Understanding the roles of behavioural ecology, genes, plant hosts and fuel for flight to predict the migratory range of aphids

Supervisory team:
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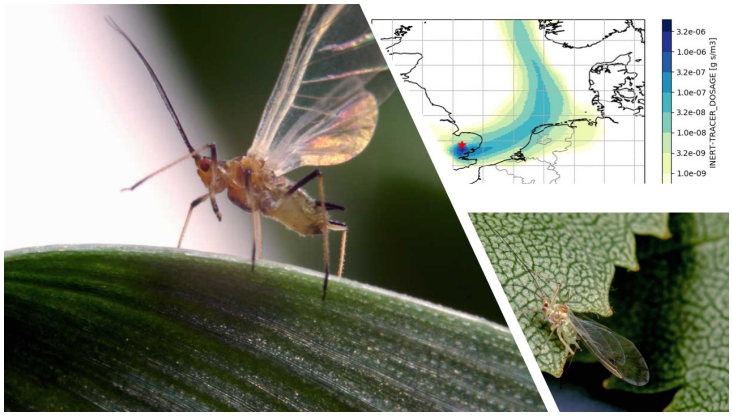
Host institution: Rothamsted Research (Harpenden)
Submit applications for this project to University of Exeter

Project description:



Since Darwin, the role of insect flight has been hotly debated and remains an exciting topic of study. The biology of insect flight attracts widespread public interest and examples range from citizen science projects on bees and butterflies through to TV programs such as Attenborough's Conquest of the Skies. For a few enigmatic species like the monarch butterfly and desert locust, the migration routes of these insects are reasonably well understood. For other species, science has yet to provide sufficient evidence on their likely migration routes, despite their ecosystem service functions. The challenge arises because these insects are much smaller than butterflies and locusts, which means that they cannot be tracked by human eye or even with computer vision systems, but instead disappear quickly out of view into the atmosphere soon after take-off. The near absence of data makes this project challenging but also exciting, likely to yield impactful media interactions and excellent publication material to advance the field.

This PhD will rise to the challenge by deploying indirect scientific methods in trajectory modelling, carbon and nitrogen isotope analyses, molecular biology and behavioural ecology experiments, to understand where highly damaging pest aphids flew from. The project is supported by the world-class Rothamsted Insect Survey's data, samples and entomological expertise alongside Exeter's recent advances in applied entomology using molecular tools, such as transcriptomics, to identify the genes involved during flight. The successful student will also learn about atmospheric models to predict the likely track of insects, working alongside staff from the Met Office, as well as the application of isotope ratio mass spectrometry to detect carbon and nitrogen isotopes on the surface of the insects and host material, both experienced by the student as rotations in year 1.

This cross-disciplinary PhD will equip the student with a broad range of skills to develop their career as well as provide sufficient interest to challenge them. Ultimately, the main outcome of the PhD will be to better understand the likely source of migrants by reviewing the wide-ranging evidence from atmospheric models, isotopes, genes and behaviour. If you are excited by the question, did individuals travel hundreds of miles from continental Europe or take a short flight within the same field? Then please apply, whatever your background.

Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.