



Moth Recorders Handbook



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Moth Recorder's Handbook

1. Introduction

Moths are a fascinating but frequently over-looked group of insects. While there are currently only 56 species of butterflies in the UK, there are over 2500 species of moths. Moths are just as colourful as butterflies and many of them are day-flying, in fact there are many more day-flying moth species than there are butterflies! Despite a long-history and the popularity of moth recording and study, basic information such as the habitat requirements, mobility and distribution of some of our most important moth species is still poorly understood. For this reason Butterfly Conservation and the National Moth Recording Scheme (NMRS) welcomes new moth recorders and we hope that this handbook will help you to get involved.

Moths are divided into two main groups, 'macro-moths' (the larger ones c. 900 species) and 'micro-moths' (the smaller ones c. 1600 species). This is a somewhat arbitrary division that is certainly not based solely on size. The boundary between the two is somewhat blurred, but it is very convenient for beginners, because all the macro-moths are listed in four recent field guides; Skinner (2009), Waring and Townsend (2009) and Townsend and Waring (2007). There are plenty of macro-moths that are easy to identify and they can be learnt very quickly with a field guide. Others are more difficult and require time and patience. However, with experience you can easily become proficient with most garden moths. The micro-moths, on the other hand, are not dealt with in a single field guide, although there are a variety of publications (some of which are quite expensive) covering different micro-moth groups. Many micro-moths require expert guidance to identify them. Most moth recorders begin with the macro-moths and some of the more obvious micro-moths and then move on to tackle more of the 'micros' once they gain experience and meet people who can help them with identification. Examples of easily identified micro-moths that are frequently encountered in gardens include:

Long-horned Flat-body, *Carcina quercana*
Mother of Pearl, *Pleuroptya ruralis*
Small Magpie, *Eurrhynx hortulata*
Gold Triangle, *Hypsopygia costalis*
Rush Veneer, *Nomophila noctuella*
Rusty-dot Pearl, *Udea ferrugalis*
Twenty-plume Moth, *Alucita hexadactyla*
Diamond-back Moth, *Plutella xylostella*
Small purple & gold (Mint Moth), *Pyrausta aurata*



There are several methods that can be used to capture moths for recording (none of which are harmful to the moths). Which is the best to use depends on the species in question, but if a general survey is required, a combination of several methods should be used. In section 3 the main methods are described.

2. Why record moths?

Moths are an important part of the UK's biodiversity. Not only do they pollinate plants, but they are also an important food source for many birds, bats and other wildlife. Blue tit chicks for example, consume an estimated 35 billion moth caterpillars a year in Britain. Recent research published in *The State of Britain's Larger Moths* report, highlighted some alarming declines in the UK's moths. Since the late 1960's, total moth numbers have fallen by a third, with potentially serious knock on effects for other wildlife. Declines have been even more severe in southern Britain (44% decrease in moth numbers) and in urban areas (50% decrease). Additionally, two-thirds of widespread and common "garden" moth species are declining in number, see the table below for some examples.

Moth species	% Decline over 35 years
Spinach	95%
Lackey	90%
Garden Tiger	89%
Cinnabar	83%
Blood-vein	79%
White Ermine	77%
Buff Ermine	73%
Buff Arches	71%
Magpie	69%
Garden Carpet	69%
Turnip	68%
Heart and Dart	67%

We know that moth numbers are falling and we also know that over 60 species of moth became extinct in Britain during the twentieth century. Conversely, at a national level the distribution of many of our macro-moth species remains unknown. Without knowing the whereabouts of a particular species, it is impossible to target conservation efforts. The Moths Count project run by Butterfly Conservation aims to encourage and stimulate moth recording throughout the UK, Channel Islands and the Isle of Man. In addition to this an ongoing recording scheme for the 900+ species of larger moths has been established. During the first three years of the project the National Moth Recording Scheme (NMRS) amassed in excess of 12 million records. The records are both historical and recent. These enable us to compare species distributions over time and allow us to assess the winners and losers among macro-moth species. For the first time in 30 years, up-to-date distribution maps of macro-moths of the UK, Channel Islands and Isle of Man are now available online (www.mothscount.org) or as hard copy in the *Provisional Atlas of the UK's Larger Moths*.



Lackey



Humming-bird Hawk-moth

How can you help conserve these important and fascinating creatures? What can an individual do in the face of massive losses of moths? Answer: record any moth sightings, be they from your back garden, a Country Park or the wider countryside and pass your records on to your local County Moth Recorder. For the purpose of biological recording, Great Britain and Ireland are divided in to small units called vice-counties. Vice-counties are based upon the ancient counties of Britain. In each vice-county is a County Moth Recorder. The County Moth Recorder is the local expert who collates and verifies local moth records. To find out who your County Moth Recorder is please visit the Moths Count website or contact Butterfly Conservation. By contributing your records to the NMRS you can help us to raise the awareness of the importance of moths, identify and promote conservation priorities, influence planning decisions, inform government policy and contribute to scientific research to help us understand the changes in fortune of our moth species.



3. Moth Recording Equipment

The following equipment is recommended for a beginner to get started:

- Moth trap - however, even this is not necessary to start - you can use alternative methods to conventional light traps (e.g. sugar, blossom, outdoor lights; these methods are described in sections 3.5 - 3.10) before you decide to spend money on a trap.
- Moth identification guide (recommendations listed below)
- Sample pots (the pot should always be substantially larger than the moth)
- Net
- Torch

Many nocturnal moths are attracted to artificial light, although there is still no convincing scientific explanation as to why this is so. The easiest way to attract moths to artificial light without using moth trapping equipment is to leave outside lights on and drape a white sheet over lit walls or fences. You can also leave your curtains open so that moths settle on the outside of the window. One recorder identified 100 species on the outside of a window over course of several years! Bathrooms also make good moth traps, leave the light on and the window open and record what comes in. Low energy light bulbs used both indoors and outdoors are just as good at attracting moths as the conventional light bulbs. However, it is more effective and efficient to use moth traps.

