

Wolf spiders may turn to cannibalism in a warming Arctic

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Wolf spiders are among the most important predators in the Alaskan Arctic. New research from Washington University in St. Louis finds that when there are lots of wolf spiders around, they turn to cannibalism more frequently. Credit: Ashley Asmus

Wolf spiders in a warming Arctic are getting bigger, reproducing more

and eating different foods. Including other spiders.

A study conducted in Alaska suggests that as female [wolf](#) spiders become larger and produce more offspring, competition among them increases—triggering higher rates of cannibalism and reducing the number of young spiders that survive to adulthood. The new research from Washington University in St. Louis is published May 5 in the *Journal of Animal Ecology*.

"Although cannibalism is probably not the best dietary choice for these spiders, our field and experimental data suggest that when there are lots of spiders around, they turn to cannibalism more frequently," said Amanda Koltz, a postdoctoral fellow in biology in Arts & Sciences and first author of the new study. "It's likely a reflection of increased competition among the spiders for resources."

This morbid scenario could already be playing out in some parts of the world—and could have consequences for invertebrate populations more broadly.

Animals such as spiders that regulate their body temperature externally are particularly likely to experience changes as a result of warming. In some areas of the Arctic, biologists have found that wolf spiders are bigger following years with longer summers. This suggests that as climate change continues to warm up the Arctic, wolf spider body sizes will generally become larger.



The researchers setting up spider traps at a field site in Alaska. Credit: Nick LaFave

At the same time, fecundity—or the number of offspring that females produce—tends to increase as females become larger, so bigger spiders might translate to more spiders in the future. But whether this change actually results in more spiders in the wild remains an important question.

"Space and resources on the tundra are finite," Koltz said.

A dietary shift

For this research, Koltz made observations at two sites in the Alaskan Arctic where the body size of the locally dominant species of wolf spider naturally varies.

She paired this comparative field-based study with a mesocosm experiment where she manipulated the number of wolf spiders in an enclosed space to see how exposure to higher spider densities affects wolf spider diets.

Within the field populations, Koltz discovered that the presence of larger female spiders was associated with fewer juvenile spiders. This was unexpected, as larger females produce more offspring. Using stable isotope analysis, she then found that the spiders at the site with larger females had different diets than at the site with smaller females.



For wolf spiders, fecundity increases with body size. Here, a wolf spider mother with her babies. Credit: Amanda Koltz

The dietary shift was consistent with what a shift toward cannibalism would look like, suggesting that where spiders were larger—and reproductive rates higher—spiders cannibalized each other more often. This idea was further supported by the experimental results.

"Wolf spiders that were experimentally exposed to higher densities underwent a dietary shift similar to that of the field population where females were bigger—and where we would expect competition and cannibalism among wolf spiders to be highest," Koltz said.

Bigger doesn't necessarily mean more

Wolf spiders from lower latitudes have previously been shown to cannibalize each other when experimentally exposed to higher densities. Yet the extent to which this behavior affected natural populations of wolf spiders has not been clear. The results of this study suggest that cannibalism does regulate wolf spider populations in the wild by reducing juvenile survival.

However, in the long term, frequent cannibalization may not be advantageous for individuals, or [spider](#) populations.

"Cannibalizing on other spiders of the same species reduces competition by reducing the number of other spiders around," Koltz said. "But evidence from other studies has shown that wolf spiders that are only fed other wolf spiders don't live as long as those that eat a more varied diet."

So even though they reproduce more, bigger spiders may not always lead to more spiders on the landscape.

"This project was based in the Arctic, but the main message is not limited to the Arctic or potentially even to [wolf spiders](#)," Koltz said.

"The results from our study are a reminder that changes in invertebrate body size driven by [climate change](#) could have widespread ecological consequences, including shifts in intraspecific competition, diet and [population](#) structure."

More information: Amanda M. Koltz et al. Impacts of female body size on cannibalism and juvenile abundance in a dominant arctic spider, *Journal of Animal Ecology* (2020). [DOI: 10.1111/1365-2656.13230](https://doi.org/10.1111/1365-2656.13230)

Provided by Washington University in St. Louis

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