BIOL683 – In Class Exercise, Week 3

This week's dataset is from a study of the broad horned flour beetles, *Gnatocerus cornutus*. The experiment involved breeding multiple generations of beetles starting with males that had horn and body size measured.

These male beetles were each mated to a randomly chosen female and 5 of the female offspring were mated to randomly chosen males. We then recorded the total number of offspring (grandchildren) produced by this mating over the course of one week. This effectively allows us to measure reproductive success of the measured male through their daughters.

The original male beetles were also placed in petri dishes (30mm diameter) with a randomly drawn male and female beetle. The male beetles fight with each other and the winner will usually secure most mating opportunities. The beetles were monitored for 1 hour and the number of mating attempts with the female were recorded. This should measure any sexual selection with large horned beetles having greater mating success.

In a separate experiment, we also recorded body size and reproductive output over one week for randomly mated females.

Dataset: gnatocerus.males.csv
id: ID assigned by the researcher
horn: the length of the horn in mm
body: the length from the tip of the abdomen to the base of the pronotum
mating.attempts: number of times that the male attempted to mate with female in 1 hour
grandchildren: mean number offspring that a daughters produced in 1 week (n=5 each)
Dataset: gnatocerus.females.csv
id: ID assigned by the researcher
body: the length from the tip of the abdomen to the base of the pronotum
offspring: number offspring produced in 1 week period

Follow these steps for this exercise:

(1) Get the dataset **gnatocerus.males.csv** and **gnatocerus.females.csv**
(2) Create a table with summary statistics for body size in males and females
(3) Exam a histogram for each of the variables studied.
(4) Calculate the residual of horn size by regressing on body size
```
md <- lm(dat$horn~dat$body)
residuals <- md[[2]]
```
(5) Examine plots that show the number of mating attempts or the number of grandchildren as a function of the raw variables (horn and body size) as well as the residual of horn size.
(6) Examine plots that show the number of offspring for females as a function of body size.

(7) Calculate the correlation between variables that you think may be important in determining the fitness of males and females.

Use your analyses to answer these questions:

(1) What is the impact of having a larger body, is it different for males and females?
(2) What are the best predictors for number of mating attempts and the number of grandchildren that a male will produce?

Homework:

(1) Produce a nice document with 4 figures that help to explain your answer to questions 1 and 2 above. Use your new statistical and graphing skills to make sure that your figures demonstrate the patterns that you believe are important in determining the fitness of the beetles.

(2) Include a script with the commands you used.