LEICESTERSHIRE ENTOMOLOGICAL SOCIETY

Birch leaf-miners

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Eriocrania salopiella

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Introduction

Leaf-mining is a specialised form of larval feeding on plants. For at least part of their life, the larva of some species of moths, flies, sawflies and beetles live and feed within a leaf, usually between the upper and lower epidermis; some may also pupate within the leaf. For many of these species, the pattern of feeding and deposition of frass may be unique to that species and, in combination with the host plant and characteristics, the larvae or pupae allows the species to be named. Many of these species are rarely recorded as adults; most are difficult to identify and require dissection. Knowledge of their distribution of many leaf-mining species in VC55 is incomplete, so recording leaf-mines will help to fill in some of the gaps.

Important!

Not all leaf-mines can be identified. Sometimes it is necessary to rear the larvae to adults. Leaf-mining is an aspect of a species' behaviour; it can vary in many ways. Environmental condition of the host plant affects behaviour and larvae can mine unexpected hosts.

- **ALWAYS** record the host plant – all keys and websites start with the host.
- **ALWAYS** include the word "**MINE**" in your comments otherwise it may be taken as the adult organism.
- **Be careful of sources** – there are a lot of hopeful or misidentified photographs on the internet.
- **Retain a specimen** of any rarities or County firsts so that they can be verified by an expert as it is not always possible from an image.
- **Take a photograph** of the fresh specimen with back-lighting to show the frass pattern. If you can, dissect out the larva/pupa and photograph.
- **Note** whether it is a tenanted or vacated mine e.g. "TM on Birch", "VM on Birch".

The leaf-miners of Birch cover most of the spectrum of leaf-mines with all the leaf-mining insect orders being represented and all the main types of mines being found.

Birch trees in VC55

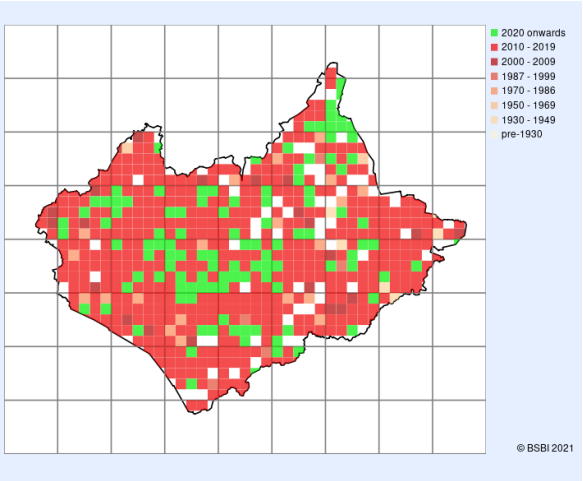

Fig 1a: ***Betula pendula*** in VC55

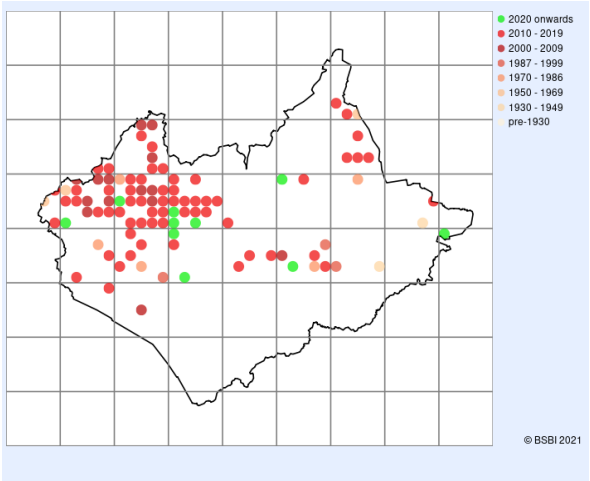

Fig 1b: ***Betula pubescens*** in VC55

Birch is a common plant in VC55. We have two native species, *Betula pendula* (Silver Birch) and *B. pubescens* (Downy Birch) (Figs 1a&b courtesy Geoffrey Hall, BSBI).

