Tutorial 4 Assignment: Data Collection and Visualization

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2024-11-03

Part A: Data Collection (2 marks)

Your group will be given data collection sheets, fill it out and hand it in when the experiment is complete.

Table 1: Section 7 Data set

Group Number	Temperature	Snail Weight (g)	Pre-trial Food Weight (g)	After-trial Food Weight (g)	Total Food Intake (g)	Food Intake by Body Weight
1	14	115.560	5.485	4.476	1.009	0.0087314
2	28	73.310	4.132	3.615	0.517	0.0070522
3	14	91.960	5.011	4.125	0.886	0.0096346
5	28	115.346	5.211	3.592	1.619	0.0140360
6	28	42.456	4.440	4.157	0.283	0.0066657
7	28	112.325	4.565	3.983	0.582	0.0051814
8	28	42.426	5.125	4.519	0.606	0.0142837
9	14	124.852	5.849	4.388	1.461	0.0117019
10	14	102.747	3.969	2.924	1.045	0.0101706
11	28	79.134	3.720	3.044	0.676	0.0085425
12	14	47.787	3.935	3.508	0.427	0.0089355
13	14	70.013	1.838	1.390	0.448	0.0063988
14	28	71.267	5.675	4.270	1.405	0.0197146
15	28	113.690	4.628	3.526	1.102	0.0096930

Part B: Data Visualization (13 marks)

1. From the class dataset, calculate the mean and standard errors for the amount food consumed by weight by the snails. Paste your table of means and standard errors below. (1 mark)

Table 2: Data for Temperature 14°C

Temperature	Food intake per weight (g)
14	0.0087314
14	0.0096346
14	0.0117019
14	0.0101706
14	0.0089355
14	0.0063988

Table 3: Data for Temperature 28°C

Temperature	Food intake per weight (g)
28	0.0070522
28	0.0140360
28	0.0066657
28	0.0051814
28	0.0142837
28	0.0085425
28	0.0197146
28	0.0096930

```
mean(Temperature14$`Food intake per weight (g)`)
```

```
## [1] 0.009262131
```

```
mean(Temperature28$`Food intake per weight (g)`)
```

```
## [1] 0.01064615
```

```
std <- function(x) sd(x)/sqrt(length(x))
std(Temperature14$`Food intake per weight (g)`)
```

```
## [1] 0.0007188723
```

```
std(Temperature28$`Food intake per weight (g)`)
```

```
## [1] 0.001747024
```

Table 4: Calculated values

Type	Temperature14	Temperature28
Mean	0.0092850	0.0106462
Standard Error	0.0007189	0.0017470

2. Create a properly formatted figure in Excel of the mean (including standard error) food consumption of snails by weight under our two temperature treatments. Paste your figure below

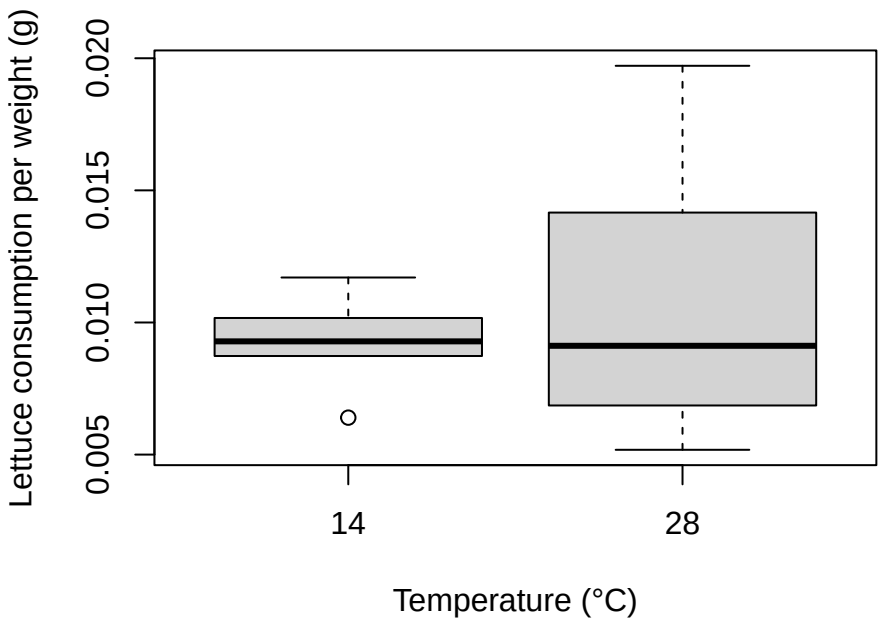

Figure 1: The effect of temperature on lettuce consumption per weight (g) of the Giant African Land Snail (*Lissachatina fulica*) (n=15). Giant African Land Snails were fed for a 30 minute period under different temperature conditions on November 1st, 2024 at the University of Guelph.

