# Exercise – Age Bias and Precision

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. Herbst and Marsden (2012) (reprint is here) compared the precision, bias, and reader uncertainty of scales, dorsal fin rays, and otolith age estimates from 151 lake whitefish (*Coregonus clupeaformis*) from Lake Champlain in 2009. The data for their comparisons were recorded in **WhitefishLC.csv**. This file contains inital age assessments for two readers on three structures (variable names are the structure name with a "1" or "2" appended to denote the reader). In addition, the two readers developed a consensus age (variable name is the structure name with a "C" appended). Load these data into R to answer the following questions.
2. Use a variety of methods (tabular, graphical, and statistical) to describe any apparent bias in *consensus* ages between scales and otoliths.
3. Describe any apparent bias in age assessment for otoliths between the two readers.
4. Describe precision of age assessment between the two readers for otoliths.
5. (*If time permits ...*) Describe any apparent bias in age assessment for scales between the two readers.
6. (*If time permits ...*) Describe precision of age assessment between the two readers for scales.
7. (*If time permits ...*) Use a variety of methods (tabular, graphical, and statistical) to describe any apparent bias in *consensus* ages between fin rays and otoliths.