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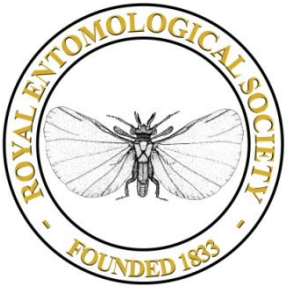


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ROYAL ENTOMOLOGICAL
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Vol. X. Part 5 (g)

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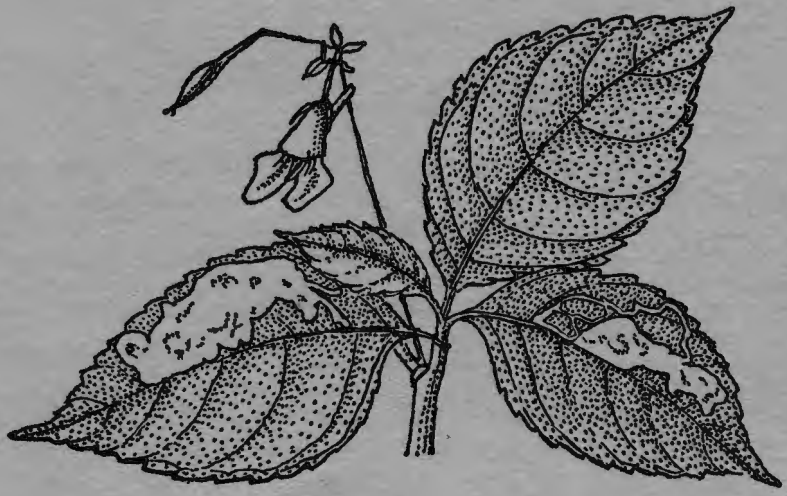

# DIPTERA

## AGROMYZIDAE

By

KENNETH A. SPENCER

LONDON
Published by the Society
and Sold at its Rooms
41, Queen's Gate, S.W. 7

July 1972

Price £2.00

## HANDBOOKS FOR THE IDENTIFICATION OF BRITISH INSECTS

The aim of this series of publications is to provide illustrated keys to the whole of the British Insects (in so far as this is possible), in ten volumes, as follows :

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Parts are issued, separately paged and priced, as they become available.

A second (revised) edition of *A Check List of British Insects*, by G. S. Kloet and W. D. Hincks, is being issued as an extra, eleventh, volume in this series.

The Society is indebted to the Royal Society for a grant towards the cost of initiating this series of *Handbooks*.

**A list of parts so far published appears on the inside and outside back covers.**

# DIPTERA

## Family AGROMYZIDAE

By K. A. Spencer

### Systematic Position of the Agromyzidae

The Agromyzidae belong to the section Acalyptratae of the suborder Cyclorrhapha Schizophora. Within this group the family occupies an isolated position. Hennig (1958) considered the most closely related family to be the Odiniidae; however, in a recent study of the relationships of the Cyclorrhapha undertaken by Griffiths (*in press*), he concludes that the sister-group of the Agromyzidae is probably the Clusiidae, although the morphological gap between these two families is still considerable. The larvae of Clusiidae feed mainly on rotting wood, which could be considered as a link to the most primitive genus of the Agromyzidae, *Phytobia* Lioy, the larvae of which feed as borers in branches or trunks of young trees.

### Generic Structure of the Agromyzidae

The family consists of two well-defined subfamilies, the Agromyzinae and Phytomyzinae, which can be readily distinguished both in the adult and larval stages. In the Agromyzinae the sub-costa is fully developed and joins vein $R_1$ before this reaches the costa (fig. 1A); most species are large and stout, with wing length of about 3 mm., and the costa generally extends strongly to vein $M_{1+2}$. In the larvae there is a third, upper arm of the cephalo-pharyngeal skeleton (fig. 2A). In the Phytomyzinae the sub-costa is greatly reduced, frequently being little more than a fold, running parallel to the sub-costa and joining the costa independently (fig. 1B); in several genera the costa is reduced and terminates at the apex of vein $R_{4+5}$. The largest species in the family occur in the primitive genus, *Phytobia* Lioy, but many species are smaller, more slender and even minute, with wing length of less than 2 mm. The cephalo-pharyngeal skeleton of the larva has only two arms (fig. 2B).

At the present time the family consists of 28 genera, of which 17 occur in Britain. Important changes in generic structure have been made in recent years. Hendel's conglomerate genus, *Dizygomyza* (1931), has now been split into a number of monophyletic genera and a further major advance was made when Nowakowski (1962) combined several genera and subgenera in the natural genus *Cerodontha* Rondani, to embrace the various groups feeding on monocotyledons, whose close relationship had not been detected by earlier workers. Finally, the genus *Amauromyza* Hendel has been enlarged to include a number of groups whose relationship is clearly indicated by their male genitalia (cf. Nowakowski, 1962, 1964, and Spencer, 1971a).

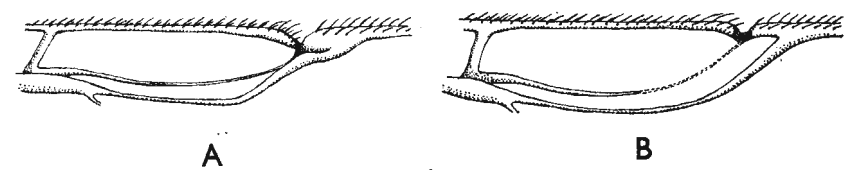
Further splitting of the genera *Agromyza* Fallén and *Phytomyza* Fallén

seems probable in future but caution will be required when revising *Phytomyza*, as many of the disparate groups which can now be detected in association with particular host families should probably at most be treated as subgenera or possibly deserve no more than species-group status.

## Life History

All Agromyzidae are exclusively phytophagous (despite some reports to the contrary) and virtually all parts of plants are used for larval feeding. The egg is inserted into green tissue of young trees, stems, leaves or the inflorescence of herbaceous plants and on hatching the larva eats out a channel in the cambium, pith or parenchyma, frequently forming a characteristic feeding track or mine, which may provide a more reliable means of identification than the external characters of the adult (see below).

The young larva normally hatches after a few days and the time spent in this stage can vary from about 10 days to several months. Overwintering as a larva is unusual but occurs in some stem-borers and also in the common leaf-miner of holly, *Phytomyza ilicis* Curtis.

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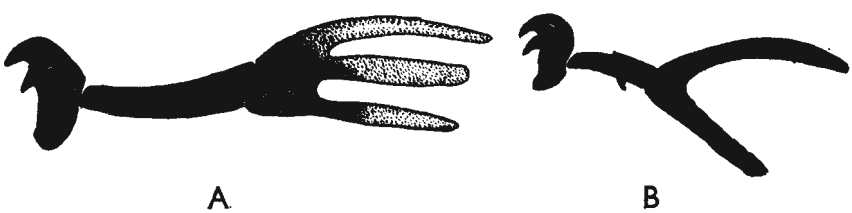


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Fig. 1.—Sub-costa of (A), subfamily Agromyzinae; (B) subfamily Phytomyzinae.
Fig. 2.—Cephalo-pharyngeal skeleton of (A), subfamily Agromyzinae; (B), subfamily Phytomyzinae (after Hering).

The pupal stage is normally 10–20 days in the early, summer generation but in species with a single generation or an additional autumn generation may be as long as 6–9 months.

In most species the larva transforms into a puparium immediately on leaving the mine and falls to the ground. In a few cases the puparium can be loosely or firmly glued to the leaf near the end of the mine; in rather more species pupation takes place within the mine or, in the case of stem-feeders, beneath the epidermis or within the hollow stem.

## Diagnostic Characters

(a) *Early stages*

Agromyzid larvae are generally whitish yellow but in some species more orange, varying in length from a few millimetres up to 2 cm. in the unusually narrow and elongate tree-boring species. The cephalo-pharyngeal skeleton, to which the mouth-hooks are articulated, provides an immediate indication of the subfamily (fig. 2A, B) but is not reliable for separating closely-related genera.

The mouth-hooks consist of a rigid, paired structure, with the two halves normally arranged asymmetrically, so that in lateral view the mouth-hooks appear to alternate (figs. 241, 243). There is little specific variation in the mouth-hooks and many species can be reliably separated on this character.

Both the anterior and posterior spiracles provide valuable diagnostic characters but the latter show greater differentiation. The spiracular processes may lie on the surface of the anal segment on scarcely defined plates or may be raised on conspicuous and characteristic stalks or protuberances (figs. 13, 19). In the primitive arrangement there are three spiracular openings or bulbs on each process (fig. 13) but very commonly these may proliferate up to 10, 15, 20, 30 or even more. With the larger numbers there is inevitably some variation but different larvae, bearing for example 3, 10, 20 or 40 bulbs will certainly represent distinct species.

De Meijere (1925 *et seq.*) has described and illustrated larval structures for many European species in a series of papers in the *Tijdschrift voor Entomologie*, Amsterdam.

The essential larval characters are detectable in the puparium, although it may not be possible to make such an accurate count of spiracular bulbs. The mouth-hooks and cephalo-pharyngeal skeleton are also preserved in the puparium, attached within the first segment (if this has not been lost on emergence of the adult).

Important additional characters are provided by the colour of the puparium, which may be white, grey, brown, orange, dull or shining black. The shape is also significant—flattened, cylindrical or ovoid (figs. 331, 341).

(b) *External characters of adult*

The main characters used in this Handbook are indicated in fig. 3, showing an adult fly in side view, together with the wing. Identification of adults, apart from the male genitalia, is dependent on an analysis of three main groups of characters, namely, the chaetotaxy, particularly of the head and mesonotum; the colour of the frons, orbits, antennae, palps, mesonotum, scutellum, legs and, less frequently, abdomen; finally, the size and shape, particularly of the head and third antennal segment, and length of the wing.

Head.—There are normally between three and six orbital bristles divided into two groups. The upper orbital bristles (ors) are generally inclined upwards or slightly outwards; the lower orbital bristles (ori) may be inclined partly upwards but also frequently inwards. The strength and number of these bristles has great taxonomic significance, although there can be slight variation within species. There are usually two upper orbital bristles, which

may be equal in length, or the upper one is frequently shorter or sometimes entirely lacking. In general the relative strength of the ors is of greater taxonomic value than that of the ori.

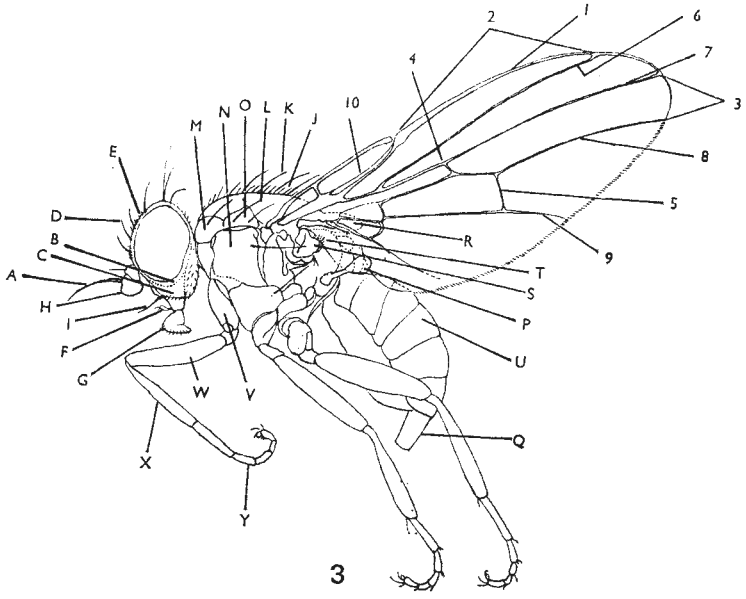


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FIG. 3.—Typical Agromyzid in side view, together with wing (after Sasakawa).

*A*, arista
*B*, cheek
*C*, jowl
*D*, orbital bristles
*E*, orbital setulae
*F*, palp
*G*, proboscis
*H*, third antennal segment
*I*, vibrissa
*J*, acrostichals
*K*, dorso-central bristles
*L*, mesonotum
*M*, humerus
*N*, mesopleural area
*O*, notopleural area
*P*, haltere
*Q*, ovipositor sheath
*R*, scutellum
*S*, squama
*T*, squamal fringe
*U*, tergites
*V*, coxa
*W*, femur
*X*, tibia
*Y*, tarsi

1, costa
2, second costal section
3, fourth costal section
4, first cross-vein
5, second cross-vein
6, $R_{2+3}$
7, $R_{4+5}$
8, $M_{1+2}$
9, $M_{3+4}$
10, $R_1$

The minute hairs immediately adjoining the eye margin referred to as orbital setulae are important generically (cf. key to genera, couplets 5 and 18) and can also be used to separate closely related species (cf. *Melanagromyza* key, couplet 2; *Ophiomyia* key, couplets 3 and 5). The direction of inclination, the strength and the number of rows present are all valuable characters.

The shape of the lunule is of particular significance in separating the subgenera of the genus *Cerodontha*, as indicated in fig. 328.

The eye in the Agromyzidae is generally bare, but may be significantly pilose as in *Cerodontha* (*Icteromyza*) *bohemanni* (Rydén) and *Phytomyza nigra* Meigen.

The general configuration of the head can be of considerable importance. In most species the orbits are not greatly differentiated but in certain cases such as *Cerodontha* (*Po.*) *muscina* (Mg.) they may be greatly enlarged laterally or in others significantly raised above the plane of the frons, as in *Phytomyza flavicornis* Fall. (fig. 232). The width of jowl in relation to the eye can show some slight variation, but where the jowls are unusually narrow or unusually broad this can be a valuable character.

The facial keel is normally not pronounced, but may be conspicuously developed and of generic significance as in *Ophiomyia*, where the raised keel entirely divides the base of the antennae. In the same genus the vibrissa in the male is normally, although not invariably, replaced by a bunch of bristles which are fused to form a vibrissal fasciculus (fig. 48). The shape and pilosity of the third antennal segment is of considerable significance. While the normal form is round or slightly longer than broad with slight but not pronounced pilosity, in certain cases the third antennal segment may be elongated (fig. 234) or may have conspicuously long pubescence as in *Liriomyza millefolii* (fig. 166) or *Phytoliriomyza scotica* (fig. 198).

The colour of the various parts of the head is of the utmost significance. The colour of the frons and the antennae is obviously important. It may be yellowish white, yellowish orange, brown, or entirely black. In black species the antennae are invariably black, while in yellowish species the third antennal segment may be yellow, slightly darkened, or entirely black. The orbits may be differentiated from the frons by distinctive black, grey or yellow coloration.

Mesonotum.—The chaetotaxy of the mesonotum is of great significance. In the grass-feeding *Agromyza* species there are a number of dorso-centrals (dc) greatly reducing in size, and frequently with no pre-sutural dc. On the other hand in the *spiraeae* group feeding on Rosaceae, there are always 3 + 1 dc, with the pre-sutural one strong and well developed. There is some degree of variation in the number of acrostichals (acr), but in most species these are quite clearly either in two rows or in four or maybe in six or more rows. In a few cases such as *Phytomyza plantaginis* and *P. syngenesiae*, acr are entirely lacking.

The colour of the mesonotum can be a valuable character. It can be partially yellow in some *Agromyza*, *Liriomyza* and *Phytomyza* species but is generally grey or more rarely brownish or brilliantly shining black. In a few *Melanagromyza* species it may be greenish or bluish.

Legs.—These provide a few good taxonomic characters, mainly colour of the coxae, femora or tibiae. The presence of a lateral bristle on the fore-tibiae is useful for distinguishing *Nemorimyza posticata*. The presence of one, two or sometimes more strong bristles on the mid-tibiae is somewhat variable, but can nevertheless be of specific significance.

Wing.—The wing length is invariably a valuable character. Important venational characters are the presence or absence of the second cross-vein and its position, either towards the wing base or well beyond the termination of vein $R_1$; and also the relative length of the last and penultimate sections of vein $M_{3+4}$. The extension of the costa to the apex of vein $M_{1+2}$ or its

reduction to the apex of $R_{4+5}$ is significant, and also in many species the costal ratio (ratio of second to fourth costal section, cf. fig. 3).

The colour of the halteres is a useful generic character with British species (cf. key to genera, couplet 2). However, in the genus *Amauromyza* there are subgenera both with black and with white halteres.

The colour of the squamal fringe is frequently a character of importance; it ranges from silvery white to jet black and shows remarkably little variation.

ABDOMEN.—The colour of the abdomen is constant in many species, for instance entirely black in most *Agromyza*, or greenish as in many *Melanagromyza* species or largely yellow in most *Liriomyza*. In certain species, particularly in the genus *Phytomyza*, the hind margins of the tergites may be partially yellow, but the degree to which this pale colour is present can vary considerably and this character must be used with caution.

The keys below are based on those prepared by Hendel (1931–6), as amended by Hering (in Spencer, 1968) for *Liriomyza* and *Phytomyza*, but in all cases with substantial modifications.

(c) *Male genitalia*

The male genitalia in the Agromyzidae have now assumed extreme significance, both for the identification of individual species and also for the clarification of generic relationships. They represent a large complex of taxonomic characters which show remarkable constancy and I know of no case where any obvious overlapping between related species occurs. Only in rare cases can species be identified more readily from external morphological characters than from differences in male genitalia. A simplified illustration of the main structures of the genitalia is shown in fig. 4.

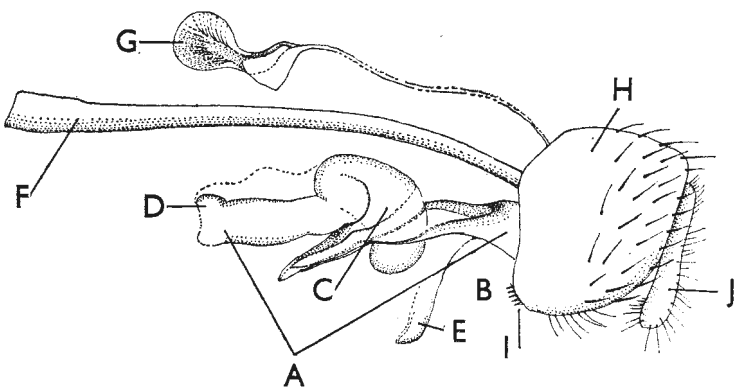


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FIG. 4.—Male genitalia of typical Agromyzid. A, aedeagus; B, basiphallus; C, mesophallus; D, distiphallus; E, hypophallus; F, aedeagal apodeme; G, ejaculatory apodeme; H, epandrium; I, surstylus; J, cercus.

The most significant and stable structure in the male genitalia is the distal end of the aedeagus, referred to here as the distiphallus. Illustrations of this in side view and in either ventral or dorsal view will invariably suffice for

completely reliable identification of a species. Other structures which can be of significance are the ninth sternite, which may be elongated (fig. 45), conspicuously broad and rounded (fig. 133) or narrow (fig. 185B), the ejaculatory apodeme in which the blade can be minute (fig. 273) or greatly enlarged as in *Amauromyza* species (fig. 136) and finally the surstyli which may have a characteristic arrangement of bristles along the inner margin (figs. 139, 202).

Accurate descriptions of genitalia which will have real meaning to later authors are extremely difficult to prepare in view of their complexity and three-dimensional nature, and one or more illustrations will invariably be of greater value than long descriptions.

## Host Specificity

Most Agromyzidae are monophagous, that is their choice of host is limited to plant species in one genus. More rarely strict monophagy occurs where only a single species of plant is attacked. A considerable number, however, are oligophagous, in other words feed indiscriminately on plants of different genera in one family or on related families in the same order. There are very few truly polyphagous species and the only such species known in Britain are *Liriomyza bryoniae* (Kalt.), *L. strigata* (Mg.), *Phytomyza horticola* Goureau and *P. syngenesiae* (Hardy).

## Leaf Mines

Most Agromyzidae are leaf-miners and the larva forms a characteristic feeding pattern on a single plant, or maybe on a group of related plants. Leaf-mines can be identified, after identification of the host-plant, according to the manner in which the larva feeds and the particular part of the leaf in which it feeds. In most species the larva forms an upper surface mine. This implies that it feeds in the upper layer of cells lying immediately below the epidermis in the area of the palisade parenchyma. Such mines are readily visible on the upper surface of the leaf. They may be largely linear or serpentine (fig. 244) or they may form an obvious blotch (fig. 168), which may be roughly circular or irregular in outline. The mine may adjoin the leaf-margin or always be in the centre of the leaf; it may lie along the midrib with lateral offshoots (figs. 38, 172). In a smaller number of species the larva feeds in the lower cells of the spongy parenchyma; such mines are often entirely invisible when examining the leaf from above and frequently escape detection (cf. *Paraphytomyza tremulae* Hering). The larva of some species feeds in the centre of the leaf between the two adjoining layers of the palisade and spongy parenchyma. Such mines are called inter-parenchymal and invariably assume a yellowish coloration (cf. *Phytomyza sphondyliivora* Sp.). They are frequently overlooked and not recognized as true mines. A further type of feeding is the full-depth mine, in which both layers of cells are eaten, the mine then appearing largely transparent. A further whole range of characters of leaf-mines is provided by the way in which the larva deposits its frass. This may be in the form of small black pellets (fig. 230) or short strips which may be widely spaced or inter-connected, or alternately on one side of the mine and the other (fig. 238B). The mine may be virtually without frass until the very end, where the entire frass is excreted at once; this may be black or it may be greenish. On completion of feeding, the

larva may leave the mine through a semicircular exit slit, either on the upper surface of the leaf (*Phytomyza conii* Hg.) or on the lower surface (*P. spondylii* R.-D.) or alternatively it may pupate within the leaf, sometimes with the anterior spiracles projecting through the leaf epidermis in a characteristic fashion.

The leaf-mining habit has been discussed in detail by Hering (1951).

## Distribution of Agromyzidae

Agromyzidae are widely distributed throughout the world but with significantly less species in the southern hemisphere than in the temperate areas of the Palaearctic and Nearctic regions. The genus *Melanagromyza* is particularly well represented in the Old and New World tropics; conversely, the two main temperate genera, *Liriomyza* Mik and *Phytomyza* Fallén, are almost entirely absent from purely tropical areas.

Approximately 1800 species are now known throughout the world. Of these, 776 occur in Europe. This high proportion of world species is certainly

Table I.—British and European Species by Genera

| | British | Total European |
|---|---|---|
| Agromyzinae | | |
| *Hexomyza* | 3 | 5 |
| *Melanagromyza* | 13 | 27 |
| *Ophiomyia* | 23 | 46 |
| *Japanagromyza* | — | 1 |
| *Agromyza* | 46 | 79 |
| Phytomyzinae | | |
| *Selachops* | — | 1 |
| *Phytobia* | 4 | 8 |
| *Amauromyza* | 8 | 18 |
| *Calycomyza* | 2 | 4 |
| *Liriomyza* | 41 | 118 |
| *Pteridomyza* | 1 | 1 |
| *Metopomyza* | 4 | 9 |
| *Phytoliriomyza* | 3 | 4 |
| *Lemurimyza* | 3 | 5 |
| *Nemorimyza* | 1 | 1 |
| *Paraphytomyza* | 15 | 41 |
| *Pseudonapomyza* | 2 | 2 |
| *Napomyza* | 7 | 11 |
| *Phytomyza* | 103 | 319 |
| *Ptochomyza* | — | 3 |
| *Xeniomyza* | — | 1 |
| *Gymnophytomyza* | — | 1 |
| *Cerodontha* | | |
| *Subgen.* | | |
| *Dizygomyza* | 13 | 29 |
| *Phytagromyza* | 1 | 1 |
| *Poemyza* | 11 | 20 |
| *Icteromyza* | 4 | 4 |
| *Cerodontha* | 3 | 7 |
| *Xenophytomyza* | 2 | 3 |
| Uncertain genera | — | 7 |
| Total | 313 | 776 |

in part due to the intensive collecting which has been undertaken in Europe during the past 50 years but the concentration of species in Europe seems to be greater than elsewhere in the Holarctic region. Only 290 species were recorded in Canada (Spencer, 1969) and less than 400 are known in the whole of North America.

In Britain 313 species are known, representing 40 per cent. of known European species. With further collecting this proportion will tend to decrease rather than increase, as certainly more species await discovery in Europe than in Britain. The total of British and European species by genera is shown in Table I.

Over two-thirds of the species now recorded for the British Isles are only known in southern England. In Scotland 74 species are known, representing 24 per cent. of the British total, while in Ireland 94 species (30 per cent.) have been recorded. The greater number of species known in Ireland is almost certainly due to the intensive collecting there in recent years by G. C. D. Griffiths and the author. The distributional pattern in the British Isles thus represents an orderly diminution of species with increasing distance from the present centre of distribution in Western Europe. The number of species in Scandinavia is not significantly greater than in Britain and with the number of species in Ireland approximately equal to those in Scotland, it appears that the present water barriers between Britain and the Continent on the one hand and Ireland and Britain on the other have had little influence in limiting the number of species. Immigration into Britain and into Ireland, whether by land connection or by aerial dispersal, has been as substantial as into northern Europe from Central Europe. The impoverishment in the fauna northwards and westwards appears thus to reflect lower temperatures, possibly greater humidity and limitation of host-plants, rather than difficulties in crossing the existing water barriers.

## British Literature on the Agromyzidae

Kloet & Hincks (1945) made the first attempt to gather together the scattered information on British Agromyzidae available at that time and listed 90 British species. Inevitably a number of the names used have now been reduced to synonyms or represent misidentifications. However, four good species referred to have not been traced in any material and are not accepted as British, as follows: *Agromyza salicina* Hendel; *Phytomyza kaltenbachi* Hendel, *P. fuscula* Zetterstedt; *Selachops flavocincta* Wahlberg.

Parmenter for a number of years actively collected Agromyzidae, particularly leaf-mines, and added a number of species to the British list (1949, 1953*a*, 1953*b*). Spencer (1953, 1954*a*, 1954*b*, 1954*c*, 1956*a*, 1956*b*, 1957*a*, 1957*b*, 1957*c*, 1957*d*, 1959) and Griffiths (1955*a*, 1955*b*, 1956, 1959, 1961, 1963, 1967*b*, 1968*a*) continued this work during the next 15 years, describing a number of new species and adding many more to the British list. Manning (1956) published a useful list of leaf-mines in Norfolk.

## Economic Importance

Throughout the world as many as 150 species of Agromyzidae feed on cultivated plants, in a number of cases causing extensive damage and substantial economic loss.

In Britain the main groups of plants affected are as follows:

1. CEREALS. In recent years winter wheat has been damaged by two species, *Agromyza nigrella* Rondani and *A. rondensis* Strobl (= *A. veris* Hering), cf. Duthoit, 1968. Other species which have severely attacked cereals in Europe are *A. ambigua* Fallén (= *A. niveipennis* Zett.) and *A. nigrociliata* Hering.
2. TOMATOES. *Liriomyza bryoniae* (Kaltenbach) has for some years been a problem in the glasshouses of the Lea Valley (cf. Speyer, 1937–51, as *L. strigata* Mg. and *L. solani* Macq.) and has recently become established in a new area of glasshouse cultivation in Sussex.
3. CRUCIFEROUS CROPS. *Phytomyza rufipes* Meigen, which feeds in stems and leaf-stalks of cabbage and other related crops, is widespread in Britain and regularly causes damage to young plants and commercial loss with such crops as cauliflower and broccoli.
4. ASPARAGUS. The stem-miner, *Ophiomyia simplex* (Loew), appears to be well established wherever asparagus is regularly cultivated.
5. LEGUMINOUS CROPS. *Liriomyza congesta* (Becker) and *Phytomyza horticola* Goureau are potentially serious pests of peas and beans.
6. TREES. The cambium borers, *Phytobia cerasiferae* Kangas on plum trees in Kent (Lee, 1953, and Pitcher, 1956) and *P. cambii* Hendel on cricket bat willows in Norfolk, and basket willows particularly in Lancashire, Yorkshire, Hertfordshire and Suffolk (Barnes, 1933).
7. HORTICULTURAL PLANTS. The most serious pest is *Phytomyza syngenesiae* (Hardy) which can largely destroy young chrysanthemum cuttings and severely damage most leaves even on adult plants (Hussey, 1969). Holly and a number of smaller garden plants, such as Aquilegia (*Phytomyza aquilegiae* Hardy, *Phytomyza minuscula* Goureau) and Dianthus (*Amauromyza* (*Tril.*) *flavifrons* (Mg.)) are regularly attacked and with severe outbreaks can be totally destroyed.

The size of populations of these species can greatly vary and when a combination of favourable factors leads to a mass outbreak, the damage caused by species which do not normally cause concern can be considerable. Careful records should therefore be kept of all species occurring on cultivated plants.

## COLLECTING AND REARING AGROMYZIDAE

The Agromyzidae are not only the largest family of acalyptrates in Britain but the populations of many species are also large. Agromyzidae can therefore be collected easily and in considerable numbers by normal sweeping in suitable habitats, such as meadows, hedgerows, rides in woods and marshland. Chalk or limestone areas (Box Hill, Surrey; Derbyshire Dales) or fens (Chippenham, Cambs., Woodwalton, Hunts.) are ideal collecting localities.

A more elegant method of collecting involves searching for larval leaf-mines or puparia in stems. In this way the host is known and identification is greatly facilitated. Leaf-mines containing larvae should be kept in a sealed plastic bag or corked tube and leaves will invariably retain their turgidity until the larvae have completed feeding. Puparia easily desiccate and a simple method of preventing this is to keep them on a layer of damp sand

in a glass tube. In many species the adults will emerge in about two weeks but where there is only a single generation or when collecting in the autumn, it may be necessary to keep the puparia throughout the winter. A period of freezing is normally necessary before the diapause can be broken. A few weeks in a refrigerator in January suffices for this and thereafter emergence can be forced and the adults obtained in March or April.

In the majority of species the adults can be swept during the period April to June. Most can be obtained in May but a few species regularly appear earlier or later, to coincide with the growth of the host-plants. The mines of a few early species begin to appear in May, with increasing numbers up to the peak at the end of June and beginning of July. Adults can again be obtained in considerable numbers in September and the late generation of mines can be collected throughout October and in mild seasons even into November. Puparia can be obtained from stems at any time from late summer and throughout the winter up to the time of emergence in May or June.

Griffiths (1962) has given useful notes on collecting and rearing.

## Hymenopterous Parasites

Apart from predators such as ants and birds, hymenopterous parasites are the main natural enemies of Agromyzid larvae and represent the primary controlling factor affecting the population of most species.

The groups known as parasites of the Agromyzidae in Britain are:

(1) Braconids. Ichneumonoidea, subfamily Alysiinae—tribes Dacnusini and Opiini.
(2) Chalcids. Families Eulophidae and Pteromalidae.
(3) Cynipids. Family Eucoilidae.

Of these, Braconids are the most numerous, with somewhat more species among the Dacnusini than the Opiini. The Dacnusini show a high degree of host specificity but this appears to be less marked in the Opiini. Griffiths has recently published a series of revisionary papers on the Alysiinae (1964 1966*a*, 1966*b*, 1967*a*, 1968*b*, 1968*c*), and Opiini have been discussed by Fischer (1962), who has given a useful list of *Opius* species bred from confirmed hosts, mainly from Britain.

Chalcids probably account for about 30 per cent. of Agromyzid parasites. The degree of host specialization appears to be significantly less than in the Braconids and the number of species in Britain is also smaller. British Eulophids have recently been revised by Askew (1968) and the Pteromalidae of North-Western Europe have been revised by Graham (1969).

Cynipids as parasites of Agromyzidae are known only from the gall-causing and stem-boring genera *Hexomyza* Enderlein and *Melanagromyza* Hendel. Few species have been reared from known hosts and there is little reliable information available on species parasitizing Agromyzidae.

## Acknowledgments

No species have been accepted as British which have not been personally examined and I would like to thank the following persons and institutions for the loan of material or facilities for the study of their collections:

*British Museum (Natural History): Dr. P. Freeman and Mr. B. H. Cogan.* The main British collection and also the collections of Professor O. W. Richards and L. Parmenter have been studied; accession material, particularly from Scotland, proved of considerable interest.

*Canadian National Collection, Ottawa, Ontario: Mr. G. E. Shewell.* A small collection made in the Midlands and West Country by Dr. J. R. Vockeroth contained interesting new records and two species not previously known from Britain.

*Hope Department of Entomology, University Museum, Oxford: Professor G. C. Varley.* The collections of A. H. Hamm and J. E. Collin were found to contain a number of undescribed species and additions to the British list.

*Royal Scottish Museum, Edinburgh: Mr. A. R. Waterston, O.B.E., and Mr. E. C. Pelham-Clinton.* New material examined revealed a number of important new records for Scotland.

*Mr. P. J. Chandler, London.* A small collection from Ireland and the south of England.

*Dr. G. C. D. Griffiths, University of Alberta, Edmonton, Alberta.* In addition to the loan of material from his collection, Dr. Griffiths has provided helpful information in numerous letters and also during personal discussions in Edmonton.

Financial support for the preparation of this Handbook was provided by a Research Grant from the Natural Environment Research Council, to whom I am deeply indebted for this assistance.

Most of the illustrations of leaf-mines are from the original drawings by Professor E. M. Hering which were used in his keys to European Leaf-mines (1957). I am very grateful to his publishers, Dr. W. Junk, The Hague, for permission to use these drawings. All other original illustrations were drawn by my wife, Ann Spencer, to whom I am extremely grateful for the meticulous care with which these have been prepared.

Finally, I would particularly like to thank Professor G. C. Varley for the invaluable practical help, advice and encouragement which he has given me throughout this project.

## Key to Genera of British Agromyzidae

1 Sub-costa developed throughout its length (fig. 1A), coalescing with $R_1$ before reaching costa (Sub-family Agromyzinae) ..... 2

– Sub-costa becoming a fold distally (fig. 1B) and ending in costa separately and basad of $R_1$ (Sub-family Phytomyzinae) ..... 5

2 Two pairs of dc; if 3 or 4 pairs, halteres black; pre-sutural dc never present ..... 3

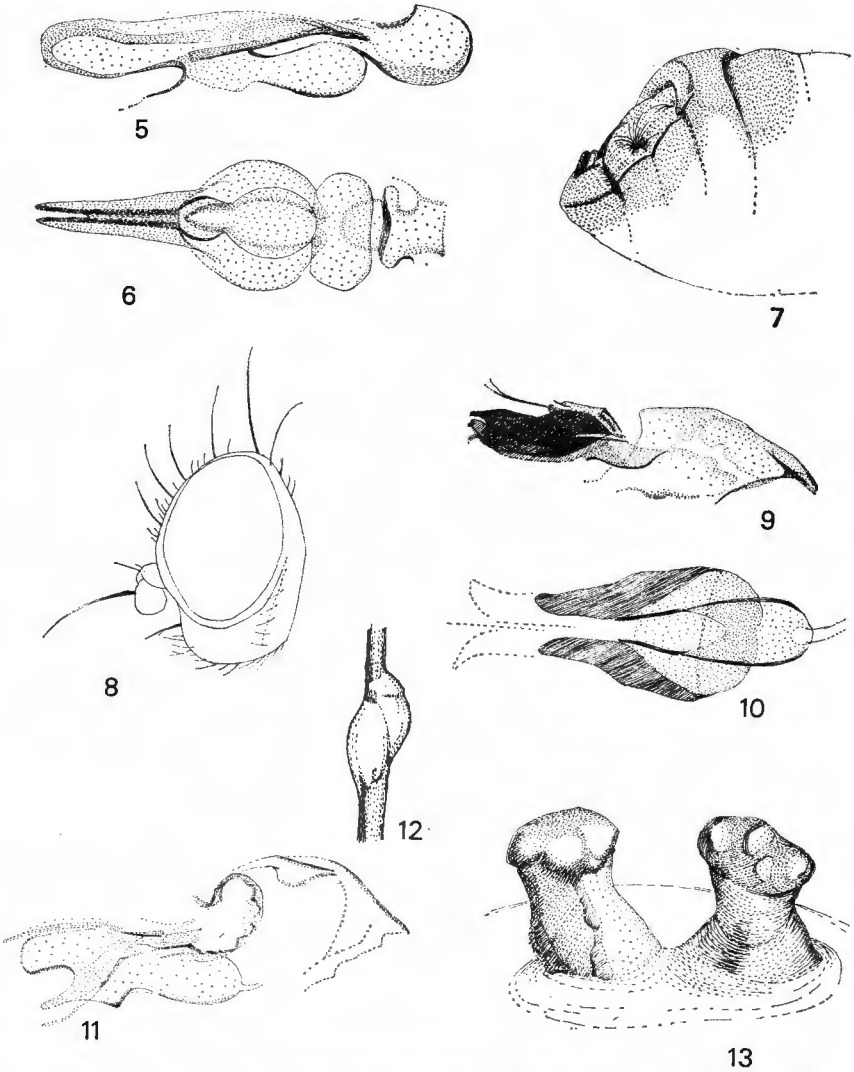
– At least 3 pairs of dc, prsc always present; halteres white or yellow; pre-sutural dc frequently present ..... **Agromyza** Fallén (p. 31)

3 Mesonotum or abdomen frequently with some metallic coloration, greenish, bluish, or coppery; costa extending strongly to vein $M_{1+2}$; mid-tibiae with 1 to 3 strong lateral bristles; larval posterior spiracles with numerous bulbs, from 6 to 20, normally surrounding a strong black horn (rarely atrophied to a mere scar); antennae not separated by raised keel, male never with vibrissal horn; aedeagus with basiphallus U-shaped (cf. figs. 23, 26).

*Biology: internal stem-borers* ..... **Melanagromyza** Hendel (p. 15)

– Uniformly black species; costa ending at $R_{4+5}$ or continuing to $M_{1+2}$; mid-tibiae without lateral bristles (weakly present in *O. simplex*, *O. pulicaria* group); posterior spiracles of larva normally on distinct stalks, each process either with 3 or more normally with numerous bulbs, never with spiracular horn; aedeagus with basiphallus having conspicuously diverging side-arms (cf. figs. 49, 52) .... 4

4 Antennae normally separated by conspicuous facial keel; male frequently with distinct vibrissal horn (figs. 40, 42); larval posterior spiracular processes normally with between 6 and 12 bulbs.
*Biology: stem- or leaf-miners* ..... **Ophiomyia** Braschnikov (p. 22)
– Antennae adjoining; vibrissal horn never present; larval posterior spiracles always with 3 bulbs on each process.
*Biology: gall-causers* ..... **Hexomyza** Enderlein (p. 15)
5 Orbital setulae erect or reclinate, or absent ..... 6
– Orbital setulae distinctly proclinate ..... 18
6 Wing with costa extending to apex of vein $M_{1+2}$; if only to $R_{4+5}$, then lunule substantially higher than semicircle (*Cerodontha* (*Phytagromyza*) *flavocingulata*) . 7
– Costa extending only to $R_{4+5}$ ..... 17
7 Scutellum dark, concolorous with mesonotum ..... 8
– Scutellum yellow; vein $M_{1+2}$ ending nearest wing tip ..... 15
8 Halteres with knob white or yellow ..... 9
– Halteres with knob black or at least partially darkened; if yellow, subgenus *Cephalomyza*, distiphallus with numerous spinules (fig. 132)
**Amauromyza** Hendel (p. 44)
9 Vein $R_{4+5}$ ending nearest wing tip ..... **Phytobia** Lioy (p. 44)
– Vein $M_{1+2}$ ending nearest wing tip ..... 10
10 Third antennal segment with a spine, scutellum with only 2 bristles; or lunule conspicuously higher than a semicircle, either narrow or triangular; or lunule conspicuously large and broad, antennal bases widely separated and third antennal segment in male normally greatly enlarged ..... **Cerodontha** Rondani (p. 97)
— Not so ..... 11
11 Fore-tibia with lateral bristle; abdomen in male conspicuously yellow
**Nemorimyza** Frey (p. 63)
— Only mid-tibia sometimes with lateral bristle, fore tibia never ..... 12
12 Orbits raised above plane of frons; frons dark . . **Liriomyza morio** (Brischke) (p. 50)
— Orbits in same plane as frons; frons yellow ..... 13
13 No pre-sutural dc; mesopleura and femora largely black
**Calycomyza** Hendel (p. 46)
— Pre-sutural dc present ..... 14
14 Antennae and legs black. **Amauromyza** (subgenus **Trilobomyza** Hendel) (p. 45)
— Antennae and legs yellow ..... **Pteridomyza** Nowakowski (p. 58)
15 Orbits largely in plane of frons; frons yellow ..... 16
— Orbits broad, raised above plane of frons; frons dark . .
**Metopomyza** Enderlein (p. 60)
16 Pre-scutellar area normally yellow; orbital setulae normally upright or slightly proclinate, rarely slightly reclinate; male genitalia: aedeagus with distinctive chitinised, paired tubules (figs. 201, 204), epandrium with a conspicuous comb-like arrangement of black spines (fig. 202) ..... **Lemurimyza** Spencer (p. 61)
— Pre-scutellar area normally dark, concolorous with mesonotum, more rarely yellow; orbital setulae distinctly reclinate; male genitalia: aedeagus variable, normally pale, scarcely chitinised, never with black tubules as in *Lemurimyza*, epandrium with hairs along inner margin, never black, comb-like process
**Liriomyza** Mik (p. 48)
17 Second cross-vein either absent, or if present, well beyond first; second costal section at least twice length of fourth; third antennal segment round
**Paraphytomyza** Enderlein (p. 63)
— Second cross-vein basal to first; second costal section conspicuously short, less than 1½ times length of fourth; third antennal segment angulate
**Pseudonapomyza** Hendel (p. 68)
18 Costa extending only to vein $R_{4+5}$ ..... 19
— Costa extending to vein $M_{1+2}$; orbital setulae conspicuously proclinate (not slightly so as in *Lemurimyza*) ..... **Phytoliriomyza** Hendel (p. 60)
19 Second cross-vein present; frons always strongly projecting; second costal section short, always less than twice length of fourth .... **Napomyza** Westwood (p. 67)
— Second cross-vein normally absent; if present, frons not projecting, second costal section longer, 2½ times length of fourth (*aprilina* group)
**Phytomyza** Fallén (p. 69)




FIGS. 5–7.—*Hexomyza simplicoides*: (5), aedeagus, side view; (6), same, ventral view; (7), front end of puparium.
FIGS. 8–10.—*H. sarothamni*: (8), head; (9), aedeagus, side view; (10), same, ventral view.
FIGS. 11–13.—*H. schineri*: (11), aedeagus, side view; (12), galls on *Populus*; (13), posterior spiracles of puparium.

## Genus **Hexomyza** Enderlein

*Hexomyza* Enderlein, 1936. Type of genus: *Melanagromyza sarothamni* Hendel, 1923.

The three British species in this small genus were included by Hendel (1931–6) in *Melanagromyza*. On external characters the two genera cannot be readily separated but *Hexomyza* species clearly form a monophyletic group, recognizable by their characteristic male genitalia (figs. 5, 9, 11) and their biology—all being gall-causers.

The species are stout, with wing venation as in *Melanagromyza*, and are uniformly black, including the halteres. The chaetotaxy is unusually unstable and not infrequently a third dorso-central bristle is present.

The British species are gall-causers on *Populus*, *Salix* and *Sarothamnus scoparius*. The genus is also known from North America, Japan and South Africa.

### Key to Species

1 Costa ending at or shortly beyond vein $R_{4+5}$; frons distinctly projecting above eye in profile, 4 or 5 orbital bristles, long; jowls broad, up to one-third height of eye; normally 2 dc but additional third also occurs; male genitalia as in figs. 5, 6 **simplicoides** (Hendel)

*Surrey: Box Hill, Effingham, Oxshott; Cambs.: Kirtling*, 2 ♂, 1 ♀, 14.vi.98 (*G. H. Verrall*). *Probably widespread but overlooked. Host:* Salix *spp., particularly* S. caprea, *larva forming oval gall in cortex of twig, pupating internally; galls with puparia April, May, emergence end May or early June; puparium yellow, conspicuously reddish brown in front* (*fig.* 7), *posterior spiracles each with* 3 *minute bulbs on short stalk.*

– Costa extending strongly to $M_{1+2}$ ..... 2

2 Mesonotum shining black; frons broad, 1½–2 times width of eye, not significantly projecting above eye in profile; orbital bristles variable from 4 to 6, orbital setulae long; jowls broad, one-quarter height of eye (fig. 8); chaetotaxy of mesonotum variable, from 2 to 4 dc; wing 2·2–3 mm.; male genitalia: aedeagus as in figs. 9, 10 ..... **sarothamni** (Hendel)

*Berks.: Silwood Park*, 1 ♀, 18.vi.62 (*O. W. Richards*). *Uncommon. Host:* Sarothamnus scoparius, *larva forming slender twig-gall, May, June; puparium greyish black.*

– Mesonotum distinctly greyish black, more matt; orbital bristles 4 or 5; 2 or 3 dc; wing 2·7–3·1 mm.; male genitalia: aedeagus as in fig. 11 ..... **schineri** (Giraud)

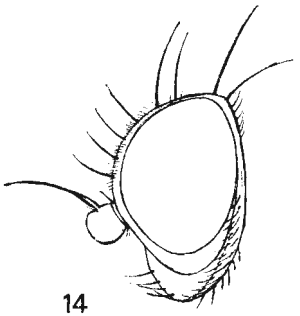
*Herts.: Hoddesdon. Probably widespread. Holarctic. Hosts:* Populus nigra, P. tremula, *larva forming oval twig gall, May, June* (*fig.* 12); *puparium yellowish grey, posterior spiracles on short stalks, each with* 3 *minute bulbs* (fig. 13).

## Genus **Melanagromyza** Hendel

*Melanagromyza* Hendel, 1920: 120. Type of genus *Agromyza aeneoventris* Fallén, 1823a.

This genus is readily recognizable by the following combination of characters:

Sub-costa well-developed and joining vein $R_1$; normally 2 pairs of strong dc (rarely 3), pre-sutural dc always lacking; costa extending to vein $M_{1+2}$, second cross-vein always present; halteres black or brown. British species are generally black, with slight greenish metallic coloration of the mesonotum and the abdomen frequently brilliantly shining green or bluish. All species are stout and frequently large, with wing length up to 3·5 mm.



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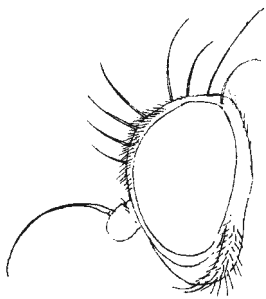

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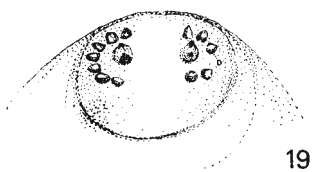

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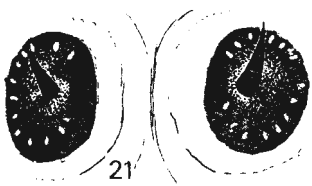

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FIGS. 14–15.—*Melanagromyza tripolii*: (14), head; (15), posterior spiracles of puparium.
FIGS. 16–17.—*M. limata*: (16), head; (17), aedeagus.
FIGS. 18–19.—*M. cunctans*: (18), gall on *Lotus corniculatus*; (19), posterior spiracles of puparium.
FIG. 20.—*M. dettmeri*: aedeagus (ex *Senecio jacobaea*).

*Melanagromyza* species are mainly internal stem-borers and nine of the 13 British species feed in this way. In *M. symphyti* Griffiths the feeding habit is slightly modified and the larvae occur mainly in the thick leaf-stalks. *M. cunctans* (Mg.) forms slender stem-galls (fig. 18) on *Lotus*. The biology of two British species, *M. pubescens* Hd. and *M. limata* Sp., a new species recently discovered in N. Wales, is unknown. A further *Melanagromyza* sp. has recently been found in eastern England feeding in the roots of *Vicia faba* L. With the limited material seen initially it was not possible to distinguish this species from *M. eupatorii* Spencer. However, in view of the differing biology, somewhat larger size and slight differences in male genitalia, I am now satisfied that this represents a distinct species which will be described shortly.

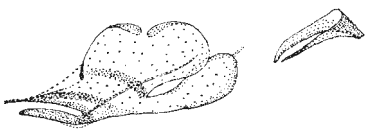
*Melanagromyza* is poorly represented in Britain and it is essentially a warm-adapted genus which is dominant in both the Old and New World tropics. The number of species diminishes rapidly in north-temperate areas and this is clearly reflected in the distribution in Britain, with only three species recorded in Scotland. There are no holarctic species. British species were discussed by Spencer (1957*d*) and European species were revised by Spencer (1966*a*). Two new British species have been described subsequently, by Griffiths (1963) and Spencer (1971*a*).

Some species in the genera *Ophiomyia* and *Hexomyza* cannot readily be distinguished from *Melanagromyza* on external characters and for convenience these have been included in the key below.

### Key to Species

(including also 5 *Ophiomyia* and 3 *Hexomyza* species)

1 Squamal margin and fringe essentially pale, white to ochrous or orange; mesonotum and abdomen variably greenish ..... 2
– Squamal margin and fringe dark, brown or black ..... 12
2 Orbital setulae entirely proclinate; orbits strongly projecting above eye (fig. 16) .. 3
– Orbital setulae entirely reclinate or appearing irregular, in two rows, both proclinate and reclinate ..... 5
3 Squamae and fringe conspicuously silvery white, margin pale yellowish; wing from 2·3 mm. in male to 3 mm. in female ..... **tripolii** Spencer
*Kent: Faversham; Essex: Flatford, Mersea; Wales: Glam.: Llanridian salt marsh (G. C. D. Griffiths). Probably widespread with food-plant, at least in south. Host:* Aster tripolium*; larva boring in stem and pupating internally, posterior spiracles separated by own diameter, each with* 14–18 *well-defined bulbs around the small central horn* (fig. 15).
– Margin of squamae darker, orange-brown to brownish black ..... 4
4 Orbital setulae long, thick, entirely proclinate (fig. 16); wing 2·8–3·1 mm.; male genitalia: aedeagus as in fig. 17 ..... **limata** Spencer
*N. Wales: Denbigh., Cefn-y-bedd,* 1 ♂, 1 ♀, 25.vi.70 (*K.A.S.*). *Rare, only known record. Host unknown.*
– Orbital setulae shorter, sparser; male genitalia as in fig. 26 **angeliciphaga** Spencer
(Orbital setulae more frequently in 2 rows, both proclinate and reclinate, cf. couplet 11.)
5 Orbital setulae in two distinct rows, the inner predominantly proclinate, the one nearer eye margin reclinate ..... 6



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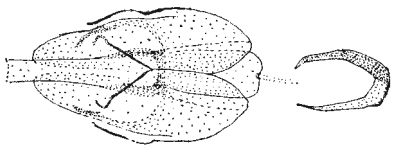

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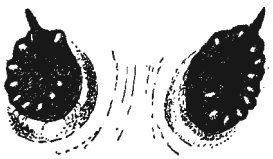

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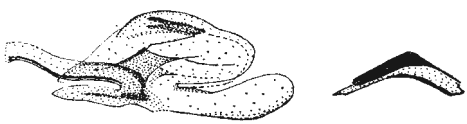

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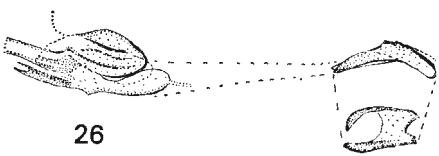

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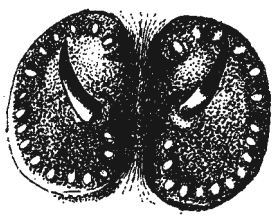

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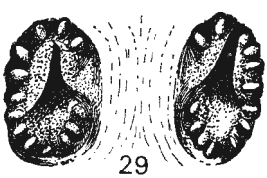

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FIGS. 22–24.—*Melanagromyza nibletti*: (22), aedeagus, side view; (23), same, ventral view; (24), posterior spiracles of puparium.

FIG. 25.—*M. lappae*: aedeagus.

FIGS. 26–27.—*M. angeliciphaga*: (26), aedeagus; (27), posterior spiracles of puparium.

FIGS. 28–29.—*M. aenea*: (28), aedeagus; (29), posterior spiracles of puparium.

– Orbital setulae sparse, reclinate; squamae and fringe silvery white, margin pale yellow; ocellar triangle large, distinctly but not brilliantly shining; eyes bare in both sexes; mesonotum shining black, abdomen shining greenish; small species, wing 2–2·4 mm. ..... **cunctans** (Meigen)
*Surrey: Box Hill; Bucks.: Ivinghoe; Hereford: Tarrington,* 1 ♀, 26.viii.02 (*Col. Yerbury*). *Uncommon. Host:* Lotus corniculatus; *larva forming slender, cylindrical gall in upper part of stem* (fig. 18), *posterior spiracles separated by slightly less than own diameter, each process with a ring of* 6–8 *ill-defined bulbs around the low protuberance replacing the normal horn* (fig. 19).

