Identifying *Epirritas* by octavals and wing patterning on live moths

Christian Heintzen, October 2025

Introduction

The identification of the 4 *Epirrita* species that occur in the British Isles poses one of the more challenging problems in macro moth recording. Despite some well-documented differences in external features[1] their similarities in flight time, habitat requirements and markings tend to discourage many observers to identify to species level, especially since county recorders usually require genital determination or inspection of two posterior projections of the 8th sternite called octavals before accepting a record[2].

The early flying Epirritas can usually be safely recorded as Small Autumnal Moth (*Epirrita filigrammaria*). This species is strongly associated with moorland habitats and is usually well-marked. Difficulties arise as the season progresses and November Moth (*Epirrita dilutata*), Pale November Moth (E*pirrita christyi*) and Autumnal Moth (*Epirrita autumnat*a) start to fly. In these cases, locating and - if necessary - uncovering the octavals will clinch identification.

Identifying Epirritas by octavals is surprisingly easy and does not require killing a moth. In many cases all that is needed is to look at the underside of the abdomen through a strong hand lens or better still a dissecting microscope as I will show in this short note. Two easy and reliable methods are described by which male Epirrita species can be identified. Female Epirrita can neither be reliably identified by octavals nor a full dissection. A key using octavals, forewing markings and habitat requirements is provided towards the end of this note. Finally, I hope to add to existing evidence that typical forms of November and Autumnal Moths can be reliably separated by wing markings alone.

Location of Octavals

Octavals are a pair of projections that are located on the underside of the male abdomen at the posterior margin of the 8th sternite (see Fig. 1). F.N. Pierce is credited with the discovery that both shape and spacing of octavals are diagnostic characters (see Allen, 1911) . Allen (1911) confirmed this for November and Pale November Moths[3]. Presumably octavals play a role in mating but evidence for this is lacking.

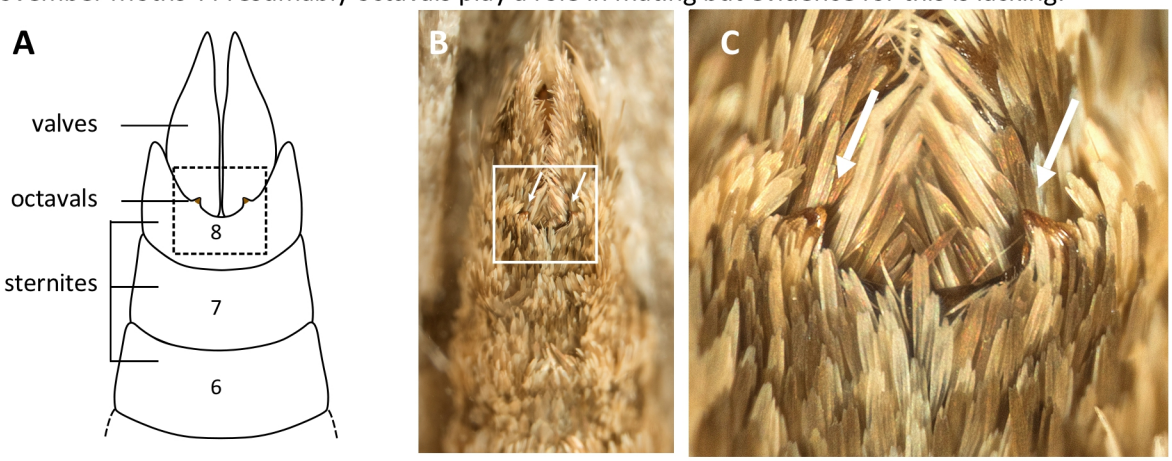

Figure 1: Location of octavals on the underside of a male Autumnal Moth. (**A**) Schematic drawing of the last segments of the male abdomen with 8th sternite and positions of the pair of octavals highlighted. (**B**) Photograph of the abdomen of a live Autumnal Moth. (**C**) close-up of the area marked in B. In this case octavals can be seen without the removal of scales.

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[1] Leverton (2000) has written an excellent account on how to identify *Epirritas* in the field using external features alone.

[2] Descriptions on genital and octaval characteristics have been published by Townsend, Clifton and Goodey (2010) (also available online at https://butterfly-conservation.org under 'difficult species guides').

