

This Leaf Ain't Big Enough for the Two of Us
Tinker final report by Benji Kessler

Sometimes, at the spider party, things get too crowded. During my Tinker field research I discovered a seemingly ritualized contest behavior between males of a jumping spider species whose behavior has not previously been studied. When males of the tiny, black and yellow jumping spider *Corythalia sulphurea* get close to one another they raise up their "arms" and face each other. When one male is bigger than the other the small one flees without contact. However, if the males are similarly sized, they will physically clash before one eventually flees. Many animal fights between males occur when individuals are fighting over females or territory, but from my observations it seems that these spiders may be fighting for a different (yet unknown) motive.

I conducted my research in Organization for Tropical Studies (OTS) Las Cruces field station in Coto Brus, Costa Rica. This field station includes a botanical garden and a swath of tropical mountainous rainforest, and is located on the Pacific side of Costa Rica just north of the border with Panama. Las Cruces is one of three OTS biological stations in Costa Rica, all of which designed to provide lodging and resources to facilitate students and other scientists to conduct tropical field research. In the botanical garden at Las Cruces there are several large planted stalks of bamboo, and it is in the fallen leaves of these plants that I found *Corythalia sulphurea* to be most abundant.

I came to Costa Rica with support from Tinker with the intention of finding jumping spiders on which I could conduct mating experiments. My research at Berkeley so far has largely consisted of laboratory mating experiments of wild-caught California jumping spiders. I have been testing the effects that different light environments and different substrates have on the probability that a pair of spiders will mate in the lab. My original intention was to conduct similar experiments on a different species of jumping spider that I would find in Costa Rica. I found an abundance of *Corythalia sulphurea* soon after I started searching for jumping spiders. While collecting these spiders I noticed on multiple occasions that males of these spiders would occasionally be displaying to each other. My adviser, professor Damian Elias, has conducted research previously on contest behavior of jumping spiders. Deciding that similar research on tropical (as opposed to temperate, as previously studied) jumping spiders would be interesting and beneficial to the field of animal behavior, I switched gears to start studying fighting behavior in this species instead of mating behavior.

Studying the behavior of these spiders in the laboratory required finding a balance of creating an environment in the lab that was controlled enough to be able to easily track results and make manipulations while still being close enough to the spiders' natural environment such that they would behave in a manner sufficiently similar to their behavior in the wild. Achieving this balance required several steps of trial and error (and in fact could use further refinement past the level I achieved in my time in Costa Rica).

My first attempt at observing the contest behavior of these spiders in the lab involved placing two males in an arena similar to those that I have previously used

in mating experiments. This arena involves a sheet of nylon stretched out as a floor for the spiders, and a sheet of clear plastic on the sides to serve as a wall. The plastic was smeared with petroleum jelly on the inside to prevent the spiders from escaping (a messy and low-tech technique, but historically very effective). Unfortunately, the walls and petroleum jelly did not inhibit the escape of *Corythalia sulphurea*; the main behavior they exhibited was an attempt to leave the arena as quickly as possible.

Given this setback, I reevaluated my arena design. I bought a planter at the local hardware store, and smeared the inside of that with petroleum jelly and used it as my new arena. My hope was that the larger diameter substrate would cause the spiders less fear. This still did not work. My net modification was to put bamboo leaves on the bottom of the planter to replicate their natural habitat. The first time I tried this was a roaring success – the spiders beautifully displayed to each other as they did in the wild. Unfortunately however, I only observed such interactions in this arena less than half of the time. Often the spiders would appear to not notice each other at all, and even more often the spiders would hide under the leaves out of the view of the camera.

My final iteration of arena engineering involved a major overhaul of the experimental design itself. Instead of using a small arena with two spiders, I started to use a medium sized (~1m diameter) arena with ten spiders in it at a time. This I felt would provide more realistic conditions without spooking the spiders, and also was consistent with the population densities of spiders in the areas I found them to be most dense. In this type of arenas males would very dependably display to one another every I did an iteration of this experiment. I took videos of several such interactions, and will be analyzing them in the coming months.

Much of the excitement of this project lies in the discoveries that are yet to come. I am very interested to see what I can glean about the contest behavior of these spiders once I re-watch and analyze the videos of their arena interactions. Furthermore, my Tinker funded exploratory investigation has allowed me to discover a jumping spider system that I believe can be a treasure trove of behavioral research for others and myself in the future. I have never personally seen such a dense population of jumping spiders in my life, and I have never heard of such a dense population living anywhere in the tropics. There are relatively very few behavioral studies of tropical jumping spiders, and I hope that the population of *Corythalia sulphurea* at Las Cruces biological station can lead to that no longer being the case. I hope to return to this field station to conduct further studies on this system and incorporate it as a major component of my dissertation research. I am very thankful for the Tinker funding, without which I never would have discovered these spiders.