Introduction to Bayesian Statistics for Ecologists
March 6-8, 2011
Bamfield Marine Science Centre
Led by Jean Richardson

Workshop Outline

The workshop will assume participants have no experience in Bayesian statistical methods. A general understanding of standard classical statistical methods (e.g. linear regression, ANOVA, etc.) will be assumed. We will perform Bayesian statistics using WinBugs run through R; some experience in R will therefore be helpful, but is not required. The focus of the workshop will be practical and we will thus cover the topics through use of examples. Many of the examples will be inspired by the book, "Introduction to WinBUGS for Ecologists" by Marc Kéry (2010, Academic Press).

I expect us to generally cover the following topics/examples, but I have intentionally kept the last half of the outline flexible to allow us to adapt the program to best suit the participants involved.

1. An introduction to Bayesian methods, and the differences from classical statistics methods, using a simple binomial model.
    a. The components of a Bayesian model.
    b. Why Bayesian statistics used to be intractable but is now possible (i.e. why we need WinBUGS).
2. Decomposition of a linear model: stochastic distributions and linear predictors/design matrices
    a. Understanding how to parameterize is necessary for producing appropriate WinBUGS code.
    b. Simple t-test data will be used to work through the mechanics of running a Bayesian model using R and WinBUGS.
3. Bayesian Linear Regression
    a. Assessing model fit: Posterior predictive values
    b. Forming predictions: Credible Intervals
4. Bayesian ANOVA
5. Bayesian Mixed Effects Models
6. Bayesian Generalized Linear Models
7. Over-dispersion and Zero-inflated Models