[3] but see Schaffers, J & Knoester, H. (2019), who found that about 5% of *E. dilutata* and *E. christyi* show intermediate phenotypes and therefore cannot be separated on the basis of octaval spacing. In this context it is worth noting that Allen (1911) succeeded in breeding hybrids of *E. dilutata* and *E. christyi* and these showed intermediate octaval phenotypes. If this happens in the wild the 5% intermediate phenotypes of Schaffers, J & Knoester, H. (2019) may in fact be hybrids between these species.

In fresh specimens, octavals are usually hidden under a layer of scales but in a good number of individuals octavals can be seen without scale removal either because scales have been lost naturally or because they are long enough to project beyond the scales (see Fig. 1). As the season progresses, scales around the abdominal tip have often been lost naturally due to moths having dragged their abdomen over the various surfaces they are settling on. Checking the underside of the abdomen should be the first step to take. If a good number of Epirritas are inspected, especially later in the season, it is often possible to identify at least a few individuals to species level without much effort. If octavals are not readily visible scales can be removed with simple tools (see Fig. 2).

Tools for scale removal

A small pointed brush or a woodcock pin feather, or any other small feather cut to a sharp point are useful tools for gentle removal of scales. A small piece of double-sided sticky tape wound around a dissecting needle is very effective at removing scales when gently brushed over the sternite. There is no need for excessive scale removal.

Figure 2. Useful tools for scale removal. Top, Woodcock pin feather attached to a wooden handle. Bottom: Dissecting needle with sticky tape wound around it.

Immobilising moths for scale removal

If octavals are not readily visible and some scales are to be brushed off, moths should be be immobilised. A method that has worked well for me is to let a moth 'walk' into a light-weight transparent polythene bag (see Fig. 3). Let the moth settle on a small piece of cardboard and take a photo for later reference. With the moth facing upwards insert the cardboard into the plastic bag. Let the moth walk off the cardboard into the bag, then remove the cardboard. It is important to use a thin i.e. lightweight polythene bag to avoid excessive pressure when the bag is subsequently flattened.

With the moth thus gently immobilised the whole bag can be flipped over and placed on a piece of Styrofoam or foam board, with ventral side facing up. To access the octavals follow the procedure as outlined in Figure 3.

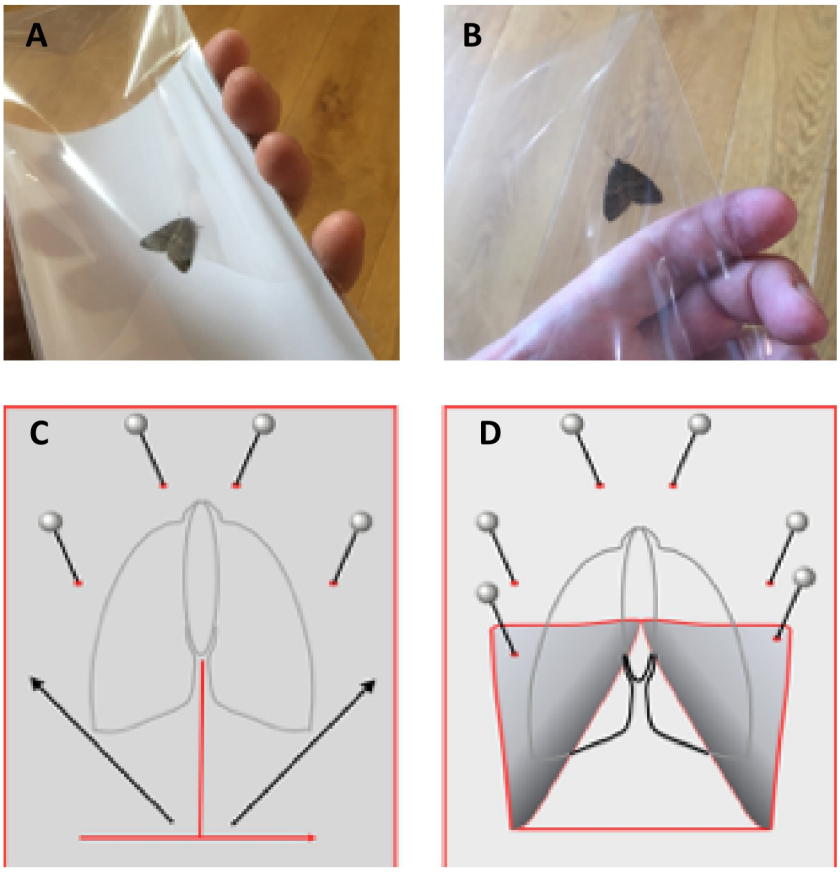


Figure 3. Preparing the moth for scale removal.

