Lab 05- Known Fate & Nesting Model

Known Fate

Background – You recently completed a telemetry study examining to examine the effect of several habitat treatments on the survival of a vertebrate for a management agency. During this study adult females were monitored weekly for 6 weeks following a 2-week period for acclimation to marking and capture myopathy. The agency had already applied different habitat treatments applied to 2 of the 3 management units they owned, but the units receiving each treatment were not selected at random, and the treatments were not replicated spatially or temporally. However, the habitat was reasonably similar in all three units at the beginning of the study. One treatment (E) provided additional escape cover, while the other increased food resources (F). Prior to conducting the research you developed several hypotheses about the way this creature would be affected by the management practices used by the agency. Mean daily temperature and precipitation were monitored at a central location. Temperatures each week averaged 38, 56, 49, 58, 60, and 55 degrees. Precipitation levels each week were 0.5, 1.25, 1.25, 1.0, ,0.9, and 0.0 inches. Your working hypotheses were as follows:

1. Survival rates were unaffected by either management practices or environmental stressors during the study.
2. Survival rates were unaffected by management practices, but survival is correlated with temperature during the previous week.
3. The effects of environmental stressors (temperature and precipitation) were negligible, but both predation and food availability affected survival.
4. The effects of environmental stressors (temperature and precipitation) were negligible; escape cover is limiting survival; food availability has no measurable effect on survival.
5. When temperatures are cooler these animals forage more frequently, thus increasing their forage requirements and vulnerability to predation. This could result in a different survival rates in F and E and an additive effect of temperature.

Making inference

1. Will these results provide information on necessary or sufficient causation? Is this study inductive or deductive in nature? Why?
2. What could be done to improve the scientific rigor of this very applied research project?

Modeling hypotheses

1. For each of the hypotheses above write the equation for the survival estimator including the logit model using β_1, β_2, β_3, ... to symbolize the estimated parameters, and tmp, prcp, trtF, trtE, trtU, tmpU, tmpE, and tmpF to indicate temperature, precipitation, food increase, escape cover increase, no habitat treatment, temperature effects in the untreated area, temperature effects E, and temperature effects in F, respectively.

2. Start an analysis in MARK using KM53.inp, which includes 6 weeks of data for 200 animals marked in each of the three treatments. Group 1 is trtU (untreated), Group 2 is trtF, and Group 3 is trtE. Cast one model corresponding to each of the 5 hypotheses listed above. Paste the results of the model selection exercise in the spreadsheet on the worksheet labeled model selection. Discuss the strength of evidence for the top 3 models.
3. On the worksheet labeled Odds, calculate and plot the logits and the survival functions for the model S(g+tmp).
4. Examine the βs for the model 5, S(g+tmp). On the worksheet labeled Odds, discuss these results in terms of the change in odds in relation to the untreated site.

Nest Success (Survival)

MARK Nesting Model

See Appendix for description of the data.

MARK includes example files with the Bart and Robson (1982) data in 2 formats. Bart and Robson.inp includes the summarized format as in Table 1, where the first column is the date of discovery, the second column is the date the nest was last known to be surviving, the forth column is the fate (1-died, 0-survived), and the fifth column is the number of nests with identical histories.

Bart and Robson Enc Hist.inp contains the same data in encounter history (LDLD) format. In the nesting model, similar to the known fate models, there are 2 entries in the encounter history for each encounter occasion. Like the Known Fate model, the first entry indicates whether a nest was monitored on that occasion and the second indicates whether it failed (1) or survived (0). Unlike known fate models it is not necessary to visit every nest on every occasion. The two numbers following the encounter history represent the number of subjects in each **group** to which the encounter history applies.

In this example the groups 1 and 2 represent, the inner and peripheral portions portions of the study area, and there are 7 occasions.

1. Download the input file nestex.inp. This is data from Dinsmore et al (2002) listed in the example in the MARK help file index under the heading Nest Survival. Create a new database in MARK for the analysis by using File/New. Specify the nesting model and that the file contains 63 occasions, 2 groups, and one covariate (age of nest at discovery).
    a. Use predefined models to run the models S(.), S(g).
    b. Now use the design matrix to specify the models S(age), and S(g+age).
    c. Next, use the design matrix to specify a model where S is a linear function of time {S(T)} by including and intercept column of ones and another column with the first 62 cells filled with the values 1,2,…62, and the next 62 columns filled with the values 1,2,…62. (Helpful Hint: right click on the empty column in the design matrix and use **Partial Continuous** to fill the next 62 cells with the values 1,2,…n.
    d. Cast and run the models S(g+T).
    e. Verify that the parameter counts are correct, and adjust them where necessary before you output the results table to an Excel spreadsheet and cut and paste it into lab04 on the page named Nestex Results.
    f. On the spreadsheet, calculate and plot the logit and the dsr estimates for the model S(g+T) fore each group over the range of T = 1-63. Note that the sign of

the β for T indicates the slope of the logit and the direction of the relationship between T and S.

g. Why are the plots of the logits parallel, but the dsr plots divergent for this additive model?