3.1 Moth Traps

There are three basic kinds of moth traps (also called light traps), although there is a growing range available. Which you use is a balance between using a trap which attracts and retains high numbers of moths but is costly and bulky, against one which attracts fewer moths, which is not a bad thing for a beginner, but is cheaper and more portable. For garden trapping, there is the issue of nuisance to consider. Some moth-trap bulbs

generate a lot of light, others e.g. actinic bulbs (a fluorescent tube producing actinic light) give off little visible light and therefore, are much less likely to annoy your neighbours. The principles of use are the same for the three: they are put out in suitable habitat at night; the light attracts moths, of which a certain percentage will fly inside the trap. Traps are typically filled with cardboard egg trays, which provide a rough surface giving secure footholds, and many dark crannies where moths can hide. Most moths quickly settle down, perhaps assuming it is dawn. The egg trays can be inspected either during the night or the following morning, and the moths can then be released unharmed.

Below is a summary of the advantages and disadvantages of each trap type.

Robinson trap

The Robinson trap uses either a mercury vapour (MV) bulb or sometimes a 40 watt actinic tube, set on a round, plastic container. Large numbers of moths are caught in this type of trap and the moths tend not to escape. The disadvantages of Robinson traps are that the trap does not collapse and therefore takes up a lot of room when transporting and storing. Additionally the trap requires a 240V power supply (mains electricity or a generator). However, perhaps the biggest constraint is that the Robinson trap is expensive, costing around £300.00.



Skinner trap

Two types of Skinner trap are available, an MV and an actinic version. The MV type has the same electrics as a Robinson trap set on a square box, typically made of plywood. The actinic version uses a horizontal fluorescent tube. It can normally be collapsed to enable easy storage and transportation, and it is cheaper (around £145) than a Robinson trap. The MV type should attract as many moths as a Robinson trap but is not as efficient at retaining them. The actinic version will not attract as many moths. The MV version requires a 240V power supply (mains electricity or a generator) while the actinic version can also be run off a 12V car battery.



Heath trap

A fluorescent tube producing actinic light is set vertically upon a small rectangular box, typically made of metal. This trap is easy to transport and store because it flat-packs. The trap runs off a 12V battery or mains electricity. Although the trap attracts significantly fewer moths than the other models, it still traps a good variety of species and is the cheapest option of the three, costing around £120.



Something else to bear in mind is the cost of running your moth trap. It would cost more in electricity to run a 125W or 250W MV bulb compared to a 12W actinic bulb, not to mention the potential annoyance to your neighbours!

Another option is to make your own moth trap; Anglian Lepidopterist Supplies has produced a handy guide with instructions on how to make one. **We strongly recommend that you buy the electrics ready wired.**

3.2 Moth Trapping Tips:

- Actinic light sources work particularly well in places where there are few competing light sources - in built-up areas MV bulbs are better, but actinic's can still be useful especially if your neighbours are light sensitive!
- Think about where you should set your trap - use habitat boundaries to get a broader mix of species, preferably in an open, but sheltered place. The site should be shaded from the early morning sun.
- Place the trap on an old white sheet, spread out on the ground. This is a good way to find moths that land short of the trap and prevents them being trampled on.
- The highest catches are on mild, cloudy, still nights with no moon. Fewer moths fly when there is a full moon. Steady drizzle will often improve catches, but heavy rain and strong wind is best avoided.
- Always ask permission of land owners before moth recording. It is also good to warn your neighbours / local people about what you are doing to ensure good relations.
- Beware of leaving moth-trapping equipment unattended at night, as it may attract unwanted attention and could be damaged or even stolen. Generators are at a particularly high risk.
- Check the trap as early as possible in the morning before the sun shines directly on the trap heating and unsettling the moths inside. This also means you can collect moths that have landed near to, but not in the trap before they fly off or are preyed upon by birds.
- If you don't have time to unload the catch first thing, site the trap in or move it to a cool, shaded position, and block the entrance with crumpled tissues or rags (a tea towel is ideal). Covering the trap with a sheet can also help.
- If you run a trap in the same place on consecutive nights, release the moths away from the line of sight of the trap so that the majority aren't re-caught immediately. Although moth trapping doesn't directly harm moths, they are unable to get on with the important tasks of feeding and reproduction while confined.
- Avoid touching the moths when you inspect them, as you may harm them. To put them in a container give the egg tray a sharp tap to dislodge them or gently lift the moth from underneath using a pencil, or rough cardboard tray, as they will grip onto rough surfaces.
- Release moths at dusk, or keep them (still on egg trays) in a part open container in a sheltered place out of the reach of birds etc. from which they can fly out by themselves at night. If you need to release the moths during daylight, place them among vegetation where they can hide away from birds or other predators. If you do this regularly it is a good idea to vary the release location so that birds do not learn the location of "fast food"!

- Species which need to be stored for expert identification can be kept for a day or two in pots in a fridge, and then released unharmed. Moths are cold blooded so keeping them cool helps them to conserve energy and prevents them from damaging themselves flapping around inside pots.
- Ensure that you know which rare or migrant species your County Moth Recorder may wish to see before accepting your record. It is a good idea to keep very interesting moths in pots which can be checked with your County Recorder (for further details see section on verification below.)
- When recording moths the protocol is that the date used for any record is the night the trap was set, not the morning after.

3.3 Getting Out and About

Although almost all moth recorders trap regularly in their own and friends/relatives gardens, moth recording of the wider countryside is very important. You can encounter different species in different habitats and you may find rarer species.



Many traps can be run from a mains electricity supply but when trapping away from the mains, there are two options:

3.4 Power sources

12V-car battery. These can be used to power actinic tubes (e.g. Heath trap). An actinic light source will reduce the numbers of moths caught, but some species appear to be more attracted to actinic than MV traps. For reasons not fully understood, this is particularly true of moths from the geometer family.

A generator. This is the more expensive and usually less portable option compared to batteries, but a generator is a very effective option for recording moths in the wider countryside as they can be used to power MV moth traps, and can run two or more traps together. If you want to transport generators a long distance from your car, a fishermen's trolley with wide wheels can be very useful.

It is important that in bad weather all connections are waterproof. (Waterproof connections can be obtained from many suppliers) and that you use a circuit breaker with mains electricity and generators. Large fishing umbrellas can be used to protect generators from the rain, although care is needed as the exhaust will get hot. Actinic tubes run relatively cool, and hence can normally be used unprotected on wet nights (provided the electrics are waterproof), but MV bulbs run hot, and should be covered with either a bulb guard or a pyrex mixing bowl to avoid the unlikely event of bulb fracture.

