

Parasitic larva ditches doomed host

A cunning insect detects when its host is under threat from predators to make a timely escape.

Lucas Laursen

A recently discovered fly, *Endaphis fugitiva*, may be the first known parasitic insect that is able to escape a host that is under attack from predators. When researchers injured the fly's host — called the banana aphid — or let brown lacewings attack the aphids, the fly larvae broke out of the aphid's body (see [video](#)).

Many animals change the niche they occupy in an ecosystem during their development — a process called heterokairy. In some cases, animals can respond to environmental factors by adjusting the time at which heterokairy starts. Frogs' eggs, for example, can hatch early if they come under attack from leeches, wasps or snakes. But *E. fugitiva*, a 'parasitoid' that kills its host when it leaves, may be the first such insect that can tell when its host is about to be overwhelmed by a predator, says Frédéric Muratori, a behavioural ecologist at the Université Catholique de Louvain in Belgium. Muratori and his colleagues reveal their results in a study¹ published in the journal *Proceedings of the Royal Society B* today.

Whereas *E. fugitiva* larvae that abandoned their aphid hosts grew to about the same adult fly size as those that grew in healthy hosts that were not attacked, Muratori and his colleagues report that the early escapers spent slightly longer in the vulnerable stage of pupation than other larvae.

"I think the main issue that comes out of this is that organisms are willing to sacrifice some minor fitness in order to survive," says parasitoid ecologist Jeffrey Harvey of the Netherlands Institute of Ecology in Heteren, who was not involved in the study but peer-reviewed the work.

The extra danger of the prolonged pupal stage may be why the fly normally stays inside its host. Harvey explains that in most parasites he's worked with, it's "game, set and match" if the host is eaten by a predator, as both parasitoid and host will die. But in this case, he says, "When the jaws of a predator clamp around the host, the fly larva detects that and pops its way out."

Stay or go?

The ability of *E. fugitiva* larvae to shift niches adaptively may help them to avoid being killed along with their host, but it comes at the cost of having to devote resources to detecting and avoiding threats, write Muratori and his co-authors. The researchers speculate that the larvae detect their host's



Attack by predators prompts *Endaphis fugitiva* to emerge from its host.

Muratori et al

imminent demise either by sensing chemical cues, such as stress factors in the aphid's blood-like 'haemolymph', or by perceiving the mechanical pressure of a predator's attack on the aphid.

Muratori began looking at this particular fly parasitoid while working for the United States Department of Agriculture in Hawaii, where entomologists use organisms similar to *E. fugitiva* to biologically control foreign pests such as aphids. Parasitoids, unlike true parasites, spend some stages of their lives inside their hosts but other stages are completed as free-living organisms outside the host. In the case of *E. fugitiva*, the larvae are born on leaves, then identify nearby vacant host aphids and climb inside, via the joint between the aphid's leg and its body. After growing by eating the aphid's body tissue, they emerge and go through a pupal stage in the soil while they metamorphose into flies. ADVERTISEMENT

Muratori would like to repeat the experiment with other parasitoids in which multiple individuals occupy a host's body to learn if any stressors prompt just a few of them to escape and to understand at what point individual larvae decide to leave.

To understand the trade-offs between the fly larvae hanging on or abandoning ship, Harvey suggests that the researchers could also compare the behaviour of larvae inside host aphids that are at a high risk of predation — such as those on exposed leaves — with those that are more hidden away. "We don't know the mortality risk of the larvae outside of the host," Muratori agrees. "This is a really key question."

References

1. Muratori, F. B., Borlee, S. & Messing, R. H. *Proc. R. Soc. B* advance online publication doi:10.1098/rspb.2009.2029 (2010).

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