IM Protocol

MOTHS

Aim

To collect and identify daily collections of macrolepidoptera, using a standard light trap

Rationale

The Lepidoptera (butterflies and moths) is a large order of insects and is among the best known, both taxonomically and biologically. For this and other reasons, such as their phytophagous larval habits, they are a good indicator group for environmental change (Woiwod & Stewart 1990; Woiwod & Thomas 1993). The Protocol involves sampling by light trap of all the macrolepidoptera (large moths) using the methodology of the Rothamsted Insect Survey. This provides a strong background of expertise to ensure that the Protocol requirements are met, as well as an existing extensive national database accumulated over the last 25 years which will form the basis for analysing future trends in populations. The background to the Rothamsted Insect Survey's light trap network is given in Taylor (1986) and in Woiwod and Harrington (1994).

Method

Equipment

A standard Rothamsted light trap (Williams 1948), which requires a continuous power supply, is used.

Location

The light trap should be sited so as to be convenient for daily emptying. Its location should be as near as possible to the TSS but will often be near to laboratories, houses or farms, where help from the occupants can sometimes be enlisted; this is likely to be the only possibility for remote sites, because of the need for a continuous power supply. The trap should be sheltered by vegetation if possible and ideally placed further than 20 m from artificial light sources.

Sampling

Ideally, traps are emptied daily throughout the year but if this is not possible samples should be accumulated, for example at weekends. Currently samples are posted to Rothamsted for identification, unless local expertise is available. All data are lodged in the Rothamsted Insect Survey's existing database as well as in the ECN database. For large sites it is desirable to run more than one trap if suitable operators can be found. Detailed instructions for trap operators are given in Appendix I.

Time

Emptying trap	40 minutes/trap/week, plus travelling
Identification	Up to 15 days/site/year for a very experienced identifier

Author

I.P. Woiwod

References

Taylor, L.R. 1986. Synoptic dynamics, migration and the Rothamsted Insect Survey. *Journal of Animal Ecology,* **55**, 1-38.

Williams, C.B. 1948. The Rothamsted light trap. *Proceedings of the Royal Entomological Society of London (A),* **23**, 80-85.

Woiwod, I.P. & Harrington, R. 1994. Flying in the face of change: the Rothamsted Insect Survey. In: *Long-term experiments in agricultural and ecological sciences,* edited by R.A. Leigh & A.E. Johnston, 321-342. Wallingford: CAB International.

Woiwod, I.P. & Stewart, A.J.A. 1990. Butterflies and moths - migration in the agricultural environment. In: *Species dispersal in agricultural habitats,* edited by R.G.H. Bunce & D.C. Howard, 819-202. London: Belhaven.

Woiwod I.P. & Thomas J.A. 1993. The ecology of butterflies and moths at the landscape scale. In: *Landscape ecology in Britain,* edited by R. Haines-Young, 76-92. (Working paper no. 21.) Nottingham: IALE (UK), Department of Geography, University of Nottingham.

Appendix I. The Rothamsted Insect Survey light trap: description and daily operation procedure

The Rothamsted Insect Survey (RIS) light trap (Williams 1948) consists of a stand approximately 1.2 m in height which supports the light source and trap. The overall height is approximately 1.5 m and the trap and stand are approximately 0.6 m in width and depth.

The light source is a 200 watt, clear, tungsten lamp powered by mains electricity. For safety, the supply is protected by a trip switch or Residual Current Device (RCD). The lamp is switched on at dusk and off at dawn each day by an automatic solar dial time-switch which self-adjusts for seasonal variation in daylength.

On entering the trap, insects are killed in a collecting jar which is lined on its inner surface with plaster and into which is absorbed daily approximately 5 ml of 1,1,2,2 tetrachloroethane. The fumes from this chemical render the insect immobile very quickly, thus preventing escape and excessive damage.

The daily routine for sample collection takes approximately five minutes. The recommended procedure, as carried out by staff of the RIS, is outlined below.

Procedure

1. Check that the RCD is in the 'on' position. If it has tripped, ensure that the power supply is on and try to re-set the RCD. If it trips again, replace the fuse in the plug and try again to set the RCD. If there is still a fault, contact an electrician.

2. Check that the clock is set at the correct time (GMT). The solar dial clock adjusts automatically for seasonal variation in daylength. It must not be altered to match changes in local time (eg British Summer Time).