6 Frons not projecting above eye in profile, squamal fringe ochrous; jowls one-sixth eye height; mesonotum somewhat matt, faintly greenish or coppery, abdomen distinctly shining, variably coppery, greenish or bluish; wing 2·7–3·2 mm.; male genitalia: aedeagus with distinctly elongate tubule distally (fig. 20) **dettmeri** Hering
*Surrey: Banstead, Betchworth, Walton Heath; Middx.: Scratch Wood; Oxford: Bagley Wood; Cambs.: Chippenham Fen; Derby.: Miller's Dale; Wales: Denbigh., Wrexham; Scotland: Perths.: Killin* (*K.A.S.*). *Widespread and common. Hosts:* Achillea millefolium, Artemisia vulgaris, Centaurea nigra, C. scabiosa, Hieracium umbellatum, Senecio jacobaea. *Larva internal stem-borer, pupating in stem; posterior spiracular plates adjoining, each with a regular ellipse of* 15 *bulbs around the strong central horn; puparium grey.*
– Frons strongly projecting above eye ..... 7

7 Two lower orbital bristles (ori), normally 2 upper orbitals (ors); mesonotum distinctly shining greenish or coppery black, abdomen more so; squamae and fringe white, margin pale yellowish brown; wing from 2·4 mm. in male to 3·5 mm. in female ..... (= *cirsii* Rondani) **aeneoventris** (Fallén)
*London: Hampstead; Surrey: Bookham, Selsdon; Middx.: Scratch Wood; Hants.: I.o.W., Branscombe,* 1 ♂, 13.v.27 *ex* Senecio jacobaea (*K. G. Blair*); *Devon: Studland; Hunts.: Woodwalton Fen; S. Wales: Glam.; Ireland* (*Haliday coll.*); *Scotland: Dunbarton, Bonhill* (*J. R. Malloch*). *Widespread and common, at least in south. Hosts:* Cirsium spp., Senecio jacobaea; *larva internal stem-borer, pupating in stem; posterior spiracular processes separated by approx. own diameter, each with an ellipse of* 14–18 *bulbs around the black central horn.*
– Three to five ori ..... 8

8 Squamae distinctly greyish, fringe ochrous, sometimes almost brownish; 2 ors, 3 or 4 ori; mesonotum only moderately shining, blackish coppery, abdomen shining greenish; wing 2·5–3 mm. (= *torilidis* Spencer) ..... **sativae** Spencer
*Surrey: Betchworth, Bookham; Suffolk: Newmarket* (*J. E. Collin*). *Local. Hosts:* Pastinaca sativa; *less commonly* Anthriscus, Pimpinella, Torilis. *Larva internal stem-borer, pupating in stem, posterior spiracular processes black, separated by own diameter, each with an ellipse of* 14 (*or slightly fewer*) *bulbs around the central horn* (fig. 21).
– Squamae and fringe white ..... 9

9 Orbits not greatly differentiated, not significantly widening at base of antennae, only slightly projecting above eye in profile ..... 10
– Orbits strongly differentiated and greatly widening below, strongly projecting above eye in profile; large species, wing 2·6–3·5 mm. ..... 11

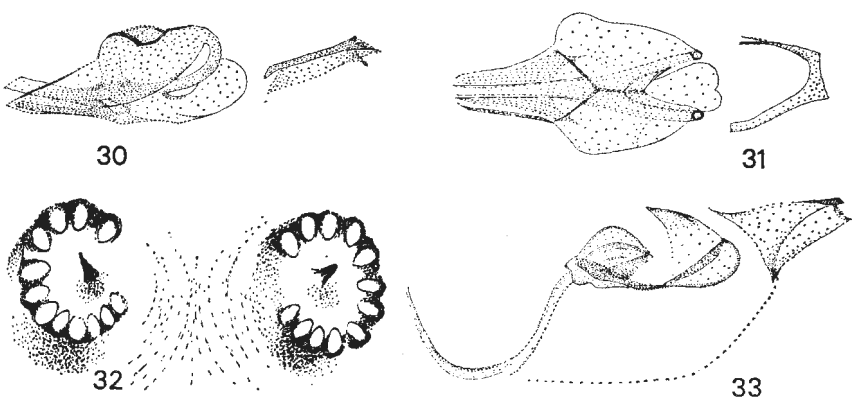
10 Mesonotum shining black; orbits projecting as narrow ring above eye in profile; large species, wing length 2·7 mm. ..... **symphyti** Griffiths
*Hunts.: Woodwalton Fen. Local. Host:* Symphytum officinale. *Larva boring in stem or leaf-stalk, pupating internally; posterior spiracular processes separated by own diameter, each with an ellipse of some* 30 *minute bulbs around the small central horn; puparium shining reddish brown.*
— Mesonotum matt viewed from front; slightly shining from behind, bluish or greenish; smaller species, wing length 2·4–2·6 mm.; male genitalia: aedeagus as in figs. 22, 23 ..... **nibletti** Spencer
*Surrey: Bookham. Local. Host:* Silaum silaus. *Larva internal stem-borer, pupating in stem; posterior spiracles separated by own diameter, solidly chitinised, black, with* 10–12 *bulbs around the strong central horn* (fig. 24).

11 Male genitalia: aedeagus with basiphallus closely adjoining distiphallus complex (fig. 25) ..... **lappae** (Loew)
*Middx.: Scratch Wood; Bucks.: Sarratt; Herts.: Barnet; N. Wales: Denbigh.: Cefn-y-bedd; Scotland: Dunbarton., Bonhill (J. R. Malloch). Host:* Arctium lappa, A. minus, *larva internal stem-borer, pupating internally; posterior spiracles adjoining, each process with* 16–22 *bulbs around the strong central horn; puparium whitish grey.*

— Male genitalia: aedeagus with conspicuous gap between basiphallus and distiphallus complex (fig. 26) ..... **angeliciphaga** Spencer
(Orbital setulae sometimes entirely proclinate, cf. couplet 4.)
*Surrey: Bookham, Box Hill; Middx.: Scratch Wood; Bucks.: Sarratt; Hunts.: Woodwalton Fen; Wales: Glam. Widespread in south. Hosts:* Angelica sylvestris, *less commonly* Heracleum sphondylium, Pastinaca sativa, *larva boring in stem and pupating internally, posterior spiracles adjoining, each process with ellipse of* 16–20 *bulbs around the strong central horn* (fig. 27); *puparium whitish yellow.*

12 Costa extending only to $R_{4+5}$ ..... 13
— Costa extending to $M_{1+2}$ ..... 14

13 Cheeks brilliantly shining black, mesonotum moderately so; second dc beyond level of supra-alar ..... **Ophiomyia simplex** (Loew)
— Cheeks and mesonotum matt; second dc behind level of supra-alar
**Hexomyza simplicoides** (Hendel)




FIGS. 30–32.—*Melanagromyza eupatorii*: (30), aedeagus, side view; (31), same, dorsal view; (32), posterior spiracles of puparium.
FIG. 33.—*M. pubescens*: aedeagus.

14 Orbital setulae in single row, proclinate above, reclinate below ..... 15
— Orbital setulae all reclinate or all proclinate ..... 16

15 Orbital setulae conspicuously long, proclinate above, a few in front reclinate (fig. 37) ..... **Ophiomyia cunctata** (Meigen)
— Orbital setulae shorter, mainly reclinate, a few at level of ors proclinate (fig. 39) **Ophiomyia beckeri** (Hendel)

16 Orbital setulae all proclinate; abdomen at least slightly greenish; squamae grey, fringe black ..... 17
— Orbital setulae all reclinate or at most those in front incurved; abdomen entirely black ..... 18

17 Abdomen brilliantly shining greenish; aedeagus as in fig. 28; wing 2·7–3·1 mm. ..... (= *fuscociliata* Hendel) **aenea** (Meigen)
*Surrey: Godalming; Middx.: Scratch Wood; Somerset: Portishead. Widespread, at least in south. Host:* Urtica dioica, *larva internal stem-borer, pupating in stem; posterior spiracles separated by own diameter, each process with elongated ellipse of about* 13 *bulbs around the strong central horn* (fig. 29).

— Abdomen only faintly greenish; aedeagus as in figs. 30, 31; smaller species, wing 2·5–2·7 mm. ..... **eupatorii** Spencer
*Cambs.: Chippenham Fen; Hunts.: Woodwalton Fen. Local. Hosts:* Chrysanthemum leucanthemum, Eupatorium cannabinum, Inula conyza, Senecio jacobaea. *Larva internal stem-borer, pupating in stem; posterior spiracles separated by own diameter, each with ring of* 10–12 *clearly-defined bulbs around the small central horn* (fig. 32).

18 Frons not projecting above eye ..... **Ophiomyia pulicaria** (Meigen)
— Frons strongly projecting above eye ..... 19

19 Three or four dc ..... **Ophiomyia orbiculata** (Hendel)
— Two (rarely three) dc ..... 20

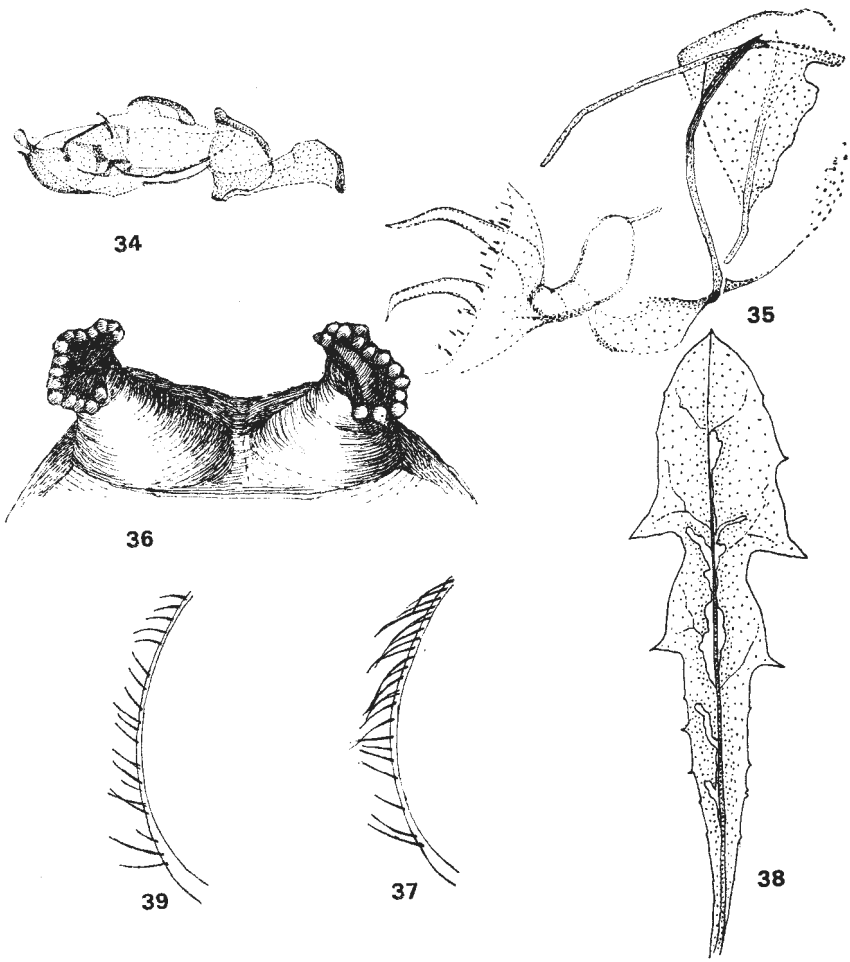



FIG. 34.—*Ophiomyia pulicaria*: aedeagus.
FIGS. 35–36.—*O. orbiculata*: (35), aedeagus; (36), posterior spiracles of puparium.
FIGS. 37–38.—*O. cunctata*: (37), orbital setulae; (38), leaf-mine on *Taraxacum*.
FIG. 39.—*O. beckeri*: orbital setulae.

20 Jowls angular, deepest at rear; orbital setulae short, sparse, third antennal segment conspicuously pubescent; mesonotum matt viewed from front, more shining black from behind; abdomen shining black; wing 2·7–3·1 mm.; male genitalia: aedeagus as in fig. 33 ..... **pubescens** Hendel
*London: Putney Heath; Cambs.: Snailwell,* 2 ♀, 20 *and* 22.vi.08 *(J. E. Collin); Wales: Glamorgan, Porthcawl,* 1 ♂, 18.vi.06 *(Col. Yerbury). Uncommon. Host: unknown.*
— Jowls broad, flat or slightly rounded below (fig. 8) ..... 21
21 Mesonotum shining black..... **Hexomyza sarothamni** (Hendel)
— Mesonotum distinctly greyish black, more matt .... **Hexomyza schineri** (Giraud)

## Genus **Ophiomyia** Braschnikov

*Ophiomyia* Braschnikov, 1897 (Hendel, 1920). Type of genus: *Agromyza maura* Meigen, 1830 (misidentified as *curvipalpis* Zetterstedt).

Most British species are immediately recognizable by the distinct facial keel dividing the base of the antennae, by the forwardly projecting jowls in both sexes (figs. 50, 51), and, in the male, by the conspicuous vibrissal fasciculus (figs. 40, 70). Coloration is uniformly black, without any trace of metallic sheen on either mesonotum or abdomen. There are only 2 pairs of dc; wing venation is as in *Melanagromyza*.

However, in five species in the *pulicaria* group (couplets 2–5) external characters dividing *Ophiomyia* and *Melanagromyza* largely disappear and the correct affiliation is only detectable from the male genitalia. In most *Ophiomyia* species the distal section of the aedeagus is highly asymmetrical and the arms of the basiphallus are characteristically elongate (figs. 59, 60).

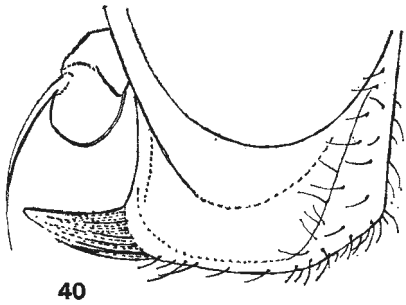
The majority of species in this genus feed as external stem-miners. Of the 23 species known in Britain 13 feed in this way. One species, *melandryi* de Meij., forms an internal stem-mine within the hollow stem of *Melandrium*. Five are leaf-miners, but of these only *maura* (Mg.) forms a typical mine in the leaf-blade (fig. 68), the others feeding inside the mid-rib, with short lateral offshoots into the leaf-blade (fig. 38). The biology is unknown for only four species.

The genus occurs predominantly in southern England, with only four species recorded in Scotland and only one in Ireland. European species were recently revised by Spencer (1964).

Two new species have been discovered during the preparation of this Handbook and three additions to the British list have been recorded.

### Key to Species

1 Distinct keel separating antennae or male with vibrissal fasciculus..... 6
– No obvious keel present, vibrissa normal..... 2
2 Costa ending at or shortly beyond vein $R_{4+5}$; frons broad, almost twice width of eye, orbits distinctly projecting above eye in profile; cheeks brilliantly shining black, forming broad ring below eye; wing 2·2–3 mm..... **simplex** (Loew)
*Oxford.: Oxford; Lancs.: Formby; Kent: Godmersham; Surrey: Wisley; Dorset: Chickerell; Herts.: Harpenden; Worcs.: Evesham; Suffolk: Newmarket (J. E. Collin). Occurring wherever food-plant is regularly cultivated. Holarctic. Host:* Asparagus officinalis, *larva forming external stem-mine, pupating in stem. A number of larvae may feed in a single stem and young plants may turn yellow and die.*
– Costa extending to vein $M_{1+2}$ ..... 3
3 Orbital setulae all reclinate ..... 4
– Orbital setulae both proclinate and reclinate (figs. 37, 39) ..... 5



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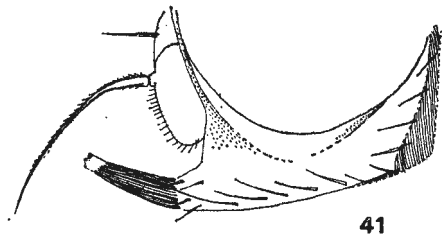

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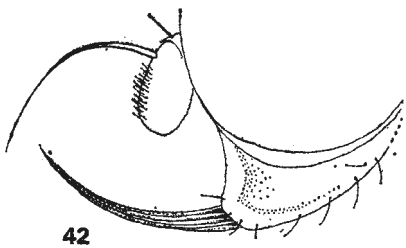

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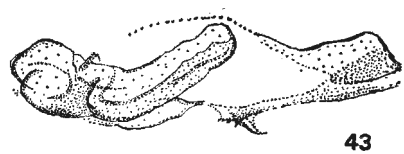

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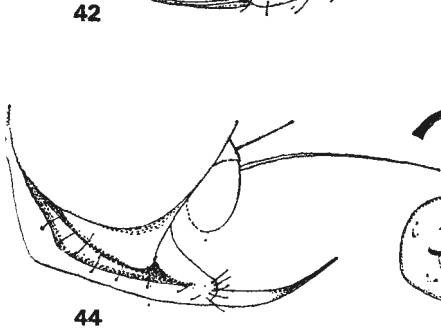

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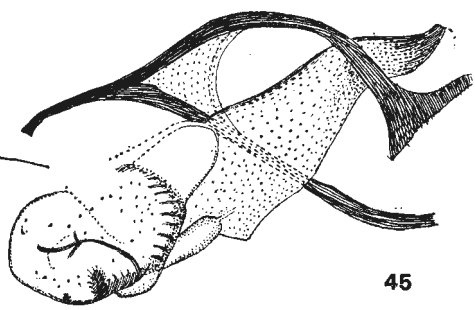

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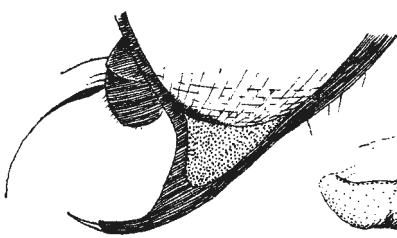

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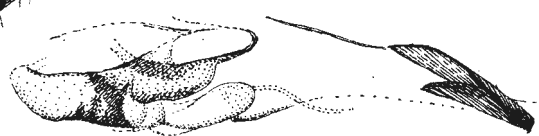

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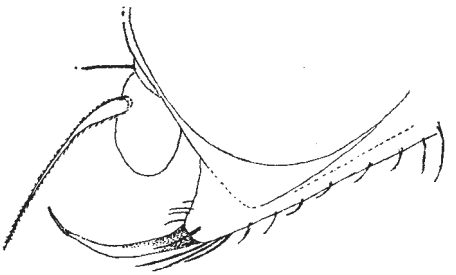
FIG. 40.—*Ophiomyia penicillata*: head.
FIG. 41.—*O. heringi*: head.
FIGS. 42–43.—*O. alliariae*: (42), head; (43), aedeagus.
FIGS. 44–45.—*O. galii*: (44), head; (45), aedeagus and ninth sternite.
FIGS. 46–47.—*O. curvipalpis*: (46), head; (47), aedeagus (holotype).



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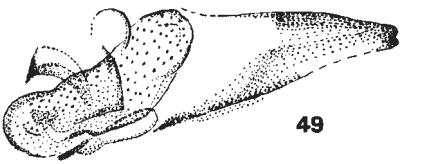

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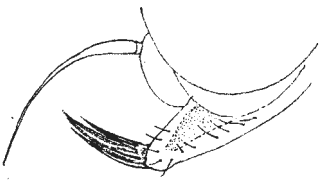

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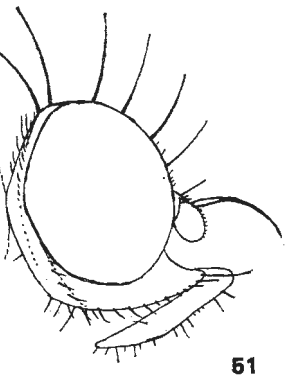

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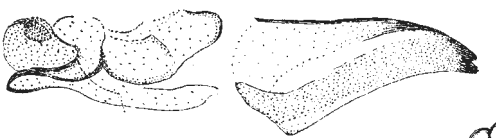

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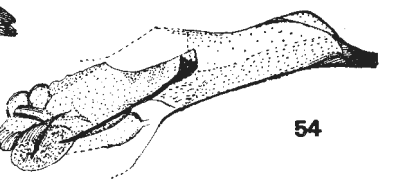

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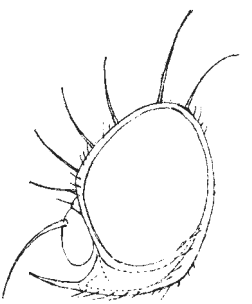

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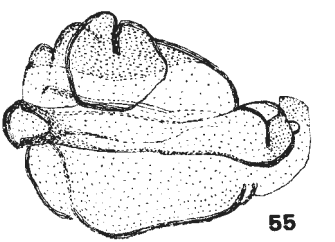

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4 Two dc; frons not significantly projecting above eye in profile; wing 1·7–2·2 mm. Male genitalia: aedeagus as in fig. 34 ..... **pulicaria** (Meigen)
*Widespread and common in south; Lancs.: Formby*, 4 ♂, 17.v.53 (*C. N. Colyer*). *Holarctic. Hosts:* Crepis, Hieracium, Hypochoeris, Leontodon, Picris, Sonchus, Taraxacum, *larva forming white mine along midrib with short offshoots into leaf-blade, pupating at base of leaf in petiole.*

– Small third and frequently fourth dc present; frons consistently and conspicuously projecting above eye in profile; wing 2–2·5 mm. Male genitalia: aedeagus as in fig. 35 ..... (= *nostradamus* Hering) **orbiculata** (Hendel)
*Middx.: Scratch Wood; Herts.: Potter's Bar; Cambs.: Snailwell*, 1 ♂, 1.vii.43 (*J. E. Collin*); *Suffolk: Orford*, 1 ♂, 20.vi.07 (*G. H. Verrall*). *Widespread in south. Hosts:* Pisum sativum, Vicia *spp., larva forming external stem-mine, pupating in stem; posterior spiracles of puparium each with some* 15 *irregular bulbs* (fig. 36).

5 Orbital setulae conspicuously long, proclinate above, a few in front reclinate (fig. 37); wing 2·5 mm. ..... **cunctata** (Hendel)
*Kent: Dartford; London: Hampstead; Hants.: I.o.W., Blackgang; Glos.: Coombe Dingle; Herts.: Tring; Suffolk: Newmarket* (*J. E. Collin*); *Lancs.: Formby* (*C. N. Colyer*); *Scotland: Dunbarton, Bonhill* (*J. R. Malloch*). *Hosts:* Crepis, Hypochoeris, Lapsana, Mycelis, Picris, Sonchus, Taraxacum, *in Britain most commonly on latter, larva forming white mine along midrib, with offshoots into leaf-blade* (fig. 38), *pupating in leaf-base; posterior spiracles each with* 9 *bulbs.*

– Orbital setulae shorter, mainly reclinate, a few above proclinate (fig. 39); wing up to 2·5 mm. ..... **beckeri** (Hendel)
*Kent: Sandwich; Essex: Thames Marshes; Oxford.: Bagley Wood; Dorset: Portland, Studland; Somerset: Berrow; Wales: Glamorgan, Porthcawl*, 1 ♂, 31.v.06 (*Col. Yerbury*); *Ireland* (*Haliday collection*). *Widespread in south but not common. Hosts:* Leontodon, Sonchus, Taraxacum (*no bred specimens recorded in England*); *mine as in* cunctata; *posterior spiracles each with* 10–12 *bulbs on a short stalk.*

6 Orbital setulae all proclinate; male without vibrissal fasciculus and without upper orbital bristles; facial keel conspicuously bulbous; orbits shining black; wing 2·2 mm. ..... **pinguis** (Fallén)
*Devon: Lyme Regis*, 1 ♂, 17.vi.58 (*K.A.S.*); *Scotland: Dunbarton., Cardross*, 1 ♂, 20.vii 08 (*J. R. Malloch*); *London, Cambridge, ex bought chicory* (*introduced from Belgium or the Netherlands*). *Uncommon. Hosts:* Cichorium intybus, Leontodon, *larva mining in basal leaves, pupating internally. This species is a serious pest of cultivated chicory in Belgium and the Netherlands and is frequently introduced into England; the mining activity is detectable from the reddish discoloration of the white leaves.*

– Orbital setulae all reclinate; vibrissal fasciculus and upper orbitals present in male. 7

7 Costa ending at or shortly after vein $R_{4+5}$ ..... 8

– Costa extending to $M_{1+2}$ ..... 10

8 Large, stout species, wing from 2·5 mm. in male to 3 mm. in female; vibrissal fasciculus broad, short (fig. 40); last section of vein $M_{3+4}$ 1·5 times penultimate; facial keel broad but flat ..... **penicillata** Hendel
*Hants.: Lyndhurst*, 1 ♂, 18.vi.97 (*Col. Yerbury*); *Sway*, 1 ♀, 17.vii.07 (*J. J. F. X. King*). *Rare. Host unknown.*

– Smaller species, wing length up to 2·4 mm.; last and penultimate sections of $M_{3+4}$ approximately equal ..... 9

9 Vibrissal fasciculus in male short, broad, at end blunt and white (fig. 41); facial keel narrow, flat ..... **heringi** Starý
*London: Hampstead. Uncommon. Hosts:* Campanula persicifolia, Jasione montana, Phyteuma spicatum (*Campanulaceae*); Crepis, Hypochoeris radicata, Lapsana communis (*Compositae*); *larva forms external stem-mine, pupating in stem.*

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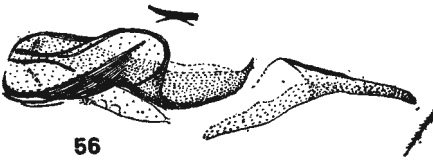
FIGS. 48–49.—*Ophiomyia ranunculicaulis*: (48), head; (49), aedeagus.
FIGS. 50–52.—*O. gnaphalii*: (50), head (male holotype); (51), head (female); (52), aedeagus.
FIGS. 53–55.—*O. senecionina*: (53), head; (54), aedeagus, side view; (55), same, ventral view.



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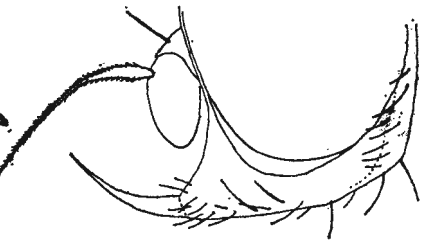

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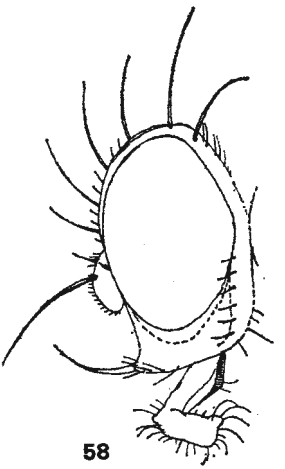

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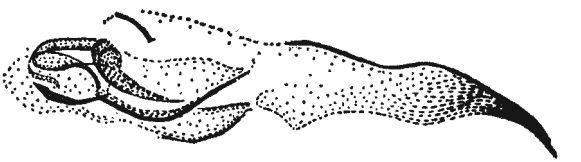

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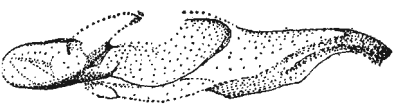

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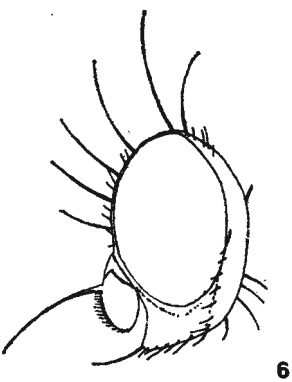

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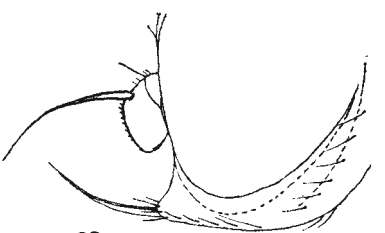

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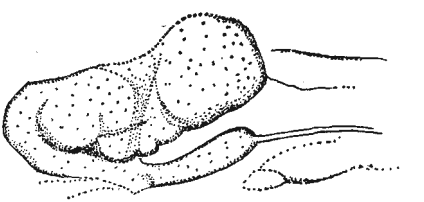

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– Vibrissal fasciculus long, with normal curvature (fig. 42); facial keel flat above, more raised below base of antennae; wing 2·3 mm.; male genitalia: aedeagus as in fig. 43 ..... **alliariae** Hering
*London: Hampstead. Uncommon. Host:* Alliaria petiolata (= officinalis), *larva forming external stem-mine, pupating in mine.*

10 Vibrissal angle acute, at most 60° ..... 11

— Vibrissal angle less acute, 70°–90° ..... 14

11 Proboscis greatly elongated (fig. 51) ..... 12

— Proboscis shorter, normal; vibrissal fasciculus regularly curving (fig. 44); facial keel broad, bulbous (holotype, Germany) or flatter (England), without central furrow; wing 1·9 mm; male genitalia: aedeagus and ninth sternite as in fig. 45 **galii** Hering
*Suffolk: Woodditton Wood,* 1 ♂, 7.viii.40 (*J. E. Collin*); *Surrey: Betchworth, mines with puparia,* 23.ix.61 (*G. C. D. Griffiths*). *Uncommon. Host:* Galium mollugo, *larva forming inconspicuous stem-mine, pupating in mine; frass in large, widely-spaced grains; puparium black, posterior spiracles each with* 4 *to* 5 *bulbs.*

12 Vibrissal angle extending beyond antennae, conspicuously elongated, fasciculus thick, fused, black in basal section, slender, white at end (fig. 46); facial keel broad but only slightly raised; wing from 1·9 mm. in male to 2·2 mm. in female; male genitalia: aedeagus as in fig. 47 ..... **curvipalpis** (Zetterstedt)
*Surrey: Box Hill, Epsom; Dorset: Portland; Cambs.: Burwell* (*J. E. Collin*); *Suffolk: Woodditton* (*J. E. Collin*). *Widespread in south, not uncommon. Hosts:* Compositae, Achillea, ?Anthemis, ?Matricaria; *Papilionaceae,* Medicago sativa(?); *larva forms external stem-mine, pupating in stem; puparium yellowish or black, posterior spiracles each with* 3 *bulbs. There is some doubt about the status of the species feeding on* Medicago *but pending further clarification it is treated as* curvipalpis.

— Vibrissal corner not so extended, forming angle of 45°–60° ..... 13

13 Vibrissal fasciculus slender, with distinctive bend at end (fig. 48); jowls narrow but distinctly extending forwards, somewhat variable, forming angle of 45°–60°; facial keel broad, moderately raised below base of antennae; wing length 2–2·3 mm.; male genitalia: aedeagus as in fig. 49 ..... **ranunculicaulis** Hering
*Wilts.: Farley Down,* 1 ♂, 11.vi.38 (*J. E. Collin*); *Scotland: Dunbarton, Bonhill* (*J. R. Malloch*). *Uncommon; new to Britain. Host:* Ranunculus acris, *larva forming external stem-mine, pupating in mine; puparium black, posterior spiracles each bearing numerous bulbs, up to* 28.

— Vibrissal corner forming angle of 45°, fasciculus consisting of short brush of largely unfused hairs (fig. 50, holotype); head in female as in fig. 51; facial keel broad but flat; wing length from 1·8 mm. in male to 2·3 mm. in female; male genitalia: aedeagus as in fig. 52 ..... **gnaphalii** Hering
*Hereford.: Ross,* 1 ♀, 18.vi.02 (*Col. Yerbury*). *Uncommon, new to Britain. Host:* Gnaphalium sylvaticum, *larva forming external stem-mine, pupating in mine.*

14 Jowls narrow, one-eighth to one-fifth height of eye ..... 15

— Jowls broader, one-quarter to one-half height of eye ..... 21

15 Ocellar triangle brilliantly shining; third antennal segment enlarged; jowls one fifth vertical height of eye; vibrissal corner forming angle of 70°, fasciculus slender, uniformly curving (fig. 53); male genitalia: aedeagus as in figs. 54, 55 **senecionina** Hering
*Surrey: Box Hill. Local. Hosts:* Senecio erucifolius, S. jacobaea, *larva forming external stem-mine, pupating in mine; posterior spiracles each with* 6 *or* 7 *bulbs.*

— Ocellar triangle at most moderately shining; third antennal segment not enlarged. 16

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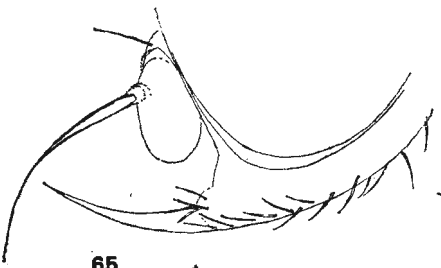
FIGS. 56–57.—*Ophiomyia melandricaulis*: (56), aedeagus; (57), head.
FIGS. 58–59.—*O. definita*: (58), head; (59), aedeagus.
FIGS. 60–61.—*O. labiatarum*: (60), aedeagus; (61), head (female).
FIGS. 62–63.—*O. collini*: (62), aedeagus; (63), head.



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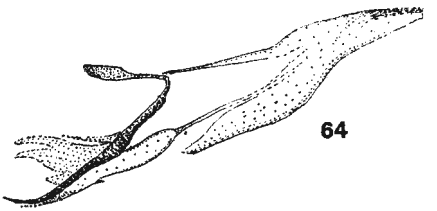

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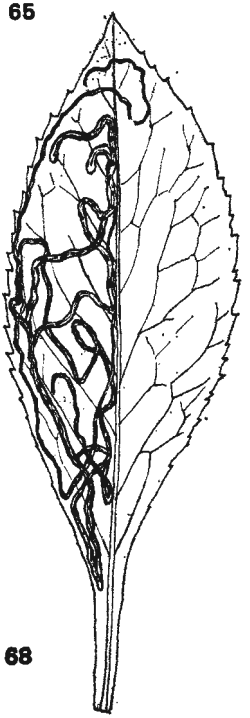

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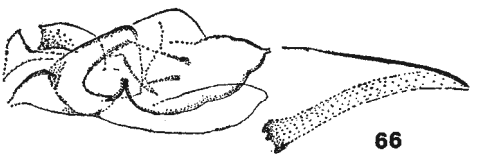

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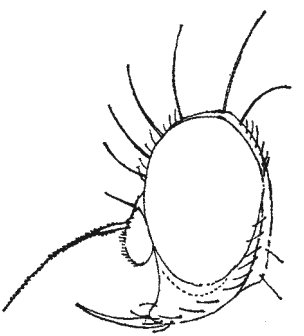

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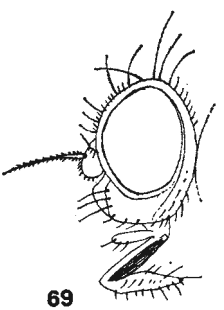

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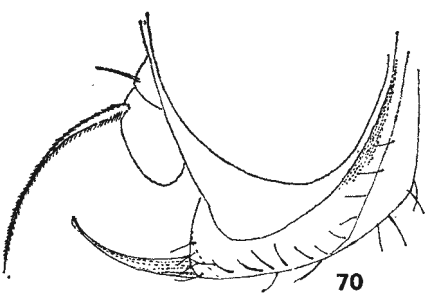

70

16 Male genitalia: aedeagus with isolated chitinised process above (fig. 56); small species, wing length 2·3 mm.; frons 1·5 times width of eye; jowls one-seventh height of eye; vibrissal fasciculus slender, short (fig. 57). . **melandricaulis** Hering
*Hunts.: Woodwalton Fen; S. Wales: Monmouth., Gower Peninsula (both G. C. D. Griffiths). Local. New to Britain. Hosts:* Melandrium rubrum *and probably other* Melandrium *spp.*, Lychnis flos-cuculi; Moehringia trinervia; *larva forms shallow external stem-mine, pupating in mine; puparium pale brown, posterior spiracles each with* 8–11 *bulbs.*

— Male genitalia: aedeagus without such process . . . . . 17

17 Facial keel narrow . . . . . 18

— Facial keel broader, frequently with distinct central furrow (*maura*) . . . . . 20

18 Facial keel flat, little more than linear; jowls conspicuously flat along lower margin, only slightly projecting in front; vibrissal fasciculus slender (fig. 58); wing length 2–2·1 mm.; male genitalia: aedeagus as in fig. 59 . . . . . **definita** Spencer
*Suffolk: Barton Mills, Woodditton Wood (J. E. Collin). Uncommon, only known records. Host unknown. May.*

— Facial keel distinctly raised above base of antennae . . . . . 19

19 Aedeagus as in fig. 60; vibrissal angle about 70° (fig. 61); wing length up to 2·3 mm., last section of $M_{3+4}$ two-thirds length of penultimate (holotype) but the two sections sometimes equal . . . . . **labiatarum** Hering
*Surrey: Box Hill, mines with larvae on* Stachys sylvatica *(G. C. D. Griffiths); Oxford.: Bagley Wood; Hunts.: Woodwalton Fen; Suffolk: Barton Mills,* 1 ♂, 9.v.39 *(J. E. Collin), probably widely distributed but not common. Holarctic. Hosts:* Stachys sylvatica, Clinopodium vulgare, Lamium *spp. (in Canada* Nepeta), *larva forming inconspicuous external stem-mine, pupating in stem near a node; posterior spiracles each with* 7 *bulbs.*

— Aedeagus as in fig. 62; head (fig. 63) with jowls forming angle of 70°, vibrissal fasciculus long, slender; facial keel narrow, moderately raised; wing length 2·2 mm. . . . . **collini** Spencer
*Cambs.: Chippenham Fen; Oxon.: Oxford. Host unknown.*

20 Male genitalia: aedeagus as in fig. 64; medium-sized species, wing 2·4–2·6 mm.; facial keel without central furrow, head as in fig. 65
(= *thalictrina* Griffiths) **aquilegiana** Lundquist
*Hunts.: Woodwalton Fen. Local. Hosts:* Thalictrum flavum, Aquilegia vulgaris; *larva forms external stem-mine, normally confined to one or two internodes, frass in widely-spaced black lumps; pupation in stem at end of mine, puparia yellow in summer generation, black in autumn generation.*

— Male genitalia: aedeagus as in fig. 66; generally smaller species, wing 1·9–2·5 mm.; facial keel frequently with well-marked central furrow, head as in fig. 67
**maura** (Meigen)
*Kent: Darenth, Ham Street; Derby: Miller's Dale, probably widely distributed. Host:* Solidago virgaurea *(in North America and Japan also* Aster *spp.), larva forming long, winding leaf-mine* (fig. 68) *with frass widely-spaced in conspicuous black lumps; pupation in leaf at end of mine, puparium white or black; posterior spiracles asymmetrical, each process with* 4 *bulbs on one arm and* 7 *on the other.*

21 Proboscis distinctly elongated (fig. 69); orbits projecting in front, orbital bristles slender; jowls broad, one-half vertical height of eye, cheeks forming broad ring below eye; antennae small, separated by narrow, low facial keel; male without vibrissal fasciculus; mesonotum blackish grey, only moderately shining
**rostrata** (Hendel)
*Cornwall: Padstow. Uncommon. Host unknown.*

— Proboscis short, normal; jowls about one-quarter height of eye; curving vibrissal fasciculus present in male; large species, wing length about 2·5 mm. . . . . 22

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FIGS. 64–65.—*Ophiomyia aquilegiana*: (64), aedeagus; (65), head.
FIGS. 66–68.—*O. maura*: (66), aedeagus; (67), head; (68), leaf-mine on *Solidago virgaurea.*
FIG. 69.—*O. rostrata*: head (after Hendel).
FIG. 70.—*O. melandryi*: head.

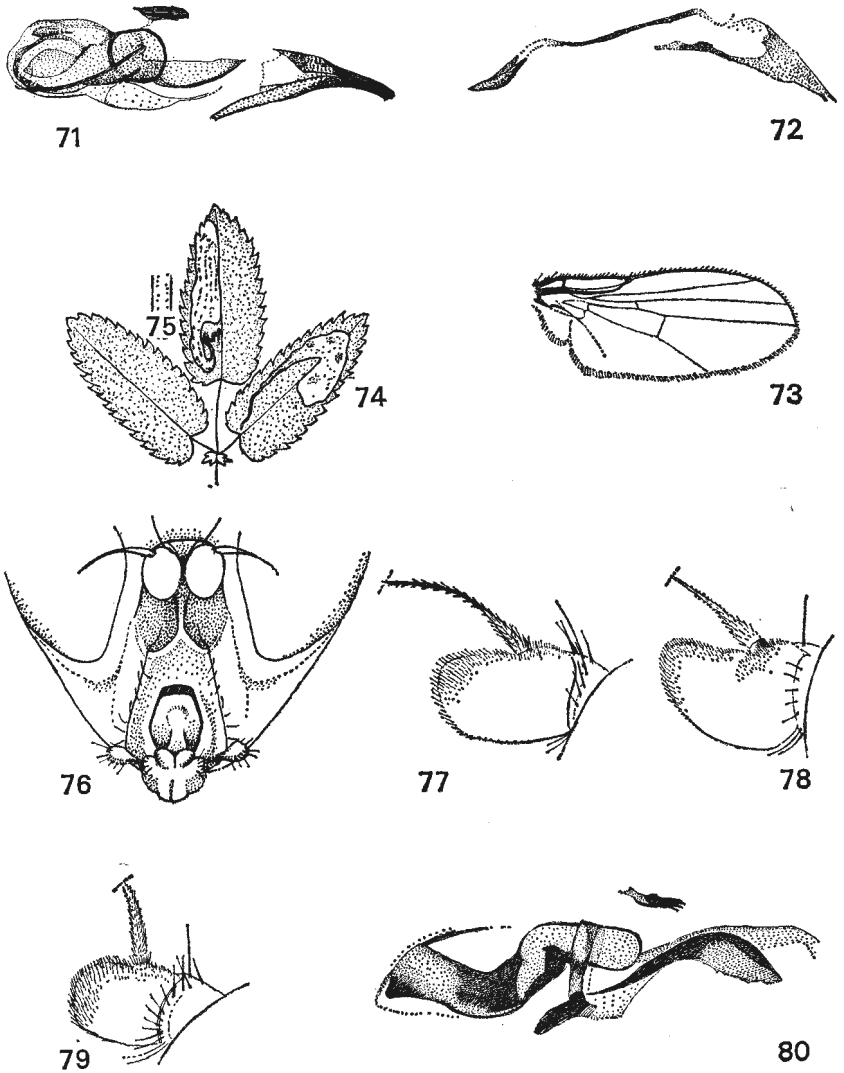



FIG. 71.—*Ophiomyia melandryi*: aedeagus.
FIG. 72.—*O. heracleivora*: aedeagus.
FIGS. 73–74.—*Agromyza sulfuriceps*: (73), wing; (74), leaf-mine on *Sanguisorba*.
FIG. 75.—*A. spiraeae*: leaf-mine on *Sanguisorba*.
FIG. 76.—*A. intermittens*: head from front, with epistoma.
FIG. 77.—*A. conjuncta*: third antennal segment.
FIG. 78.—*A. ambigua*: third antennal segment.
FIGS. 79–80.—*A. nigrella*: (79), third antennal segment; (80), aedeagus.

22 Facial keel obviously raised below base of antennae; head as in fig. 70; male genitalia: aedeagus as in fig. 71 ..... **melandryi** de Meijere
*Surrey: Godalming; Somerset: Radstock; Cornwall: Carbis Bay,* 1 ♂, 1 ♀, 31.v.31 *(Thornley); Suffolk: Barton Mills; Derby.: Miller's Dale; Wales: Llanridian; Scotland: Dunbarton., Bonhill. Widespread. Host:* Melandrium rubrum, *larva mining inside hollow stem where pupation also takes place; puparium brown, posterior spiracles each with* 12–13 *bulbs in a regular ellipse.*

— Facial keel broad but flat; male genitalia: aedeagus aberrant, as in fig. 72 **heracleivora** Spencer
*Surrey: Bookham; Herts.: Scratch Wood; Berks.: Silwood Park. Apparently widespread in south but not common. Host:* Heracleum sphondylium, *larva forming external mine on stem or leaf-stalk, pupating either at leaf-base or beneath epidermis of main stem.*

## Genus **Agromyza** Fallén

*Agromyza* Fallén, 1810: 21. Type of genus: *Agromyza nigripes* Meigen, 1830.

Diagnostic characters of this genus are:

Sub-costa well developed and joining $R_1$ before reaching costa (fig. 1A); at least 3 pairs of dc, pre-sutural dc frequently present and strong; pre-scutellars present; second cross-vein normally present (frequently absent in *A. intermittens* Beck.), discal cell large; stout species, wing length frequently over 3 mm.; most species entirely dark but a number with frons reddish or, in *flaviceps* Fall. and *sulfuriceps* Strobl, yellow; halteres white or yellow.

Of 46 species now known in Britain, 43 are leaf-miners; there is one stem-miner and one gall-causer, and only one of unknown biology. The leaf-miners on Gramineae form a compact group, having generally uniform genitalia differing only in detail (figs. 80, 82). This is the largest group in Britain with 15 species; the second largest group is that associated with Papilionaceae, with 12 species. Hosts of the remaining species are spread over seven further families.

The genus *Agromyza* is represented throughout the world and comprises over 150 species, of which over half are found in the Palaearctic region. Two species, *A. bromi* Sp. and *A. erythrocephala* Hend., are now recorded for the first time in Britain.

### Key to Species

1 Mesonotum with 3 or 4 post-sutural dc and two or more pre-suturals which are greatly reduced in strength and size ..... 2
– Mesonotum with 2 + 1 or 3 + 1 dc, with the fourth, pre-sutural, always strongly developed ..... 26

2 Wing tip at apex of $M_{1+2}$ (fig. 73); all antennal segments pale, normally bright yellow, occasionally more brownish; frons largely yellow, orbits darkened; mesonotum and scutellum matt, blackish grey; legs black apart from yellow fore knees; wing 1·6–2·1 mm. ..... **sulfuriceps** Strobl
*Cambs.: Chippenham Fen; Hunts.: Woodwalton Fen; Scotland: Dunbarton., Bonhill (J. R. Malloch). Probably widespread but local. Holarctic. Hosts:* Rosaceae, *particularly* Filipendula, Fragaria, Potentilla, Rubus, Sanguisorba; *mine a linear-blotch, frass distinctly in 2 rows, even at end* (fig. 74)*; posterior spiracles of larva (puparium) each with* 6 *bulbs.*
– Wing tip between apex of veins $R_{4+5}$ and $M_{1+2}$ ..... 3

3 Entire insect rusty-yellow; large species, wing 2·8–3·3 mm. ..... **ferruginosa** Wulp
*Surrey: Charterhouse (P. J. Chandler); Cambs.: Chippenham Fen; Hunts.: Woodwalton Fen. Local. Host:* Symphytum officinale; *mine large blotch, several larvae feeding together.*

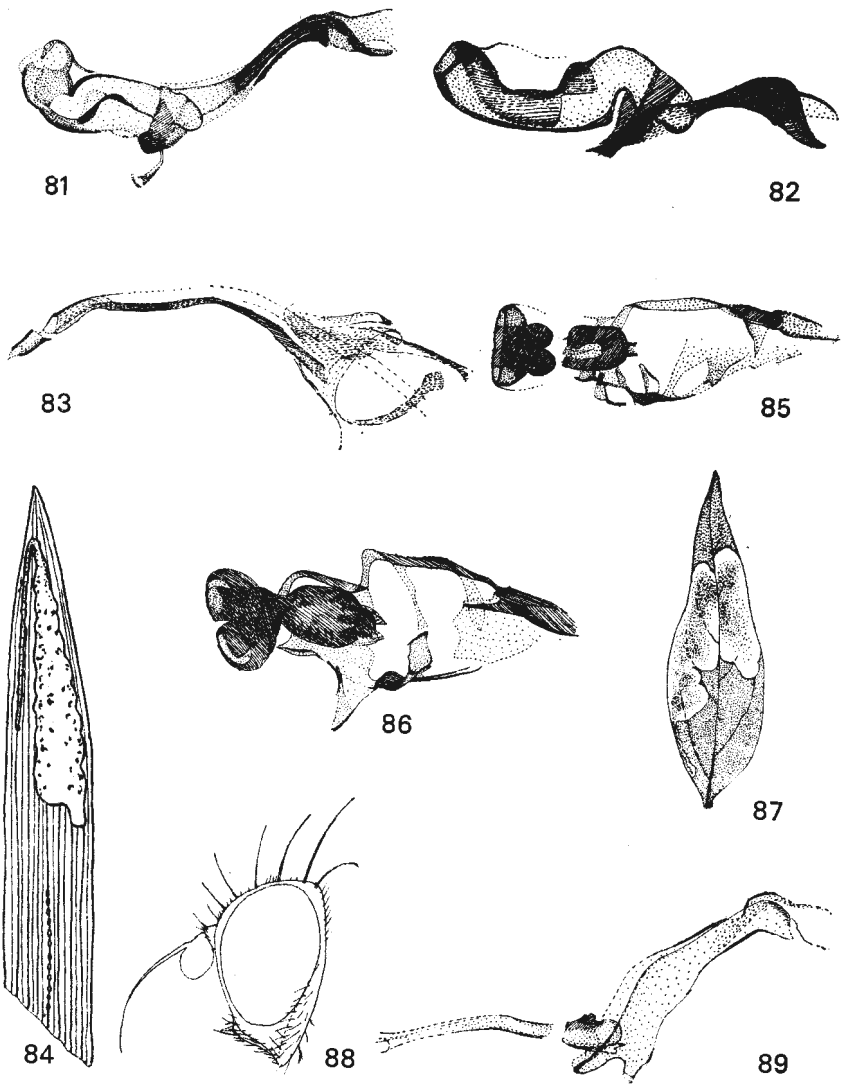
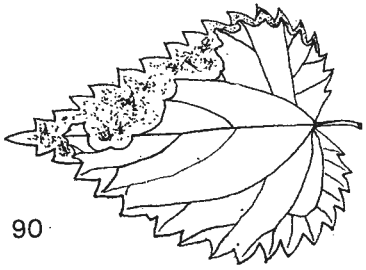
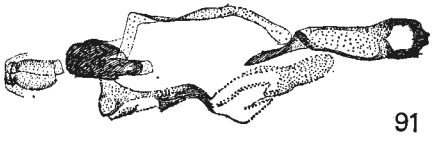
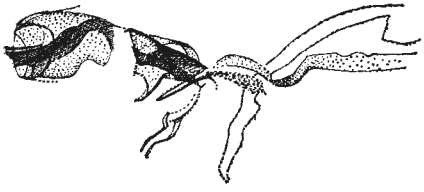


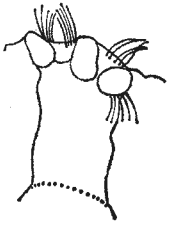

FIG. 81.—*Agromyza bromi*: aedeagus.
FIG. 82.—*A. nigrociliata*: aedeagus.
FIG. 83.—*A. cinerascens*: aedeagus.
FIG. 84.—*A. rondensis*: leaf-mine on *Triticum*.
FIG. 85.—*A. abiens*: aedeagus.
FIGS. 86–87.—*A. lithospermi*: (86), aedeagus; (87), leaf-mine on *Lithospermum*.
FIGS. 88–89.—*A. reptans*: (88), head; (89), aedeagus.

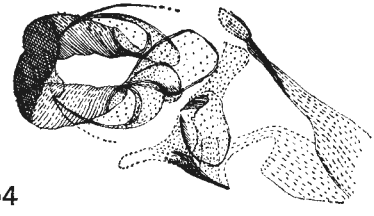
– Yellow and black or entirely black species ..... 4
4 Costa extending only to vein $R_{4+5}$ ..... 5
– Costa extending to vein $M_{1+2}$ ..... 13
5 Squamal fringe pale, white or ochrous ..... 6
– Squamal fringe dark, brown to black ..... 11
6 Broad epistoma present (fig. 76); frons red, orbits black; antennae partially pale but third segment largely black; orbital bristles conspicuously slender; mesonotum greyish black; legs black, with all knees yellowish; wing 2·3–2·75 mm., second cross-vein frequently absent ..... **intermittens** Becker
*Oxon.: Oxford,* 1 ♂, 20.v.08 (*J. R. Malloch*); *Cambs.: Chippenham Fen; Hunts.: Woodwalton Fen. Local. Hosts: Gramineae, particularly* Secale cereale.
– No epistoma present, frons black or brown ..... 7
7 Mesonotum shining black ..... 8
– Mesonotum distinctly grey-dusted ..... 12
8 Third antennal segment elongate (fig. 77); squamal fringe ochrous; legs entirely black; wing 1·8–2·2 mm. ..... **conjuncta** Spencer
*Cambs.: Dullingham,* 1 ♂, 12.vi.41, *swept on oats* (*J. E. Collin*); *Wales: Glam., Porthcawl,* 1 ♀, 22.vi.03 (*Col. Yerbury*); *Scotland: Dunbarton., Bonhill. Uncommon but widespread in Europe, particularly in south. Hosts: Gramineae, preferred genera unknown.*
– Third antennal segment with distinct angle at upper corner (fig. 78) or slightly rounded, somewhat longer than broad (fig. 79) ..... 9
9 Third antennal segment with distinct angle at upper corner (fig. 78); wings conspicuously pale, whitish; squamal fringe silvery; wing 2·75–3 mm.
(= *niveipennis* Zett.) **ambigua** Fallén
*Kent: Thames Marshes. Local. Holarctic. Hosts: Gramineae, particularly* Avena sativa *and* Secale cereale.
– Third antennal segment slightly rounded, somewhat longer than broad (fig. 79); wings normal ..... 10
10 Frons and jowls dark, brownish to black; squamal fringe variable, whitish to ochrous wing 2·5–3·1 mm.; aedeagus with elongate distiphallus (fig. 80)
**nigrella** Rondani
*Essex: Flatford; London; Surrey: Chobham; Northumb.: Wooler; Scotland, Aberdeen.: Braemar,* 1 ♀, 1.viii.37 (*R. L. Coe*); *Dunbarton.: Bonhill,* 1 ♀, 7.ix.07 (*J. R. Malloch*). *Generally distributed. Hosts:* Gramineae, *particularly* Dactylis, Festuca, Glyceria, Holcus, Lolium, Phleum, Poa, Secale, Setaria, Trisetum *and* Triticum (*Hering,* 1957); *a potentially serious pest on wheat.*
— Frons and jowls slightly paler brownish; squamal fringe uniformly white; generally smaller species, wing 2·5–2·6 mm.; aedeagus with conspicuously short distiphallus (fig. 81) ..... **bromi** Spencer
*Kent: Dartford,* 1 ♂, 9.vi.12 (*J. E. Collin*); *Suffolk: Felixstowe,* 1 *sex indet.,* 14.vii.1894 (*G. H. Verrall*); *Newmarket,* 1 ♂, 3.vi.1901 (*G. H. Verrall*). *New to Britain. Possibly widespread but previously overlooked. Host: Gramineae, only recorded host* Ceratochloa unioloides (= Bromus catharticus *auct.*), *Berlin Botanical Gardens* (*holotype*).
11 Frons not projecting above eye in profile; squamal fringe entirely black; jowls at most one-quarter height of eye; wing 2·75–3 mm. ..... **mobilis** Meigen
*London to Dorset; Derby.: Miller's Dale. Staffs.: Newcastle-under-Lyme; Northumb.: Wooler; Yorks.: Burley in Wharfedale; Scotland: Perths. Common. Hosts: Gramineae, only confirmed host* Triticum aestivum.
— Frons strongly projecting above eye; squamal fringe brown to black; jowls deep, one-third height of eye; wing 2·9–3·5 mm.; male genitalia: aedeagus as in fig. 82
**nigrociliata** Hendel
*London: Hampstead; Surrey: Colley Hill, Epsom, Kew; Cornwall: Carbis Bay,* 1 ♂, 10.vi.33 (*A.T.*). *Probably generally distributed, at least in south. Hosts: Gramineae, particularly* Secale *and* Triticum, *also* Agropyron, Arrhenaterum *and* Hordeum; *a potentially serious pest on cereals.*
12 Fore-knees yellowish; 3 strong, post-sutural dc, rarely any pre-suturals; wing 1·8–2·7 mm.; male genitalia; aedeagus as in fig. 83 ..... **cinerascens** Macquart
*Surrey: Bookham, Limpsfield, Mitcham; Sussex: Buxted; Glos.: Bristol; Hants.: Holywell,* 1 ♀ (*J. E. Collin*); *Suffolk: Barton Mills,* 1 ♂, 9.iv.25 (*J. E. Collin*). *Widespread, at least in south. Hosts: Gramineae, particularly* Dactylis glomerata.

