Examination of Sexual Cannibalism in Golden Orb Weaver Spiders, *Nephila plumipes*

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Statistical Analysis

Each experiment was first tested for normality using both the Kolmogorov-Smirnoff and Shapiro-Wilk tests. To further supplement normality testing, visual analysis of normality plots was also conducted. To analyze each experiment, the best suited test was determined once the data was found to be either parametric or non-parametric. Experiment 1 compares the fecundity of female golden orb weaver spiders, *Nephila plumipes*, that had cannibalized male golden orb weaver spiders and females that had not cannibalized males. To compare the two independent groups an Independent Samples t-test is the most appropriate. Experiment 2 compares the various sizes of males (small, medium and large) with their ability to successfully copulate. The nonparametric, Kruskal-Wallis One-way ANOVA test is the most appropriate test to compare the three independent samples. Experiment 3 compares how close male spiders approached female spider models that had been covered with the either the scent of a starved or satiated female spider. Once again, to compare the two independent groups an Independent Samples t-test is the most appropriate.

Results

Experiment 1 contains parametric data (Kolmogorov-Smirnoff $p = 0.200$ and Shaprio-Wilk $p = 0.405$), allowing for the Independent Samples t-test. When a female golden orb weaver spider has cannibalized a male, its fecundity is 1.33 times higher than a female has not cannibalized a male ($t = 3.213$, $df = 28$, $p = 0.003$; Fig. 1).

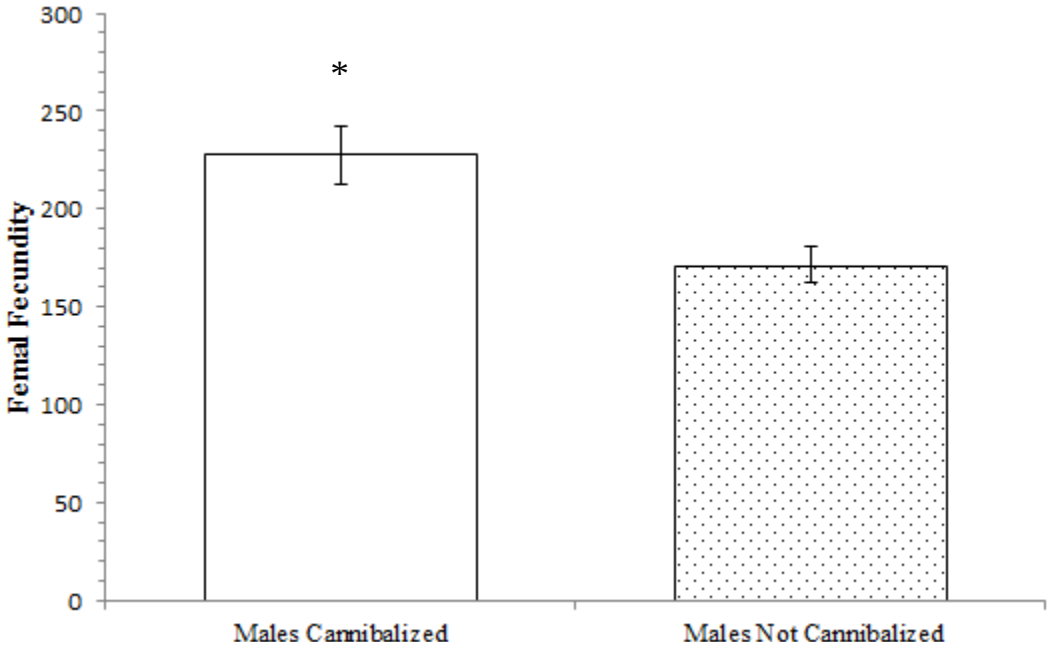

Figure 1. Mean ± SEM of female fecundity in golden orb weaver spiders that had either cannibalized or not cannibalized a male. * denotes a significant difference at $p \leq 0.05$

Experiment 2 does not have parametric data (Kolmogorov-Smirnoff $p < 0.001$ and Shaprio-Wilk $p = 0.011$), therefore a non-parametric ANOVA test must be used. There is no significant difference in

copulation success rate among the three sizes of male golden orb weaver spiders ($X^2 = 0.912$, df = 2, p = 0.634, Fig. 2)

