WILD 595-1 Fall 2015  
Lab 05

**Closed Population Models**

Northern pike were introduced into Crawford Reservoir in southwest Colorado. Biologists would like to know how many pike are in the reservoir to better understand how big of a problem the pike pose and how difficult it will be to remove them. A 2-occasion mark-recapture study is performed to estimate pike population size. Pike length is recorded for all captured fish because length is expected to influence capture probability. Data are in the file *crawford.inp*.

1. Use the Huggins closed capture models. Fit models p(.)=c(.), p(t)=c(t), p(.) c(.) and p(length)+c(length).
2. What does each model represent about the sampling process?
3. Estimate population size as a derived parameter

**Robust Design Models**

Northern pike were also introduced into Lake Catamount near Steamboat Springs, Colorado. Biologists would like to understand pike survival and growth and then remove the pike. Therefore, they conducted a robust design study over 5 years at Lake Catamount. Each spring, pike were caught with gill nets and angling. There were 2 secondary occasions during the first 4 years and 3 occasions the fifth year. After year 4, pike are removed from the lake in a separate capture effort. Fish length is collected as a covariate.

1. Create a robust design Mark file using the data *catamount.inp*
2. Open the PIM chart and PIM matrices. Examine the complexity of the huge number of parameters. Consider the benefits of tackling the estimation problem with a predefined set of models rather than a fluid set of models.
3. Consider the capture probability portion of the robust design. Build models with p(t)=c(t), p(t)=c(t)+length, p(.) c(.), p(.) c(.)+Length, p(.) c(.)
4. Now consider the open population portion. Build models with S(.), S(t) and S(removal). Also build models with gamma’(.)=gamma”(.) and gamma’(.) gamma”(.)
5. Provide a biological interpretation for each model.