
ANGRY ORCHARD


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Papers and proposals

- Model specification
  - Preliminary proposals: condensed version of posterior and joint, perhaps in a box
  - Full proposals: posterior and joint, perhaps somewhat condensed, in box separate from main flow of text.
  - Papers: posterior and joint in supplementary materials or main body of text depending on complexity of model.
  - Table for priors with moments and parameters if informative
- Rationale for priors
- Algorithm with full conditionals if your are writing your own sampler.
- Checks for convergence and posterior predictive checks
- Inference from single model
  - table with statistics needed for priors
  - plots of posterior distributions overlaid on priors
  - derived quantities
- Inference from multiple models

We used a fully Bayesian, state space model to obtain posterior distributions of parameters, latent states, and derived quantities of interest. A model of ecological processes, models linking the processes to data, and models for parameters (Berliner 1996) provided a unified framework for inference,

$$\left[\boldsymbol{\theta}_p, \boldsymbol{\Theta}_d, \mathbf{n}_{(t)}, \mathbf{n}_{(t-1)} | \mathbf{Y}_{(1,t)}, ..., \mathbf{Y}_{(4,t)}\right] \propto \underbrace{\left[\mathbf{n}_{(t)} | \boldsymbol{\theta}_p, \mathbf{n}_{(t-1)}\right]}_{\text{process}} \prod_{l=1}^{4} \underbrace{\left[\mathbf{Y}_{(lt)} | \boldsymbol{\theta}_{d(l)}, \mathbf{n}_{(t)}\right]_l}_{\text{data}} \underbrace{\left[\boldsymbol{\theta}_p, \boldsymbol{\Theta}_d\right]}_{\text{parameters}} . \qquad (1)$$

The notation $[a\,|b,c]$ reads the probability or probability density of a conditional on b and c. The quantity $\boldsymbol{\theta}_p$ is a vector of parameters in the process model; $\boldsymbol{\theta}_{d(l)}$ is a vector of parameters in data model l, $\mathbf{n}_t$ is a vector representing the true, unobserved demographic

You need a library

- For everyone:
  - Hobbs N. T. and M. B. Hooten, 2105 *Bayesian models: A statistical rimer for ecologists*. Princeton University Press.
  - Gelman, A., and J. Hill. 2009. *Data analysis using regression and multilevel / hierarchical models*. Cambridge University Press, Cambridge, UK.
  - A. Gelman, J. B. Carlin, H. S. Stern, D. Dunson, A. Vehhtari, and D. B. Rubin. 2013. *Bayesian data analysis*. Chapman and Hall / CRC, London, UK.
  - McCarthy, M. A. 2007. *Bayesian methods for ecology*. Cambridge University Press, Cambridge, U. K.
- For population and community ecologists:
  - Royle, J. A., and R. M. Dorazio. 2008. *Hierarchical modeling and inference in ecology: The analysis of data from populations, metapopulations, and communities*. Academic Press, London, UK.
  - Link, W. A., and R. J. Barker. 2010. *Bayesian inference with ecological applications*. Academic Press.
  - Kery, M. a. M. S. 2012. *Bayesian population analysis using WinBUGS: A hierarchical perspective*. Academic Press, Waltham, MA, USA.
- For ecosystem scientists and physiological ecologists:
  - Ogle, K., and J. J. Barber. 2008. Bayesian data-model integration in plant physiological and ecosystem ecology Progress in Botany 69
  - Dietz, M. C. Ecological Forecasting. Princeton University Press, Princeton New Jersey, USA, 2017.

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- For leaning spatial modeling
  - Cressie, N., and C. K. Wikle. 2011. Statistics for spatio-temporal data. Wiley.
  - Hooten, M. B. Devin S. Johnson, Brett T. McClintock, and JUan M. Morales. Animal movement: statistical models for telemetry data.
  - Marta Blangiardo and Michela Cameletti. 2015. Spatial and Spatio-temporal Bayesian Models with R-INLA. Wiley, Chichester, West Sussex, United Kingdom
  - S. Banerjee, P. C. Bradley, and A. E. Gelfand. Hierarchical modeling and analysis for spatial data. CRC Press, New York, New York, USA, 2004.