

# RACHEL DRAKE

PHD STUDENT – UNIVERSITY OF ST ANDREWS

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PhD candidate in Statistical Ecology at the University of St Andrews, focusing on developing and applying hierarchical and simulation-based models to large, heterogeneous citizen science datasets. Experienced in cross-disciplinary collaboration and stakeholder engagement. Seeking an internship to contribute strong quantitative and programming expertise to applied analytical challenges.

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## EDUCATION

### PhD in Statistical Ecology – University of St Andrews

2023-Present

- Thesis: Species distribution models for citizen science data
- Supervisors: Dr Alison Johnston, Professor David Borchers
- Key training: Developing personalised data solutions, hierarchical modelling, addressing sampling bias

### BSc (Hons) in Mathematics and Statistics – University of Edinburgh

2020-2023

- Awarded 1<sup>st</sup> Class Honours
- Key training: Bayesian modelling in R, biostatistics, missing data practices

## PERSONAL TRAINING AND DEVELOPMENT

- **Hierarchical Spatial Modelling for Applied Population and Community Ecology** - Jeff Doser & Marc Kéry (2024)
- **Interdisciplinary PhD Development Programme** - leading to Associate Fellowship of Interdisciplinary Studies, St Andrews Graduate School (2024–25)

## TECHNICAL SKILLS

- **Programming & Data Analysis:** Proficient in R (*tidyverse*, *ggplot2*, *terra*, *luna*, *ubms*, *Stan*, *spOccupancy*, *spAbundance*, *ggtree*); experience with Python for statistical and mathematical workflows.
- **Statistical Modelling:** Skilled in custom-built GLMMs, occupancy models, and simulation studies designed from real ecological data. Practical experience implementing Bayesian models using Stan.
- **Spatial & Ecological Data:** Experienced with large and complex datasets, including eBird (>4 billion records), the Macaulay Library, British Trust for Ornithology, and landcover databases.
- **Data Management & Quality Assurance:** Managing restricted-access and sensitive datasets, ensuring compliance with ethical and security requirements. Strong command of data cleaning, integration, and quality control workflows.
- **Statistical Communication:** Advanced data visualisation and reporting using R (ggplot2 and custom graphics). Consistently praised for clarity and accessibility of statistical outputs.
- **Software & Tools:** R, Python, GitHub, Microsoft Office Suite.

## CORE SKILLS

- **Interdisciplinary Collaboration:** PhD based in an interdisciplinary research centre at the interface of statistics and ecology, with active collaboration across statistical, biological, and computational backgrounds.
- **Communication & Stakeholder Engagement:** Experienced in presenting complex analyses to diverse audiences. Successfully manage collaborations with eBird, Cornell Lab of Ornithology, and the British Trust for Ornithology, maintaining productive partnerships and external data access.
- **Scientific Writing & Reporting:** Strong written communication demonstrated through co-authored publications, manuscript preparation, and scientific reports.
- **Project & Time Management:** Proven ability to deliver results across multiple concurrent projects with international collaborators and tight deadlines.
- **Teamwork & Independence:** Published coauthor on collaborative projects while independently leading key PhD components. Capable of both self-directed research and effective teamwork within analytical groups.
- **Analytical Agility:** Flexible and adaptable, able to pivot analytical approaches to meet emerging project goals and data challenges.
- **Knowledge Integration:** Experience linking statistical, ecological, and computational methods to draw robust insights from complex systems.

## SELECTED PROJECTS

### **Presence of the Merlin Bird Identification App in the eBird Database**

The use of automated bird identification apps is changing how citizen scientists collect data, with implications for ecological modelling. This project uses a customised zero-inflated beta family linear mixed model to assess how reporting rates vary across species, observers, and levels of identification experience, revealing heterogeneous effects of app use on detection data.

### **Quantifying and Modelling Spatiotemporal Trends in Bird Detection Modality**

Using archival data from the Macaulay Library (bird photos and audio recordings), this project quantifies how observers detect species and how detection modality changes across space and time. Patterns are modelled as functions of avian phylogeny and environmental interactions, offering insights into how observer behaviour shapes biodiversity datasets. Both projects form core components of PhD research at the University of St Andrews