

A male-killing bacterium results in female-biased sex ratios in green lacewings

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A photo of a green lacewing (*Mallada desjardinsi*). Credit: Masayuki Hayashi

A maternally transmitted *Spiroplasma* bacterium is the likely cause of the green lacewing's female-biased sex ratio, according to a study published June 15, 2016 in the open-access journal *PLOS ONE* by

Masayuki Hayashi from Chiba University, Japan, and colleagues.

Maternally transmitted microbes can gain a reproductive advantage by inducing a female-biased sex ratio in their hosts, increasing their likelihood of transmission, and some bacteria are known to kill male hosts to effect this ratio. The authors of the present study bred wild-caught green lacewings (*Mallada desjardinsi*) and analyzed their broods' sex ratios to measure female bias. They then utilized DNA sequencing, electron microscopy, and antibiotic treatment to determine the likely underlying cause of skewed sex ratios.

The authors found that of 35 broods, 21 had such strongly biased sex ratios that they were entirely female. When these broods were treated with an antibiotic to kill any bacteria, brood mortality was reduced and the sex ratio was restored to 1:1, indicating that male-killing bacteria had been infecting the lacewings. The authors identified the likely culprit as an endosymbiotic *Spiroplasma* bacterium, which appears to be closely related to two known *Spiroplasma* plant pathogens. The authors speculate that this *Spiroplasma* species may have originally infected a plant, then jumped hosts and evolved to infect the lacewings.

While the authors found some broods were also infected with *Rickettsia* [bacteria](#), only *Spiroplasma* was associated with female bias. However, despite the dramatic bias observed in most broods, the authors found that *Spiroplasma* infection did not always distort sex ratios and further research may be needed to investigate the possible existence of host suppressors against male-killing.

Author Daisuke Kageyama notes: "A bacterium—a close relative of phytopathogenic *Spiroplasma*—causes male-specific lethality, leading to a strongly female-biased [sex ratio](#) in a green lacewing population."

More information: Hayashi M, Watanabe M, Yukuhiro F, Nomura

M, Kageyama D (2016) A Nightmare for Males? A Maternally Transmitted Male-Killing Bacterium and Strong Female Bias in a Green Lacewing Population. *PLoS ONE* 11(6): e0155794. [DOI: 10.1371/journal.pone.0155794](https://doi.org/10.1371/journal.pone.0155794)

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