Day 1

Background: inferences about animal populations
- why estimate stuff
  - science
  - conservation/management
- what to estimate
- how to estimate: basic principles

Occupancy: relevance to ecology and conservation
- Classes of ecological questions
- Conservation/management

Statistical background
- concepts and notations
- probability
- Maximum likelihood and Bayesian estimation
- logistic regression, covariate modelling and odds ratios
- hypothesis testing
- model comparison and multi-model inference

Single-season model (part I)
- basic sampling situation (data type)
- model history and development
- missing observations
- covariates

Introduction to PRESENCE
- worked single-season example (no covariates)
- examination of the output
- results and interpretation

Introduction to WinBUGS
- rework PRESENCE example in WinBUGS

Single-season model (part II)
- model assumptions
- dealing with heterogeneity
- small sample/finite population inference
- modelling spatial correlation in occupancy
Day 2

**Design matrices and fitting custom single-season models in PRESENCE**
- worked single-season example (with covariates)
- examination of the output
- results and interpretation
- using results to develop maps

**Advanced modelling using WinBUGS**
- including covariates
- spatial correlation

**Single-season study design**
- site selection
- allocation of effort
- design comparisons
- survey timing
- miscellaneous issues
- covariates
- GENPRES

**GENPRES exercises**

**Multiple-season model (part I)**
- basic sampling situation (data type)
- model history and development
  - implicit dynamics
  - explicit dynamics
- missing observations
- covariates
Day 3

Multiple-season models in PRESENCE
- worked MS examples
- examination of the output
- results and interpretation

Multiple-season model (part II)
- alternative parameterizations
- characterizing occupancy dynamics
- modelling spatial correlations in occupancy dynamics

Worked multiple-season examples and computer exercises
- incorporating interesting biology into modelling
- further worked examples
- examination of the output
- results and interpretation

Using WinBUGS to fit multi-season models

Multiple-season study design
- relationship with single-season designs
- long-term design
- adding sites over time
- GENPRES

Multi-state occupancy
- 3-state occupancy – single season
- 3-state occupancy – dynamics
- worked examples

Joint habitat-occupancy dynamics
- simultaneous modelling of habitat and occupancy
- worked examples
Day 4

**Modelling multiple ‘species’ simultaneously**
- different ‘species’ (or genders/age classes of same species) may exhibit a similar response to a covariate or environmental changes.
- using PRESENCE to fit such models
- worked examples

**Species richness and community dynamics**
- applying single-species methods to address community-level questions
- worked examples

**Species co-occurrence**
- do species co-occur independently?
- single-season model (co-occurrence pattern)
- multi-season model (co-occurrence process)
- worked examples of each

**Other extensions**
- Incorporation of count data and estimates of abundance
- Marked animals
- Combining occupancy and telemetry data

**Summary, discussion and consulting session**
- analyze own data
- ask specific questions of the instructors