Migrating insects fly in the fast lane

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A study published today in *Science*, by researchers at Rothamsted Research, the Met Office, the Natural Resources Institute, and the Universities of Exeter, Greenwich and York, sheds new light on the flight behaviours that enable insects to undertake long-distance migrations, and highlights the remarkable abilities of these insect migrants.

Many insects avoid cold British winters by migrating south in autumn to over-wintering sites around the Mediterranean. Migrant insects then return to the UK in spring. How such small insects undertake journeys of several thousands of kilometres has long fascinated scientists.

The reported study was funded by BBSRC and used two sets of specially-designed radar equipment to observe migrating butterflies and moths flying several hundreds of metres above the ground, and to describe the sophisticated flight behaviours that they have evolved. These insect migrants have a compass sense that enables them to select winds which will take them in their chosen direction, and to travel at speeds of up to 100 km per hour. The fast speeds of winds aloft mean that insects travel more-or-less downwind, but they make subtle adjustments to their headings so that they partially correct for wind-induced drift away from their preferred direction of travel.

Dr Chapman said "Migratory butterflies and moths have evolved an amazing capacity to use favourable tailwinds. By flying at the heights where the wind currents are fastest, migratory moths can travel between their summer and winter grounds in just a few nights".

Dr Hill said "We estimate that over 2 billion insects were involved in the mass migration events that we studied. These insect migrants are clearly very successful."

The study used a computer model dubbed "NAME" to demonstrate that the flight behaviours observed result in migrants travelling nearly twice as far and closer to their preferred direction as an insect just randomly drifting downwind. Many migratory insects are pests of agricultural crops, so the model will be useful for predicting migration events in the future.

Ms Burgin said "We combined the results from the radar measurements of moth flight with the outputs of a model of atmosphere motion to show that by hitchhiking on suitable winds, insects can travel at greater speeds than many migrating birds, which is important given the short lifespan of insects."

This study illustrates how insects successfully undertake long-distance migrations in favourable directions. Climate change is likely to significantly alter the frequency of insect migrants, including introducing some agricultural pests that are completely new to the UK. Thus, a better understanding of their migration strategies is increasingly crucial in helping to secure food supplies in the long term.

More information: The research is published in the current issue of *Science* (published 5 February 2010) as "Flight Orientation Behaviors Promote Optimal Migration Trajectories in High-flying Insects" by Jason W. Chapman, Rebecca L. Nesbit, Laura E. Burgin, Don R. Reynolds, Alan D. Smith, Douglas R. Middleton, and Jane K. Hill.

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