

Insects that deter predators produce fewer offspring

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Scientists studied the defences used by caterpillars that transform into large white butterflies, called *Pieris brassicae*. The insects regurgitate semi-digested cabbage leaves to make them smell and taste unpleasant to predators. The team found, however, that frequent use of this defence reduces the caterpillars' growth rate and the number of eggs they produce. It remains unclear why their defences affect them in this way, but the loss of nutrition from frequent regurgitation is thought to play a part.

Caterpillars are a target of pest control, as they destroy food crop by eating the leaves of cabbages and other vegetable crop. This new study, however, suggests that natural [predators](#), such as farmland birds, do not necessarily have to consume large numbers of insects, to have a significant effect on the size of the population. Researchers found that 40% of [caterpillars](#) that defended themselves from predators by regurgitating food, died before transforming into a butterfly, despite successfully surviving the initial attack.

The study also showed that on average large caterpillars have 60 eggs, but those that used their defences against daily predator attacks produced approximately 30 eggs. It is thought that this effect could be widespread amongst herbivorous insects, suggesting that predators may have a larger impact on reducing the population of agricultural pests than previously thought.

Dr Mike Speed, from the University of Liverpool's Institute of

Integrative Biology, explains: "Research has shown that large insects produce more eggs than smaller ones. This is commonly assumed to always be the case, but we have found that those that regurgitate food as a defence against predators, have fewer eggs, similar to the numbers of offspring smaller insects have. We also found that these insects grow at a slower rate and even those that successfully change into a butterfly, are smaller than normal."

Dr Andrew Higginson, from the University of Glasgow, said:

"Interestingly, the caterpillars that grew at a slower rate were not forced, as a result of the attack, to metamorphose prematurely. They could have fed for longer, grown larger and produced more offspring, despite the daily use of their defences, but they appear to 'choose' to change into a smaller butterfly. More study is required to understand why they do this, but it could be that the threat of a fatal attack is too large for them to remain at the larval stage for too long and prompts them to transform into a butterfly early."

Dr Speed added: "This work demonstrates that it is important to maintain the diversity of predators such as wild birds, particularly in areas where large numbers of insects can destroy food crop. We now need to look at the defence mechanisms of a variety of [insects](#) to understand if other species react in similar ways."

More information: The study, funded by the Natural Environment Research Council (NERC), is published in the *Journal of Animal Ecology*.

Provided by University of Liverpool

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