Presenting Data (graphs, tables, figures)

Getting Ready

- Assemble data sheets, graph paper, calculator

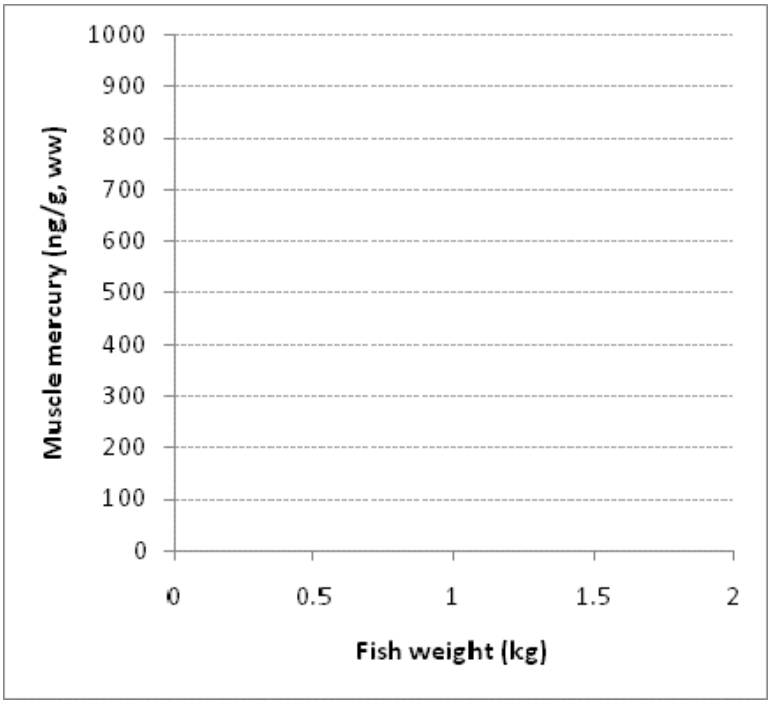
Doing the Activity

- Calculate and record basic descriptive statistics about your data (mean, median, minimum, maximum, range, and standard deviation)
- Identify patterns and relationships in the data
  - Are two things related?
  - Are groups of things different?

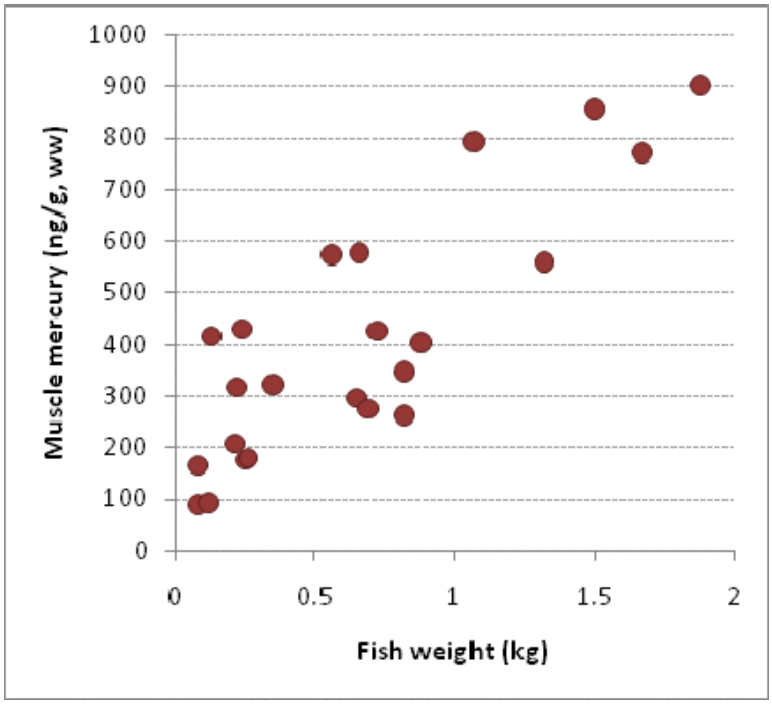
Are two things related?

