Anglian Lepidopterist Supplies

Specialising in moth traps and related equipment

ALS Beginners Guide to Moth Trapping

2nd Edition

Contents

1. Trapping in your Garden

The study of moths through the use of non-lethal light traps is a fascinating and rapidly growing hobby. Putting a moth trap out in the garden at dusk, and going through the catch in the morning is an easy and enjoyable way to study the range of insects visiting your garden. We are all used to the ten or so butterflies that visit most gardens, but the diversity of other lepidoptera which is using your garden may come as a surprise. Even urban gardens should attract well over 100 species during the year, with more favoured gardens easily achieving lists of 200-300 species per year. The peak months are July and August when nightly catches of several hundred moths can be expected, and for the beginner the range of species is at first site daunting. However, an hour or two with a copy of Skinner will usually sort out the majority, and having seen the species once things can only get easier!

In order to maximise the variety of moths occurring in your garden a variety of strategies can be adopted. One key to success is to establish as wide a range of (native) plants as possible. These will act as food plants for larval stages, and hopefully give rise to a wider variety of moths in future years. Obviously, traps situated in more mature gardens tend to do better than new gardens, since a wider range of plants are available. In goes without saying that the use of pesticides should be discouraged! If you want to catch moths, you may have to accept that some of your plants are going to suffer some caterpillar damage. Remember that the majority of adult moths are nectar feeders and hence scented flowers will often help to increase the size of catch. Nicotinia and Night-scented Stock are both widely available from garden centres as annual bedding plants, and both release their strongest scent during the evening and night-ideal for the moths. On a slightly larger scale, Honeysuckle is also a good attraction species, since it is also strongly scented during the early evening.

In small gardens, traps should not be run every night unless the moths can be released elsewhere. Running traps on successive nights in small areas will result in re-trapping a small proportion of the moths you released that day. This prevents the moths from feeding and from mating. By running the trap every other night, moths are given a chance to `do their own thing' every so often. In larger gardens where the moths can be released well away from the trapping site, this restriction does not apply. However, moths will respond to light traps at considerable distances, and we recommend that catches be released at least 50M away from the trapping location. When releasing catches, think about the release site. Ideally you should provide a site which is relatively overgrown, giving the moths somewhere to hide during the day. Concentrating large numbers of moths in one area on release should also be avoided. It's good for the local bird population, but not so good for the moths! If the trap has to be left before unloading, for example because you don't have time to unload before going to work, the trap should be moved into a cool, shaded position. The addition of a small piece of damp cloth or sponge to the bottom of the trap will also help prevent casualties from dehydration. Geometrid moths should, when ever possible, be checked early in the morning. Once the temperature warms up, some will disappear as soon as the lid is removed. Consequently, emptying the trap in the shed or other convenient room is also recommended. That way, the prize specimen can be captured in a pot against the window as it makes a break for freedom. However, don't blame us if you unload a trap full of Silver Y moths (which are daylight fliers) in your living room and spend the next week trying to re-catch them!

2. Moving Further Afield

For most mothers the garden list is the most important list of moths we keep. However, although most gardens will yield a list of 200+ species, that still leaves another 600 odd species to see. The key to finding new species is to venture further afield and try some new habitats. NEVER trap on a site without first obtaining permission. The majority of local nature reserves maintain a bird list, a butterfly list and a dragonfly list, but know very little about the moths that occur on the site. Consequently a chat with the warden will usually yield permission to trap on a regular basis. If you manage to obtain permission to visit a site, please remember to send in all records both for individual sessions and for the year if visiting regularly. If the site is overlooked from public areas, or overlooks the coast, a call to the police and/or the coast guard is also advisable. Members of the public seeing bright lights in unfamiliar circumstances will sometimes notify the police, and if you have forewarned them, they will not have to visit, and can reassure the concerned person who places the call. Similarly boats may report bright lights on the coast, and a call to the coast guard can prevent any problems arising.

Trapping at home is straightforward. The trap is run off the house mains with the cable going through the window. When trapping away from home base, the question of power supplies arises. If you're very lucky, the warden will allow you to use on site power, although usually you will be expected to `bring your own'. Even if using on site power, some form of portable power source is always useful enabling you to visit different habitats in remote corners of the reserve. Two options are available. The use of actinic tubes as opposed to MV bulbs allows the trap to be powered from a 12V-car battery. Actinic tubes are low current devices, although they do require a high voltage to initially strike. Consequently, the electrics are slightly more complex, but are still easy to wire up yourself. Our design of a portable Skinner trap uses a removable central light board. Hence, it is straightforward to build two light boards for a given trap; an MV board for use in the garden, and an actinic board for use in remote sites. Such an arrangement has the advantage of being lightweight (and hence easily portable), and relatively cheap. However, an actinic light source will reduce the numbers of moths caught. Typically, such a trap will catch about 40%-50% of the number of moths of an MV trap, with a slightly less drastic reduction in the number of species since some species appear to be more attracted to actinic than MV traps. For reasons not fully understood, this is particularly true of geometrid moths.

