**Stat 401: lab 7 – self assessment**

The data in cavity.txt are measurements of nesting cavity size for 9 species of birds and mammals that nest in cavities in southern Colorado. Specifically, the measurement is the area of the cavity entrance, although I will call that nest size throughout. A preliminary analysis shows a clear pattern of unequal variances. Analysis of log transformed size is much closer to equal variances. All of your analyses should use log transformed size as the response. You will have to do the log transformation as part of your analysis.

1) Test the null hypothesis that all species have the same median nest size. Report the p-value and a one-sentence conclusion.

2) Six of the species in this study weigh less than 100gm (typical adult body size). They are the two mice, wren, bluebird, flycatcher and titmouse (collectively the “small” species). The other three species (flicker, owl and kestrel, collectively the “large” species) weigh more than 100gm. You want to estimate the difference in log size between large and small species. What are the coefficients to estimate this difference (as large – small)?

3) Estimate that difference and its standard error. (Note: pay attention to the order of the groups)

4) I have found typical body masses for each species. They are in the table below. What are the coefficients that will test for a linear trend?

5) Calculate the T statistic and p-value for the test of no linear trend in log size.

6) Calculate all pair-wise differences of means. Report results for the difference between Mouse and PlainTitmouse. How much larger is the titmouse? What is the se of that estimate? What is the p-value for the test of no difference between these two species, when you use Fisher’s LSD approach?

7) Consider all pair-wise differences of means using Tukey’s honestly significant difference to adjust for multiple comparisons. Report results (estimate, se, p-value) for Mouse vs PlainTitmouse.

**Answers:**

1) p < 0.0001, very strong evidence that at least one species has a nest size that differs from the others.

2) see table below, Coef for 2 column. Note: groups ordered as given in the book.

Species body mass (gm) Coef for 2) Coef for 4) (in ‘nice’ form)

Mouse 20gm -1/6 -10

Pinyon Mouse 15gm -1/6 -11

Bewick Wren 20gm -1/6 -10

Mtn Bluebird 30gm -1/6 - 8

Ash Thr. Flycatcher 30gm -1/6 - 8

Plain Titmouse 25gm -1/6 - 9

Northern Flicker 140gm 1/3 14

Western Screech Owl 230gm 1/3 32

Am. Kestrel 120gm 1/3 10

3) estimate = 0.861, se = 0.100

5) T = 6.64, p < 0.0001

Notes: The mean body mass is 70gm, so mass-mean values are 50 -40 -50 -50 -40 70 -55 -45 160 when sorted in alphabetic order to match JMP/R/SAS order of groups. Nice values are these divided by 5.

If you get T= -2.4, p = 0.017, groups are in the wrong order (following the above list, which is book order)

6) diff = -0.265, se = 0.119, p = 0.027

7) diff = -0.265, se = 0.119, p = 0.39