



Success of Batesian Mimicry in the Ant-Mimicking Spider *Myrmarachne formicaria*

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Introduction

Myrmarachne formicaria (Salticidae) is an ant-mimicking spider native to Eurasia which arrived in North America fairly recently, first noted in Ohio in 2001. *M. formicaria* spiders mimic ants in both their body shape and their movements. These spiders move their first pair of forelegs to mimic ant antennae, as well as bob their abdomen (Durkee et. al., 2011). In these ways the spider may be using the antipredator strategy of Batesian mimicry, in which a harmless or palatable organism mimics the appearance of a more dangerous or distasteful species.

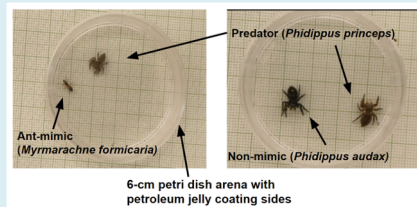
The goal of this study was to evaluate the success of Batesian mimicry in this spider through experiments that staged encounters between *M. formicaria* and another salticid spider that has the potential to be a predator.



A male *M. formicaria* with its distinctive enlarged chelicerae.

Methods

We staged encounters between potential predators (the salticid *Phidippus princeps*) and male ant-mimicking spiders (n=33 trials). These outcomes were compared to trials between these predators and another species of salticid spider which did not mimic ants (*Phidippus audax*) (n=33 trials). A 60-mm petri dish was used as the arena for each trial. Its sides were coated with petroleum jelly to prevent crawling on to the lid, while a paper divider separated the two spiders until the trial began. Trials lasted 4 minutes or until an attack occurred. By using BORIS (Friard and Gamba, 2016) event logging software, we scored the frequency of behaviors in the ant-mimics including abdominal bobbing and movement of their enlarged chelicerae. To determine if relative size was a factor in the outcome of the trials, we used ImageJ (Schneider et al., 2012) to determine the length of each spider. The data were analyzed and visualized using the software program R (R Core Team, 2020) and RStudio (RStudio Team, 2020).



Setup for trials involving ant-mimicking (left) and non-mimic (right) spiders.

Results

Ant-mimicking spiders were attacked significantly less often than non-mimicking spiders. Ant-mimics that were not attacked displayed more chelicerae movement and abdomen movement during the trial than those that were attacked.

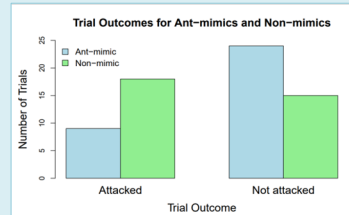


Figure 1. Ant-mimicking spiders are less likely to be attacked by the predators than are non-mimic spiders (χ^2 test of independence, $\chi^2 = 4.01$, $p = 0.045$).

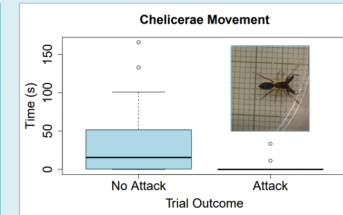


Figure 2. Ant-mimics that were not attacked exhibited a longer duration of chelicerae movement than those that were attacked (Wilcoxon rank sum test: $W = 48$, $p = 0.018$).

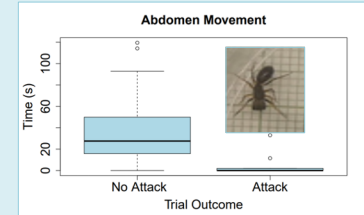


Figure 3. Ant-mimics that were not attacked exhibited a longer duration of abdomen movement than those that were attacked (Wilcoxon rank sum test: $W = 21$, $p < 0.001$).

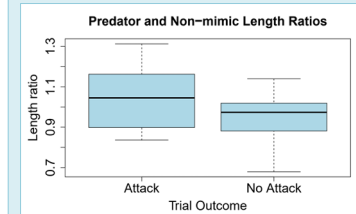


Figure 4. There is no significant difference in the predator to non-mimic length ratios for trials in which non-mimics were attacked and those with no attack ($t = 1.58$, $df = 30$, $p = 0.125$).

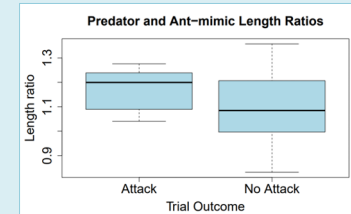


Figure 5. There is no significant difference in the predator to ant-mimic length ratios for trials in which ant-mimics were attacked and those with no attack ($t = 1.61$, $df = 30$, $p = 0.117$).

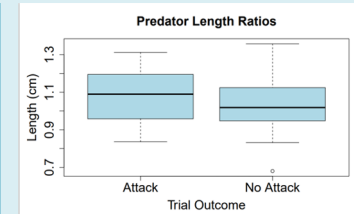


Figure 6. Predators that attacked their opponents were not significantly different in size from predators that did not attack (Wilcoxon rank sum test: $W = 587.5$, $p = 0.234$).

The outcomes of trials with either ant-mimics or non-mimics did not depend on the relative sizes of predators and their opponents. Predator size was also not a factor in whether it attacked its opponent.

Discussion

Ant-mimicking spiders were attacked less often than non-mimicking spiders, suggesting that these spiders do benefit from resembling ants. Similar studies have shown that other ant-mimic species were consumed a third less often than non-mimics (Durkee et. al., 2011). Some aggressive behaviors exhibited by the ant-mimics, including chelicerae and abdominal movements, seem to increase their chance of avoiding attack. Our results also ruled out the influence of size as a factor for likelihood of attacks, as we determined that the outcome of trials did not depend on the relative sizes of the predator and either ant-mimic or non-mimic. Additionally, larger predators were not more likely to attack opponents. It seems evident that ant-mimicking spiders' resemblance of ants both in their behavior and appearance relates to their ability to survive encounters with other jumping spider predators.



An ant-mimic with its chelicerae spread while confronting a salticid predator.

References

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