The second possibility is to buy a generator. This is the more expensive option, the less portable option (generators are not lightweight devices), but the most effective option for catching moths. A 650W generator will comfortably run three correctly wired MV traps. A 650W generator will provide 650/240 = 2.7A. Running a 125W MV trap with a choke and bulb, the trap will draw 1.15A, and hence the generator will only comfortable power two traps. Addition of a power balancing capacitor will drop the current taken by the trap to 0.7A, allowing three to be run with no problem. The figures for an 80W MV trap are 0.8A dropping to 0.4A for a balanced system. Hence the 650W generator will power up to six 80W traps. Generators have been regularly run with upwards of a 30% overload with no apparent ill effects. However, we strongly recommend staying within the manufacturers specifications when designing a mobile trapping system. Tank capacities vary, and the petrol consumption of the generator will also vary with load. If the traps are to run all night, the tank on the generator will need topping up from time to time. If the tank becomes empty, and the generator turns itself off during the hours of darkness virtually all your catch will

escape. In addition remember that since the resistance of MV bulbs varies with temperature, a hot MV bulb will not re-light. In the event of a generator or power failure to a trap, it will usually take a few minutes for the bulb to cool down and re-strike. Small portable generators are also desirable items. The noise of a generator together with the presence of strange blue lights may well attract people to the site, and unattended generators could have a habit of going missing. Consequently, you should take every precaution to secure generators when in operation. Heavy-duty chain and padlocks are available from most hardware stores, and the generator should be secured to a large immovable object. While this will deter the casual thief, be warned that the determined thief will return with heavy duty bolt cutters. Regardless of how you secure your generator, if someone REALLY wants to steal it they will. It is therefore advisable to remain on site with your equipment whenever possible, particularly in more public places.

Although a 650W generator will power three 125W MV traps, thought should be given to the placement of traps. A single trap may attract moths at distances of 50M or more, and hence in open sites where traps are in line of sight with each other a separation of at least 100M should be maintained. Two traps placed close to each other will usually attract a combined catch smaller than a single trap run at the same site. If you watch the reaction of moths around a trap, one possible reason for this suggests itself. The larger moths tend to power past an MV trap, before turning and repeating the procedure. Often they will land on the ground or surrounding fences and walls. After repeated passes they will eventually fly straight into the bottom of the trap. Presumably the presence of two traps close together results in the moths flying backwards and forwards between the traps. Moths that land in between the two traps would then tend to stay put rather than being attracted back to a single lamp. Even when well spaced, a number of moths will be found outside the trap. You should therefore develop the habit of checking surrounding vegetation, walls, fences etc. for roosting moths when checking a trap. Although on open sites a minimum distance of 100M between traps is advised, on more heavily overgrown sites a smaller spacing can be used with good effect. When considering the placement of traps, you should try to establish them in areas where the bulbs can shine into as much habitat as possible. However, some moths rarely stray far from their food plant in which case traps will need to be established closer to relevant vegetation. Indeed, to trap Shaded Fan-foot it may be necessary to actually place the trap inside bramble bushes, since the moth rarely ventures away from the food plant! When siting traps, remember that traps placed close to water sources will usually be less productive due to the cold air and mist that may arise from the surface of the water overnight. However, this should not put you off since many moths will be found associated with waterside plants, sedges and reeds.

Remember that a generator is producing a 240V AC output, and a 650W generator is therefore capable of delivering about 2.7A. In inclement weather it is therefore very important to waterproof all connections. Plastic washing up bowls, plastic buckets and particularly Tupperware sandwich boxes all play important roles in the mobile mothers kit and should be used to cover all connections, sockets and plugs. Chokes will run hot, and hence should not be placed in enclosed plastic boxes. Allow space for air to circulate. The majority of generators are waterproof, but usually only provide standard three pin wall sockets for output. Water seepage into these sockets can again create dangerous conditions. The use of large fishing umbrellas to protect generators from the rain is therefore a sensible precaution. In general, if you are in

any doubt as to the safety of your electrics DONT use it, and consult a professional electrician. One final word of warning: Actinic tubes run relatively cool, and hence can normally be used unprotected on wet nights (provide your electrics are waterproof), but MV bulbs run hot, and being made of glass are not suitable for use on wet nights unprotected. Drops of rain hitting the hot glass will often case the bulbs to crack. Usually MV bulbs will still operate when the outer glass envelope is cracked. However, it is dangerous to use bulbs in such a condition. The outer glass envelope filters out harmful UV radiation. Using a bulb with a damaged outer cover can seriously damage your eyes. Damaged bulbs should therefore be thrown away immediately and replaced with fresh bulbs. MV bulbs should therefore be protected with heat resistant glass cover-Pyrex dishes being the most popular.

3. The Effectiveness of Various Moth Trap Designs

The Robinson moth trap is the standard against which other moth traps are compared. At peak times of the year catches or 500-1000 moths a night are possible, and the site of up to six species of Hawk moth in a trap is spectacular. The Skinner trap uses the same electrics as the Robinson and hence will attract a similar number of moths. However, it is less efficient at holding moths than the Robinson, although the addition of things such as flaps to the bottom of the perspex sides will narrow the gap between the two types of trap. The major advantage of the Skinner is the price and the portability. We are able to offer Skinner Traps at under a quarter of the coast of a Robinson trap. In addition, Skinner Traps are easily collapsed when not in use making them idea for trapping away from the garden, when traps, electrics, generators etc. take up more boot space in the car than you would imagine. Neither of these traps requires the use of a killing agent, but both do require a 240V-power supply necessitating the use of mains electricity or a generator.

