Pollinators and Predators

By Peter Lesica

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We are attracted to flowers because of their beauty; their color and form enchant or intrigue us. However, other animals are attracted to flowers not for aesthetic reasons but for matters of life and death. We all know that flowers have evolved to attract insects that carry pollen between individuals and allow plants to produce seeds without inbreeding. Pollinators such as bees and butterflies are most noticeable. Then there are the insects that eat the flowers. Pull apart a seed head or developing fruit from most plants, and you're likely to find a beetle, fly or moth larvae feeding and growing. Sometimes the same insect does both pollination and seed predation. Probably the most famous example of this comes from the yucca. The female yucca moth gathers pollen and places it on the stigma of a yucca flower. The moth then lays an egg in the ovary of the same flower, and the developing larvae feed on the developing seeds (my taxonomy professor used to quip that this was the first known case of a pistil-packing mama).

There are other animals frequenting flowers that are not pollinators or seedeaters. Most of us have reached to examine an inflorescence and been surprised by the presence of a bright white of yellow spider camouflaged among the flowers. Most often in our area these flower spiders are crab spiders, so-called because they hold their legs in a way that resembles a crab. Spiders benefit from waiting on inflorescences because the flowers attract insects, but there is a less obvious advantage to frequenting flowers. Spiders are usually thought of as feeding solely on insects; however, crab spiders have been observed feeding on pollen and nectar. Researchers in Virginia found that mature male crab spiders do not capture prey but instead feed on nectar while looking for a receptive female. Males that had nectar available to them lived 25%

longer. So male spiders sip nectar, and the females prey on both pollinators and seed predators. It's obvious that pollinators have a positive effect, and seed predators a negative effect on the plant. So what is the overall effect on the plant?

The answer seems to be that it is different for each situation. Recently Reuven Dukas, a student at Simon Fraser University in Vancouver, attempted to answer this question with a series of experiments using artificial flowers much like hummingbird feeders. He placed a dead honeybee or a frozen spider on some artificial flowers but not others and compared how often honeybees visited them. Bees never landed on flowers with the dead bee and only 25% of the time on flowers with the spider, but they landed 75-95% of the time on those without the dead bee or spider. Dukas's study clearly demonstrated that the presence of a spider can deter pollinators. We might expect that fewer pollinators mean lower seed production, but his study did not directly address how plants are affected by their arachnid guests.

Nearly thirty years ago Svata Louda, then a student at San Diego State University, devised a field study that did assess how and how much spiders affected seed output. She studied goldenbush (*Haplopappus venetus* = *Isocoma menziesii*), a shrub similar to our rabbitbrush. At least 11 species of insects feed on the inflorescence of goldenbush, while two bees and a wasp are the common pollinators. Spiders on the inflorescences of goldenbush had good and bad effects by reducing both pollination and seed predation. However, in her study the reduction in seedeaters more than compensated for the loss of pollinators because inflorescences with spiders produced more viable seeds than those that were unoccupied. Nevertheless, Louda admits that her results could have been reversed had the spiders arrived earlier and deterred more pollinators while allowing late-hatching seed predators to lay their eggs unimpeded. Although goldenbush inflorescences with spiders produced more seeds, we don't know if this translated into a larger population of shrubs.

The plant inflorescence is the scene of complex interactions among the different insects and spiders. But it's far more than a neutral stage because these animals affect and are affected by the plant. Research to date suggests that there are no generalizations in such complex systems. Spiders may or may not enhance the performance of their host plants. Most likely it depends on what plant you're looking at and which year you're looking at it. One thing is sure; it makes a fascinating story.

Contact the author for sources.