

Assignment 3: Goodness-of-fit Testing in Program MARK

Objectives: This assignment will familiarize you with the tools of goodness-of-fit testing in Program MARK. The purpose of GOF testing is to determine whether the assumptions of mark-recapture analyses are met by the data in the capture histories. It also allows you to correct for a lack of fit between the global model and your data by calculating the variation inflation factor, $c\text{-hat}$. Return to your Semipalmated Sandpiper analyses and use the GOF tests of Program Mark to calculate $c\text{-hat}$ for the standard CJS model $\phi(\text{sex}^*t), p(\text{sex}^*t)$.

Exercise:

The three tests available in Program Mark include Program Release, the Bootstrap GOF test and the Median $c\text{-hat}$ procedure. When applying the Bootstrap GOF test, use the Deviance only option and conduct at least 1000 simulations. When applying the Median $c\text{-hat}$ procedure, vary $c\text{-hat}$ within the range of 1 to 2.5 with a total of at least 1000 simulations (e.g., 10 intervals with 100 replicates each, 50 intervals with 20 replicates each, etc).

Hand in a short paragraph that addresses the following questions:

1. Do the diagnostic tests of Program Release give any indication of what transitions are contributing to a lack of fit? Can you combine the different component tests (3.Sr, 3.Sm, 2.C) to calculate goodness-of-fit to a different global model?
2. What is the estimate of $c\text{-hat}$ obtained with each of the three procedures? Provide enough details to show how $c\text{-hat}$ (and P -values if relevant) were calculated. Experiment with different numbers of simulations to see if your estimate change substantially if $n = 100, n = 1000$, etc.
3. Do the different procedures result in different estimates of $c\text{-hat}$? If so, which estimate of $c\text{-hat}$ should you use?
4. If you use Model Adjustments to change the value of $c\text{-hat}$, how does accounting for overdispersion affect the results of your model selection?
5. If you use Model Adjustments to change the value of $c\text{-hat}$, how does accounting for overdispersion affect the parameter estimates and their confidence intervals from your best fit model where $\Delta\text{QAICc} = 0$?
6. For many types of mark-recapture data, no GOF tests are available. If this had been the case for the Semipalmated Sandpiper data set, how would you have proceeded? Can you devise a sensitivity test that would allow you to assess how robust your conclusions would be if you had been forced to assume that $c\text{-hat} = 1$?