The actinic trap is even more portable. Actinic tubes will run off a 12V battery, and hence you do not have to transport generators around with you. They again suffer from loss of catch, and are less efficient at attracting moths as well. However, they do offer a cheap way to begin mobile moth trapping.

Perhaps the easiest way to begin moth trapping is to suspend the light source over a large white sheet. This is also great fun as you can watch the moths arrive at the trap. Obviously no attempt is made to hold the catch, and hence you must stay with the trap all night, potting the moths for inspection as they arrive. On busy nights many moths will be missed, and the risk of double counting is high, and hence such traps should not be used for accurate survey work. However, they do provide a good introduction to mothing, and are usually very social traps, with people racing round like lunatics trying to catch the `prize' specimen before it flies off never to be seen again! The rate of arrival at such traps will depend upon the light source used. If illumination is provided by an MV then arrival rates will be similar to the Robinson and Skinner traps (1000 moths a night sitting on a white sheet is a lot to catch!) while if using actinic light sources the catch will be correspondingly closer to that of a Heath trap.

4. Building Your Own Moth Trap

Anyone able to handle a saw can cheaper build his or her own Skinner style moth trap. The ALS design is a modified version of the basic Skinner pattern. It is best constructed from 5mm thick exterior ply. This should be wood stained/varnished/painted for extra durability. The basic plans for construction are as follows:

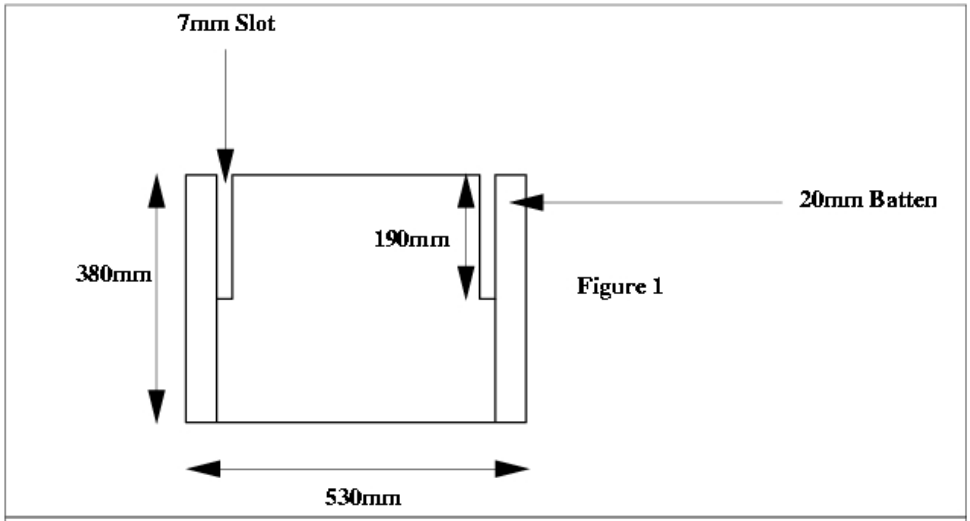

Figure 1

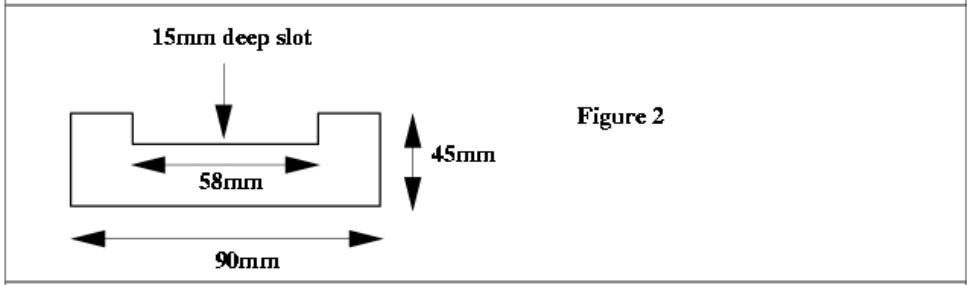

Figure 2

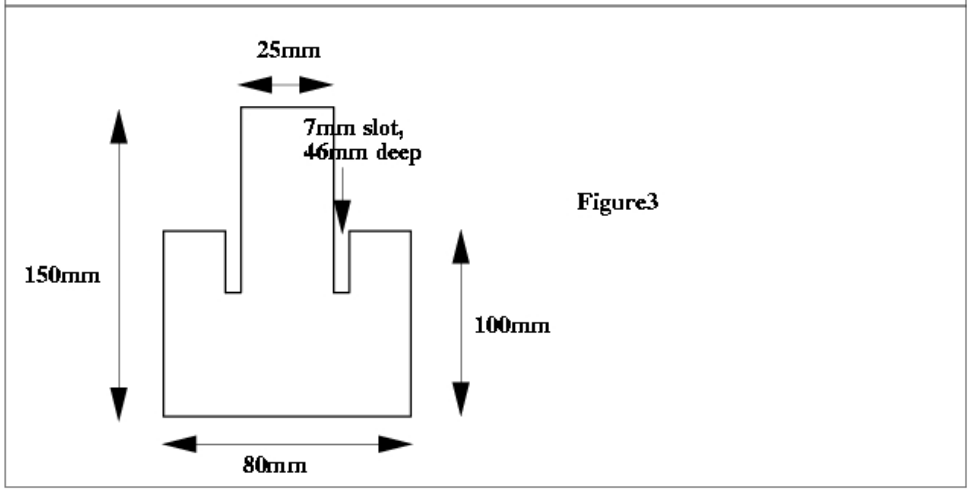

Figure3

Begin by cutting four rectangular pieces 380mm X 530mm which will form the four sides of the trap. 20mm in from each of the short edges cut a 7mm slot of length 190mm. Then attach a length of 20mm X 20mm battening to each of the short edges. You now have four sides as shown in figure 1, which can be slotted together, to form a box: the basis of the moth trap.

