**Winter, 2011 Biometry Quiz #2**

1. **[XX pts]** Use the background information and the analytical results from R displayed on the handout to answer the following questions. Make sure to answer each question as thoroughly as possible and by citing supporting evidence where appropriate.
2. Assess the assumptions on the original scale.
3. Assess the type(s) of effects that are evident in the data (*explicitly state whether you are analyzing the data on the original or transformed scale*).
4. Explicitly identify which levels or which groups (*depending on types of effects are evident*) are statistically different.
5. Construct a graphic that illustrates your results from question (c) (*make sure to explicitly identify which graph(s) you marked*).
6. Summarize the findings in terms of the biology of pied flycatchers.
7. **[2 pts]** The relationship between the number of decaying objects in a discrete set (e.g., number of tulip bulbs in a box that rot) and time can be modeled with



where N0 (the constant initial number of objects) and  (the mean lifetime) are parameters to be estimated, Nt (number of objects at time t) and t (time) are variables, and e is the “natural number” constant. Algebraically linearize this function (*show your work*) and explain how the original parameters (N0 and ) can be determined from the results of the linearized function (*i.e., how do these parameters relate to the intercept and slope of the linearized function*).

1. **[2 pts]** Kleiber's law is the observation that, for the vast majority of animals, an animal's metabolic rate scales to the ¾ power of the animal's mass. Thus, if *q* is the animal's metabolic rate and *M* is the animal's mass then Kleiber's law states that *q* = a*M*3/4, where a is a proportionality constant. Thus, for example a cat that has a mass 100 times that of a mouse will have a metabolism roughly 31 times greater than that of a mouse. Suppose that you have metabolism and mass data for a large number and wide variety of animals. What would you do with these data to determine if Kleiber’s Law (i.e., a power constant in the relationship equal to ¾) is upheld or not. Be specific.
2. **[6 pts]** Explain why one experiment where two factors are simultaneously manipulated is “better” than two separate experiments where one factor at a time is manipulated. Assume that the two situations have the same number of individuals to use for the manipulations.
3. In the same study described on the handout the researchers also recorded the number of hatchlings from each nest (factors remained the same). The two-way ANOVA table for these data are shown below. Fill in the missing results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source** | **df** | **SS** | **MS** | **F** | **p** |
| csm | 2 | 250.356 | 125.178 | 99.2513 | <2e-16 |
| fh | 1 | 0.002 | 0.002 | 0.0014 | 0.9702 |
| csm:fh | 2 | 0.742 | 0.371 | 0.2943 | 0.7456 |
| Residuals | 109 | 137.473 | 1.261 |  |  |
| Total | 114 | 388.574 |  |  |  |