3.5 Sugaring

Moth traps will attract the greatest variety of moths, but not all moths are equally attracted to light. Some can be observed using sugary bait instead. Moths come to “sugar” because they feed on nectar, sap and honeydew, all of which are unrefined sources of sugar (however, some moths do not feed as adults, and therefore will never be seen at sugar sources). The success of the technique is variable - warm humid nights with a light wind are best for sugaring (as they are for most forms of mothning), but the technique will also work on far from ideal nights, and not work on nights that seem good for no apparent reason.



Ingredients

454g Tin of Black Treacle
1Kg Brown Sugar (the darker the better)
500ml Brown Ale or Bitter (fizzy drink like cola will do as an alternative)
Paint brush.



Slowly heat the ale (or cola) in a large pan and simmer for five minutes. Stir in and dissolve the sugar, followed by the treacle and then simmer for two more minutes. Allow to cool before decanting into a container. A drop of rum stirred in just before use is recommended but not essential. Paint the mixture about eye level onto 10-20 tree trunks or fence posts just before dusk and check for moths by torch-light for the first two hours of darkness.

A variation of this technique is “**wine roping**”. This works on a similar principle to the above.



Ingredients

Bottle of cheap red wine
1kg sugar
1m lengths of thick cord or light rope made from absorbent material. (New rope should be boiled in water before use to remove noxious chemicals).

Heat the wine and stir in and dissolve the sugar. Allow to cool and soak the lengths of rope. Drape the “wine ropes” over low branches,

bushes or fences just before dusk and check for moths by torch-light for the first two hours of darkness.

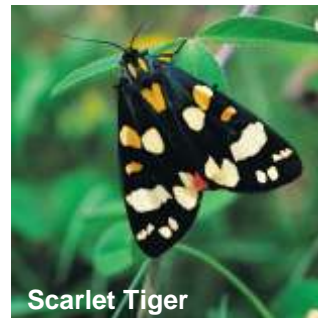
3.6 Natural attractants

Using natural attractants is the easiest method to employ and requires the least equipment and preparation, simply knowledge of the local area and the location of good nectar sources. The method involves searching suitable flowering plants for an hour or two after dusk with a torch. There are certain nectar sources that are widespread and productive; some of the most effective are listed below:

- Buddleia – a great nectar source for moths
- Sallow blossom
- Campions
- Rosebay Willowherb
- Aphid honeydew (the sticky stuff that coats leaves and cars under aphid-infested trees)
- Ragwort
- Brambles
- Ivy blossom

3.7 Daytime Searches for Adults

Daylight searching of relevant habitat is required for day-flying species such as Speckled Yellow, Burnets, Clearwings and many others. In addition, species that fly at dusk, especially many of the geometrids that are not effectively trapped at light will require searches with a net at dusk; this is known as “dusking”.



3.8 Nets - how to use them

Nets can be useful; however, many day-flying moths can also be identified using close-focus binoculars and stealth. If you do use a net it is important that you do not harm the moths, so the following procedures should be followed:

1. While you are surveying, always have your net in your hand ready to use.
2. **Only attempt to net moths that are free-flying.** If you try netting them when they are perched, or flying low to the ground, you could end up trapping them between the net and vegetation, causing them damage.
3. To net a moth, keep your eye on the flying insect whilst swinging the net sideways to catch it at the bottom of the net bag, and then **immediately twist your wrist** downwards so that the entrance of the net is blocked by the bag itself - otherwise your moth will fly straight out again!

4. Lower the net to the ground, and then gently manoeuvre a moth pot inside the net and over the insect, with the net acting as the “lid”, taking care not to touch the insect with the pot. Then, keeping the net tight over the top of the pot, ensure that the insect is well inside the pot before putting the pot’s lid in position. You can then take the pot out to identify the moth.
5. Don’t keep the moth longer than you have to - let it go once you have made your identification.

If you are new to using nets give yourself time to practice before you carry out serious surveying as it can take time to get the hang of it. The general rule of thumb is that if you aren’t looking like an idiot then you’re not doing it right!! When you use a net it is a good idea to explain to passers by what you are doing and why- people can be suspicious of nets and may assume you are causing harm rather than contributing to conservation through recording.

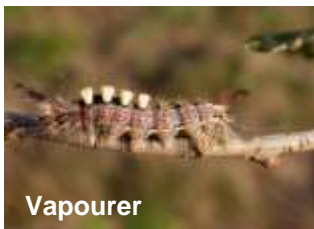
The following moths and butterflies are protected under Schedule 5 of the Wildlife and Countryside Act 1981 and netting these species without a licence is illegal:

Reddish Buff
 Fiery Clearwing
 Fisher's Estuarine Moth
 Barberry Carpet
 Black-veined Moth
 Sussex Emerald
 New Forest Burnet
 High Brown Fritillary
 Marsh Fritillary
 Swallowtail
 Large Blue
 Heath Fritillary

Essex Emerald and Large Copper are also covered by this legislation, although they are now extinct in the UK.

3.9 Larval Searches

Larval searching is the best recording method for some species. It is also a method that confirms breeding at the site (adults may simply be travelling through). This can be done through using a beating tray (or even a turned-up umbrella!), which is held underneath a suitable branch of a tree or small shrub while the branch is given a sharp tap with a stick. Dislodged larvae fall onto the tray where they can be examined and identified.



Alternatively a sweep net can be used, although best not used on shrubs and trees! This is swept backwards and forwards through the top of the vegetation dislodging larvae, which can then be removed from the net and examined. Many larvae are only active by night, so sweeping and beating is often best undertaken at night.

3.10 Pheromone Lures

Historically, for some species, moth recorders have used female moths to attract males of the same species. Females were put in nets which were hung from tree branches, within minutes, males would appear having detected the female pheromones. More recently, synthetic pheromones have been produced, particularly for clearwing moth species. Clearwing moths are day-flying species, they are not attracted to light and are difficult to observe and record. Our current understanding of the distribution of clearwing moths is poor; however, with the advent of pheromone lures this can only be improved.