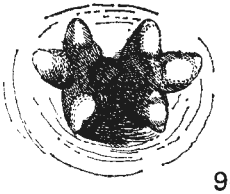


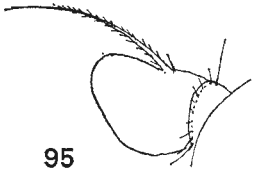



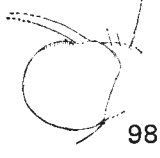



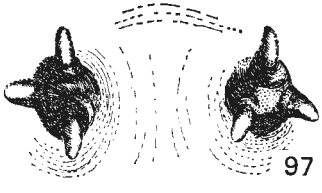




FIG. 90.—*Agromyza reptans*: leaf-mine on *Urtica*.
FIG. 91.—*A. myosotidis*: aedeagus.
FIGS. 92–93.—*A. pseudoreptans*: (92), aedeagus; (93), posterior spiracle of larva (after Nowakowski).
FIG. 94.—*A. pseudorufipes*: aedeagus.
FIGS. 95–96.—*A. albipennis*: (95), third antennal segment; (96), posterior spiracles of puparium.
FIG. 97.—*A. nigripes*: posterior spiracles of puparium.
FIG. 98.—*A. lucida*: third antennal segment.

— Legs entirely black; 2 or more pre-sutural dc; wing 1·75–3 mm.
(= *veris* Hering) **rondensis** Strobl
*Kent: Darenth; Berks.: Windsor Forest; Glos.: nr. Bristol; Devon: Brixham, Paignton; Hunts.: Woodwalton Fen; Durham: Sunderland; Scotland: Banff., Falls of Tarnash,* 1 ♂, 1 ♀, 1.vii *and* 9.vi.36 (*R. L. Coe*). *Hosts:* Gramineae, *incl.* Arrhenaterum, Bromus, Calamagrostis, Dactylis, Hordeum vulgare, Poa, Secale cereale, Triticum; *mine greenish* (fig. 84), *with only single larva; puparium reddish brown.*

13 Frons or antennae at least partially yellowish or reddish ..... 14
— Black or dark brown species, legs sometimes yellowish brown ..... 15

14 Legs entirely black; small species, wing 2·5 mm.; squamal fringe black, veins dark; third antennal segment round ..... **igniceps** Hendel
*Kent: Sittingbourne; Hants.: I.o.W. Host:* Humulus lupulus, *larva forming irregularly linear mine, with frass in conspicuous black strips.*
— Tibiae and tarsi and all knees yellowish; large species, wing 2·8–3·5 mm.; squamal fringe yellow, all veins pale; third antennal segment longer than broad; male genitalia: aedeagus as in fig. 85 . . . (= *rufipes* Mg. of authors) **abiens** Zetterstedt
*Generally distributed; Ireland, Co. Down. Hosts:* Boraginaceae, *particularly* Borago, Cynoglossum, Echium, Pentaglottis, Symphytum; *mine large blotch which can fill entire leaf, many larvae feeding together.*

15 Squamal fringe pale, silvery or ochrous ..... 16
— Squamal fringe black ..... 23

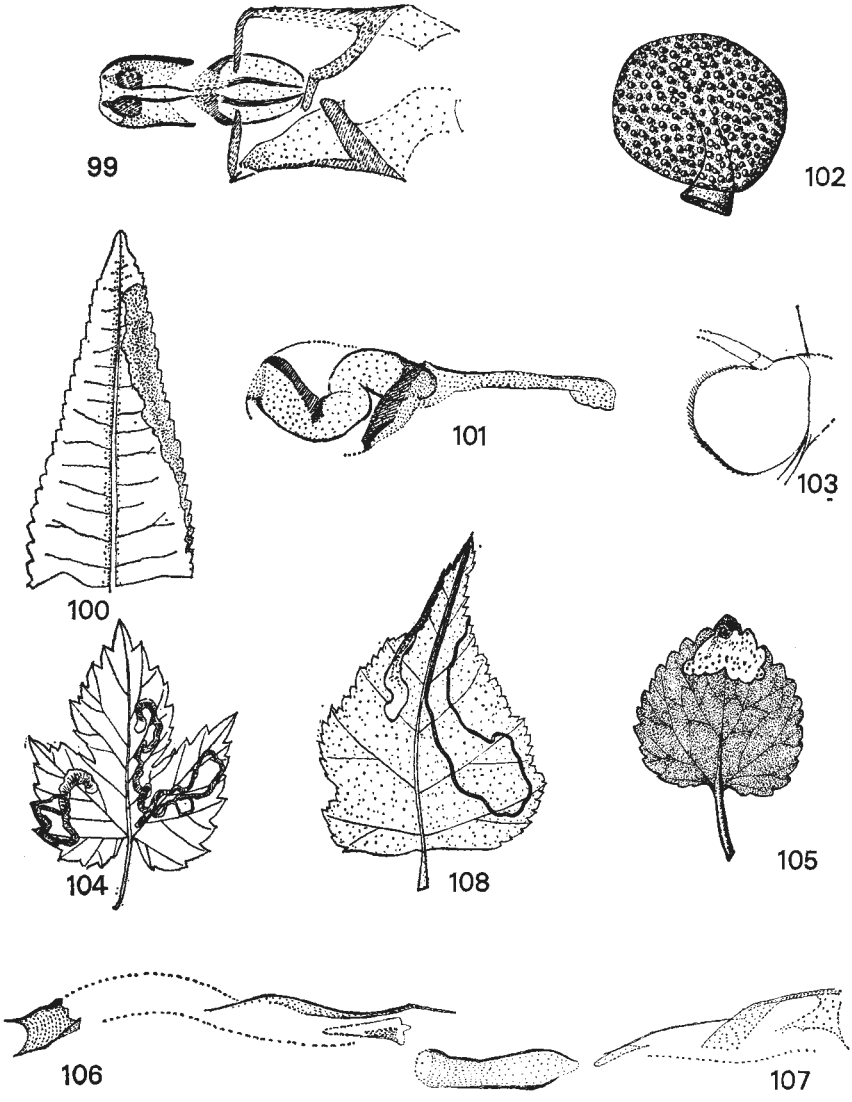
16 Mesonotum essentially matt, greyish or grey-black ..... 17
— Mesonotum more obviously shining black ..... 21

17 First and second antennal segments conspicuously yellow; frons brown, not projecting above eye; orbital setulae sparse, in single row; jowls relatively deep, one-fifth height of eye; fore knees, tibiae and tarsi distinctly yellowish; wing 2·9–3·3 mm. Male genitalia: aedeagus with distiphallus enlarged (fig. 86) **lithospermi** Spencer
*Hereford: Tarrington,* 1 ♂, 2.vi.02 *Woolhope,* 1 ♂, 14.ix.02 (*Col. Yerbury*); *Cambs.: Chippenham Fen; Kirtling,* 1 ♀, 11.ix.98 (*G. H. Verrall*); *Local. Host:* Lithospermum officinale, *larvae forming large blotch* (fig. 87).
— First and second antennal segments darker, not contrasting with brown or black third segment ..... 18

18 Jowls deeply extended at rear, one-quarter to one-sixth vertical height of eye . . . . 19
— Jowls narrower, at rear about one-ninth vertical height of eye ..... 20

19 Orbits slightly but distinctly projecting above eye in profile (fig. 88); male genitalia: aedeagus ending in paired, elongate tubules (fig. 89); wing 2·8–3·5 mm. **reptans** Fallén
*London: Hampstead; Hants.: I.o.W.; Cornwall: Helston; Suffolk: Barton Mills, Newmarket; Yorks.: Ingleborough; Scotland: Inverness, Loch Morlich,* 1 ♂, 1 ♀, 14.vii.36 (*R. L. Coe*). *Widespread and common; holarctic. Host:* Urtica dioica, *larva forming dark, greenish black blotch* (fig. 90); *posterior spiracles of larva each with* 3 *bulbs on a low protuberance (without hairs, cf.* pseudoreptans *Now.*, fig. 93).
— Orbits not significantly projecting above eye; male genitalia: aedeagus as in fig. 91 **myosotidis** Kaltenbach
*Herts.: Barnet; Oxford.: Oxford; Suffolk: Dunwich,* 2 ♂, 2 ♀, *Sept.* 52 (*L. Parmenter*); *N. Wales: Denbigh., Cefn-y-bedd* (*K.A.S.*). *Local. Hosts:* Myosotis, Pentaglottis, Symphytum, *larva forming large blotch.*

20 Male genitalia: aedeagus as in fig. 92; wing from 2·8 mm. in male to 3·5 mm. in female ..... (= *urticae* Nowakowski) **pseudoreptans** Nowakowski
*London: Hampstead; Surrey: Box Hill; Suffolk: Boyton; Scotland: Dunbarton., Bonhill,* 1 ♂, 27.vi.08 (*J. R. Malloch*); *Ireland: Co. Clare, Dunratty,* 1 ♂, 30.viii.1969 (*K.A.S.*). *Common; holarctic. Host:* Urtica dioica, *larva forming irregular linear-blotch; posterior spiracles each with* 3 *bulbs and* 4 *groups of hairs* (fig. 93).
— Male genitalia: aedeagus as in fig. 94 ..... **pseudorufipes** Nowakowski
*Surrey: Bookham; Yorks.: Harrogate, Ingleborough* (*G. C. D. Griffiths*); *Wales: Radnor, Llangammarch,* 1 ♂, 3.viii.13. (*J. E. Collin*). *Local. Host:* Myosotis *spp., larva forming large blotch, frequently entering second leaf to complete development.*




FIGS. 99–100.—*Agromyza dipsaci*: (99), aedeagus; (100), leaf-mine on *Dipsacus*.
FIGS. 101–102.—*A. alunulata*: (101), aedeagus; (102), anterior spiracle of larva (Hering).
FIG. 103.—*A. hendeli*: third antennal segment.
FIG. 104.—*A. flaviceps*: leaf-mine on *Humulus*.
FIG. 105.—*A. flavipennis*: leaf-mine on *Lamium*.
FIG. 106.—*A. spiraeae*: aedeagus.
FIGS. 107–108.—*A. alnibetulae*: (107), aedeagus; (108); leaf-mine on *Betula*.

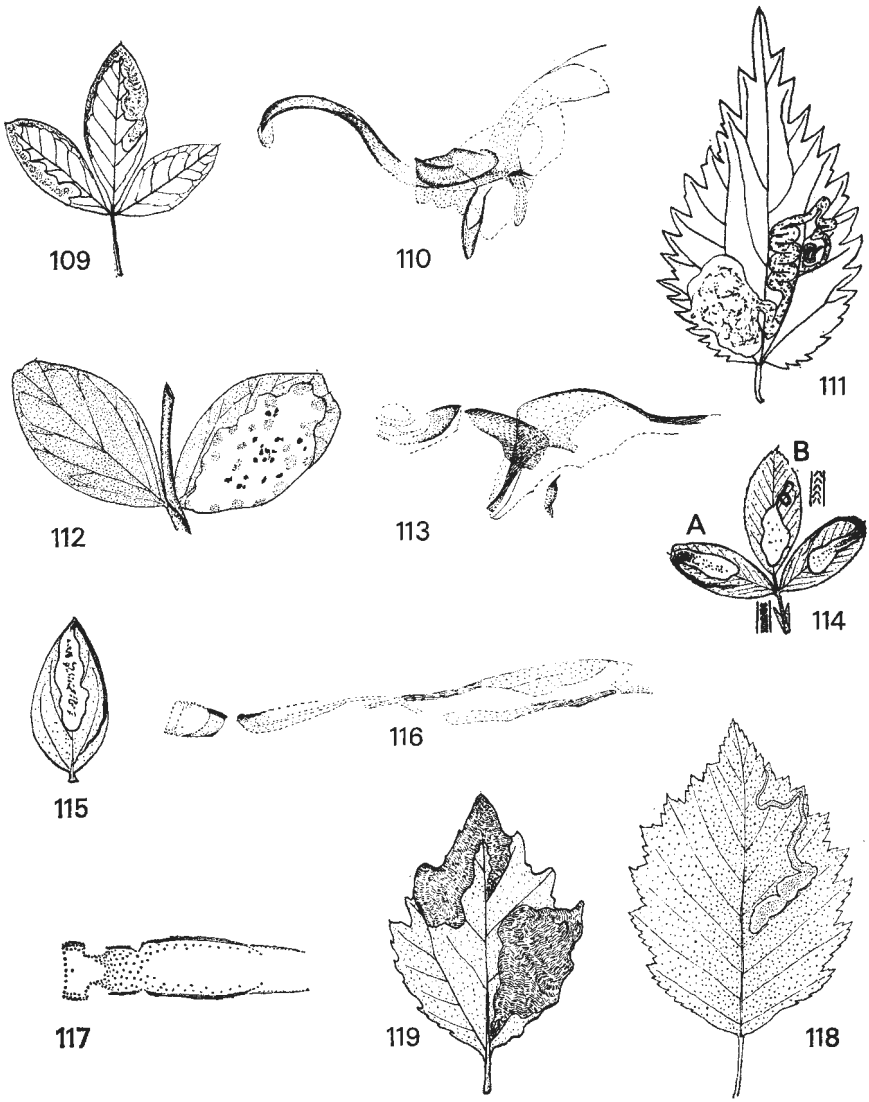



FIG. 109.—*Agromyza demeijerei*: leaf-mine on *Laburnum*.
FIGS. 110–111.—*A. anthracina*: (110), aedeagus; (111), leaf-mine on *Urtica*.
FIG. 112.—*A. lathyri*: leaf-mine on *Lathyrus*.
FIG. 113.—*A. felleri*: aedeagus.
FIG. 114A.—*A. frontella*: leaf-mine on *Medicago*.
FIG. 114B.—*A. nana*: leaf-mine on *Medicago*.
FIG. 115.—*A. pulla*: leaf-mine on *Genista*.
FIGS. 116–118.—*A. alnivora*: (116), aedeagus, side view; (117), same, ventral view; (118), leaf-mine on *Alnus*.
FIG. 119.—*A. albitarsis*: leaf-mine on *Populus*.

21 Third antennal segment small, round; first and second antennal segments slightly paler, brownish; frons brownish black; knees, tibiae and tarsi yellowish brown, legs otherwise black; wing 2·2–2·8 mm. ..... **phragmitidis** Hendel

*Oxford.: Hogley,* 1 ♂, 11.v.27 (*A. H. Hamm*); *Devon.: Wonwell; Hunts.: Woodwalton Fen; Ireland: Co. Clare, Dunratty* (*K.A.S.*). *Local. Host:* Phragmites communis, *several larvae feed together to form large, upper surface blotch-mine; puparium either in mine or frequently adhering to leaf near end of mine, variable in colour, yellowish to almost black.*

— Third antennal segment enlarged, cut away below (fig. 95); first and second segments normally black; legs entirely black ..... 22

22 Squamal fringe silvery white; wing 2–3 mm. ..... **albipennis** Meigen

*Surrey: Ash Vale; Herts.: Rickmansworth; Middx.: Finchley; Oxon.: Oxford; Hunts.: Woodwalton Fen; Staffs.: Newcastle-under-Lyme; Scotland: Dunbarton, Bonhill* (*J. R. Malloch*); *Ireland: Co. Clare, Dunratty. Widespread and common; holarctic. Hosts: Gramineae, particularly* Phalaris arundinacea, *less commonly* Poa *and* Hordeum; *rarely other grasses. Larvae feed singly, forming linear-blotch mine, pupating in or outside mine, frequently adhering to leaf near end of mine; posterior spiracles of larva* (*puparium*) *each with* 3 *bulbs, the two processes adjoining* (fig. 96).

— Squamal fringe ochrous; wing 2–2·8 mm. ..... **nigripes** Meigen

*London: Hampstead; Surrey: Ash Vale, Bookham; Bucks.: Beaconsfield; Cambs.: Chippenham Fen; Hunts.: Woodwalton Fen; Isles of Scilly: Annet; Ireland: Co. Clare. Widespread and common; holarctic. Hosts: Gramineae, particularly* Glyceria maxima, *also* Holcus *spp.; larvae feed singly, pupating outside mine; posterior spiracles each with* 3 *bulbs, the two processes distinctly separated* (fig. 97).

23 Third antennal segment small, round (fig. 98) ..... 24

— Third antennal segment enlarged, cut away below ..... 25

24 Margin of squamae brownish orange, fringe blackish ochrous; wing 2·2–3 mm. (= *airae* Karl) **lucida** Hendel

*Surrey: Ash Vale; Cambs.: Chippenham Fen; Scotland: Dunbarton., Bonhill* (*J. R. Malloch*); *Ireland: Co. Clare. Probably widespread but local; holarctic. Hosts:* Deschampsia caespitosa, Glyceria maxima; *larvae either singly or several in leaf, then forming large blotch; pupating externally, puparium black or dark red.*

— Margin of squamae black, fringe jet black; frons and antennae entirely black; orbital setulae numerous, in 2 rows; jowls angular, one-sixth to one-quarter height of eye; mesonotum entirely black, only moderately shining; legs black; wing in male 2·8–3 mm.; male genitalia: aedeagus as in fig. 99 ..... **dipsaci** Hendel

*Middx.: Scratch Wood; Surrey: Chelsham,* 1 ♂, 1.vi.43 (*R. L. Coe*); *Hunts.: Monk's Wood,* 1 ♂, 1 ♀, 1.vi.70 (*K.A.S.*). *Uncommon. Host:* Dipsacus fullonum, *larva forming funnel-shaped blotch mine at margin of leaf* (fig. 100). *Only a single generation, in early summer.*

25 Frons broad, 1½–2 times width of eye; 5 or 6 pairs of well-developed dc; entirely black species; wing 2·5–2·75 mm. in male; male genitalia: aedeagus as in fig. 101 (= *distorta* Griffiths) **alunulata** (Hendel)

*Surrey: Ash Vale. Uncommon. Host:* Glyceria maxima, *larva forming blotch mine, pupating externally, unusual in having greatly enlarged anterior spiracles* (fig. 102), *each with* 200–250 *bulbs* (*adaptation to aquatic environment*).

— Frons narrower, equal to or 1½ times width of eye; at most 4 developed dc; third antennal segment as in fig. 103; black species, legs largely black but all knees faintly yellowish; wing 2·5–3·1 mm. ..... **hendeli** Griffiths

*Cambs.: Chippenham Fen; Hunts.: Woodwalton Fen; Oxford.: Hogley. Local. Host:* Phragmites communis, *normally* 3 *or* 4 *eggs laid together and the larvae form large, communal mine; pupation externally, the black or brown puparium frequently adhering to leaf near end of mine.*

26 2 + 1 dc; all legs bright yellow; antenna and frons predominantly yellow, the latter distinctly projecting above eye in profile; mesonotum matt-grey; wing 2·3 mm. **flaviceps** Fallen

*London: Hampstead; Surrey: Godalming; Essex: Broxbourne; Suffolk: Chillesford,* 1 ♂, 24.v.10 (*J. E. Collin*); *Norfolk: Norwich; N. Wales: Denbigh., Cefn-y-bedd. Widespread. Host:* Humulus lupulus, *larva forming irregular linear mine, with greenish-diffused frass* (fig. 104).

— 3 + 1 dc. ..... 27

27 Mesonotum shining black; third antennal segment round, large; wing 2·5 mm. **flavipennis** Hendel

*Bucks.: Slough; Surrey: Bookham,* 1 ♀, 23.v.54 (*G. C. D. Griffiths*). *Uncommon. Host:* Lamium album, *larva forming blotch adjoining margin of leaf* (fig. 105)*; puparium reddish-brown, posterior spiracles each with* 3 *bulbs.*

— Mesonotum black or grey but not shining ..... 28

28 Squamal fringe dark, brown to black ..... 29

— Squamal fringe pale, whitish, yellow or at most ochrous ..... 38

29 Costa extending to just beyond vein $R_{4+5}$; frons dark brown, orbits black, distinctly projecting above eye in profile; third antennal segment small, round, arista short; mesonotum matt-grey; legs entirely black; wing from 1·9 mm. in male to 2·4 mm. in female, last section of $M_{3+4}$ distinctly longer than penultimate **vicifoliae** Hering

*Surrey: Box Hill; Scotland: Dunbarton., Bonhill,* 1 ♂, 12.vi.09 (*J. R. Malloch*). *Local. Host:* Vicia *spp., larva forming blotch mine, without initial linear section, invariably associated with mid-rib; frass diffused.*

— Costa extending to $M_{1+2}$ ..... 30

30 Frons dark, black or brownish; first cross-vein around midpoint of discal cell .... 31

— Frons distinctly reddish in front; first cross-vein well before midpoint of discal cell ..... 33

31 Veins pale, yellowish; squamal fringe frequently pale—cf. couplet 43 **alnivora** Spencer

— Veins dark, normal ..... 32

32 Mesonotum distinctly matt, greyish black, particularly viewed from behind; frons dull black in front, invariably more brownish behind; femora black but knees and also tibiae and tarsi more yellowish; wing from 2 mm. in male to 2·6 mm. in female, first cross-vein at midpoint of discal cell, rarely more basad; second costal section long, about 5 times length of fourth; male genitalia: aedeagus as in fig. 106 ..... **spiraeae** Kaltenbach

*Common and widespread throughout Britain; Scotland: Dunbarton., Bonhill; Perths., Killin; Sutherland, Lochinver,* 1 ♂, 21.vi.1911 (*Col. Yerbury*)*; Ireland: Co. Clare, Co. Galway; holarctic. Hosts:* Rosaceae, *occurring commonly on* Agrimonia, Filipendula, Fragaria, Geum, Potentilla, Rubus, Sanguisorba; *larva forms initially a linear mine which later develops into a conspicuous blotch* (fig. 75)*; posterior spiracles of larva each with* 3 *bulbs. On* Filipendula *entirely linear mines are not uncommon* (fig. 359)*; the species concerned is almost certainly distinct from* spiraeae *but it has not yet been possible to establish any differences in the adults.*

— Mesonotum more blackish, less grey; frons uniformly sooty-black; wing 2·2–2·5 mm.; male genitalia: aedeagus as in fig. 107 ..... **alnibetulae** Hendel

*London: Hampstead; Kent: Darenth; Surrey: Oxshott; Yorks.: Malham Tarn; Westmorland: Grasmere; Wales: Denbigh., Cefn-y-bedd; Ireland: Co. Cork. Widespread with food-plant. Host:* Betula *spp., larva forming long, winding linear mine, sometimes considerably widening at end* (fig. 108).

33 Tibiae and tarsi and fore knees conspicuously yellowish ..... 34

— Legs black, at most fore knees indistinctly yellowish ..... 35

34 Squamal fringe brownish ochrous; all knees distinctly yellowish; frons projecting above eye; wing 2·4–3 mm. ..... **demeijerei** Hendel

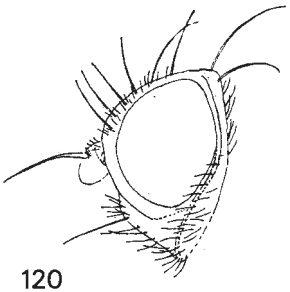
*Widespread in England with food-plant. Host:* Laburnum anagyroides, *larva initially forming narrow linear mine adjoining margin of leaf, later forming broad blotch, with conspicuously greenish-diffused frass* (fig. 109).

— Squamal fringe darker, more blackish; only fore knees conspicuously yellowish; frons slightly projecting above eye; generally larger species, wing 2·4–3·3 mm.; male genitalia : aedeagus as in fig. 110 ..... **anthracina** Meigen

*London: Hampstead; Surrey: Godalming; Cambs.: Chippenham Fen; Dorset: West Bay; Scotland: Dunbarton., Bonhill,* 2 ♂, 8 *and* 15.viii.08 (*J. R. Malloch*)*; Sutherland, Golspie,* 1 ♂, 7.vii.04 (*Col. Yerbury*). *Widespread, but local. Host:* Urtica dioica, *larva forming linear-blotch between two veins, not adjoining margin of leaf* (fig. 111)*, frass in distinct black strips or pellets; posterior spiracles of larva each with* 3 *bulbs on a conspicuous protuberance.*

35 Legs entirely black; wing 2·5–3 mm. ..... 36

— Legs with at least fore knees yellowish; small species, wing 2·2–2·4 mm. ..... 37



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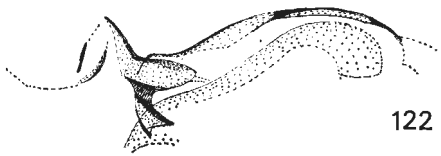

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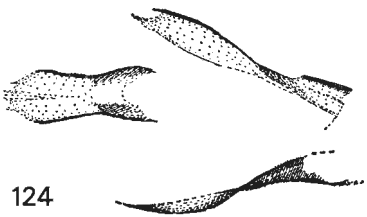

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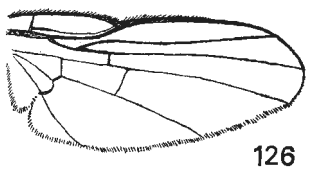

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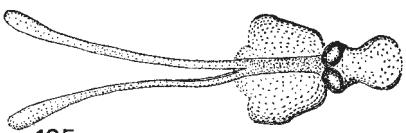

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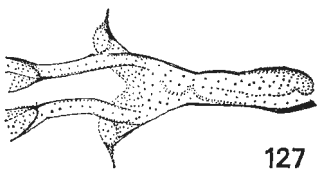

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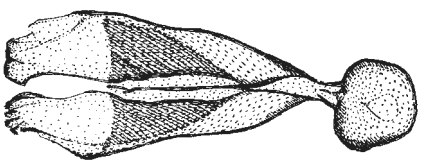

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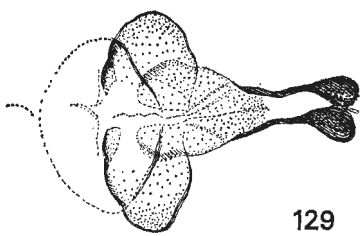

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FIGS. 120–121.—*Agromyza erythrocephala*: (120), head; (121), posterior spiracle of larva (Hering).
FIGS. 122–123.—*A. johannae*: (122), aedeagus; (123), leaf-mine on *Sarothamnus*.
FIG. 124.—*A. bicophaga*: aedeagus.
FIG. 125.—*Phytobia errans*: aedeagus.
FIGS. 126–127.—*P. cerasiferae*: (126), wing; (127), aedeagus.
FIG. 128.—*P. carbonaria*: aedeagus.
FIG. 129.—*P. cambii*: aedeagus.

36 Large species, wing 2·6–3 mm.; frons reddish, orbits slightly darkened, conspicuously projecting above eye in profile; third antennal segment variable, brownish black to black; mesonotum matt-grey; squamae pale, fringe black **lathyri** Hendel

*Kent: New Cross; Surrey: Kew. Local. Hosts:* Lathyrus, Pisum sativum, *larva forming initial lower-surface linear mine, which later develops into large whitish blotch with frass in large black lumps* (fig. 112). *Larva* (*puparium*)*: posterior spiracles each with up to* 40 *bulbs* (*contrast* varicornis *with* 3).

— Smaller species, wing 2·5 mm.; frons reddish, orbits black, only slightly projecting above eye towards base of antennae; third antennal segment largely black; squamal fringe brownish ochrous, male genitalia : aedeagus as in fig. 113 **felleri** Hering

*Surrey: Betchworth, Coulsdon. Local. Host:* Vicia sepium, *larva forming primary blotch-mine which entirely fills a leaf and usually shows some reddish discoloration; frass in distinct black grains.*

37 All knees yellowish; wing 2·4 mm. in female; mid-tibia with 2 weak lateral bristles; frons red, orbits black, very narrowly projecting above eye in profile; mesonotum greyish black, only weakly shining; squamae pale grey, fringe brownish grey..... **marionae** Griffiths

*Hunts.: Woodwalton Fen; Cambs.: Chippenham Fen; Ireland: Co. Down. Hosts:* Vicia cracca *and* V. sylvatica, *larva forming long whitish stem-mine, feeding downwards from a leaf-stalk or part of the upper stem; pupation externally, puparium yellowish.*

— Only fore knees yellowish; wing 2·2 mm. in female; mid-tibiae without lateral bristles..... (? = *felleri* Hering) **rubiginosa** Griffiths

*Sussex: Chailey,* 30.v.54 (*G. C. D. Griffiths*). *Host unknown. Possibly synonymous with* felleri *Hering.*

38 Costa ending at vein $R_{4+5}$..... 39

— Costa extending to vein $M_{1+2}$..... 41

39 Mesonotum black, largely shining but somewhat dusted; third antennal segment black, enlarged with very long, thick pubescence in male, sparser but long pubescence at upper corner in female; frons reddish, orbits black; jowls deeply extended; legs largely black; wing 1·9–2·2 mm..... **frontella** Rondani

*Essex: Rainham, Colchester; Kent: Otford; Surrey: Godalming. Local. Host:* Medicago sativa, *larva forming initial linear mine running towards apex of leaf, which then turns back along midrib, developing into a blotch* (fig. 114A).

— Mesonotum grey-black, largely matt ..... 40

40 Third antennal segment enlarged in male, covered with thick, long pubescence, in female with a fringe of long pubescence; frons broad, twice width of eye, reddish; orbits black, distinctly projecting above eye towards antennae; legs largely black; wing 2–2·5 mm..... **nana** Meigen

*Common and widely distributed in England; Scotland: Inverness., Nethy Bridge; Perths.: Killin; Skye, nr. Armadale; Ireland: Co. Clare, Co. Kerry, Co. Mayo. Hosts: Papilionaceae,* particularly Medicago, Melilotus, Trifolium, *larva producing a short linear mine which then develops into a conspicuous white blotch on the midrib* (fig. 114B).

— Third antennal segment not enlarged in male, with normal short pubescence in both sexes; frons narrower, 1½ times width of eye (= *genistae* Hendel) **pulla** Meigen

*Middx.: Scratch Wood; Oxford.: Blaydon,* 1 ♂, 5.v.28 (*A. H. Hamm*). *Probably widely distributed with its food-plant. Host:* Genista tinctoria, *larva forming initial linear mine, which later develops into a blotch* (fig. 115).

41 Frons black or dark brown..... 42

— Frons at least partially reddish ..... 44

42 Legs entirely black or at most knees inconspicuously yellowish; veins black; large species, wing 2·5–3 mm..... **nigrescens** Hendel

*Surrey: Kew; Yorks.: Gorsdale Scar; Wales: Cardiff; Scotland; Edinburgh. Widespread with food-plant. Host:* Geranium *spp., larva forming initial narrow linear mine which after first moult widens into irregular blotch; frass in conspicuous black lumps and strips.*

— Tibiae and tarsi yellow to yellowish brown; veins pale..... 43

43 Second costal section long, 5 times length of fourth; tibiae and tarsi normally bright yellow, strongly contrasting with black femora; mesonotum matt-grey, squamal fringe pale (more rarely appearing brownish, cf. couplet 31); wing 2·7–3·1 mm.; male genitalia : aedeagus as in figs. 116, 117 ..... **alnivora** Spencer

*Kent: St. Mary's Cray*, 1 ♀, 2.ix.1900 (*G. H. Verrall*); *Oxford.: Hogley; Cambs.: Chippenham Fen; Scotland: Inverness., Nethy Bridge*, 1 ♀, 11.vii.04 (*J. King*); 1 ♀, 8.vii.05 (*Col. Yerbury*). *Not common but widespread. Host:* Alnus incana, *larva forming linear mine, narrow at first but considerably widening towards end* (fig. 118).

— Second costal section shorter, 4 times length of fourth; tibiae and tarsi basically yellowish but normally darker, yellowish brown; mesonotum blackish grey; squamal fringe silvery yellow; wing 2·2–2·7 mm.

(= *lygophaga* Hering) **albitarsis** Meigen

*Devon.: Slapton; Hunts.: Woodwalton Fen. Local but widespread; holarctic. Hosts:* Populus *spp.*, Salix *spp., larva forming greenish blotch which quickly turns brown* (fig. 119)*; frequently several larvae feed together.*

44 Exceptionally large species, wing from 3·4 mm. in male to 4 mm. in female; frons strongly projecting above eye in profile (fig. 120); all antennal segments orange; mesonotum entirely matt-grey ..... **erythrocephala** Hendel

*Hunts.: Woodwalton Fen, galls found* 16.vii.66 (*G. C. D. Griffiths*). *New to Britain. Host:* Vicia cracca (*in Germany also other* Vicia *spp.*), *larva forming stem-gall about* 2 *cm. long, pupating externally; larva with posterior spiracles each having up to* 35 *bulbs* (fig. 121).

— Smaller species, wing at most 3·1 mm. ..... 45

45 Last section of $M_{3+4}$ short, about two-thirds length of penultimate; first and second antennal segments bright orange, third variably darkened; palps orange; mesonotum black, largely matt (not grey); large species, wing from 2·8–3·1 mm.; mid-tibia with 1 or 2 strong bristles.... (= *watersi* Spencer) **varicornis** Strobl

*London: Hampstead; Hants.: I.o.W., Luccombe; Cambs.: Cambridge; N. Wales: Denbigh., Cefn-y-bedd. Probably occurring widely with food-plant. Hosts:* Lathyrus sylvestris *and* L. latifolius, *larva forming long white mine along the winged stem, frequently starting in leaf. Posterior spiracles of larva* (*puparium*) *each with* 3 *bulbs* (*contrast* lathyri *with* 40).

— Last section of $M_{3+4}$ longer than or at most equal to penultimate; first and second antennal segments darker; palps black; mesonotum blackish grey; smaller species, wing 2–2·9 mm.; mid-tibia normally without bristles, in larger specimens, particularly females, sometimes one weak bristle present ..... 46

46 Third antennal segment black, at most faintly paler on inside; first cross-vein normally near centre of discal cell, rarely more basad; wing 2–2·5 mm. (up to 2·9 mm. in females ex *Spartium junceum* in Spain); male genitalia : aedeagus as in fig. 122 ..... **johannae** de Meijere

*London: Hampstead; Herts.: Barnet; Surrey: Headley; Scotland: Inverness., Aviemore; Ireland: Belfast. Abundant with food-plant. Hosts:* Sarothamnus scoparius, *more rarely* Genista *spp., once found on* Ulex europaeus (*G. C. D. Griffiths*), *larva forming initial linear mine, normally adjoining leaf-margin and running towards apex of leaf, then widening into a blotch* (fig. 123)*; larva with two rounded protuberances between posterior spiracular processes and anus.*

— Third antennal segment orange, sometimes slightly darkened; first cross-vein at anterior third of discal cell; wing 2·2–2·5 mm.; male genitalia : aedeagus as in fig. 124 ..... **bicophaga** Hering

*Surrey: Chipstead* (*mine only*). *Uncommon. Host:* Vicia cracca*; mine at beginning linear, later a primary blotch.*

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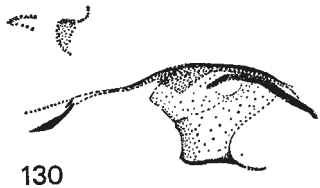
FIG. 130.—*Amauromyza* (*Am.*) *morionella*: aedeagus.
FIG. 131.—*A.* (*Camp.*) *gyrans*: leaf-mine on *Campanula.*
FIGS. 132–133.—*A.* (*Ceph.*) *chenopodivora*: (132), aedeagus; (133), ninth sternite.
FIG. 134.—*A.* (*Tril.*) *verbasci*: leaf-mine on *Verbascum.*
FIGS. 135–137.—*A.* (*Tril.*) *flavifrons*: (135), aedeagus; (136), ejaculatory apodeme; (137), leaf-mine on *Saponaria.*
FIG. 138.—*A.* (*Tril.*) *labiatarum*: leaf-mine on *Lamium.*
FIGS. 139–140.—*Calycomyza artemisiae*: (139), epandrium with surstyli; (140), leaf-mine on *Artemisia.*



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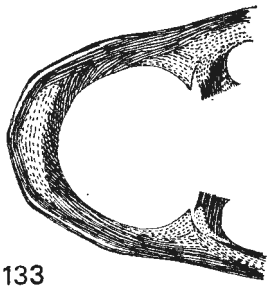

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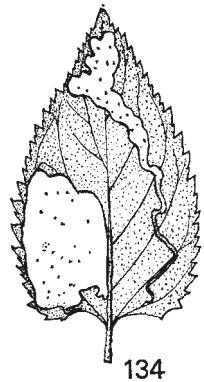

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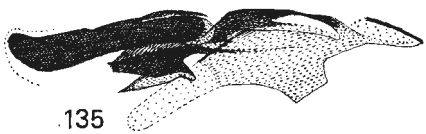

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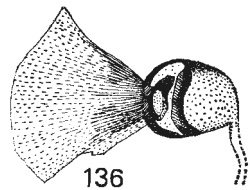

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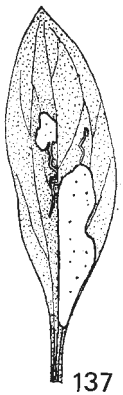

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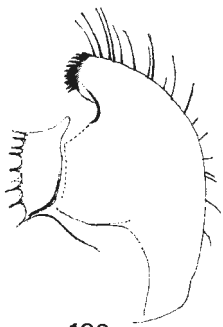

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## Genus **Phytobia** Lioy

*Phytobia* Lioy, 1864. Type of genus: *Agromyza errans* Meigen, 1830.

The main characters of this genus are as follows:

Sub-costa running direct to costa (though in some species appearing to join vein $R_1$); orbital setulae erect or reclinate; pre-sutural dc strongly developed; scutellum concolorous with mesonotum (in British species); large species, wing length from 3 to nearly 4·5 mm., costa extending to $M_{1+2}$ (except in one North American species), second cross-vein present.

All species, as far as is known, feed in the cambium of the twigs or trunks of trees. The larvae can be up to 2 cm. long and permanent damage is caused to the wood, affecting its ultimate commercial value.

Four species are known in Britain out of the eight known in Europe. The European species were recently revised by Spencer (1971*b*). The largest species known in the family occurs in this genus—*P. gigas* Spencer from Burma with wing length in the male of 6·5 mm.

### Key to Species

1 Last section of vein $M_{3+4}$ approximately 1½ times length of penultimate; medium-sized species, wing length 2·9–3·6 mm. ..... 2

– Last section of $M_{3+4}$ equal to or shorter than penultimate; very large species, wing 4–4·3 mm. ..... 3

2 Mesonotum greyish black, distinctly matt; wing 3·2–3·6 mm.; male genitalia : aedeagus as in fig. 125 ..... **errans** (Meigen)
*Kent: Dartford, Tunbridge Wells; Herts.: Felden; Oxford.: Hill Copse, Hogley, Yarnton. Scotland: Dunbarton., Bonhill,* 1 ♀, 6.vii.09 (*J. R. Malloch*). *Host: unknown.*

— Mesonotum more shining; slightly smaller species, wing 2·9–3·5 mm. (fig. 126); male genitalia : aedeagus as in fig. 127 ..... **cerasiferae** (Kangas)
*Kent: East Malling* (*R. S. Pitcher*). *Only other known record: Corsica,* 1 ♂ (*E. Lindner*). *Host:* Prunus cerasifera, *larva boring in stem, pupating in early spring on ground* (*Pitcher,* 1956).

3 Mesonotum distinctly black, at least moderately shining; lunule and jowls reddish silvery; fourth dc weak, shorter than third; male genitalia : aedeagus as in fig. 128 ..... (= *latigenis* Hendel) **carbonaria** (Zetterstedt)
*Herts.: Felden,* 1 ♂, 8.vii.98 (*A. Piffard*); *Cambs.: Kirtling,* 12.vii.25 (*J. E. Collin*); *Cornwall: Truro,* 1 ♀, 4.vii.31 (*J. E. Collin*); *Scotland: Dunbarton., Bonhill,* 1 ♂, 5 ♀, 4–16.vii.09 (*J. R. Malloch*). *Hosts: Rosaceae,* Crataegus, Malus.

– Mesonotum matt-grey; lunule silvery; third and fourth dc equal; male genitalia : aedeagus as in fig. 129
(= *barnesi* Hendel) (= ?*tremulae* Kangas) **cambii** (Hendel)
*Kent: Dartford,* 1 ♂, 5.vii.1900 (*Col. Yerbury*); *Hants.: Beaulieu,* 1 ♀, 23.v.94 (*G. H. Verrall*); *New Forest,* 1 ♂, 13.vi.38 (*J. E. Collin*); *Herts.: Batford, Harpenden* (*Barnes*); *Suffolk: Barton Mills,* 1 ♂, 17.vi.32 (*J. E. Collin*); *Ireland* (*Haliday collection*); *Scotland, Inverness.: Nethy Bridge,* 1 ♂, 20.vi.1900 (*Col. Yerbury*); *Nairn,* 1 ♂, 6.vi.05 (*Col. Yerbury*); *Inverness.: Loch Eilich,* 1 ♂, 9.vi.34 (*J. E. Collin*). *Widespread. Host:* Salix *spp.*, Populus tremula, *larva boring in cambium of stem, pupating on ground.*

## Genus **Amauromyza** Hendel

*Amauromyza* Hendel, 1931. Type of genus: *Agromyza lamii* Kaltenbach, 1858.

This genus was originally proposed by Hendel, as a subgenus of *Dizygomyza*, for the small group of species associated with *lamii* having black

halteres. Affinities in the male genitalia have recently led to an enlarged concept of the genus with four well-defined subgenera (Spencer, 1971*a*).

The eight species known in Britain can all be readily identified on external characters, but in some species the generic affiliation is only apparent from the male genitalia. All species in the genus have a broad, largely rounded ninth sternite (fig. 133) and a characteristic bowl-shaped base of the ejaculatory apodeme (fig. 136).

Species in this genus are either leaf-miners forming a distinctive blotch (figs. 131, 134) or internal stem-borers. The stem-borers are all in the subgenus *Cephalomyza* but this also includes at least one blotch-miner, *madrilena* Spencer, known only in Spain.

## Key to Species

1 3 + 0 dc; small black species, mesonotum shining black; wing at most 2·3 mm. . . 2

– 3 + 1 dc; black and yellow species. . . . . 3

2 Halteres black; frons somewhat projecting above eye; wing 1·7–2·1 mm., last section of $M_{3+4}$ twice length of penultimate; male genitalia : aedeagus greatly reduced, as in fig. 130 (subgenus *Amauromyza*) . . . . . **morionella** (Zetterstedt)
*Kent: Dartford,* 1 ♀, 9.vi.12 (*Col. Yerbury*); *Surrey: Kew,* 2 ♂, 21–22.vii.58 (*K.A.S. and E. M. Hering*); *Hants.: I.o.W., Needles,* 2 ♂, 3 ♀, *emerged* 1–9.iv.54, 25.iv *and* 10.v.55 *from mines found* 10.viii.54 (*L. Wakely*). *Local. Hosts:* Ballota nigra, Marrubium vulgare, *larva forming early linear mine, which at second instar develops into a blotch; pupation externally.*

– Halteres yellow; frons not projecting above eye; very small species, wing 1·7 mm.; discal cell small, last section of $M_{3+4}$ at least 3 times length of penultimate; male genitalia: paired processes of distiphallus strongly developed (subgenus *Campanulomyza*) . . . . . **gyrans** (Fallén)
*Ireland: Co. Clare, the Burren; mines with larvae* 12–14.vi.65 *and* 1–10.ix.66, *giving adults following April* (*G. C. D. Griffiths*). *Host:* Campanula rotundifolia (*in Europe also other* Campanula *spp.*), *larva forming shallow white blotch mine* (fig. 131), *single larva in mine; on Continent larger mine on* C. trachelium *always containing several larvae possibly represents distinct species* (cf. *Hering* in *Spencer,* 1968: 297).

3 Frons black, halteres normally black, yellow only in *monfalconensis*; or frons bright yellow, only 1 upper orbital bristle reclinate and jowls exceptionally deep, two-thirds height of eye; male genitalia: aedeagus with large, paired black process distally, enclosed in strong membrane bearing conspicuous spines (fig. 132) (subgenus *Cephalomyza*) . . . . . 4

– Frons pale, bright yellow or brown, 2 upper orbital bristles reclinate, jowls narrower, one-quarter to one-sixth height of eye; male genitalia: paired processes of distiphallus strongly developed but without spinular membrane (fig. 135) (subgenus *Trilobomyza*) . . . . . 6

4 Head entirely black . . . . . 5

– Head entirely yellow; mesonotum matt, ash-grey; femora black with all knees bright yellow; wing length 2·5 mm., last section of vein $M_{3+4}$ just less than twice length of penultimate. . . . . **luteiceps** (Hendel)
*Suffolk: Chillesford,* 1 ♀, 11.vii.08 (*J. E. Collin*). *New to Britain, uncommon in Europe. Host unknown.*

5 Halteres black; mesonotum matt-black; frons strongly projecting above eye; arista distinctly pubescent; male genitalia: aedeagus as in fig. 132, ninth sternite as in fig. 133. . . . . (= *abnormalis* auctt.) **chenopodivora** Spencer
*Cambs.: Cambridge, larvae* 8.ix.61 (*G. C. D. Griffiths*); *Derby.: Worthington,* 4 ♂, 9.vi.43 (*J. E. Collin*). *New to Britain. Host:* Chenopodium album, *larva internal stem-borer, pupating in stem.*

– Halteres yellow; orbits distinctly projecting above eye; 2 ors, the upper directed slightly outwards, the lower inwards, 3 ori; mesonotum matt-black, legs entirely black; wing 2·1–2·75 mm., last section of $M_{3+4}$ 1½ times length of penultimate **monfalconensis** (Strobl)

*Kent: Folkestone, Hythe; Middx.: Scratch Wood; Dorset: Lyme Regis; Derby.: Miller's Dale; Scotland; Inverness., Inverness,* 1 ♂, 9.vi.53 (*K.A.S.*). *Widespread. Host unknown, probably internal stem-borer.*

6 Third antennal segment black ..... 7

– Third antennal segment yellowish brown; frons yellow; mesonotum matt, greyish black; notopleural area paler, brownish, all knees bright yellow; wing 2·5 mm. **verbasci** (Bouché)

*Surrey: Box Hill; Hants.: I.o.W., Brading; Devon.: Torcross; Cornwall: Lizard; Hereford.: Woolhope; Ireland: Dublin* (*K.A.S.*). *Widespread, at least in south. Hosts:* Verbascum *spp.*, Scrophularia nodosa; *also* Buddleja davidii, *larva forming conspicuous blotch* (fig. 134), *pupating externally.*

7 Frons bright yellow; legs and abdomen entirely black: wing 2 mm.; male genitalia: aedeagus as in fig. 135; ejaculatory apodeme as in fig. 136, with conspicuous bowl-shaped base ..... **flavifrons** (Meigen)

*Widespread but local: N. Wales: Denbigh., Cefn-y-bedd* (*K.A.S.*); *Scotland: Dunbarton., Cardross,* 1 ♂, 14.vii.08 (*J. R. Malloch*). *Hosts:* Dianthus, Lychnis, Melandrium, Saponaria, Silene, Stellaria (*Caryophyllaceae*); *also on* Beta vulgaris *and* Spinacia oleracea (*Chenopodiaceae*), *larva forming white linear-blotch* (fig. 137).

– Frons pale to dark brown; knees yellow; abdomen with front tergites broadly yellow bordered: wing 2·2–2·5 mm., last section of vein $M_{3+4}$ long, 2½ times length of penultimate ..... **labiatarum** (Hendel)

*Widespread and locally common in south; N. Wales: Denbigh., Cefn-y-bedd* (*K.A.S.*); *Ireland: Co. Kilkenny, Kilkenny* (*K.A.S.*); *Scotland: Perths., Killin. Hosts:* Ajuga, Ballota, Galeobdolon, Lamium, Stachys, Teucrium (*Labiatae*); *also* Verbena officinalis (*Verbenaceae*); *larva forming linear-blotch mine* (fig. 138).

## Genus **Calycomyza** Hendel

*Calycomyza* Hendel, 1931. Type of genus: *Agromyza artemisiae* Kaltenbach, 1856.

Genus readily recognizable by the yellow frons and notopleural area and black scutellum. Epandrium in all species with a conspicuous patch of bristles on the hind-corners (fig. 139).

Hendel originally described *Calycomyza* as a subgenus of *Dizygomyza* but Nowakowski (1962) first proposed its upgrading to full generic rank. This has proved to have been fully justified, following examination of material from many parts of the world (Spencer, 1969).

The world distribution of *Calycomyza* is unusual. It occurs predominantly in the New World, with 39 of the 40 known species recorded in the Nearctic and Neotropical Regions. Only two species are found in Britain.

As far as is known all species in this genus are leaf-miners.

### Key to Species

1 Squamal fringe white; mesonotum shining black; small species, wing 2–2·35 mm.; discal cell small, last section of $M_{3+4}$ 2–2½ times length of penultimate **humeralis** (Roser)

*Scotland: Dunbarton., Bonhill,* 1 ♂, 8.viii.08 (*J. R. Malloch*). *Kent: Faversham; Oxon.: Oxford, Parks,* 1921 (*A. H. Hamm*); *Suffolk: Flatford; Essex: Walton-on-the-Naze,* 2 ♀, 5.vi.08; 2 ♀, 7.vii.12 (*J. E. Collin*). *Widespread but local; virtually cosmopolitan. Hosts: Compositae, particularly* Aster, *including* A. tripolium, Bellis *and* Erigeron, *larva forming small whitish blotch-mine, puparium in mine, firmly glued to leaf by mass of black frass.*

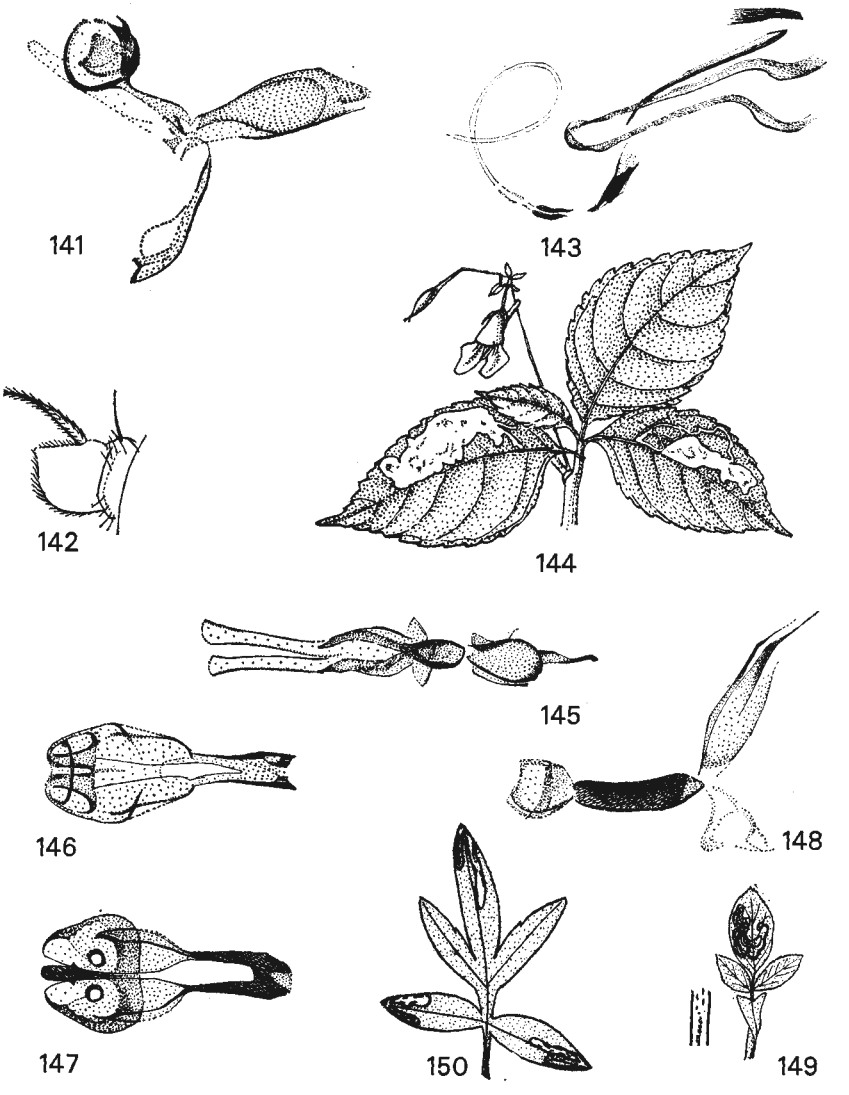



FIG. 141.—*Liriomyza morio*: aedeagus.
FIG. 142.—*L. angulicornis*: third antennal segment.
FIGS. 143–144.—*L. melampyga*: (143), aedeagus; (144), leaf-mine on *Impatiens*.
FIG. 145.—*L. lutea*: aedeagus.
FIG. 146.—*L. orbona*: aedeagus (lectotype).
FIG. 147.—*L. portentosa*: aedeagus.
FIGS. 148–149.—*L. cicerina*: (148), aedeagus; (149), leaf-mine on *Ononis*.
FIG. 150.—*L. artemisicola*: leaf-mine on *Artemisia*.

