# Regression HW

*March 28, 2017*

## Weight-length regression

Weight-length relationships are important in fisheries. Some specific examples:

1. estimating weights from lengths when it was not possible to record weight in the field
2. converting growth in length to growth in weight
3. estimating biomass of a fish community using only length and species data

Weight-length is usually modeled with linear regression as: $W_i = \alpha L_i^{\beta} 10^{\epsilon_i}$

Take the log of both sides: $log(W_i) = log(\alpha) + \beta log(L_i) + \epsilon_i$

## Weight-length of Bull Trout

Use the same Bull Trout dataset as from the ANOVA HW (`BullTrout.csv`). In your ANOVA HW, you found that the mass of Bull Trout was *different in the two different eras* (1977-79 vs. 2001), so we will only model era #1.

1. Read in the data from `BullTrout.csv`. Remove the data from era #2 (2001) so that you only have era #1 data (1977-79).
2. Plot length (`fl`, mm) vs weight (`mass`, g).
3. Check the 2 assumptions of linear regression (`mass ~ fl`) using a residual plot.
4. Transform the data and show that the linear regression assumptions are met for the transformed data.
5. Fit the linear model. What are your conclusions?
6. How much of the variance in *log(weight)* does your model explain?
7. Plot your length-weight fit with a 95% prediction interval.
8. Predict the mass of fish with fork length (`fl`) = 150, 250, and 310 mm. Show these predictions on your plot with blue points (*hint:* use `points` function with `pch=19, col="blue"`).