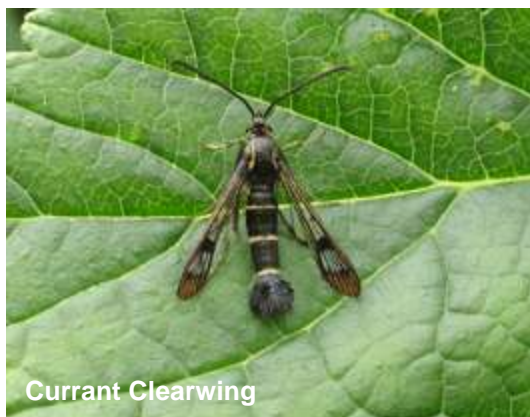
How to use pheromone lures

Two types of lure are available, the rubber bung type which you should prick with a pin to release the impregnated pheromone. The other is the tube type pheromone; the lid should not be removed as the pheromone is released slowly through the plastic vial which is semi-permeable.

Hang your pheromone lure in a net bag (washing powder tablet bags are quite handy) and securely fasten them to a branch in the survey area. Lures should be hung at least 10 metres apart. Sit back and relax and wait several minutes for the fooled males to arrive! For the best results, set your pheromone lures between midday to early afternoon on warm sunny days when there is little or no wind. You should not have to wait long; generally males will be attracted to a lure within 5 minutes. If you have not attracted any moths within 10 minutes, move on to then next lure or sampling area.



Pheromone lure in situ



Curren Clearwing

When not in use, pheromone lures should be stored separately, to avoid cross contamination, and sealed in airtight containers in the freezer. This prolongs the life of the lures; one moth recorder reported recently that he has used the same lures for 8 years using this storage method.

Which pheromone lures to use

Pheromone lures are available for 14 Clearwing species. Although most of the lures are species specific, the 'classic six' pheromones will attract all of the Clearwing species except for the Welsh Clearwing and the Hornet Clearwing.

Species	Flight Period	Larval Food-plant
Raspberry Clearwing	June to August	Raspberry
Hornet Moth	June & July	Poplar
Dusky Clearwing	June & July	Aspen and possibly Poplar
Currant Clearwing	June & July	Black Currant, Red Currant, Gooseberry
Yellow-legged Clearwing	June, July, August & September	Oak
White-barred Clearwing	June, July & August	Alder and Birch
Welsh Clearwing	June & July	Mature Birch
Sallow Clearwing	July	Willow
Orange-tailed Clearwing	June & July	Wayfaring Tree and Guelder Rose
Red-belted Clearwing	June & July	Fruit Trees
Red-tipped Clearwing	June, July & August	Willow
Large Red-belted Clearwing	May & June	Birch Trees and Stumps
Six-belted Clearwing	June, July & August	Bird's-foot Trefoil and Kidney Vetch
Thrift Clearwing	June & July	Thrift

4. How to record moths

Getting started

- Buy, make or borrow a moth trap. The latter is a great idea when you are just getting started. Ask your County Moth Recorder, local moth group or Butterfly Conservation Branch if they have moth traps for loan.
- Buy or borrow a modern field guide to the macro-moths.
- You don't have to identify every moth you catch, start with the big, bright, distinctive ones. Difficult macro-moths and micro-moths can frustrate even experienced moth recorders.
- Make contact with local moth recorders, they will probably be able to help you with identification from photographs etc.
- Attend local moth trapping events.
- Check your trap in the morning when the moths are still and relatively easy to observe.

Discuss your trapping activity with your neighbours in case the light causes any annoyance, they may even get interested themselves and you can help spread the moth-ing gospel!

4.1 Rearing moths and caterpillars

Many people start by rearing caterpillars that they find in their gardens. Rearing moths is great fun and is relatively straight forward, providing the caterpillars are fed the correct food-plant, usually this is the plant on which they are found. It is best to collect the stem that the caterpillar is on rather than trying to remove the caterpillar from the stem, caterpillars are quite delicate. In addition to this, some caterpillars have irritating hairs so it is best not to touch them. Put the food-plant stems in a small jar containing water. The top of the small jar should be blocked with cotton wool to prevent caterpillars falling in and drowning. Place the food-plants in a larger container and put the caterpillars on the

stems. Frass (caterpillar droppings) should be cleared out of the containers regularly to avoid the growth of mould. Accumulation of moisture (condensation) on the inside of the container should be avoided. As the caterpillars grow they will eat more, so you should keep a close eye on the food resources and add to them when they are running out or if they begin to wilt. It is very important to feed them the same plant that you found them on, if you give them the wrong plant to eat they will starve and die.

When the caterpillar is fully grown it will undergo pupation. Pupation sites should be provided for the caterpillar within the container. Many moths pupate underground so you should provide a thick layer of soil in the container. Some caterpillars spin up a cocoon, these will need leaves and tissue in which to do so. Others need bits of bark or corrugated card in which to pupate i.e. the Puss moth. Pupae that form during the spring or summer usually hatch within a few weeks. Pupae that form in autumn will overwinter and should be stored in soil in sealed containers and kept in a cool but frost free place, an unheated shed or out-house is an ideal place for this. The soil/pupae should be lightly misted with water very occasionally over winter and spring to keep the atmosphere humid.

When the adults are ready to emerge, a few twigs and stems should be placed in the container. This enables the moths to climb up and inflate their wings. If they do not have somewhere to do this their wings will be deformed and the creature will be unable to fly. You should ensure that the container is large enough for the moth to expand its wings.

If the caterpillars were found in the wild the resulting adults should be released back in the same area. The moths should be released at dusk or hidden in dense vegetation to prevent them being eaten by birds.

If the caterpillars you have reared are from an entomological supplier or are exotic species, you should not release these in to the wild. Indeed, it may be illegal to do so.

5. Submitting records

Moths are an under-recorded group of insects, so your sightings (records) can contribute important information on the distribution and status of these species. Additionally it is exciting because you may turn up unusual or rare species. Try to keep an accurate account of your records, and please submit them to your County Moth Recorder at the end of each year. The County Moth Recorder will collate your records and make them available for wider use for conservation, education and other public benefits (although they work on an entirely voluntary basis and may or may not be able to provide you with feedback). This is also the route by which your records contribute to the National Moth Recording Scheme. Many Counties have a Moth Group; your County Moth Recorder will be able to let you know if such a group exists in your area.

There is no particular recording form used to submit information. It is best if you contact your local County Moth Recorder to ask what format he/she would prefer information to be submitted in. As a guide, submit the minimum information shown below (the record will be more useful if the other useful information is also included).

5.1 What is a record?

The minimum information required for a moth record is the following:

What - Species' name (English and Latin). This must be accurate, if in any doubt about an identification, it is best not to submit the record.

