

Rothamsted Repository Download

A - Papers appearing in refereed journals

Bell, J. R. and Shephard, G. 2024. How aphids fly: take off, free flight and implications for short and long distance migration . *Agricultural and Forest Entomology*. p. afe.12623. <https://doi.org/10.1111/afe.12623>

The publisher's version can be accessed at:

- <https://doi.org/10.1111/afe.12623>
- <https://doi.org/10.5281/zenodo.10250516>

The output can be accessed at: <https://repository.rothamsted.ac.uk/item/98z13/how-aphids-fly-take-off-free-flight-and-implications-for-short-and-long-distance-migration>.

© 19 April 2024, Please contact library@rothamsted.ac.uk for copyright queries.

RRES Press Release 19 April 2024 Upside down and bolt upright - aphid aerial acrobatics revealed

High speed camera shows posture and wingbeat patterns in detail for the first time

A state-of-the-art camera with high frame rates and high resolution has shown the flight dynamics of two aphid species in unmatched detail for the first time.

The take-off and free flight of *Drepanosiphum platanoidis* and *Myzus persicae*, both common crop pests, were studied in still air using ultra slow-motion, high-speed photography in high definition (HD). The wing tip and body posture were tracked to show how they are displaced during each wingbeat cycle.

[The unique footage](#) shows that aphids demonstrate a high degree of flight control and manoeuvrability in the lab, occasionally using forward and inverted flight, two aerial modes that are otherwise poorly known.

The new Rothamsted camera, funded by BBSRC, is operated by the team at the [National Insect Survey](#). The ultra slow-motion videos will enable researchers to learn more about the biomechanics and physical mechanisms which aphids use to fly, much of which was previously unknown despite being crucial to understanding their migratory behaviour.

"Aphids are as beautiful and as graceful in flight as their colourful distant cousins, the butterflies."

[Professor James Bell](#), who until recently was head of the Rothamsted Insect Survey and is now at Keele University, led the research and said: "Aphids are as beautiful and as graceful in flight as their colourful distant cousins, the butterflies. But, if we are to make progress in improving food security, major challenges must be overcome to protect our crops. In particular, to inform the risk of virus transmission, we need to build on this research to understand the energetic cost of flight for aphids over short and long distances."



[Click on image for video of Aphid taking flight](#)

Aphids often don't affect plants directly by their feeding behaviour. Instead, the damage is indirectly caused by viruses that are transmitted by the aphids during feeding. These can stunt growth, yellow leaves and thus reduce yields. Some species of aphids are also known to excrete honeydew, a sticky, sugary substance that can attract other insects and promote the growth of mould. Often, we only become aware of this after our parked car succumbs to the sticky rain of honeydew that falls from the tree canopy above.

It's been estimated that [crop losses caused by aphids could be as high as £190 million every year](#), and although methods to control their populations already exist, these often involve killing the aphids off, depriving birds and other species of an important food resource.

Researchers are therefore studying new methods of managing these pests that do not involve lethal force such as pesticides, and by studying the movements and mechanisms involved in helping these insects to fly, scientists believe they could use footage like this to better identify which insects are carrying disease or viruses and deploy control strategies accordingly to manage them.

Publication

Bell, J.R. & Shephard, G. (2024) How aphids fly: Take-off, free flight and implications for short and long distance migration. *Agricultural and Forest Entomology*, 1–10. Available from: <https://doi.org/10.1111/afe.12623>