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The Long Term Experiments

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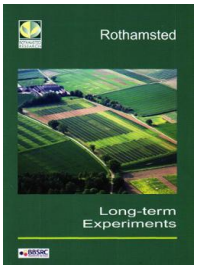

The Rohamsted Inscet Survey

Rothamsted Research

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Scientists at Southampton Oceanography Centre analysed samples of herbage from the Park Grass experiment over a 50-year period to measure concentrations of plutonium and uranium. They were able to detect the effects of, and distinguish between, nuclear bomb tests carried out by the US, USSR, UK and France, and show that plutonium contamination from weapons testing in the Nevada Desert in 1952/3 reached Northern Europe. Such measurements have only become possible in recent years with the development of more sophisticated analytical techniques.

THE ROTHAMSTED INSECT SURVEY

Between 1933 and 1937 and again between 1946 and 1950 the larger (macro) moths were recorded in a light trap run at the edge of Barnfield, one of Rothamsted's Classical experiments. In 1960, a trap of identical design was placed at the same site, immediately producing information on long-term changes in farmland moth populations. This provides the only quantitative insect data that compares populations before and after the important period around the Second World War, when many agricultural practices were changing rapidly. Between 1960 and 1970 a national network of Rothamsted-style light traps was developed that has continued ever since. Currently, there are about 90 such traps in operation throughout the UK, most of which are run by volunteers, and from which all macro-moths are identified and counted on a daily basis.

Light trap

In 1965, a 12.2m high suction trap was designed and set up at Rothamsted to monitor migrating aphid populations, and over the next few years a network of such traps was installed across the UK. Currently there are 16 traps in operation in England and Scotland with the English sites being coordinated from Rothamsted and

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the Scottish sites from the Scottish Agricultural Science Agency in Edinburgh. These traps are emptied daily and all aphids are identified and counted. Together, the national light and suction-trap networks are known as the Rothamsted Insect Survey (RIS) and provide the most extensive long-term quantitative datasets on insect populations anywhere in the world.

Suction trap

RIS data have been used for a wide range of research purposes from applied pest forecasting to fundamental studies on insect population dynamics and the effects of climate change on insect populations. For example, understanding the relationship (Fig. 12) between winter temperatures and the times of the first flights of *Myzus persicae*, the peach-potato aphid (which is responsible for the transmission of potato and sugar beet viruses), has helped us to facilitate optimal timing of control measures and avoid their unnecessary use. It also aids assessment of the likely impact of warmer winters on the flight phenology of this important pest. Data from

Fig.12 *Myzus persicae* at Rothamsted 1965-2005
(2005 is shown in red)

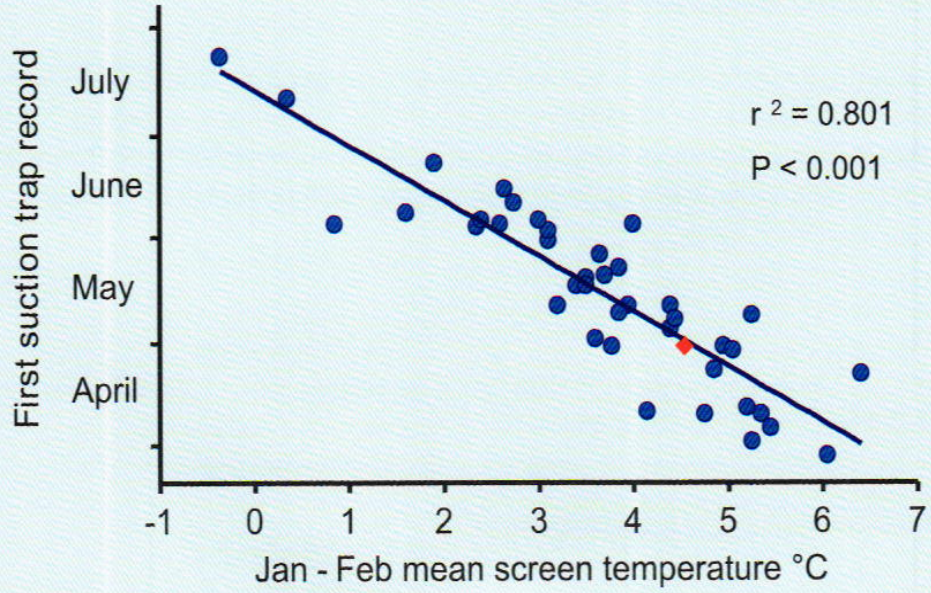

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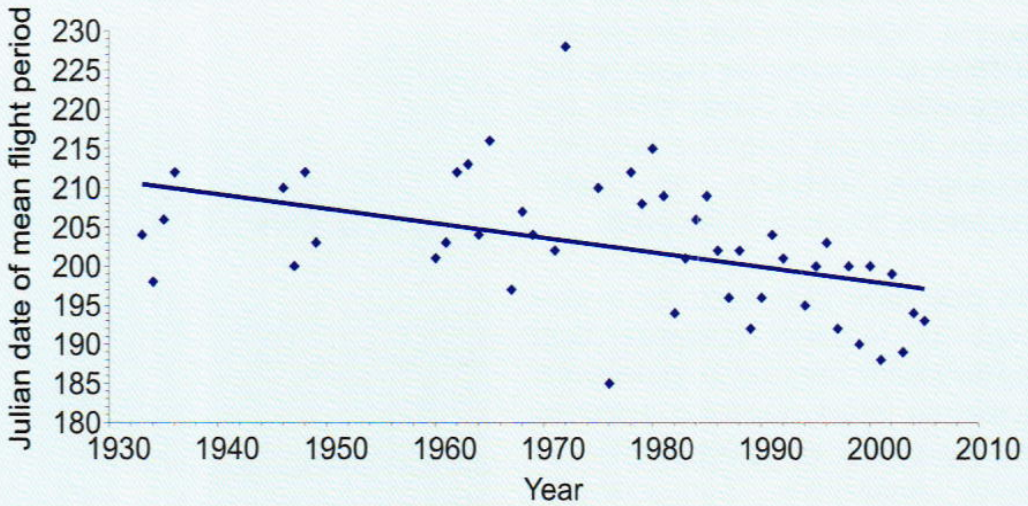
Fig.13 Flight phenology of *Eilema lurideola*, the common footman, Barnfield light-trap 1933-2005



light traps show that there is a long-term trend towards earlier flight times for some moths (Fig. 13). Data from the Rothamsted estate also suggest that there was a big decline in moth populations during the 1950s. An analysis of the national RIS moth dataset also suggests a more recent decline in moth populations across the UK, which is of conservation concern.

There are now over 70 12.2m suction traps, operated by various organisations across Europe from which the data are being coordinated for a range of research purposes with particular emphasis on climate change studies (http://www.rothamsted.bbsrc.ac.uk/examine/).

In 1999, a vertical looking insect radar (VLR) was installed at Rothamsted with a second one in operation at Chilbolton (Hampshire). These are operated by the Rothamsted Radar Entomology Unit in close collaboration with the RIS and are providing important additional long-term data on high-altitude insect behaviour.

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