From 20mm thick timber cut two pieces as shown in figure 2. This will form the support for the light board.

From 20mm thick timber cut two pieces as shown in figure 3. These will form the support for the perspex covers of the trap.

Attach the pieces from 2) and 3) to two opposite sides of the box. The pieces should be attached to the inside face of the box, with the light board holder being located 90mm below the top edge of the sheet and the perspex holder bing a further 90mm below the bottom of the light board holder.

Cut a 475mm length of 55mm X 20mm thick timber to form the light board. Drill two holes in the board. One should be central to take the cable to the light holder. The second should be towards one end to enable the cable to be threaded through the light board. The bulb holder is then attached centrally to the board and wired up.

Cut two pieces of perspex 475mm in length by 45mm in depth. These will form the vertical baffles of the trap and can be dropped into the vertical slots in the blocks cut in 2.

Cut two pieces of perspex 475mm long to form the slopping sides of the trap. The width of the perspex sides can be adjusted, but should be approximately 370mm.These can now be fitted to form the sides of the skinner trap. The final trap should appear as shown in figure 4.

Figure 4: The Finished Skinner Moth Trap

5. Pests and Other Non-Moth Species

The same principle that attracts moths to moth traps will often also attract other insects. Typically this will be large number of lacewings, shield bugs and ichneuman flies. None of these presents particular problems, although they can be annoying if you are emptying the trap indoors.

Occasionally dragonflies and butterflies will also be found in the trap. More serious are three pests that show up in regular numbers. Firstly, MV traps seem to attract

numbers of large beetles. Giant Diving Beetles can bite, but the more regular burrowing beetles, which are either black or black with orange stripes, should be avoided. They are carrion feeders, and consequently smell terribly! If you get the smell on your clothes it can take a long time to get rid of, so such beetles should be removed from the trap with care.

The most serious pests are wasps and in old deciduous woodland Hornets. First thing in the morning, both wasps and Hornets are generally docile and can be removed from the trap with little trouble. However, on warm mornings the insects will be more active and greater care should be exercised. In addition, wasps will occasionally kill moths within the trap, and Hornets will eat large numbers of moths leaving you with nothing but bits of wing in the bottom of the trap. Since the MV trap is concentrating moths from the surrounding area into the trap, such loss can be serious and should be avoided if possible. If you know you are near a Hornet's nest trap elsewhere.

Finally, when trapping regularly (particularly in your garden) be aware that birds will quickly learn to exploit the moth trap as a source of food. When operating a moth trap, you will usually find a number of moths on surrounding vegetation, fences and walls, as well as inside the trap. Moths that are outside the trap can become a target for Blue Tits, Wrens and Blackbirds. You should therefore try and check the locality as early as possible in the morning to prevent loss of potentially interesting species. After all, Merville du Jour, the prize of the autumn, is more regularly found outside than inside the trap.

6. Sugar Traps and Wine Ropes

Another approach to the capture of moths for study is the use of sugar traps and wine roping. In this approach, a strong, sweet mixture is painted onto posts, fences or trees, or an impregnated rope is draped over suitable supports. Moths will visit the `trap' to feed, and can then be potted for examination. Light traps will attract the greatest variety of moths, but some species, which are very rare at light, can be found more frequently by sugaring e.g. Old Lady.

The simplest form of sugaring consists of the use of rotting fruit as an attractant. A netting bag can be suspended over the bait, and the moths will be attracted to the fruit by scent, will feed, and then be captured in the trap. This is the classic method of trapping some tropical butterflies, but can also be used for moths in this country.

Alternatively sugaring can be tried. To make a sugar solution, place approximately ½ a pint of beer (stout works well) in a saucepan together with about 1kg of brown sugar (unrefined sugar is good, and dark molasses sugar is even better) and about 0.5kg of dark treacle. Bring the mixture to the boil stirring continuously to dissolve the sugar and treacle into the mixture. Simmer for about five minutes, and then remove from the heat and allow to cool. While, the mixture cools, a scum will form on the surface. This is sugar crystallising out of the solution, and it should be stirred back into the mixture. When completely cold, the mixture can be transferred to a suitable storage jar (old coffee jars are good). The mixture is applied to fence posts, tree stumps and other convenient surfaces, and should be checked for feeding moths throughout the night.

