

Introduction to estimation and modelling of ecological populations – Workshop Agenda –

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Agenda

The following is an approximate agenda for the course. Exact timings may vary depending on rate of class progress.

Day 1

- Background
 - Why, what and how of sampling animal populations
 - Statistical methods overview
 - Computer exercises
- Multivariate abundance modelling
 - Historical approaches
 - Incorporating predictor variables
 - Exercises in R using the `mvabund` package:
 - * Tasmanian woodland birds
 - * Reptile community in rural Australia
 - * NSW marine fish assemblages

Day 2

- Distance sampling
 - Potential applications and limitations
 - Detection functions
 - Incorporating predictor variables
 - Study design fundamentals
 - Line transect sampling
 - Point transect sampling
 - Exercises:
 - * Calculation of detection functions
 - * Computer exercises

Day 3

- Capture-recapture - abundance estimation (closed population)
 - Background and historical approaches
 - Likelihood-based methods
 - Incorporating variation in capture probabilities
 - Computer exercises using R and RMark
 - * Data input
 - * Defining models and model sets
 - * Running models
 - * Interpreting output
 - Study design
 - How to run a simulation
 - Mark-resight approaches
 - Double observer

Day 4

- Spatially explicit capture recapture (SECR or SCR)
 - Why spatial information on captures can be useful
 - Overview of modelling theory
 - Exercises in R
 - * Data input and formatting
 - * Creating habitat masks (from scratch or from shapefiles)
 - * Fitting models
 - * Model selection
 - * Estimating density and interpreting results
 - Avoiding common time-wasting hurdles
 - Study design

Day 5

- Capture-recapture - survival estimation (open population)
 - Cormack-Jolly-Seber model
 - Pollock's robust design
 - Study design
 - Computer exercises in R
- Occupancy modelling
 - Overview of single-season and multi-season models
 - Fitting models in R
 - Study design considerations
- Overview of other relevant methods
 - SECR mark-resight
 - SECR open-population
 - Multi-state capture-recapture
 - Incorporating species traits in to multivariate analyses
 - Double observer distance sampling

Software list

The following software will be required for the course and should be preinstalled on your laptop before the course. Most exercises will be conducted in R, and participants are expected to be comfortable in using R to perform basic tasks such as data input/output, data summaries, loading packages and simple plots.

- R <http://www.r-project.org>
- An R integrated development environment (IDE) is advised. The instructors will be using R-Studio in class (<https://www.rstudio.com>), which is recommended, but participants may use other IDEs if they prefer
- MARK (to be used via the RMark R package. **Mac and Linux OS users must read these instructions to successfully install MARK for use with RMark unless they will be using a Windows virtual machine for all R exercises in the course**)
- A PDF reader
- Spreadsheet software (e.g., MS Excel or Libre Office Calc)

In addition to installing R, the following R packages will also need to be installed. Additional packages may be installed during the course, please verify that you have sufficient permissions to install additional packages.

- RMark
- mvabund
- secr