Silver Birch is more likely to be found on light, acid soils and usually in drier places than the Downy Birch, which favours wetter soils and is more associated with upland areas in Britain. Silver Birch is almost ubiquitous across the Vice-County whereas Downy Birch is mainly found in the north-west. Natural distribution of both species has been much affected by mass tree planting, especially in the National Forest area, where both native species are common in recent plantations on all soil-types. The two species do hybridise and there are a couple of verified records for VC55. Several non-native species are grown in parks, gardens, streets and open spaces; perhaps the commonest are *B. utilis (*Himalayan Birch), often as the intensely white barked cultivar *jacquemontii,* and *B. papyrifera* (Paper-bark Birch).

Some leaf-miners can be found on all species of Birch trees in all habitats, including non-natives, but some species seem to prefer areas where there is some long-established birch woodland, often supplemented by new planting or recent natural regeneration; some leaf-miners favour seedlings and saplings. Many of these birch woods are on the former coalfield in the north-west - classic sites to look for leaf mines are Bagworth Heath, Albert Village Lake, and Newfield Colliery (Fig 2) and New Lount in Moira. Our other main area is Charnwood Forest, and sites such as Ulverscroft, Bardon Hill, Bradgate Park, Charnwood Lodge and Warren Hills will be worth investigating.

Fig 2: Semi-mature Birch woodland and regenerating birch at Newfield colliery – both species of native Birch are present. (Sue Timms, 26th August, 2021)

Outside the north-west quadrant of VC55, birch woodland is relatively scarce – but as I live in this part of the County, most of my recording is inside this area and my knowledge of the rest of the County is patchy! Any notes on distribution are provisional and speculative. It would be interesting to hear of other good birch woodlands in other parts of the VC55. The impacts

of mass tree-planting of Birch must also be considered - and has this inadvertently introduced new species to the County?

Information on species preference is not usually given in sources; the two native species are frequently undifferentiated as the host plant. This may repay further investigation; it is possible that some of the scarcer Birch leaf-mining species in VC55 prefer *B. pubescens* to *B. pendula* – or perhaps prefer the wetter habitat. The only species listed with this preference *is Phylloporia bistrigella*.

The Birch leaf-mining calendar

A useful source is Ben Smart's '*Micro-moth Field tips*' which helpfully provides species accounts for each month of the year (Smart, 2018).

- **April and May** – *Eriocrania cicatricella, sangii, unimaculella* and *semipurpurella; Coleophora serratella*
- **June and July** –*Eriocrania salopiella* and later on *E. sparrmannella; Stigmella lapponica* and *S. continuella*; the first brood of *Caloptilia, Phyllonorycter* and *Parornix; Fenusa, Scolioneura* and *Fenusella sawflies*, the weevils *Orchestes rusci* and *O. testaceus; Agromyza alnibetulae*
- **July and August** – *Stigmella* spp., *Heliozela hammoniella, Bucculatrix demaryellla, Ectoedemia minimella* and *Phylloporia bistrigella;* sawflies *Heterarthrus nemoratus* and *Profenusa thomsonii;* weevil *Rhamphus pulicarius*
- **September to November** – most vacated *Stigmella* mines can still be identified, and second broods of *Caloptilia*, *Phyllonorcyter* and *Parornix* appear; *Coleophora serratella*; *Ectoedemia occultella,* late broods *of Scolioneura* sawflies
- **Spring to Autumn** – *Lyonetia clerkella*

Types of mines

Photographs of most of these mines can be found on the NatureSpot website https://www.naturespot.org.uk/

Gallery mines

Fig 3: ***Stigmella confusella*** – fine linear frass-line

Fig 4: ***Stigmella continuella*** – coiled frass fills gallery

Galleries are caused by the larva feeding in a linear manner and they usually get progressively wider as the larva grows. Some mines can be false blotches, caused by loops of galleries running into each other; in these cases, the frass lines are usually preserved.

The classic gallery mines are produced by ***Stigmella*** species (Figs 3&4) of moths in the Nepticulidae. There are six species found on Birch in VC55 all of which can be distinguished with care by examining the larva and the deposition of frass in the mine - the frass can be coiled, linear or dispersed. A shining black or opalescent egg can be seen with a hand lens or microscope on the leaf surface at the narrow start of the mine.

The Apple Leaf-miner moth, ***Lyonetia clerkella*** is polyphagous, including Birch. The gallery is narrow with long sweeping curves (Fig 5) and the larva is a different shape to *Stigmella*; there is also no egg at the start of the mine. A very short hook-shaped mine is produced in the early instar stage of ***Bucculatrix demaryella*** moths. After this stage, the larva leaves the mine to feed freely on the leaf surface, causing 'windows'. A false blotch is produced by the larvae of ***Ectoedemia minimella,*** a species rarely found in VC55. One leaf-mine of Birch is attributed to the fly ***Agromyza alnibetulae*** (fig 6) and appears to be relatively common. As with many fly-mines, the frass is deposed in two rows in the gallery.