The principle problem with sugaring is that the mixture leaves sticky residues on the treated surfaces. These can be a problem if trapping in areas popular with the general public. If a visitor leans against a sugared post it will create a nasty stain. Instead of sugaring you may therefore wish to try wine ropes. A similar mixture is made,

substituting the ½ pint of beer for a bottle of cheap red wine. (You can use vintage claret if you like-but cheap wine is easier on the pocket!) This will produce a runnier mixture which should be transferred into a sealable bucket. Paint kettles available from most DIY shops are ideal. A few short (couple of feet) lengths of clean cotton rope are then immersed into the liquid and left to become impregnated with the solution. To use the wine ropes, the lengths of rope are removed from the bucket, given a quick shake to remove excess, and then draped over tree branches, fence wire etc. Rubber gloves are recommended as this is a messy process. Moths will alight on the roped to feed during the night. When the session is finished the ropes are collected up and returned to the paint kettle leaving very little mess behind.

Both sugaring and wine ropes will attract moths in roughly equal numbers. However, the success of the technique is very variable. Some nights will produce lots of specimens while on others the sugar will be ignored. It seems that warm humid nights with a light wind are best for sugaring (as they are for most forms of mothing), but the technique will also work on far from ideal nights, and not work on nights that seems good for no apparent reason. To further increase the effectiveness of both sugar and wine ropes, add a few drops of rum and/or amyl acetate (smells like pear drops) to the solution before use. Banana essence used for baking cakes also seems to be effective. If you are retaining specimens caught at sugar to pin, they should be retained for a few days in the fridge before killing and setting. Otherwise, such specimens are very prone to greasing (see section 10 for a full discussion of this problem).

7. Daylight Flyers, Larva and Other Non-Light Based Techniques

Remember that there are a number of moth species which daylight fly, and hence will not be encountered in a light trap. Burnets and Clearwings, and species such as Mother Shipton fall into this category. For these species, a daylight search of the relevant habitat with a net will usually locate the moths. Similarly, many geometrids fly at dusk, when light traps are less effective due to residual light giving less contrast with the light from the trap. Hence, when trapping it is usually advantageous to establish the traps well before dusk, and then search the area as dusk descends, again, using a net, if you wish to compile a complete record of the moths visiting a given site.

During daylight hours a number of other techniques are also available. Searching fence posts can often be rewarding. On a recent trip to Scotland, the only Ringed Carpet seen during the trap was found sat on a post during the afternoon. Moths such as Light Knot Grass and Belted Beauty can also be found in this manner in the correct habitat. Any shops, hotels, petrol stations and lavatory blocks that leave the lights on all night are also worth checking during the day.

Larval searching can also be rewarding, and for some species is the best way of seeing specimens. Moths such as the Chestnut Coloured Carpet rarely come to light and are best found in the larval stage. The Fox Moth is another species which is seen in much larger numbers in the larval stage. Two main methods of searching for larval are available. Firstly, beating can be very successful. A beating tray can be constructed from a white sheet stretched across canes, can be purchased, or in extreme circumstances replaced by an up side down umbrella! This is held underneath a suitable branch of a tree or small shrub, and the branch is given a sharp blow with a blunt object. The handle of your butterfly net works well if nothing else is available. Larva will then be dislodged and will fall onto the tray where they can be examined

and identified. The colour identification guide to caterpillars by Porter is essential for this task.

The second principle method of finding larva is the use of a sweep net. This is a heavy-duty version of a standard butterfly net, with both the frame and the bag being beefed up and reinforced. The net is swept backwards and forwards through the top of the vegetation (typically heather, bilberry, bog myrtle etc.) dislodging larva which can then be removed from the net and examined. In emergencies, you can use your butterfly net, but be warned, the frame will quickly bend, and more usually, the net will snag and your finish up with a hole in the fabric. However, if you have left the sweep net at home it can work. Many larva are only active by night, and so it is worth sweeping and beating during darkness as well as during the daylight hours. The big advantage of combining larval work with visits to remote sites is the ability to see species with widely differing flight times on a single visit. A trip in late spring will be good for adults and for the larva of a number of species which will be on the wing in the autumn.

In addition to macro-moths, a light trap will also attract many other moth species which are not covered in Skinner-The micros. However, the standard traps are less efficient at catching micros than macros. Pyralids, Plumes and Tortrix are the usual types encountered. In general the micros are harder to identify than the macros, and hence, it is wise to become accustomed to the macros before starting on the micro moths. However, be aware that you can not distinguish micros and macros merely on size. When one of us first started, he was releasing lots of Marbled Beauty every morning in the belief that they were `just a pretty pyralid'! A copy of Goater's book on British Pyralid moths will usually help to prevent this occurring. The many very small micro moths found in Britain are usually very difficult or impossible to identify in light traps. They are better located by searching food plants for the larval stages.

