

# Israeli studies try to understand how invasive brown-widow spiders spread

While the bite of the brown widow spiders is slightly less toxic than that of the black widow, it is still deadly.

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Brown widow spider.  
(photo credit: FLICKR)

Both the black widow spider and its lesser-known eight-legged arachnid cousin, the brown widow, produce deadly venom, although the bite of the brown is somewhat less toxic than that of the black.

Another characteristic they share is that they are invasive species.

What makes invasive species able to spread and thrive far away from their native habitat? Humans continue to transport species to new environments, both intentionally and unintentionally. That can cause ecological and economic damage. Yet even with the explosive growth of invasive species, we still don't know a lot about which traits make the most successful invaders able to thrive and spread to new places.

“To better understand invasive species, we need to figure out how traits shift in invasive populations, as some individuals survive transport, and establish and spread to new habitats, thus expanding their range,” says Dr. Monica Mowery, a Zuckerman STEM (science, technology, engineering and math) postdoctoral fellow in Prof. Michal Segoli's lab at the Jacob Blaustein Institutes for Desert Research at Ben-Gurion University of the Negev's Sde Boker campus.

“When this happens, traits can shift as species adapt to the new environment. For example, dispersal ability and defenses against predators and parasites may be particularly important during range expansion,” she explained.



Brown widow. (credit: FLICKR)

The brown widow spider, *Latrodectus geometricus*, is an invasive species with neurotoxic venom. It is suspected to have evolved in [Africa](#), although it was first described from [South America](#), which adds confusion as to where it might have originated. Since the 1930s, it has been spreading to many regions around the world, including Israel and the US, mainly through human-mediated transport.

By studying a globally invasive species like the brown widow, it is possible to use the invasion as a natural experiment to answer ecological and evolutionary questions, and better manage other global invaders, Mowery said.

In the US, brown widows were first found in Florida nine decades ago. By 2000, they had reached California, some 3,500 km. (nearly 2,200 miles) away. In Israel, the spiders were first detected in Tel Aviv in 1980 and have more recently spread south through the [Negev Desert](#) to Eilat and north to Haifa.

They live at high densities in urban habitats like parks and playgrounds and can displace local spider species. As a result, they can have negative effects on both humans and the ecosystems they invade.

What do brown widows look like?

Unlike the black widow, its starkly black-and-red colored relative, the coloration of a brown widow consists of a mottling of tan and brown with black accent marking.

In mature females, there is usually a dorsal longitudinal abdominal stripe and three diagonal stripes on each flank. At the top of each diagonal stripe, there is a black mark, which is rather conspicuous and resembling a square. Since the brown widow looks similar to immature western black widow spiders, knowing which is which is difficult and requires some experience.

In addition to spreading with help from humans, spiders commonly disperse on their own. Spiders can spread short distances by rappelling on strands of silk.

CHARLES DARWIN was fascinated as spiders ballooned past the HMS Beagle. Their skill at dispersing is a key factor in invasion success but is rarely studied in the field.

In a recently published study in the journal *Ethology*, Mowery reported that brown widow spiderlings from a newly invasive population in the Negev Desert dispersed aerially under an unusually broad range of temperatures, wind speeds and during the day and night. Her study is an important step to understanding the importance of ballooning as opposed to human-mediated dispersal during the species' range expansion.

In another new study in *Animal Behaviour*, Mowery – in a collaboration between Ben-Gurion University Prof. Yael Lubin, Dr. Ally Harari at the Volcani Center and Maydianne Andrade and Andrew Mason at the University of Toronto-Scarborough – tested how traits of invasive spiders shift on a broad geographic scale on two continents. They compared eight populations of invasive brown widows, four in the US and four in Israel, for which the first detection dates are known.

To test which traits shifted during the invasion process, they collected spiders from these populations and measured their tendency to disperse, as well as traits that may affect survival and establishment, such as spider body size and traits related to reproduction and fertility.

“We found that spiders from newly established populations in Israel dispersed at a higher rate and were quicker to disperse than spiders from older established populations. This was not the case in the US populations. Spiders in more recently established populations in Israel were larger than those in older populations, but there were no consistent patterns across American populations. We also found that spiders from recently established populations varied more in egg sac traits, which may be beneficial in a new, unpredictable environment.

“Overall, we found patterns of traits shifting with invasion establishment time in Israel, but not the US. The lack of differences in the US might be explained by the large geographic distances, long time scale of invasion and likely occurrence of multiple invasions,” Mowery added.

Interactions with native competitors and predators may affect invasion success. After colonization, invasive species spread to new locations where they may have an advantage over native species. One possible advantage is avoidance of parasites or better defenses against them.

In a new study in *Behavioral Ecology*, Mowery, Valeria Arabesky, Lubin and Segoli tested this idea by comparing the defenses of the invasive brown widow and a native white widow spider.

They found that a common natural enemy – a parasitoid wasp – prefers native white widow spider egg sacs compared to those of the invasive brown widow spider. More and larger wasps emerged from the native widow egg sacs, indicating that the species is a better host for the wasp. The lower suitability of brown widow egg sacs for the wasp parasitoid may explain the rapid invasive spread of brown widow spiders worldwide.

“Once we know which combinations of traits lead to invasion success, we will be able to better predict potential invasive species and manage species that are already spreading,” Mowery concluded.