Fig 5: ***Lyonetia clerkella***

Fig 6: ***Agromyza alnibetulae***

Blotch and gallery/blotch mines

True blotch mines are formed by the larvae feeding in a circular manner, in wide sweeping movements the frass being gathered into one part of the mine or dispersed throughout.

Fig 7**:** ***Fenusella nana***
– three dark spots on ventral surface

Fig 8: ***Heterarthrus nemoratus***
– stumpy legs and dark mesosternum

The five species of sawfly recorded on Birch all produce large and rather undifferentiated blotches: to identify these with confidence it is best to dissect out the larva. The combination of spots on the ventral surface (Fig 7) and the dorsal prothoracic marking can be diagnostic and species of ***Heterarthrus*** (Fig 8) and ***Profenusa*** have stumpy reduced front legs (being sawflies, there are no abdominal legs).

Changes from gallery to blotch usually happen as a result of a new instar. The **Eriocranidae** moths produce blotch mines (Fig 9), sometimes after a short gallery, which are unique in having frass in spaghetti- like strings. Some species occur very early in the year – as soon as the first leaves open the first Eriocranid mines appear. Identification can be challenging and always requires examination of the larvae.

Ectoedemia occultella moths produce small blotches with dark centres (Fig 10); these are common, including birches in parks and gardens.

Fig 9: ***Eriocrania salopiella***

Fig 10: ***Ectoedemia occultella***

Rhamphus pulicarius (Coleoptera: Curculionidae) is more often found on Sallow (*Salix*) but can occur on birch, making small irregular blotches or wide galleries, with a small oval bright yellow larva inside; as with all beetle larvae, there are no abdominal legs.

Tentiform mines

These are caused by ***Phyllonorycter, Parornix*** and ***Caloptilia*** moths. Tentiform mines are caused by the contraction of one surface of the leaf, causing a blister to form in which the larva feeds and may also pupate. ***Phyllonorycter ulmifoliella*** is fairly frequent (Fig 11), including trees in parks and gardens, but I have not found the other two Birch-mining species. Pupation is in a cocoon in the mine. There are records for ***P cavella*** from VC*55,* but the differences between the mines are slight and I would recommend that the moth is reared to be certain of identity.

Parornix betulae and ***Caloptilia*** start life in a small inconspicuous gallery leading to a *Phyllonorycter*-like mine, with a brown rather than green epidermis. The larva soon leaves this and lives inside a folded leaf edge or 'leaf cone' formed by a double down-fold on a leaf tip or edge. ***Parornix*** larvae can be easily distinguished from *Phyllonorycter* by the four dark dots on the pronotum (Fig 12).

Fig 11: ***Phyllonorycter ulmifoliella***

Fig 12: ***Parornix betulae***
larva with four dark spots on pronotum

'Cut-out' mines

Three species on Birch make an excision at the end of the mine, forming a parcel in which the larva drops to the ground to pupate. These are attractive but rarely recorded mines with most records coming from the north-west region of the vice-county. The weevil ***Orchestes rusci*** (Fig 13) can be quite frequent where it occurs; the excision is circular and follows a broad widening gallery along the leaf edge. The moth ***Heliozela hammoniella*** mine (Fig 14) starts as a gallery in the midrib or vein, leading to an oval excision.

Fig 13: ***Orchestes rusci***

Fig 14: ***Heliozela hammoniella***

Fig 15: ***Phylloporia bistrigella***

The moth ***Phyllloporia bistrigella*** (Fig 15) mines start as a gallery, then become a blotch, and finally an excision is made. The part of the leaf which is cut off by the gallery often becomes a paler green.

Coleophora mines

The larvae of the *Coleophora* species of moths live in portable cases made from silk and plant material, which are attached to the host, usually to a leaf, often being less than 1cm long when mature. The larva feeds through a tiny circular hole in the leaf surface, making short forays from the case into the leaf and retreating into the case. The larva will move around in its case and make new mines so the blotches are often in clusters. A short search may reveal the cased larva itself; sometimes the construction and materials used are characteristic of a species but often it will need to be reared to adult to identify.