- Graphing two numbers

  - Set up a graph with an X (horizontal) and Y (vertical) axis. Typically we put the response or dependent variable on the Y axis, and the predictor or independent variable on the X axis. Identify which is the independent and which is the dependent variable. In our example, fish size is independent and mercury content is dependent – we're asking if mercury content depends on fish size. Don't forget to label the axes with what they represent and the units of measure. The graph should look something like this:

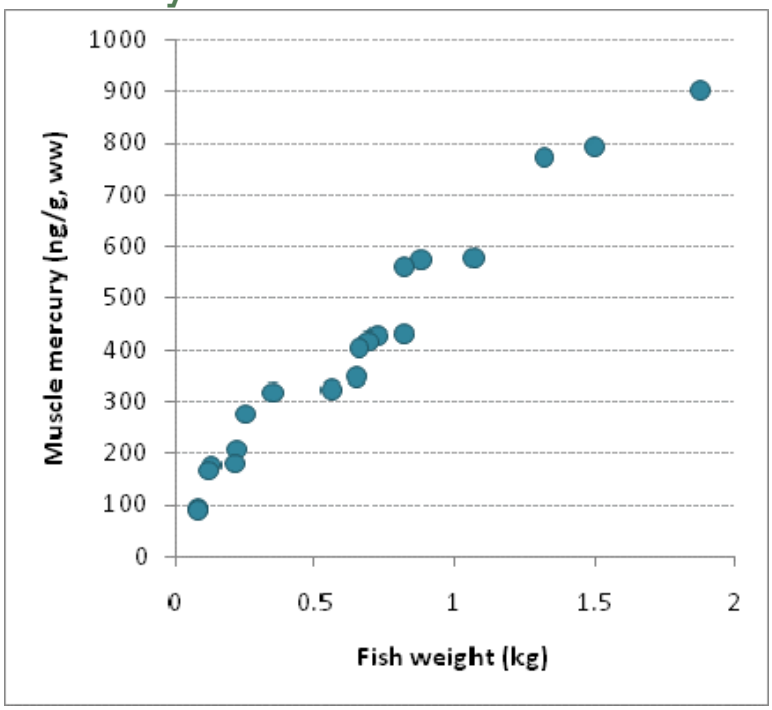


a. Now plot the data points. The graph that results will be called a scatterplot, or an X-Y plot. For each fish size value, trace up to the corresponding mercury value. The graph might look something like this (although where the points are will be different, based on your data):

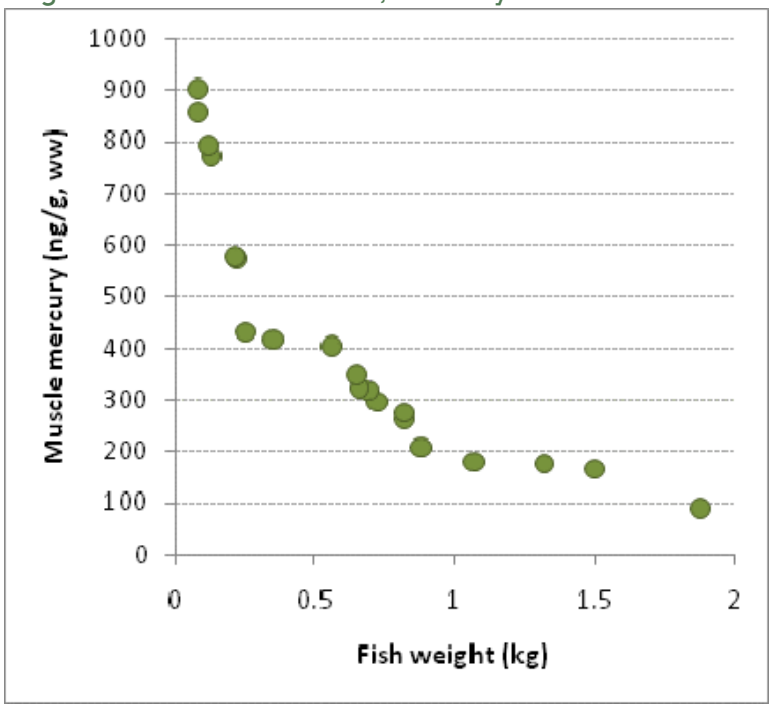


b. To assess whether the two things are related, students need to understand a bit more about what the relationship might look like. There are three main types of relationship:

