

Stat 8801 Case Study 4: Eagle Wing Flaps

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Recap of Situation: In this case, the client wants to study how the bald eagle's flight patterns are related to weather patterns, or more specifically, temperature. They collected data one hour each week for six months. Temperature and numbers of flaps for the first thirty seconds were recorded. Because soaring birds did not flap at all, they may have 25% zeros in their data.

Possible Issues with Study: First of all, there could be confounding variables, such as wind speed, height of flight, size of bird, etc. Effects of these variables should be taken into account. Second, more information on their data collection procedure will be needed. Did they pick a fixed time and day each week to visit the preserve? Are there different locations? How many people have been collecting the data? How could they make sure that they did not count a same bird twice in one hour?

Questions for Client: There are several questions that we would like to ask. We would like to know some background of their study. For examples, are there typical behaviors of the bald eagles at certain time of day? If the client is interested in how flight patterns are related to weather patterns, why did he/she choose temperature alone to represent weather patterns? Wind can be another important element of weather. More details of the data collection procedure will be helpful, too. Did they record any other factors? We assume that temperature will not change very much during one hour, but did they visit the preserve at a fixed time of day each week? We will also ask some questions about their data structure. What is the range of temperature? How many birds did they typically observe each time? Is the variation of flap numbers very large? In addition, whether the client prefer a simple analysis or a more complicated model is also important to know before the analysis.

Methods to Analyze the Data: First, a 2D plot can be used to examine any patterns and need for transformation. To deal with the zeros, we can add an indicator variable, *soaring*, and then apply a logistic regression on *temperature* to see if there is an effect. If the number of flaps is close to zero, not the typical 10–40, round it to zero. In the case of no effect at all, the client can choose to throw out those zeros and then conduct a simple regression analysis if he/she wants a simple method. If a fancier method is required, we can consider a zero-inflated regression model.