

Cannibalism may contribute to the successful invasion by harlequin ladybirds of new habitats

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INRA research scientists, working in collaboration with European and Russian scientists, have studied the cannibalistic behaviour of native and invasive populations of the *Harmonia axyridis* ladybird. Their findings suggest that this behaviour may procure them a real survival advantage during the colonisation of new habitats.

Harmonia axyridis is better known as the Asiatic or [harlequin ladybird](#). Present today on all continents, it takes its name from its region of origin, identified as being in Asian countries: Japan, China, Korea and Eastern Russia. Sadly, this ladybird species is now renowned for its massive invasive episodes that are widely reported in the media. Initially, from the 1910s, this ladybird was used in North America, Europe and then South America to control aphid populations in productive greenhouses. At the end of the 20th century, *Harmonia axyridis* suddenly became invasive in a large part of the American continent, and a few years later in Western Europe and parts of South America and Africa. In these affected regions it overwhelms native species, thus disturbing natural ecosystems.

To try and understand this abrupt invasive behaviour, French, Belgian, Russian and British researchers studied the evolution of [cannibalism](#) in *Harmonia axyridis* during its development. In fact, cannibalism is a widespread behaviour in insects, linked to the genetic profile of individuals. The degree of recourse to cannibalism varies within species

and is dependent on the density of a population and the resources available to it.

The scientists compared three samples of ladybirds maintained in similar experimental environments but presenting different genetic traits: a group of invasive individuals collected in France and the UK, a group made up of native individuals from Russia and Japan, and a third group comprising ladybirds reared in the laboratory and used for biological control. In all three groups, they observed that the level of cannibalism - which consists in eating the eggs - was much higher among larvae than among adults, and increased significantly in line with the rise in population density. The scientists therefore suggest that larvae - unlike adults - are unable to leave the leaves on which the eggs have hatched and are therefore incapable of searching elsewhere for sources of food. Cannibalism therefore appears to be a spontaneous response to a situation of nutritional depletion to which the larvae are not adapted, unlike adults that are more able to fast or disperse and find food.

A second important finding was that the level of cannibalism was markedly higher among the invasive larvae than in the other two groups. These results agree with the hypothesis of them procuring an advantage through cannibalism following their introduction into a new environment.

The scientists also tried to determine whether the level of cannibalism had evolved during the geographical spread of these invasive ladybirds in Europe. To achieve this, they compared samples collected from recently invaded regions in France with samples collected in Belgium, where *Harmonia axyridis* was reported as early as 2001. The results showed that the level of cannibalism was the same in these two samples.

These results suggest that this survival tactic has only developed to the benefit of larvae and during the initial phases of invasion, as cannibalism

rates were similarly low among adults in all the populations studied. Cannibalism may therefore represent a real evolutionary benefit that is specifically selected in invasive individuals of *Harmonia axyridis* during their colonisation of new habitats.

More information: Ashraf Tayeh, Arnaud Estoup, Eric Lombaert, Thomas Guillemaud, Natalia Kirichenko, Lori Lawson-Handley, Patrick De Clercq and Benoît Facon, "Cannibalism in invasive, native and biocontrol populations of the harlequin ladybird," *BMC Evolutionary Biology* 2014 [DOI: 10.1186/1471-2148-14-15](https://doi.org/10.1186/1471-2148-14-15)

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