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### **Spiders in Fire-Dependent Florida Scrub**

Written by Research Associate Dr. Jim Carrel

The vast majority of the 171 spider species that are stored as specimens in the Archbold Collection of Arthropods live in arid scrub habitats that are maintained by periodic fires. “If I walk across acre after acre of scrub shortly after an intense fire has burned over it, the spiders seem to be completely absent,” claims Dr. Jim Carrel, Archbold Research Associate. “Clear evidence of this is that no spider webs are visible on the thousands and thousands of charred stems, regardless of where you look hour after hour.” Yet, Dr. Carrel and other scientists know that within a few years, for all intents and purposes they will be back. This raises the intriguing question: how does the spider community reassemble itself after Florida scrub is burned?

Part of the answer to this question lies in the fact that some 30 species of spiders at Archbold (approximately 20% of the total) live underground and escape the flames altogether. If they have more than an inch of sand above them, many individuals survive. Field studies on spiders have shown that burrowing wolf spiders in the genus *Geolycosa* are particularly good at this: 95% of individual spiders in their burrows at least 4 inches below ground were alive after intense burns. Hence, although these species are particularly cryptic, that is hidden from view most of the time in the sand, they seem to persist despite a conflagration.

How do the rest of the spiders, approximately 140 species, recolonize burned scrub? Clearly some walk or run in from unburned scrub bordering a burned area. However, spiders are severely limited in their ability to locomote and move, which explains why most of the time they are seen sitting at rest, not running around like many ground beetles. Hence, most individual spider cover hundreds of feet at best in a lifetime.

The answer to this enigma lies the remarkable process called ballooning. This involves tiny spiders climbing up or a perch, putting out one or more strands of non-sticky silk that is taken up by the wind, and then being taken aloft on gentle air currents. This passive form of animal dispersal is remarkably widespread across the world. It explains how the majority of immature spiders get to their native habitats each year. You can watch a very cool video of a 'ballooning spider' take flight at: <http://www.sciencemag.org/news/2018/04/watch-ballooning-spider-take-flight>.

Not only is ballooning the dominant means of spiders getting from their birth sites to new ones, but the numbers of individuals involved annually is truly staggering. Most ballooning occurs in spring or fall after baby spiders emerge from silken egg sacs constructed by their mothers. "If I look up into the sky on a balmy day in March or October," Carrel explains, "sheltering my eyes from the sun, I often see a few long strands of simmering silk drifting every second or two over the rooftops of Archbold's buildings. This otherwise invisible river of airborne "spidery kites" may continue for hours. It is estimated on the order of 2-10 million spiders naturally fall out of the sky and land on an acre of scrub over the course of each year. Even though 99.9% die as immature spiders, enough persist to regenerate the mature spider community.

Timing of a burn in the scrub can have drastic, short-term effects on ballooning spider populations. For instance, day-active garden orb-weavers (genus *Argiope*) disperse on the wind in late spring, so summer burns reduce the number of adults the following fall by over 80% since most immature spiders are incinerated. In contrast, winter burns preceding the ballooning season have been shown to have no effect on the abundance of adult females in the fall. This information is useful to land managers who are responsible for maintaining the biotic integrity of scrub ecosystems.

**Photo 1: Red Widow Spider *Latrodectus bishopi*, commonly found in the scrub habitat.  
Photo Credit: Archbold Biological Station**