(A) A cardboard with the settled moth is slotted into a thin polythene bag.
(B) Moth after moving off the cardboard into the bag.
(C) Schematic showing how to expose the abdominal tip. The bag is placed on styrofoam such that the moth is ventral side up and pins are placed around the moth to prevent movement as shown. Pins need to be placed some distance away from the moth to prevent excessive pressure.
(D) With a sharp tool a straight cut some distance away and parallel to the wing tips is met by a cut down from the tip of the abdomen to create two flaps that can be folded over towards the wing tips. To expose the abdomen the flaps are pulled slightly sideways to extend the cut well above the abdominal tip and fixed with a pin as shown. Scales can now be gently removed with a brush or tip of a feather.

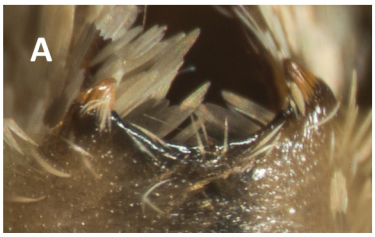
Removing scales on anaesthetised moths.

Winter moths are well adapted to cold shock and quickly fall into a torpid state when exposed to freezing temperatures. This method involves a short exposure to -20°C. Three to five minutes at -20°C will usually suffice to induce torpor but it may take twice as long depending on the speed of temperature conduction. The state of the moth should be checked every 3-5 minutes to avoid killing it. Once out of the cold it is critical to act quickly as moths will become mobile within a few minutes at room temperature. Flip the moth on its back and gently secure a non-sticky tape across wings and body (see attached photo) with abdomen sticking out. Now proceed with the method for removing scales as described above. If carried out carefully the moth will revive quickly and fly off as soon as they are freed from the tape.

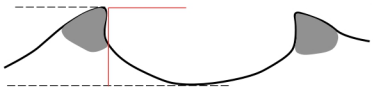
Figure 4: Anaesthetised Epirrita secured with tape for scale removal around octavals. Foam board is used as the surface and insect pins to secure the tape. As mentioned above the tape needs to be smooth and non-sticky to prevent rubbing off scales on the wings and not too tightly pinned down to avoid squashing the moth. I use the protective paper of double-sided sticky tape which is very smooth but any other smooth tape or paper could be used, such as tracing paper.

Diagnostic feature of Epirrita octavals

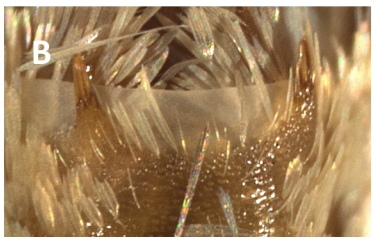
The differences in octaval shape and spacing are summarised below. A key combining these with external features and habitat requirements is shown on page 5.



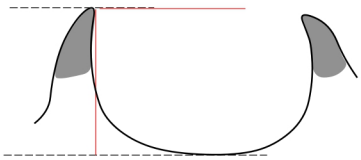
Autumnal Moth
Small Autumnal Moth



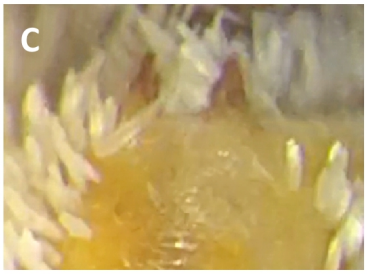
Octavals short, stubby, widely spaced with a shallow depression between projections. The gap between the tip of the projections is much wider than the depth of the depression between octavals. Octavals topped with thorns (hardened scales) that are angled towards the midline.



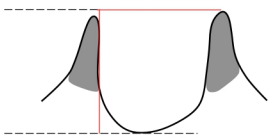
November Moth



Long octavals with deep depression between projections. The gap between the tip of the projections is wider than the depth of the depression between octavals. Thorns may be slightly angled towards the midline but often are more or less straight.



Pale November Moth



Octavals are closely spaced with a deep depression between projections. The gap between the tip of the projections is just about as wide as the depth of the depression between octavals. The thorns are more or less straight.

Figure 5: **Diagnostic feature of Epirrita octavals.** Autumnal Moth (**A**), November Moth (**B**), and Pale November Moth (**C**) with scales removed. Note that octavals of Small Autumnal Moth are indistinguishable from those of Autumnal Moth.

