Spiders adjust courtship signals for maximum effect

January 24 2011

This is a male wolf spider, common to the eastern US and Canada, on leaf litter. Credit: George Uetz, University of Cincinnati

Communication is important in any relationship, but for spiders, it can be a matter of life or death.

After all, a male spider needs to convince potentially cannibalistic females that he is a suitable mate and not a meal. And new research from the University of Cincinnati shows that male wolf spiders are "leaving" little to chance when it comes to increasing their opportunities to successfully mate.

To improve the chances of the right message getting across, male

Schizocosa ocreata wolf spiders, commonly found in the eastern United States and Canada, adjust the modes of their signaling (vibrations vs. visual cues) depending on the habitat (leaves, soil, rock, wood) on which they find themselves.

That's the finding of new research published in the February 2011 issue of the journal *Animal Behavior*. The research was carried out by George Uetz, UC professor of biology, and former UC doctoral student Shira Gordon, now a research fellow at the University of Strathclyde, Scotland.

In a series of studies by Gordon and Uetz, male wolf spiders were placed within laboratory containers on natural-habitat substrates including soil, rock, wood and leaf litter for equal amounts of time. It was found that males signaling via vibrations on leaf litter were more than twice as successful in inducing females to mate as were males signaling via vibrations on other substrates. Males signaling via vibrations on leaf litter successfully attracted a mate over 85 percent of the time. Males sending mating cues while positioned on other environmental surfaces successfully attracted a mate less than 30 percent of the time.

When the spiders were given a choice of occupying any of the four substrate types, males and females visited all four but remained twice as long on leaf litter vs. the other substrates. They thus increased their opportunities for successful mating due to the efficacy of communication (seismic signaling) on leaf litter.

"Importantly, this indicates that the spiders likely recognized the difference between habitats and the efficacy of signaling via vibrations on leaf litter," said Gordon.

This efficacy of the seismic signaling for mating was measured via a laser vibrometer, a highly sensitive instrument capable of detecting the

barely perceptible vibration signals of these tiny animals. The males send out these signals via body bounces and stridulation (rubbing opposing parts of special "file and scraper" organs) on these environmental surface substrates. The measurements found that such movements made atop leaves transmitted significantly more mating signal vibrations vs. those made upon other surfaces (rock, soil, wood). As a consequence, these different substrates can dramatically affect the spiders' ability to communicate.

While the male spiders did continue the leg taps and body bounces on surfaces that transmit faint or no vibrations (wood, soil, stone), the males also altered their communications to produce significantly more visual signals (raising and arching a foreleg) when placed on soil, rock or wood substrates vs. leaf-litter substrate.

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Said Uetz, "In other words, when the seismic signals aren't working due to the environment, male wolf spiders have the ability to vary their signals and shift to another communications mode. They then put more effort into another channel, this being visual cues, in order to get the

desired response. We can think of it as going to plan B."

He added that, traditionally, such behavioral flexibility has been considered a hallmark of vertebrate animals but not invertebrates: "These findings suggest that invertebrates have more ability to modify their behavior than has been traditionally thought to be the case. This ability enables them to compensate for the impact that an animal's environment has on its ability to communicate."

Provided by University of Cincinnati