8. Killing Agents and Identification via Genitalia Examination

The beginner usually concentrates on macro-moths as illustrated in Skinner. With the aid of this 'lepidopterist's bible', the majority of moths caught will be readily identifiable. However, even within this well studied group there remain a few species or species groups which can not be easily identified. Minor's, Ear's, Lesser Common Rustic and Common Rustic and November Moth, Pale November Moth and Autumnal Moth are the classic examples. For these species it is necessary to resort to genitalia dissection to firmly establish the identity of the moth. Although many people will be happy to record the moths as Common Rustic sp. for example, some people may wish to positively identify specimens. Moths can be keep alive for periods of several days if placed in the refrigerator, allowing second opinions to be taken. However, for the species mentioned above, the only sure way to identify the moth is to kill it, and do a dissection. Usually the moths will die quickly if placed in the freezer. Alternatively a simple killing jar can be constructed from an old coffer jar. Place cotton wool in the bottom of the jar, add a small quantity of ethyl acetate, and then place a round cardboard disc over the cotton wool to prevent moths coming into contact with it. Moths placed in the jar will quickly become stationary. However, they should be left for at least 20 minutes to ensure they are dead (longer with larger specimens). The moths can be removed from the jar and should be sufficiently relaxed to set immediately. Ethyl acetate will dehydrate moths, and hence specimens should not be left in the jar for too long or they will become stiff. Alternatively, moths can be killed using ammonia. This does not stiffen moths to the same extent as ethyl acetate,

and is a better killing agent for most micros and geometers. However, it does tend to discolour green moths by turning them brown! The moth should then be allowed to dry out, and the genitalia plate can be removed and inspected. Hopefully, by retaining positively identified specimens, new field marks allowing identification of live moths may be found.

The reproductive organs are contained on a hard plate in the lower half of the insect's abdomen, the males usually in the 8th or 9th segment and females in the 7th, 8th and 9th segments. The features of the female genitalia are more difficult to work from, but the features of the male genitalia are much larger and hence easier to work with. To inspect the genitalia, you should begin by removing the abdomen of the specimen. This can be done with freshly dead specimens, but in general it is easier to work with long dead, dry specimens. The abdomen is removed by applying upward pressure to the tip of the abdomen which should then snap off. Occasionally, the hind wings of set specimen will also be removed. These can be glues back into place with insect body cement. Place the removed abdomen in 20% Potassium Hydroxide solution. The solution can then be placed on a 40W light bulb to provide bottom heat. The abdomen should be left in the warm solution until soft, which can take anything up to one and a half hours for larger specimens, but typically only about 20 minutes for the smaller moths. Do not attempt to provide any more heat than that provided by a 40W bulb. This will result in the solution boiling, and spitting which can be dangerous. With the abdomen now softened, it can be transferred to a watch glass or petri dish filled with water. The addition of a few drops of alcohol will lower the surface tension of the water and make working with the plate easier. The genitalia plate can then be gently stroked out. This is achieved by holding the top (open end) of the abdomen with either a dissection needle or a seeker. A seeker is then moved down the abdomen towards the tip with gently stroking motions. You should try and keep the specimen covered with fluid while extracting the genitalia plate to prevent air bubbles entering the organs. As you stroke the abdomen, the genitalia plate will pop out of the tip of the abdomen. The plate is fairly robust and can then be gently held in place while remaining debris is cleaned away. The ideal tool for cleaning genitalia plates can be formed from the pinfeather of either a snipe or woodcock. (Have a word with a local game dealer and you can sometimes obtain them). Mounted on a suitable piece of dowel, this forms a superb brush for cleaning debris away from genitalia. However, make sure you have rinsed the plate in a petri dish of alcohol/water before using your brush. Potassium hydroxide will dissolve it! Cleaning and examination can be done by eye for larger moths, but a binocular stereo microscope will make life very much easier and is essential for the smaller specimens. The cleaned plate can now be transferred to a petri dish of water and given a final rinse before examination. A number of standard guides give details of the genitalia of difficult species. We also offer various photographs of prepared plates were available.

For female moths a slightly different technique is required. As the tip of the genitalia plate starts to emerge from the abdomen, it should be examined. The moth can then be sexed as you will either see the claspers of the male moth or the tip of the anal propeller in female specimens. If the moth is a female, the skin of the abdomen should be carefully cut all the way around the abdomen about three segments back from the tip. This can be done with a dissecting needle. The whole tip of the abdomen is then removed. The bursar of the female moth will come with the tip. The remaining collar of skin can then be cut length wise and peeled away from the genital plate. If you try

and squeeze the female genitalia out of the tip of the abdomen, usually the bursar will break off from the rest of the genitalia.

If you wish to preserve the genitalia as a reference sample, then you should prepare either a temporary or permanent mount. For a temporary mount, a few drops of aqueous mountant can be run off a glass rod onto the plate, and a cover glass is then gently lowered into place. For a permanent mount more care should be taken. Firstly, air bubbles will invariably be present somewhere within the genitalia structure. This should carefully be removed by use of the dissecting needles. The structure consists of a set of hollow tubes, and the air bubbles can be manoeuvred around within these tubes until they arrive at an opening when they can be removed. When the bubbles have been removed, the plate is transferred into isopropyl alcohol. This is a dehydrating agent. The plate should be held in position (e.g. with the claspers apart for male moths) and the plate will gradually harden and set. At this stage the plate is fragile and care should therefore be exercised when moving the plate around. Next, the plate can be stained in an alcohol based stain (if required)-cholorazal black being the most widely used. Staining will often enhance subtle, difficult to see features. However, caution is urged since over staining will obliterate those same features. The plate is then transferred into euparal essence and left to wet. A few drops of euparal can then be placed on a clean slide (give then a wipe with isopropyl alcohol to remove grease) and the plate is lowered into position and sealed with a cover glass. When placing cover slips, the rear edge should first be placed in contact with the slide. The front edge is then gently lowered. This helps to prevent air bubbles forming in the mountant. The slide and the specimen should be clearly labelled with a unique number that ties the two together. A data label giving the species details should also be attached to the specimen. Remember that a museum has been described as a set of useful labels, occasionally with specimens attached!

