; blue: crevices. ....  | 45 |
| Figure 11. Boxplot for incident light variables comparing sites and types of crevices. Orange: nests; blue: crevices. ....   | 47 |
| Figure 12. Minimum daily temperatures recorded inside communal nests during the 100 day incubation period. Temperature measurements were recorded from 23 <sup>rd</sup> November 2018 to 28 <sup>th</sup> February 2019. Grey squares show minimums for Morton while blue triangles show minimums for Yengo. ....  | 48 |
| Figure 13. Minimum daily temperatures recorded in Yengo study site inside communal nests and crevices available on the landscape, during the 100 day incubation period. Temperature measurements were recorded from 23 <sup>rd</sup> November 2018 to 28 <sup>th</sup> February 2019. Orange squares show minimums for crevices while grey triangles show minimums for nests. .... | 49 |



|   |     |
|---|-----|
| Figure 14. Minimum daily temperatures recorded in Morton study site inside communal nests and crevices available on the landscape, during the 100-day incubation period. Temperature measurements were recorded from 23 <sup>rd</sup> November 2018 to 28 <sup>th</sup> February 2019. Orange squares show minimums for crevices while grey triangles show minimums for nests. .... | 49  |
| Figure 15. Maximum daily temperatures recorded inside communal nest during the 100-day incubation period. Temperature measurements were recorded from 23 <sup>rd</sup> November 2018 to 28 <sup>th</sup> February 2019. Grey squares show maximums for Morton while blue triangles show maximums for Yengo. ....  | 50  |
| Figure 16. Mean daily temperatures recorded inside communal nests during the 100-day incubation period. Temperature measurements were recorded from 23 <sup>rd</sup> November 2018 to 28 <sup>th</sup> February 2019. Grey squares show means for Morton while blue triangles show means for Yengo.....   | 51  |
| Figure 17. Correlation between maximum daily air temperatures and maximum daily nest temperatures for a nest from Morton (orange) and a nest from Yengo (blue). Air temperatures are from nearest weather stations to each site. Solid orange line indicates line of best fit for Morton, while the blue line shows line of best fit for Yengo. ....                                | 52  |
| Figure 18. Monthly average of hours per day on which nests had reports of temperatures above species CTmax.....   | 53  |
| Figure 19. Sum of number of hours during which temperatures inside communal nests exceeded species CTmax. Day corresponds to incubation period day. Bars correspond to the sum of hours for all the nests on each site. Orange bars Yengo, blue bars Morton. ....   | 53  |
| Figure 20. Occurrences for <i>Amalosia lesueurii</i> after processing.....  | 72  |
| Figure 21. Percentage of contribution of the different bioclimatic variables to the selected optimal model.....   | 75  |
| Figure 22. Predictions of the distribution of the velvet gecko ( <i>Amalosia lesueurii</i> ) for current climatic conditions using Maxent. ....   | 77  |
| Figure 23. Predicted distribution of the velvet gecko ( <i>Amalosia lesueurii</i> ) for current time with a land cover base layer. ....   | 78  |
| Figure 24. Future changes on species distribution under different emission scenarios, showing the amount of area with no change, contraction or expansion for all the projected years.....  | 79  |
| Figure 25. Projected future distribution of the velvet gecko for 2085 under RCP 8.5 emission scenario. ....   | 80  |
| Figure 26. Projected future distribution of the velvet gecko for 2085 under RCP 3PD emission scenario. ....   | 102 |

|   |     |
|---|-----|
| Figure 27. Projected future distribution of the velvet gecko for 2085 under RCP 4.5 emission scenario. .... | 103 |
| Figure 28. Projected future distribution of the velvet gecko for 2085 under RCP 6 emission scenario. ....   | 104 |
| Figure 29. Projected future distribution of the velvet gecko for 2025 under RCP 8.5 emission scenario. .... | 105 |
| Figure 30. Projected future distribution of the velvet gecko for 2045 under RCP 8.5 emission scenario. .... | 105 |
| Figure 31. Projected future distribution of the velvet gecko for 2065 under RCP 8.5 emission scenario. .... | 106 |

# List of Tables

|   |    |
|---|----|
| Table 1. Normality and homogeneity of variances tests for physical structure and incident light variables of nests and crevices. ....                                   | 42 |
| Table 2. Pearson correlations between physical structure variables.....   | 46 |
| Table 3. Pearson correlations between incident light variables.....   | 46 |
| Table 4. Correlation between air temperatures (retrieved from nearest station to study sites) and measured nests and crevices temperatures.....                         | 64 |
| Table 5. Correlation between bioclimatic variables used for the species distribution modelling.....   | 92 |
| Table 6. Parameters, AIC, and delta AIC for the candidate models. Feature classes as follows, linear (L), quadratic (Q), product (P), hinge (H) and threshold (T). .... | 93 |

# Abstract

Reptiles are susceptible to changes in climate because their physiology and behaviour is strongly influenced by temperature. However, reptiles may adapt to shifts in climate migrating to new areas or altering their nesting behaviour in ways that buffer embryos from thermal stress. In this thesis, I investigated geographic variation in nest site selection in the velvet gecko (*Amalosia lesueurii*), a widely distributed and abundant lizard species. To assess how this species might shift its geographic range in future, I modelled the species current and future distribution using the algorithm MaxEnt.

To examine plasticity in species' nest-site selection, I compared the thermal regimes, physical structure and incident light variables of nests in two geographically distant populations (Morton National Park and Yengo National Park). I found strong positive correlations between air temperatures and nest temperatures, with temperatures in some nests exceeding the species' critical thermal maximum during summer heatwaves. Both populations differed in the physical structure, incident light and thermal characteristics of nest sites, so that mean nest temperatures did not differ between locations. Notably, females from the southern population selected more open nest sites than females from the northern population, suggesting that females can adjust nest-site choice to suit local environments. However, nests in the northern population experienced much higher daily maximum temperatures than nests from the southern population, which could have negative consequences for hatching success during hot summers.

To predict the geckos' future distribution, I used a correlative modelling approach in MaxEnt. Modelling showed that the species has a high predicted occurrence across the Sydney Basin, the New England Tablelands, and the southern part of New South Wales (NSW) North Coast. The most important predictor variable in my models was the mean temperature of the warmest quarter. Potentially, the effects of air temperatures on the embryonic life stage may influence the species distribution. The species is predicted to suffer range contractions under future climatic conditions for every emission scenario. The greatest losses are likely to occur around the Sydney Basin region and New England Tablelands. Loss of the velvet gecko from the Sydney region would have serious consequences for the persistence of the vulnerable broad-headed snake (*Hoplocephalus bungaroides*) which relies on geckos as the main food source. My study gives an insight of the threats and general effects of the rising temperature on an abundant and widely distributed Australian reptile.