

## Lab 09 – Patch Occupancy models

### Part 1 – Henslow's Sparrow use of pitcher plant bogs

- a. Create a new MARK result file from the hesp.inp input file. The data include 2 occasions and 10 covariates. The names of the covariates are listed at the top of the input file.  
AREA – bog area  
SEEDS – number of grass seeds/m<sup>2</sup>  
FORBS – area of forbs<sup>1</sup>  
GRASS – area in grass cover<sup>1</sup>  
LITTER – area in litter cover<sup>1</sup>  
MOSS – area in moss cover<sup>1</sup>  
SHRUB – area in shrub cover<sup>1</sup>  
PITCHER – area in pitcher plants<sup>1</sup>  
SEASON – 0 burned during dormant season, 1 burned during growing season, and  
YEARS – years since burned.  
<sup>1</sup>arcsine transformed
- b. Determine the naïve estimate of occupancy using the capture histories in the cells at the top of the worksheet labeled hesp.inp.
- c. Create the 10 models shown in Table 3 on Page 7 of [Tucker et al. 2003](#). Paste the results table on the worksheet labeled "Occupancy."
- d. Use model averaging to calculate the unconditional estimates of occupancy and detection. How do these compare to the naïve estimates of occupancy and detection?

### Part 2

- e. Create a new mark input file using "Robust Design Occupancy.inp." These data include capture histories for 1 group, 15 occasions, and 5 primary sampling periods. The time intervals between the sampling occasions are listed at the top of the input file. These data are from a hypothetical population. Cast models corresponding to the following hypotheses:
  - 1) Extinctions and colonizations = 0, detection rates different in each session and each time
  - 2) Extinction and colonization vary among time periods, detection rates different in each session and each time.
  - 3) Extinction and colonization increasing or decreasing over time, , detection rates different in each session and each time.
  - 4) Extinction and colonization constant over time, detection rates different in each session and each time.
  - 5) Extinctions and colonizations = 0, detection rates different in each session but constant over time.
  - 6) Extinction and colonization vary among time periods, detection rates different in each session but constant over time.

- 7) Extinction and colonization increasing or decreasing over time, detection rates different in each session but constant over time.
  - 8) Extinction and colonization constant over time detection rates different in each session but constant over time.
  - 9) Extinctions and colonizations = 0, detection rates all equal.
  - 10) Extinction and colonization vary among time periods, detection rates all equal.
- f. Use the Bootstrap GOF to determine whether there is reason to believe that there are problems with the fit of the most general model (based on 100 (trials) simulations). What is your conclusion and how did you determine your answer?
  - g. Show your calculation of  $\hat{c}$ .
  - h. Adjust the table of model results if necessary, and paste it on the RD Occupancy worksheet.