9. Setting Moths

If a moth is to be retained as a specimen, then it should be killed as soon as possible. However, moths should only be taken for valid reasons, and in particular for further study as reference material. Please do not collect specimens for the sake of adding another specie to your collection. Freshly killed moths can be set immediately, but older dried specimens will need to be relaxed. This is achieved by either placing the dead moth in a plastic container containing a few freshly chopped laurel leaves, or by using a specialised relaxing box. The leaves are placed in the bottom of the container and covered with a piece of paper. The moth is then placed on top of the paper and the box is sealed. Do not use adsorbent kitchen paper in the relaxing box. This will adsorb moisture from the moth, which can then be transferred back to the moth. This process can lead to mould growth on the body of the moth, ruining the specimen. The moth should take about two days to relax, but should be checked regularly for mould formation. If left in the relaxing jar too long, discoloration can occur, particularly to the green moths. If using a relaxing box, relaxing fluid should be used. This is basically water with a few drops of phenol added to prevent mould growth.

Once the moth has fully relaxed it should be pinned and set. Begin by placing a pin through the thorax of the insect. Three types of pins are available, but English pins (brass plated with heads) and stainless steel pins are the most popular. The stainless pins are available in a variety of lengths and are corrosion resistant. However, the moths do have a tendency of becoming loose on the pins after setting. The moth should then be placed in the correctly sized setting board, by inserting the pin

centrally into the channel of the board. The moth should be positioned so that its body lies level with the top of the board, allowing the wings to be set in a horizontal position. The wings are then moved into position by pushing against the costal vein close to the thorax. The leading edge of the forewing should be brought up to be at right angles with the body, and the hindwing is then brought up beneath it. You should aim to produce a nice symmetric arrangement, as asymmetrically set moths with look peculiar in your collection. The antennae should also be straightened. Setting paper is then placed over the wings. In general two strips are used. A narrow strip will hold the wings in place initially, and finally a wider strip is placed to completely cover the wing. This prevents the edges curling and becoming damaged during setting. The paper is held in place by pins, with glass headed map pins being the most popular. The whole setting board is then placed in the airing cupboard for about two weeks to allow the moths to set in position. The boards can be placed in a sealed cardboard box (I use an A4 paper box) with naphthalene and vapona added to prevent pest attacks.

The moths can then be transferred to a museum box or specimen cabinet. All specimens should be clearly labelled, since an unlabelled specimen is of no use for further study. Pest attack of the mounted specimens is highly likely unless preventative measures are taken. The main pests are lice, beetle larvae and mites. A few crystals of naphthalene should be place in each draw of the cabinet or in each museum box. This gives off a strong scent, and an alternative is to include a small piece cut off a block of solid fly killer (vapona) in each storage device. Cabinets made of cedar seem to be much less prone to attack since the small of cedar wood is a natural insect repellent.

10. Specimen Maintenance and Repair

No matter how careful you are with set specimens, accidents will happen. Some, such as greasing are unavoidable, particularly with moths that feed internally in the larval stage. Others are more avoidable such as dropping a pair of forceps into your store box on top of large numbers of carefully retained, set, dissected and identified specimens. I’ve done this once, and the result is heart breaking as wings, antennae and legs fly in all directions. After a great deal of bad language, the situation can usually be rescued by some careful work with insect glue.

The first problem that can strike a collection of stored moths is attack by insect pests. Museum beetles will always managed to attack a collection left unprotected. Always place naphthalene into camphor cells in each store box/draw of your cabinet, and check the level from time to time. If you forget to refill the cells, disaster awaits! However, provided the infestation is found quickly, there are ways to remedy the situation. Naphthalene is only a deterrent to insects, not an insecticide. If a collection has beetle problems, charge all the camphor cells with para-dichlorobenzene available from most entomological suppliers. This is an insecticide and will quickly kill of the destructive beetle larva. (Strips of a solid fly killer such as Vapona can also be used to cleanse a collection). Personally, I keep my camphor cells full, and also pin a strip of Vapona inside each store box, and so far I have had no problems with beetle damage.

The second major problem that can strike is greasing. Unfortunately, there is nothing you can do to prevent a grease attack, and some species are more prone to such attacks than others. Moths taken at sugar can be problem as are most species in which the larva feed inside plant material. It can also be caused by the killing process, since ethyl acetate which is widely used as a killing agent is also a fat solvent. Grease first

shows itself as a ‘wet look’ to the abdomen of specimens which if left unchecked will spread, and eventually coat the wings producing a very poor looking specimen. Since the problem is common, it is fortunate that the problem is relatively easy to cure. If only the abdomen of a specimen is effected, it should be removed and soaked in ethyl acetate for anything from several hours to several days in extreme cases. When clean, the abdomen can be glued back into place. Ethyl acetate remember is a fat solvent, and will dissolve the fat which is causing the grease attack. If the ethyl acetate become tinged brown while degreasing a specimen, it should be replaced with fresh solution. If the grease attack has spread further, the whole specimen can be immersed in ethyl acetate. However, great care is needed to achieve total immersion. Do NOT simply try and sink the specimen. The surface tension of the cleaning fluid will cause the wings to snap off. Instead, the specimen must be submerged edge on (wing tip first). The easiest way to achieve this is to place a spiked block (available from florists as a base for flower arranging) into a coffee jar. Fill the jar with fluid and then carefully immerse the specimen, holding in upright between the spikes in the bottom of the jar. Leave until the grease has dissolved which should take a few hours up to a few days. When clean, the specimen can be removed and allowed to dry naturally. A final brush up of the hairs along the abdomen and the specimen will look good as new. However, be warned-in many cases the grease will re-appear. It may take months or years but rest assured, the grease will return.

