Graph Construction

Updated 9 February 2011

In this exercise, you will learn to construct the basic graphs used by biologists. The rules for graph construction presented here will **apply to all graphs you construct during the semester**. In the first set of exercises (B), you will reproduce graphs given to you. In the second set of exercises (C), you will be given data and asked to construct graphs that display certain statistical properties.

SYSTAT is capable of making at least 50 different graph types. In this exercise, you will learn four graphs commonly used by biologists.

A. Basic graph types

1. **Histogram** (*Graph→Histogram*) - plots the frequency of occurrence on the Y-axis of a variable on the X-axis
2. **Bar** (*Graph→Bar*) - plots the mean of a variable as a bar on the Y-axis against a categorical variable on the X-axis
3. **Dot** (*Graph→Summary Charts→Dot*) - plots the mean of a variable as a symbol on the Y-axis against a categorical variable on the X-axis
4. **Scatterplot** (*Graph→Scatterplot*) – plots cases of one variable on the Y-axis against cases of another variable on the X-axis

Requirements of all graphs

- The Y variable is always read before the X variable. For example, "plot Y against X", "plot Y by X", and "Y is regressed against X". For this class, X is never plotted against Y.
- Essential graph elements: axes (Y, X), axis labels (with units of measurement, if applicable), ticks (major, minor), major tick labels, caption
- Elements essential for specific graph types: bars, symbols, error bars, fill, data points, line, smoother
- Each graph must be self-explanatory and be able to stand alone (figure captions are considered part of the graph). Captions should be descriptive, not interpretative.
- Non-standard abbreviations must be defined.
- Graphs displaying means (Bar, Dot) must portray the mean, error bars, and sample size **for each mean**.

B. Graph reproduction - Reproduce each graph (1-5) illustrated below. Read the description of each data file before beginning. Copy and paste your SYSTAT output into a Word file named *graphexercise* and save to your M-drive.

1. HISTOGRAM - A SYSTAT Histogram plots the frequency of a single variable. Duplicate the Histogram below. Note axis titles, axis ranges, data plotted, bar fill, etc. The data are in RANDOM.SYD.

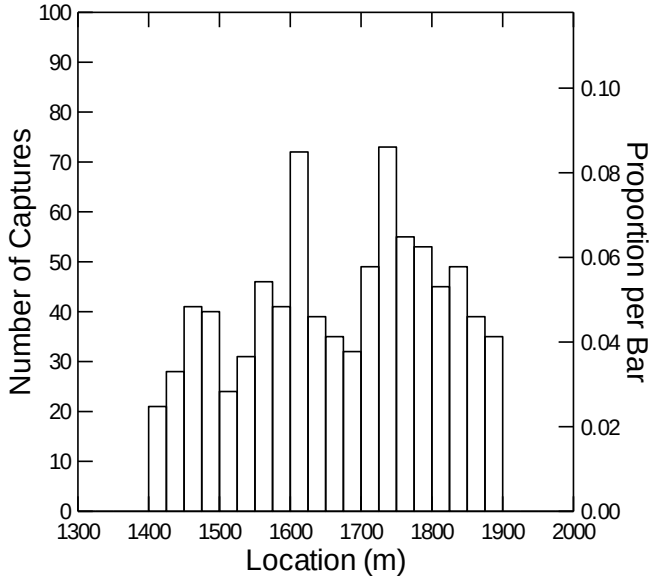

Fig. 1. The distribution of captures of green snakes according to location.

2. BAR - A SYSTAT Bar graph plots the mean of one variable against another variable. Duplicate the BAR graph below. Note bar fill, axis titles, error bars, data plotted, etc. The data are in TREAT.SYD.

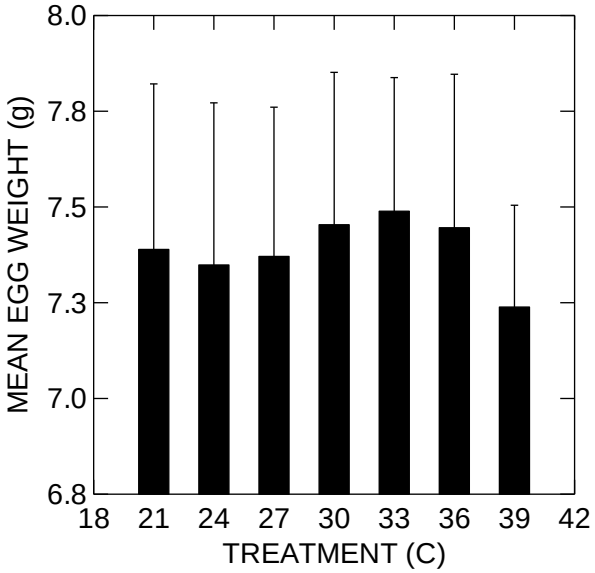

Fig. 2. The relationship of egg weight and temperature in eggs of softshell turtles. Each treatment contained 33 eggs. Error bars indicate ± 1 SD.

3. DOT - A SYSTAT Dot graph plots the mean of one variable against a discrete or categorical variable. Duplicate the Dot graph below. Note symbols, error bars, axis titles, axis ranges, selected data plotted etc. The data are in USOPHEO.SYD.