– Squamal fringe dark brown to black; mesonotum more matt, greyish black; larger species, wing 2·5–2·7 mm.; male genitalia: epandrium and surstyli as in fig. 139 **artemisiae** (Kaltenbach)

*London: Hampstead; Cambs.: Chippenham Fen; Oxford.: Shotover,* 1 ♂, 14.vi.23 *ex mine* 14.x.22 (*A. H. Hamm*); *Norfolk: Norwich; Lancs.: Withington,* 1 ♂, 1 ♀, 1.ix.42 (*H. Britten*). *Widespread. Holarctic. Hosts:* Artemisia vulgaris, Eupatorium cannabinum, *larva forming greenish blotch, pupating externally* (fig. 140).

## Genus **Liriomyza** Mik

*Liriomyza* Mik, 1894. Type of genus: *Liriomyza urophorina* Mik, 1894.

In Britain species in this genus are immediately recognizable by the distinctive coloration, with both frons and scutellum largely yellow. One exception is *Liriomyza morio* (Brischke) which is entirely dark but the correct generic affiliation is revealed by the male genitalia (fig. 141).

A small group of species previously included in *Liriomyza* but with the orbital setulae not obviously reclinate and distinctive male genitalia are now included in a separate genus, *Lemurimyza* Spencer (cf. p. 61). For convenience, these species are nevertheless also included in the key to *Liriomyza* species given below.

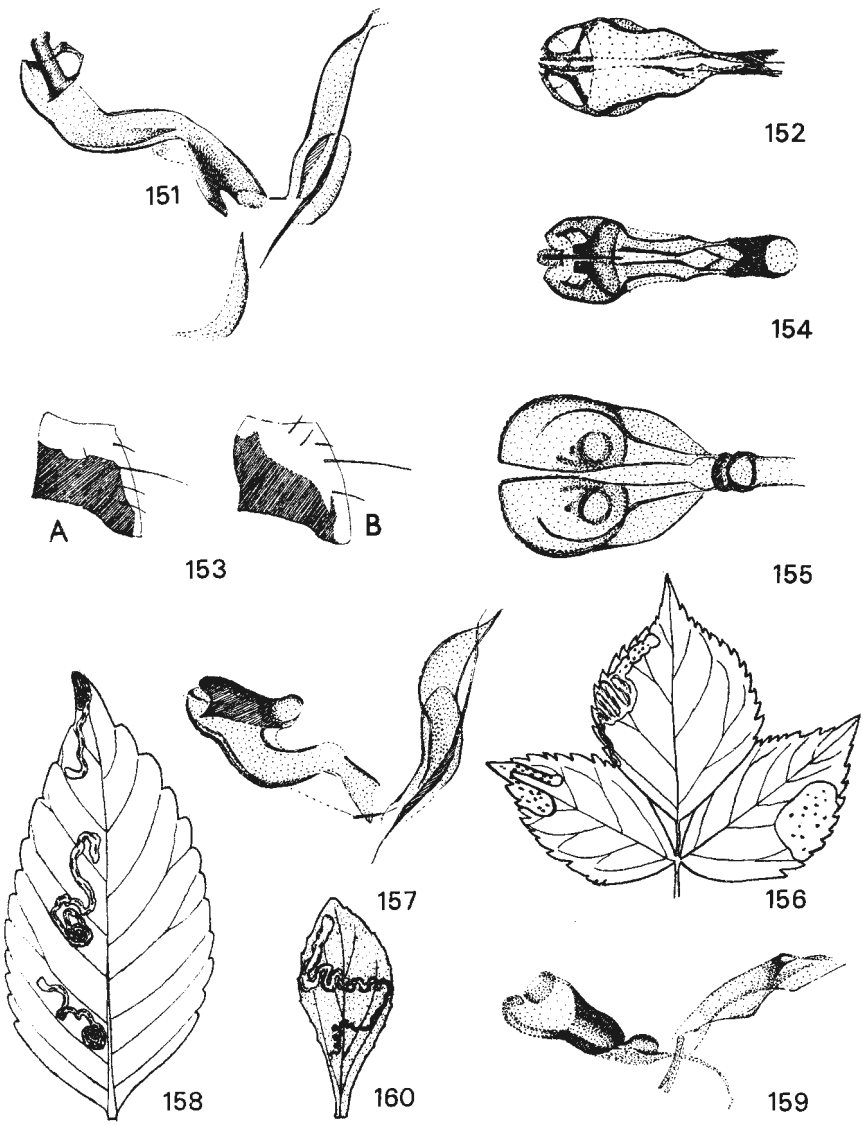
Of 41 species now recorded in Britain, 34 are leaf-miners, two are stem-feeders and one feeds in flower-heads. The biology of four species is unknown. Morphological differences between many closely related species are slight but the minor colour differences which are detectable are remarkably constant. However, a positive identification of many such species is only possible from examination of the male genitalia and illustrations of the aedeagus are therefore given in all such cases.

Hendel (1920, 1931) undertook two major revisions of this genus. Unfortunately he was unable to examine the types of a number of species. He changed his concepts in some cases between his 1920 and 1931 papers and in the latter took arbitrary decisions on the identity of species, particularly those described by Meigen with types in Paris, which he had not seen. Three such species, *pumila* Meigen, *pusilla* Meigen and *pusio* Meigen, have now been finally clarified, following examination of Meigen's types.

In addition to the detailed key to species, a simplified key to species groups is provided.

### Simplified Key to Species Groups of *Liriomyza*

| | | |
|---|---|---|
| 1 | Mesonotum yellow centrally | *lutea* group (3) |
| – | Mesonotum entirely dark to margin of scutellum | 2 |
| 2 | Third antennal segment black or at least partially darkened | *orbona* group (9) |
| – | Third antennal segment entirely yellow | 3 |
| 3 | Femora at least basally black, knees yellow | *flaveola* group (14) |
| – | Femora yellow, at most with dark striations | 4 |
| 4 | Acr in 6 rows | *amoena* Meigen (17) |
| – | Acr in 2–4 rows | 5 |
| 5 | Acr in 4 rows | 6 |
| – | Acr in 2 rows | *congesta* group (45) |
| 6 | Both vt on dark ground or vti at margin of black and yellow | *eupatorii* group (19) |
| – | Dark ground not extending to base of vti (inner vertical bristle) | 7 |
| 7 | Dark at most to base of vte (outer vertical bristle) | *strigata* group (25) |
| – | Both vt on yellow | *hieracii* group (30) |




FIGS. 151–152.—*Liriomyza phryne*: (151), aedeagus, side view; (152), same, ventral view.
FIGS. 153A–154.—*L. pedestris*: (153A), mesopleuron; (154), aedeagus.
FIGS. 153B–155. *L. flaveola*: (153B), mesopleuron; (155), aedeagus.
FIG. 156.—*L. amoena*: leaf-mine on *Sambucus*.
FIG. 157.—*L. pusio*: aedeagus (holotype).
FIG. 158.—*L. eupatorii*: leaf-mine on *Eupatorium*.
FIGS. 159–160.—*L. pusilla*: (159), aedeagus; (160), leaf-mine on *Aster*.

KEY TO BRITISH SPECIES

(including also 3 *Lemurimyza* species)

1 Scutellum entirely dark brown; all antennal segments normally black, occasionally somewhat paler; frons dark brown, orbits conspicuous, raised, more blackish; legs entirely black; mesonotum shining black; wing length 1·5–1·75 mm.; discal cell small, last section of vein $M_{3+4}$ three times length of penultimate; male genitalia: aedeagus as in fig. 141 ..... **morio** (Brischke)
*Surrey: Great Humble; Bucks.: Beaconsfield. Local. Hosts:* Asperula odorata, Galium *species, larva forming initial linear mine, which can later widen to form a blotch.*

– Scutellum yellow, at least centrally ..... 2

2 Mesonotum yellow centrally adjoining scutellum ..... 3

– Mesonotum dark to margin of scutellum ..... 7

3 Dark area of mesonotum solid, not divided into bands; yellow area U-shaped .... 4

– Dark area of mesonotum divided into distinct bands (fig. 203); entire area adjoining scutellum yellow; third antennal segment rounded ..... 5

4 Third antennal segment angulate (fig. 142); small species, wing length 1·8 mm.
(= *triglochinae* Hendel) **angulicornis** (Malloch)
*Kent: Gravesend (Col. Yerbury); Dorset: Studland (J. E. Collin); Suffolk: Aldeburgh, Barton Mills (J. E. Collin). Host:* Triglochin maritima *and* T. palustris, *larva forming long narrow leaf-mine, pupating internally. Local. Holarctic. New to Britain.*

– Third antennal segment rounded (cf. *Lemurimyza*, p. 61)
**Lemurimyza pectoralis** (Becker)

5 Third antennal segment black or at least darkened, brownish (cf. *Lemurimyza*, p. 61) ..... **Lemurimyza dorsata** (Siebke)

– Third antennal segment yellow ..... 6

6 Last and penultimate sections of vein $M_{3+4}$ equal or last section at most slightly longer; male genitalia: aedeagus as in fig. 143
(= *impatientis* Brischke) **melampyga** (Loew)
*London: Hampstead; Westmorland: Grasmere; Ireland: Haliday collection. Local. Holarctic. Host:* Impatiens noli-tangere *and* I. parvi-flora, *larva forming conspicuous greenish blotch, pupating externally* (fig. 144).

– Last section of $M_{3+4}$ $1\frac{3}{4}$–$2\frac{1}{2}$ times length of penultimate; male genitalia: aedeagus as in fig. 145 ..... (= *melanorhabda* Hendel) **lutea** (Meigen)
*Kent: Wrotham; Herts.: Tring; Cambs.: Chippenham Fen; Westmorland: Grasmere; Wales: Denbigh., Cefn-y-bedd; Scotland: Dunbarton., Bonhill (J. R. Malloch). Local. Host:* Angelica sylvestris, Pastinaca sativa *and probably other Umbelliferae, larva feeding in seed-head, pupating externally.*

7 Third antennal segment at least partially darkened, black or brownish ..... 8

– Third antennal segment yellow ..... 13

8 Halteres brownish black; second and third antennal segments black; legs entirely black (cf. *Lemurimyza*, p. 61) ..... **Lemurimyza alpicola** (Strobl)

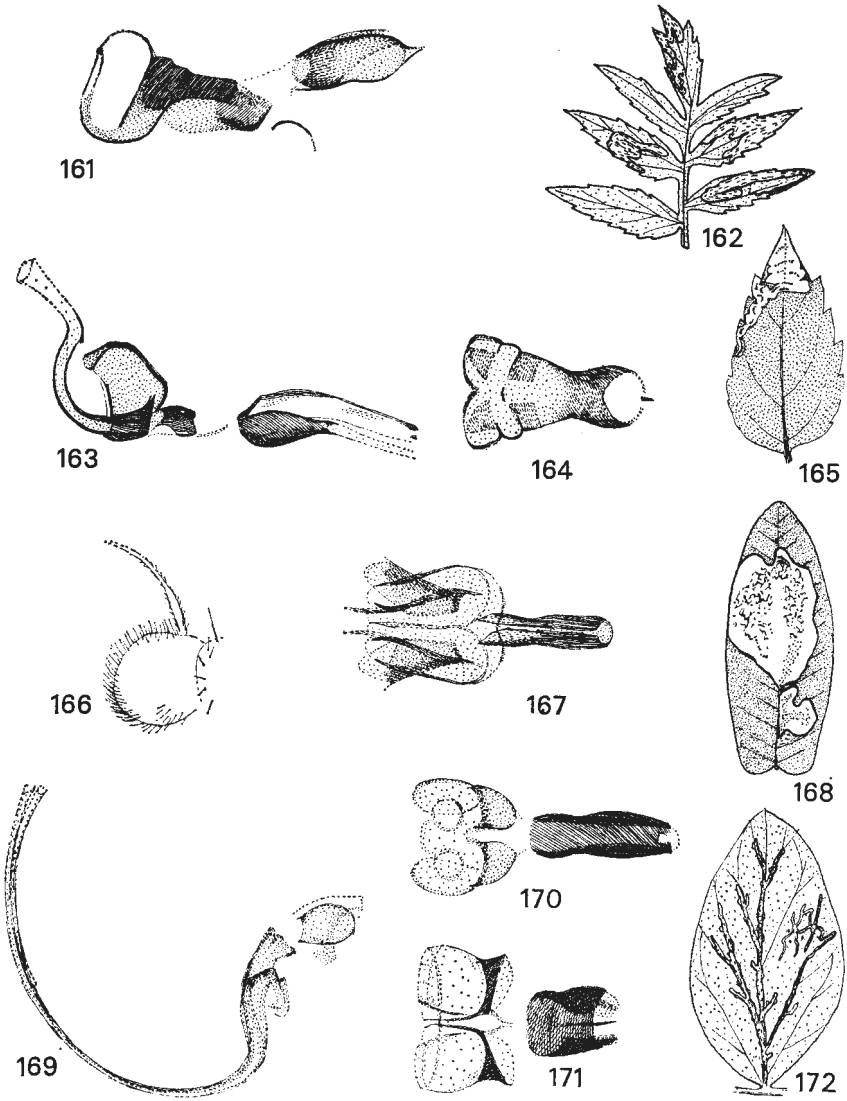
– Halteres yellow; legs never entirely black ..... 9

9 Femora black, with contrasting yellow knees; third antennal segment variably darkened apically, brownish or blackish but somewhat yellow below; mesonotum matt, blackish grey ..... 10

– Femora basically yellow but variably darkened with brownish or blackish stripes, knees not contrasting yellow ..... 11

10 Aedeagus as in fig. 146; wing 1·7–2·6 mm.; discal cell variable, last section of $M_{3+4}$ from 2–3 times length of penultimate
(= *orbonella* Hendel) **orbona** (Meigen)
*Widespread in May/June from Cornwall: Isles of Scilly to Scotland: Sutherland, Invernaver (E. C. Pelham-Clinton); Ireland: Co. Clare, Burren,* 1 ♀, 29.vii.70 *(K.A.S.). Host:* Bellis perennis *(G. C. D. Griffiths). The affiliations of* orbona *and its male genitalia indicate a close relationship with the* flaveola *group of grass-feeders and confirmation is therefore required whether the sole host is* Bellis.

— Aedeagus as in fig. 147; wing 2·4 mm.; last section of $M_{3+4}$ twice length of penultimate ..... **portentosa** Spencer
*Cambs.: Chippenham Fen. Rare, a previously unknown species. Host unknown.*




FIGS. 161–162.—*Liriomyza valerianae*: (161), aedeagus; (162), leaf-mine on *Valeriana*.
FIG. 163.—*L. bruscae*: aedeagus.
FIGS. 164–165.—*L. eupatoriana*: (164), aedeagus; (165), leaf-mine on *Eupatorium*.
FIG. 166.—*L. millefolii*: third antennal segment.
FIGS. 167–168.—*L. pascuum*: (167), aedeagus; (168), leaf-mine on *Euphorbia*.
FIG. 169.—*L. polygalae*: aedeagus.
FIG. 170.—*L. erucifolii*: aedeagus.
FIGS. 171–172.—*L. strigata*: (171), aedeagus; (172), leaf-mine on *Pisum*.

11 Third antennal segment with conspicuously long pubescence (fig. 166), at most only slightly darkened (see couplet 26) ..... **millefolii** Hering

— Third antennal segment normal, with short pubescence ..... 12

12 Mesonotum moderately shining black; third antennal segment entirely dark, blackish brown; femora variably darkened, sometimes appearing almost black from above but always yellow below; small species, wing 1·3–1·5 mm.; male genitalia: aedeagus as in fig. 148 ..... **cicerina** (Rondani)

*Kent: Otford, Wrotham; Surrey: Box Hill. Local. Host:* Ononis spinosa, *larva forming shallow winding mine, which may develop into secondary blotch* (fig. 149), *pupation externally.*

— Mesonotum distinctly matt, greyish black; third antennal segment brownish distally, yellowish below and on inside; femora largely yellow, with some irregular brownish markings; wing 1·6–1·9 mm. ..... **artemisicola** de Meijere

*Kent: Folkestone; London: Hampstead; Glos.: Kilcot; Lancs.: nr. Manchester; N. Wales: Denbigh., Cefn-y-bedd; Ireland: Co. Wexford, Rosslare (K.A.S.). Widespread. Host:* Artemisia vulgaris, *larva forming short linear mine usually confined to single leaf segment* (fig. 150), *pupation externally.*

13 Femora black basally, yellow at most on distal half ..... 14

— Femora essentially yellow, variably darkened by irregular striations ..... 16

14 Fore femora up to one-half yellow distally; mesopleura black only in lower front corner, yellow above; both vt on yellow ground; wing 2·1–2·4 mm.; male genitalia: aedeagus as in figs. 151, 152 ..... **phryne** Hendel

*Surrey: Bookham; Hunts.: Woodwalton Fen; Oxon.: Oxford; Warwick.: Rugby. Host: Gramineae, incl.* Arrhenaterum elatius, Holcus lanatus, *pupation externally; posterior spiracles each with an ellipse of 6–8 bulbs.*

— Fore femora less than one-third yellow distally; mesopleura largely black, yellow only on upper quarter; at least vte on black ground ..... 15

15 Mesopleura black in lower three-quarters, with mesopleural bristle on black ground (fig. 153A); mesonotum somewhat matt or (in Mediterranean) conspicuously shining; wing 2·3–2·4 mm.; male genitalia: aedeagus as in figs. 154 **pedestris** Hendel

*Devon: Dartmoor; Dorset: Portland; Oxon.: Oxford. Uncommon in U.K., widespread in Mediterranean area. Host:* Deschampsia flexuosa, *probably other Gramineae.*

— Mesopleura black along front and lower margins, mesopleural bristle on yellow ground (fig. 153B); mesonotum invariably somewhat matt; wing 2·1–2·7 mm.; male genitalia: aedeagus as in fig. 155 ..... **flaveola** (Fallén)

*Common and widespread throughout country; Ireland: Co. Clare; Scotland: Aberdeen, Banff., Inverness and Moray. Hosts: Gramineae, particularly* Bromus, Dactylis, Holcus, Poa, *larva forming narrow whitish linear mine, pupating externally; puparium reddish, posterior spiracles each with 3 bulbs.*

16 Mesopleura solidly black at least to midway between mesopleural bristle and upper margin; femora bright yellow, tibiae and tarsi black; mesonotum matt black; wing 2·2 mm., last section of $M_{3+4}$ $2\frac{1}{2}$ times penultimate; male genitalia: aedeagus ending in 2 distinct tubules, of same form as *bruscae* (cf. fig. 163) **virgo** (Zetterstedt)

*Staffs.: Newcastle-under-Lyme,* 1 ♂, 1 ♀, 3.vi.60 (*J. R. Vockeroth*). *New to Britain. Host:* Equisetum fluviatile, *larva forming external stem-mine, pupating at end of mine, with puparium projecting through the epidermis; posterior spiracles each with up to 40 minute bulbs.*

— Mesopleura at least yellow on upper quarter ..... 17

17 Acr in 6 rows; mesonotum deep black, moderately shining; black at hind margin of eye reaching to base of vte; wing 2–2·2 mm. ..... **amoena** (Meigen)

*Common in south; Westmorland: Grasmere; Ireland: Dublin; Co. Wexford, New Ross (K.A.S.). Host:* Sambucus nigra, *larva initially forming irregular linear mine, which later develops into a conspicuous blotch* (fig. 156).

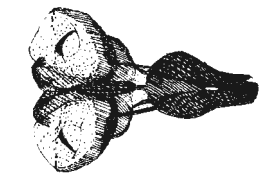
— Acr in 2–4 rows ..... 18

18 Acr in 4 rows ..... 19

— Acr in 2 rows ..... 45

19 Both vertical bristles on dark ground or at least dark ground extending up to base of vti; femora entirely yellow ..... 20

— Dark ground not reaching base of vti ..... 25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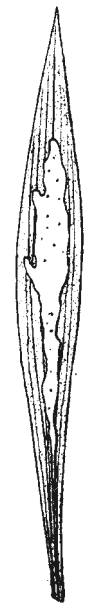
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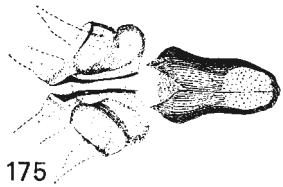
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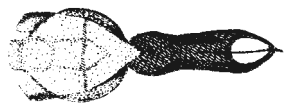
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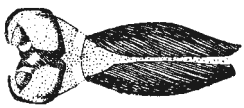
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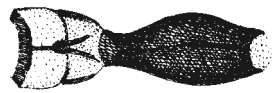
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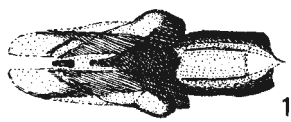
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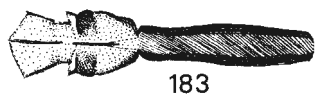
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FIG. 173.—*Liriomyza soror*: aedeagus.
FIG. 174.—*L. solivaga*: aedeagus.
FIG. 175.—*L. centaureae*: aedeagus.
FIGS. 176–177.—*L. tragopogonis*: (176), aedeagus; (177), leaf-mine on *Tragopogon*.
FIG. 178.—*L. flavopicta*: aedeagus (paratype).
FIG. 179.—*L. hampsteadensis*: aedeagus.
FIGS. 180–181.—*L. latipalpis*: (180), palp; (181), aedeagus.
FIG. 182.—*L. bryoniae*: leaf-mine on *Lycopersicum* (tomato).
FIGS. 183–184.—*L. demeijerei*: (183), aedeagus; (184), leaf-mine on *Artemisia*.

20 Frons and orbits entirely yellow ..... 21
— Orbits adjoining eye margin at least narrowly black; small species, 1·5–1·8 mm... 24
21 Acr extending to level of first dc, with frequently one or more hairs even beyond; mesonotum deep black, moderately shining; wing 1·8–2·25 mm.; male genitalia: aedeagus as in fig. 157 ..... (= *graminicola* de Meijere) **pusio** (Meigen)
*Hunts.: Woodwalton Fen (G. C. D. Griffiths), Monk's Wood (K.A.S.); Devon: Dawlish, Paignton, Torquay (J. R. Vockeroth). Local, possibly overlooked. Host: Gramineae, only recorded species* Arrhenaterum elatius; *posterior spiracles of larva (puparium) each with an ellipse of* 8–9 *bulbs.*
— Acr not reaching level of first dc ..... 22
22 Mesonotum slightly greyish black, somewhat matt; wing 2 mm. **eupatorii** (Kaltenbach)
*Surrey: Holmbury St. Mary; Dorset: Lyme Regis; Cambs.: Chippenham Fen. Local. Holarctic. Hosts:* Eupatorium cannabinum, Solidago virgaurea, Galeopsis tetrahit (*rarely also on* Aster, Helianthus, Lapsana); *larva forming linear mine commencing with a conspicuous spiral* (fig. 158); *posterior spiracles of larva (puparium) each with* 3 *bulbs.*
— Mesonotum deep black, more shining ..... 23
23 Male genitalia: aedeagus as in fig. 159; wing 1·6–2 mm. (= *fasciola* Meigen) **pusilla** (Meigen)
*Herts.: Barnet; Devon: Slapton; Wales, Glam.: Cardiff; Ireland, Co. Clare; Scotland, Sutherland: Loch Assynt,* 1 ♂, 26.vi.11 (*Col. Yerbury*). *Widespread. Hosts: most frequently* Bellis perennis, *more rarely* Aster, Solidago, *larva forming irregular linear mine* (fig. 160).
— Male genitalia: aedeagus as in fig. 161; wing 1·8 mm. ..... **valerianae** Hendel
*Cambs.: Chippenham Fen; Wilts.: Heddington. Local. Host:* Valeriana dioica, V. officinalis, *larva forming irregular linear mine* (fig. 162); *posterior spiracles of larva (puparium) each with* 3 *bulbs.*
24 Mesonotum conspicuously matt-grey; male genitalia: aedeagus as in fig. 163 **bruscae** Hering
*Herts.: Barnet (G. C. D. Griffiths); London: Hampstead,* 1 ♂, 30.v.52 (*K.A.S.*). *Uncommon. New to Britain. Host:* Equisetum arvense, *larva mining the narrow branches, pupating externally; puparium pale or dark brown (when black parasitized), posterior spiracles each with* 9–10 *conspicuously elongate bulbs.*
— Mesonotum deep black, moderately shining; male genitalia: aedeagus as in fig. 164 **eupatoriana** Spencer
*Wilts.: Heddington; Cambs.: Chippenham Fen. Local. Host:* Eupatorium cannabinum, *mine filling apex of leaf segment, with a short final section extending further into leaf* (fig. 165); *pupation normally in leaf at end of mine.*
25 Dark ground at rear of eye margin extending at least to base of vte but not reaching vti ..... 26
— Both vt clearly on yellow ground; hind margin of eye either entirely yellow or if for short distance dark, this not approaching base of vte ..... 30
26 Third antennal segment with conspicuously long whitish pubescence (fig. 166), normally entirely yellow, occasionally distinctly darkened (couplet 11); mesonotum shining black, mesopleura with only small black patch on lower margin; small species, wing 1·3–1·6 mm. ..... **millefolii** Hering
*London: Hampstead; Middx.: Scratch Wood. Probably widespread, at least in south. Holarctic. Host:* Achillea millefolium, *larva forming irregular linear mine.*
— Third antennal segment with normal, short pubescence; mesonotum distinctly matt black ..... 27
27 Femora distinctly darkened by irregular brownish black striations; relatively large species, wing 2 mm.; male genitalia: aedeagus as in fig. 167.. **pascuum** (Meigen)
*Kent; Surrey; Hants.: I.o.W., apparently widespread at least in south. Host:* Euphorbia amygdaloides, *larva forming conspicuous blotch* (fig. 168), *with characteristic greenish-diffused frass, several larvae frequently feeding together.*
— Femora more yellow, with only faint brownish striations ..... 28
28 Second dc at level of supra-alar; mesonotum greyish black; small species, wing 1·5 mm.; male genitalia: aedeagus as in fig. 169 ..... **polygalae** Hering
*Surrey: Box Hill; Ireland: Co. Clare (G. C. D. Griffiths). Local. Host:* Polygala vulgaris, *larva forming irregular linear-blotch mine.*
— Second dc far beyond level of supra-alar ..... 29

29 Small species, wing 1·5–1·7 mm.; male genitalia: aedeagus as in fig. 170
**erucifolii** de Meijere

*Middx.: Scratch Wood*, viii.62 (*G. C. D. Griffiths*). *Uncommon. New to Britain. Hosts:* Senecio erucifolius *and* S. jacobaea, *larva forming irregular linear mine, normally adjoining margin of leaf; posterior spiracles of larva (puparium) each with* 3 *bulbs.*

— Larger species, wing 1·8–2·1 mm.; male genitalia: aedeagus as in fig. 171
(= *pumila* Meigen) **strigata** (Meigen)

*Widespread throughout country; Ireland, Co. Clare; Scotland: Perths., Killin (K.A.S.). Hosts: a polyphagous species, feeding predominantly on Compositae and Campanulaceae but also on a wide range of other families, including in Britain Caryophyllaceae, Convolvulaceae, Cruciferae, Labiatae, Malvaceae, Papilionaceae, Umbelliferae* (Hydrocotyle) *and Valerianaceae; genera in Compositae recorded as hosts in Britain include* Artemisia, Aster, Bidens, Centaurea, Cicerbita, Cichorium, Cirsium, Dahlia, Eupatorium, Helianthus, Lactuca, Lapsana, Senecio *and* Taraxacum*; larva forms distinctive mine along midrib, with short offshoots along lateral veins* (fig. 172)*; posterior spiracles of larva (puparium) each with* 10–12 *bulbs.*

30 Third antennal segment with conspicuously long pubescence.....31
— Third antennal segment with short pubescence, normal.....35

31 Lower ors at least partially incurved, upper reclinate.....32
— Both ors reclinate.....34

32 Hind margin of eye entirely yellow; frons conspicuously projecting above eye in profile; 1 + 3 ori; mesonotum somewhat matt, black; wing 1·7 mm.; male genitalia as in fig. 173.....**soror** Hendel

*Kent: Otford*, 1 ♀, 2.viii.58; *Wrotham*, 1 ♀, 28.v.70 (*both K.A.S.*). *Uncommon. Host:* Cirsium *spp. (in Germany), larva forming irregular linear mine; posterior spiracles each with* 3 *bulbs.*

— Hind margin of eye partially black beyond vte; frons visible at most as narrow ring above eye in profile; 1 + 2 ori; very small species, wing 1·2–1·5 mm.....33

33 Mesonotum moderately shining black; wing 1·5 mm. (see couplet 34)
**centaureae** Hering

— Mesonotum distinctly matt; minute species, wing 1·2 mm.; male genitalia: aedeagus as in fig. 174.....**solivaga** Spencer

*Surrey: Box Hill. Rare, a previously unknown species.*

34 Hind margin of eye partially black beyond vte; mesonotum deep black, moderately shining; male genitalia: aedeagus as in fig. 175.....**centaureae** Hering

*Surrey: Box Hill; Middx.: Scratch Wood; Bucks.: nr. Tring; Cambs.: Chippenham Fen; Wales, Glam.: Cefn Rhigos (G. C. D. Griffiths); Denbigh.: Cefn-y-bedd (K.A.S.); Scotland, Aberdeen.: Den of Pitlurgh,* 1 ♀, 17.vii.36 (*R. L. Coe*)*; Sutherland: Loch Assynt,* 1 ♀, 24.vii.11 (*Col. Yerbury*). *Widespread. Host:* Centaurea nigra, *larva forming irregular linear mine; posterior spiracles each with an ellipse of* 10 *bulbs.*

— Hind margin of eye yellow, mesonotum more obviously grey-black; wing 1·8 mm.; male genitalia: aedeagus as in fig. 176.....**tragopogonis** de Meijere

*London: Cripplegate (L. Parmenter); Middx.: Scratch Wood; Essex: Stanford-Le-Hope; Norfolk: Norwich. Local. Host:* Tragopogon pratensis, *larva forming linear blotch mine along mid-rib* (fig. 177)*; posterior spiracles each with* 10 *bulbs.*

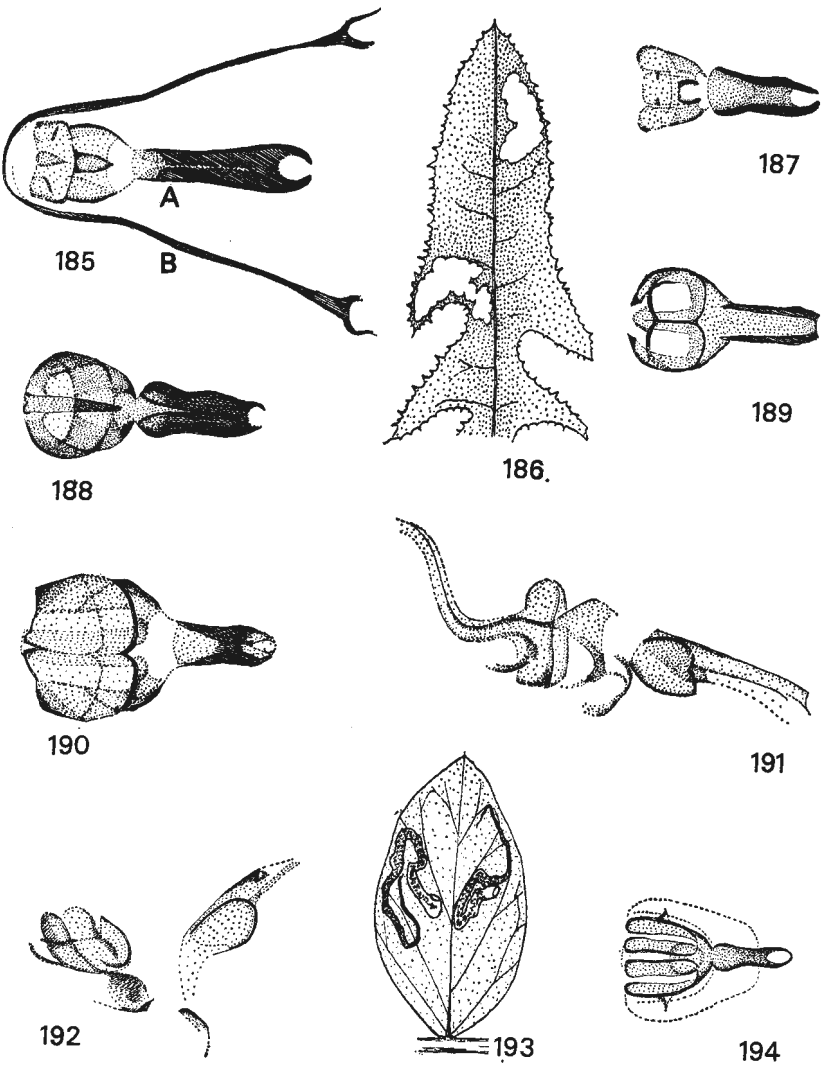
35 Upper ors reclinate, lower distinctly incurved; very small species, wing 1·3–1·5 mm. 36
— Both ors reclinate.....37

36 Mesonotum greyish black, obviously matt; male genitalia: aedeagus as in fig. 178
**flavopicta** Hendel

*Middx.: Scratch Wood (mines only). Host:* Achillea millefolium, *larva forming narrow stem-mine on upper part of stem below flower-head.*

— Mesonotum more black, somewhat shining; male genitalia: aedeagus as in fig. 179
**hampsteadensis** Spencer

*London: Hampstead; Middx.: Scratch Wood; Bucks.: Wendover. Rare, a previously unknown species. Host uncertain but possibly* Achillea millefolium, *on which original series was caught.*




FIGS. 185–186.—*Liriomyza sonchi*: (185A), aedeagus; (185B), ninth sternite; (186), leaf-mine on *Sonchus*.
FIG. 187.—*L. taraxaci*: aedeagus (same scale as Fig. 185).
FIG. 188.—*L. hieracii*: aedeagus.
FIG. 189.—*L. ptarmicae*: aedeagus.
FIG. 190.—*L. tanaceti*: aedeagus.
FIG. 191.—*L. equiseti*: aedeagus.
FIGS. 192–193.—*L. congesta*: (192), aedeagus; (193), leaf-mine on *Pisum*.
FIG. 194.—*L. pisivora*: aedeagus.

37 Palps conspicuously broadened apically (fig. 180); frons distinctly projecting above eye in profile, femora bright yellow; mesopleura dark along front and lower margins; mesonotum matt black; wing 1·7–2·4 mm.; male genitalia: aedeagus as in fig. 181 ..... **latipalpis** Hendel

*Suffolk: Aldeburgh,* 3 ♂, 2 ♀, 18.ix.09; 1 ♀, 21.v.10; *Butley,* 1 ♀, 29.vi.07; *Norfolk: Holme,* 2 ♂, 2 ♀, 31.vii.47 (*all J. E. Collin*). *New to Britain. Uncommon. Host: unknown.*

— Palps narrow, normal ..... 38

38 Discal cell large, last section of vein $M_{3+4}$ thus only twice length of penultimate; hind margin of eye black up to base of vte; mesonotum slightly matt but distinctly black rather than grey; mesopleura with small black bar at front of lower margin; wing length 1·75–2·1 mm. ..... ( = *solani* Hering) **bryoniae** (Kaltenbach)

*Surrey: Kew Gardens; Herts.: Cheshunt; Sussex: Worthing. Local, probably introduced. Hosts in U.K.:* Lycopersicum esculentum (*tomato*), Cucumis sativus (*cucumber*), Atropa belladonna (*Kew*); *in Europe polyphagous. Larva forms short, irregular linear mine* (fig. 182). *This is a common pest of tomatoes in glasshouses.*

— Discal cell smaller, last section of vein $M_{3+4}$ 2½–4 times length of penultimate . . 39

39 Mesopleura entirely yellow; coxae and femora bright yellow; mesonotum moderately shining black; small species, wing 1·5–1·6 mm.; male genitalia: aedeagus as in fig. 183 ..... **demeijerei** Hendel

*London: Hampstead. Uncommon. Host:* Artemisia vulgaris, *larva forming short, upper surface linear mine* (fig. 184).

— Mesopleura with at least small dark area on lower margin ..... 40

40 Mesonotum somewhat greyish black; acr more frequently only in 2 rows (see couplet 47) ..... **congesta** (Becker)

— Mesonotum deeper black, even though somewhat matt ..... 41

41 Hind margin of eye normally entirely yellow (rarely very small area black but well beyond base of vte); male genitalia: aedeagus and ninth sternite as in fig. 185A, B **sonchi** Hendel

*London: Hampstead; Middx.: Scratch Wood; Berks.: Pangbourne; Ireland: Co. Clare, Co. Wexford, Rosslare* (*K.A.S.*). *Widespread, at least in south. Host:* Sonchus oleraceus *and other* Sonchus *spp.* (*in Germany also* Arnoseris), *larva forming small primary blotch* (fig. 186), *often several larvae feeding together; posterior spiracles each with an ellipse of* 8–10 *bulbs.*

— Hind margin of eye distinctly black, approaching but not reaching base of vte . . 42

42 Mesopleura with black band along entire lower margin ..... 43

— Mesopleura paler, with only small black bar on lower margin ..... 44

43 Male genitalia: aedeagus as in fig. 187 ..... **taraxaci** Hering

*Widespread in south; Scotland: Perths., Killin; Ireland: Co. Kilkenny* (*K.A.S.*). *Holarctic. Hosts:* Leontodon autumnalis, Taraxacum *spp., larva forming small irregular blotch, posterior spiracles, each with ellipse of* 8–10 *bulbs.*

— Male genitalia: aedeagus as in fig. 188 ..... **hieracii** (Kaltenbach)

*Wales: Denbigh., Cefn-y-bedd; leaf-mines probably referable to this species also seen at Kent: Dungeness; London: Hampstead; Somerset: Cheddar; Derby.: Miller's Dale. Hosts:* Hieracium vulgatum (*in Germany* H. lachenalii, H. laevigatum *and* H. murorum); *larva forming small blotch, posterior spiracles each with about* 8 *bulbs.*

44 Conspicuous yellow area above mid-coxa dividing black of sternopleura and hypopleura; male genitalia as in fig. 189 ..... **ptarmicae** de Meijere

*Middx.: Scratch Wood, local. Host:* Achillea ptarmica, *larva forming narrow linear mine commencing on lower surface; posterior spiracles each with* 3 *bulbs.*

— Area above mid-coxa also black; male genitalia: aedeagus as in fig. 190 **tanaceti** de Meijere

*Surrey: Godalming; Ireland: Co. Kerry, Dingle; Co. Clare, Burren,* 28–29.vii.70 (*K.A.S.*). *Probably not uncommon but overlooked. Hosts:* Chrysanthemum, Tanacetum, *larva forming narrow linear mine, with frass in black strips; posterior spiracles each with about* 10 *bulbs.*

45 Third antennal segment with conspicuously long pubescence (acr normally irregularly in 3/4 rows, see couplet 34) ..... **tragopogonis** de Meijere

— Third antennal segment with short, normal pubescence; small species, wing 1·5–1·75 mm. ..... 46

46 Mesonotum conspicuously matt, greyish; acr in 2 rows, at most an isolated additional hair in front; last section of vein $M_{3+4}$ 2½ times length of penultimate; male genitalia: aedeagus as in fig. 191 ..... **equiseti** de Meijere
*Herts.: Barnet (G. C. D. Griffiths). Uncommon. New to Britain. Host:* Equisetum arvense, *larva mining the narrow branches, pupating externally; posterior spiracles each an irregular ellipse of* 9–14 *minute round bulbs.*

— Mesonotum with more distinct subshine, slightly more black, rather than grey; last section of $M_{3+4}$ 3 times penultimate ..... 47

47 Abdomen with tergites yellow laterally and frequently also hind margins narrowly yellow; male genitalia: aedeagus as in fig. 192 ..... **congesta** (Becker)
*Widespread and common, at least in south; Ireland: Co. Clare. Hosts: Papilionaceae, particularly* Lathyrus *spp.*, Medicago sativa, Pisum sativum, Trifolium repens, Vicia faba *and other* Vicia *spp., larva forming short linear mine with frass in minute grains at each side of a green central band* (fig. 193)*; posterior spiracles each with* 3 *bulbs.*

— Abdomen largely black, at most front tergites yellow laterally; male genitalia: aedeagus as in fig. 194 ..... **pisivora** Hering
*Kent: Hayes; Surrey: Chipstead; Herts.: Potter's Bar. Hosts:* Lathyrus *spp.*, Pisum sativum, *larva forming longer linear mine, normally starting on lower surface, frass in black strips alternately at sides of the mine; posterior spiracles normally each with* 7 *bulbs.*

## Genus **Pteridomyza** Nowakowski

*Pteridomyza* Nowakowski, 1962. Type of genus: *Agromyza hilarella* Zetterstedt, 1848.

This is a monotypic genus, erected for the isolated species, *hilarella* (Zett.). *P. hilarella* was placed by Hendel (1931–6) in his artificial genus *Praspedomyza*, which has now been synonymised with *Liriomyza*. Its distinctive genitalia resemble those of species both in *Liriomyza* and *Phytoliriomyza* (Spencer, 1969) but it nevertheless appears justifiable at the present time to retain it in *Pteridomyza*.

*P. hilarella* is a holarctic species feeding as a leaf-miner on the ferns *Pteridium aquilinum* and *Polypodium vulgare*.

### One British Species

Small, variable species, wing length 2 mm., last section of $M_{3+4}$ almost twice length of penultimate; frons normally bright yellow, occasionally distinctly darker; upper orbits blackish, projecting above eye towards base of antennae (fig. 195); jowls and face entirely yellow; antennae normally bright yellow, third segment sometimes brownish; mesonotum matt black, normally with 3 + 1 differentiated dc, but pre-sutural one sometimes small; mesopleura and all legs bright yellow; male genitalia: aedeagus as in fig. 196 .... **hilarella** (Zetterstedt)
*Widespread in south. Ireland: Co. Clare,* 1 ♂, 17.v.67 *ex mines* 29.viii.66 *(G. C. D. Griffiths); Scotland: Dunbarton., Bonhill (J. R. Malloch). Hosts:* Pteridium aquilinum *and less commonly* Polypodium vulgare, *larva forming short linear mine in single section of a frond; pupation externally.*

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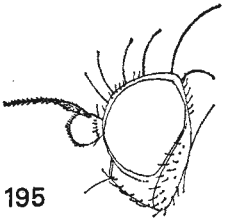
Figs. 195–196.—*Pteridomyza hilarella*: (195), head; (196), aedeagus.
Fig. 197.—*Metopomyza flavonotata*: aedeagus.
Figs. 198–199.—*Phytoliriomyza scotica*: (198), head; (199), wing.
Fig. 200.—*P. perpusilla*: wing.
Figs. 201–202.—*Lemurimyza alpicola*: (201), aedeagus; (202), epandrium.
Fig. 203.—*L. dorsata*: mesonotum.
Fig. 204.—*L. pectoralis*: aedeagus.



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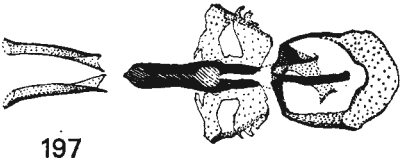

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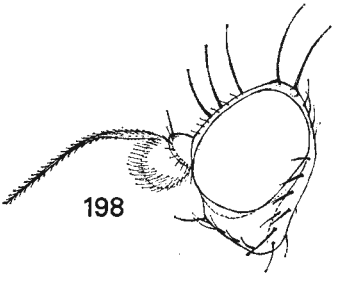

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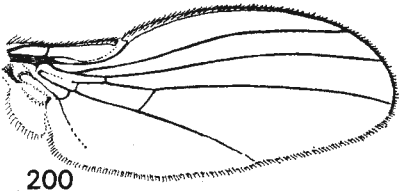

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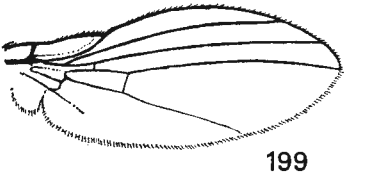

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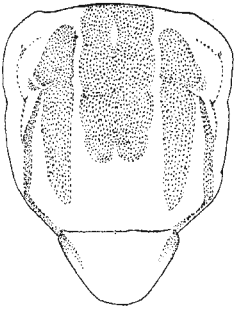

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## Genus **Metopomyza** Enderlein

*Metopomyza* Enderlein, 1936. Type of genus: *Agromyza flavonotata* Haliday, 1833.

The species in this small genus are generally shining black but the scutellum is always bright yellow. A single British species, *violiphaga* (Hd.), is somewhat paler, with the frons brown and notopleura yellow. The costa extends strongly to vein $M_{1+2}$, the second cross-vein is normally present but in one species, *xanthaspis* (Loew), is lacking.

Four species are known in Britain, two representing additions to the British list. Three are leaf-miners—two on *Carex* and one on *Viola*, while the fourth, *flavonotata* (Haliday), almost certainly feeds on Gramineae.

### Key to Species

1 Sides of thorax and all antennal segments entirely black.....2

– Paler species, frons brown, inner margin of orbits yellowish, black adjoining eye margin; all antennal segments yellow; notopleural triangle yellow, pleura and legs otherwise black; mesonotum matt black; small species, wing 1·5 mm., last section of $M_{3+4}$ twice length of penultimate.....**violiphaga** (Hendel)
*Kent: Ham Street,* 1 ♀, *ex* Viola *sp.*, 1.viii.54; *Surrey: Holmbury St. Mary; S. Wales: Brecon (G. C. D. Griffiths); Scotland: Perth., Killin, empty leaf-mines, Aug.* 55 *(K.A.S.). Uncommon. Host:* Viola *spp., larva forming shallow white blotch mine, beginning with short initial linear section, pupation externally.*

2 All knees bright yellow; frons pale brown; orbits less than one-third width of frons; wing 1·15–1·8 mm.; second cross-vein normally present but not infrequently lacking, when present last section of $M_{3+4}$ 3 times length of penultimate
**flavoscutellaris** (Zetterstedt)
*Dorset: Studland,* 1 ♂, 23.v.12*; Suffolk: Aldeburgh,* 2 ♀, 20 *and* 23.v.10 *(both J. E. Collin); Scotland, Moray.: Culbin Sands,* 1 ♀, 5–7.vii.36 *(R. L. Coe). New to Britain. Host:* Carex *spp., mine upper surface, deep, narrow, frass in* 2 *regular rows, pupation externally.*

– Legs entirely black or fore knees at most indistinctly paler, yellowish.....3

3 Second cross-vein present; entirely black species apart from scutellum; wing 1·9–2·2 mm.; male genitalia: aedeagus as in fig. 197.....**flavonotata** (Haliday)
*Widespread in south; Derby.: Miller's Dale,* 1.vi.56 *(K.A.S.); Ireland:* 1 ♀, *Co. Wicklow (Haliday); Scotland: Dunbarton., Bonhill,* 1 ♀, 17.vii.07 *and* 1 ♂, 20.vi.08 *(J. R. Malloch). Not uncommon in meadows in early summer Host unknown, almost certainly Gramineae.*

– Second cross-vein lacking; frons dark, black to dark brown; orbits conspicuously broad, at least one-third width of frons; fore knees sometimes indistinctly yellowish; smaller species, wing 1·4–1·65 mm.....**xanthaspis** (Loew)
*Suffolk: Barton Mills,* 3 ♀, 23.vi.34 *and* 3.vi.50; *Scotland: Inverness., Cairngorms, Riach, Devil's Ditch,* 1 ♂, 1 ♀, 15.vi.36 *(all J. E. Collin). New to Britain. Host:* Carex *spp., mine initially lower surface, later developing into a broad blotch, with frass scattered irregularly, pupation externally.*

## Genus **Phytoliriomyza** Hendel

*Phytoliriomyza* Hendel, 1931. Type of genus: *Agromyza perpusilla* Meigen, 1830.

Hendel erected *Phytoliriomyza* as a subgenus of *Liriomyza* for the single species, *perpusilla* (Meigen), in which the orbital setulae are proclinate (cf. fig. 198). The scutellum may be yellow or grey and the halteres are frequently somewhat darkened. The last section of vein $M_{3+4}$ is always longer than the penultimate section (figs. 199, 200).

Thirteen described species are now known in the genus, of which three occur in Britain. The biology is known of only a single species and this is a stem-miner.

KEY TO SPECIES

1 Third antennal segment with conspicuously long pubescence (fig. 198); wing 1·5–1·9 mm., last section of $M_{3+4}$ twice length of penultimate (fig. 199) **scotica** Spencer

*Scotland: Dunbarton., Bonhill, June–July,* 1907 *and* 1908 (*J. R. Malloch*). *Also known from N. Germany (von Tschirnhaus). Host: unknown.*

– Third antennal segment with slight, normal pubescence ..... 2

2 Last section of vein $M_{3+4}$ about 1½ times length of penultimate, wing length 1·6–2·2 mm.; colour highly variable, from largely black (Greenland) to largely yellow; halteres frequently darkened, brown ..... **arctica** (Lundbeck)

*London: Cripplegate,* 1 ♀, 19.viii.50*; Essex: Flatford,* 1 ♀, 10.vii.51 (*both L. Parmenter*)*; Hunts.: Woodwalton Fen. Uncommon in England but semi-cosmopolitan and locally abundant. Host:* Sonchus oleraceus *and probably other Compositae, larva feeding as external stem-miner.*

– Last section of vein $M_{3+4}$ twice length of penultimate, second cross-vein conspicuously slanting (fig. 200); very small species, wing length 1·5–1·8 mm.; colour also somewhat variable but never completely dark as in *arctica*; frons, jowls, face normally yellow, third antennal segment darker, brown; mesonotum and scutellum matt grey, legs largely yellow, sometimes more brownish; abdomen yellow or black ..... **perpusilla** (Meigen)

*Kent: Deal,* 1 ♀, 3.vi.48 (*L. Parmenter*)*; Essex: Manningtree, on salt marshes,* 1 ♀, 17.vii.61 (*K.A.S.*)*; Walton-on-the-Naze,* 5 ♂, 5 ♀, 9.vii.12 (*J. E. Collin*)*; Suffolk: Barton Mills,* 1 ♂, 1 ♀, 11.ix.34 (*J. E. Collin*)*; Norfolk: Northrepps,* 1 ♂, 2 ♀, 8.viii.23 (*J. E. Collin*). *Local. Host: unknown, possibly* Aster tripolium *is one host.*

## Genus **Lemurimyza** Spencer

*Lemurimyza* Spencer, 1965a. Type of genus: *Liriomyza enormis* Spencer, 1963.

On external characters this genus closely resembles *Liriomyza* but the orbital setulae are normally upright or even slightly proclinate, not distinctly reclinate; the mesonotum is normally yellow adjoining the scutellum (fig. 203) and the halteres may be dark, black or brown. In all species the form of aedeagus (figs. 201, 204) and the internal structures of the epandrium (fig. 202) are characteristic and distinctive.

Three species are known in Britain; *alpicola* (Strobl) was recently transferred to this genus from *Metopomyza* (Spencer, 1971*a*).

The host is not known for any species in this genus. The larvae are almost certainly not leaf-miners but probably feed internally either in stems or flower-heads.

KEY TO SPECIES

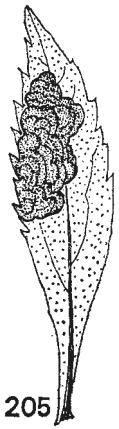
1 Halteres brownish black; second and third antennal segments black; legs entirely black; mesonotum black, moderately shining, scutellum bright yellow centrally, black at sides; mesopleura black below, yellow on upper third, notopleura and lower half of humerus yellow; abdomen entirely black; wing 2–2·3 mm., last section of $M_{3+4}$ 1½ times length of penultimate; male genitalia: aedeagus as in fig. 201; epandrium as in fig. 202 ..... **alpicola** (Strobl)

*Scotland: Dunbarton.,* 2 ♂, 20.vi, 2 ♀, 21.vi.08; 1 ♀, 19.vii.09 (*J. R. Malloch*). *Only other known locality: Austrian Alps. Host unknown*

– Halteres bright yellow; second antennal segment yellow; mesonotum yellow centrally adjoining scutellum; abdomen partially yellow ..... 2

2 Palps entirely yellow; third antennal segment black or brownish; dark area of mesonotum (fig. 203) matt grey, divided into bands; legs entirely, pleura largely yellow; abdomen yellow; wing 2·1 mm. ....(= *striata* Hendel) **dorsata** (Siebke)

*Staffs.: Madeley,* 1 ♂, 28.vi.26 (*H. Britten*)*; Wales: Brecknock, Usop,* 1 ♂, 8.viii.13 (*J. E. Collin*). *Uncommon. Host: unknown.*



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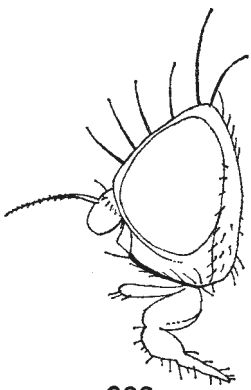

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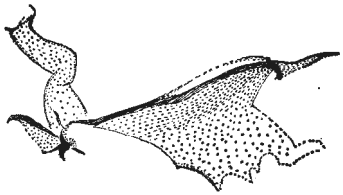

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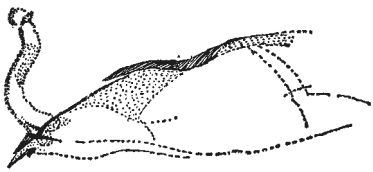

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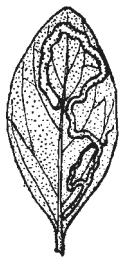

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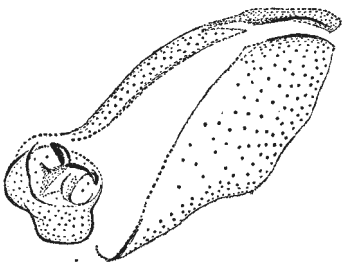

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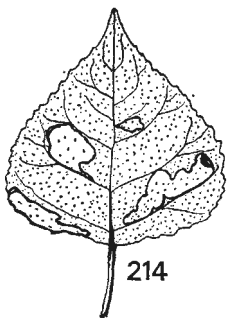

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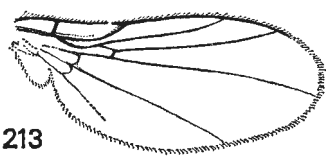

213

– Palps largely black; third antennal segment black; dark area of mesonotum deeper black, not divided into bands; tibiae and tarsi darker, brownish; abdomen with tergites broadly yellow behind and laterally but black centrally; larger species, wing length up to 2·5 mm., last section of $M_{3+4}$ twice length of penultimate; male genitalia: aedeagus as in fig. 204. . . . . **pectoralis** (Becker)
*Derby.: Dovedale,* 1 ♀, 9.vii.50 (*L. Parmenter*). *Previously only known from Mediterranean area and Canary Islands. Host unknown.*

## Genus **Nemorimyza** Frey

*Nemorimyza* Frey, 1946. Type of genus: *Agromyza posticata* Meigen, 1830.