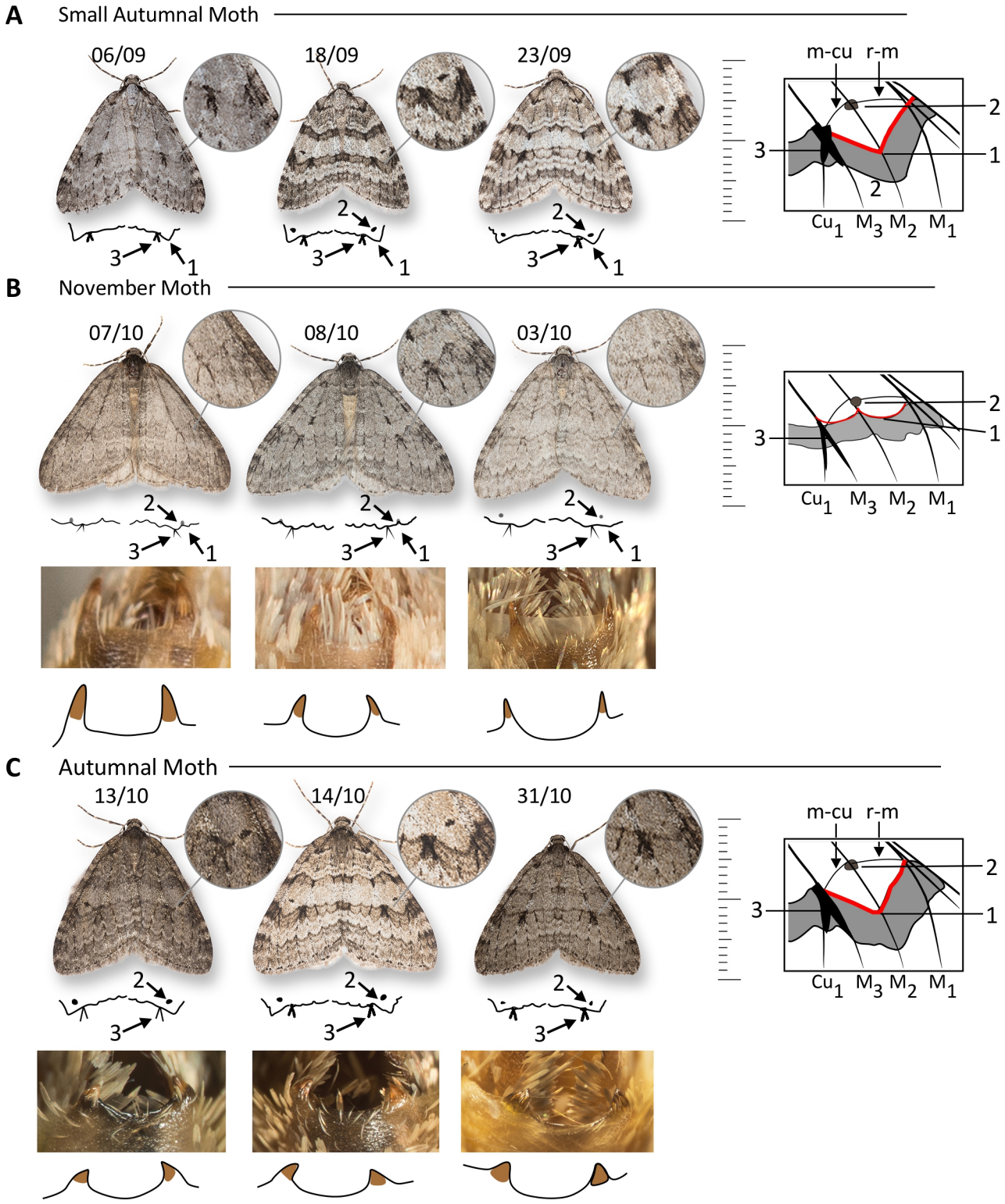
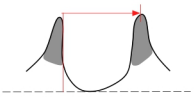


Figure 6: Octavals and wing patterning of **(A)** Small Autumnal Moth, **(B)** November Moth, and **(C**) Autumnal Moth. Octavals were revealed using the methods described above. Circles show the magnified diagnostic features of the forewing centred around the discal spot and postmedian fascia. Traces below photos of moths show the path of the most anterior of the crossbands that make up the postmedian fascia, with diagnostic features numbered 1-3 where (1) is the shape of the most anterior border of the postmedian fascia, (2) the position of the discal spot, and (3) the intensity of dark staining around the base of Wing veins Cu1 and M3. The drawings on the right show the diagnostic features with reference to the position of the wing veins in that area in more detail. Photos of moths were taken before scale removal and moths were released following scale removal. No octavals of Small Autumnal Moth are shown as they are indistinguishable from those of Autumnal Moth Wing patterning between Small Autumnal and Autumnal Moths is also very similar All moths were caught in the Glossop area at the dates shown. Scale is in mm.

