Controlling invasive predators at a national scale.

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# Overview

Throughout my candatiture I have developed my thesis while simulationously writing a series of computationally reproducible pipelines (packages and repostories) that ensure sound curation, analysis and communication of datasets collected for large-scale pest control programs *[Davidson2020-Reproducibility; Invasive species database]*. I use this framework to address the “unexpected” outcomes of predator removal in two case studies*[Davidson2020-Beech-forests; MPD-forests]*. I fit different state-space models to account for the underlying demographic processes of increased complexity. I use New Zealand PFNZ 2050 “appollo shot” to demostrate the applicability of this reproducible method to support citizen science and community driven predator control*[Davidson2020-PFNZ2050]*.

# Introduction

Invasive species are regarded to impact native species globally. Meta-analysis highlight the unexpected impacts of not monitoring and account for dynamic changes in both species interactions and enviromental changes. Under these conditions, repeatabilty and computational reproducibility are vital aspects to the development of this research.

# Reproducible framework

*[publication: Davidson2020-Reproducibility]*

Reproducible approaches to replicate theoretical scenarios provide the framework to account for changes in such unanticipated and complex outcomes.

To begin with, i taken the exsisiting research analysis to build a research synthesis database of the theoretical relationships proposed in over 100 years of conservation research in NZ (e.g. Holland et al. 2015; Ruscoe et al. 2005; Choquenot & Ruscoe 2000; Ruscoe et al. 2004; King et al. 2003).

# Literature review

*[publication: Davidson2020-Invasive species database]*

I estimate the effects of predator control from these models but addionationally provide a reproducible workflow in systems with and without stoat control, varying control methods and differences in resources flow between these systems (Chapter Four).

# Case studies

I then apply a Bayesian modelling framework to two case studies, incorperating increased complexity from beech forests (Chapter Two) t mixed forest dynamics (Chapter Three) in NZ forests. Each case study consists of high quality CR datasets. The CR study design allows me to encorperate both the proposed ecological processes (e.g. predation) know to drive populations and the observation error (e.g. estimating population size) from the research synthesis.

## Beech Forests

Compare the importance of bottom-up and top-down processes in regulating invasive species in New Zealand forests.

*[publication: Davidson2020-Beech-forests]*

## Mixed Podocarp forests

A more complex set of interreacting invasive species.

*[publication: Davidson2020-MPD-forests]*

# Discussion

*[publication: Davidson2020-PFNZ2050]*

The computationally reproducible framework I propose in this thesis (chapter 2 and 3) are a key aspect of achieving PFNZ2050. Resources and man-power are driven by communities for New Zealands predator-free NZ 2050 to achieve targets. If these predator targets are not repeatable, it will not be possible to scale control to a national, human-inhabited enviroment due to the exessive unexpected outcomes are likely.

## Undocumented References

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