This is a monotypic genus, erected for the holarctic species, *posticata* (Mg.). Hendel (1931–6) placed *posticata* with the tree-boring group now in the genus *Phytobia* but it is clearly in no way related to this group. Its inclusion in a monotypic genus appears to be substantiated by its distinctive genitalia (Spencer, 1969: fig. 280).

ONE BRITISH SPECIES

Frons and antennae black, lunule conspicuously silvery; mesonotum shining black, with 3 + 0 dc; legs black with fore knees yellow; fore tibia with 1 lateral bristle, mid-tibia with 2; abdomen with front tergites yellow in male, entirely black in female; squamae white, fringe silvery; large species, wing up to 3·3 mm., discal cell large, last section of $M_{3+4}$ about two-thirds length of penultimate
**posticata** (Meigen)
*Kent: Darenth; London: Hampstead; Herts.: Barnet; Ireland: Co. Cork, Glengariff (K.A.S.); Co. Kerry, Killarney. Widespread in south but local. Host:* Solidago virgaurea *and cultivated* S. canadensis *(in Canada also* Aster *spp.), larva forming large brownish blotch, with conspicuous feeding lines* (fig. 205); *pupation externally.*

## Genus **Paraphytomyza** Enderlein

*Paraphytomyza* Enderlein, 1936. Type of genus: *Phytagromyza luteoscutellata* de Meijere, 1924 (as *Phytagromyza xylostei* Robineau-Desvoidy).

The significant character differentiating this genus from *Phytomyza* is the arrangement of the orbital setulae, which are here reclinate, upright or lacking (always distinctly proclinate in *Phytomyza*). The costa always ends at $R_{4+5}$ and the second cross-vein may be present or lacking. Hendel (1920) erected the genus *Phytagromyza* for this group, with *Domomyza flavocingulata* Strobl as type of the genus. However, it has since been shown that *flavocingulata* is in no way related to the other species in the group and correctly belongs to *Cerodontha* (p. 101). The available name *Paraphytomyza* is now accepted for Hendel's concept of *Phytagromyza*.

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FIG. 205.—*Nemorimyza posticata*: leaf-mine on *Solidago*.
FIG. 206.—*Paraphytomyza orphana*: head.
FIG. 207.—*P. discrepans*: aedeagus.
FIG. 208.—*P. buhri*: aedeagus.
FIG. 209.—*P. lonicerae*: leaf-mine on *Lonicera*.
FIGS. 210–211.—*P. similis*: (210), aedeagus; (211), leaf-mine on *Knautia*.
FIG. 212.—*P. hendeliana*: leaf-mine on *Lonicera*.
FIG. 213.—*P. nigrivenis*: wing.
FIG. 214.—*P. populicola*: leaf-mine on *Populus*.
FIG. 215.—*P. populi*: leaf-mine on *Populus*.

Of the 15 species in this genus known in Britain, nine are certainly congeneric, with known hosts in the related families Rubiaceae, Dipsacaceae and Caprifoliaceae. The larvae feed as leaf-miners or external stem-miners. The remaining group of six species feed as leaf-miners on Salicaceae and further study may justify giving this group separate generic status, as already suggested by Nowakowski (1962 : 102).

KEY TO SPECIES

1 Apex of wing lies midway between veins $R_{4+5}$ and $M_{1+2}$; third antennal segment yellow or black ..... 2
– Apex of wing at vein $M_{1+2}$; third antennal segment yellow ..... 9
2 Scutellum yellow, at least centrally; frons bright yellow; femora black, with all knees yellow ..... 3
– Scutellum uniformly dark, grey or black (at most faintly yellow between basal scutellars when viewed from rear) ..... 4
3 Mesonotum uniformly matt greyish black, scutellum narrowly yellow centrally; orbital setulae invariably entirely lacking; third antennal segment largely black, possibly yellow basally; palps black; small species, wing 1·9–2·4 mm.
**anteposita** (Strobl)
*Kent: Darenth; Middx.: Scratch Wood; Scotland: Dunbarton., Bonhill,* 1 ♀, 15.vi.08 (*J. R. Malloch*), *Probably widespread, at least in south. Host:* Galium aparine, *larva forming external stem-mine* (*report as stem-borer in* Galium mollugo *inaccurate*).
– Mesonotum matt-greyish in front but divided by yellow bands at rear; scutellum conspicuously yellow, apart from small dark areas laterally; orbital setulae minute but normally detectable, rarely entirely absent; third antennal segment largely yellow, slightly darkened apically; palps yellow; larger species, wing 2·4–2·9 mm. ..... (= *tristriata* Hendel) **trivittata** (Loew)
*Surrey: Box Hill; Hants.: Beaulieu; Glos.: Blaise Woods; Somerset: Radstock. Host:* Galium mollugo, *larva feeding as internal stem-borer* (*Hering,* 1941 *and de Meijere,* 1943, *ascribe this record in error to* P. anteposita).
4 Mouth-parts conspicuously elongate, jowls characteristically rounded (fig. 206); mesonotum shining black; frons reddish, all antennal segments black; wing 2·25–2·75 mm. ..... **orphana** (Hendel)
*Surrey: Godalming; Middx.: Scratch Wood; Dorset: Portland; Suffolk: Barton Mills; Derby.: Miller's Dale; Scotland: Banff., Falls of Tarnash,* 1 ♂, 1 ♀, 1.viii.36 (*R. L. Coe*). *Widespread. Host:* Galium aparine, *larva external stem-miner* (*de Meijere*).
– Mouth-parts shorter, normal; jowls flatter ..... 5
5 3 + 1 dc, pre-sutural dc well developed; frons orange-yellow, all antennal segments black; mesonotum moderately shining black; femora black, only fore knees bright yellow; wing 2–2·5 mm.; male genitalia: aedeagus as in fig. 207
**discrepans** (Wulp)
*Surrey: Godalming; Middx.: Scratch Wood; Cambs.: Chippenham,* 1 ♀, 1.vi.03 (*G. H. Verrall*); *Suffolk: Orford,* 1 ♂, 27.vi.08 (*J. E. Collin*); *Scotland: Dunbarton., Bonhill,* 2 ♂, 2 ♀, 29.v.07–26.vi.08 (*J. R. Malloch*). *Host unknown.*
– Pre-sutural dc not differentiated, 3–5 post-sutural dc ..... 6
6 Frons reddish orange, orbits darkened, brown to deep black; very small species, wing 1·5–1·75 mm.; normally only 3 dc, rarely fourth and fifth just detectable; second cross-vein normally absent, occasionally present on one or both wings; male genitalia: aedeagus as in fig. 208
(= *simplonensis* Spencer) **buhri** (de Meijere)
*Kent: Wrotham; Surrey: Betchworth; Cornwall: Lizard; Suffolk: Newmarket. Widespread with food-plant. Host:* Galium mollugo, *larva forming whitish stem-mine, pupating externally.*
– Frons darker, brownish black in front, paler behind; larger species, wing length 2·25–2·75 mm.; 5 differentiated dc ..... 7
7 All knees yellowish; mesonotum matt greyish ..... 8

– Only fore knees distinctly yellow, on mid- and hind legs at most indistinctly paler; mesonotum darker, more black; all antennal segments black; wing up to 2·75 mm. **lonicerae** (Robineau-Desvoidy)

*Widespread in south, mines in early summer, single generation. Holarctic. Host:* Lonicera periclymenum, Symphoricarpos rivularis, *larva forming long white mine, pupating externally* (fig. 209)*; posterior spiracles of larva (and puparium) with distinctive horn-like process within the ellipse of bulbs.*

8 All knees bright yellow; mesonotum conspicuously ash-grey; dc strong, at least 5 differentiated; frons brownish black in front, paler, yellow or brown behind; wing 2·25–2·5 mm.; male genitalia: aedeagus as in fig. 210 . . . **similis** (Brischke)

*Surrey: Box Hill, Coulsdon; Glos.: Kilcot; N. Wales: Denbigh., Cefn-y-bedd; Ireland, Co. Clare, mines on* Succisa pratensis *probably referable to this species (Griffiths,* 1968*a* : 46). *Local. Host:* Knautia arvensis (?Succisa pratensis), *larva forming long, whitish linear mine, which may develop into a secondary blotch* (fig. 211).

– Fore knees distinctly yellow, on mid- and hind-legs sometimes similar, frequently only inconspicuously paler; mesonotum greyish but slightly darker, almost brownish; dc somewhat weaker; second antennal segment sometimes paler, yellowish; wing up to 2·75 mm. . . . . **hendeliana** (Hering)

*Common in southern England; Ireland: Co. Clare, Co. Cork, Co. Galway (mines from Scotland, Sutherland: Golspie may refer to this species or to* P. lonicerae). *Host:* Lonicera periclymenum, Symphoricarpos rivularis, *larva forming long white mine, pupating externally* (fig. 212)*; posterior spiracles of larva (and puparium) without horn within ellipse of spiracular bulbs.*

9 Scutellum dark, black or grey . . . . . 10

– Scutellum largely yellow; frons, antennae and femora bright yellow . . . . . 11

10 Mesonotum and scutellum shining black; frons and orbits dark, brownish black; femora yellow basally, dark on distal third; wing conspicuously infuscated, veins black, length 1·6 mm., second costal section short, equal to length of fourth (fig. 213) . . . . . **nigrivenis** (Spencer)

*Dorset: Axmouth. Uncommon. Host unknown.*

— Mesonotum and scutellum matt grey, frons and orbits yellow; wing hyaline, veins pale, length 2·1 mm., second costal section 3 times length of fourth **langei** (Hering)

*Surrey: Box Hill; Kent: Cudham,* 25.ix.65 (*mines only*). *Host:* Salix, *normally* S. caprea, *larva forming narrow, winding linear mine, brown when old, pupating externally.*

11 Second cross-vein present, almost in line with first; entire insect largely yellowish; third antennal segment normally bright yellow (in one specimen seen, pale grey); dark area of mesonotum divided into bands, mainly rusty-yellow but lateral bands sometimes darker, greyish; wing length 1·8 mm. . . . . **heringi** (Hendel)

*Surrey: Reigate; Middx.: Scratch Wood; Herts.: Brookman's Park. Apparently not common but possibly overlooked. Host:* Fraxinus excelsior, *larva forming linear mine which frequently conspicuously widens at end, appearing blotch-like; pupation externally. Mines in October.*

— Second cross-vein absent . . . . . 12

12 Mesonotum with 3 rusty-reddish bands; entire insect otherwise including head, antennae and legs yellow; all bristles yellowish; wing length 1·8 mm. **populicola** (Haliday)

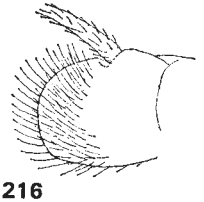
*Bucks.: Black Park. Uncommon. Host:* Populus nigra, *larva forming shallow, greenish upper surface blotch* (fig. 214), *pupating externally.*

— Mesonotum partially grey or black . . . . . 13

13 Mesonotum with dark area solid, black, largely shining, narrowly yellow adjoining scutellum and at hind corners; all bristles pale, yellowish; wing length 2 mm. **tremulae** (Hering)

*London: Hampstead; Surrey: Bookham; Bucks.: Wexham. Probably widespread, at least in south. Host:* Populus tremula, *larva forming short, broad, irregular linear mine on underside of leaf.*

— Mesonotum with dark area divided into bands; bristles dark . . . . . 14



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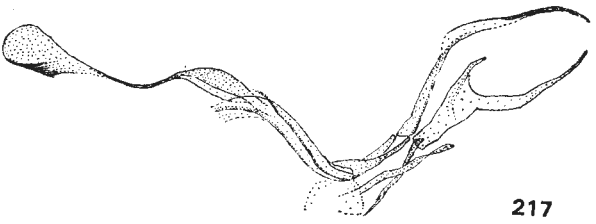

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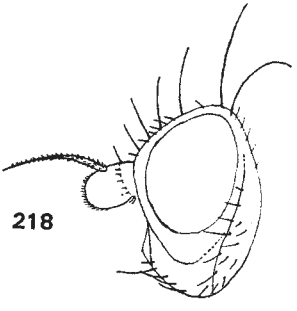

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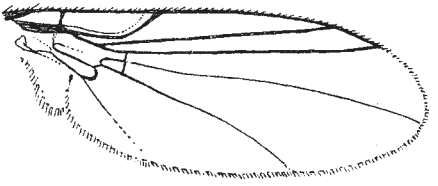

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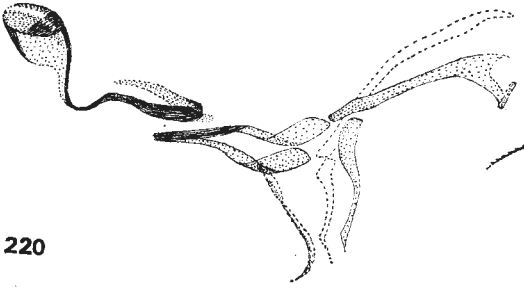

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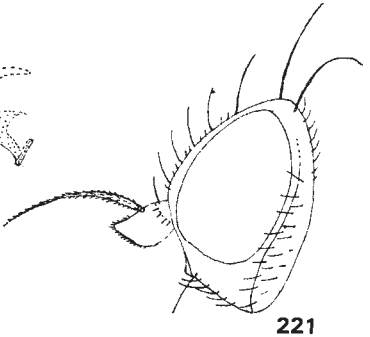

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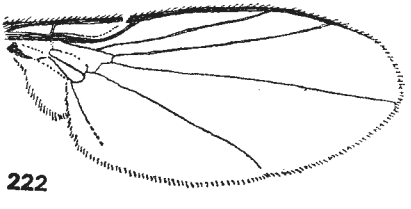

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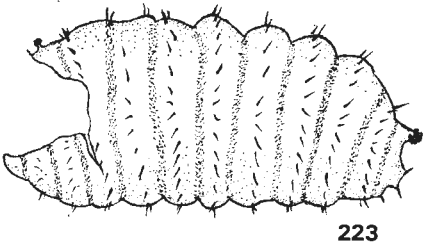

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14 Scutellum and mesopleura entirely yellow; mesonotum matt grey, conspicuously divided into bands ..... **tridentata** (Loew)

*Surrey, London, Oxford, probably widespread, at least in south. Host:* Salix *spp., particularly* S. viminalis, *larva forming yellowish blotch, pupation either externally or at end of mine.*

— Scutellum at least narrowly dark outside basal scutellars, mesopleura faintly grey on lower margin or more conspicuously blackish grey (*populivora*); mesonotum matt grey or darker, black, but distinctly divided into bands (= *populivora* Hendel) **populi** (Kaltenbach)

*London: Hampstead; Surrey, Oxford, widespread in south. Host:* Populus nigra, *larva forming long winding mine, initially lower surface, later upper surface* (fig. 215)*; pupating in mine. The darker form was described by Hendel as a distinct species,* populivora, *but with both forms obtained from the same groups of mines and no differences in male genitalia, it now seems clear that the species is polymorphic, irrespective of generations.*

## Genus **Napomyza** Westwood

*Napomyza* Westwood (Haliday MS), 1840. Type of genus: *Phytomyza elegans* Meigen, 1830 (as *festiva* Meigen).

This genus has the main characteristics of *Phytomyza*, with proclinate orbital setulae and costa ending at vein $R_{4+5}$ but in addition cross-vein *mm* is always present and closely adjoining vein *rm* (fig. 219). The frons is normally yellow and strongly projecting (fig. 218), and the second costal section conspicuously short (fig. 219).

A small group of species with the second cross-vein present was until recently included in *Napomyza* but studies of male genitalia have shown that these correctly belong in *Phytomyza*. They can be differentiated from true *Napomyza* species by the non-projecting frons and longer second costal section (*Phytomyza* key, couplet 112).

*Napomyza* species are primarily internal stem-borers, pupating in the stem. *N. lateralis* Fall. sometimes also feeds in the flower-head and one European species, *N. carotae* (Spencer, 1966*b*) feeds mainly in the root. Puparia of an unidentified species have been found in stems of *Anthriscus sylvestris*.

European species were recently revised by Spencer (1966*b*), and Griffiths (1967*b*) has subsequently described a further new species from Britain. Seven species are known in Britain, out of the total of 12 known in Europe. Two species have been described from South Africa and eight new species were recently recorded in Canada (Spencer, 1969).

Known parasites belong to the genera *Chorebus* and *Dacnusa* (Dacnusini) and it is of interest to note that in general the species parasitising the genus *Napomyza* are those associated with the other stem-boring or stem-mining genera, *Melanagromyza* and *Ophiomyia* (Griffiths, 1967*b*).

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FIG. 216.—*Napomyza hirticornis*: third antennal segment.
FIG. 217.—*N. scrophulariae*: aedeagus.
FIGS. 218–220.—*N. lateralis*: (218), head; (219), wing; (220), aedeagus.
FIG. 221–223.—*Pseudonapomyza atra* (221), third antennal segment; (222), wing; (223), puparium.

KEY TO SPECIES

1 Scutellum yellow; notopleura and upper three-quarters of mesopleura yellow; third antennal segment conspicuously elongate; large species, wing 3·2–3·5 mm. **elegans** (Meigen)

*Cambs.: Chippenham Fen; Ireland: Co. Down, Co. Wicklow; Scotland: Sutherland, Golspie; Inverness.: Aviemore, Glenmore (J. E. Collin). Host: unknown but adults are frequently caught on* Valeriana officinalis, *larva possibly root-feeder on this host.*

– Scutellum grey or black ..... 2

2 Legs largely black, at most fore knees slightly yellowish; frons blackish brown, orbits yellow but black adjoining eye margin; mesonotum blackish rather than grey; abdomen black; wing 2·5–2·8 mm. ..... **nigriceps** Wulp

*Kent: Tunbridge Wells; Cudham,* 1 ♂, 19.v.63 (*R. I. Vane-Clark*); *Surrey: Godstone; Suffolk: Barton Mills,* 2 ♂, 2 ♀, 17.iv.20; 2 ♂, 1 ♀, 10.v.31; 1 ♂, 28.iv.56; *Northants.: Polton,* 1 ♂, 4.v.23 (*all J. E. Collin*). *Local. Host: unknown.*

– All femora with conspicuously yellow knees; frons orange-yellow; mesonotum matt, grey ..... 3

3 Third antennal segment with conspicuous pubescence (fig. 216); wing from 2·1 mm. in male to 2·4 mm. in female ..... **hirticornis** Hendel

*Middx.: Scratch Wood; S. Wales: Glam., Gower Peninsula; Scotland: Midlothian, Arniston; Ireland: Co. Clare, Fanore. Local. Host:* Jasione montana, Centaurea nigra, *larva internal stem-borer.*

– Third antennal segment appearing bare ..... 4

4 Orbital setulae numerous, usually in at least 3 rows anteriorly ..... 5

– Orbital setulae sparser, not more than a dozen present, in at most 2 rows ..... 6

5 3 lower orbital bristles; consistently large species, wing 3·5–3·8 mm., second costal section only slightly longer than fourth ..... **tripolii** Spencer

*Kent: Faversham. Probably widespread on salt marshes, at least in south. Host:* Aster tripolium, *larva feeding as internal stem-borer.*

– Normally 2 lower orbital bristles; smaller species, wing 2–2·5 mm. in male, up to 3·2 mm. in female, second costal section about 1½ times length of fourth **bellidis** Griffiths

*Herts.: Barnet. Probably more widespread. Host:* Bellis perennis, *larvae feeding in basal leaves, mainly in mid-rib, moving from one leaf to another via the base of the leaves; pupation internally.*

6 Third antennal segment small, round; large species, wing up to 3·9 mm. in female; male genitalia: aedeagus with only slight curvature (fig. 217) **scrophulariae** Spencer

*London: Hampstead; Scotland: Edinburgh, Braid Hills; Ross and Cromarty, Skye (K.A.S.); Ireland: Co. Down, Newcastle. Probably widespread. Host:* Digitalis purpurea; *possibly also* Scrophularia nodosa, Verbascum, Mentha.

– Third antennal segment slightly longer than broad, only slightly rounded below (fig. 218); smaller species, wing from 2·5 mm. in male to 3 mm. in female (fig. 219); male genitalia: aedeagus with distinctive curvature (fig. 220) **lateralis** (Fallén)

*Surrey: Richmond; London: Hampstead; Herts.: Brookman's Park; Scotland: Inverness., Inverness. Widespread, common; holarctic. Hosts: Compositae, particularly* Anthemis, Bidens, Calendula, Dimorphotheca, Matricaria, Senecio; *larvae normally feed in stem but have been found in inflorescence of* Matricaria.

## Genus **Pseudonapomyza** Hendel

*Pseudonapomyza* Hendel, 1920. Type of genus: *Phytomyza atra* Meigen, 1830.

This genus is poorly represented in Britain, with only two out of the world total of 35 species. *P. atra* (Meigen) is widespread in Europe but has only been recorded in southern England. *P. lacteipennis* (Malloch), hitherto only known from the United States and Canada, has recently been discovered in S. Devon.

The genus at present includes two distinct groups—one feeding on Gramineae, having the third antennal segment angulate (fig. 221) and distinctive wing venation (fig. 222) and the other, occurring in the Old World tropics, feeding on Acanthaceae. The latter group probably deserves separate generic status. Many species in both groups bear distinctive papilli on the larva and puparium (fig. 223).

KEY TO SPECIES

1 Mesonotum shining black; tarsi dark, brown or black; wing hyaline, normal **atra** (Meigen)

*London: Wood Green*, 1 ♂, 14.v.48 (*C. N. Colyer*); *Kent: Otford, Wrotham; Middx.: Scratch Wood; Surrey: Box Hill; Bucks.: Ivinghoe. Widespread in south but local. Hosts: Gramineae, including* Avena, Lolium, Phalaris, Poa, Secale*; larva leaf-miner, each segment bearing a row of characteristic papilli* (fig. 223).

– Mesonotum matt grey; tarsi yellowish; wings conspicuously white **lacteipennis** (Malloch)

*Devon: Dawlish Warren*, 1 ♂, 1 ♀, 25.viii.60 (*J. R. Vockeroth*). *New to Britain and to Palaearctic Region. Host unknown but certainly Gramineae.*

## Genus **Phytomyza** Fallén

*Phytomyza* Fallén, 1810. Type of genus: *Phytomyza flaveola* Fallén = *obscurella* Fallén, 1823b, by subsequent designation of Coquillett.

The proclinate orbital setulae and termination of the costa at vein $R_{4+5}$ are the essential characters of this genus. The second cross-vein is normally lacking but it has recently been found that certain species with this vein present (fig. 324), which have hitherto been placed in *Napomyza*, correctly belong here. Four such species are included in the key below at couplet 112.

This is by far the largest world genus with 445 described species. In Britain 103 identified species are known and three further unidentified species have been recognized from their leaf-mines (p. 108). In British species, 80 are leaf-miners, five feed mainly in the mid-rib, with only short feeding offshoots into the leaf-blade, four are internal stem-borers, six feed in seed-heads and the biology of 11 is unknown. The majority of the latter almost certainly feed in stems.

Identification of some groups of closely related species is difficult on external characters alone but fortunately in this genus the male genitalia are highly differentiated and the characteristic aedeagus enables species to be readily recognized. Illustrations of the aedeagus are given below of 43 species.

Many species groups in this genus are exclusively associated with hosts in one or a small number of related families. However, it seems undesirable to treat these as separate genera or even subgenera, in view of the general uniformity of essential morphological characters throughout the genus, as at present defined.

In addition to the detailed key to species, a simplified key to groups of species is provided, which it is hoped may facilitate identification.

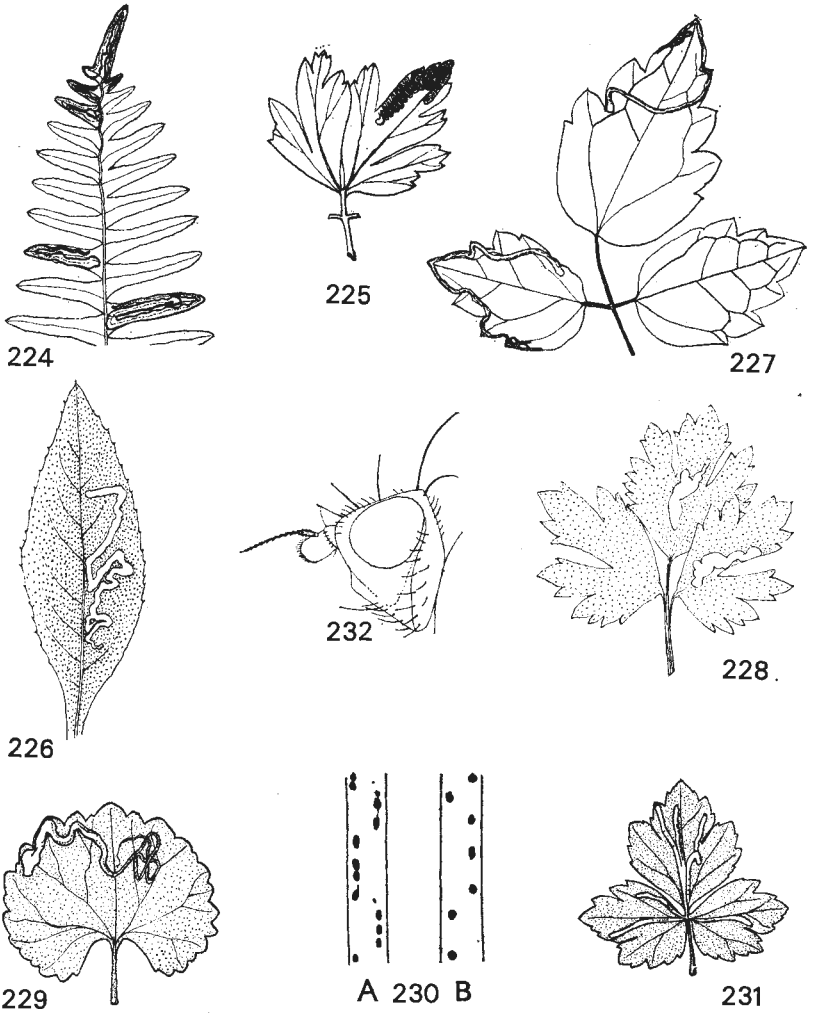



FIG. 224.—*Phytomyza scolopendri*: leaf-mine on *Polypodium*.
FIG. 225.—*P. anemones*: leaf-mine on *Anemone*.
FIG. 226.—*P. conyzae*: leaf-mine on *Inula*.
FIG. 227.—*P. vitalbae*: leaf-mine on *Clematis*.
FIG. 228.—*P. notata*: leaf-mine on *Ranunculus*.
FIG. 229.—*P. ranunculi*: leaf-mine on *Ranunculus*.
FIG. 230.—Frass pattern of (A), *P. ranunculi*; (B), *P. ranunculivora*.
FIG. 231.—*P. ranunculi* ssp. *stolonigena*: leaf-mine on *Ranunculus*.
FIG. 232.—*P. flavicornis*: head.

### Simplified Key to Groups of British Phytomyza Species

1 Second cross-vein lacking ..... 2
– Second cross-vein present ..... *aprilina* group (112)
2 Frons pale, yellow or orange ..... 3
– Frons darker, brown, grey or black ..... 16 (73)
3 Scutellum yellow ..... *ranunculi* group (4)
– Scutellum dark ..... 4 (12)
4 Femora yellow ..... *rufipes* group (13)
– Femora dark ..... 5 (17)
5 Third antennal segment partially pale ..... *cytisi* group (18)
– Third antennal segment dark ..... 6 (20)
6 Sides of thorax yellowish ..... *cirsii* group (21)
– Sides of thorax dark ..... 7 (35)
7 Upper ors shorter than lower or lacking ..... 8 (36)
– Upper ors at least as strong as lower ..... 9 (48)
8 Second costal section not significantly more than 3 times length of fourth ..... *angelicae* group (36)
– Second costal section $3\frac{1}{5}$–5 times length of fourth ..... *spondylii* group (42)
9 Frons partially darkened ..... *ilicis* group (48)
– Frons entirely pale ..... 10 (51)
10 Acr numerous, in 3–5 rows ..... *aquilegiae* group (52)
— Acr sparse, in 2 rows ..... 11
11 Arista distinctly thickened basally ..... *crassiseta* Zett. (55)
— Arista normal ..... 12
12 Eye pilose ..... *nigra* Mg. (56)
— Eye largely bare ..... 13
13 Fore coxae yellow ..... *plantaginis* group (59)
— Fore coxae dark ..... 14
14 Acr lacking ..... *syngenesiae, horticola* (62)
— Acr present ..... 15
15 Second costal section short, $1\frac{1}{2}$ times fourth ..... *asteris* group (66)
— Second costal section longer, $2\frac{1}{2}$–$4\frac{1}{2}$ times fourth ..... *taraxacocecis* group (67)
16 Upper ors shorter than lower, or absent ..... 17 (74)
— The two ors equal ..... 20 (92)
17 Second costal section short, $1\frac{1}{2}$–3 times fourth ..... 18 (76)
— Second costal section longer, slightly over 3–5 times fourth ..... 19 (86)
18 Acr in 2 rows ..... *melana* group (77)
— Acr in 3–6 rows ..... *obscura* group (80)
19 Mesonotum black ..... *minuscula* group (86)
— Mesonotum matt-grey ..... *chaerophylli* group (88)
20 Second costal section short, $1\frac{1}{2}$–3 times length of fourth ..... 21 (93)
— Second costal section longer, slightly over 3–5 times length of fourth ..... *agromyzina* group (108)
21 Acr in 4–6 rows ..... *albipennis* group (95), *calthivora* group (98)
— Acr in 2 rows or lacking ..... *cineracea* group (106)

### Key to Species

1 Second cross-vein lacking ..... 2
– Second cross-vein present ..... 112
2 Frons essentially pale, yellow or orange ..... 3
– Frons darker, brown, grey or black, at most partially yellow in lower half ..... 73
3 Scutellum yellow, at least centrally or at apex ..... 4
– Scutellum uniformly dark, grey or black ..... 12
4 Third antennal segment dark, brown or black ..... 5
– Third antennal segment yellow, at least in lower half; 2 equal ors; hind margin of eye entirely yellow; mesonotum matt-grey; legs entirely yellow; wing up to 3·3 mm. ..... (= *hieracii* Hendel) **analis** Zetterstedt

*Yorks.: Malham Tarn (H. M. Russell); Scotland: Argyll., Inverary (J. E. Collin). Uncommon. Host:* Hieracium *spp., particularly* H. pilosella; *mine internal, mainly in basal leaves, running along mid-rib, with short lateral offshoots into leaf-blade.*

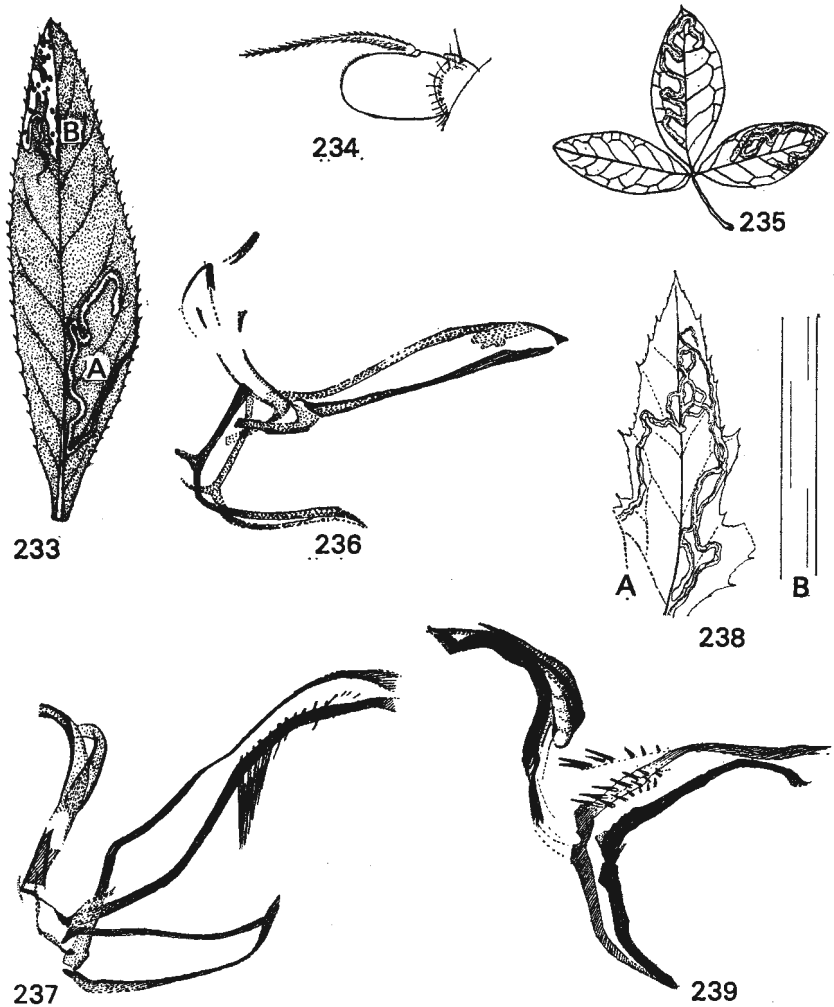



FIG. 233A.—*Phytomyza cirsii*: leaf-mine on *Cirsium*.
FIG. 233B.—*P. rydeniana*: leaf-mine on *Cirsium heterophyllum*.
FIG. 234.—*P. orobanchia*: third antennal segment.
FIG. 235.—*P. cytisi*: leaf-mine on *Laburnum*.
FIG. 236.—*P. tanaceti*: aedeagus.
FIGS. 237–238.—*P. bipunctata*: (237), aedeagus; (238A), leaf-mine on *Echinops*; (238B), frass line.
FIG. 239.—*P. rydeniana*: aedeagus.

5 The two ors equal.....6

– Upper ors shorter, weaker than lower, or entirely absent.....9

6 Mesonotum brilliantly shining black; first and second antennal segments yellow; hind margin of eye entirely yellow; sides of thorax largely and legs entirely yellow; wing from 2·1–2·6 mm.....**scolopendri** Robineau-Desvoidy
*Somerset: Cheddar; Devon: Hope; Cornwall: Hayle; Westmorland: Ambleside; Ireland: Co. Kerry, Killarney. Widespread but local. Hosts:* Asplenium **ruta-muraria**, Phyllitis scolopendrium, Polypodium vulgare, *most frequently on* Polypodium (fig. 224), *on* scolopendrium *mine unusually long, up to* 10 *cm., pale yellowish green, pupation in mine or externally.*

– Mesonotum matt, blackish or grey.....7

7 Femora pale, entirely yellow or at most somewhat brownish; mesonotum ash-grey; medium-sized species, wing 1·8–2·2 mm.....**anemones** Hering
*Sussex: Chailey (G. C. D. Griffiths); Glos.: Gloucester, mines* 11.v.57 *(R. S. George). Local. Host:* Anemone *spp., mainly* A. nemorosa, *mine linear but normally developing into secondary blotch* (fig. 225)*; single generation, adults end April, mines May.*

– Femora black, knees conspicuously yellow; mesonotum darker, blackish .....8

8 Scutellum largely bright yellow, only small patches at sides black; mesopleura mostly yellow, with black patch in lower front corner; small species, wing 1·6–2 mm.....**corvimontana** Hering
*Middx.: Scratch Wood; Westmorland: Grasmere; Scotland: Perth., Killin. Probably widespread with food-plant. Host:* Achillea ptarmica, *mine linear, frequently adjoining mid-rib.*

– Scutellum dull yellow only in centre, sometimes almost entirely dark and pale area only detectable from rear between posterior scutellars; mesopleura largely dark, yellow at most in upper third; humerus and notopleura variable, yellow to dark brown; third antennal segment somewhat enlarged; larger species, wing 2·1–2·5 mm. .....(= *pseudohellebori* Hendel) **fallaciosa** Brischke
(*If scutellum entirely dark, see couplets* 25 *or* 69.)
*Widespread in south; N. Wales: Denbigh., Cefn-y-bedd; Scotland: Dunbarton.; Ireland: Co. Clare. Host:* Ranunculus acris, R. repens *and possibly other* Ranunculus *spp., mine a secondary blotch normally filling the apex of a leaf segment, appearing dark brown; puparium normally black, more rarely whitish, in mine.*

9 Acrostichals sparse, in at most 2 rows .....10

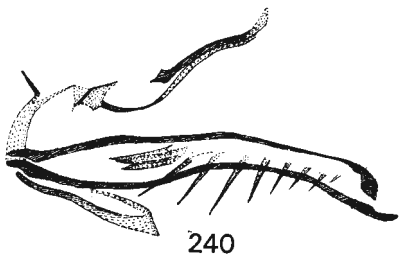
– Acrostichals more numerous, irregularly in 4 rows; mesonotum matt-grey centrally, but with 2 yellow patches at corners adjoining scutellum; femora black, knees contrasting yellow; wing 2 mm.....**conyzae** Hendel
*Widespread in south; N. Wales: Denbigh., nr. Wrexham (K.A.S.); Ireland: Co. Wexford, Rosslare (K.A.S.). Hosts:* Inula conyza, Pulicaria dysenterica, *mine irregularly linear* (fig. 226), *pupation in mine or externally.*

10 Second antennal segment black; mesonotum matt-grey, entirely dark to margin of scutellum; wing 2·2 mm. .....**vitalbae** Kaltenbach
*Widespread in S. England, also in S. Wales: Glam., Gower Peninsula; Ireland: Co. Cork, Glengariff (K.A.S.); Dublin. Host:* Clematis vitalba, *mine irregularly linear* (fig. 227), *only on upper surface, puparium dark brown.*

— Second antennal segment yellow.....11

11 Second costal section long, about 3 times length of fourth; large species, wing from 2·4 mm. in male to 3·2 mm. in female; mesonotum variable, black, grey or largely yellowish; in palest form sides of thorax, legs and scutellum entirely yellow, in darkest form sides of thorax suffused with grey, legs variably blackish and scutellum only faintly yellow centrally.....11a

— Second costal section shorter, little over twice length of fourth; mesonotum consistently matt-grey; smaller species, wing up to 2·2 mm.....**notata** Meigen
*Surrey: Mickleham; Middx.: Scratch Wood. Probably widespread, at least in south. Host:* Ranunculus *spp., mainly* R. acris *and* R. repens, *mine short, broad, essentially linear but sometimes appearing blotch-like* (fig. 228).



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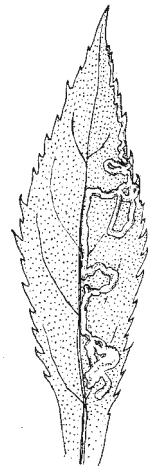

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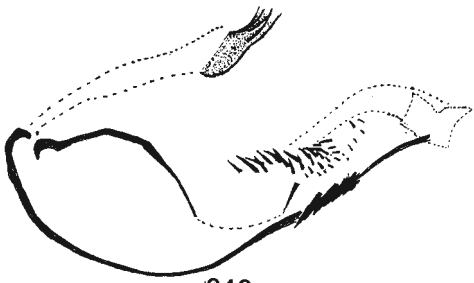

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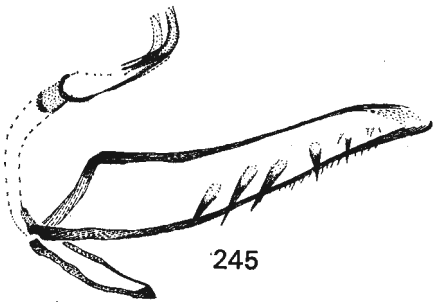

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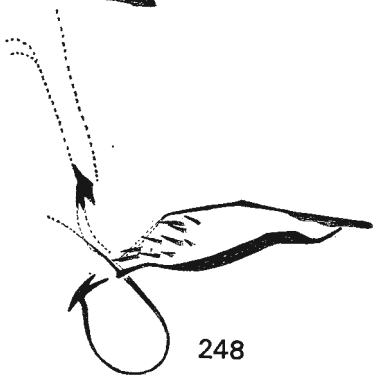

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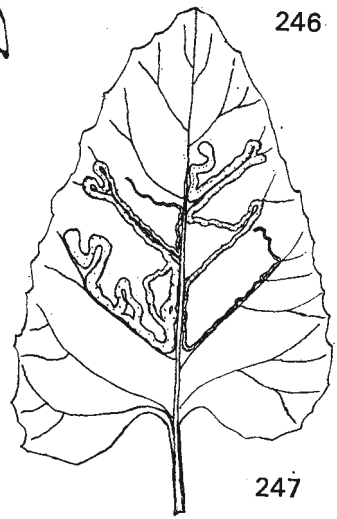

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11a Mine linear, in leaf-blade (fig. 229) ..... **ranunculi** (Schrank)
*Common and widespread throughout England and Scotland, generally distributed but less abundant in Ireland. Holarctic. Host:* Ranunculus *spp., including* R. flammula *and* R. lingua, *mine with frass grains* (fig. 230A) *close together, often connected in strings or strips* (*contrast* P. ranunculivora, *couplet* 80, fig. 230B).

— Mine with short, parallel-sided offshoots from mid-rib (fig. 231) **ranunculi** ssp. **stolonigena** Hering
*London: Hampstead, empty mines* 31.i.71 (*K.A.S.*). *This probably represents a distinct species but in the absence of males confirmation from genitalia has not yet been possible.*

12 Femora essentially yellow, at most with darker striations ..... 13

— Femora dark, grey or black, at most knees yellow ..... 17

13 Third antennal segment entirely or partially pale, yellowish ..... 14

— Third antennal segment black, first and second bright yellow; jowls deeply extended at rear; mesonotum ash-grey; small species, wing 1·3–1·7 mm., second costal section conspicuously short, 1½–2 times length of fourth .... **isais** Hering
*Surrey: Chipstead* (*L. Wakely*). *Local. Host:* Odontites verna, *larva feeding and pupating in seed-heads; puparium shining black.*

14 Sides of thorax yellow ..... 15

— Sides of thorax dark, similar to mesonotum ..... 16

15 Mesopleura entirely yellow; third antennal segment yellow; 1 ors; eye narrow, conspicuously slanting (fig. 232); jowls deeply extended at rear, equal to height of eye; mesonotum matt, blackish grey; wing 2·1–2·6 mm.... **flavicornis** Fallén
*Middx.: Scratch Wood; Cambs.: Chippenham Fen; Scotland: Dunbarton., Bonhill* (*J. R. Malloch*); *Ireland, Co. Clare. Widespread, holarctic. Host:* Urtica dioica, *larva boring in stem and pupating internally; one generation.*

— Mesopleura blackish grey at least up to mesopleural bristle; third antennal segment basically yellowish orange but variably darkened on outside; 2 ors; eye rounder but distinctly slanting; jowls deeply extended at rear; mesonotum totally matt, greyish with brownish tinge; large species, wing 2·4–2·9 mm.... **rufipes** Meigen
*Widespread throughout England; Scotland: Dunbarton., Bonhill* (*J. R. Malloch*); *East Lothian* (*E. B. Basden*); *Ireland: Co. Mayo, Westport. Holarctic. Hosts: Cruciferae, mainly* Brassica *spp., larva feeding inside stem or midrib of larger leaves, normally pupating externally; a species of some economic importance.*

16 Eye in both sexes bare; orbital setulae sparse, in single row; mesonotum matt grey; in female ovipositor conspicuously elongated; small species, wing 1·8–2·2 mm. ..... **varipes** Macquart
*Cambs.: Wicken Fen; Suffolk: Barton Mills; Ireland: nr. Dublin; Co. Clare, the Burren; Scotland: Isle of Lewis. Widespread with host-plant. Holarctic. Host:* Rhinanthus *spp., larva feeding and pupating in seed-heads; puparium flattened, shining black.*

— Eye in both sexes conspicuously pilose; orbital setulae long, numerous, in 2 rows; mesonotum matt black; large species, wing in male 2·9 mm.... **dasyops** Hendel
*Scotland: East Lothian, Aberlady,* 1 ♀, 7.v.09 (*A. E. J. Carter*). *New to Britain. Uncommon, previously only known from Austria and Denmark. Host unknown.*

17 Third antennal segment at least partially pale, brownish ..... 18

— Third antennal segment dark, predominantly black ..... 20

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FIGS. 240–241.—*Phytomyza artemisivora*: (240), aedeagus; (241), head of larva.
FIGS. 242–244.—*P. eupatorii*: (242), aedeagus; (243), head of larva showing frontal projection; (244), leaf-mine on *Eupatorium*.
FIG. 245.—*P. leucanthemi*: aedeagus.
FIGS. 246–247.—*P. lappae*: (246), aedeagus; (247), leaf-mine on *Arctium*.
FIG. 248.—*P. spondylii*: aedeagus.

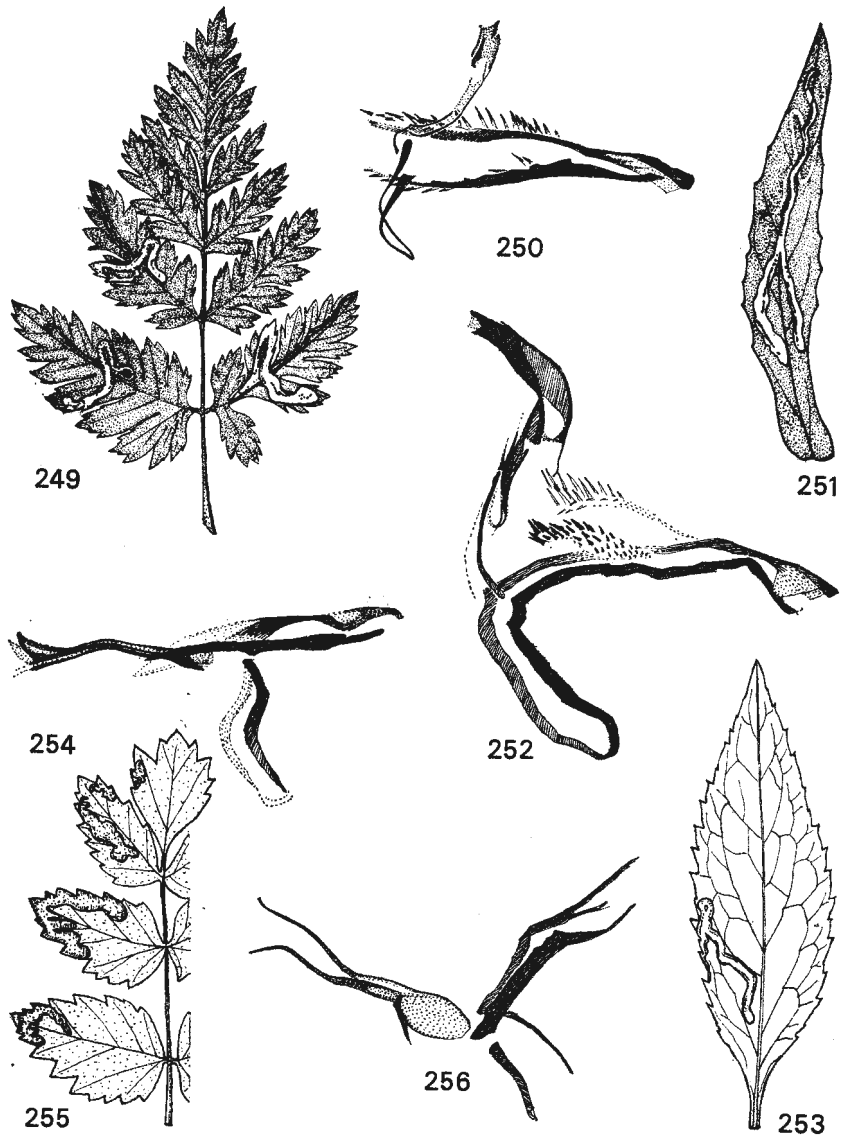


FIG. 249.—*Phytomyza conii*: leaf-mine on *Conium*.
FIGS. 250–251.—*P. marginella*: (250), aedeagus; (251), leaf-mine on *Picris*.
FIG. 252.—*P. alpina*: aedeagus.
FIG. 253.—*P. solidaginis*: leaf-mine on *Solidago*.
FIGS. 254–255.—*P. pimpinellae*: (254), aedeagus; (255), leaf-mine on *Pimpinella*.
FIG. 256.—*P. angelicae*: aedeagus.

18 Sides of thorax conspicuously yellow; third antennal segment more than usually pilose; upper ors normally shorter than lower (rarely equal); both vt on yellow ground; wing 2·3–2·5 mm., second costal section 3 times length of fourth (= *cirsicola* Hendel) **cirsii** Hendel

*London: Hampstead; Suffolk: Flatford; Ireland: Co. Clare, the Burren. Widespread, probably not uncommon but overlooked. Host:* Cirsium arvense, C. palustre *and probably other* Cirsium *spp., mine shallow, upper surface, whitish* (fig. 233A)*; puparium black, posterior spiracles with an ellipse of up to* 26 *minute bulbs, pupation externally.*

— Sides of thorax black, at most mesopleura narrowly yellow along upper margin; third antennal segment virtually bare; both vt on dark ground; second costal section 2–2½ times length of fourth ..... 19

19 Third antennal segment conspicuously elongate (fig. 234); frons frequently projecting above eye; the 2 ors equal; wing 2·3–2·5 mm. ..... **orobanchia** Kaltenbach

*Herts.: nr. Ivinghoe (K.A.S.); Hants.: Leckford (P. J. Chandler and A. E. Stubbs). New to Britain. Local but probably widespread. Host:* Orobanchia *spp., larva feeding both in seed-head and stem, pupating internally.*

— Third antennal segment large but more rounded; frons not significantly projecting above eye; upper ors generally weaker than lower; smaller species, wing 1·75–2·2 mm. ..... **cytisi** Brischke

*London: Hampstead; Oxon.: Oxford; Suffolk: Newmarket. Probably widespread, at least in south. Host:* Laburnum anagyroides, *irregular, whitish linear mine* (fig. 235)*, frass conspicuous; puparium brown, pupation externally.*

20 Sides of thorax pale, yellow or whitish ..... 21

— Sides of thorax predominantly dark, black or grey ..... 35

21 Legs entirely black; all antennal segments black; notopleura conspicuously pale, whitish yellow; mesopleura yellow only above mesopleural bristle; acr numerous, in some 6 rows; second costal section from 2½–3½ times length of fourth; wing 2·4–2·7 mm. ..... **aconiti** Hendel

*London: Buckingham Palace Gardens; Surrey: Kew Gardens; Wisley: Royal Horticultural Society Gardens; Hants.: Ringwood; Suffolk: Newmarket. Widespread in gardens. Holarctic. Hosts:* Aconitum *spp.,* Delphinium *spp., larvae feeding communally, as many as* 6 *together, forming large blackish blotch, puparium dark brown.*

— At least fore femora with yellow knees ..... 22

22 Second costal section 2½–3 times length of fourth ..... 23

— Second costal section 3⅓–4 times length of fourth ..... 27

23 First and second antennal segments bright yellow; vertex and entire hind-margin of eye normally yellow (indistinct black area rarely reaching eye margin well beyond base of vte); all knees bright yellow; mesonotum matt-grey, acr in 4 rows; wing 1·6–2 mm. ..... **matricariae** Hendel

*Herts.: Ugley; Glos.: Tewkesbury; Suffolk: Barton; Lancs.: Manchester; Scotland: Edinburgh (K.A.S.); Dunbarton., Bonhill (J. R. Malloch). Widespread. Holarctic. Hosts:* Achillea millefolium, Matricaria maritima, Tanacetum vulgare, *larva mining even in finest sub-divisions of the leaves; puparium brownish black, posterior spiracles each with up to* 16 *minute bulbs.*

— Second antennal segment dark, black or at most slightly paler; dark area adjoining hind margin of eye extending at least to base of vte ..... 24

24 Only fore knees conspicuously yellow, femora on mid- and hind legs either entirely black or knees at most inconspicuously paler; 1 ors, acr in 2 rows; mesonotum entirely dark, without yellow patches at hind corners; notopleura yellowish; mesopleura broadly yellow on upper margin; very small species, wing 1·4–1·6 mm.; largely grey (see couplet 38) ..... **silai** Hering

*Surrey: Egham; Cambs.: Chippenham Fen. Local. Host:* Silaum silaus, *larva mining initially on lower surface of leaf, later filling the tip of a leaf on upper surface with a linear-blotch mine; larva with conspicuous frontal projection* (cf. fig. 243)*; puparium black, posterior spiracles each with* 20 *bulbs.*

— Femora black, with all knees bright yellow ..... 25

25 Two ors ..... 25a

— Upper ors lacking, at most represented by minute hair, sometimes on one side only ..... 26

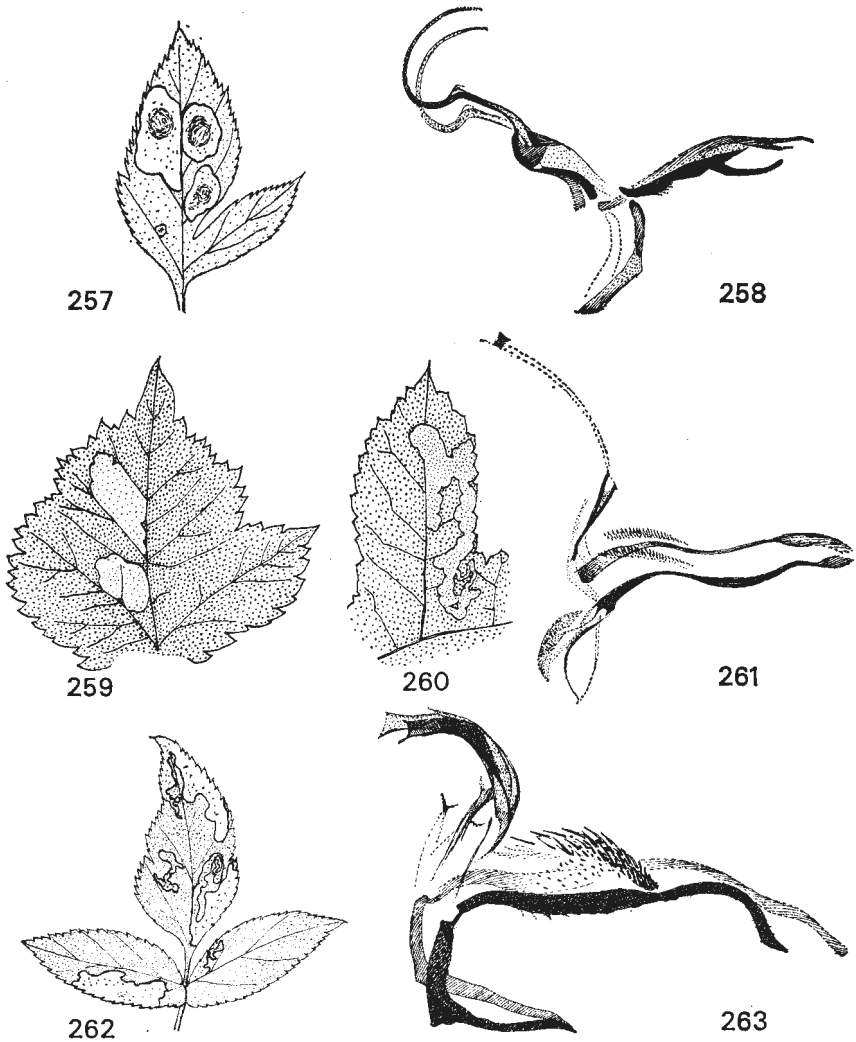


FIG. 257.—*Phytomyza angelicae*: leaf-mine on *Angelica*.
FIGS. 258–259.—*P. heracleana*: (258), aedeagus; (259), leaf-mine on *Heracleum*.
FIG. 260.—*P. sphondyliivora*: leaf-mine on *Heracleum*.
FIGS. 261–262.—*P. angelicastri*: (261), aedeagus; (262), leaf-mine on *Angelica*.
FIG. 263.—*P. campanulae*: aedeagus.