Keys to the identification of *Epirrita* species based on octavals, wing pattern and habitat*

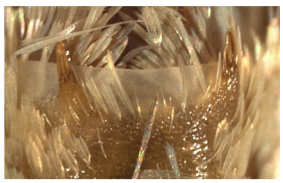
Octaval Key

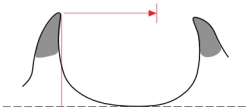
1a Octavals closely spaced. The gap between the tip of the projections is just about as wide as the depth of the depression between octavals. **Pale November Moth** (*Epirrita christyi)*



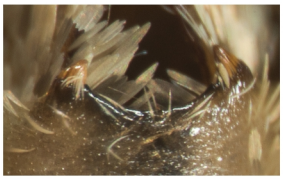
1b Octavals widely spaced. The gap between the tip of the projections is much wider than the depth of the depression between octavals.----------**2**

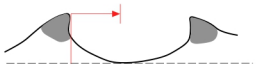
2a Octavals relatively long, widely spaced, projecting well beyond the sternite margin. The depression between octavals that is wider than the depth of the depression. The fused scales a the tip of the projections ('thorns') are slightly angled towards the midline or more or less straight. **November Moth** (*Epirrita dilutata)*





2b Octavals are short, stubby and widely spaced with a relatively shallow depression between projections that are angled towards the midline. The gap between projections is much wider than the depth of the depression between octavals. ----------**3***



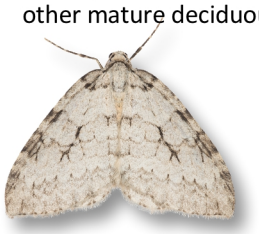


* In a population a species consists of a group of individuals of various genotypes that manifest as a range of external characteristics (phenotypes) with some phenotypes falling outside what is considered typical. There are some well-marked November Moth with discal spots that are well separated from the postmedian fascia and conversely, drab looking rather feature-less Autumnal Moth. In such cases, however, checking octavals or careful inspection of features around the discal spot and postmedian fascia usually resolves any identification problems. In rare cases, however, the observed features are somewhat intermediate between the two species. Allen (1911) showed, more than 100 years ago, that November and Pale November Moths can hybridise, and then have intermediate octaval phenotypes. Perhaps hybridisation between Epirrita species is more widespread than thought and may explain the more confusing examples.

External features and habitat key

1a Paler species with affinity to beech woods but also other mature deciduous woodlands.

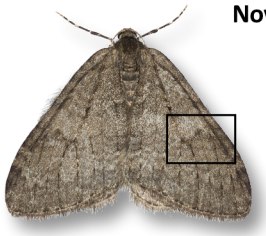
Pale November Moth (*Epirrita christyi)*

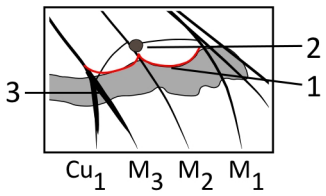


1b Drab or well-marked species utilising either a wide range of deciduous woodlands, upland birch woods, and heather moorland---------- **2***

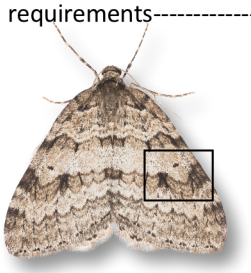
2a Mostly drab looking species lacking contrast between fascias. The most anterior band of the postmedian fascia is more or less horizontal when moths are at rest and lack a sharp indentation (2). The discal spot (1) is weak and often fused with the postmedian fascia. Where wing vein M3 and Cu1 meet (3) veins are often just visible as a weakly darkened lines. Found in a wide range of deciduous woodlands and hedgerows.