On birch, the polyphagous ***Coleophora serratella*** (Fig 16) seems relatively frequent and can be common where it occurs. Cases are of two kinds; the juvenile cases which are present in autumn, and the mature cases which are ready in May, many of which retain a serrated crest from the construction material.

Fig 16: Case and leaf mines of ***Coleophora serratella***

Other *Coleophora* known to be Birch leaf-miners have been recorded in VC55 as adult moths – they are often attracted to light. As far as I am aware the only recent leaf-mine record apart from the above is ***Coleophora milvipennis***.

The list of known leaf-miners recorded in VC55 is presented in the Appendix.

Acknowledgements

Thanks to Adrian Russell, Graham Calow, Graham Finch, Pete Leonard and Mark Skevington for help with identification, distribution and knowledge about leaf-miners in VC55.

Website sources of information

http://www.leafmines.co.uk
https://bladmineerders.nl
http://www.ukflymines.co.uk
https://www.naturespot.org.uk

Other sources

Leicestershire and Rutland Environmental Records Centre https://my.lerc.online/?src=lr

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Appendix

The table below lists the Birch leaf-miners recorded in VC55 to date with thanks to Adrian Russell for additional information on distribution, status and numbers of records on the Vice-County Lepidoptera database.

Family/species	Mine details	Comments
Coleoptera		
Orchestes rusci	Gallery/blotch leaf-edge, circular cut-out	Occasional?
Rhamphus pulicarius	Small blotch	Occasional – more often on sallow
Diptera		
Agromyza alnibetulae	Gallery	Occasional?
Hymenoptera		
Fenusa pumila	Blotch	Frequent/ common
Fenusella nana	Blotch with frass packed into triangle at leaf-edge	Occasional
Heterarthrus nemoratus	Blotch, brownish	Rare?
Profensua thomsonii	Blotch	Rare?
Scolioneura betuleti	Blotch	Frequent, two generations
Lepidoptera		
Bucculatrix demaryella	Gallery	Rare – three records: Bagworth, Croft & Melton
Coleophora milvipennis	Small blotch with central hole	Rare - two records of larval case and mine, Hicks Lodge and Bagworth (plus an adult record from Sapcote)
Coleophora serratella	Small blotch with central hole	Occasional. Can be abundant where it occurs - 43 records
Ectoedemia minimella	Gallery/false blotch	Few (14) recent records; only five of mines - Martinshaw, Terrace Hills, Holwell, Ratby & Normanton le Heath
Ectoedemia occultella	Small blotch	Common/easily recorded. On isolated trees as well as those in birch woodland - 141 records
Eriocrania cicatricella	Blotch; frass in strings	Scarce, but probably under-recorded - six records
Eriocrania salopiella	Blotch/short gallery; frass in strings	Scarce, but probably under-recorded - four records
Eriocrania sangii	Blotch; frass in strings	Scarce, but probably under-recorded - 11 records in total but only five mine records
Eriocrania semipurpurella	Blotch; frass in strings	Scarce, but probably under-recorded - 11 records of adults & five mine records
Eriocrania sparrmannella	Blotch/short gallery; frass in strings	Scarce, but probably under-recorded - three records, all mines
Eriocrania unimaculella	Blotch; frass in strings	Scarce, but probably under-recorded - two mine records + two adult records
Heliozela hammoniella	Gallery in midrib/vein, then cut-out	Rare – five records: Bagworth, Newfield, Cloud Wood, New Lount, Albert Village.
Lyonetia clerkella	Long gallery; no egg	Polyphagous and abundant (625 mine records) but less frequently recorded on Birch (28 records)
Parornix betulae	Gallery, then tentiform, then folded leaf	Occasional? Widely distributed records; probably under-recorded - 18 records all of mines
Phyllonorycter cavella	Tentiform; pupa in cocoon	Rare? Only 6 records
Phyllonorycter ulmifoliella	Tentiform; pupa in cocoon	Frequent? On isolated trees as well as those in birch woodland - 49 records
Phylloporia bistrigella	Gallery, then blotch, then oval cut out	Scarce; few records, all from NW Leics/Charnwood Forest; Downy Birch. Lount, Bagworth, Martinshaw, Rough Hill, Cademan Woods.
Stigmella betulicola	Gallery with thick frass-line, larvae dark head	Rare - Newfield colliery, Bagworth, Shepshed/Hathern, Albert Village Lake
Stigmella confusella	Gallery; very narrow frass-line right from start	Occasional; can be frequent when it occurs - 15 records
Stigmella continuella	Gallery; coiled frass fills mine	Occasional? Seven records
Stigmella lapponica	Early frass-filled gallery, then narrow line	Occasional; can be frequent when it occurs - 17 records
Stigmella luteella	Gallery with thick frass-line, larvae pale head	Occasional; can be frequent when it occurs, including trees in parks/gardens - 34 records
Stigmella sakhalinella	Gallery; coiled frass; clear margin from start	Rare? - five records: Leicester (Gilroes Cemetery and Willowbrook Park) Harby, Croft & Sapcote