25a Upper ors weaker than lower but invariably present; third antennal segment essentially dark but frequently with faint brownish undertone (see couplet 18) **cirsii** Hendel

— The two ors equal ..... **fallaciosa** Brischke
*Variable species, scutellum normally partially yellowish (couplet 8); or scutellum and sides of thorax dark (couplet 69).*

26 Third antennal segment small, round; mesonotum blackish grey; wing up to 1·9 mm.; male genitalia: aedeagus as in fig. 236..... **tanaceti** Hendel
*Surrey: Horsley (G. C. D. Griffiths); Ireland: Co. Clare, the Burren. Probably widespread. Host:* Tanacetum vulgare, *larva forming linear mine, frass with closely adjoining grains; puparium black.*

— Third antennal segment distinctly enlarged; mesonotum matt, ash-grey; wing up to 1·9 mm.; male genitalia: aedeagus as in fig. 237..... **bipunctata** Loew
*London: Hampstead; Surrey: Kew Gardens. Probably frequently occurring together with host-plant. Host:* Echinops banaticus, E. commutatus *and probably other cultivated* Echinops *spp., larva forming narrow linear mine* (fig. 238A), *with frass in a conspicuous, almost unbroken line at the side of the channel* (fig. 238B).

27 Mesopleura yellow in upper third or half; mesopleural bristle normally free-standing on yellow ground..... 28

— Mesopleura at most yellow above mesopleural bristle..... 34

28 Large species, wing 2·4–2·8 mm.; upper ors reduced but invariably present; vertex largely yellow, vti always on yellow ground; second costal section long, up to 4 times length of fourth; male genitalia: aedeagus as in fig. 239 **rydeniana** Hering
*Yorks: Malham Tarn; Northumberland: Bamburgh; Scotland: Perths., Killin. A boreal-alpine species, not known to occur south of Yorks. Host:* Cirsium heterophyllum, *rarely* C. palustre (*Buhr, Thuringia*); *long, irregular, linear mine with frass in large widely-spaced lumps* (fig. 233B).

— Smaller species, wing 2·1–2·4 mm..... 29

29 Both vt on dark ground, vti at most at margin of black and yellow..... 30

— At least vti clearly on yellow ground ..... 31

30 Male genitalia: aedeagus as in fig. 240; larva without projection above mouth-hooks (fig. 241)..... **artemisivora** Spencer
*Common in south; Derby.: Miller's Dale. Host:* Artemisia vulgaris, *mine long, whitish, frequently adjoining a vein; puparium black, posterior spiracles each with about 20 bulbs.*

— Male genitalia: aedeagus as in fig. 242; larva with characteristic projection above mouth-hooks (fig. 243)..... **eupatorii** Hendel
*Surrey: Cosford Mill, Godalming; Cambs.: Chippenham Fen; Norfolk: Norwich; N. Wales: Denbigh., Cefn-y-bedd. Local. Host:* Eupatorium cannabinum; *mine long, linear, upper or lower surface, often adjoining a vein* (fig. 244).

31 Mesopleura yellow in upper third; wing up to 2·4 mm.; male genitalia: aedeagus as in fig. 245..... **leucanthemi** Hering
*Surrey: Box Hill; Herts.: East Barnet; Scotland: Perths., Killin (K.A.S.). Widespread but local. Hosts:* Chrysanthemum leucanthemum; *less commonly on related species. Mine irregularly linear, whitish, distinctly widening, most frequently on lower leaves; puparium black.*

— Mesopleura yellow in upper half..... 32

32 Acr numerous, in 5–6 rows in front; male genitalia: aedeagus as in fig. 246 (= *lappina* R.-D.) **lappae** Goureau
*Common and widespread in south; Scotland: Perths., Killin. Host:* Arctium lappa, A. minus; *long, white linear mine, frequently adjoining a vein* (fig. 247).

— Acr sparser, at most 4 rows in front; male genitalia: aedeagus as in fig. 248...33
(If sides of thorax darker, see couplet 46.)

33 Larva leaving mine through lower surface of leaf, pupating on ground (= *pastinacae* Hendel) **spondylii** Robineau-Desvoidy
*Widespread and common throughout British Isles. Holarctic. Hosts:* Heracleum sphondylium, H. mantegazianum *and other introduced species,* Pastinaca sativa, Astrantia *spp. (Kew); mine linear, white.*

— Larva leaving mine through upper surface of leaf, puparium frequently glued to leaf near end of mine ..... **conii** Hering
*Hunts.: Woodwalton Fen; Suffolk: Clare. Local. Host:* Conium maculatum; *mine linear, more greenish* (fig. 249).

34 Notopleura whitish yellow; yellow patches at hind corners of mesonotum conspicuous, extending to scutellum; male genitalia: aedeagus as in fig. 250 (= *sonchi* Robineau-Desvoidy) **marginella** Fallén
*Widespread in south; Scotland: Sutherland, Golspie; Ireland: Co. Cork, Bantry; Co. Galway, Clifden (K.A.S.). Hosts:* Sonchus, Lapsana, Picris, Taraxacum; *mine both lower and upper surface, long, linear, conspicuously broad* (fig. 251).

— Notopleura largely suffused with grey, only partially yellowish; yellow patches at hind corners of mesonotum inconspicuous or lacking, never extending to scutellum; male genitalia: aedeagus as in fig. 252 ..... **alpina** Groschke
*Yorks.: Ingleborough; Scotland: Perth., Killin; Sutherland, Golspie; Inverness., Holspeg Point; Ireland: Co. Clare, Burren. A boreal-alpine species, not known to occur south of Yorkshire, common in Scotland. Host:* Senecio jacobaea; *mine irregularly linear, long, towards end wide; pupation externally, puparium black.*

35 Upper ors shorter than lower or lacking ..... 36
— The two ors equal or the upper stronger ..... 48

36 Second costal section not significantly more than 3 times length of fourth ..... 37
— Second costal section 3½–5 times length of fourth ..... 42

37 Mesonotum moderately shining, blackish grey; frons dark yellowish, orbits brownish black; all antennal segments, pleura, femora and abdomen entirely black; small species, wing 1·8–2·2 mm., second costal section 2½ times fourth **fulgens** Hendel
*Surrey: Mickleham (G. C. D. Griffiths). Uncommon, only also known from two localities in Austria and S. Germany. Host:* Clematis vitalba; *mine beginning on lower surface, the linear upper surface section eaten out somewhat irregularly at sides; puparium dark brown.*
— Mesonotum matt, grey ..... 38

38 Acr in only 2 rows; 1 ors; only fore knees distinctly yellow; notopleura largely grey but normally more yellowish (see couplet 24) ..... **silai** Hering
— Acr more numerous, at least in front ..... 39

39 Humerus largely yellow, only small central area dark; second costal section short, twice length of fourth; mesonotum distinctly grey; wing 1·6–2·1 mm. **solidaginis** Hendel
*Kent: Darenth. Probably widespread, at least in south. Host:* Solidago virgaurea; *irregular linear mine* (fig. 253), *frass in more or less connected strips.*
— Humerus black; second costal section longer, 2¾–3 times length of fourth ..... 40

40 Face black; wing length 2–2·1 mm. ..... **virgaureae** Hendel
*Surrey: Holmbury St. Mary (G. C. D. Griffiths). Host:* Solidago virgaurea, *mine irregularly linear, frass in separate grains.*
— Face pale, keel entirely yellow, depressions at most yellowish grey ..... 41

41 Male genitalia: aedeagus as in fig. 254; wing length 1·6–2·1 mm. **pimpinellae** Hendel
*Middx.: Mill Hill. Probably more widespread, at least in south. Host:* Pimpinella major; *mine a linear-blotch, adjoining a leaf-segment* (fig. 255).
— Male genitalia: aedeagus as in fig. 256 ..... **angelicae** Kaltenbach
*Widespread throughout country, from Cornwall to Scotland, also Ireland. Host:* Angelica sylvestris, *larva forming conspicuous, almost circular, yellowish blotch; several mines normally occur in one leaf* (fig. 257) *and may run together to give the appearance of a single large mine.*
— Male genitalia: aedeagus as in fig. 258 ..... **heracleana** Hering
*Cornwall: Portleven; Derby.: Miller's Dale; N. Wales: Denbigh., Cefn-y-bedd; Scotland: Perths., Killin; Ireland: Co. Clare, Burren; Co. Cork, Bantry; Co. Kilkenny, Kilkenny (all K.A.S.). Not uncommon in west and north, absent from S.E. Host:* Heracleum sphondylium; *mine an elongate yellowish blotch, normally confined between two veins* (fig. 259).

42 Orbits conspicuously darkened, black or at least greyish; in darker specimens cheeks narrowly black below eye; all knees yellow; second costal section 3½–4 times fourth; large species, wing 2·4–2·9 mm. . . . . **sphondyliivora** Spencer
*London: Hampstead; Dorset: Studland; Wilts.: Corsham; Somerset: Cheddar; Hunts.: Monk's Wood. Local, belicved to be confined to south. Host:* Heracleum sphondylium*; mine inter-parenchymal, greenish, not always readily visible, an irregular linear-blotch* (fig. 260).

— Orbits pale . . . . . 43

43 Only fore knees distinctly yellow . . . . . 44

— All knees conspicuously yellow . . . . . 47

44 Facial keel yellow, depressions at most yellowish grey (see couplet 41) **heracleana** Hering

— Face darker, largely black . . . . . 45

45 Male genitalia: aedeagus as in fig. 261 . . . . . **angelicastri** Hering
*Widespread throughout British Isles, from Cornwall to Scotland and Ireland. Host:* Angelica sylvestris*; mine commencing on lower surface, main section on upper surface irregularly linear, sometimes almost blotch-like* (fig. 262).

— Male genitalia as in fig. 248 . . . . . 46
(Sides of thorax normally paler, see couplet **33.**)

46 Larva leaving mine through lower surface exit slit, immediately pupating on ground . . . . . **spondylii** Robineau-Desvoidy

— Larva leaving mine through upper surface exit slit, puparium normally glued to leaf near end of mine . . . . . **conii** Hering

47 Male genitalia: aedeagus as in fig. 263; frons orange-yellow; hind margin of eye black, both vt on dark ground; first antennal segment pale, second and third black; acr coarse in 4–5 rows, a few extending to level of first dc; lower corner of humerus and notopleura invariably slightly yellowish; wing from 2·1–2·7 mm., second costal section from 3½–4 times length of fourth . . . . **campanulae** Hendel
*Surrey: Box Hill; Somerset: Cheddar; Derby.: Miller's Dale (K.A.S.); Ireland: Co. Clare, Burren. Widespread but local. Hosts:* Campanula glomerata, C. rotundifolia, C. trachelium, *mine irregularly linear, whitish, short.*

— Male genitalia: aedeagus as in fig. 264; morphology as in *campanulae* **tussilaginis** Hendel
*Surrey: Box Hill; Derby.: Miller's Dale (K.A.S.). N. Wales: Denbigh., Cefn-y-bedd (K.A.S.); Ireland: Co. Tipperary, Tipperary (K.A.S.). Probably widespread. Hosts:* Petasites hybridus, Tussilago farfara*; mine linear, initially narrow, widening up to 3 mm. at end, generally long* (fig. 265)*, often forming secondary blotch.*

48 Frons distinctly darkened, either uniformly brown, brownish black in front or wholly greyish yellow . . . . . 49

— Frons uniformly yellow . . . . . 51

49 Frons strongly projecting above eye in profile; frons brown; third antennal segment distinctly elongate; wing 2·1 mm. . . . . **cineracea** Hendel
(See couplet 107, frons normally dark.)

— Frons not projecting . . . . . 50

50 Frons dark in front, paler, yellowish brown behind; acr in 6–8 rows; relatively large species, wing 2·8–3 mm., second costal section 3½–4 times length of fourth **ilicis** Curtis
(If frons entirely dark, see couplet 111.)
*Widespread throughout country; Scotland: Dunbarton.; Ireland: Dublin, Co. Down, Co. Kerry. Host:* Ilex aquifolium*; larva initially feeds in mid-rib, later producing characteristically irregular upper surface linear-blotch; pupation in mine, a single generation.*

— Frons greyish yellow, orbits bright yellow; acr sparse, in 2 rows; small species, wing 2 mm., second costal section shorter, at most 3 times length of fourth; male genitalia: aedeagus as in fig. 266 . . . . . **glacialis** Griffiths
*Scotland: Inverness (R. L. Coe). Uncommon, new to Britain. Host: unknown.*

51 Acr numerous, in 3–5 rows . . . . . 52

— Acr sparse, in 2 rows or entirely lacking . . . . . 55

52 Second costal section short, 1½–2½ times length of fourth; all knees yellowish . . 53

— Second costal section longer, 3–3½ times length of fourth . . . . . 54

53 Second costal section very short, only slightly more than 1½ times length of fourth; orbits conspicuously projecting above eye (fig. 267); 2 ori; jowls deep, two-thirds height of eye; mesonotum matt-grey ..... **gilva** Spencer
*Kent: Darenth,* 1 ♂, 8.v.54 (*G. C. D. Griffiths*). *Only known specimen. Host: unknown.*

— Second costal section longer, slightly over twice length of fourth; orbits not projecting above eye; normally 3 ori; jowls little more than one-third height of eye; mesonotum matt, brownish black; wing 2·2–2·5 mm..... **krygeri** Hering
*Oxon.: Oxford; Monmouth.: St. Pierre* (*M. W. R. de V. Graham*). *Host:* Aquilegia vulgaris, *larva feeding in seed capsules.*

54 Very large species, wing 3·3–3·8 mm.; third antennal segment with distinct fringe of hairs; acr irregularly in 3 or 4 rows in front; both vt on black ground; male genitalia: aedeagus as in fig. 268..... **continua** Hendel
*Kent: Bromley,* 1 ♂, 21.v.67 (*P. J. Chandler*); *Somerset: Sharpham,* 1 ♂, 26.v.51 (*L. Parmenter*); *Cambs.: Chippenham Fen,* 1 ♀, 8.vii.54 (*K.A.S.*); *Lincs.: Crowland,* 1 ♀, 2.vi.70 (*K.A.S.*); *Scotland: Dunbarton., Bonhill,* 3 ♂ (*J. R. Malloch*); *Inverness., Aviemore,* 1 ♀, 24.ix.61 *and Fife, Tayport,* 1 ♀, 4.x.62 (*E. C. Pelham-Clinton*). *Apparently widespread, previously overlooked. New to Britain. Host: unknown.*

— Second costal section 3 times length of fourth; smaller species, wing 2·1–2·5 mm.; 2 ori, mesonotum dark, matt black, not grey or brown..... **aquilegiae** Hardy
*Common in south in gardens. Host:* Aquilegia vulgaris *and other species; larva forms large primary blotch* (fig. 269A), *leaves often being largely destroyed and the plants suffering considerable damage.*

55 Arista conspicuously thickened (fig. 270); small species, wing up to 2 mm., second costal section short, 1½–2 times length of fourth..... **crassiseta** Zetterstedt
*Surrey: Mickleham; Devon: Bolt Head; Hunts.: Woodwalton Fen; Cambs.: Chippenham Fen; Ireland: Co. Clare, Burren; Co. Down, Rostrevor Wood; Co. Galway, Galway; Scotland: Dunbarton. Widespread throughout British Isles. Host:* Veronica *spp.; mine normally begins along margin of leaf* (fig. 271) *sometimes later developing into secondary blotch; puparium pale yellow, with dark line along ventral surface, in mine.*

— Arista slender, normal..... 56

56 Eye conspicuously pilose; frons yellowish orange, orbits distinctly paler; mesonotum matt-grey, acr in 2 rows; all knees yellow; wing normally 2 mm., second costal section twice length of fourth; male genitalia: aedeagus as in fig. 272; ejaculatory apodeme unusually small (fig. 273) ..... **nigra** Meigen
(If frons dark, see couplet 105.)
*Widespread and common throughout British Isles, including Ireland; in Scotland also on Rhum and Skye. Holarctic. Hosts: Gramineae, including* Arrhenaterum, Brachypodium, Calamagrostis, Dactylis, Festuca, Holcus, Milium, Phalaris, Poa, Secale, Triticum*; mine long, narrow, whitish, puparium yellow, in mine; anterior spiracles projecting through epidermis* (fig. 274A), *posterior spiracles as in* fig. 274B (*cf.* P. milii, figs. 323A, B).

— Eye largely bare..... 57

57 Fore coxae distinctly yellow..... 58

— Fore coxae predominantly dark, grey or black..... 62

58 Second costal section short, 1½ times length of fourth..... 59

— Second costal section distinctly longer, slightly over twice length of fourth.... 60

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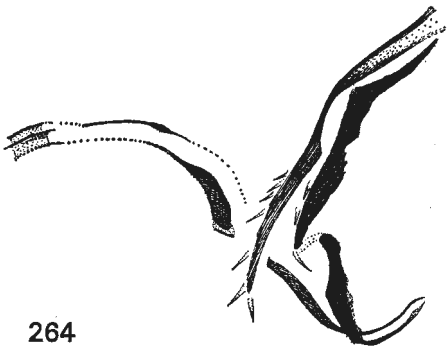
FIGS. 264–265.—*Phytomyza tussilaginis*: (264), aedeagus; (265), leaf-mine on *Petasites.*
FIG. 266.—*P. glacialis*: aedeagus.
FIG. 267.—*P. gilva*: head.
FIG. 268.—*P. continua*: aedeagus.
FIG. 269A.—*P. aquilegiae*: leaf-mine on *Aquilegia.*
FIG. 269B.—*P. minuscula*: leaf-mine on *Aquilegia.*
FIGS. 270–271.—*P. crassiseta*: (270), arista; (271), leaf-mine on *Veronica.*
FIGS. 272–274.—*P. nigra*: (272), aedeagus; (273), ejaculatory apodeme; (274A), anterior spiracles of larva; (274B), posterior spiracles.



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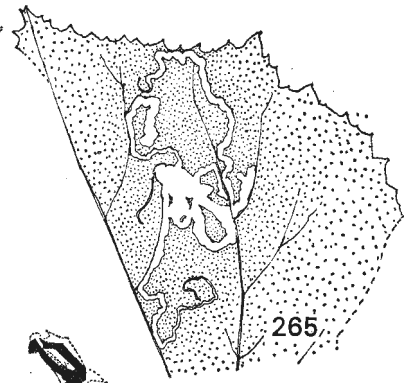

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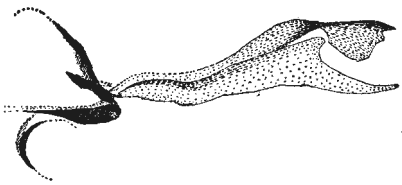

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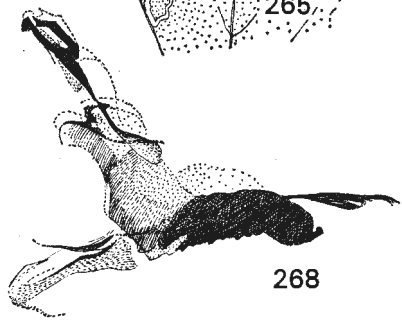

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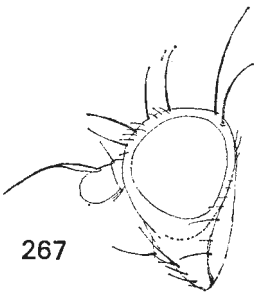

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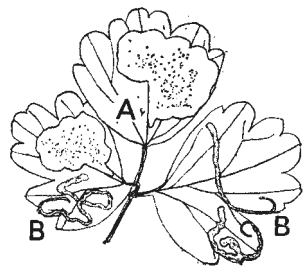


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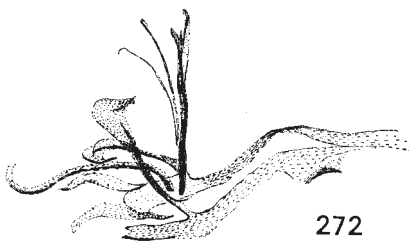

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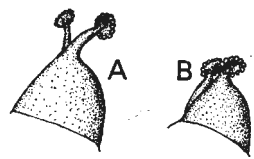


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59 Second antennal segment bright yellow, upper orbits pale, vti on yellow ground **griffithsi** Spencer

*Surrey: Box Hill. Uncommon. Host:* Plantago media, *mine initially lower surface but largely on upper surface, irregularly linear, finally almost filling the petiole* (fig. 275A), *where pupation takes place; posterior spiracular processes only slightly raised.*

— Second antennal segment darker, yellowish grey; upper orbits darkened, greyish, vti on dark ground (= *plantaginicaulis* Hering) **plantaginis** Robineau-Desvoidy

*Common and widespread throughout country, including Scotland and Ireland. Holarctic. Hosts:* Plantago *spp., particularly* lanceolata *and* major*; mine long, narrow, whitish, linear* (fig. 275B).

60 Second antennal segment black; wing length in female 2·8 mm., second costal section 2½ times length of fourth ..... **clematidis** Kaltenbach

*Hants.: I.o.W.,* 1 ♀, 1950 (*K. G. Blair*). *New to Britain. Uncommon. Host:* Clematis vitalba, *larva feeding in seed-head. Hendel* (1936 : 380) *based his description of this species on specimens bred from seeds of* Thalictrum, *which had been described as* thalictri *Escher-Kundig, and incorrectly synonymized* thalictri *with* clematidis. *The only extant specimen of* clematidis *appears to be this female from the Isle of Wight and I am satisfied that this is distinct from* thalictri*; it is in poor condition and a detailed diagnosis is not possible.*

— Second antennal segment yellow ..... 61

61 Male genitalia: aedeagus as in fig. 276; posterior spiracles of larva enlarged, each with up to 45 bulbs ..... (= *pedicularis* Hering) **tenella** Meigen

*Scotland: Inverness., Loch Pityoulish,* 1 ♀, **3**.vii.**33**; *Moray., Culbin Sands,* 1 ♂, 1 ♀, 5–7.vii.**36** (*all R. L. Coe*)*; Ireland: Co. Clare, Burren* (*G. C. D. Griffiths*). *Host:* Pedicularis palustris, *larvae feeding in seeds.*

— Male genitalia: aedeagus as in fig. 277; posterior spiracles of larva smaller, each with up to 25 bulbs ..... **affinis** Fallén

*Ireland: Co. Clare, Burren* (*G. C. D. Griffiths*). *Probably widespread in Britain with food-plant. Host:* Euphrasia *spp., including* brevipila, micrantha *and* nemorosa, *larva feeding in seeds.*

62 Acr lacking, at most single, isolated hairs present ..... 63

— Acr more numerous, distinctly in 2 rows ..... 64

63 Male genitalia: distiphallus with two large, diverging processes above (fig. 278) (= *atricornis* auctt.) **horticola** Goureau

*Widespread in south from Kent to Cornwall; Leicester.: Leicester; Ireland: Haliday collection. Possibly less common than* syngenesiae. *Hosts: a polyphagous species, feeding frequently on Compositae and many other families; hosts known in Britain include* Dahlia (*Compositae*)*;* Brassica, Capsella, Cardaria, Cheiranthus, Hesperis, Sisymbrium (*Cruciferae*)*;* Galeopsis (*Labiatae*)*;* Allium (*Liliaceae*)*;* Lavatera, Malva (*Malvaceae*)*;* Papaver (*Papaveraceae*)*;* Pisum, Vicia (*Papilionaceae*)*, mine linear, whitish, both upper and lower surface, pupation at end of mine* (fig. 279).

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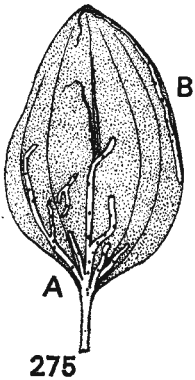
FIG. 275A.—*Phytomyza griffithsi*: leaf-mine on *Plantago.*
FIG. 275B.—*P. plantaginis*: leaf-mine on *Plantago.*
FIG. 276.—*P. tenella*: aedeagus (after Griffiths).
FIG. 277—*P. affinis:* aedeagus
FIGS. 278–279.—*P. horticola*: (278), aedeagus, dorsal view; (279), leaf-mine on *Cheiranthus.*
FIG. 280.—*P. syngenesiae*: aedeagus, dorsal view.
FIG. 281.—*P. asteris*: aedeagus, side view.
FIG. 282.—*P. farfarella*: aedeagus, side view.
FIG. 283.—*P. taraxacocecis*: aedeagus.
FIG. 284.—*P. notabilis*: aedeagus.

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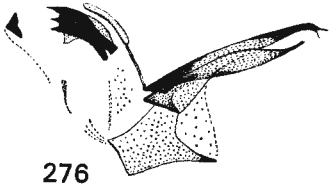

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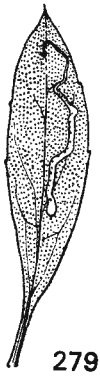

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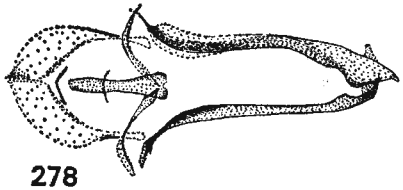

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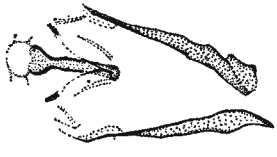

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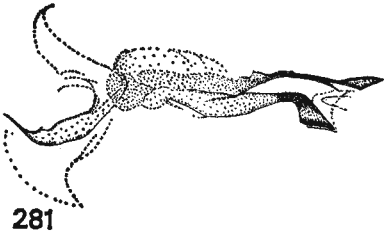

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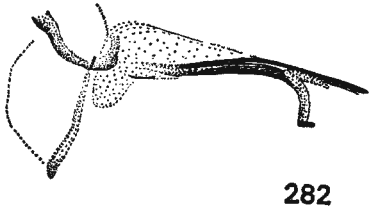

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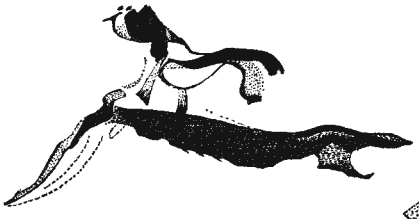

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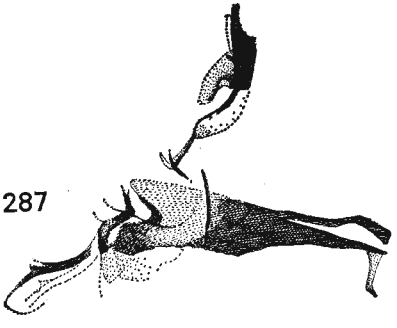

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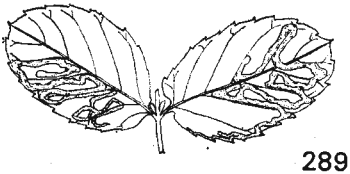

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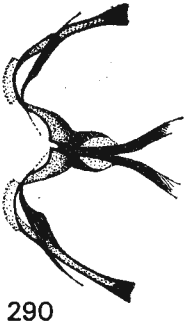

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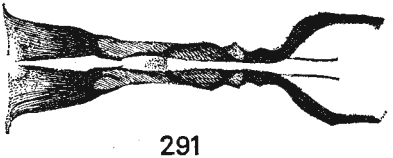

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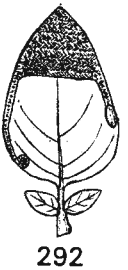

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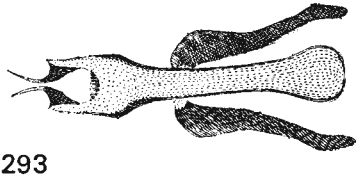

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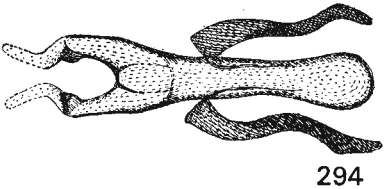

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— Male genitalia: diverging processes of distiphallus substantially smaller (fig. 280) (= *atricornis* auctt.) **syngenesiae** (Hardy)

*Common throughout Britain; holarctic. Hosts: essentially oligophagous on Compositae, with only infrequent records on other families; hosts confirmed in Britain include* Arnoseris, Chrysanthemum, Hieracium, Inula, Lactuca, Senecio, Serratula, Sonchus, Tanacetum, Taraxacum; *mine as in* horticola. *Leaf-mines referable to one or other of these two species (previously known as the single species,* atricornis Mg., *cf. Griffiths,* 1967c) *found in Britain on following additional genera of Compositae:* Achillea, Anthemis, Arctium, Artemisia, Aster, Bidens, Centaurea, Cichorium, Cirsium, Echinops, Erigeron, Eupatorium, Matricaria.

64 Only fore knees distinctly paler, knees on mid- and hind-legs scarcely differentiated; small species, wing length 1·6 mm., second costal section less than twice length of fourth; face black ..... **brevicornis** Hendel

*Cambs.: Chippenham Fen,* 1 ♀, 5.vi.55 (*K.A.S.*). *Uncommon. New to Britain. Host: unknown.*

— All knees yellow ..... 65

65 Second costal section short, at most 1·5 times length of fourth; small species, wing less than 2 mm. ..... 66

— Second costal section longer, 2½–4½ times length of fourth ..... 67

66 Hind margin of eye largely yellow, both vt on yellow ground; second antennal segment yellow; wing 1·8–2 mm.; male genitalia: aedeagus as in fig. 281 **asteris** Hendel

*Kent: Faversham; Ireland: Co. Clare, Dunratty* (*K.A.S.*)*; Poulnaclogh Bay* (*G. C. D. Griffiths*)*, Co. Down, Carlingford Loch* (*G. C. D. Griffiths*). *Widespread around coasts. Host:* Aster tripolium*; mine linear, initially on lower surface but mainly upper surface, pupation in mine.*

— Hind margin of eye black, both vt on dark ground; smaller species, wing little more than 1·5–1·7 mm.; male genitalia: aedeagus as in fig. 282. . . . **farfarella** Hendel

*Ireland: Co. Clare, Ballyvaughan, Lough Rask* (*R. L. Coe*). *Only known British record but almost certainly more widespread, not uncommon on Continent, also known from Faroes and Iceland. Host:* Taraxacum officinale, Leontodon autumnalis, *mine linear, details not recorded, pupation in mine.*

67 Large species, wing 2·7–3·8 mm. ..... 68

— Smaller species, wing 2·1–2·5 mm. ..... 69

68 Second costal section less than 3 times length of fourth; vti on yellow ground; male genitalia: aedeagus as in fig. 283 ..... **taraxacocecis** Hering

*London: Hampstead,* 1 ♀, 19.v.57 (*K.A.S.*)*; Herts.: New Barnet; Hants.: New Forest; Dorset: Studland; Suffolk: Newmarket. Widespread, at least in south. Host:* Taraxacum officinale, *mine in mid-rib, causing gall-like swelling.*

— Second costal section 4½ times length of fourth; wing in male 2·7 mm.; male genitalia: aedeagus as in fig. 284 ..... **notabilis** Spencer

*Scotland: Edinburgh,* 1 ♂, 2.vi.05. *Only known specimen. Host: unknown.*

69 Humerus and notopleura slightly paler, yellowish ..... **fallaciosa** Brischke

(Scutellum normally yellowish centrally, see couplet 8.)

— Humerus and notopleura uniformly greyish ..... 70

70 Medium-sized species, wing 2·2–2·5 mm. ..... 71

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FIG. 285.—*Phytomyza rhabdophora*: aedeagus.
FIG. 286.—*P. cecidonomia* ssp. *britannica*: aedeagus.
FIG. 287.—*P. ferina*: aedeagus.
FIG. 288.—*P. melana*: aedeagus.
FIG. 289.—*P. petoei*: leaf-mine on *Mentha*.
FIG. 290.—*P. sedicola*: aedeagus.
FIGS. 291–292.—*P. origani*: (291), aedeagus; (292), leaf-mine on *Origanum*.
FIG. 293.—*P. myosotica*: aedeagus.
FIG. 294.—*P. symphyti*: aedeagus.

— Generally smaller species, wing from 2 mm. in male to 2·3 mm. in female (= *affinis* auctt.) **autumnalis** Griffiths

*Common and widespread, at least in south; Ireland: Co. Tipperary, Tipperary (K.A.S.). Hosts:* Cirsium arvense, C. dissectum, C. palustre, C. vulgare, *most frequently on former; also on* Centaurea nigra*; mine long, distinctly greenish; pupation in mine; in early generations puparium white, in late autumn generation black. It seems possible that the species on* Cirsium *and on* Centaurea *may be distinct but the male genitalia appear to be identical.*

71 Male genitalia: aedeagus highly asymmetrical (fig. 285) . . . **rhabdophora** Griffiths

*Devon: Lyme Regis,* 1 ♂, 2 ♀, 14.vi.58 (*K.A.S.*)*; Ireland: Co. Clare, Ballyvaughan, Lough Rask* (*R. L. Coe*). *New to England. Local but probably widespread. Only also known from two localities in Germany. Host: unknown.*

— Male genitalia: aedeagus symmetrical . . . . . 72

72 Male genitalia: aedeagus as in fig. 286 **cecidonomia** Hering subsp. **britannica** Griffiths

*Kent: Westerham; Surrey: Buckland, Chiddingfold; Herts.: Scratch Wood; Dorset: Lyme Regis; Scotland: Dunbarton* (*J. R. Malloch*)*; Ireland: Co. Clare, Mullagh More; Wales: Glam., Gower Peninsula. Widespread. Host:* Hypochoeris radicata, *mine as in* taraxacocecis (*couplet* 68).

— Male genitalia: aedeagus as in fig. 287 . . . . . **ferina** Spencer

*Hants.: Stockbridge,* 1 ♂, 1 ♀, 21.v.58 (*K.A.S.*). *Only known specimens. Host: unknown.*

73 Upper ors distinctly shorter than lower, reduced to a minute hair or entirely absent . . . . . 74

— The two ors equal . . . . . 92

74 Wings conspicuously brownish; very large species, wing 3·1–3·5 mm.; only 1 ors; third antennal segment somewhat elongate; frons black; all knees yellow **nigripennis** Fallén

*Surrey: Selsdon; Sussex: Laughton; Oxon.: Bagley. Local. Host: unknown but specimens have been caught on* Anemone nemorosa *and the larva possibly feeds in the root. Only a single generation, mid-April to mid-May.*

— Wings hyaline, normal . . . . . 75

75 Second costal section short, 1½–3 times length of fourth . . . . . 76

— Second costal section longer, from slightly over 3 to 5 times length of fourth . . . . . 86

76 Acr at most in 2 rows . . . . . 77

— Acr in 3–6 rows . . . . . 80

77 Fore knees distinctly yellow . . . . . 78

— Fore knees not significantly differentiated; mesonotum matt, greyish black; second costal section little more than 1½ times length of fourth . . . . . 79

78 Second costal section unusually short, 1¼ times length of fourth; only 1 ors; mesonotum black, moderately shining; minute species, wing from 0·95–1·3 mm. **scabiosae** Hendel

*Surrey: Chipstead* (*F. Rumsey*). *Local. Host:* Scabiosa columbaria*; mine linear, upper surface, winding, pupation in mine; puparium white, grey or shining black.*

— Second costal section longer, slightly over twice length of fourth; mesonotum matt, brownish black; wing 1·5–1·7 mm.; male genitalia: aedeagus as in fig. 288 **melana** Hendel

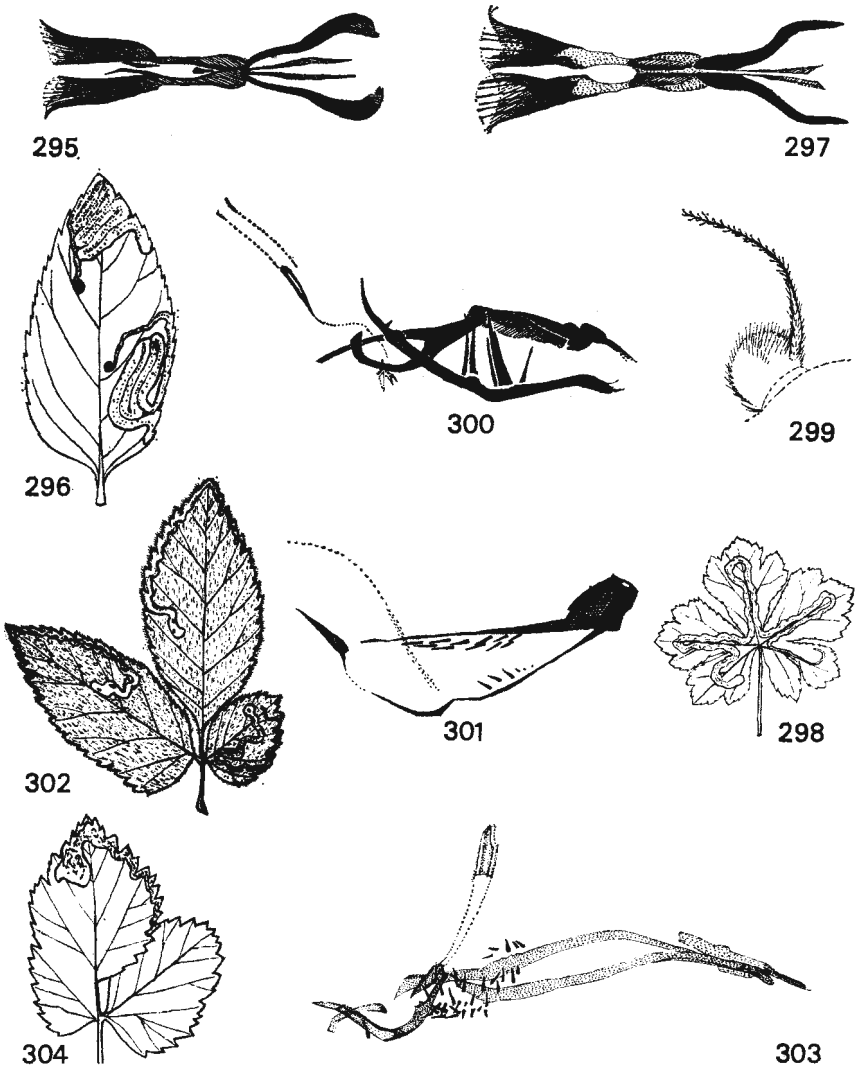
*Surrey: Egham. Local. Host:* Pimpinella saxifraga*; mine linear, considerably widening towards end, generally following margin of leaf.*

79 Only 1 ors; wing 1·6–2 mm. . . . . **petoei** Hering

*London: Hampstead; Surrey: Epsom; Glos.: Kilcot. Probably not uncommon in south. Host:* Mentha spicata *and probably other* Mentha *spp., mine upper surface, irregularly linear* (fig. 289)*; puparium often remains in mine, grey.*

— Upper ors well developed, only slightly weaker than lower; wing 1·5–1·9 mm. **vulnerariae** Spencer

*Devon: Hope Cove. Uncommon, only type specimens known. Host:* Anthyllis vulneraria*; mine in sepals, linear; puparium orange-brown.*




FIGS. 295–296.—*Phytomyza tetrasticha*: (295), aedeagus; (296), leaf-mine on *Mentha*.
FIG. 297.—*P. obscura*: aedeagus.
FIG. 298.—*P. brunnipes*: leaf-mine on *Sanicula*.
FIGS. 299–300.—*P. adjuncta*: (299), third antennal segment; (300), aedeagus.
FIGS. 301–302.—*P. chaerophylli* (301), aedeagus of ♂ ex *Chaerophyllum temulum*; (302), leaf-mine on *Chaerophyllum*.
FIGS. 303–304.—*P. obscurella*: (303), aedeagus; (304), leaf-mine on *Aegopodium*.

80 Only 1 ors; orbits moderately shining black, frons dark brown; mesonotum matt, black, with slight subshine ..... **ranunculivora** Hering
*Surrey: Chipstead; Middx.: Mill Hill; S. Wales: Tenby. Widespread. Host:* Ranunculus *spp.; mine long, linear, whitish, frass in widely spaced grains* (fig. 230B)*; puparium orange-yellow.*

— Upper ors well developed ..... 81

81 Wing base dark, not differentiated ..... 82

— Wing base conspicuously pale, whitish yellow ..... 83

82 Male genitalia: aedeagus as in fig. 322; variable species, normally 2 equal ors, second costal section more than 3 times length of fourth (cf. couplet 111) **milii** Kaltenbach

— Male genitalia: aedeagus as in fig. 290; upper ors only slightly shorter than lower; inner side of orbits generally somewhat pale, yellowish; mesonotum matt, acr in 4 rows in front; fore knees distinctly yellow; wing 1·9–2·2 mm., second costal section 2⅓–2½ times length of fourth ..... **sedicola** Hering
*Westmorland: Keswick,* viii.31 (*J. C. Robbins*). *Local. New to Britain. Host:* Sedum telephium *and other related flat-leaved species; mine whitish, irregularly linear, frequently forming secondary blotch; pupation normally in mine.*

83 Consistently small species, wing less than 2 mm ..... 84

— Slightly larger species, wing up to 2·3 mm ..... 85

84 Male genitalia: aedeagus as in fig. 291; wing 1·7–1·9 mm ..... **origani** Hering
*Kent: Otford; Surrey: Box Hill; Somerset: Cheddar; Derby.: Miller's Dale,* 3.x.70 (*K.A.S.*). *Widespread with food-plant, at least in south. Host:* Origanum vulgare*; mine beginning with small spiral, followed by a linear section and then a conspicuous blackish blotch* (fig. 292)*; pupation in mine, puparium yellowish.*

— Male genitalia: aedeagus as in fig. 293; wing normally 1·8 mm **myosotica** Nowakowski
*Surrey: Bookham* (*E. M. Hering*)*; Oxon.: Oxford; Hunts.: Woodwalton Fen. Widespread but local. Host:* Myosotis palustris, M. sylvatica *and probably other species; mine initially linear, later developing into a whitish blotch; pupation in mine on lower surface; puparium yellowish orange.*

85 Male genitalia: aedeagus as in fig. 294; slightly larger species, wing 2·1–2·3 mm. **symphyti** Hendel
*Oxon.: Oxford; Devon: Slapton; Hunts.: Woodwalton Fen; Derby.: Miller's Dale,* 3.x.70 (*K.A.S.*). *Local but widespread. Host:* Symphytum officinale; *mine and pupation as in* myosotica*, blotch becoming blackish; puparium normally dark, reddish brown.*

— Male genitalia: aedeagus as in fig. 295 ..... **tetrasticha** Hendel
*London: Hampstead; Hants.: I.o.W., Niton; Hunts.: Woodwalton Fen; Norfolk: Norwich; N. Wales: Denbigh., Cefn-y-bedd; Ireland: Dublin. Widespread. Host:* Mentha aquatica, M. longifolia, M. rotundifolia*; mine beginning with small spiral, later developing into a greenish blotch, brown when old; puparium frequently in mine* (fig. 296)*; posterior spiracles of larva each on raised protuberance, with* 11–15 *bulbs.*

— Male genitalia: aedeagus as in fig. 297 ..... **obscura** Hendel
*Oxon.: Oxford. Local. Host:* Clinopodium vulgare (= Calamintha vulgaris)*; mine as in* tetrasticha*; posterior spiracles of larva on lower protuberance, larger, each with* 26–28 *bulbs.*

86 Mesonotum essentially black, moderately shining; small species, wing 1·7–2·2 mm. 87

— Mesonotum more grey, matt ..... 88

87 Intra-alar hairs entirely lacking or at most 1 or 2 present; upper half of frons paler, yellowish brown, orbits contrasting black; small species, wing 1·7–2 mm. **minuscula** Goureau
*Common and widespread throughout British Isles, particularly in gardens. Hosts:* Aquilegia *spp.*, Thalictrum *spp., larva forming short, irregular linear mine* (fig. 269B)*, with frass in conspicuous black strips; puparium orange.*

— Intra-alar hairs well developed, normally 5 or 6 present; frons brownish, orbits less contrasting; generally somewhat larger species, wing up to 2·2 mm. **brunnipes** Brischke
*Surrey: Mickleham, Reigate; Herts.: Brookman's Park. Local. Host:* Sanicula europaea*; mine irregularly linear* (fig. 298)*, frequently following midrib of a leaf-segment, appearing greenish or brownish; puparium black.*

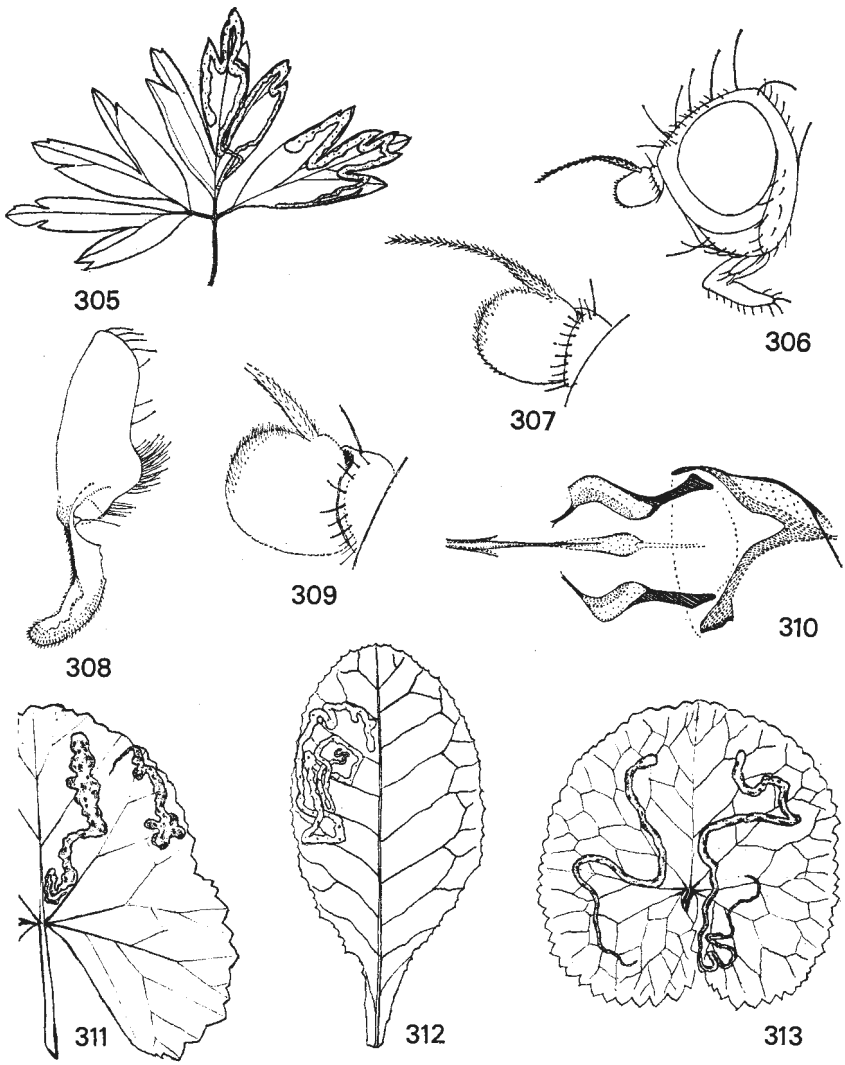



FIG. 305.—*Phytomyza hendeli*: leaf-mine on *Anemone*.
FIG. 306.—*P. albipennis*: head.
FIGS. 307–308.—*P. evanescens*: (307), third antennal segment; (308), epandrium.
FIGS. 309–310.—*P. enigmoides*: (309), third antennal segment (same scale as Fig. 307); (310), aedeagus.
FIG. 311.—*P. calthivora*: leaf-mine on *Caltha*.
FIG. 312.—*P. primulae*: leaf-mine on *Primula*.
FIG. 313.—*P. calthophila*: leaf-mine on *Caltha*.

88 Third antennal segment with conspicuously long pubescence, particularly on upper corner (fig. 299); wing 1·8–2·1 mm., second costal section 3–4 times length of fourth; male genitalia: aedeagus as in fig. 300
(= *silaicomes* Hering) **adjuncta** Hering
*Middx.: Scratch Wood; Mill Hill. Certainly more widespread, at least in south. Hosts:* Pimpinella major, P. saxifraga*; also* Silaum silaus (*possible misidentification); mine short, linear; puparium black.*

— Third antennal segment with short, inconspicuous pubescence ..... 89

89 Second costal section from slightly over 3 to 4 times length of fourth ..... 90

— Second costal section 4–5 times length of fourth ..... 91

90 Upper ors minute or lacking; frons broad, at least twice width of eye, slightly paler, brownish behind; only fore knees yellowish; wing from 1·8–2·1 mm.; male genitalia: aedeagus as in fig. 301
(= *anthrisci* Hendel; *conopodii* Hering) **chaerophylli** Kaltenbach
*Common and widespread throughout British Isles. Hosts:* Anthriscus sylvestris, Chaerophyllum temulum, Conopodium majus*; less frequently* Daucus carota, ?Sison amomum, ?Torilis japonica*; mine short, linear, generally closely following margin of a leaf-segment* (fig. 302)*; first generation mines normally in April, but larvae can be found feeding throughout the winter.*

— Upper ors only slightly shorter than lower; male genitalia: aedeagus as in fig. 322
**milii** Kaltenbach
(Cf. couplet 111, normally 2 equal ors.)

91 Consistently large species, wing 2·2–2·7 mm.; frons distinctly yellowish brown between orbits and ocellar triangle; male genitalia: aedeagus as in fig. 303
**obscurella** Fallén
*Common, at least in south; Ireland: Co. Wexford, Rosslare (K.A.S.). Host:* Aegopodium podagraria*; mine irregularly linear* (fig. 304)*, whitish green, when old brownish; puparium shining black.*

— Generally smaller species; male genitalia: aedeagus as in fig. 322
**milii** Kaltenbach
(Cf. couplet 111, normally 2 equal ors.)

92 Second costal section short, 1½–3 times length of fourth ..... 93

— Second costal section longer, from slightly over 3–5 times length of fourth .... 108

93 Mesonotum distinctly shining black; frons and orbits uniformly black; acr in 4 rows; small species, wing 1·6–1·8 mm., second costal section twice length of fourth ..... **hendeli** Hering
*Somerset: nr. Frome. Local. Host:* Anemone nemorosa*; mine narrow, linear, normally adjoining margin of leaf* (fig. 305).

