

# STA 695: Ecological Statistics

## Part II: Advanced Mark-Recapture Models

### **Instructor**

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Office hours: Monday 3:00-5:00

### **Lectures**

Lectures for the second half of the course will take place in two rooms depending on what activities are planned. For discussing papers we will meet in MDS 312 (usually Monday and Wednesday) and for computing exercises we will meet in MDS 337 (usually on Friday).

### **Web-Site**

Course materials will be posted on Blackboard. If I have slides for a lecture then I will do my best to post them by 9:00am on the day of the class. Please let me know if you have any troubles accessing the Blackboard site.

### **Materials**

The course will primarily be based on published papers which I will make available on Blackboard. If other materials are required then I will post these on Blackboard or distribute them in class. The list of potential papers that we will read is included on page 3. I will provide further details and may make adjustments to this list as we go.

# Assessment

Your grade in this half of the course will contribute 50% to your final course grade and will comprise the following components:

1) Class Participation (10%)

As a paper based class, it is important that you read the assigned papers before class and come prepared to discuss what you have read.

2) Computing Exercises (10%)

As part of the course you will complete computer exercises fitting the models we study to real data. As part of these exercises you will need to submit answers to specific questions or a brief report describing the work you have done and the results you have found.

3) Final Project (30%)

The final component of assessment in this course will be a group project. Working in groups of three (or one group of two) you will each select a paper in a given area in mark-recapture modeling. Your group will give a presentation during the last week of class and submit a short written report summarizing the papers you have read and their contribution to the field of ecological statistics. I will provide more information about the final projects shortly.

## Tentative Outline

In the second half of the course we are going to consider some of the more recent developments in modeling mark recapture data, including aspects of Dr. Schofield's and my own research. In general, recent developments have addressed problems with modeling more and more complex data structures or incorporating complicated aspects of population dynamics. For the first few weeks, we will consider classical extensions to some of the models you have seen so far. We will then see how Bayesian methods can be used to address the same problems.

Oct 22 – 26	<b>Random Effects Models</b>
M	Burnham and White (2002)
W	Computing: Exercise #1
F	Class Canceled
Oct 29 – Nov 2	<b>Multi-State Models with State Uncertainty</b>
M	Kendall et al. (2003)
W	Pradel (2005)
F	Computing: Exercise #2
Nov 5 – 9	<b>Bayesian Inference I</b>
M	Link and Barker (2010) – Chapter 9
W	Brooks et al. (2000)
F	Computing: Introduction to WinBUGS
Nov 12 – 16	<b>Bayesian Inference II</b>
M	Royle and Link (2002)
W	Royle et al. (2007)
F	Computing: Exercise #3
Nov 19 – 23	
M	To be determined
W	Thanksgiving
F	Thanksgiving
Nov 26 – 30	<b>Bayesian Inference – Further Extensions</b>
M	Bonner and Schwarz (2006)
W	King (2012)
F	To be determined
Dec 3 – 7	<b>Group Presentations</b>
M	Group 1
W	Group 2 (11:00-11:5) & Group 3 (1:00-1:50)
F	Group 4

## References

- Bonner, S. J. and Schwarz, C. J. (2006). An extension of the Cormack-Jolly-Seber model for continuous covariates with application to *microtus pennsylvanicus*. *Biometrics*, 62(1):142–149.
- Brooks, S. P., Catchpole, E. A., and Morgan, B. J. T. (2000). Bayesian animal survival estimation. *Statistical Science*, 15(4):357–376.
- Burnham, K. P. and White, G. C. (2002). Evaluation of some random effects methodology applicable to bird ringing data. *Journal of Applied Statistics*, 29:245–264.
- Kendall, W. L., Hines, J. E., and Nichols, J. D. (2003). Adjusting multistate capture-recapture models for misclassification bias: Manatee breeding proportions. *Ecology*, 84(4):1058–1066.
- King, R. (2012). A review of bayesian state-space modelling of capture-recapture-recovery data. *Interface Focus*, 2(2):190–204.
- Link, W. A. and Barker, R. J. (2010). *Bayesian Inference*. Academic Press, San Diego, California.
- Pradel, R. (2005). Multievent: an extension of multistate capture-recapture models to uncertain states. *Biometrics*, 61:442–447.
- Royle, J. A., Dorazio, R. M., and Link, W. A. (2007). Analysis of multinomial models with unknown index using data augmentation. *Journal of Computational and Graphical Statistics*, 16(1):67–85.
- Royle, J. A. and Link, W. A. (2002). Random effects and shrinkage estimation in capture-recapture models. *Journal of Applied Statistics*, 29(1-4):329–351.