Where – A six figure grid reference is most useful, combined with the name of the nearest town / village as stated on an Ordnance Survey map (see below for instructions on how to calculate a grid reference)

When – Date. For light-trapping records, the convention is that the date should be the one on which the trap was switched on, even if the moth arrived after midnight, or if you check the trap the next day.

Who – Your name and contact details. If the identification was verified by someone else, record their name too.

Number – Ideally you should count the number (abundance) of each species of moth recorded. This provides valuable abundance data that can be used to assess species population trends, particularly when the trap is run regularly in a back garden.

Additional desirable information that adds value to your moth records includes the following:

- Vice-county number
- Trapping method
- Life-cycle stage
- Habitat type

Note: Your County Moth Recorder may request additional information, or for the records to be presented in a particular way to make their job easier.

5.2 Mapping and grid references

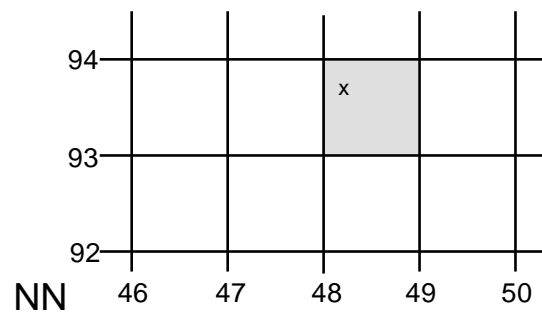
For recording to provide effective data for local purposes, such as planning and conservation work or national analysis of how particular species are faring, records have to be related to sites. Therefore, the grid reference for any moth record should be to at least 1km square accuracy (four-figure grid reference), and preferably six-figure references which pinpoint a sighting to a 100m x 100m square.

When it comes to mapping moth records data are often plotted in a summary form on distribution maps e.g. as tetrads (2km × 2km squares) for local maps, or hectads (10km x 10km squares) for the national scale.

5.3 How to work out a grid reference

Please use only the National Grid references from Ordnance Survey maps - not road maps, which may have non-standard grids.

1km squares are marked by a grid of light blue lines on 1:50,000 series (Landranger) OS maps. The grid reference of a 1km square consists of the 100km square code (e.g. NN), which will be marked somewhere on the map, followed by four numbers, which mark the bottom left-hand corner of the square (see example below). The first two numbers refer to the horizontal (West-East) scale and the second two the vertical (South-North). It is very important to put these in the right order.



100 km square code: NN
Shaded 1km square: NN4893

A six-figure (100m square) grid reference is derived by dividing the 1km square into tenths, from the left (west) and the bottom (south). For example, the map reference of the cross in the shaded square above is given by combining the east-west reference, 482, with the north-south reference, 937, giving a full reference of: NN482937.

When you move into another 1km square, record sightings separately, this enables correct identification of important sites.

If you do not have access to suitable maps or are not familiar with grid references, please do not be put off from recording the moths that you see. Contact your local County Moth Recorder and they may be able to help. OS maps and grid references can be viewed online at sites such as www.streetmap.co.uk. For further details on how to calculate a grid reference see; www.ordnancesurvey.co.uk/oswebsite/gi/nationalgrid/nationalgrid.pdf

5.4 Recording Software

You do not have to keep your records on a computer. Recording on paper is fine, but you should also follow the format below and it is best to check with your County Moth Recorder that he or she can handle paper records. However, storing your records electronically should help your County Moth Recorder considerably and also enable you to analyse your records with ease. There is no one recommended software package for storing data, but the MapMate programme (available from Teknica Ltd or www.mapmate.co.uk) is the most widely used by moth recorders, as it is simple to use and can import and export files to other databases. Alternatively, online recording is an option, Butterfly Conservation is currently developing an online recording system; this will be available in due course at www.mothscount.org. It may be best to consult with your County Moth Recorder to discuss the best way of storing data. Microsoft Excel is also used by many moth recorders; a suggested template to use is as follows:

Code	Taxon	Vernacular	Site	Gridref	VC	Recorder	Determiner	Date	Quantity	Method	Sex	Stage	Status	Comment

If your County Moth Recorders uses MapMate to collate local moth records then you must fill in the columns with the bold headings. This information is required to import data into MapMate. However, if you did not record the quantity of moths, for example, it is possible to enter *not recorded* in the cells.

Explanation of column headings:

Code – The reference number devised by Bradley and Fletcher for the checklist of Lepidoptera.

Taxon – Scientific name or Latin name

Vernacular – Common or English name

Site – Site name / location name

Gridref – 6, 8 or even 10 figure Ordnance Survey map grid reference

VC – Vice-county number

Recorder – Name of person who recorded the moth

Determiner – Name of person who identified the moth species - if different to the recorder

Date – Date when moth was recorded, the preferred format is *dd/mm/yyyy*.

Quantity – Number of moths recorded

Method – Trapping/ survey method (i.e. visual search, type of light trap, wine-ropes etc)

Sex – Male / female moth or not recorded

Stage – Adult, egg, larva, pupa

Status – Not used for moths – you can enter *not recorded* in this column.

Comment – Any other information relating to the record

Please **do not** forward datasets to County Recorders in a 'Crosstab' format (similar to the example below). Crosstabs cannot be easily reformatted to a "one record per row" format required to import to a database.

	A local NR	A Wood	A local NR	A Wood
	125W MV	125W MV	125W MV	125W MV
	13/6/2007	15/7/2007	17/7/2007	21/10/2007
2089 Heart and Dart	12	45	16	-
2107 Large Yellow Underwing	9	-	17	13
2125 Setaceous Hebrew Character	-	9	23	14

5.5 Verification of Records

There are some moth species that are commonly and easily confused. On occasion your moth records may be queried by the County Moth Recorder or the National Moth Recording Scheme. Please do not take these queries as an insult. Data verification is very important to ensure quality control for future use of the data.

5.6 Critical Species or Difficult Species

Some moth species are very difficult to tell apart. These are called 'critical species' and include some common macro-moths that are found in gardens. Such species need special attention. Some can be identified by careful examination of wing patterns, antennae etc. but others can only be identified reliably by examining their genitalia, e.g. Grey Dagger and Dark Dagger, Common Rustic and Lesser Common Rustic. Sometimes this can be done on a live moth, but in some cases this is not possible. Modern field guides provide some information about critical species and you will gradually learn which species are involved. The Moths Count project has produced *British and Irish moths: an illustrated guide to selected difficult species (covering the use of genitalia characteristics and other features)*. This guide provides the next step for people wishing to make definitive identifications of difficult macro-moths such as dark and grey daggers, ear moths, copper underwings and the November moth group. This guide focuses mainly, but not exclusively on genitalia characteristics and aims to help raise awareness and increase recorders' ability to identify these species correctly.

