**FISH 458/558 - Fish Population Dynamics**

**LAB ASSIGNMENT #11 (Data exploration and Index of Abundance)**

*Complete and return your assignment (via Canvas) in the form of a Word document by the due date (with any answers and figures requested and with the R script copied in).*

*Guidelines:*

* *Include course, lab number, and date at the top of the document; do not write your name.*
* *Number and label the questions and answers clearly! (We should easily be able to find your answers!)*
* *Include all of the requested output (e.g., values, data tables, and plots), not just the code for them. (We will not copy your code into R to see if it works).*
* *Include informative captions for figures and tables. See research articles for examples. [We will take points off if these are not included!].*
* *Submit a Word document unless directed otherwise (no r files or pdfs please).*
* *Include all your code used for the problems.*
* *Answer ALL questions using complete sentences that are clear and informative.*

1. In Lab we calculated a stratified mean of Atlantic Croaker catch-per-unit-effort (CPUE), but we did not explore the data set thoroughly. The data came from a multispecies monitoring trawl survey that is designed to many fish species in Chesapeake Bay. If our goal is to develop the best CPUE time series we can for Atlantic Croaker, we may choose to limit/restrict our dataset to what we think is most representative of the Atlantic Croaker population. For example, Atlantic Croaker may not always be present in large numbers in the Bay, given their seasonal migrations, or they may not regularly inhabit some parts of the bay. Re-evaluate the dataset and develop what might be a better Index for Croaker using the data. Include the following:
   1. Examine the dataset graphically, and determine whether any data restrictions may be warranted based on **Month** or **Region**. Use any graphical approaches you think would be helpful (e.g., coplots, histograms, boxplots, scatterplots, …). Some helpful response values to plot could potentially include CPUE and log(CPUE+1). Include only the most informative plots. (7 pts)
   2. [**Extra Credit; 2 pts**] – Do some graphical exploration of the data using fraction of tows that are not empty (i.e., tows that had at least 1 Croaker). Describe your findings. [Note, you will need to figure out how to calculate the proportion of non-zero tows, for different factors. For example, how does the proportion of non-zero tows change by Month or Region?]
   3. Based on your graphical exploration, state your observations of the patterns in the data. Do you think you would be justified in restricting the data set to specific months and/or regions? (You may also support your decision using the scientific literature). (4 pts)
   4. Based on your decisions regarding the Month variable, subset your data set accordingly by removing the unwanted Months. Recalculate the annual time series of stratified mean CPUE for Croaker. Make a plot of this new annual index (with SE). (4 pts)
   5. Describe how this new time series differs from the one we calculated in lab. Which is better, and why? (3 pts)
   6. Explain what a random stratified mean is and how it is different from an arithmetic mean. Include some sort of simple conceptual example (that you make up) to help your explanation. Under what conditions would a stratified mean be much better than an arithmetic mean? (5 pts)
2. Answer these questions (1 pt):
3. How many hours did you spend on this assignment as a whole?
4. Did you work with anyone else or at least consult with someone? Who? Include an image.
5. Were there any particular things you struggled with in this lab and how did you overcome them?
6. **[558 Students Only]** Work on your projects. Provide a short (3-5 sentence) summary of the progress you’ve made and any issues you may be having. (4 pts)