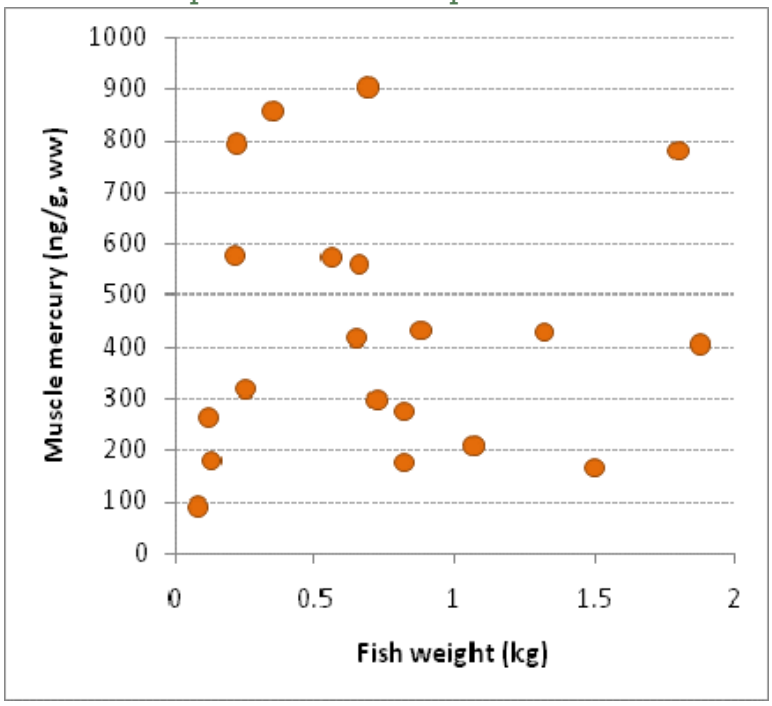
i. Positive. As size increases, so does mercury:



i. Negative. As size decreases, mercury increases:

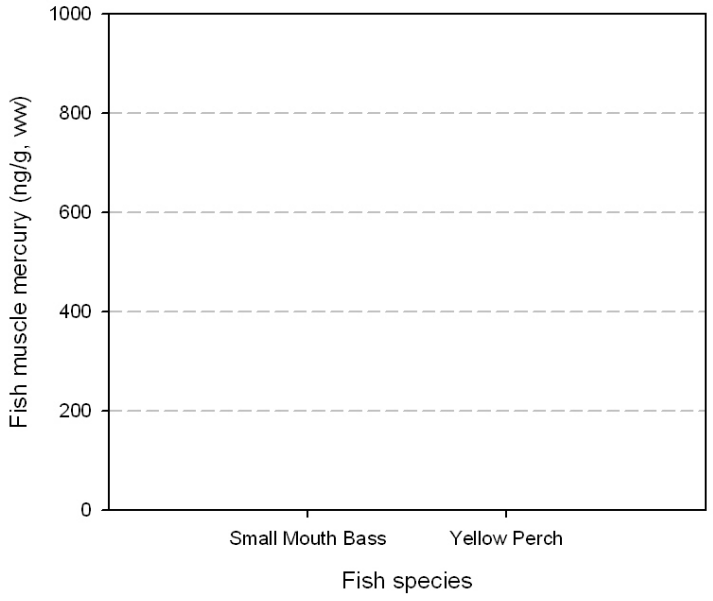


ii. No relationship. There's no clear pattern between size and mercury:



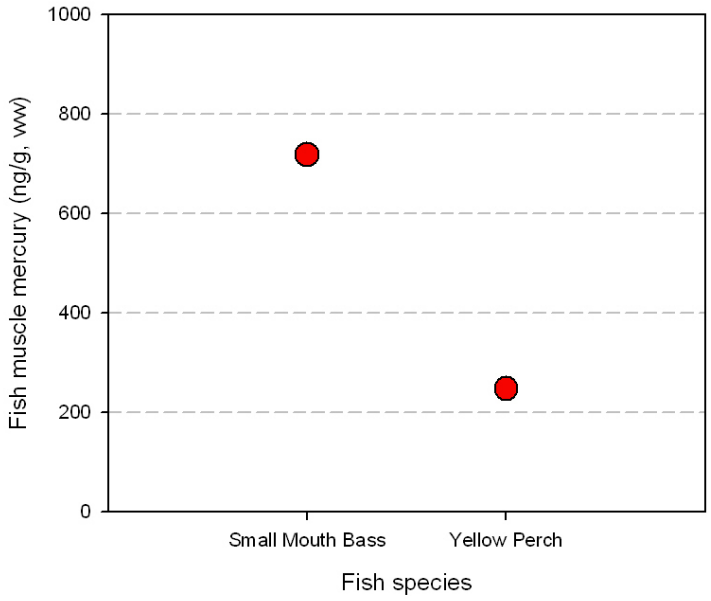
Are groups of things different?