It is important not to misidentify species in your records. It is perfectly acceptable to record groups of species (often referred to as aggregates or agg.), for example Marbled Minor agg. if you have not definitively identified the moth in question as either Marbled Minor, Rufous Minor or Tawny Marbled Minor.

5.7 Moth Grading Systems

Many County Moth Recorders have developed grading systems to assist with the verification of difficult to identify species within their counties. Moths are placed in different categories depending on how difficult or easy they are to identify. For more tricky species, additional evidence may be required about the record. In a few cases this will include showing the moth to the County Moth Recorder. The County moth list will be accompanied by a lettered or numbered code, for example:

A = accepted without supporting evidence, easily identified, common locally and already on county list

P = photo, easily confused species photo required

S = specimen, specimen required for species that are not included on existing county lists and where dissection is the only definitive method of identification.

Please check with your local County Moth Recorder to find out if such a system is in place. Sometimes this information is available on the website of the County Moth Group, if one exists for your county.

6. Moth surveys

Knowledge of a species' current distribution is fundamental before effective and targeted conservation action can be implemented. Surveys of rare and threatened species are required to determine their distribution and status both regionally and nationally. Many targeted moth surveys are run locally and nationally. To find out about surveys in your local area contact your County Moth Recorder. National surveys of many nationally threatened species e.g. UK Biodiversity Action Plan (BAP) species are coordinated by Butterfly Conservation.



Goat Moth

Such survey work is required in many parts of the UK, Isle of Man and Channel Islands on a variety of species. Techniques and time of year will vary with species but would probably include daytime fieldwork for adults, light-trapping at night, "sugaring" and searches for larvae, eggs or even characteristic signs of feeding damage.



False Mocha

The distribution of several priority species needs to be clarified in the UK, for example the Goat Moth, Forester, False Mocha, Sloe Carpet, Scarce Vapourer, Small Dark Yellow Underwing and Scarce Pug.

We have only limited knowledge of the national distribution of even some of our commonest moths in the UK, so any moth recording in any part of the country is beneficial. It may be worth approaching wildlife trusts

and local National Trust offices etc. to find out if they want moth surveys carried out on their sites. Many nature reserves do not have comprehensive moth lists.

7. Moth Trapping Health and Safety

Moth trapping is a safe hobby; however, there are a couple of things you should consider. You should make sure that your trap and electrical equipment is in good working order and that you use waterproof connectors. You should avoid looking directly at mercury vapour lamps, because the ultra violet light emitted can damage your eyes in the longer term. On rare occasions MV light bulbs may crack if they are damaged, or if rain falls on a hot bulb. We recommend you use a bulb guard and a rain guard to minimise the potential of this happening. It is not only moths that are attracted to light, biting and stinging insects such as mosquitoes, midges, hornets, wasps and bees can often turn up in your trap.

8. Some recommended sources for moth traps and other equipment

Alana Ecology Ltd

The Old Primary School, Church Street, Bishop's Castle, Shropshire SY9 5AE

Tel: 01588 630173, Fax: 01588 630176

email: sales@alanaecology.com

www.alanaecology.com

Anglian Lepidopterist Supplies (Moths Count Business Friend)

A and J Clifton, Station Road, Hindolveston, Norfolk, NR20 5DE, UK

Tel/Fax: 01263 862068

email: Jon.Clifton@btinternet.com

www.angleps.com

Bioquip

1 Clive Cottage, London Road, Allostock, Knutsford, Cheshire, WA16 9LT

Tel: 08717340111 or international calls +44 1565 722928, Fax: 08717340555

email: pmh@biota.co.uk

www.bioquip.net

B&S Entomological Services

37 Derrycarne Road, Portadown, Co. Armagh, BT62 1PT, Northern Ireland

Tel: 077 6738 6751 or 028 3833 6922, Fax: 028 3833 6922

email: enquiries@entomology.org.uk

www.entomology.org.uk

Watkins & Doncaster (Moths Count Business Friend)

PO Box 5, Cranbrook, Kent TN18 5EZ

Tel: 0845 833 3133, Fax 01580 754054

email: sales@watdon.co.uk

www.watdon.com

9. Key Identification Books for beginners

Bird-dropping Tortrix moths of the British Isles. A Field Guide to the Bird-dropping Mimics, Jon Clifton & Jim Wheeler (2011). Photographs of 59 moths in their natural resting postures are alongside set specimens and key diagnostic features are indicated. Flight-period, distribution and information about food-plants are also included.

British moths and butterflies. A photographic guide, Chris Manley (2008). Featuring stunning photographs of British macro-moths, almost 500 micro-moths and butterflies. Descriptions of broad distribution, flight-times and food-plants are detailed.

Caterpillars of the British Isles, Jim Porter (2010). A reprint of the 1997 publication. A photographic guide to macro-moth and butterfly caterpillars of the British Isles, giving distribution, flight-times and habitats and food-plants for each species. Apollo books.

Concise Guide to the moths of Great Britain and Ireland, Martin Townsend and Paul Waring (2007). Illustrated by Richard Lewington - shows all macro-moths in natural resting postures as well as concise field notes. British Wildlife Publishing.

Field guide to the moths of Great Britain and Ireland (2nd edition), Paul Waring & Martin Townsend (2009). Illustrated by Richard Lewington - shows all macro-moths in natural resting postures as well as detailed field notes. British Wildlife Publishing.

The Colour identification guide to the moths of the British Isles (3rd edition), Bernard Skinner (2009). A comprehensive photographic guide to all macro-moths of the British Isles with moths shown in 'set' (pinned) postures. Gives distribution, flight-times, habitats and food-plants for each species. Apollo Books.

The moths and butterflies of Great Britain and Ireland, Eds. John Heath & A. Maitland Emmet (1976 onwards). Harley. Great Horkesley. A multi-volume series covering micro- and macro-moths, not yet complete.)

10. Specialist Identification Books

A field guide to the smaller British Lepidoptera (2nd edition), A.M. Emmet (1988). British Entomological & Natural History Society. London.