— Mesonotum more matt, black, blackish-grey or grey ..... 94

94 Acr in 4–6 rows ..... 95

— Acr sparse, in 2 rows or lacking ..... 105

95 Proboscis conspicuously elongate (fig. 306) ..... 96

— Proboscis short, broader, normal ..... 98

96 Wings conspicuously white; jowls broad, almost half height of eye; frons sooty-black, orbits paler, grey, distinctly projecting above eye; arista fine, bare; proboscis elongate (fig. 306); mesonotum ash-grey, acr in 4 rows; wing 2·6 mm., second costal section short, less than twice length of fourth . . **albipennis** Fallén
*Kent: Wrotham,* 1 ♂, 28.v.70 (*K.A.S.*)*; Berks.: Wytham; Bucks.: Bovingdon; Scotland: East Lothian, Aberlady,* 1903. *Host: Unconfirmed but specimens have been caught on* Ranunculus *and the larva possibly feeds as an internal stem-borer.*

— Wings hyaline, normal; jowls narrower, one-third height of eye; smaller species, wing 2·1–2·3 mm.; second costal section slightly more than twice length of fourth ..... 97

97 Third antennal segment small (fig. 307); male with conspicuous flap-like appendages on epandrium (fig. 308); orbits narrow but slightly projecting above eye
**evanescens** Hendel
*Kent: Wrotham,* 1 ♂, 1 ♀, 28.v.70*; Lincs.: Surfleet,* 1 ♂, 3.vi.70*; Warwick.: Rugby,* 1 ♂, 20.v.70 (*all K.A.S.*)*; Scotland: Banff., Falls of Tarnash,* 1 ♂, 1.vii.36 (*R. L. Coe*). *Local. New to Britain. Host:* Ranunculus *spp., larva feeding as internal stem-borer.*

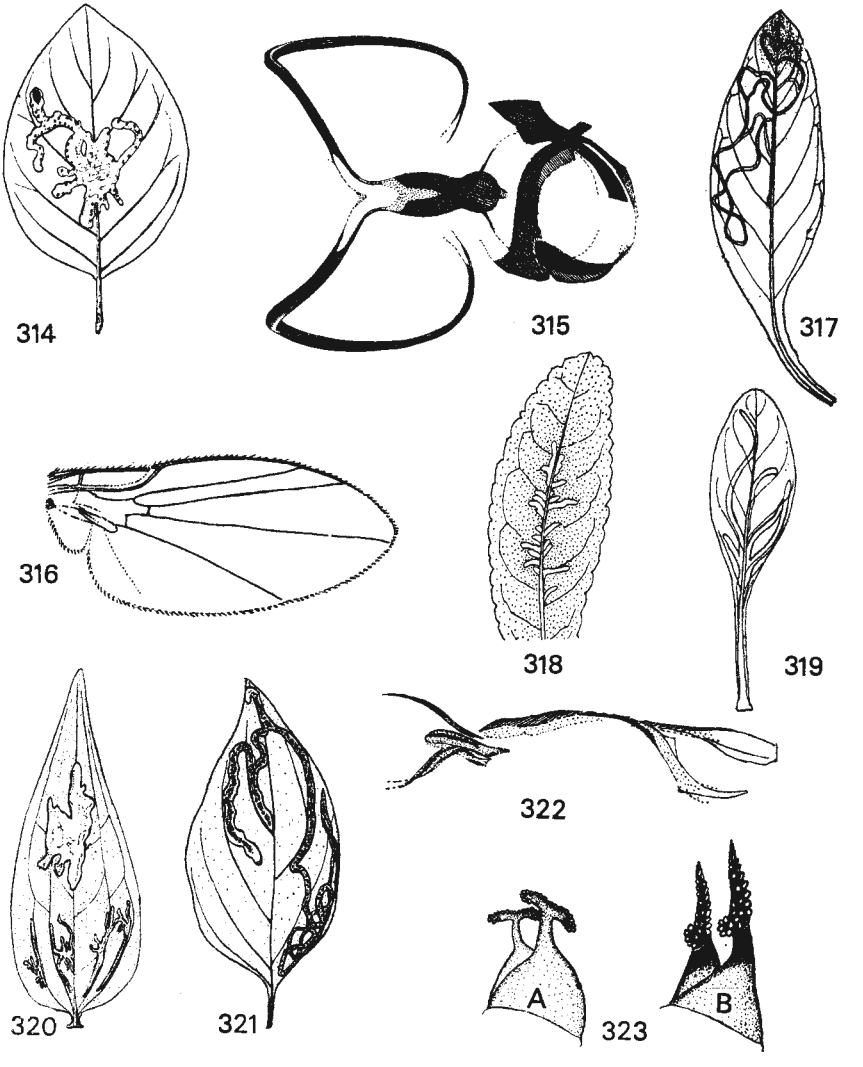



FIG. 314.—*Phytomyza periclymeni*: leaf-mine on *Lonicera*.
FIG. 315.—*P. heringiana*: aedeagus.
FIGS. 316–317.—*P. succisae*: (316), wing; (317), leaf-mine on *Succisa*.
FIGS. 318–319.—*P. nigritella*: (318), leaf-mine on *Dipsacus*; (319), leaf-mine on *Knautia*.
FIG. 320.—*P. gentianae*: leaf-mine on *Centaurium*.
FIG. 321.—*P. agromyzina*: leaf-mine on *Cornus*.
FIGS. 322–323.—*P. milii*: (322), aedeagus; (323A), anterior spiracles of larva; (323B), posterior spiracles.

— Third antennal segment larger (fig. 309); epandrium in male normal; orbits broader; male genitalia: aedeagus as in fig. 310 ..... **enigmoides** Hering
*Surrey: Effingham.* 1 ♂, 17.v.53 (*K.A.S.*). *Uncommon.*

98 Wings infuscated, distinctly brownish; frons dark brown, orbits black; third antennal segment enlarged; large species, wing 2·6–2·9 mm., second costal section 2¼ to almost 3 times length of fourth ..... **calthivora** Hering
*Wilts.: Corsham* (*K.A.S.*). *Uncommon. Host:* Caltha palustris*; mine linear but becoming very broad, up to 5 mm.* (fig. 311), *greenish, normally on lower leaves, near water; puparium black.*

— Wings hyaline, normal ..... 99

99 Jowls unusually broad, at least half height of eye; cheeks more than half depth of jowls; frons dark brown, orbits broad, contrasting greyish; mesonotum entirely matt, grey with a brownish tinge; femora entirely black; wing 2·2 mm. in female, second costal section 1½ times length of fourth ..... **cinerea** Hendel
*Derby.: Miller's Dale. Uncommon. Host:* Centaurea scabiosa*; mine a brownish blotch, at apex of leaf segment, several larvae feed together, pupating loose in mine; puparium brown.*

— Jowls at most one-third to one-quarter height of eye, cheeks narrower ..... 100

100 All knees distinctly yellowish; frons brownish grey, distinctly more yellowish above, orbits darker, black; wing 2 mm., second costal section 2½ times length of fourth ..... **primulae** Robineau-Desvoidy
*Common and widespread throughout England; Scotland: Perths., Killin; Sutherland, Lairg; Ireland: Co. Clare, Burren; Co. Kerry, Killarney. Hosts:* Primula *spp., particularly* P. veris *and* P. vulgaris*; frequent on cultivated garden species; mine long, white, linear, with frass in conspicuous, widely spaced black lumps* (fig. 312)*; puparium white, in mine.*

— At most fore knees yellowish ..... 101

101 Fore knees yellowish; mesonotum matt grey ..... 102

— All femora entirely black; mesonotum grey but distinctly shining; wing length 2·2 mm., second costal section 2½ times length of fourth .... **calthophila** Hendel
*Wilts.: Corsham; Cambridge.: Whittlestone; Westmorland: Grasmere; Yorks.: Malham Tarn* (*K.A.S.*)*; Norfolk: Norwich; Ireland, Co. Clare. Widespread but local. Host:* Caltha palustris*, mine long, narrow* (fig. 313).

102 Hairs in intra-alar area lacking; small, uniformly dark species, wing 1·8–2 mm. **periclymeni** de Meijere
*Surrey: Box Hill; Ireland: Co. Cork, Glengariff* (*K.A.S.*). *Local, new to Ireland. Host:* Lonicera periclymenum, Symphoricarpos rivularis*; mine star-shaped when small, later an irregular brownish blotch* (fig. 314)*; puparium uniformly brown, loosely attached in mine.*

— At least 4–6 hairs in intra-alar area ..... 103

103 Frons and orbits at least slightly projecting in profile (= *ramosa* Hendel) **nigritella** Zetterstedt
(See couplet 107, acr normally in only 2 rows.)

— Frons and orbits not projecting above eye in profile ..... 104

104 Small species, wing up to 1·8 mm., second costal section less than 2½ times length of fourth; frons dark brown, slightly paler above; acr in 4–5 rows; male genitalia: aedeagus as in fig. 315 ..... **heringiana** Hendel
*Kent: Darenth. Local. Host:* Malus sylvestris*, also cultivated apple; mine irregularly linear, even forming secondary blotch; pupation in mine.*

— Male genitalia: aedeagus as in fig. 322 ..... **millii** Kaltenbach
(See couplet 111, second costal section normally more than 3 times length of fourth.)

105 Eyes distinctly pilose; frons yellowish grey or dark brown ..... **nigra** Meigen
(See couplet 56, frons normally paler, yellow.)

— Eyes bare ..... 106

106 Acr entirely lacking, mesonotum conspicuously ash-grey; frons brownish black; small species, wing 1·6–2 mm., second costal section short (fig. 316), at most twice length of penultimate ..... **succisae** Hendel
*Middx.: Scratch Wood; Hunts.: Woodwalton Fen; Wales: Glam., Neath Vale* (*G. C. D. Griffiths*)*; Ireland: Co. Clare, Poulavallan; Co. Kerry, Killarney. Local. Host:* Succisa pratensis*; mine irregularly linear* (fig. 317)*, mined area invariably assumes conspicuous violet discoloration; pupation internally, puparium white.*

— Acr in at least 2 rows ..... 107

107 Frons conspicuously projecting above eye, brown; third antennal segment distinctly elongate; wing length 2·1 mm., acr in 2 rows; second costal section short, little more than twice length of penultimate..... **cineracea** Hendel
*Berks.: Newbury; Wilts.: Gastard; Lincs.: Crowland; Scotland: Inverness., Aviemore; Perths.: Fortingall. Widespread. Holarctic. Host:* Ranunculus *spp., larva feeding as internal stem-borer.*

— Frons at most slightly projecting, blackish brown; acr normally in 2 rows, only in larger specimens more numerous; wing 2·2–3·2 mm., second costal section 2½–3 times length of fourth..... (= *ramosa* Hendel) **nigritella** Zetterstedt
*Widespread in south; Scotland: Perths.: Killin (K.A.S.). Host:* Dipsacus fullonum, *less frequently* Knautia arvensis, Succisa pratensis*; larva feeding mainly inside midrib, forming short lateral mines into the leaf-blade* (figs. 318, 319)*; puparium white, inside midrib.*

108 Abdomen with front tergites laterally yellowish; only fore knees yellow, legs otherwise black; wing from 1·7 mm. in male to 2·5 in female **gentianae** Hendel
*Kent: Ham Street; Surrey: Box Hill; Oxon.: Wytham; Glos.: Kilcot; Ireland: Co. Clare, Murrough. Local. Common in mountains of Central Europe. Hosts:* Centaurium minus, Blackstonia perfoliata (*on Continent* Gentiana *spp.*)*; white blotch mine* (fig. 320), *in which the larva is very difficult to detect, pupation internally.*

— Abdomen black..... 109

109 Tibiae and tarsi pale yellow, all knees yellow..... 110

— Tibiae and tarsi black..... 111

110 Frons black in front, brownish ochrous behind; third antennal segment black; wing 2·2–2·5 mm..... **luzulae** Hering
*Oxon.: Oxford (A. H. Hamm). Local. Host:* Luzula pilosa, *mine beginning on lower surface but main section on upper surface, brownish; pupation internally.*

— Frons uniformly dark; third antennal segment frequently paler, slightly yellowish; wing 2–2·5 mm..... **agromyzina** Meigen
*Kent: Darenth; Sussex: Southlease; Devon: Wonwell; Norfolk: Norwich. Probably widespread. Holarctic. Host:* Cornus sanguinea*; mine linear, upper surface, with frass in conspicuous black strips* (fig. 321).

111 Acr numerous, in 6–8 rows; frons generally paler behind; large species, wing 2·5–3 mm..... **ilicis** Curtis
(See couplet 50, frons frequently paler.)

— Acr sparser, in 3–5 rows; frons blackish brown, generally paler behind; third antennal segment small, round; the 2 ors normally equal but upper sometimes shorter; legs black, only fore knees distinctly differentiated, yellowish; wing range 1·7–2·9 mm. but normal size between 2·2–2·6 mm.; ratio of second to fourth costal sections variable, from 2½–4 times, normally just less than 3½ times; male genitalia: aedeagus as in fig. 322
(= *intermedia* Spencer) **milii** Kaltenbach
*Widespread and abundant in south and in Scotland, and almost certainly throughout British Isles; Ireland: Co. Clare, Co. Galway, Co. Mayo. Holarctic. Hosts: Gramineae, particularly* Milium effusum, Hordeum, Hierochloe *and* Poa*; mine linear, pupation internally; anterior spiracles of puparium as in* fig. 323A, *posterior spiracles as in* fig. 323B, *these elongated and projecting through epidermis of leaf* (*cf.* P. nigra, figs. 274A, B).

112 Frons, face, jowls yellow..... 113

— Frons, face, jowls brown or black..... 114

113 Proboscis conspicuously elongate (cf. fig. 306), orbits darkened; small species, wing 2·3 mm. (fig. 324), second costal section only slightly more than 3 times length of fourth ..... **rydeni** Hering
*Scotland: Banff., Glen of Drumloch,* 1 ♂, 10.vii.36*; Inverness., Nethy Bridge,* 1 ♂, 16.vii.36 (*both R. L. Coe*). *New to Britain. Uncommon, only known from Sweden and Bornholm. Host:* Ranunculus acris*; mine a brownish blotch, filling apex of a leaf segment, pupation internally.*

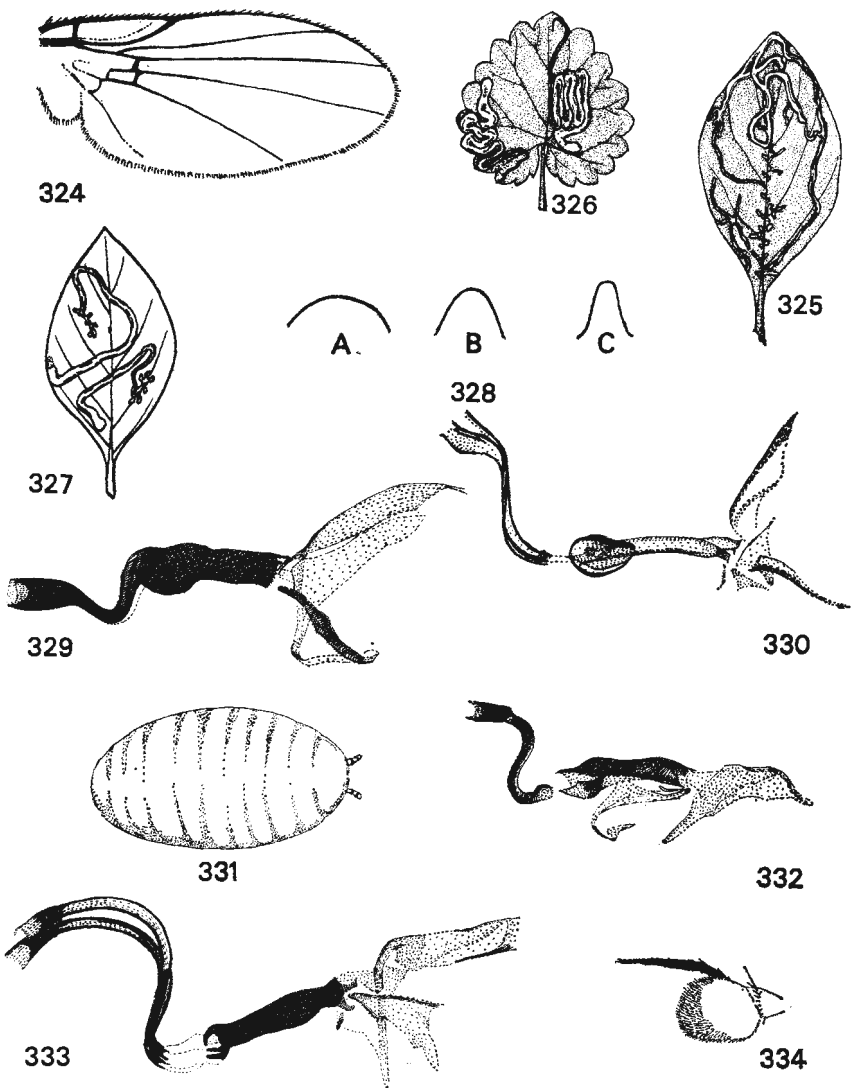



Fig. 324.—*Phytomyza rydeni*: wing.
Fig. 325.—*P. aprilina*: leaf-mine on *Lonicera*.
Fig. 326.—*P. glechomae*: leaf-mine on *Glechoma*.
Fig. 327.—*P. harlemensis*: leaf-mine on *Lonicera*.
Fig. 328.—Lunule of A, B, *Cerodontha*, sub-genus *Dizygomyza*; C, sub-genus *Poemyza*.
Fig. 329.—*Cerodontha* (*Diz.*) *scirpi*: aedeagus.
Figs. 330–331.—*C.* (*Diz.*) *angulata*: (330), aedeagus; (331), puparium.
Fig. 332.—*C.* (*Diz.*) *mellita*: aedeagus.
Fig. 333.—*C.* (*Diz.*) *eucaricis*: aedeagus.
Fig. 334.—*C.* (*Diz.*) *crassiseta*: third antennal segment.

— Proboscis short, broad, normal; orbits yellow, not differentiated from frons; larger species, wing 2·5–3·3 mm., second costal section long, over 4 times length of fourth.....(= *lonicerella* Hendel) **aprilina** Goureau

*Surrey: Chiddingfold; Devon: Wonwell; Cornwall: Portleven; also S. Wales and Northumberland; Ireland: Co. Clare, Poulavallan; Co. Cork, Bantry; Co. Down, Rostrevor; Co. Galway, Clifden; Co. Kerry, Killarney. Widespread, particularly in west and north. Host:* Lonicera periclymenum*; mine initially stellate, later linear, upper surface sections apparently disconnected where feeding occurs on lower surface* (fig. 325)*, frass in conspicuous black strips; puparium pale green, white when empty, in mine.*

114 Third antennal segment enlarged, conspicuously black; acr sparse, in 2 rows; legs entirely black; wing 2 mm., second costal section twice length of fourth **glechomae** Kaltenbach

*Surrey: Mickleham; London: Hampstead; Norfolk: Norwich; Yorks.: Croft area (P. H. Grimshaw); Scotland: Midlothian, Braid Hills (K.A.S.); Ireland: Co. Clare, Poulavallan. Widespread, Host:* Glechoma **hederacea***; mine linear, whitish, frequently forming a secondary blotch* (fig. 326).

— Third antennal segment small, round; acr in 4 rows; fore knees distinctly yellow; wing up to 2·4 mm., second costal section longer, 3½ times length of fourth (= *xylostei* Kaltenbach) **harlemensis** Weyenbergh

*Widespread throughout British Isles. Hosts:* Lonicera periclymenum, Symphoricarpos rivularis*; mine an irregular stellate blotch, with linear offshoots* (fig. 327)*; pupation in mine, puparium brown, with a dark longitudinal line ventrally, firmly glued to leaf with frass.*

## Genus **Cerodontha** Rondani

*Cerodontha* Rondani, 1861. Type of genus: *Chlorops denticornis* Panzer, 1806.

This genus was until recently restricted to the small group of species having a conspicuous spine on the third antennal segment and with only two scutellar bristles. *C. denticornis* (Pz.) is a common British species with these characters (fig. 357).

Nowakowski (1962) noted the close affinity of the male genitalia between *Cerodontha* s.s. and Hendel's subgenera *Dizygomyza, Poemyza* and *Icteromyza* which were included by him in the genus *Dizygomyza* (Hendel, 1931–6) and later by Frick (1952) in *Phytobia*. Nowakowski (1962, 1967) therefore expanded the original concept of *Cerodontha* to embrace these four subgenera and also *Xenophytomyza* Frey and later *Phytagromyza* Hendel (= *Crastemyza* Nowakowski). *Cerodontha* is a large genus, well represented throughout the world, with the larvae feeding exclusively on the monocotyledon families Gramineae, Cyperaceae, Iridaceae and Juncaceae.

In Britain 34 species are now known in this genus, of which three were recently described as new (Spencer, 1971*a*) and four—*Diz. eucaricis* Now., *Diz. suturalis* (Hd.), *Po. phalaridis* Now. and *Po. superciliosa* (Zett.)—represent additions to the British list. Of these 34, 12 feed on Gramineae, seven on Cyperaceae, two on Iridaceae, one on Juncaceae and the host of12 is unknown. *Diz. morosa* (Mg.) and *Diz. caricivora* (Groschke) have been recorded in British literature but such records are based on misidentifications (Spencer 1971*a*, 1971*b*).

### Key to Subgenera of Genus Cerodontha Rondani

1 Scutellum with only two bristles; third antennal segment with spine or at least angulate at upper corner.....2

– Scutellum with four bristles; third antennal segment not so, sometimes greatly enlarged in male.....3

2 Third antennal segment with spine or blunt, spine-like projection at upper corner (figs. 357, 358), frons and femora yellow..... **Cerodontha** Rondani (p. 107)
– Third antennal segment at least slightly angulate at upper corner (figs. 355, 356); entirely black species..... **Xenophytomyza** Frey (p. 106)
3 Lunule broad, in form of semicircle (fig. 328A); or slightly higher but still broad (fig. 328B); or costa ending at vein $R_{4+5}$..... 4
– Lunule substantially higher than semicircle (fig. 328C); third antennal segment always small, round; black or partially yellow species.. **Poemyza** Hendel (p. 102)
4 Costa ending at vein $R_{4+5}$; male with finger-like projection at upper margin of epandrium (fig. 343); larval posterior spiracles in form of widely separated flat, oval plates each bearing some 15–20 bulbs
(= *Crastemyza* Nowakowski) **Phytagromyza** Hendel (p. 101)
– Costa extending to vein $M_{1+2}$; male at most with small projecting knob at upper margin of epandrium (cf. fig. 347); larval spiracles not so..... 5
5 Frons black or brown; ocellar triangle not extended; pre-scutellars frequently present; third antennal segment in male enlarged (figs. 337, 339)
**Dizygomyza** Hendel (p. 98)
– Frons yellow or brownish yellow; ocellar triangle extended, apex approaching margin of lunule; pre-scutellars always absent; third antennal segment not enlarged in male..... **Icteromyza** Hendel (p. 104)

## Subgenus **Dizygomyza** Hendel

*Dizygomyza* Hendel, 1920. Type of subgenus: *Agromyza morosa* Meigen, 1830.

Lunule large, broad, semicircular (fig. 328A) or higher, U- or V-shaped (fig. 328B); antennal bases widely separated or more approximate; third segment frequently enlarged in male (figs. 337, 339); pre-scutellars normally present, sometimes weak.

Nowakowski (1967) placed the species-group with the higher lunule (fig. 328B) into a separate subgenus *Butomomyza*. Although this might appear justified with exclusively European material, which was all that Nowakowski studied, it was found that with species from North America and elsewhere the tenuous differences between *Dizygomyza* and *Butomomyza* broke down (Spencer, 1969 : 110). I therefore consider it correct here to include "*Butomomyza*" species in the subgenus *Dizygomyza*.

Twelve species are now known in Britain. Of these, the host is known of eight and all are leaf-miners—in the families Cyperaceae, Juncaceae and Iridaceae.

### Key to Species

1 Lunule higher than semicircle, not greatly widened at base (fig. 328B); third antennal segment in male not enlarged..... 2
– Lunule broad, in form of semicircle (fig. 328A); third antennal segment greatly enlarged in male (figs. 337, 339)..... 6

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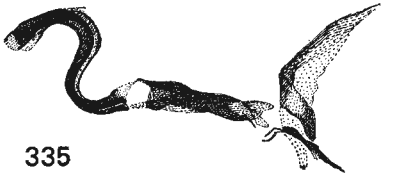
Fig. 335.—*Cerodontha* (*Diz.*) *iridis*: aedeagus.
Fig. 336.—*C.* (*Diz.*) *caricicola*: aedeagus.
Figs. 337–338.—*C.* (*Diz.*) *bimaculata*: (337), third antennal segment; (338), aedeagus (same scale as Fig. 340).
Figs. 339–341.—*C.* (*Diz.*) *luctuosa*: (339), third antennal segment; (340), aedeagus; (341), puparium.
Fig. 342.—*C.* (*Diz.*) *ireos*: leaf-mine on *Iris pseudacorus*.
Fig. 343.—*C.* (*Phytagromyza*) *flavocingulata*: epandrium.
Fig. 344.—*C.* (*Poemyza*) *phalaridis*: aedeagus.



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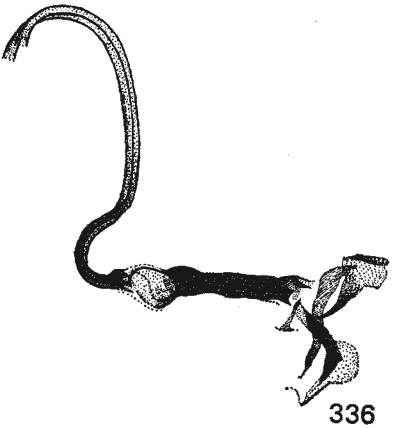

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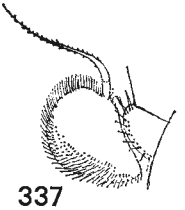

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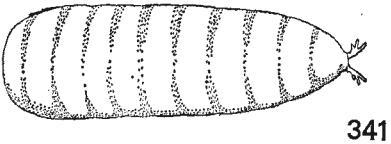

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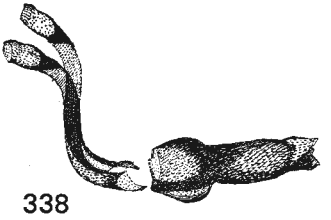

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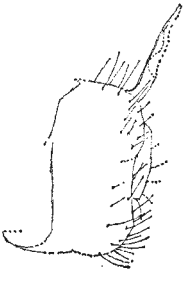

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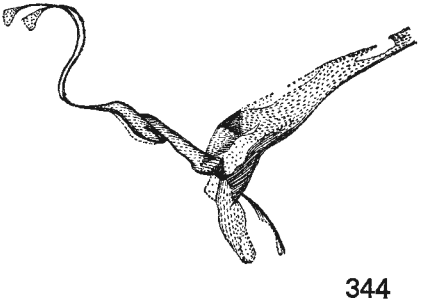


344

2 All legs entirely black; mesonotum jet black, moderately shining; squamal margin and fringe black; wing from 2·75 mm. in male to 3 mm. in female, last and penultimate sections of $M_{3+4}$ equal ..... **fonsecai** Spencer
*Glos.: Coombe Dingle, nr. Bristol,* 1 ♂, 30.iv.50 (*E. A. Fonseca*); *Hereford.: Woolhope,* 1 ♀, 20.v.02 (*Col. Yerbury*); *Cambs.: Chippenham Fen,* 5 ♀, 20.v.09 (*J. E. Collin*); *Suffolk: Barton Mills,* 1 ♀, 29.iv.13 (*J. E. Collin*). *Uncommon. Host unknown.*
– Fore knees distinctly yellow; squamal fringe at most brownish black ..... 3
3 Lower ors slightly incurved; tibiae and tarsi black; squamal fringe consistently dark, brownish black; wing 2·3–2·5 mm., last and penultimate sections of $M_{3+4}$ approximately equal; male genitalia: aedeagus as in figure 329 .... **scirpi** (Karl)
*Surrey: Godalming. Probably widespread. Holarctic. Host:* Scirpus sylvaticus, *larva forming very long mine, pupating at base of leaf; puparium rather flat, pale brown, in mine.*
– The two ors parallel, reclinate ..... 4
4 Only fore knees yellow; upper ors distinctly longer than lower ..... 5
– Frequently all knees yellowish; the 2 ors equal; squamal fringe variable from yellowish to brownish ochrous; orbital setulae short; wing from 2·4–2·75 mm., the two sections of $M_{3+4}$ equal or the last slightly shorter; male genitalia: aedeagus as in figure 330 ..... (= *semiposticata* Hendel) **angulata** (Loew)
*London: Hampstead; Middx.: Scratch Wood; Dorset: Lyme Regis; S. Wales: Glam. Widespread in south. Holarctic. Host:* Carex pendula *and other* Carex *spp., larva forming yellowish green leaf-mine; pupation externally, puparium oval* (fig. 331), *dark brown, frequently adhering to leaf.*
5 Squamal fringe consistently dark, brownish black; tibiae and tarsi somewhat pale, brownish; mesonotum greyish black; wing 2·5–3 mm., last section of $M_{3+4}$ longer than penultimate, from slightly so to 1½ times; male genitalia: aedeagus as in figure 332 ..... **mellita** Spencer
*Suffolk: Orford,* 2 ♂, 1 ♀, 14 and 19.vi.07 (*J. E. Collin*). *Host unknown, almost certainly* Carex.
– Squamal fringe pale, yellowish; tibiae and tarsi dark, largely black but fore knees contrasting yellow; mesonotum deep black; wing 2·9 mm., last section of $M_{3+4}$ equal to or slightly shorter than penultimate; male genitalia: aedeagus as in figure 333 ..... **eucaricis** Nowakowski
*Hunts.: Woodwalton Fen; Surrey, Glam.* (*G. C. D. Griffiths*). *New to Britain. Local. Holarctic. Host:* Carex, *recorded in Britain on* C. acutiformis *and* C. pseudocyperus. *Puparium dark brown, posterior spiracles with conspicuous chitinized plates above the* 3 *bulbs; pupation in mine.*
6 Only fore knees yellow, knees on mid- and hind legs either entirely black or at most faintly paler ..... 7
– All knees bright yellow ..... 12
7 Abdomen entirely shining black ..... 8
– Front tergites variably yellow, all at least with conspicuous yellow margins .... 11
8 Arista conspicuously thickened (fig. 334), tapering uniformly from apex to base **crassiseta** (Strobl)
*Kent: Stone Marshes. Uncommon. Host:* Poa *and probably other grasses.*
– Arista normal; thickened only at base ..... 9
9 Small species, wing 1·8–2·2 mm., last section of $M_{3+4}$ up to 1½ times length of penultimate; pale species, frons and orbits yellowish brown; facial keel yellowish; humerus and notopleural triangle brownish (= *plumbea* Hendel) **fasciata** (Strobl)
*Bucks.: Aylesbury,* 1 ♀, 23.vii.56 (*K.A.S.*). *Uncommon, only known from Austria and Sweden* (*as* grisea *Rydén*). *New to Britain. Host: unknown.*
– Larger species, wing 2·3–3·2 mm.; facial keel and notopleural triangle uniformly dark ..... 10
10 Frons and orbits dark, blackish; lunule dark silvery, generally slightly higher than semicircle; third antennal segment in female almost angulate on upper corner; last section of vein $M_{3+4}$ slightly longer than penultimate; male genitalia: aedeagus as in figure 335 ..... **iridis** (Hendel)
*Abundant with food-plant throughout southern Counties. Host:* Iris foetidissima, *a number of larvae feeding together to form an inconspicuous, mottled, greenish mine, pupating laterally across the leaf at end of mine.* (*Mines also found on* I. spuria *and* I. ochroleuca *cultivated in a nursery at Enfield, Middx.*)

— Frons and orbits paler, brownish, orbits frequently narrowly yellow on inner margin; lunule pale silvery, semicircular; third antennal segment in female round, bare; male genitalia: aedeagus conspicuously long (fig. 336)
(= *soenderupi* Hering) **caricicola** (Hering)
*London: Hampstead; Sussex: Rusper; Middx.: Scratch Wood; Oxford.: Bagley Wood. Widespread. Host:* Carex pendula *and other* Carex *spp., larva forming long, yellowish mine, pupating in leaf at end of mine.*

11 Orbits distinctly shining black, frons dark brown or black; pubescence on third antennal segment of male conspicuously long (fig. 337); male genitalia: aedeagus short, tubes of distiphallus broad at end (fig. 338)..... **bimaculata** (Meigen)
*Kent: Hayes Common,* 1 ♀, 22.vii.58 *(E. M. Hering); Surrey: Colley Hill; Middx.: Scratch Wood; Hants.: New Forest,* 1 ♀, 27.ix.03 *(D. Sharp); Suffolk: Woodditton Wood,* 2 ♀, 29.v.08 *(G. H. Verrall); Hunts.: Woodwalton Fen; Hereford.: Tarrington,* 1 ♂, 16.viii.02*; Cusop,* 1 ♂, 20.viii.02 *(both Col. Yerbury); Westmorland: Newby,* 1 ♂, vi.29 *(F. W. Edwards); Yorks.: Malham Tarn; Scotland; Banff.: Loch Park,* 1 ♂, 3.vii.36 *(R. L. Coe); Inverness.: Aviemore,* 1 ♂, 4.vi.52 *(R. B. Benson). Widespread but local. Host:* Luzula *spp., leaf-miner, pupation in leaf.*

— Orbits normally matt black, frons paler brown; pubescence on third antennal segment of male thick but shorter (fig. 339); male genitalia: aedeagus longer, distal tubules narrower, widely separated at end (fig. 340)
(= *effusi* Karl) **luctuosa** (Meigen)
*Hants.: New Forest,* 1 ♂, 21.ix.04 *(F. C. Adams); Somerset: Radstock,* 1 ♀, 5.vi.54 *(K.A.S.); Cambs.: Chippenham Fen,* 1 ♂, 5.vi.55 *(K.A.S.); Cheshire: Rostherne,* 1 ♂, 26.vi.42 *(H. Britten); Wales, Merioneth.: Barmouth,* 1 ♂, 11.v.02 *(Col. Yerbury); Ireland (Haliday); Scotland: Aberdeen., Balmoral Forest,* 2 ♂, 1–4.viii.37 *(R. L. Coe); Banff., Falls of Tarnash,* 1 ♀, 9.vii.36*; Glen of Drumloch,* 1 ♀, 16.viii.37 *(both R. L. Coe). Widespread. Holarctic. Host:* Juncus effusus, *leaf-miner; puparium elongate* (fig. 341).

12 Abdomen with tergites conspicuously yellow-bordered and laterally yellow in front; notopleural triangle variably pale, brownish yellow; third antennal segment in male with thick but short pubescence; small species, wing up to 2·5 mm..... **suturalis** (Hendel)
*Cambs.: Chippenham Fen,* 1 ♂, 11.v.54*; Suffolk: Barton Mills,* 1 ♂, 29.iv.34 *(both J. E. Collin). Host:* Carex *spp., leaf-miner.*

— Abdomen normally entirely black, tergites rarely with very narrow yellow margins; notopleural triangle dark, black, at most slightly paler at upper corners; larger species; wing up to 2·75 mm.....(= *iracos* R.-D.) **ireos** (Goureau)
*Widespread and common throughout U.K. in association with host; Scilly Isles,* 1 ♂, 24.viii.60 *(R. Tubbs); Ireland: Tipperary,* 16.viii.69 *(K.A.S.); Scotland, most northerly record: Banff. Host:* Iris pseudacorus, *larva forming short white mine* (fig. 342), *pupating in leaf.*

## Subgenus **Phytagromyza** Hendel

*Phytagromyza* Hendel, 1920. Type of subgenus: *Domomyza flavocingulata* Strobl, 1909.
*Crastemyza* Nowakowski, 1967. Type of subgenus: *Domomyza flavocingulata* Strobl.

*P. flavocingulata* is a somewhat isolated species, with the costa reduced to vein $R_{4+5}$ and the larval posterior spiracles each with an ellipse of some 15–20 bulbs. The male genitalia indicate a close relationship with *Dizygomyza* species but particularly in view of the larval differences, it appears justified to retain this species in a distinct subgenus. A further species, *P. frankensis*, which is closely related to *flavocingulata*, was recently described from western Canada (Spencer, 1969).

ONE BRITISH SPECIES

Costa ending at vein $R_{4+5}$; male with finger-like projection from upper margin of epandrium (fig. 343); lunule small but higher than semicircle, upper margin at level of upper ori; orbits brownish, paler on inner margin; third antennal segment small in both sexes; frons ochrous above, brownish below; mesonotum matt-grey; legs black, only fore knees narrowly yellowish; squamae and fringe yellow; wing from 2·5 mm. in male to 3 mm. in female, last section of vein $M_{3+4}$ $2\frac{1}{2}$ times length of penultimate ..... **flavocingulata** (Strobl)

*London: Hampstead; Glos.: Coombe Dingle (E. A. Fonseca); Cambs.: Chippenham Fen; Lincs.: Surfleet,* 4 ♂, 3 ♀, 3.vi.70 *(K.A.S.); Suffolk: Orford,* 1 ♀, 19.vi.07*; Woodditton,* 1 ♀, 25.v.30 *(both J. E. Collin); Scotland: Dunbarton., Bonhill,* 1 ♀, 16.vi, 1 ♂, 27.vi, 1 ♂, 1 ♀, 29.vi.08*;* 1 ♀, 14.vii.08*; Cardross,* 1 ♂, 6.iv.08 *(all J. R. Malloch); Inverness., Nethy Bridge,* 1 ♀, 26.6.00 *(Col. Yerbury); Sunderland, Tongue,* 1 ♀, 18.vi.84 *(G. H. Verrall). Holarctic. Hosts: Gramineae, including* Agropyron repens, Agrostis stolonifera (= alba auctt.), Dactylis glomerata, Festuca *spp.*, Holcus lanatus *and* Poa trivialis*; pupation both in mine and externally.*

## Subgenus **Poemyza** Hendel

*Poemyza* Hendel, 1931. Type of subgenus: *Agromyza pygmaea* Meigen, 1830.

Lunule generally higher than semicircle (fig. 328C); orbits pronounced, normally raised above frons; abdomen broad. Eleven species are known in Britain; the host is known of nine and these are all leaf-miners on Gramineae.

KEY TO SPECIES

1 Femora entirely yellow; frons bright yellow; upper orbits brownish black; third antennal segment brownish black, second bright yellow; lunule whitish yellow; humeral callus yellow behind; wing length 3·1 mm..... **cingulata** (Zetterstedt)

*Scotland: Argyll., Dunoon,* 1 ♀, vi.98 *(P. H. Grimshaw). Rare, only other known specimens from Lapland. Host unknown.*

– Femora at least basally black ..... 2

2 All femora yellow on distal half or third; small species, wing 2 mm. ..... 3

– At most femora with yellow knees ..... 4

3 Orbits conspicuously shining black adjoining eye margin, bright yellow beside frons; aedeagus greatly elongated, with narrow distal tubules, not rotated (fig. 344) ..... **phalaridis** Nowakowski

*Norfolk: Middleton, High Fence,* 1 ♂, 19.viii.35*; Suffolk: Butley,* 1 ♂, 24.vi.07 *(both J. E. Collin). New to Britain. Uncommon. Host:* Phalaris arundinacea*, larva forming leaf-mine, pupating externally.*

– Orbits yellow, generally slightly brownish below; aedeagus shorter, distal tubules broad, rotated (fig. 345) ..... **muscina** (Meigen)

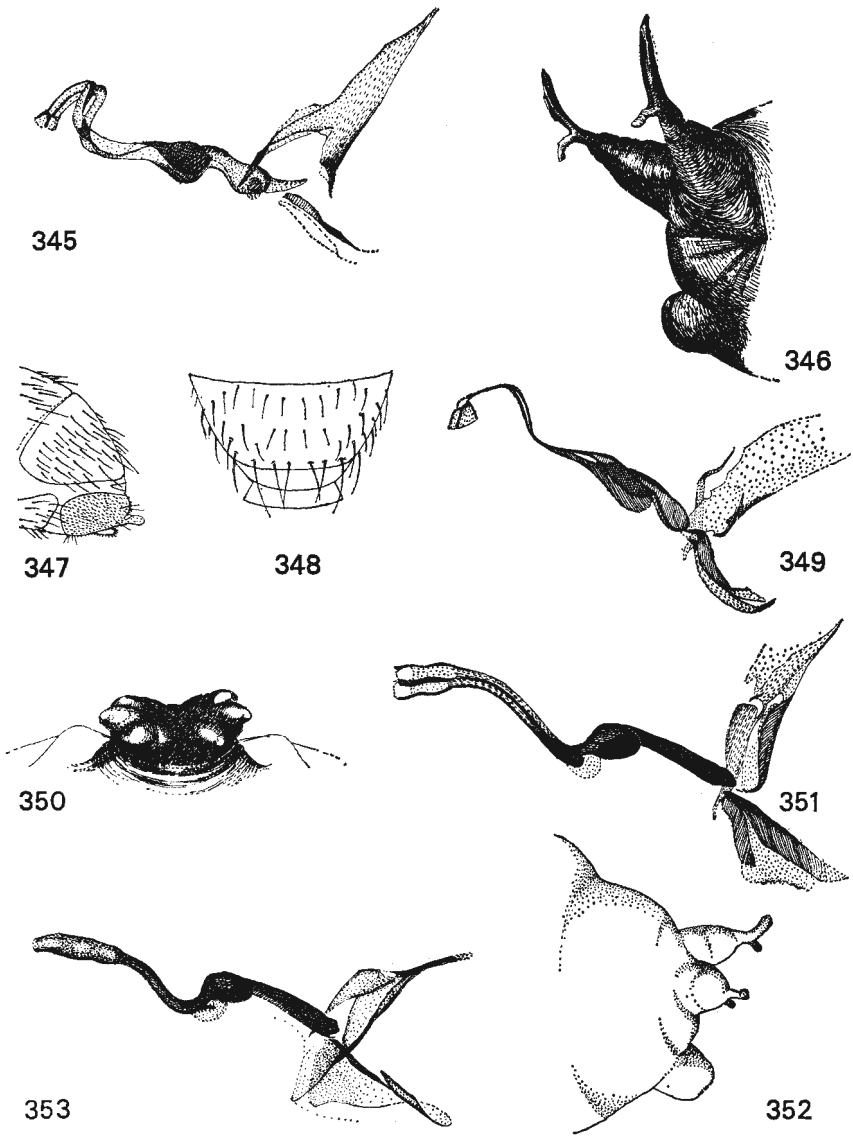
*Kent: Maidstone,* 1 ♂, 22.vi.55 *(K.A.S.); Surrey, Colley Hill,* 1 ♀, 15.iv.61 *(K.A.S.); Norfolk: Middleton,* 2 ♂, 1 ♀, 19.viii.35 *(J. E. Collin); Wales: Merioneth., Ganllwyd,* 1 ♂, 20.iv.38 *(J. E. Collin); Scotland: Inverness., Aviemore,* 1 ♂, 1.vi.13 *(J. E. Collin); Aberdeen., Den of Pitlurgh,* 1 ♀, 17.vii.36 *(R. L. Coe); Moray., Culbin Sands,* 1 ♀, 5–7.vii.36 *(R. L. Coe); Dunbarton., Bonhill,* 1 ♂, 3 ♀, 18.iv.07 *(J. R. Malloch). Widespread and not uncommon. Holarctic. Hosts: Gramineae, including* Calamagrostis *spp. and* Hierochloe odorata*, larva pupating externally; posterior spiracles as in* figure 346.

4 Notopleural triangle and rear of humeral callus bright yellow ..... 5

– Pleura uniformly dark ..... 6

5 Orbits shining black below, yellow above; ori directed inwards and upwards; in male epandrium with knob above cerci (fig. 347) ..... **lateralis** (Macquart)

*Hunts.: Woodwalton Fen; Suffolk: Barton Mills,* 1 ♂, 10.v.1931 *(J. E. Collin). Uncommon in England, widespread in southern Europe. Hosts: Gramineae, including* Agropyron repens, Phalaris arundinacea, Triticum aestivum. *Leaf-miner, pupating in mine.*




FIGS. 345–346.—*Cerodontha* (*Po.*) *muscina*: (345), aedeagus; (346), posterior spiracles of puparium.
FIG. 347.—*C.* (*Po.*) *lateralis*: epandrium.
FIG. 348.—*C.* (*Po*) *superciliosa*: epandrium.
FIG. 349.—*C.* (*Po.*) *incisa*: aedeagus.
FIG. 350.—*C.* (*Po.*) *hammi*: posterior spiracles of puparium.
FIGS. 351–352.—*C.* (*Po.*) *deschampsiae*: (351), aedeagus; (352), posterior spiracles of puparium.
FIG. 353.—*C.* (*Po.*) *atra*: aedeagus.

– Orbits largely yellow, at most very narrowly black adjoining eye margin, variably brownish below; ori directed inwards and forwards; in male rectangular plate along upper margin of epandrium (fig. 348) ..... **superciliosa** (Zetterstedt)
*Norfolk: Blakeney*, 3 ♂, 1 ♀, 20.vii.20; *Winterton*, 3 ♂, 3 ♀, 6.viii.33 (*all J. E. Collin*); *Scotland: Moray., Culbin Sands*, 1 ♀, 5–7.vii.36 (*R. L. Coe*). *Essentially a coastal species. New to Britain. Hosts:* Ammophila arenaria, Agropyron repens (*in Poland*).

6 Only fore knees yellow ..... 7
– All knees conspicuously yellow ..... 9
7 Squamal margin and fringe pale, yellowish ..... 8
– Squamal margin and fringe black; mesonotum moderately shining black; wing length 2·3–2·75 mm., last section of $M_{3+4}$ twice length of penultimate **pygmaea** (Meigen)
*Widespread and common; Ireland: Co. Clare; Scotland: Dunbarton., Bonhill* (*J. R. Malloch*). *Holarctic. Hosts: Gramineae, including* Brachypodium sylvaticum, Bromus *sp.*, Dactylis glomerata, Deschampsia, Festuca *spp.*, ?Molinia caerulea. *Normally several larvae feed together, pupating in mine; puparium metallic blackish.*

8 Mesonotum distinctly matt-black; orbits broad, moderately shining black, not appreciably lighter on inner margin; third antennal segment small, round; legs black, apart from narrowly yellow fore knees; wing 2·3–2·75 mm., last section of $M_{3+4}$ twice length of penultimate; male genitalia: aedeagus as in fig. 349 **incisa** (Meigen)
*London: Hampstead; Middx.: Scratch Wood; Oxon.: Oxford; Suffolk: Chillesford; Ireland: Co. Clare, Burren; Scotland: Dunbarton., Bonhill. Widespread. Holarctic. Hosts: Gramineae, recorded in Britain from* Phalaris arundinacea (*Griffiths*); *other known hosts include* Bromus arvensis, Calamagrostis epigejos, Lolium perenne *and* Phragmites communis. *Puparium shining metallic-black, in mine, posterior spiracles each with 3 bulbs on conspicuous conical protuberance.*
– Mesonotum moderately shining-black; orbits more conspicuously yellow on inner margin ..... **hammi** Spencer
*Oxon.: Oxford, Free Ferry Road* (*Hamm*). *Host: Gramineae, species not recorded. Puparium brown, posterior spiracles each with 3 bulbs* (fig. 350).

9 Large species, wing from 2·75 mm. in male to 3·6 in female; last section of $M_{3+4}$ $1\frac{1}{5}$ to $1\frac{1}{2}$ times length of penultimate; 3 ori; margin of squamae concolorous with fringe, yellow ..... **phragmitidis** Nowakowski
*Widespread with food-plant. Host:* Phragmites communis, *larva forming long, shallow mine, pupating in leaf; puparium black, elongate at rear.*
– Smaller species, wing not more than 2·1 mm.; last section of $M_{3+4}$ only slightly less than twice length of penultimate; 2 ori; margin of squamae and fringe variable, either entirely white or slightly darker, ochrous to brownish ..... 10

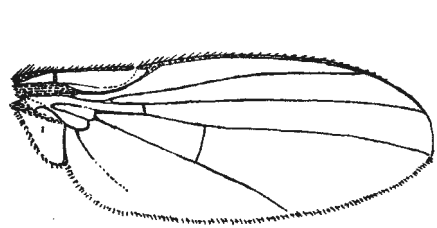
10 Aedeagus with broadening of distal tubules short (fig. 351) **deschampsiae** Spencer
*Middx.: Scratch Wood* (*G. C. D. Griffiths*); *Cambs.: Chippenham Fen. Uncommon. Host:* Deschampsia caespitosa (*in Poland and Germany also found on* Calamagrostis canescens), *larva pupating in mine; puparium brown, with distinctive hind spiracles* (fig. 352).
— Aedeagus with broadened end of distal tubules longer (fig. 353) ..... **atra** (Meigen)
*Kent: Otford*, 2 ♂, 2.viii.58; *Surrey: Box Hill*, 4 ♀, 31.v.60; *probably widespread. Host: Gramineae, species not known.*

## Subgenus **Icteromyza** Hendel

*Icteromyza* Hendel, 1931. Type of subgenus: *Agromyza geniculata* Fallén, 1823*a*.

This small group is readily recognizable by the following combination of characters:

Antennae widely separated, lunule normally semicircular, frons yellowish (in British species); ocellar triangle extended, at least in outline, and frequently reaching margin of lunule; wings slender, discal cell large; abdomen long and slender.



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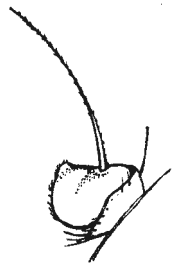

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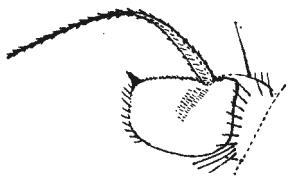

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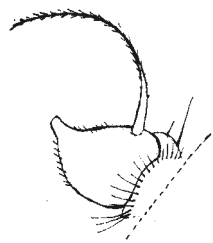

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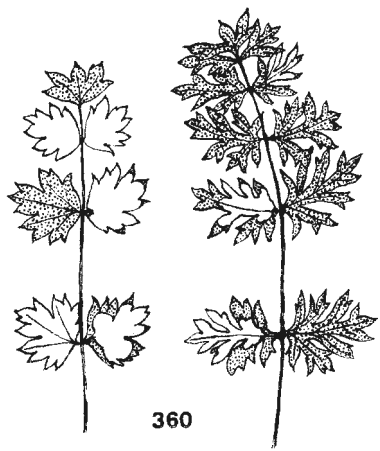

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FIG. 354.—*Cerodontha* (*Ict.*) *capitata*: wing.
FIG. 355.—*C.* (*Xenophytomyza*) *atronitens*: third antennal segment.
FIG. 356.—*C.* (*Xen.*) *biseta*: third antennal segment.
FIG. 357.—*C.* (*Cer.*) *denticornis*: third antennal segment.
FIG. 358.—*C.* (*Cer.*) *hennigi*: third antennal segment.
FIG. 359.—Leaf-mine of *Agromyza* sp. on *Filipendula ulmaria*.
FIG. 360.—Leaf-mines of *Phytomyza* sp. on *Pimpinella saxifraga*.

Four species are now known in Britain, two—*Ict. bohemanni* (Rydén) and *Ict. lineella* (Zett.)—representing additions to the British list. The host is only known of *Ict. geniculata* (Fall.) and this feeds inside the stem of *Eriophorum*.

KEY TO SPECIES

1 Palps black; large species, wing 3·5 mm. (fig. 354) ..... **capitata** (Zetterstedt)
*Oxford: Eynsham*, 1 ♂, 2.vii.10 (*J. E. Collin*); *Herts.: Welwyn*, 1 ♀, viii.27 (*F. W. Edwards*); *Dorset; Somerset; Cornwall: St. Boswell's*, 2 ♂, 22.vii.04 (*J.W.*); *Derby.: Goyt Valley*, 1 ♂, 2 ♀, 18–20.vii.39 (*F. W. Edwards*); *Cumberland: Grasmere, White Moss*, 1 ♂, 30.vi.36 (*J. Smart*); *Scotland: Aberdeen., Den of Pitlurg*, 1 ♀, 17.vii.36; *Moray., Elgin, Culbin Sandhills*, 1 ♀, 2.vii.33 *and* 1 ♂, 5–7.vii.36 (*all R. L. Coe*); *Ireland: Co. Cork, Tober Ghobnatan*, 1 ♀, 28.vi.69; *Co. Kerry: Killarney*, 1 ♂, 1 ♀, 2.vii.69 (*all P. J. Chandler*). *Widespread. Holarctic. Host: possibly* Juncus *but this requires confirmation; flies are frequently caught on this plant but intensive searching has failed to reveal larvae or puparia.*
– Palps yellow; smaller species, wing up to 2·75 mm. ..... 2
2 Third antennal segment black, small, round; coxae black; eye bare **geniculata** (Fallén)
*Bucks.: Burnham Beeches*, 1 ♀, 27.viii.67 (*P. J. Chandler*); *Hereford.: Moccas Pool*, 1 ♂, 2 ♀, 6.viii.13 (*J. E. Collin*). *Uncommon. Host:* Eriophorum latifolium (*Poland*), *larva forming leaf-mine and pupating in leaf.*
– Third antennal segment from bright yellow (male) to dark brown (female), large, round; at least fore coxae yellow ..... 3
3 Eye conspicuously pilose; fore femora yellow in distal half (= *hirticeps* Hendel) **lineella** (Zetterstedt)
*Cornwall: St. Boswell's*, 1 ♂, 22.vii.04 (*J.W.*); *Yorks: Burnley-in-Wharfedale*, 1 ♀, July 1899 (*P.H.G.*). *Uncommon. Host unknown.*
– Eye bare; fore femora broadly yellow but for not more than distal third **bohemanni** (Rydén)
*Hereford.: Moccas Pool*, 4 ♂, 3 ♀, 6.viii.13 (*J. E. Collin*). *Uncommon. Host unknown.*

## Subgenus **Xenophytomyza** Frey

*Xenophytomyza* Frey, 1946. Type of subgenus: *Haplomyza atronitens* Hendel, 1920.
Small, entirely black species; third antennal segment angulate (figs. 355, 356); scutellum with only 2 bristles.

Two common British species are known in this small subgenus. Although no specimens have been bred, it is virtually certain that the larvae feed on Gramineae, probably in the leaf-sheath, where the mines are not readily visible.

KEY TO SPECIES

1 Costa ending midway between $R_{4+5}$ and $M_{1+2}$; second cross-vein normally absent, if present (sometimes on one wing only) last section of $M_{3+4}$ 2–2½ times length of penultimate; third antennal segment with conspicuous angle at upper corner (fig. 355); wing from 1·8–2·5 mm. ..... **atronitens** (Hendel)
*Widespread in south; Scotland: Banff., Glen of Drumloch*, 1 ♂, 10.vii.36 (*R. L. Coe*); *Dunbarton., Cardross*, 2 ♂, 15 *and* 19.vii.07 (*J. R. Malloch*). *Host: unknown but certainly Gramineae.*
– Costa fully developed to $M_{1+2}$; second cross-vein present, last section of $M_{3+4}$ shorter, less than twice length of penultimate; third antennal segment less conspicuously angulate (fig. 356); somewhat larger species, wing from 2·25–2·5 mm. ..... **biseta** (Hendel)
*Widespread in south; N. Wales: Denbigh., Cefn-y-bedd* (*K.A.S.*); *Ireland, Co. Clare. Host: unknown but certainly Gramineae.*

## Subgenus **Cerodontha** Rondani

*Cerodontha* Rondani, 1861. Type of subgenus: *Chlorops denticornis* Panzer, 1806.

Distinctive characters of this subgenus are:

Third antennal segment with conspicuous spine (fig. 357) or distinctly angulate (fig. 358); scutellum with only 2 bristles; frons yellow; wing and abdomen slender.

This is a small but homogeneous group, occurring throughout the world from the Yukon Territory in northern Canada to southern Australia. Three species occur in Britain, including the very common spring species, *C. denticornis* (Pz.). This feeds inside the leaf-sheath of grasses; the host and biology of *C. fulvipes* (Mg.) is unconfirmed but will almost certainly prove to be similar.