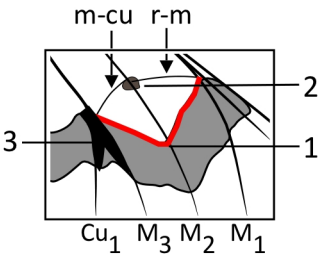
November Moth (*Epirrita dilutata)*





2b The anterior band of the postmedian fascia is sharply indented near the leading edge of the forewing (1) and angles around an often distinct discal spot that typically stays well clear of the fascia (2). The fascias are often well-marked and contrasting. Where wing vein M3 and Cu1 meet (3) they and adjacent areas are strongly darkened. Moths with more exacting habitat requirements----------**3***





3a Flying in August/September on heather moorland, generally smaller, well marked with a silvery sheen.

Small Autumnal Moth (*Epirrita filigrammaria)*

3b Flying from mid- October to November in birch woods, on average larger, often well-marked species.

Autumnal Moth (*Epirrita autumnata*)

Flight times of Epirritas in Glossop- and Longdendale

I have trapped Small Autumnal Moths in the first week of September, but I have caught too few to make any detailed statements about flight time. Interestingly, more than 60 years ago Roy Leverton caught his first Small Autumnal Moths on the 16th September in Hollingworth Clough, which is little more than 1 mile from where I have caught most of my Small Autumnal Moths (Roy Leverton, personal communication). They probably start flying earlier but in any case are clearly the first Epirrita species to emerge. November Moth follow towards the end of September and numbers peak around mid-October followed by a rapid decline, with only few spilling into early November. In contrast, the first Autumnal Moth appear in mid-October and peak around the first week of November before numbers taper off with only a few present at the end of November.

In conclusion (and given the apparent absence of Pale November Moth in our area) it is safe to say that any drab Epirrita encountered in the first two weeks in October is almost certainly a November Moth whilst any (usually more strongly patterned) Epirrita found in November is almost certainly an Autumnal Moth.

There is an area of overlap where both moths occur together but even in these cases the pronounced drabness of most November moth and the usually much more patterned/banded appearance of Autumnal Moth will allow a fairly safe separation. As said, these are local emergence dates. As pointed out by Leverton (2000), flight periods can change depending on latitude, so may be significantly shifted one way or the other depending on whether one is trapping in southern England or northern Scotland.

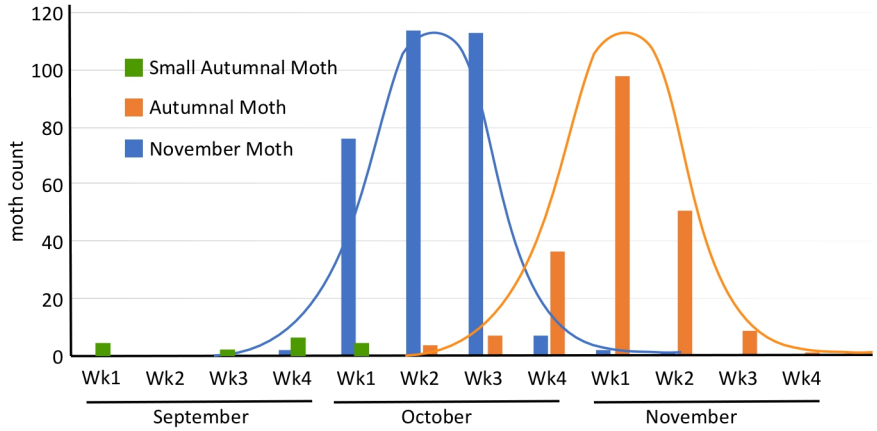


Figure 7: Graph showing numbers of Small Autumnal Moth, Autumnal Moth and November Moth caught at actinic light traps in and around Glossop. Collecting more data, especially for Small Autumnal Moth will reveal more detail but it is already clear that, locally, the so-called November Moth is best described as October Moth, whilst the Autumnal moth is in fact the better November Moth.

Concluding remarks

In my experience, and echoing that of Leverton (2000), once sufficient experience is gained (underpinned by octaval inspections or dissections), it is relatively easy to distinguish most of the male November and Autumnal Moth in the field, either on wing patterning alone or in combination with their flight time and habitat. Every once in a while a spot-check of octavals should be performed to reassure yourself and others of your identification skills. I have only had one Pale November Moth, so can't add anything from experience about its external characteristics or flight time.

Good quality photographs taken under controlled and reproducible lighting conditions of moths identified based on their octavals should prove to be a useful in honing your identification skills. A library of such photos will allow for side by side comparisons of many individuals at once and over time will reveal distinct (if occasionally subtle) differences in wing patterning that may otherwise be missed.

References

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