British and Irish moths: an illustrated guide to selected difficult species (covering the use of genitalia characteristics and other features), M.C. Harvey, J. Clifton & B. Goodey (2010). Butterfly Conservation, Wareham, Dorset.

British and Irish Pug Moths. A guide to their identification and biology, A.M. Riley & G. Prior (2003). Harley Books.

British Pyralid moths, B. Goater (1986). A comprehensive photographic guide to pyralid moths of the British Isles, giving distribution, flight-times and habitats and foodplants for each species. Harley Books.

British Tortricoid moths - Cochyliidae and Tortricidae: Tortricinae. J.D. Bradley, W.G. Tremewan & A. Smith (1973). Ray Society. London.

British Tortricoid moths - Tortricidae: Olethreutinae. J.D. Bradley, W.G. Tremewan & A. Smith (1979). Ray Society. London.

Checklist of Lepidoptera recorded from the British Isles (2nd edition), Bradley, J (2000).

This is available from D. Bradley, The Glen, Frogham, Fordingbridge, Hants, U.K. SP6 2HS.

Practical Hints for the Field Lepidopterist (Vol. 23) J.W. Tutt

This book may be of interest with tips for finding specific moths in the days before light traps. However, it uses old scientific names. Written in three parts at the turn of the century (1900 not 2000!), this book has been reprinted because of its scarcity and value to students of Lepidoptera. Parts I to II all give a comprehensive month by month guide to which species and stages of macros and micros to look for and how to find them. Part III also contains an extensive biological account of the early stages and how to keep, rear, photograph (using early 1900's technology!) and describe them. 422 pages. Hardback. (Reprinted 1994). A separate supplement is included (An index to the Modern Names - Vol. 23a), which cross-references old and current scientific names and English names of the species covered.

A number of useful European books are also available which will help with identification of British species. Many counties have published local lists and atlases; these are useful to help you find out what you are likely to come across in your locality.

11. Reference books

Enjoying Moths, Roy Leverton (2001). This book is the only one of its kind about "mothing" - including sections on finding and trapping moths, rearing caterpillars, photography and presenting scientific data. The text is liberally illustrated with line drawings and the author's own superb photographs. T&AD Poyser Ltd.

Moths, Michael Majerus (2002). A comprehensive account of the diverse natural history of these fascinating and popular insects. An examination of all aspects of moths, from their life histories to their role as pests to humans. He covers their reproduction, feeding, evolution, habitats and conservation. The book also discusses the enemies of moths, and the ways they have evolved to avoid detection, including camouflage, warning coloration, and mimicry. Harper Collins Publishers Ltd.

Provisional Atlas of the UK's Larger Moths, L. Hill, Z. Randle, R. Fox & M. Parsons (2010). This book presents up-to date distribution maps generated from the National Moth Recording Scheme for over 850 species of macro-moth. Butterfly Conservation, Wareham, Dorset.

The Natural History of Moths, Mark Young (1997). A broad picture of moth biology and ecology, including breeding, feeding, distribution and life-history, is brought together in this book, using results of amateur study and scientific research. T&AD Poyser Ltd.

12. Book Suppliers

Amazon

www.amazon.co.uk

Apollo Books (Moths Count Business Friend)

www.apollobooks.com Source of the Moths of Great Britain and Ireland series and more.

Atropos books

www.atroposuk.co.uk

Aurelian Books: David Dunbar, 31 Llanvanor Road, London NW2 2AR

Tel & Fax: 020 8455 9612 Email: dgldunbar@aol.com

British Wildlife Publishing (Moths Count Business Friend)

The Old Dairy, Milton on Stour, Gillingham,
Dorset, SP8 5PX Tel: 01747 835511 Fax: 01747 835522

www.britishwildlife.com

Lydie Rigout

1 Hillside Avenue, Canterbury, Kent CT2 8ET

Tel: 01227 769924, Fax: 01227 456013 email: Lr@insects.demon.co.uk

www.insects.demon.co.uk

Natural History Book Service: NHBS Mailorder Bookstore, 2-3 Wills Road Totnes

Devon, TQ9 5XN Tel: 01803 865913 Fax: 01803 865280 Email: nhbs@nhbs.co.uk

www.nhbs.co.uk

Pemberley Natural History Books

18 Bathurst Walk, Richings Park, Iver, Bucks. SL0 9AZ Tel: 01753 631114 Fax: 01753

631115 email: ian.johnson@pemberleybooks.com

www.pemberleybooks.com

Pendleside Books (new, out of print and antiquarian books): Fence, Burnley, BB12

9QA Tel: 01282 615617

Subbuteo Everything for the amateur or serious entomologist. From colourful visual Identification charts to titles devoted to specific families of Lepidoptera and Microlepidoptera.

www.wildlifebooks.com

13. National Societies

Many national societies publish journals covering moth topics which are free to their members, especially Butterfly Conservation and the British Entomological and Natural History Society (BENHS).

Butterfly Conservation

The UK Charity dedicated to conserving butterflies, moths and their habitats through landscape scale projects. Butterfly Conservation is a membership organisation and by

joining us you are helping to conserve these amazing insects. Butterfly conservation publishes its *Butterfly* magazine 3 times a year. The magazine is full of interesting information about moths, butterflies and their conservation.

www.butterfly-conservation.org

Amateur Entomologists' Society (AES)

The AES is an organisation for people interested in insects. The AES produce three publications for its members; the AES bulletin, Bug Club Magazine and Invertebrate Conservation News.

www.amentsoc.org

British Entomological & Natural History Society (BENHS)

The BENHS is an entomological society that runs open days, field meetings and exhibitions. Its journal, the British Journal for Entomology and Natural History, is published four times a year and is free to members.

www.benhs.org.uk

Royal Entomological Society (RES)

The Royal Entomological Society plays a role both nationally and internationally in disseminating information about insects and improving communication between entomologists. Antenna is the free publication available to members of the RES. Along with publicising the activities of the RES, this journal also contains entomological news and reports. The RES publish other journals which are available through subscription.

www.royensoc.co.uk

14. Journals

Atropos

This journal is published three times a year. The central theme of the journal is insect migration, covers all aspects of British Lepidoptera and Odonata are covered including, conservation, identification, biology and field observation.

www.atropos.info

British Wildlife

Six issues of British Wildlife are published each year. This is the “*magazine for the modern naturalist*”. Each edition features among other things a wildlife report on moths written by Dr Paul Waring.

www.britishwildlife.com

Entomologist's Gazette

This journal contains articles and notes on the biology, ecology, distribution, taxonomy and systematics of all orders of insects, but with a bias towards butterflies and moths. It is published quarterly.

www.pemberleybooks.co.uk

Entomologist's Record & Journal of Variation

This journal carries peer-reviewed papers and shorter notes and communications mostly about moths. Journal content ranges widely from descriptions of species new to science

or taxa new to Britain, through to short notes on interesting observations that ought to be placed on record for others to access, or accounts of entomological trips. The journal is published six times a year.

www.entrecord.com

15. Websites

The following websites are full of moth related information and resources. This list will get you started. Further information can be found following the “Links” section where you will be directed to other moth related web sites.