3. Briefly describe the results of the class experiment. Remember to include the major trend and numerical evidence. (2 marks)

```
##
## Call:
## lm(formula = `Food intake per weight (g)` ~ Temperature, data = snail_w)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -0.0054648 -0.0026734 -0.0004287  0.0020569  0.0090684
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.009262   0.001609   5.756 9.08e-05 ***
## Temperature28 0.001384   0.002129   0.650    0.528
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.003941 on 12 degrees of freedom
## Multiple R-squared:  0.03403,    Adjusted R-squared:  -0.04647
## F-statistic: 0.4227 on 1 and 12 DF,  p-value: 0.5278
```

The figure above represents the consumption of lettuce by the Giant African Land Snail (*Lissachatina fulica*) according to the temperature conditions in its optimal temperature range (22 to 28°C). Two main temperatures, 14°C and 28°C were used by a heating pad and ice as the snail ate the lettuce over a 30 minute period. In tracking the lettuce consumption rate, there appears to be a single outlier in the data set at the

14°C temperature of ~0.007g. This outlier could be due to experimental error caused by putting the snail under stress by moving the container or if the snail took longer to acclimate, etc. Additionally, there appears to be a greater standard error at the 28°C temperature. This means that it is a less accurate representation of the population of these species at this temperature outside of this experiment, compared to the 14°C which the standard error was smaller, causing it to be a more accurate representation of this population under these conditions. This graph also shows that the range for higher temperature ranges is more vast, and that at 28°C, we see the highest lettuce consumption per weight value of ~0.019g, compared to at 14°C where the highest consumption per weight is ~0.012g. These findings shown in the graph support the prediction that the Giant African Land Snail consumes more food at higher temperatures compared to lower temperatures.

Part C: Figure and Description of Predicted Results for your Invasive Focal Species (10 marks)

1. Using your feedback from Assignment 3, re-state the prediction for your focal species.

If house sparrows are more effective at occupying human-made nesting sites compared to the American tree sparrow, then areas with bigger hole nesting boxes will have a higher decline in tree sparrow population density than smaller hole nesting boxes.
2. Create a figure and figure caption based on your prediction for your focal species. Figures must be fully labelled and include appropriate legends if applicable. (8 marks)

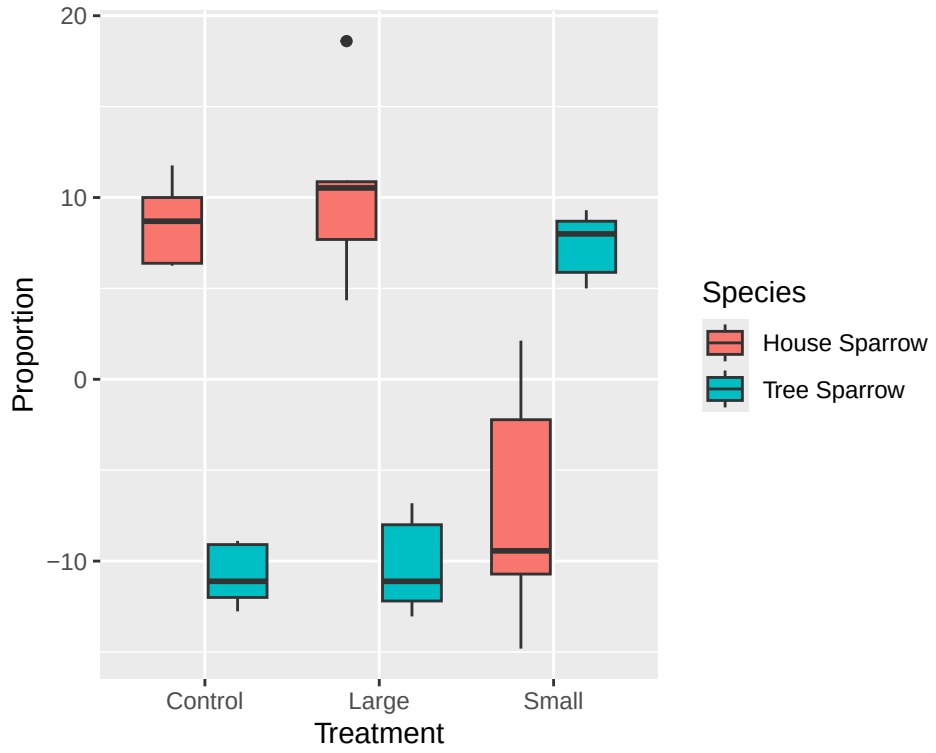

Figure 2: Sparrow population proportion change in 100m squared area with different opening size nesting boxes during 2 years of study. Various locations in southern Ontario.

Table 5: Summary of Sparrow boxplot data

Treatment	Species	mean	se
Control	House Sparrow	8.618667	1.0587836

Control	Tree Sparrow	-10.771373	0.7736607
Large	House Sparrow	10.408133	2.3612796
Large	Tree Sparrow	-10.233579	1.2076229
Small	House Sparrow	-7.011525	3.0572217
Small	Tree Sparrow	7.376066	0.8281892

3. Describe the major trend in your prediction figure that you would want a reader to take away from it. (2 marks)

The graph above depicts the relationship between the size of the nesting box opening and the density of the House sparrow and the American tree sparrow. The graph shows that there is a difference in both sparrow density between different opening size boxes, compared to a control where there were no nesting boxes at the sites. The major trend the reader should take away from this data is a decrease in American tree sparrow density of the area with bigger opening nesting box and an increase in the House sparrow density with bigger openings of the nesting box which supports our prediction. As depicted in the graph, when there is a smaller opening in the nesting boxes, the density of the House sparrow is , and the Tree sparrow has a density of ~2100. As we increase the size of this hole, we see that the House sparrow density remains large at ~ 3200 and the American tree sparrow density decreases to ~1700.