Loner spiders prevail as pioneers

October 4 2016, by Sean Nealon

nelosimus studiosus. Credit: Jonathan Pruitt, UCSB

A spider looking to immigrate to a different environment is three to four times more likely to survive if it goes by itself, as opposed to as part of a group.

"This is a pretty surprising result that breaks from long-held intuitions that moving as a group would enhance survival rates (for social organisms)," said Jessica Purcell, an assistant professor of entomology at the University of California, Riverside, who is a co-author of a just-published paper on the topic.

One possible reason that individual spiders fare better than groups is that singleton immigrants entering an existing colony of natives are less likely to throw off the colony traits that determine colony survival. In this case, the trait that appears to be most important in determining colony survival is maintaining the right mixture of docile versus aggressive 'personality types' within the colony. The researchers plan to perform additional tests to distinguish between this and other possible causes of this pattern.

Local adaptation of animals has long been a central topic in ecology and evolution because adaptive, specialized traits can allow species to expand into new environments, which in turn can help promote diversification.

The research here focused on the species Anelosimus studiosus, which is found in temperate and tropical areas in North America and South America. It is one of about 30 species of spider, of more than 40,000, that is social, meaning it lives long-term with others of the same species.

Nest of Anelosimus studiosus. Credit: Jonathan Pruitt, UCSB

The researchers collected spiders at four sites in Tennessee and Virginia and brought them back to the lab to determine their personality type – docile or aggressive. They used several methods to test spiders' personality types, including whether the spiders huddle together with fellow spiders or isolate themselves as aggressive loners, how quickly individual spiders attack prey, and how they react when perturbed.

After determining personality type and individually marking the spiders, they were returned to the field and monitored for three months under the

three scenarios the researchers were studying.

These scenarios were: (1) individual spiders placed in a foreign environment; (2) individual spiders with their native colonies placed in a foreign environment; and (3) individual spiders placed into a pre-existing colony in the foreign environment.

While the researchers found variation in survival rates based on whether an individual or group was transplanted, they found individual personality did not impact survival rates on its own. Spiders that were moved across contrasting environments with their groups were almost certainly doomed to perish, along with their colony mates, in colony extinction events. Whereas, spiders that moved across environments alone, regardless of whether or not they joined pre-existing groups, had survival rates similar to those of native spiders. The researchers conclude that a mismatch between the colony traits of immigrant colonies and the colony traits favored at their new site is likely responsible for these findings. One of the implications of these findings is that selection against particular colony traits may prevent immigrants from moving across environments, which could ultimately create the right conditions for speciation.

The paper, which was published in the journal *Animal Behaviour*, is called "Social context, but not individual personality, alters immigrant viability in a spider with mixed social structure."

More information: Spencer J. Ingley et al. Social context, but not individual personality, alters immigrant viability in a spider with mixed social structure, *Animal Behaviour* (2016). DOI: 10.1016/j.anbehav.2016.08.009