

# Ladybirds, biological weapons and the success of invasive species

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New research has uncovered how invasive species, such as the Harlequin Ladybird, comes to dominate. Credit: Andreas Vilcinskas of the University of Giessen

(Phys.org) —An article written by Professor Emeritus Stuart Reynolds, in our Department of Biology & Biochemistry, looking at the success and characteristics of invasive species has been published today (Friday) in the journal *Science*.

Citing recent research into the spread of Harlequin Ladybirds, Professor Reynolds' 'Perspective' piece looks at how very small numbers of a new species can come to dominate, outcompeting native species and colonising an area.

Biological invasions pose a serious threat to biodiversity and are increasing in frequency, yet in spite of this, our understanding about

what factors enable an introduced species to become successful invaders has been limited to date. Now new research, referred to in Professor Reynolds' article, has reported important findings that demonstrate how certain species use their own 'biological weapon' to wipe out a native population.

The research, carried out by Professor Andreas Vilcinskas from the University of Giessen, looked at the well-known invasive Harlequin Ladybird species. Harlequins have been intensely studied because they are easily observed by members of the public and for several years have been subject to online 'citizen science' reporting campaigns in the UK.

Originally from China, Harlequins are good at controlling aphids and have been widely introduced as a biological control agent all over the world. However, once introduced, local ladybirds cannot compete and in some cases become extinct. This study identified that Harlequins are bad for local ladybirds because they carry a disease – a kind of fungus – that lives in their blood. This disease is harmless to Harlequins but fatal to other ladybirds.

Most significantly, Vilcinskas' work shows that Harlequins are able to tolerate the fungus because they have a special adaptation of their immune system that suppresses the fungus but does not kill it. It is a reasonable hypothesis that the association between the Harlequin and the fungus is in fact an adaptation – the Harlequins are using the fungus as a biological weapon to compete with other ladybirds.

In his piece, Professor Reynolds compares the success of invading species, such as the Harlequin, with that of Spanish conquistadores as they invaded the New World in the sixteenth century. Just as in a biological invasion, tiny numbers of invaders were able to overcome native inhabitants in part because they carried diseases, which they had immunity against but which could be deadly for locals.

Commenting, Professor Reynolds said: "This research shows how the interaction between disease and immunity is one of the most important drivers of the evolution of animal and plant communities. It also helps us to understand how delicately balanced interactions between pathogens and host immune systems are vulnerable when species are moved from one place to another."

The article is titled "Immunity and [Invasive Species](#)."

**More information:** [www.sciencemag.org/content/340/6134/816.full](http://www.sciencemag.org/content/340/6134/816.full)

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