Spiders found able to custom build webs to trap best food source

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Dew on a spider's web in the morning. Credit: Wikipedia/Luc Viatour/Lucnix.be

(Phys.org)—A small team of researchers with affiliations in China, Taiwan, Australia and Denmark has found that orb-web spiders are able to customize their webs to help ensure they capture the most nutritious prey around. In their paper published in the journal *Royal Society Open Science,* the team describes how they set up several experiments to test

spider web customization and what they found by doing so.

Spiders spin webs of sticky silk to capture prey as it flies by—the stickiness keeps the prey in place and the bounciness of the web alerts the spider that something has been caught—the spider than zips over to the prey and kills and eats it. It seems like a simple enough process, but now the researchers with this new effort have found that it is actually more complicated than it looks—because the spiders are noting how effective their webs are at trapping different types of prey, and are adjusting their web to increase its efficiency at capturing the kind of food it wants most.

In their lab, the researchers set up four types of experiments involving the spiders along with crickets and flies (the two most common type of prey for the spiders) and the spiders' web: live crickets, live flies, dead crickets with fly stimulation and dead flies with cricket stimulation. Crickets, the researchers note, create a lot of web action when they hit, and then they jab at the web as they try to hop out. Flies create very little shaking when they hit, and tend to vibrate the web in buzzing fashion due to wing action. The researchers also noted that crickets offer a lot more protein per meal than do flies, which makes them a preferable prey. But, flies can be more abundant, offering a more regular feast.

In watching the spiders in action, the researchers found that the spiders would fortify their web if crickets were caught regularly, making sure it could stand up to the pounding it took, but if crickets were scarce, the spiders would increase the overall size of the web and decrease the mesh size, increasing the chances of capturing more flies.

The researchers suggest that the protein the spiders find in their prey is the main driver of web construction, the more available in a meal, the more desirable it is. But, they also note that the spider has to calculate risks, because creating web strands uses up protein—if the spider

miscalculates, it could wind up with a useless web.

More information: Can differential nutrient extraction explain property variations in a predatory trap? DOI: 10.1098/rsos.140479

Abstract
Predators exhibit flexible foraging to facilitate taking prey that offer important nutrients. Because trap-building predators have limited control over the prey they encounter, differential nutrient extraction and trap architectural flexibility may be used as a means of prey selection. Here, we tested whether differential nutrient extraction induces flexibility in architecture and stickiness of a spider's web by feeding Nephila pilipes live crickets (CC), live flies (FF), dead crickets with the web stimulated by flies (CD) or dead flies with the web stimulated by crickets (FD). Spiders in the CD group consumed less protein per mass of lipid or carbohydrate, and spiders in the FF group consumed less carbohydrates per mass of protein. Spiders from the CD group built stickier webs that used less silk, whereas spiders in the FF group built webs with more radii, greater catching areas and more silk, compared with other treatments. Our results suggest that differential nutrient extraction is a likely explanation for prey-induced spider web architecture and stickiness variations.

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