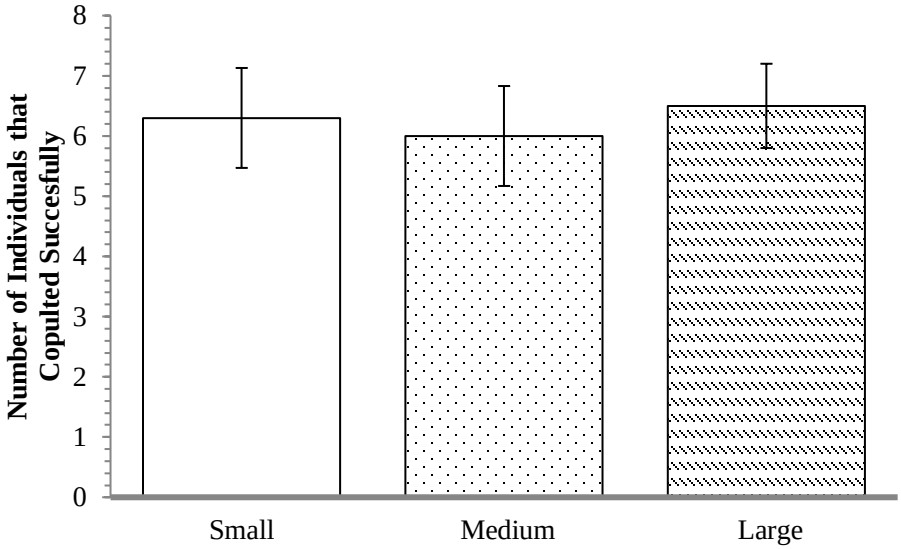

Figure 2. Mean ± 95% confidence interval of the amount of spiders, per group of 10, which copulated successfully based on their body size.

Experiment 3 has parametric data (Kolmogorov-Smirnoff p = 0.123), therefore an Independent Samples t-test can be used. Male golden orb weaver spiders came 2.39 times closer to models of female golden orb weaver spiders that had been scented as satiated females than those that had be scented as starved females (t = -10.052, df = 22, p < 0.001, Fig. 3).

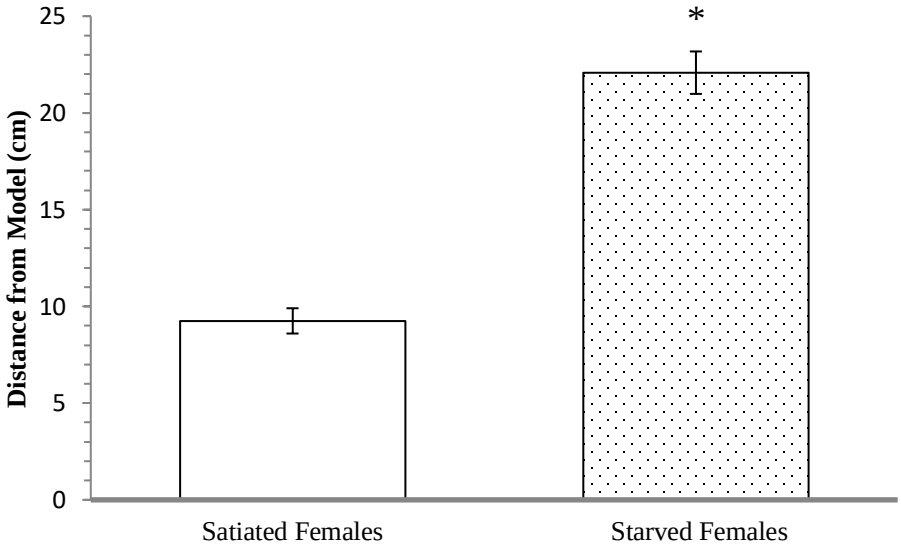

Figure 3. Mean ± SEM of the distance a male golden orb weaver spider is away from a model of a female scented as either satiated of starved. * denotes significance at $p \leq 0.05$.

Discussion

The complete role that sexual cannibalism plays is hard to understand, but some insights can be drawn from the analysis of sexual cannibalistic behaviour in golden orb weaver spiders. It is clear that males stay further away from females when they are starved, which could suggest that females are using males as a source of nutrients. Female golden orb weavers are generally much larger than their male counterparts (Elgar and Fahey 1996) and could consume males because they are a nutrient source that is located very close and they have just expended a lot of energy in the act of copulation so they may be easier to capture and kill. Other studies have found that males who are cannibalized generally copulate for a longer period of time (Elgar and Schneider 2001), which means they have expended more energy and are easier to kill and consume. Subsequently, since females are much larger than males, it could be the reason as to why no preference is shown towards the size of males that successfully copulate as they will dominate over any sized male.

As fecundity in females increases with cannibalism, it is only beneficial to the female. Therefore, female spiders may use cannibalism to increase the amount of potential future offspring with a different mate. This could be why males are more willing to approach a satiated female, as they would have a greater amount of reproductive success.

Literature Cited

Elgar, M.A. and B.F. Fahey. 1996. Sexual cannibalism, competition, and size dimorphism in the orb-weaving spider Nephila plumipes Latreille (Araneae: Araneoidea). Behavioral Ecology 7:195-198.

Elgar, M.A. and Schneider, J.M. 2001. Sexual cannibalism and sperm competition in the golden orb-web spider Nephila plumipes (Araneoidea): female and male perspectives. Behavioral Ecology 12(5): 547-552