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ENTOMOPHAGOUS FUNGI AS MORTALITY AGENTS OF BALLOONING SPIDERLINGS

Organisms with high fecundity are expected to have a high incidence of juvenile mortality. Many species of spiders produce a hundred or more eggs per egg sac and multiple broods per year. Juvenile spiders are subject to the usual array of parasites and predators, but then those spiderlings that balloon for dispersal are confronted with many additional mortality factors. Those that have been cited in the literature are predation, landing in an inhospitable site, and harsh weather conditions.

I propose that an additional and significant mortality factor affecting ballooning spiders is infection by entomophagous fungi. Several investigators have reported on adult spider mortality by fungi in the field and in the laboratory. In Panama, *Nomuraea* sp. was found on five species of the Araneidae (Nentwig 1985). Humber and Rombach (1987) found the fungus *Torrubiella ratticaudata* its anamorph *Gibellua clavulifera* var *alba*, as well as *G. pulchra* and *Nomuraea atypicola* on salticid spiders. In a recent laboratory study, Greenstone et al. (1987) demonstrated that spiders across a broad taxonomic range are susceptible to the fungus, *N. atypicola*. Here I present evidence of fungal attacks on juvenile spiders found in a southern deciduous forest.

I collected ballooning spiders from a 45 m forest-meteorology tower in Oak Ridge, TN from Sept-Oct, 1987 and May-June, 1988. Spiders were collected on traps made of polyvinyl chloride sewage pipe (outside diameter—15 cm, length—94 cm) coated with a fruit tree banding compound (Pest Glue, R. Seabright Industries). I removed spiders with forceps from the traps daily, soaked the spiders in paint thinner to remove the sticky material, and then preserved the spiders in 70% ethanol. I identified the spiders to family with the aid of a Wild dissecting microscope and noted the presence or absence of fungi. Similarly, insects collected on the traps were also examined for the presence of fungi; however no fungal growths were ever seen on insects. Traps were cleaned weekly to ensure that fungi did not grow on the traps, and daily collections of spiders ensured that infection of individuals occurred prior to entrapment.

In the fall study, 98% (n = 617) of all trapped spiders were immatures that ranged in size from 1-3 mm. Of these, 20% were infected with fungi that appeared as a round mass of hyphae between leg #1 and leg #2 at the juncture of the coxa and the cephalothorax. All of the infected spiders were immature Thomisidae. Fewer infected spiderlings were observed in the spring (5% of total sample, n = 318); however, individuals that represented the families Araneidae, Linyphiidae, Salticidae, Erigonidae, and Thomisidae were infected with fungi. Samples of infected spiderlings were sent to Richard Humber, Boyce Thompson Institute, for identification. Due to the absence of sporulative structures, he was unable to positively identify the fungus; however, based on growth patterns he felt that this fungus was probably a species of *Gibbellula* or *Torrubiella*, some of the most common and widely distributed spider pathogens.

It would be interesting to know if spiderlings are exposed to fungal spores in the egg case, as spiderlings before dispersing, or in air as they are ballooning.

This could easily be tested by collecting and culturing spiderlings at various stages utilizing the techniques described by Greenstone et al. (1987).

The observations reported here imply that pathogenic fungi may be important sources of mortality among spiderlings. Furthermore, infected ballooning spiderlings may play a role in dispersal of pathogenic fungi.

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