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ROTHAMSTED
RESEARCH

Guide to the Classical and Other Long-term Experiments, Datasets and Sample Archive



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The Rothamsted Insect Survey (Ris)

Rothamsted Research

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with over 800 requests from 30 different countries since monitoring began in 2010. Data from the long-term experiments, both current and historic, has been used in over 170 publications since 2010.

Future developments include the addition of data from other Rothamsted long-term experiments; including the Highfield Ley-arable Experiment. In addition, the increased adoption of FAIR data principles (Wilkinson *et al*, 2016) with persistent identifiers, structurally improved metadata, vocabularies and visualisation tools, will enable this unique resource to be discovered and even more widely used by the international scientific community. For more details, see Perryman *et al*. (2018).

THE ROTHAMSTED INSECT SURVEY (RIS)

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



Light trap on edge of Barnfield

50

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.



Suction trap

Currently, there are about 80 such traps in operation, most of which are run by volunteers throughout the UK, from which all macro-moths are identified and counted on a daily basis. The light trap dataset, including records derived from decommissioned traps, now includes information from 500 sites, many of which have moth record data that extend to a decade or more.

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 also installed across the UK. Currently there are 16 traps in operation in England and Scotland with the English sites being coordinated from Rothamsted and the Scottish sites from the Scottish Agricultural Science Agency in Edinburgh. These traps are emptied daily and all aphids are identified and counted along with other key pests, according to need. Currently, recorded pests include, but are not limited to, the cabbage stem flea beetle, pollen beetle, pea and bean weevil, spotted-winged *Drosophila* and also beneficial insects like lacewings and ladybirds. Forecasts of aphid phenology and abundance, in addition to weekly bulletins on population levels of key pest species, continue to be provided to growers, crop consultants and levy boards. We also communicate changes in the non-aphid fraction in a weekly summary called

RIS Remarks which provides qualitative changes in abundance.

Since its conception the RIS has promoted the adoption of suction trap technology; currently 128 suction traps are in operation across the world and more are anticipated. 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. The data are held in a database named 'Paul' which currently holds 45 million UK and some European insect records and is used to service data requests.

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 (Bell *et al*, 2015). For example, understanding the relationship (Figure 16) between winter temperatures and the times of the first flights of *Myzus persicae*,

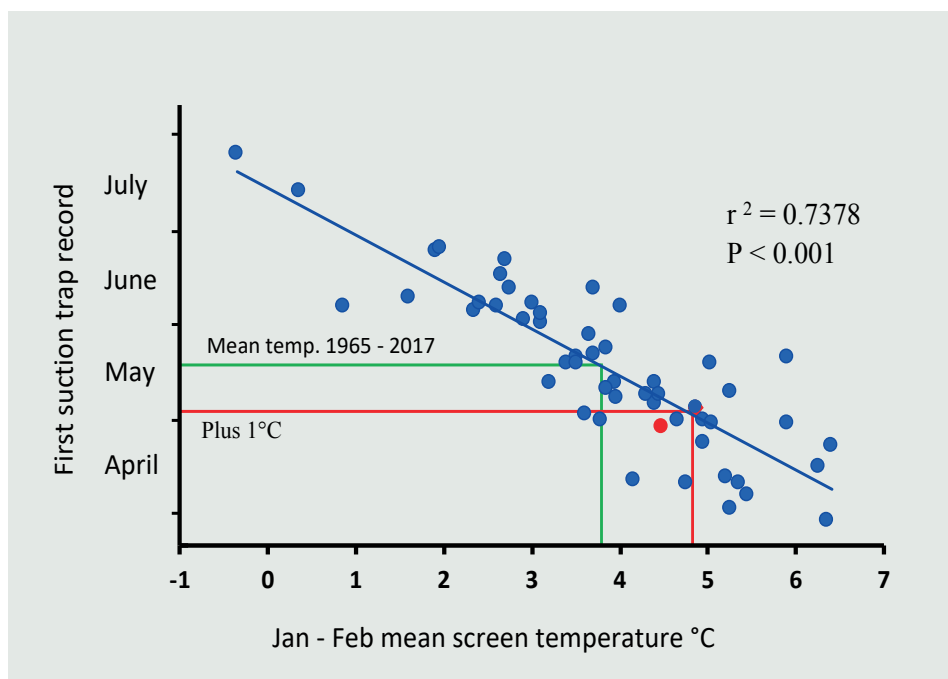


Fig. 16 Rothamsted; relationship between winter temperature and the times of the first flights of *Myzus persicae* (peach-potato aphid). Data for 2017 shown in red.

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 light traps show that there is a long-term trend towards earlier flight times for some moths. 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, particularly in southern Britain where declines are dramatic (Fox *et al*, 2013). An update of those trends is being prepared with Butterfly Conservation for the *State of Britain's Larger Moths* report due to be published in 2019 (<https://insectsurvey.com/trends>).

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.

UK ENVIRONMENTAL CHANGE NETWORK (ECN)

Rothamsted Research, at its research facilities in Harpenden, Hertfordshire (ECN Rothamsted) and North Wyke, Devon (ECN North Wyke), has been part of the Environmental Change Network (ECN) since its inception in 1992. It manages two of the eleven terrestrial sites (twelve initially) that constitute the ECN. The

ECN is supported by fourteen independent government departments and agencies and was established to identify, assess and research environmental change nationally, and provide a basis for European and international collaboration. Its specific objectives are:

- To maintain a selected set of terrestrial and freshwater sites within the UK from which comparable long-term datasets are obtained by means of measurement, at regular intervals, of variables identified as being of major environmental importance.
- To compile, validate and archive datasets for use in identifying environmental change and develop an improved understanding of the causes of change.
- To make these long-term datasets available to researchers.
- To provide, for research purposes, a range of representative sites where there is good instrumentation and reliable information.

All of the ECN sites have well defined monitoring areas but within each there is a designated Target Sampling Site (TSS). At ECN Rothamsted, monitoring is done across the whole of the farm, but focusses on the Park Grass experiment (the designated TSS),

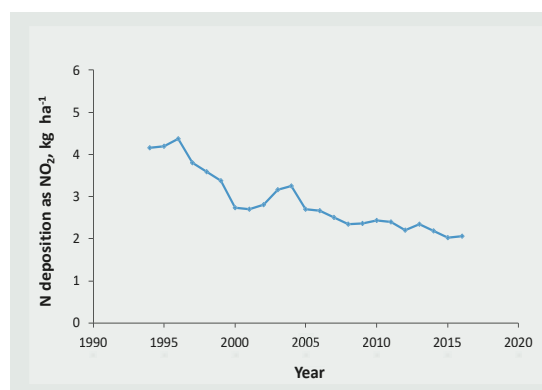


Fig. 17 Rothamsted; mean annual N deposition as NO₂ at Rothamsted Meteorological Station, 1994–2016.