Understanding the trends in Koala (*Phascolarctos cinereus*) abundance on the south Coast of NSW

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knitr::opts_chunk$set(echo = FALSE,
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1 Project Scope

The 2021 report compares the results from three periods of local Koala surveys using faecal pallet surveys [Phillips and Hopkins, 2008, Phillips and Callaghan, 2011] on the South-Eastern New South Wales coast (SENSW) in coastal forests to the north-east of Bega between 2007 and 2021. (three periods). In this report we have investigated the differences between sites and survey periods that have been used to generate each of the `iKoala` reports for 2021. The terminology and analyses performed within this report are consistent with earlier analysis in [Gruber et al., 2013, Gruber and Adamack, 2015] unless otherwise stated. We also extend on the results generated from the `iKoala` application to fit a new occupancy model accounting for species of tree as a potential factor impacting the survey detection.

In the 2021 report we figure 1 we have estimated the abundance of koalas across all five sites as well as site specific abundance for each of the study areas. The terminology and analyses performed within this report are consistent with earlier analysis [Gruber et al., 2013, 2014, Gruber and Adamack, 2015] unless otherwise stated:

1. **Monitoring design of sampling area and periods**: The first section of the report looks at the sampling design at each of the 5 sites during each of the 3 periods.
2. **Raw Occurrence data:** The raw observations of Koala presence determined by the presence of koala faecal pellets at a sampling sites overall and for each period.

Figure 1: I be testing u

3. **Occupancy model:** The previous (prior to 2020) Koala report fitted an occupancy model to the data by dividing the observed occupancy into the three groups and estimated koala abundance after accounting for detection issues. The 2021 report has updated this model to account for the processes effecting detection in a more ecologically meaningful way based off a Bayesian State-Space model that accounts for both the observation and process error associated with estimating Koala abundance.

4. **Previous analyses (ran for full dataset only)**: Two key aspects of previous reports have been included as additional information into the following aspects of this research data. These analyses have been done at the level of the whole dataset (by combining all sites (n = 5). Each individual analysis for further investigation can be generated from the `iKoala` application.

    - **Activity**: Activity was estimated as the proportion of trees with one or more koala faecal pellets at a sampling site for each of the three periods.
    - **Tree preferences**: Koalas are know to select certain tree species (referred to as 'strike rate') - defined as the probability for every period that a faecal pellet is found under a tree of a particular tree species.

Additional notes on the project structure can be found in the `./README.Rmd` file. *For more information on terminology, sampling methods and analysis, please, refer to the reports referred to above. These pdfs can also be found within the project folder* `/_resources/pdfs/pastReports/`.

2 Introduction

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3 Method

3.1 Data input

The terminology and analyses performed within this report are consistent with reports by [Biolink, 2011, Gruber et al., 2014]. Throughout the report the following terms are consistant:

- **Subareas** are defined to capture a representative (and random) replicate across the entire study area (subareas' = 5).
- Each **site** is a single location in a subarea where the "absence" or "presence" of faecal pellets was collected. Sites represent unique locations between periods but some sites are sampled multiple times across all periods.
- **Period:** over the duration of our study (2007-2020) there are several periods of differing sample design and data collection. This grouping allows us to account for these differences throughout the study.
- **Occurrence:** is determined by the presence or absence of koala faecal pellets at a sampling site for a given period.
- **Active:** a *site or tree* where at least one koala faecal pellet was found during a period.
- **Activity level:**, which is the proportion of trees with one or more koala faecal pellets at sampling sites for every period.

3.1.1 Monitored sites

3.1.2 Visited sites

References

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