OUTLINE

Monitoring Biodiversity and Threatened Species Workshops provide training to empower stewards of biodiversity and conservation in cost-effective survey design to map the distribution, and measure the abundance of, threatened species, manage threatening processes (e.g. weeds, feral animals, climate change) and monitor populations and impacts through time.

Practical "how to" workshops provide simple, step-by-step procedures, combining theory and innovative survey design with detectability / occupancy modelling techniques for monitoring biodiversity. Workshops include examples (followed by individual post-workshop exercises) to provide practical training in the use of GIS software (ArcGIS *or* QGIS) and freeware including PRESENCE (detectability and occupancy modelling) and DISTANCE (detectability and line-distance sampling).

Project specific follow-up consulting is available following completion of the workshops.

Workshops (30-60 minutes) **include:**

1. Introduction to Biodiversity monitoring
2. Species Distributions: Review and map Historical records.
3. Grid it ! Cost effective and efficient survey techniques.
4. Baseline Surveys: calculating Naïve occupancy using activity and/or abundance.
5. Detectability: Repeat surveys to estimate detectability, optimize detection (weather, time of year, etc)
6. Estimating Occupancy (correcting for Detectability).
7. Population Estimation: using spatial data, and vegetation / habitat layers.
8. Population Estimation: using Line-distance Sampling to estimate Detectability
9. Optimized Monitoring Strategies: # of surveys required, monitoring multi-taxa etc.
10. Long-term Monitoring: repeated occupancy and population parameters, inter-generational surveys, post-impact (e.g. invasive spp., climate change).
11. + + + Directed workshops focussing on your site / threatened species

Participants will be trained in:

- Theoretical and Practical aspects of Biodiversity Monitoring
- Spatial ecology skills – GIS mapping in freeware: *QGIS* or *ArcGIS*
- Applied skills in detectability and occupancy modelling freeware: *Presence*
- Applied skills in detectability / line-distance sampling freeware: *Distance*
- Combining these skills for evidence-based management of threatened species
- Biodiversity Report writing (optional)

Contact: Dr Jean-Marc Hero **Tel. 0408 915 015** **Email: jhero@usc.edu.au**

BM Workshop 1. Introduction to Biodiversity monitoring

- **Discuss Biodiversity Monitoring**
- **Simulate monitoring biodiversity** using occupancy modelling through time.

Post workshop Exercise: participants upload raw data for their own species/area of interest into GIS.

BM Workshop 2. Species Distributions: Review and map Historical records.

- **Discuss background research on the ecology of the species of interest**
- **Examine the historical records in your area of interest.**
- **Initiate a Virtual Field Project: Map a species distribution using historical records,**
- **Estimate naïve occupancy**

Example: create map, import koala data, create area of interest (polygon), overlay a fishnet (grid), and interpolate the data (create heatmap), estimate naïve occupancy

Software: QGIS / ArcGIS How to upload historical records, create grids, and a Heatmap

Post workshop Exercise: participants map historical records (raw data) and create a fishnet (grid) overlay, and interpolate and estimate naïve occupancy for a species of their choice.

BM Workshop 3. Grid it ! Cost effective and efficient survey techniques.

- **Discuss systematic survey design: sampling without bias**
- **Random grid placement**
- **Scale and reducing spatial autocorrelation** (avoiding pseudoreplication)

Example: creating a grid overlay in GIS

Software: QGIS / ArcGIS

Post workshop Exercise: create a grid overlay, and save survey point intercepts for field sampling

BM Workshop 4. Baseline Surveys: calculating Naïve occupancy using activity and/or abundance.

- **What is occupancy ?**
- **Calculate Naïve occupancy at different scales**

Examples: koala pres/abs using 10 line transects

koala pres/abs using 68 point samples (250 x 250m grid)

koala pres/abs using x point samples (500 x 500m grid)

Software: QGIS / ArcGIS How to create a grid.

Post workshop Exercise: calculate change in Naïve Occupancy for your chosen Belair species over time OR calculate Naïve Occupancy for your species – using historical records / survey data

Contact: Dr Jean-Marc Hero **Tel. 0408 915 015** **Email: jhero@usc.edu.au**

BM Workshop 5. Detectability: Repeat surveys to estimate Detectability & Survey Optimization

(# of repeat surveys required for monitoring).

- **Discuss Measures of Detectability**
- **Use repeat surveys through time to estimate Detectability**

Example: Koala surveys at Belair NP (100m wide strip transects repeated over 3 time periods)

Software: PRESENCE

Post workshop Exercise: analyse detectability for your species using Presence

BM Workshop 6. Estimating Occupancy (correcting for Detectability).

- **Discuss Occupancy**

Example: Analyses data from a triple survey using **PRESENCE** freeware

Software: **PRESENCE**

Post workshop Exercise: Estimate occupancy with your own data (if available) using presence.

BM Workshop 7. Population Estimation: using spatial data, and vegetation / habitat layers.

- **Discuss refining your survey using species habitat requirements**
  (e.g. food plants, burrows, hollow bearing trees, leaf-litter etc).

Example: Calculating koala density correcting for vegetation/habitat mapping (Belair NP)

Software: **QGIS / ArcGIS**

Post workshop Exercise: Estimate the population size using your own data / species after correcting for vegetation associations.

BM Workshop 8. Population Estimation: using Line-distance Sampling to estimate Detectability

- **Discuss line-distance sampling**

Example: Estimate koala population size using line-distance sampling (Belair NP)

Software: **DISTANCE**

Post workshop Exercise: line-distance sampling to estimate population size of your species using Distance.

BM Workshop 9. Optimized Long-term Monitoring Strategy: inter-generational surveys, post impact, repeated occupancy, and population parameters.

- **Discuss ways of optimizing monitoring strategies.**

Example: Using inter-generation surveys to monitor changes in Occupancy, impact response etc

Software: **PRESENCE**

Post workshop Exercise: Examine inter-generation surveys for your species using **PRESENCE**.

10. Continuing Directed Workshops ... focussing on your site / threatened species

Contact: Dr Jean-Marc Hero **Tel. 0408 915 015** **Email: jhero@usc.edu.au**