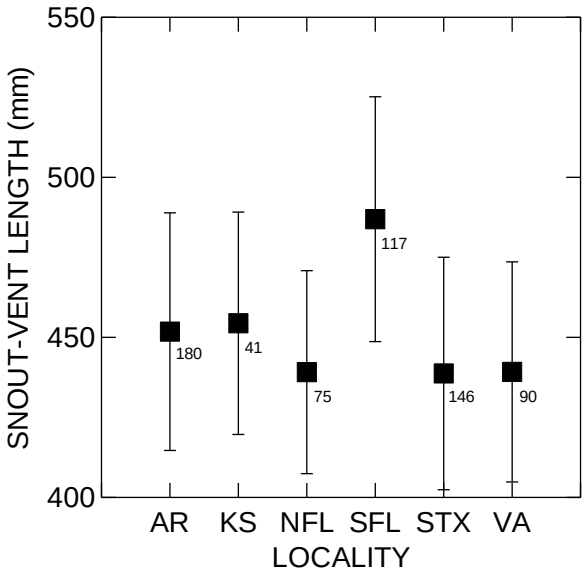

Fig. 3. The relationship of snout-vent length and locality in green snakes. NFL = north FL; SFL = south FL, STX = south TX. Plotted are mean ± 1 SD. Sample sizes are indicated beside each mean.

4. DOT - A SYSTAT Dot graph plots the mean of one variable against a discrete or categorical variable. Duplicate the Dot graph below. Note symbols, error bars, fill, axis titles, axis ranges, data plotted, etc. The data are in TREAT.SYD.

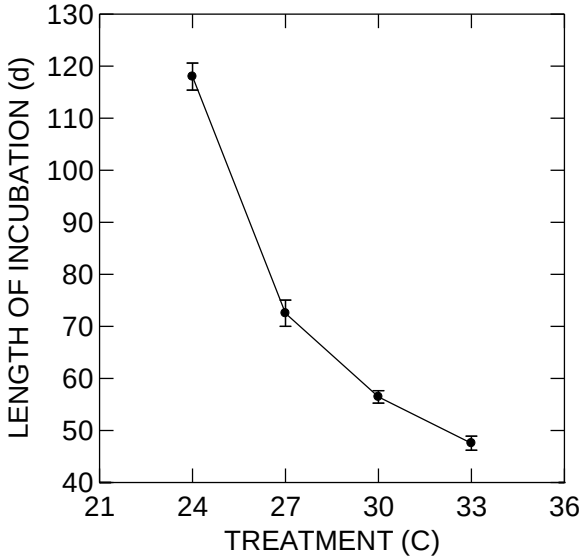

Fig. 4. Length of incubation according to incubation temperature in eggs of softshell turtles. Plotted are mean ± 1 SD. Sample sizes are 24C n=2, 27C n=25, 30C n=24, 33C n=20.

5. Scatterplot - A SYSTAT Scatterplot plots individual cases of one variable against another variable. Duplicate the scatterplot below. Note symbols, axis titles, axis ranges, selected data plotted, etc. The data are in LONOKE.SYD.

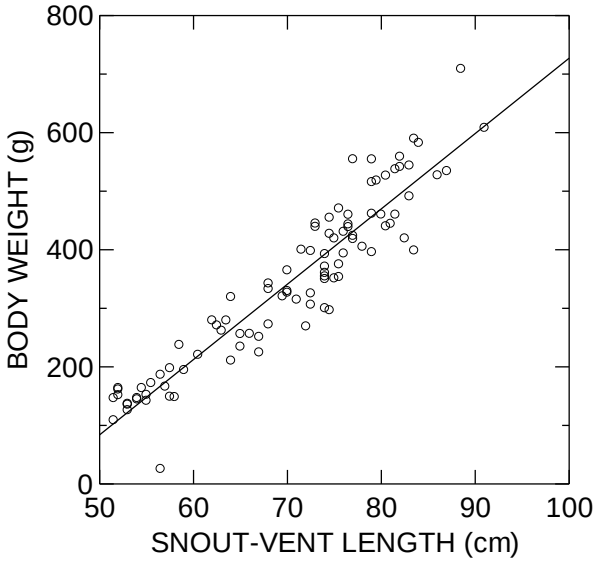

Fig. 5. The relationship of body weight and snout-vent length in 99 adult (>50 cm) male diamondback water snakes.

C. Graph construction: Construct an appropriate graph for each of the following problems and save in your *graphexercise* file.

6. Use the following data on bill lengths (mm) of 42 belted kingfishers to construct a data file with variables length and group. Prepare a single BAR graph named Fig. 6 that depicts the descriptive statistics for each sex and for sexes combined (3 groups). Use B&W *Fill* to differentiate among the three bars. Construct a table similar to the one below and fill in with appropriate values. Compare tabled values with values estimated from the graph. Do they match?

males: 48.1, 47.7, 48.0, 50.6, 50.8, 49.9, 49.3, 50.8, 46.9, 49.9, 48.8, 47.5, 48.2, 51.0, 48.8, 52.0, 51.8, 51.0, 50.1, 47.7, 49.9
females: 53.8, 59.2, 52.3, 59.3, 56.5, 56.2, 55.6, 57.7, 52.5, 47.8, 51.5, 55.8, 57.5, 56.8, 47.0, 50.4, 58.0, 61.2, 56.5, 59.3, 59.2

Table 1. Mean, standard deviation, and sample size for the bill length of belted kingfishers

Group	Mean	SD	N
Males			
Females			
All			

For problems 7-10, use the data file LONOKE.SYD (read description of data file before beginning).

7. Construct a graph (Fig. 7) that plots weight against length for snakes collected in ponds #53 and #54. Indicate sample size.

8. Construct a graph (Fig. 8) that illustrates the descriptive statistics of body weight for each sex. Restrict cases to snakes ≥30 and ≤90 cm SVL. Use fill to differentiate graphics between the sexes.

9. Construct a graph (Fig. 9) that illustrates the frequency of female snakes captured in minnow ponds by snout-vent length. Indicate sample size.

10. Transform variable WGT with common logarithms. Construct a graph (Fig. 10) that plots cases of the transformed variable against SVL. Indicate sample size.

Turn in a printed copy of *graphexercise* to the Biostats assignment box in S161 by class time on the due date.