Exercise – Age-Length Key

Answer the following questions with R code by creating (*and editing if you make a mistake*) an R script and iteratively running the code in RStudio.

1. Wolfert (1980) examined the population of Rock Bass (*Ambloplites rupestris*) from Eastern Lake Ontario in the late 1970s. In his studies, he measured the total length of 1288 Rock Bass. Scales were removed for age assignment from as many as 10 fish from each 10-mm length interval. The lengths and ages (if they existed) from all 1288 fish are recorded in **RockBassLO2.csv** [Note: the filename contains an "oh" not a "zero".]. Load these data into R.

2. Separate the observed data into age- and length-samples. How many fish are in the age-sample? How many fish are in the length-sample?

3. Add a variable containing the 10-mm length categories to the age-sample (save as a new data frame). Then construct a table of the **number** (not proportion) of fish in each age and 10-mm TL category in the age sample. From these results, compute each of the following *BY HAND* (i.e., not using R).

   (a) How many fish in the age-sample are in the 180-mm length category?
   (b) How many age-7 fish are in the age-sample?
   (c) What proportion of Rock Bass in the 140-mm length category are age-4?
   (d) What proportion of Rock Bass in the 200-mm length category are age-8?

4. Construct an age-length key from the table above (using R). From these results answer the following questions.

   (a) What proportion of Rock Bass in the 210-mm length category should be assigned an age of 5?
   (b) How many of thirty Rock Bass in the 180-mm length category should be assigned an age of 5?

5. Use the semi-random age assignment technique from Isermann and Knight (2005) to assign ages to the un-aged fish in the length-sample (save as a new data frame). Combine the age-sample and the age-assigned length-sample into a single data frame. Add a variable containing the 10-mm length categories to the combined data frame. Use the combined data frame to answer the following questions.

   (a) How many fish are estimated to be age-5? [Hint: use `xtabs()` or `Summarize()`.]
   (b) How many fish are estimated to be age-11?
   (c) Plot the age distribution for all fish.
   (d) How many fish are in the 150-mm length interval? [Hint: use `xtabs()`.]
   (e) What is the mean length of age-5 fish?
   (f) Plot the length-at-age with the mean length-at-age superimposed for all fish.
   (g) Did your "neighbor" get the *exact* same results in their analysis? Why or why not? If not, how different were they?