1. You will need numeric data for one variable, and a categorical variable – named groups – for the other. For example, you might be looking to find whether different fish species had different mercury concentrations. Your hypothesis might be that perch have more mercury than bass.
    a. Set up a graph with an X (horizontal) and Y (vertical) axis. Typically we put the response or dependent variable on the Y axis, and the predictor or independent variable on the X axis. Identify which is the independent and which is the dependent variable. In our example, fish species is independent and mercury content is dependent – we're asking if mercury content depends on fish species. Don't forget to label the axes with what they represent and the units of measure. The graph should look something like this:

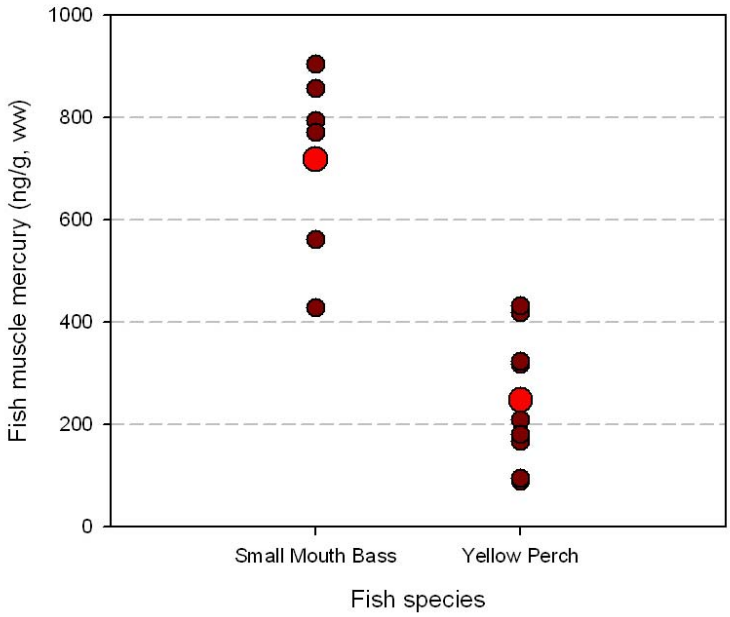


    c. Calculate the mean for each group. In our example, the mean mercury in Perch was 307 ng/g; the mean mercury in Bass was 719 ng/g.

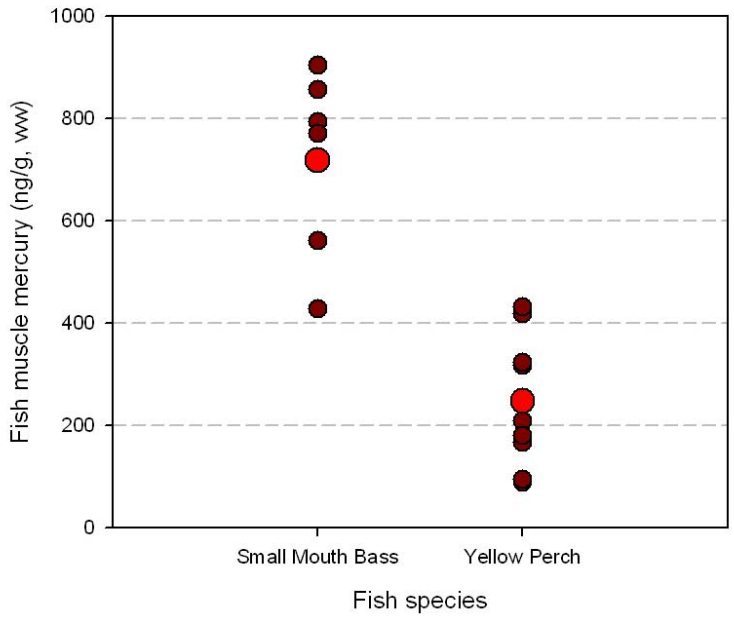
Start by plotting the mean for each group as a dot on the graph:



d. We need to get an idea of how variable the data are for each species. Plot the minimum and maximum above and below the mean, and fill in with the other values, like this:



a. We need to get an idea of how variable the data are for each species. Plot the minimum and maximum above and below the mean, and fill in with the other values, like this:



Now that you have some statistics about the data and a graph showing the patterns or differences, it's time to interpret what the results mean. Think of the graph and data as evidence, and the scientist (you) now needs to judge whether the hypothesis was supported or not. In the graph above, showing perch versus bass mercury, the means are different, and there's not much overlap in the data. So the scientists would conclude that bass had more mercury than perch in their study, and that fish species does matter. If the hypothesis was that perch would have more mercury, it would not be supported by the data.

Note that scientists avoid the terms "right" and "wrong" and do not say that we "prove a hypothesis".