Moths Count

Moths Count aims to encourage interest in moths throughout the UK, Channel Islands and Isle of Man and to run an ongoing National Moth Recording Scheme to improve knowledge and conservation of the 900+ species of larger moths.

www.mothscount.org

Dissection Group

This site contains images of British and European moth genitalia preparations. The content augments information given in text books.

www.dissectiongroup.co.uk

The Garden Moth Scheme

This site provides information on getting involved in the Garden Moth Scheme.

www.gms.staffs-ecology.org.uk

National Biodiversity Network

The National Biodiversity Network (NBN) is the UK's web based route to wildlife information. The NBN Gateway enables people to access biological records and share data.

www.nbn.org.uk

Ordnance Survey Get-a-map

Great Britain's national mapping agency provides accurate and up-to date geographical data. By entering a place name, postcode or National Grid reference you can Get-a-map (up to 1:25 000 scale) for anywhere in the UK.

www.getamap.ordnancesurveyleisure.co.uk

UK Leps

This site is a great online resource for identifying eggs, larvae, pupae and adult moths and butterflies.

www.ukleps.org

UK Moths

UK Moths is an online guide to moth identification. The aim of the site is to illustrate as many species of British moths as possible and to provide this information in an accessible format.

www.ukmoths.org.uk

16. E-Groups

The following groups are web based forums for moth enthusiasts to share moth related information and anecdotes.

Butterfly Conservation on Facebook

www.facebook.com/savebutterflies

Back Garden Moths

Visit www.back-garden-moths.co.uk/forum to register

Gloucestershire Moth Group

To join the group, send a blank email to: Glosmoths-subscribe@yahoogroups.co.uk

Leicestershire and Rutland Moth Group

To join the group, send a blank email to: VC55Moths-subscribe@yahoogroups.com

Migrant Recorders Network

To join the group, send a blank email to: MigrantRecordersNetwork-subscribe@yahoogroups.com

Moths Ireland

To join the group, send a blank email to: MothsIreland-subscribe@yahoogroups.com

Scottish Moths

To join the group, send a blank email to: ScottishMoths-subscribe@yahoogroups.com

UK Moths Yahoo Group

To join the group, send a blank email to: ukmoths-subscribe@yahoogroups.com

UK Lepidoptera

To join the group, send a blank email to: uk-leps-subscribe@yahoogroups.com

Please remember that moth records posted to such website and e-groups will not necessarily be accessible to your County Moth Recorder and therefore will not reach the National Moth Recording Scheme for use in conservation, education and research.

Please ensure that you send all of your moth records to your County Moth Recorder, even if you have also posted them on the internet.

17. Butterfly Conservation Branches

England

Bedfordshire and Northamptonshire	www.bedsnorthants-butterflies.org.uk
Cambridgeshire and Essex	www.cambs-essex-butterflies.org.uk
Cheshire and Peak	www.cheshire-butterflies.co.uk
Cornwall	www.cornwall-butterfly-conservation.org.uk
Cumbria	www.cumbria-butterflies.org.uk
Devon	www.devon-butterflies.org.uk
Dorset	www.dorsetbutterflies.com
East Midlands	www.eastmidlands-butterflies.org.uk
Gloucestershire	www.gloucestershire-butterflies.org.uk
Hampshire and Isle of Wight	www.hantsiow-butterflies.org.uk
Hertfordshire and Middlesex	www.hertsmiddx-butterflies.org.uk
Kent	www.kentbutterflies.org
Lancashire	www.lancashire-butterflies.org.uk
Lincolnshire	www.lincolnshire-butterflies.org.uk
Norfolk	www.norfolk-butterflies.org.uk
North East England	www.northeast-butterflies.org.uk
Somerset and Bristol	www.somerset-butterflies.org.uk
Suffolk	www.suffolkbutterflies.org.uk
Surrey	www.surreybutterflies.org
Sussex	www.sussex-butterflies.org.uk
Upper Thames	www.upperthames-butterflies.org.uk
Warwickshire	www.warwickshire-butterflies.org.uk
West Midlands	www.westmidlandsbutterflyconservation.org.uk
Wiltshire	www.wiltshire-butterflies.org.uk
Yorkshire	www.yorkshirebutterflies.org.uk

Scotland

South West Scotland	www.southwestscotland-butterflies.org.uk
Highlands and Islands	www.highland-butterflies.org.uk
East Scotland	www.eastscotland-butterflies.org.uk

Wales

North Wales	www.northwalesbutterflies.org.uk
South Wales	www.southwales-butterflies.org.uk

Northern Ireland

Northern Ireland	www.bcni.org.uk
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18. Local Moth Groups

Argyll Moth Recording Group
Bedfordshire Moth Group
Berkshire Moth Group
Caithness Moths
Cheshire Moth Group
Cornwall Moth Group
Derbyshire & Nottingham Entomological Society
Devon Moth Group
Dorset Moth Group
Dumfries and Galloway Moths
Essex Field Club
Glamorgan Moth Recording Group
Hampshire Moth Group
Hertfordshire Moth Group
Huntingdonshire Moth and Butterfly Group
Kent Moth Group
Lancashire Moth Group
Monmouthshire Moth and Butterfly Group
Montgomeryshire Moth Group
Moths Ireland
Norfolk Moths
Northamptonshire Moth Group
Northumberland Moths
Scottish Moths internet discussion group
Somerset Moth Group
Staffordshire Moth Group
Suffolk Moth Group
Sussex Moth Group
West Midlands Moth Group
Worcester Moth Group
Yorkshire Naturalists Union
Harrogate and District Naturalist Society

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www.mothscount.org