The final problem that can strike a collection is breakage. This is usually accident, but may be deliberate if, for example, an abdomen has been removed to de-grease. The main thing to do when a breakage occurs is stay calm- rash actions at this stage can make the problem much worse. A steady hand, patience and adhesive are the key to solving the problem. Three types of glue are needed to achieve most repairs-a body cement, a wing cement and clear nail varnish. Each has an important role to play in restoring specimens. For body repairs such as replacing abdomens, a small quantity of body cement is placed on the broken surface of the pinned specimen, and the piece that has broken off is carefully offered up. When you are happy with the placement, support the abdomen with a pair of crossed pins and leave the specimen to dry for about 24 hours. If several abdomens have been removed in the same cataclysmic event, please exercise great care in replacing them on the correct body. In a hundred years time, someone may come to dissect your specimen and will be very confused if the abdomen of a Common Wainscot has been glued onto the body of a Shuttle-shaped Dart! If in doubt, the abdomens should be left off the specimens, so a wrong repair will remove much of the value of the collection. Wings broken at the base, heads, and legs can all be treated in the same manner. However, when repairing wings, the specimen is best returned to a setting board to support the wing. Be careful about the amount of glue you use- if you cement the wing to the setting board you are in real trouble!

The trickiest repair to achieve is antennae breakage. For a basal break (e.g. the antennae has snapped off the head at its base), it can be reattached using insect body cement. The specimen is usually best returned to a setting board to achieve this in order to support the antennae while the glue dries. Extreme care is needed to handle broken antennae since when dry they are incredibly fragile. A damp finger is usually the best way of picking them, after which it often pays to soften them in a relaxing jar for about 24 hours. If you attempt to pick up broken antennae with forceps they will usually shatter- making the problem very much worse. Non-basal breaks are even worse to deal with. In principle, the broken pieces can be supported with crossed pins,

and a small dab of nail varnish is then applied to the end of the piece of antennae still attached to the specimen, before carefully manoeuvring the broken section back into position. Personally, I find this to be virtually impossible. If the specimen looks really odd with broken antennae, then personally I remove the antennae all together.

The last type of breakage is, thankfully, the rarest. Usually set specimens fall to pieces in identifiable chunks, and can be glued back together. However, occasionally wing tears do occur, and are again, very hard to fix. The principle problem is the strong possibility of gluing the specimen to the support surface while attempting to fix the tear. If this happens the specimen is scrap. The way to achieve wing repairs is via the addition of patches to the under surface of the wings. The patches are held in place using wing cement. However, I find that such repairs usually appear fairly obvious and the specimen is best scrapped if the wings are badly holed. However, if it is a prize specimen that is irreplaceable that you are trying to repair, then with luck and a following wind, reasonable results may be achieved.

11. Mothing and the Weather

A variety of factors effect the size of catch that may be expected in a night's mothing. The principle factors are temperature, degree of cloud cover, wind and rain. In general cold conditions will greatly decrease the size of catch you obtain. Particularly bad are sudden cold nights after a prolonged mild spell. In such circumstances, both the number of moths and the variety of species will seriously decline. On a similar vein, clear nights will also tend to decrease the catch size. In part this is linked to temperature. Cloud cover at night leads to milder conditions, while clear nights are usually colder. In addition, cloudy nights are also darker, removing light pollution from the stars and particularly the moon. The presence of a full moon will interfere with the catch due to the presence of a secondary light source. Similarly, the presence of other light sources such as streetlights will also tend to decrease your catch.

Wind and rain also effect catch size. Strong winds discourage moths from flying, and will lead to lower total catch sizes. When trapping on windy nights other problems also arise. Be sure to secure the trap, and the covers of bulbs etc. A strong gust can turn a moth trap over, with potentially disastrous results for the bulb and electrics. If trapping away from home, care should also be taken to secure covers of electrical connections, and guys ropes should be used on umbrellas (or other devices) used to cover generators. On windy nights try to position traps out of the wind in sheltered corners of whatever habitat you may be surveying. Rain can have a variety of effects. Steady drizzle will often improve catches. The cloud cover helps to maintain the temperature, which increases moth activity. In addition, the presence of rain tends to suppress scents, and hence moth activity tends to be concentrated closer to the ground, and therefore closer to your trap! However, very heavy rain is usually disastrous, suppressing moth activity, and soaking equipment and mothers alike. Finally, keep on eye on the pressure charts. Movement of air masses from the south will often bring continental migrants to the British coast. On occasions when the conditions look really good, mothers will often load up the car and head to the south coast for the night. The presence of large numbers of migrants, and different types of Hawk moth in the trap is well worth the effort. See you there next time the weather looks good!