3. By turning the manual switch on the clock, check that the light bulb is working. If it is not, replace the bulb and try again. If it still does not work, contact an electrician. Only 200 watt, clear, tungsten bulbs should be used.

4. Take a collecting jar, which has been dosed with approximately 5 ml of tetrachloroethane and capped with the appropriate jar lid, to the trap and replace the one containing the previous night's sample. To prevent contact with the tetrachloroethane vapour and spillage of the sample, always use the jar lid.

5. In a well-ventilated area or a fume cupboard, tip the sample into one or more (depending on the size of the sample) tissue-lined pill boxes. Ensure that no insects remain in the jar and replace the jar lid. Gently fold the tissue over the sample, taking care to avoid crushing the insects, and close the box. Re-dose the jar for use the following day with approximately 5 ml of tetrachloroethane and immediately replace the lid.

6. On the box or boxes containing the sample, write the site name and the date on which the sample was taken. If it was collected on 15 June 1995, the light would have been switched on at dusk on the 14 June and off at dawn on the 15 June. The correct date to be written on the box is therefore 14-15 June 1995. If the sample is accumulated over several nights, the correct date would be that on which the trap was set and that on which the jar was emptied. For example, if the trap ran over the weekend of Saturday 28 and Sunday 29 January, and was emptied on Monday 30 January, the correct date would be 27/30 January 1995. If two boxes are used to accommodate the sample, write the appropriate date and '1/2' on each box. Details of any dates on which the trap was not operating, eg because of lamp failure, should be reported.

Tetrachloroethane

Although alternatives are being sought, tetrachloroethane is the only compound which has the correct properties to enable the rapid killing of insects entering the collecting jar whilst also remaining effective for 24 hours or more. **However, it is toxic by inhalation, skin and eye contact and is assumed to be poisonous if taken by mouth. Prolonged continued high exposure may cause jaundice. The following precautions must therefore be observed.**

1. Avoid breathing the vapour and avoid contact with skin, especially the eyes.

2. When pouring, wear safety spectacles; always work in a well-ventilated area, preferably outside; take the collecting jar to the tetrachloroethane, not *vice versa.*

3. Allow small spillages to evaporate; keep away from the spillage site.

4. Large spillages should be absorbed on to sand and removed outside to evaporate. When doing so, wear safety spectacles, gloves and a respirator.

5. In the case of skin contact, remove contaminated clothing and wash the skin with running water followed by soap and water.

Electricity

The trap operates by mains electricity. The supply should always be disconnected before a bulb is replaced. No part of the electrical circuit should be exposed without prior consultation with an electrician. The RCD should be tested regularly, according to the manufacturer's recommendations.

Specification of results and recording conventions

The measurement variables listed below are those required for each IM sampling location at an ECN Site. Sites submitting data to the ECNCCU should refer to the accompanying Data Transfer documentation for the specification of ECN dataset formats, available on the restricted access Site Managers' extranet. Contact ecnccu@ceh.ac.uk if you need access to this documentation.

The first 4 key parameters uniquely identify a sample or recording occasion in space and time, and must be included within all datasets:

• Site Identification Code (e.g. T05)	Unique code for each ECN Site
• Core Measurement Code (e.g. PC)	Unique code for each ECN 'core measurement'
• Location Code (e.g. 01)	Each ECN Site allocates its own code to replicate sampling locations for each core measurement (e.g. for different surface water collection points)
• Sampling Date (/time)	Date on which sample was collected or data recorded. This will include a time element where sampling is more frequent than daily

ECNCCU 2001

Core measurement: invertebrates – moths (IM Protocol)

Variable	Units	Precision of recording
Site Identification Code		
Core Measurement Code		
Location Code		
Date trap set		
Sampling date[1]		
Species code	RIS code[2]	
Species name	genus species	
Number caught	count	1

Recording forms
Please refer to the Rothamsted Insect Survey, Institute of Arable Crops Research, Rothamsted Experimental Station, Harpenden, Herts, UK.

Notes
1. The Sampling Date is the date on which the catch is collected following overnight recording. Any nights on which the trap was not operating, for example because of lamp failure, should also be reported, using the Sampling Date.
2. The coding system should follow the Heslop (1964) numbering system used by the Rothamsted Insect Survey.