### Key to Species

1 Acr entirely lacking; frons yellow, third antennal segment black, with conspicuous spine at upper corner (fig. 357); mesonotum either matt black or yellowish behind; mesopleura black or yellow; scutellum black or partially yellow; wing 1·8–2·5 mm. ..... **denticornis** (Panzer)

*Widespread from the south to Scotland; most northerly record Outer Hebrides, Lewis: Melbost,* 11.vi.62 *(Broomfield & Vardy); Ireland: Co. Clare, Co. Mayo. Hosts: Gramineae, including* Alopecurus pratensis, Agropyron repens, Festuca gigantea, F. pratensis, Holcus lanatus *and* Phalaris arundinacea*; larva mines from leaf into leaf-sheath where pupation takes place.*

*This species is notable for its colour variation. The darkest form has been described as* nigroscutellata *Strobl and the palest as* semivittata *Strobl. In the majority of specimens the coloration is intermediate. The darkest forms are normally found in the spring and early summer from April to June, the palest from June to September.*

– Acr present ..... 2

2 Mesonotum and scutellum shining black; third antennal segment with fine spine; acr in 2 rows; mesopleura black; wing 1·7–2·6 mm.

(= *femoralis* Zetterstedt) **fulvipes** (Meigen)

*Widespread in south; Ireland: Co. Clare; Scotland: Aberdeen., Den of Pitlurg,* 1 ♂, 1 ♀, 17.vii.36 *(R. L. Coe); Inverness., Feshie Bridge,* 1 ♂, 1 ♀, 1.vii.33 *(R. L. Coe). Host:* Poa trivialis, *possibly other Gramineae.*

– Mesonotum and scutellum matt-black; third antennal segment with blunt angle at upper corner (fig. 358); acr in 4 rows; mesopleura black with upper margin yellow; large species, wing 2·75–4 mm.

(= *lateralis* (Zetterstedt)) **hennigi** Nowakowski

*Hunts.: Woodwalton Fen,* 1 ♀, vi.39 *(F. W. Edwards); Suffolk: Barton Mills; Oxford.: Hall Copse,* 6 ♂, 5 ♀, 2.vii.34 *and* 25.vii.39 *(J. E. Collin); Cambs.: Chippenham Fen,* 1 ♀, 5.vi.30 *(J. E. Collin). Host:* Calamagrostis epigejos *(L.) Roth.*

## Mines of Unidentified Species

COMPOSITAE

*Bellis perennis* L. Devon: Sharpitor, Bolt Head, 17.ix.54 (*K.A.S.*). Irregular linear mines, frass in scattered strips, puparia black. *Phytomyza bellidina* Hering, 1935, is known from the Mediterranean area mining *Bellis* but in this species the frass is in distinct lumps and the mine ends with the appearance of a blotch. *P. simmi* Beiger, 1960, was described from Poland on the same host, in which the mines more closely resemble those from Devon, but the British species cannot be satisfactorily identified until adults can be obtained.

DIPSACACEAE

*Succisa pratensis* Moench. Griffiths (1963 : 145) found unidentified puparia in stems of this host at Woodwalton Fen, 7.x.61. The species concerned is probably *Ophiomyia rostrata* (Hendel) or *O. longilingua* (Hendel). Neither has been bred in Britain.

ROSACEAE

*Filipendula ulmaria* L. Linear mines (fig. 359) of a species which is probably distinct from *Agromyza spiraeae* Kalt. are not uncommon on this host. However, it has not yet been possible to confirm differences between the adults of this species and *A. spiraeae* (cf. Hering in Spencer, 1968 : 303).

UMBELLIFERAE

*Pimpinella saxifraga* L. Yorks.: nr. Settle, 30.vii.62 (*G.C.D. Griffiths*). Whitish blotch mines (brown when old) of a *Phytomyza* sp., possibly referable to *Phytomyza pauli-loewi* Hendel, 1920 (fig. 360).

*Smyrnium olusatrum* L. Ireland: Co. Wexford, Rosslare, 4.viii.70 (*K.A.S.*). Linear mines (empty) of a *Phytomyza* sp. The only Agromyzid known on this host is *Phytomyza smyrnii* Spencer, 1954d, described from Portugal. The mines from Rosslare do not entirely agree with those of *P. smyrnii* and the identity of this species must remain in doubt until adults can be obtained.

## Host-Plants of British Agromyzidae

Families and genera in the dicotyledons are arranged alphabetically, as it is felt that this will facilitate reference by entomologists who may not be familiar with current botanical classification.

The larval feeding habit is indicated as follows: F, seed-feeder (flower-head); G, gall-causer; L, leaf-miner; LM, leaf-miner associated with mid-rib (intermediate with stem-feeding); R, root-feeder; SB, stem-borer; SM, stem-miner; T, tree-feeder, in trunk or branches.

### Pteridophyta

| | | |
|---|---|---|
| EQUISETACEAE | | |
| *Equisetum arvense* L. | *Liriomyza bruscae* Hg. | L |
| | *Liriomyza equiseti* de Meij. | L |
| *Equisetum fluviatile* L. | *Liriomyza virgo* (Zett.) | SM |
| POLYPODIACEAE | | |
| *Asplenium ruta-muraria* L. | *Phytomyza scolopendri* R.-D. | L |
| *Phyllitis scolopendrium* (L.) Newn. (= *Scolopendrium vulgare* Sm.) | *Phytomyza scolopendri* R.-D. | L |
| *Polypodium vulgare* L. | *Pteridomyza hilarella* (Zett.) | L |
| | *Phytomyza scolopendri* R.-D. | L |
| *Pteridium aquilinum* (L.) Kuhn | *Pteridomyza hilarella* (Zett.) | L |

### Spermatophyta

| | | |
|---|---|---|
| ANGIOSPERMAE | | |
| DICOTYLEDONEAE | | |
| AQUIFOLIACEAE | | |
| *Ilex aquifolium* L. | *Phytomyza ilicis* Curt. | L |
| BALSAMINACEAE | | |
| *Impatiens noli-tangere* L. | *Liriomyza melampyga* (Lw.) | L |
| *Impatiens parviflora* DC. | *Liriomyza melampyga* (Lw.) | L |
| BETULACEAE | | |
| *Alnus incana* (L.) Moench | *Agromyza alnivora* Sp. | L |
| *Betula pubescens* Ehrh. | *Agromyza alnibetulae* Hd. | L |
| BORAGINACEAE | | |
| *Borago officinalis* L. | *Agromyza abiens* Zett. | L |
| *Cynoglossum officinale* L. | *Agromyza abiens* Zett. | L |
| *Echium vulgare* L. | *Agromyza abiens* Zett. | L |
| *Lithospermum officinale* L. | *Agromyza lithospermi* Sp. | L |
| *Myosotis palustris* L. | *Agromyza myosotidis* Kalt. | L |
| | *Phytomyza myosotica* Now. | L |
| *Myosotis sylvatica* Ehrh. | *Phytomyza myosotica* Now. | L |
| *Myosotis* spp. | *Agromyza pseudorufipes* Now. | L |
| *Pentaglottis sempervirens* (L.) Tausch | *Agromyza abiens* Zett. | L |
| | *Agromyza myosotidis* Kalt. | L |
| *Symphytum officinale* L. | *Agromyza abiens* Zett. | L |
| | *Agromyza ferruginosa* Wulp | L |
| | *Agromyza myosotidis* Kalt. | L |
| | *Melanagromyza symphyti* Griff. | LM,SB |
| | *Phytomyza symphyti* Hd. | L |

| | | |
|---|---|---|
| **BUDDLEJACEAE** | | |
| *Buddleja davidii* Franch. | *Amauromyza* (*Trilobomyza*) *verbasci* (Bché.) | L |
| **CAMPANULACEAE** | | |
| *Campanula glomerata* L. | *Phytomyza campanulae* Hd. | L |
| *Campanula persicifolia* L. | *Ophiomyia heringi* Starý | SM |
| *Campanula rotundifolia* L. | *Amauromyza* (*Campanulomyza*) *gyrans* (Fall.) | L |
| | *Phytomyza campanulae* Hd. | L |
| *Campanula trachelium* L. | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza campanulae* Hd. | L |
| *Jasione montana* L. | *Ophiomyia heringi* Starý | SM |
| | *Napomyza hirticornis* Hd. | SB |
| *Phyteuma spicatum* L. | *Ophiomyia heringi* Starý | SM |
| **CANNABINACEAE** | | |
| *Humulus lupulus* L. | *Agromyza flaviceps* Fall. | L |
| | *Agromyza igniceps* Hd. | L |
| **CAPRIFOLIACEAE** | | |
| *Lonicera periclymenum* L. | *Paraphytomyza hendeliana* (Hg.) | L |
| | *Paraphytomyza lonicerae* (R.-D.) | L |
| | *Phytomyza aprilina* Gour. | L |
| | *Phytomyza harlemensis* Wey. | L |
| | *Phytomyza periclymeni* de Meij. | L |
| *Sambucus nigra* L. | *Liriomyza amoena* (Mg.) | L |
| *Symphoricarpos rivularis* Suksdorf | *Paraphytomyza hendeliana* (Hg.) | L |
| | *Paraphytomyza lonicerae* (R.-D.) | L |
| | *Phytomyza harlemensis* Wey. | L |
| | *Phytomyza periclymeni* de Meij. | L |
| **CARYOPHYLLACEAE** | | |
| *Dianthus* spp. | *Amauromyza* (*Trilobomyza*) *flavifrons* (Mg.) | L |
| *Lychnis flos-cuculi* L. | *Ophiomyia melandricaulis* Hg. | SM |
| *Lychnis* spp. | *Amauromyza* (*Trilobomyza*) *flavifrons* (Mg.) | L |
| *Melandrium album* (Weig.) | *Amauromyza* (*Trilobomyza*) *flavifrons* (Mg.) | L |
| *Melandrium rubrum* (Weig.) | *Ophiomyia melandricaulis* Hg. | SM |
| Garcke | *Ophiomyia melandryi* de Meij. | SM |
| | *Amauromyza* (*Trilobomyza*) *flavifrons* (Mg.) | L |
| *Moehringia trinervia* (L.) Clairv. | *Ophiomyia melandricaulis* Hg. | SM |
| *Saponaria officinalis* L. | *Amauromyza* (*Trilobomyza*) *flavifrons* (Mg.) | L |
| *Silene* spp. | *Amauromyza* (*Trilobomyza*) *flavifrons* (Mg.) | L |
| *Stellaria holostea* L. | *Amauromyza* (*Trilobomyza*) *flavifrons* (Mg.) | L |

| | | |
|---|---|---|
| CHENOPODIACEAE | | |
| *Chenopodium album* L. | *Amauromyza* (*Cephalomyza*) *chenopodivora* Sp. | SB |
| *Beta vulgaris* L. | *Amauromyza* (*Trilobomyza*) *flavifrons* (Mg.) | L |
| *Spinacia oleracea* L. | *Amauromyza* (*Trilobomyza*) *flavifrons* (Mg.) | L |
| COMPOSITAE | | |
| *Achillea millefolium* L. | *Melanagromyza dettmeri* Hg. | SB |
| | *Ophiomyia curvipalpis* (Zett.) | SM |
| | *Liriomyza millefolii* Hg. | L |
| | *Liriomyza flavopicta* Hd. | SM |
| | *Phytomyza matricariae* Hd. | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Achillea ptarmica* L. | *Liriomyza ptarmicae* de Meij. | L |
| | *Phytomyza corvimontana* Hg. | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Anthemis cotula* L. | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Anthemis* sp. | *?Ophiomyia curvipalpis* (Zett.) | SM |
| | *Napomyza lateralis* (Fall.) | SB,F |
| *Arctium lappa* L. | *Melanagromyza lappae* (Lw.) | SB |
| | *Phytomyza lappae* Gour. | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Arctium minus* (Hill) Bernh. | *Melanagromyza lappae* (Lw.) | SB |
| | *Phytomyza lappae* Gour. | L |
| *Arctium vulgare* (Hill) A. H. Evans | *Phytomyza lappae* Gour. | L |
| *Arnoseris minima* (L.) Schweigg. & Koerte | *Phytomyza syngenesiae* (Hardy) | L |
| *Artemisia absinthium* L. | *Liriomyza strigata* (Mg.) | L |
| *Artemisia vulgaris* L. | *Melanagromyza dettmeri* Hg. | SB |
| | *Calycomyza artemisiae* (Kalt.) | L |
| | *Liriomyza artemisicola* de Meij. | L |
| | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza artemisivora* Sp. | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Aster novae-angliae* L. | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Aster* spp. | *Liriomyza eupatorii* (Kalt.) | L |
| | *Liriomyza pusilla* (Mg.) | L |
| *Aster tripolium* L. | *Melanagromyza tripolii* Sp. | SB |
| | *Calycomyza humeralis* (Roser) | L |
| | *Napomyza tripolii* Sp. | SB |
| | *Phytomyza asteris* Hd. | L |

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| *Bellis perennis* L. | *Calycomyza humeralis* (Roser) | L |
| | *Liriomyza orbona* (Mg.) | L |
| | *Liriomyza pusilla* (Mg.) | L |
| | *Napomyza bellidis* Griff. | LM |
| | *Phytomyza* sp. | L |
| *Bidens tripartitus* L. | *Napomyza lateralis* (Fall.) | SB |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Calendula officinalis* L. | *Napomyza lateralis* (Fall.) | SB |
| *Centaurea cyanus* L. | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza syngenesiae* (Hardy) | L |
| *Centaurea nigra* L. | *Melanagromyza dettmeri* Hg. | SB |
| | *Liriomyza centaureae* Hg. | L |
| | *Liriomyza strigata* (Mg.) | L |
| | *Napomyza hirticornis* Hd. | SB |
| | *Phytomyza autumnalis* Griff. | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Centaurea scabiosa* L. | *Melanagromyza dettmeri* Hg. | SB |
| | *Phytomyza cinerea* Hd. | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Chrysanthemum argyrophyllum* Ling | *Phytomyza syngenesiae* (Hardy) | L |
| *Chrysanthemum leucanthemum* L. | *Melanagromya eupatorii* Sp. | SB |
| | *Phytomyza leucanthemi* Hg. | L |
| | *Phytomyza syngenesiae* (Hardy) | L |
| *Chrysanthemum* sp. | *Liriomyza tanaceti* de Meij. | L |
| *Cicerbita macrophylla* (Willd.) Wallr. | *Liriomyza strigata* (Mg.) | L |
| *Cichorium intybus* L. | *Ophiomyia pinguis* (Fall.) | LM |
| | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Cirsium arvense* (L.) Scop. | *Melanagromyza aeneoventris* (Fall.) | SB |
| | *Phytomyza autumnalis* Griff. | L |
| | *Phytomyza cirsii* Hd. | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Cirsium dissectum* (L.) Hill | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza autumnalis* Griff. | L |
| *Cirsium heterophyllum* (L.) Hill | *Phytomyza rydeniana* Hg. | L |
| *C. palustre* (L.) Scop. | *Melanagromyza aeneoventris* (Fall.) | SB |
| | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza autumnalis* Griff. | L |
| | *Phytomyza cirsii* Hd. | L |

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| *C. vulgare* (Savi) Ten. | *Melanagromyza aeneoventris* (Fall.) | SB |
| | *Phytomyza autumnalis* Griff. | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Cirsium* spp. | *Liriomyza soror* Hd. | |
| *Crepis biennis* L. | *Ophiomyia cunctata* (Hd.) | LM |
| | *Ophiomyia heringi* Starý | SM |
| | *Ophiomyia pulicaria* (Hd.) | LM |
| *Dahlia* spp. | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza horticola* Gour. | L |
| *Dimorphotheca* sp. | *Napomyza lateralis* (Fall.) | SM |
| *Echinops banaticus* Rochel | *Phytomyza bipunctata* Lw. | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Echinops commutatus* Juratzka | *Phytomyza bipunctata* Lw. | L |
| *Erigeron canadensis* L. | *Calycomyza humeralis* (Roser) | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Eupatorium cannabinum* L. | *Melanagromyza eupatorii* Sp. | SB |
| | *Calycomyza artemisiae* (Kalt.) | L |
| | *Liriomyza eupatoriana* Sp. | L |
| | *Liriomyza eupatorii* (Kalt.) | L |
| | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza eupatorii* Hd. | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Gnaphalium sylvaticum* L. | *Ophiomyia gnaphalii* Hg. | SM |
| *Helianthus annuus* L. | *Liriomyza strigata* (Mg.) | L |
| *Helianthus* spp. | *Liriomyza eupatorii* (Kalt.) | L |
| *Hieracium pilosella* L. | *Ophiomyia pulicaria* (Hd.) | LM |
| | *Phytomyza analis* Zett. | LM |
| *Hieracium umbellatum* L. | *Melanagromyza dettmeri* Hg. | SB |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Hieracium vulgatum* (Fr.) Almq. | *Liriomyza hieracii* (Kalt.) | L |
| *Hypochoeris radicata* L. | *Ophiomyia heringi* Starý | SM |
| | *Ophiomyia pulicaria* (Hd.) | LM |
| | *Phytomyza cecidonomia* ssp. *britannica* Griff. | LM |
| *Inula conyza* DC. | *Melanagromyza eupatorii* Sp. | SB |
| | *Phytomyza conyzae* Hd. | L |
| *Inula crithmoides* L. | *Phytomyza syngenesiae* (Hardy) | L |
| *va xanthifolia* Nutt. | *Liriomyza strigata* (Mg.) | L |
| *actuca bourgae* Irish & Taylor (Kew) | *Liriomyza strigata* (Mg.) | L |
| *Lactuca* sp. (cult.) | *Phytomyza syngenesiae* (Hardy) | L |
| *Lapsana communis* L. | *Ophiomyia cunctata* (Mg.) | LM |
| | *Ophiomyia heringi* Starý | SM |

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| | *Liriomyza eupatorii* (Kalt.) | L |
| | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza marginella* Fall. | L |
| *Leontodon autumnalis* L. | *Ophiomyia pulicaria* (Hd.) | LM |
| | *Liriomyza taraxaci* Hg. | L |
| | *Phytomyza farfarella* Hd. | L |
| *Leontodon* spp. | *Ophiomyia beckeri* (Hd.) | LM |
| | *Ophiomyia pinguis* (Fall.) | L |
| *Matricaria maritima* L. ssp. *inodora* (L.) Clapham | *Phytomyza matricariae* Hd. | L |
| | *Napomyza lateralis* (Fall.) | SB, F |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Matricaria* sp. | *?Ophiomyia curvipalpis* (Zett.) | SM |
| *Petasites hybridus* (L.) Gaertn., Mey. & Scherb. | *Phytomyza tussilaginis* Hd. | L |
| *Picris hieracioides* L. | *Ophiomyia pulicaria* (Hd.) | LM |
| *Picris* sp. | *Phytomyza marginella* Fall. | L |
| *Pulicaria dysenterica* (L.) Bernh. | *Phytomyza conyzae* Hd. | L |
| *Senecio aquaticus* Hill | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Senecio cruentus* DC. | *Phytomyza syngenesiae* (Hardy) | L |
| *Senecio erucifolius* L. | *Melanagromyza dettmeri* Hg. | SB |
| | *Ophiomyia senecionina* Hg. | SM |
| | *Liriomyza erucifolii* de Meij. | L |
| *Senecio jacobaea* L. | *Melanagromyza aeneoventris* (Fall.) | SB |
| | *Melanagromyza dettmeri* Hg. | SB |
| | *Melanagromyza eupatorii* Sp. | SB |
| | *Ophiomyia senecionina* Hg. | SM |
| | *Liriomyza erucifolii* de Meij. | L |
| | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza alpina* Groschke | L |
| | *Phytomyza syngenesiae* (Hardy) | L |
| *Senecio squalidus* L. | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Senecio sylvaticus* L. | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Senecio vulgaris* L. | *Napomyza lateralis* (Fall.) | SM |
| *Serratula quinquefolia* Bieb. | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Serratula tinctoria* L. | *Phytomyza syngenesiae* (Hardy) | L |
| *Solidago canadensis* L. | *Liriomyza pusilla* (Mg.) | L |
| | *Nemorimyza posticata* (Mg.) | L |
| *Solidago virgaurea* L. | *Ophiomyia maura* (Mg.) | L |
| | *Liriomyza eupatorii* (Kalt.) | L |
| | *Liriomyza pusilla* (Mg.) | L |
| | *Nemorimyza posticata* (Mg.) | L |
| | *Phytomyza solidaginis* Hd. | L |

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| | *Phytomyza virgaureae* Hd. | L |
| *Sonchus arvensis* L. | *Ophiomyia pulicaria* (Hd.) | LM |
| | *Liriomyza sonchi* Hd. | L |
| *S. asper* (L.) Hill | *Ophiomyia cunctata* (Hd.) | LM |
| | *Ophiomyia pulicaria* (Hd.) | LM |
| | *Liriomyza sonchi* Hd. | L |
| | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza syngenesiae* (Hardy) | L |
| *Sonchus oleraceus* L. | *Ophiomyia beckeri* (Hd.) | LM |
| | *Liriomyza sonchi* Hd. | L |
| | *Liriomyza strigata* (Mg.) | L |
| | *Phytoliriomyza arctica* (Lund.) | SM |
| | *Phytomyza marginella* Fall. | L |
| | *Phytomyza syngenesiae* (Hardy) | L |
| *Sonchus palustris* L. | *Liriomyza sonchi* Hd. | L |
| | *Phytomyza* sp. (*syngenesiae* group) | L |
| *Tanacetum vulgare* L. | *Liriomyza tanaceti* de Meij. | L |
| | *Phytomyza matricariae* Hd. | L |
| | *Phytomyza syngenesiae* (Hardy) | L |
| | *Phytomyza tanaceti* Hd. | L |
| *Taraxacum officinale* agg. | *Ophiomyia beckeri* (Hd.) | LM |
| | *Ophiomyia cunctata* (Hd.) | LM |
| | *Ophiomyia pulicaria* (Hd.) | LM |
| | *Liriomyza strigata* (Mg.) | L |
| | *Liriomyza taraxaci* Hd. | L |
| | *Phytomyza farfarella* Hd. | L |
| | *Phytomyza marginella* Fall. | L |
| | *Phytomyza taraxacocecis* Hg. | LM |
| *Tragopogon pratensis* L. | *Liriomyza tragopogonis* de Meij. | L |
| *Tussilago farfara* L. | *Phytomyza tussilaginis* Hd. | L |
| CONVOLVULACEAE | | |
| *Ipomoea* sp. (cult.) | *Liriomyza strigata* (Mg.) | L |
| CORNACEAE | | |
| *Cornus sanguinea* L. | *Phytomyza agromyzina* Mg. | L |
| CRASSULACEAE | | |
| *Sedum telephium* L. | *Phytomyza sedicola* Hg. | L |
| CRUCIFERAE | | |
| *Alliaria petiolata* (Bieb.) Cavara & Grande (= *officinalis* Bieb.) | *Ophiomyia alliariae* Hg. | SM |
| *Brassica nigra* (L.) Koch | *Phytomyza horticola* Gour. | L |
| *Brassica* spp. | *Phytomyza rufipes* Mg. | L |
| *Cardaria draba* (L.) Desv. (= *Lepidium Draba* L.) | *Phytomyza horticola* Gour. | L |
| *Capsella bursa-pastoris* (L.) Medic. | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza horticola* Gour. | L |
| *Cheiranthus cheiri* L. | *Phytomyza horticola* Gour. | L |
| *Hesperis matronalis* L. | *Phytomyza horticola* Gour. | L |

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| *Sisymbrium ussoanum* Losc. & Pard. (Kew) | *Phytomyza horticola* Gour. | L |
| CUCURBITACEAE | | |
| *Cucumis sativus* L. | *Liriomyza bryoniae* (Kalt.) | L |
| DIPSACACEAE | | |
| *Dipsacus fullonum* L. | *Agromyza dipsaci* Hd. | L |
| | *Phytomyza nigritella* Zett. | LM |
| *Knautia arvensis* (L.) Coult. | *Paraphytomyza similis* (Bri.) | L |
| | *Phytomyza nigritella* Zett. | LM |
| *Scabiosa columbaria* L. | *Phytomyza scabiosae* Hd. | L |
| *Succisa pratensis* Moench | *?Ophiomyia* sp. | SM |
| | *?Paraphytomyza similis* (Bri.) | L |
| | *Phytomyza nigritella* Zett. | LM |
| | *Phytomyza succisae* Hd. | L |
| EUPHORBIACEAE | | |
| *Euphorbia amygdaloides* L. | *Liriomyza pascuum* (Mg.) | L |
| GENTIANACEAE | | |
| *Centaurium minus* Moench | *Phytomyza gentianae* Hd. | L |
| *Blackstonia perfoliata* (L.) Huds. | *Phytomyza gentianae* Hd. | L |
| GERANIACEAE | | |
| *Geranium* spp. | *Agromyza nigrescens* Hd. | L |
| LABIATAE | | |
| *Ajuga reptans* L. | *Amauromyza* (*Trilobomyza*) *labiatarum* (Hd.) | L |
| *Ballota nigra* L. | *Amauromyza* (*Amauromyza*) *morionella* (Zett.) | L |
| | *Amauromyza* (*Tril.*) *labiatarum* (Hd.) | L |
| *Clinopodium vulgare* L. (= *Calamintha vulgaris* (L.) Druce | *Ophiomyza labiatarum* Hg. | SM |
| | *Phytomyza obscura* Hd. | L |
| *Galeobdolon luteum* L. | *Amauromyza* (*Tril.*) *labiatarum* (Hd.) | L |
| *Galeopsis tetrahit* L. | *Liriomyza eupatorii* (Kalt.) | L |
| | *Liriomyza strigata* (Mg.) | L |
| | *Phytomyza horticola* Gour. | L |
| *Glechoma hederacea* L. | *Phytomyza glechomae* Kalt. | L |
| *Lamium album* L. | *Agromyza flavipennis* Hd. | L |
| | *Ophiomyia labiatarum* Hg. | SM |
| | *Amauromyza* (*Tril.*) *labiatarum* (Hd.) | L |
| | *Liriomyza strigata* (Mg.) | L |
| *Lamium rubrum* L. | *Ophiomyia labiatarum* Hg. | SM |
| | *Amauromyza* (*Tril.*) *labiatarum* (Hd.) | L |
| *Marrubium vulgare* L. | *Amauromyza* (*Amauromyza*) *morionella* (Zett.) | L |
| *Mentha aquatica* L. | *Phytomyza tetrasticha* Hd. | L |
| *Mentha longifolia* (L.) Huds. | *Phytomyza tetrasticha* Hd. | L |

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| *Mentha rotundifolia* (L.) Huds. | *Phytomyza tetrasticha* Hd. | L |
| *Mentha spicata* L. emend. Huds. | *Phytomyza petoei* Hg. | L |
| *Mentha* sp. | *?Napomyza scrophulariae* Sp. | SB |
| *Origanum vulgare* L. | *Phytomyza origani* Hg. | L |
| *Stachys palustris* L. | *Ophiomyia labiatarum* Hg. | SM |
| *Stachys sylvatica* L. | *Ophiomyia labiatarum* Hg. | SM |
| *Stachys* spp. | *Amauromyza* (*Tril.*) *labiatarum* (Hd.) | L |
| *Teucrium scorodonia* L. | *Amauromyza* (*Tril.*) *labiatarum* (Hd.) | L |
| MALVACEAE | | |
| *Althaea rosea* Cav. | *Liriomyza strigata* (Mg.) | L |
| *Lavatera aborea* L. | *Phytomyza horticola* Gour. | L |
| *Malva sylvestris* L. | *Phytomyza horticola* Gour. | L |
| OLEACEAE | | |
| *Fraxinus excelsior* L. | *Paraphytomyza heringi* (Hd.) | L |
| OROBANCHACEAE | | |
| *Orobanchia* spp. | *Phytomyza orobanchia* Kalt. | SB, F |
| PAPAVERACEAE | | |
| *Papaver* sp. | *Phytomyza horticola* Gour. | L |
| PAPILIONACEAE | | |
| *Anthyllis vulneraria* L. | *Phytomyza vulnerariae* Sp. | L |
| *Galega officinalis* L. (Kew) | *Liriomyza congesta* (Beck.) | L |
| *Genista aetnensis* DC. (cult.) | *Agromyza johannae* de Meij. | L |
| *Genista tinctoria* L. | *Agromyza pulla* Mg. | L |
| | *Agromyza johannae* de Meij. | L |
| *Laburnum anagyroides* Medic. | *Agromyza demeijerei* Hd. | L |
| | *Phytomyza cytisi* Bri. | L |
| *Lathyrus latifolius* L. | *Agromyza lathyri* Hd. | L |
| | *Agromyza varicornis* Str. | L, SM |
| *Lathyrus montanus* (L.) Bernh. | *Liriomyza congesta* (Beck.) | L |
| *Lathyrus pratensis* L. | *Liriomyza congesta* (Beck.) | L |
| *Lathyrus sylvestris* L. | *Agromyza varicornis* Str. | L, SM |
| *Lathyrus* spp. | *Liriomyza pisivora* Hg. | L |
| *Lotus corniculatus* L. | *Melanagromyza cunctans* (Mg.) | G |
| *Lupinus* sp. | *Liriomyza strigata* (Mg.) | L |
| *Medicago sativa* L. | *Agromyza frontella* Rond. | L |
| | *Agromyza nana* Mg. | L |
| | *?Ophiomyia curvipalpis* (Zett.) | SM |
| | *Liriomyza congesta* (Beck.) | L |
| *Melilotus officinalis* (L.) Lam. | *Agromyza nana* Mg. | L |
| | *Liriomyza congesta* (Beck.) | L |
| *Ononis spinosa* L. | *Liriomyza cicerina* (Rond.) | L |
| *Pisum sativum* L. | *Agromyza lathyri* Hd. | L |
| | *Ophiomyia orbiculata* (Hd.) | SM |
| | *Liriomyza congesta* (Beck.) | L |
| | *Liriomyza pisivora* Hg. | L |
| | *Phytomyza horticola* Gour. | L |

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| *Sarothamnus scoparius* (L.) Wimmer | *Hexomyza sarothamni* (Hd.) | G |
| *Trifolium pratense* L. | *Agromyza johannae* de Meij. | L |
| *Trifolium repens* L. | *Agromyza nana* Mg. | L |
| | *Agromyza nana* Mg. | L |
| | *Liriomyza congesta* (Beck.) | L |
| *Ulex europaeus* L. | *Agromyza johannae* de Meij. | L |
| *Vicia cracca* L. | *Agromyza bicophaga* Hg. | L |
| | *Agromyza erythrocephala* Hd. | G |
| | *Agromyza marionae* Griff. | SM |
| | *Liriomyza congesta* (Beck.) | L |
| *Vicia faba* L. | *Melanagromyza* sp. n. | R |
| | *Liriomyza congesta* (Beck.) | L |
| *Vicia sepium* L. | *Agromyza felleri* Hering | L |
| | *Liriomyza congesta* (Beck.) | L |
| | *Phytomyza horticola* Gour. | L |
| *Vicia sylvatica* L. | *Agromyza marionae* Griff. | SM |
| *Vicia* spp. | *Agromyza vicifoliae* Hg. | L |
| | *Ophiomyia orbiculata* (Hd.) | SM |
| | *Liriomyza congesta* (Beck.) | L |
| PLANTAGINACEAE | | |
| *Plantago coronopus* L. | *Phytomyza plantaginis* R.-D. | L |
| *Plantago lanceolata* L. | *Phytomyza plantaginis* R.-D. | L |
| *Plantago major* L. | *Phytomyza plantaginis* R.-D. | L |
| *Plantago maritima* L. | *Phytomyza plantaginis* R.-D. | L |
| *Plantago media* L. | *Phytomyza griffithsi* Sp. | L |
| POLYGALACEAE | | |
| *Polygala vulgaris* L. | *Liriomyza polygalae* Hg. | L |
| PRIMULACEAE | | |
| *Primula veris* L. | *Phytomyza primulae* Hd. | L |
| *Primula vulgaris* Huds. | *Phytomyza primulae* Hd. | L |
| RANUNCULACEAE | | |
| *Aconitum* spp. (cult.) | *Phytomyza aconiti* Hd. | L |
| *Anemone nemorosa* L. | *Phytomyza anemones* Hg. | L |
| | *Phytomyza hendeli* Hg. | L |
| *Aquilegia vulgaris* L. | *Ophiomyia aquilegiana* Lundq. | SM |
| | *Phytomyza aquilegiae* Hardy | L |
| | *Phytomyza krygeri* Hg. | F |
| | *Phytomyza minuscula* Gour. | L |
| *Caltha palustris* L. | *Phytomyza calthivora* Hg. | L |
| | *Phytomyza calthophila* Hd. | L |
| *Clematis vitalba* L. | *Phytomyza clematidis* Kalt. | F |
| | *Phytomyza fulgens* Hd. | L |
| | *Phytomyza vitalbae* Kalt. | L |
| *Delphinium* spp. (cult.) | *Phytomyza aconiti* Hd. | L |
| *Ranunculus acris* L. | *Ophiomyia ranunculicaulis* Hg. | SM |
| | *Phytomyza cineracea* Hd. | SB |
| | *Phytomyza evanescens* Hd. | SB |
| | *Phytomyza fallaciosa* Bri. | L |
| | *Phytomyza notata* Mg. | L |

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| | *Phytomyza ranunculi* (Schrk.) | L |
| | *Phytomyza ranunculivora* Hg. | L |
| | *Phytomyza rydeni* Hg. | L |
| *Ranunculus ficaria* L. | *Phytomyza ranunculi* (Schrk.) | L |
| *Ranunculus flammula* L. | *Phytomyza ranunculi* (Schrk.) | L |
| *Ranunculus lanuginosus* L. | *Phytomyza cineracea* Hd. | SB |
| | *Phytomyza evanescens* Hd. | SB |
| *Ranunculus lingua* L. | *Phytomyza ranunculi* (Schrk.) | L |
| *Ranunculus repens* L. | *Phytomyza cineracea* Hd. | SB |
| | *Phytomyza fallaciosa* Bri. | L |
| | *Phytomyza notata* Mg. | L |
| | *Phytomyza ranunculi* (Schrk.) | L |
| *Thalictrum flavum* L. | *Ophiomyia aquilegiana* Lundq. | SM |
| | *Phytomyza minuscula* Gour. | L |
| ROSACEAE | | |
| *Agrimonia eupatoria* L. | *Agromyza spiraeae* Kalt. | L |
| *Crataegus* sp. | *Phytobia carbonaria* (Zett.) | T |
| *Filipendula ulmaria* (L.) Maxim. | *Agromyza spiraeae* Kalt. | L |
| | *Agromyza sulfuriceps* Str. | L |
| | *Agromyza* sp. | L |
| *Filipendula vulgaris* Moench | *Agromyza spiraeae* Kalt. | L |
| *Fragaria vesca* L. | *Agromyza spiraeae* Kalt. | L |
| | *Agromyza spiraeae* Kalt. | L |
| *Geum urbanum* L. | *Agromyza spiraeae* Kalt. | L |
| *Malus sylvestris* (L.) Mill. | *Phytomyza heringiana* Hd. | L |
| *Malus* sp. | *Phytobia carbonaria* (Zett.) | T |
| *Potentilla anserina* L. | *Agromyza spiraeae* Kalt. | L |
| *Potentilla erecta* (L.) Räusch. | *Agromyza spiraeae* Kalt. | L |
| *Potentilla palustris* (L.) Scop. | *?Agromyza sulfuriceps* Str. | L |
| *Potentilla* spp. | *Agromyza sulfuriceps* Str. | L |
| *Prunus cerasifera* Ehrh. | *Phytobia cerasiferae* (Kangas) | T |
| *Rubus idaeus* L. | *Agromyza spiraeae* Kalt. | L |
| | *Agromyza sulfuriceps* Str. | L |
| *Rubus parviflorus* Nutt. | *Agromyza spiraeae* Kalt. | L |
| *Sanguisorba officinalis* L. | *Agromyza spiraeae* Kalt. | L |
| | *Agromyza sulfuriceps* Str. | L |
| RUBIACEAE | | |
| *Asperula odorata* L. | *Liriomyza morio* (Bri.) | L |
| *Galium aparine* L. | *Paraphytomyza anteposita* (Str.) | SM |
| | *Paraphytomyza orphana* (Hd.) | SM |
| *Galium mollugo* L. | *Ophiomyia galii* Hg. | SM |
| | *Paraphytomyza buhri* (de Meij.) | SM |
| | *Paraphytomyza trivittata* (Lw.) | SM |
| *Galium* spp. | *Liriomyza morio* (Bri.) | L |
| SALICACEAE | | |
| *Populus alba* L. | *Agromyza albitarsis* Mg. | L |
| *Populus nigra* L. | *Agromyza albitarsis* Mg. | L |
| | *Hexomyza schineri* (Gir.) | G |
| | *Paraphytomyza populi* (Kalt.) | L |
| | *Paraphytomyza populicola* (Hd.) | L |

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|---|---|---|
| *Populus tremula* L. | *Agromyza albitarsis* Mg. | L |
| | *Hexomyza schineri* (Gir.) | G |
| | *?Phytobia cambii* (Hd.) | T |
| *Salix alba* L. | *Paraphytomyza tridentata* (Lw.) | L |
| *Salix caprea* L. | *Hexomyza simplicoides* (Hd.) | G |
| | *Paraphytomyza langei* (Hg.) | L |
| *Salix repens* L. | *Agromyza albitarsis* Mg. | L |
| *Salix viminalis* L. | *Paraphytomyza tridentata* (Lw.) | L |
| *Salix* spp. | *Phytobia cambii* (Hd.) | T |
| SCROPHULARIACEAE | | |
| *Digitalis purpurea* L. | *Napomyza scrophulariae* Sp. | SB, F |
| *Euphrasia brevipila* Burnat & Gremli | *Phytomyza affinis* Fall. | F |
| *Euphrasia micrantha* Rchb. | *Phytomyza affinis* Fall. | F |
| *Euphrasia nemorosa* (Pers.) H. Mart. emend. Löhr, var. *collina* Pugsl. | *Phytomyza affinis* Fall. | F |
| *Odontites verna* (Bell.) Dum. (= *Bartsia odontites* (L.) Huds.; *O. rubra* Gilib.) | *Phytomyza isais* Hering | F |
| *Pedicularis palustris* L. | *Phytomyza tenella* Mg. | F |
| *Rhinanthus calcareus* Wilmott | *Phytomyza varipes* Macq. | F |
| *Rhinanthus minor* Ehrh. | *Phytomyza varipes* Macq. | F |
| *Scrophularia aquatica* L. | *Amauromyza* (*Trilobomyza*) *verbasci* (Bché.) | L |
| *Scophularia nodosa* L. | *Amauromyza* (*Trilobomyza*) *verbasci* (Bché.) | L |
| | | L |
| | *?Napomyza scrophulariae* Sp. | SB |
| *Verbascum thapsus* L. | *Amauromyza* (*Trilobomyza*) *verbasci* (Bché.) | L |
| *Verbascum* sp. | *?Napomyza scrophulariae* Sp. | SB |
| *Veronica chamaedrys* L. | *Phytomyza crassiseta* Zett. | L |
| *Veronica montana* L. | *Phytomyza crassiseta* Zett. | L |
| *Veronica officinalis* L. | *Phytomyza crassiseta* Zett. | L |
| SOLANACEAE | | |
| *Atropa belladonna* L. | *Liriomyza bryoniae* (Kalt.) | L |
| *Lycopersicum esculentum* Mill. | *Liriomyza bryoniae* (Kalt.) | L |
| TROPAEOLACEAE | | |
| *Tropaeolum major* L. | *Phytomyza horticola* Gour. | L |
| UMBELLIFERAE | | |
| *Aegopodium podagraria* L. | *Phytomyza obscurella* Fall. | L |
| *Angelica sylvestris* L. | *Melanagromyza angeliciphaga* Sp. | SB |
| | *Liriomyza lutea* (Mg.) | F |
| | *Phytomyza angelicae* Kalt. | L |
| | *Phytomyza angelicastri* Hg. | L |
| | *Melanagromyza sativae* Sp. | SB |
| *Anthriscus sylvestris* (L.) Bernh. | *Napomyza* sp. | SB |
| | *Phytomyza chaerophylli* Kalt. | L |

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| *Astrantia* sp. (Kew) | *Phytomyza spondylii* R.-D. | L |
| *Chaerophyllum temulum* L. | *Phytomyza chaerophylli* Kalt. | L |
| *Conium maculatum* L. | *Phytomyza conii* Hg. | L |
| *Conopodium majus* (Gouan) Lor. & Barr. | *Phytomyza chaerophylli* Kalt. | L |
| *Daucus carota* L. | *Phytomyza chaerophylli* Kalt. | L |
| *Heracleum mantegazianum* Somm. & Lev. | *Phytomyza spondylii* R.-D. | L |
| *Heracleum sphondylium* L. | *Melanagraomyza angeliciphaga* Sp. | SB |
| | *Ophiomyia heracleivora* Sp. | SM |
| | *Phytomyza heracleana* Hg. | L |
| | *Phytomyza spondylii* R.-D. | L |
| | *Phytomyza sphondyliivora* Sp. | L |
| *Hydrocotyle vulgaris* L. | *Liriomyza strigata* (Mg.) | L |
| *Pastinaca sativa* L. | *Melanagromyza angeliciphaga* Sp. | SB |
| | *Melanagromyza sativae* Sp. | SB |
| | *Liriomyza lutea* (Mg.) | F |
| | *Phytomyza spondylii* R.-D. | L |
| *Pimpinella major* (L.) Huds. | *Melanagromyza sativae* Sp. | SB |
| | *Phytomyza adjuncta* Hg. | L |
| | *Phytomyza pimpinellae* Hd. | L |
| *Pimpinella saxifraga* L. | *Phytomyza adjuncta* Hg. | L |
| | *Phytomyza melana* Hd. | L |
| | *Phytomyza* sp., near *pauli-loewi* Hd. | L |
| *Sanicula europaea* L. | *Phytomyza brunnipes* Bri. | L |
| *Silaum silaus* (L.) Schinz & Thell. | *Melanagromyza nibletti* Sp. | SB |
| | *?Phytomyza adjuncta* Hg. | L |
| | *Phytomyza silai* Hg. | L |
| *Sison amomum* L. | *?Phytomyza chaerophylli* Kalt. | L |
| *Smyrnium olusatrum* L. | *Phytomyza* sp., nr. *smyrnii* Sp. | L |
| *Torilis japonica* (Houtt.) DC. | *Melanagromyza sativae* Sp. | SB |
| | *?Phytomyza chaerophylli* Kalt. | L |
| URTICACEAE | | |
| *Urtica dioica* L. | *Agromyza anthracina* Mg. | L |
| | *Agromyza pseudoreptans* Now. | L |
| | *Agromyza reptans* Fall. | L |
| | *Melanagromyza aenea* (Mg.) | SB |
| | *Phytomyza flavicornis* Fall. | SB |
| VALERIANACEAE | | |
| *Kentranthus ruber* (L.) DC. | *Liriomyza strigata* (Mg.) | L |
| *Valeriana dioica* L. | *Liriomyza valerianae* Hd. | L |
| *Valeriana officinalis* L. | *Liriomyza strigata* (Mg.) | L |
| | *Liriomyza valerianae* Hd. | L |
| VERBENACEAE | | |
| *Verbena officinalis* L. | *Amauromyza* (*Trilobomyza*) *labiatarum* (Hd.) | L |

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| VIOLACEAE | | |
| *Viola* spp. | *Metopomyza violiphaga* (Hd.) | L |
| MONOCOTYLEDONEAE | | |
| CYPERACEAE | | |
| *Carex acutiformis* Ehrh. | *Cerodontha* (*Diz.*) *caricicola* (Hg.) | L |
| | *Cerodontha* (*Diz.*) *eucaricis* Now. | L |
| *Carex pendula* L. | *Cerodontha* (*Diz.*) *angulata* (Lw.) | L |
| | *Cerodontha* (*Diz.*) *caricicola* (Hg.) | L |
| *Carex pseudocyperus* L. | *Cerodontha* (*Diz.*) *caricicola* (Hg.) | L |
| | *Cerodontha* (*Diz.*) *eucaricis* Now. | L |
| *Carex* spp. | *Cerodontha* (*Diz.*) *suturalis* (Hd.) | L |
| | *Metopomyza flavoscutellaris* (Zett.) | L |
| | *Metopomyza xanthaspis* (Lw.) | L |
| *Eriophorum latifolium* Hoppe (in Poland) | *Cer.* (*Ict.*) *geniculata* (Fall.) | L, SB |
| *Scirpus sylvaticus* L. | *Cerodontha* (*Diz.*) *scirpi* (Karl) | L, SB |
| GRAMINEAE | | |
| *Agropyron caninum* (L.) Beauv. | *Agromyza nigrociliata* Hd. | L |
| *Agropyron repens* (L.) Beauv. | *Cerodontha* (*Phytag.*) *flavocingulata* (Strobl) | L |
| | *Cerodontha* (*Po.*) *lateralis* (Macq.) | L |
| | *Cerodontha* (*Po.*) *superciliosa* (Zett.) | L |
| | *Cerodontha* (*Cer.*) *denticornis* (Pz.) | L |
| *Agrostis stolonifera* L. | *Cerodontha* (*Phytag.*) *flavocingulata* (Strobl) | L |
| *Alopecurus pratensis* L. | *Cerodontha* (*Cer.*) *denticornis* (Pz.) | L |
| *Ammophila arenaria* (L.) Link | *Cerodontha* (*Po.*) *superciliosa* (Zett.) | L |
| *Arrhenaterum elatius* (L.) J. & C. Presl | *Agromyza albipennis* Hd. | L |
| | *Agromyza nigrociliata* Hd. | L |
| | *Agromyza rondensis* Str. | L |
| | *Liriomyza pusio* (Mg.) | L |
| | *Phytomyza nigra* Mg. | L |
| *Arrhenatarum* spp. | *Liriomyza phryne* Hd. | L |
| *Avena sativa* L. | *Agromyza ambigua* Fall. | L |
| | *Pseudonapomyza atra* (Mg.) | L |
| *Brachypodium sylvaticum* (Huds.) Beauv. | *Cerodontha* (*Po.*) *pygmaea* (Mg.) | L |
| | *Phytomyza nigra* Mg. | L |
| *Bromus arvensis* L. | *Cerodontha* (*Po.*) *incisa* (Mg.) | L |
| *Bromus villosus* Forsk. | *Agromyza rondensis* Str. | L |

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| *Bromus* spp. | *Cerodontha* (*Po.*) *pygmaea* (Mg.) | L |
| | *Liriomyza flaveola* (Fall.) | L |
| *Calamagrostis canescens* (Weber) Roth | *Cerodontha* (*Po.*) *muscina* (Mg.) | L |
| | *Phytomyza nigra* Mg. | L |
| *Calamagrostis epigejos* (L.) Roth | *Agromyza rondensis* Str. | L |
| | *Cerodontha* (*Po.*) *incisa* (Mg.) | L |
| | *Cerodontha* (*Cer.*) *hennigi* Now. | L |
| *Calamagrostis* spp. | *Cerodontha* (*Po.*) *muscina* (Mg.) | L |
| *Ceratochloa unioloides* (Willd.) Beauv. (= *Bromus catharticus* auct.) | *Agromyza bromi* Sp. | L |
| *Dactylis glomerata* L. | *Agromyza cinerascens* Macq. | L |
| | *Agromyza nigrella* Rond. | L |
| | *Agromyza rondensis* Strobl | L |
| | *Cerodontha* (*Phytag.*) *flavocingulata* (Strobl) | L |
| | *Cerodontha* (*Po.*) *pygmaea* (Mg.) | L |
| | *Liriomyza flaveola* (Fall.) | L |
| | *Phytomyza nigra* Mg. | L |
| *Deschampsia caespitosa* (L.) Beauv. | *Agromyza lucida* Hd. | L |
| | *Cerodontha* (*Po.*) *deschampsiae* Sp. | L |
| | *Cerodontha* (*Po.*) *pygmaea* (Mg.) | L |
| *Deschampsia flexuosa* (L.) Trin. | *Liriomyza pedestris* Hd. | L |
| *Festuca gigantea* (L.) Vill. | *Cerodontha* (*Cer.*) *denticornis* (Pz.) | L |
| *Festuca pratensis* Huds. | *Cerodontha* (*Cer.*) *denticornis* (Pz.) | L |
| *Festuca rubra* L. | *Phytomyza nigra* Mg. | L |
| *Festuca* spp. | *Agromyza nigrella* Rond. | L |
| | *Cerodontha* (*Phytag.*) *flavocingulata* (Strobl) | L |
| | *Cerodontha* (*Po.*) *pygmaea* (Mg.) | L |
| *Glyceria fluitans* (L.) R.Br. | *Agromyza nigrella* Rond. | L |
| | *Agromyza nigripes* Mg. | L |
| *Glyceria maxima* (Hartm.) Holmb. | *Agromyza alunulata* (Hd.) | L |
| | *Agromyza lucida* Hd. | L |
| | *Agromyza nigripes* Mg. | L |
| *Hierochloe odorata* (L.) Beauv. | *Cerodontha* (*Po.*) *muscina* (Mg.) | L |
| *Hierochloe* sp. | *Phytomyza milii* Kalt. | L |
| *Holcus lanatus* L. | *Agromyza nigrella* Rond. | L |
| | *Agromyza nigripes* Mg. | L |
| | *Cerodontha* (*Phytag.*) *flavocingulata* (Strobl) | L |
| | *Cerodontha* (*Cer.*) *denticornis* (Pz.) | L |
| | *Liriomyza phryne* Hd. | L |
| | *Liriomyza flaveola* (Fall.) | L |
| | *Phytomyza nigra* Mg. | L |

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| *Holcus mollis* L. | *Agromyza nigripes* Mg. | L |
| | *Liriomyza flaveola* (Fall.) | L |
| *Hordeum murinum* L. | *Agromyza albipennis* Mg. | L |
| | *Agromyza nigrociliata* Hd. | L |
| *Hordeum vulgare* L. | *Agromyza albipennis* Mg. | L |
| | *Agromyza rondensis* Str. | L |
| | *Phytomyza milii* Kalt. | L |
| *Lolium perenne* L. | *Agromyza nigrella* Rond. | L |
| | *Cerodontha* (*Po.*) *incisa* (Mg.) | L |
| | *Pseudonapomyza atra* (Mg.) | L |
| *Milium effusum* L. | *Phytomyza milii* Kalt. | L |
| | *Phytomyza nigra* Mg. | L |
| *Molinia caerulea* (L.) Moench | *Cerodontha* (*Po.*) *?pygmaea* (Mg.) | L |
| *Phalaris arundinacea* L. | *Agromyza albipennis* Mg. | L |
| | *Cerodontha* (*Po.*) *phalaridis* Now. | L |
| | *Cerodontha* (*Po.*) *incisa* (Mg.) | L |
| | *Cerodontha* (*Cer.*) *denticornis* (Pz.) | L |
| | *Pseudonapomyza atra* (Mg.) | L |
| | *Phytomyza nigra* Mg. | L |
| *Phleum* spp. | *Agromyza nigrella* Rond. | L |
| *Phragmites communis* Trin. | *Agromyza hendeli* Griff. | L |
| | *Agromyza phragmitidis* Hd. | L |
| | *Cerodontha* (*Po.*) *incisa* (Mg.) | L |
| | *Cerodontha* (*Po.*) *phragmitidis* Now. | L |
| *Poa annua* L. | *Phytomyza milii* Kalt. | L |
| *Poa compressa* L. | *Agromyza rondensis* Str. | L |
| *Poa trivialis* L. | *Agromyza rondensis* Str. | L |
| | *Cerodontha* (*Phytag.*) *flavocingulata* (Strobl) | L |
| | *Cerodontha* (*Cer.*) *fulvipes* (Mg.) | L |
| | *Phytomyza milii* Kalt. | L |
| | *Phytomyza nigra* Mg. | L |
| *Poa* spp. | *Agromyza albipennis* Mg. | L |
| | *Agromyza nigrella* Rond. | L |
| | *Liriomyza flaveola* (Fall.) | L |
| | *Pseudonapomyza atra* (Mg.) | L |
| | *Cerodontha* (*Diz.*) *crassiseta* (Zett.) | L |
| *Secale cereale* L. | *Agromyza ambigua* Fall. | L |
| | *Agromyza intermittens* Beck. | L |
| | *Agromyza nigrella* Rond. | L |
| | *Agromyza nigrociliata* Hd. | L |
| | *Agromyza rondensis* Str. | L |
| | *Pseudonapomyza atra* (Mg.) | L |
| | *Phytomyza nigra* Mg. | L |
| *Setaria* spp. | *Agromyza nigrella* Rond. | L |

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| *Trisetum flavescens* (L.) Beauv. | *Agromyza nigrella* Rond. | L |
| *Triticum aestivum* L. | *Agromyza mobilis* Mg. | L |
| (= *vulgare* Host.) | *Agromyza nigrella* Rond. | L |
| | *Agromyza nigrociliata* Hd. | L |
| | *Agromyza rondensis* Strobl | L |
| | *Cerodontha* (*Po.*) *lateralis* (Macq.) | L |
| | *Phytomyza nigra* Mg. | L |
| IRIDACEAE | | |
| *Iris foetidissima* L. | *Cerodontha* (*Diz.*) *iridis* (Hd.) | L |
| *Iris pseudacorus* L. | *Cerodontha* (*Diz.*) *ireos* (Gour.) | L |
| JUNCACEAE | | |
| *Juncus effusus* L. | *Cerodontha* (*Diz.*) *luctuosa* (Mg.) | L |
| *Luzula multiflora* (Retz.) Lej. | *Cerodontha* (*Diz.*) *bimaculata* (Mg.) | L |
| *Luzula pilosa* (L.) Willd. | *Cerodontha* (*Diz.*) *bimaculata* (Mg.) | L |
| | *Phytomyza luzulae* Hd. | L |
| JUNCAGINACEAE | | |
| *Triglochin maritima* L. | *Liriomyza angulicornis* (Mall.) | L |
| *Triglochin palustris* L. | *Liriomyza angulicornis* (Mall.) | L |
| LILIACEAE | | |
| *Allium sativum* L. | *Phytomyza horticola* Gour. | L |
| *Asparagus officinalis* L. | *Ophiomyia simplex* (Lw.) | SM |

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