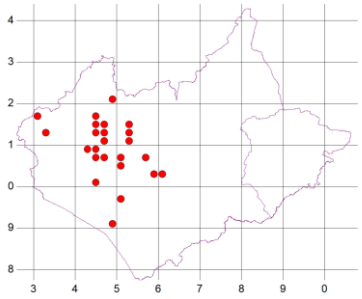
The following species have also been recorded fairly recently in VC55, but not as leaf-miners of Birch:

- **Coleoptera**: *Anoplus plantaris, Orchestes testaceus* and *Tachyerges stigma*
- **Lepidoptera**: *Caloptilia betulicola, C. populetorum; Coleophora betulella, siccifolia, potentillae/violacea* and *binderella. Roeslerstammia erxlebella, Caloptilia stigmatella* and *Phyllonorycter corylifoliella* may also occur on birch but there are no verified VC55 records that I am aware of for birch although they have been recorded as mines on other host species.

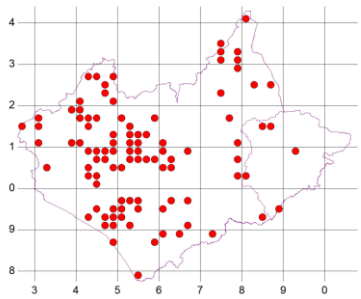
Some VC55 distribution maps of Birch leaf-mining insects

Maps have been provided by Adrian Russell (moths) and Ray Morris (*Agromyza*)

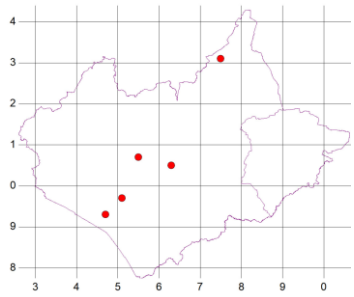
Stigmella lapponica



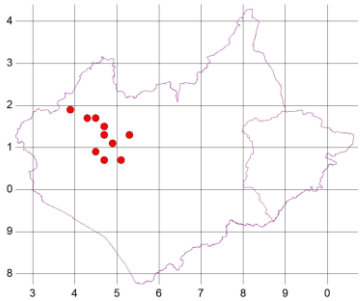
Ectoedemia occultella



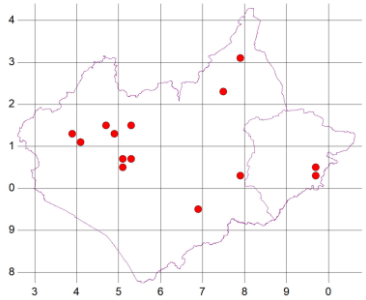
Stigmella sakhalinella



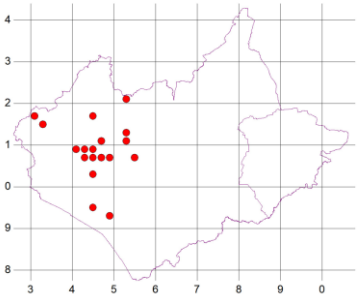
Phylloporia bistrigella



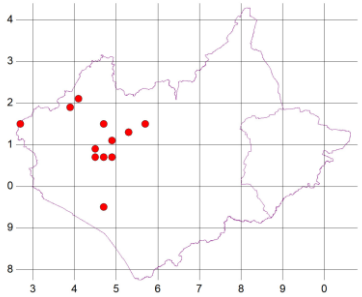
Ectoedemia minimella



Coleophora serratella



Eriocrania sangii



Agromyza alnibetulae