**The Correlation of Wing Size and Testes Size of the Cabbage White Butterfly**

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**INTRODUCTION**

Like many aspects of evolutionary traits, sexual selection varies among species due to a variety of things, such as location, behavior, fitness, and the importance of mating within a species. The species we will be focusing on is the cabbage white butterfly (*Pieris rapae*). These butterflies have a wide geographic distribution. They are a good model of study because of their wide distribution, and because of their mating strategies. The female butterflies choose to mate with males based on their wing coloration (Yildizhan et al., 2009). When it comes to sexual selection, it can cause quite a domino effect. The females that choose which males to mate with are carrying on traits in their offspring that will inevitably affect the entire population. These traits may have positive or negative effects on the population.

We can use sexual traits to determine the quality of offspring because the males that are able to mate would be in the same pool as those males that have access to greater resources, which in turn gives those males a higher fitness (Espeset et al. 2019). When looking at sexual traits, we will be looking at the size of the male testes. It has been shown that males with larger testes will have more offspring, which reasons are not relevant for this study (Espeset, Forister 2021). If females are drawn to these males, they will likely have offspring in which the males have large testes, and again the domino effect takes off and the fitness increases (Espeset, Forister 2021). The fitness will increase if the heritable traits are favorable by selection. Females look at the wing coloration of males, along with their displays.

Based on this background and this knowledge, we can question the relatedness of the males’ wings and testes. If a male has large testes and could be able to produce a higher number of offspring, would that male put more energy into the look and size of his wings to attract more mates? We hypothesize that wing length and testes size will have a positive correlation.

**METHODS**

***Data collection***

The data in this study was extracted from “*In Search of an Honest Butterfly: Sexually Selected Wing Coloration and Reproductive Traits From Wild Populations of the Cabbage White Butterfly*” (Espeset, Forister 2021). Collected data includes the wing length and testes size of various cabbage white butterflies. The butterflies were collected at 4 sites total, 2 in California and 2 in Nevada. The wings were measured from basal tip to apex tip, and the testes were removed and weighed to the nearest microgram. (Espeset, Forister 2021).

***Statistical Analysis***

The data was analyzed using R Studio ("Ghost Orchid" version for macOS). Once the data was read into the software, the parameter and plot functions were used to create a graph to create a scatterplot of the variables against one another. Then a Pearson’s correlation test was used to compare the wing length and testes size.

**RESULTS**

The scatterplot in Figure 1 shows the testes weight and wing length for each butterfly. Using Pearson’s correlation, the correlation was found to be 0.372.

Chart, scatter chart

Description automatically generated

Figure 1. Male cabbage white butterflies plotted in accordance with the wing length and testes size fitted with a best fit line.

**DISCUSSION**

When looking at Figure 1, it is visible there is a positive correlation between wing length and testes weight based on the line shown. By seeing this positive correlation with the line, we can tell that as wing length increases, so does the testes size. Besides the chart showing some positive correlation, the Pearson’s correlation was 0.3, which is below the 0.5-1 range, so the correlation is not extremely strong. Those with wings that can be more easily seen will be chosen often by the females, and therefore there will be more offspring with favored traits. Naturally in some species, an organism will put more energy towards a trait or characteristic that allows for a higher fitness. These results support the hypothesis that male wing length and testes size are positively correlated.

**WORK CITED**

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